UNIVERSITY COUNCIL
ACADEMIC PROGRAMS COMMITTEE
REQUEST FOR DECISION

PRESENTED BY: Susan Detmer, chair, Academic Programs Committee

DATE OF MEETING: June 18, 2020

SUBJECT: College of Engineering – Replacement program for the Bachelor of Science in Engineering (B.E.) program

DECISION REQUESTED:
It is recommended:
That Council approve the replacement program for the Bachelor of Science in Engineering (B.E.) program, effective May 2021.

PURPOSE:
University Council has the authority to approve major changes to an existing degree program.

CONTEXT AND BACKGROUND:
The College of Engineering is proposing a significant redesign of the first year of its Bachelor of Science in Engineering (B.E.) program. The first year of the B.E. program is taken by all students before they select their specific engineering discipline. This replacement program moves to an integrated model of instruction. While the technical content of the replacement program remains similar to the existing program and meets Canadian engineering accreditation requirements, the new program includes both Course Learning Outcomes specific to each course and Program Learning Outcomes which cut across multiple courses.

The new curriculum is more modular, collaborative, experiential and integrated. It is designed to ensure that students will learn prerequisite skills in one course before needing them in another and courses in the program will be linked through assignments, problem solving, and standards of performance and systems of assessment.

All B.E. programs at USask are accredited through the Canadian Engineering Accreditation Board and the change to the first year curriculum ensures that all eight programs still meeting accreditation requirements.

The College of Engineering consulted broadly both internally and externally in developing this replacement program, and specifically worked closely with the College of Arts and Science to develop courses or redesign courses to deliver as part of this new first year.
The academic programs committee reviewed this proposal at its May 27, 2020 meeting and were impressed with the scope of the change and the collaboration between the College of Engineering and the College of Arts and Science in the development and delivery of this redesign of the first-year program. The committee also commended the College of Engineering for the work it undertook in consulting with the Gwenna Moss Centre in its development of this program. The committee voted to recommend that Council approve this replacement program.

**FURTHER ACTION REQUIRED:**
Changes to tuition related to this change require approval through the processes defined in the *Tuition and Fees Authorization Policy*.

**ATTACHMENTS:**

1. Proposal for Academic and Curricular Change – First Year Redesign in Engineering
Memorandum

To: Dr. Susan Detmer, Chair, Academic Programs Committee of Council
From: Dr. Bruce Sparling, Associate Dean Academic, College of Engineering
       Dr. Gordon DesBrisay, Vice Dean Academic, College of Arts and Science
Date: May 12, 2020
Subject: Joint Submission - Proposed Revision to First-Year Engineering Curriculum and New Arts and Science Courses

Dr. Detmer:

We are pleased to jointly present the proposal for a revised first-year Engineering curriculum and the accompanying new courses in the College of Arts and Science. Through consultation with representatives from the Office of the University Secretary and Registrar’s Office it was determined that these should be submitted to the Academic Programs Committee of Council together.

The consultation process for the proposed changes was extensive, as outlined in the proposal. In the College of Engineering, the proposal was recommended for approval by the Undergraduate Academic Programs Committee at their meeting on March 9, 2020, and received college-level approval from the Engineering Faculty Council on May 12, 2020. In the College of Arts & Science, the new courses were circulated in the January 2020 College Challenge, and received college-level approval from the Academic Programs Committee (B.Sc.) on January 16, 2020. The Arts & Science Faculty Council was informed of this approval at their meeting on February 4, 2020.

The College of Engineering would like to take this opportunity to thank the College of Arts and Science for their ongoing support and unprecedented collaboration on this project.

Please do not hesitate to contact either of us directly should you have any further comments, questions, or concerns.

Sincerely,

Bruce Sparling, Ph.D., P. Eng., FCSCE
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College of Engineering
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Gordon DesBrisay, Ph.D.
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College of Arts and Science
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PROPOSAL IDENTIFICATION

Title of proposal: First Year Redesign in Engineering

Degree(s): Bachelor of Science in Engineering (B.E.)

Field(s) of Specialization: Chemical, Civil, Computer, Electrical, Environmental, Geological, Mechanical Engineering and Engineering Physics

Degree College: College of Engineering

Contact person(s) (name, telephone, fax, e-mail):

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Email: engr.academicdean@usask.ca

Proposed date of implementation: September 2021
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1. Academic justification:

“The rapidly evolving role of the engineering profession in society requires an engineering graduate with a more diverse and robust skill set than ever before”. In 2016-2017 the College of Engineering embarked on a complete redesign of its Common First Year curriculum. “This project started from a blank slate and posed the question, “If we could design any first year program that we wanted, what would we create?” The goal is to offer a first year program that excites, engages, inspires, and holistically prepares students for learning in subsequent years”. To read more about the Vision, Mission, Values and Delivery Strategy for this project please see Appendix A.

This project is also outlined in the College’s 2018-2025 Strategic Plan. The following Commitment is listed under the Strategic Pillar: Teaching and Learning, “Implement a revised first-year engineering program that will be recognized as the most innovative and effective program in Canada”. Ties to the University Plan can also be seen particularly through the “Courageous Curiosity” and “Boundless Collaboration” sections of the framework. This change to the Common First Year curriculum of the Bachelor of Engineering programs at USask is a useful addition to the University because it is designed to enhance student learning, to increase student enrollment and to enhance the reputation of the College and the University with its unique structure and design objectives (see Appendix B for the Structural Model).

An analysis of 17 first year engineering programs, common program or mechanical (for direct entry), from across Canada was conducted in the early stages of the development of this redesign. Institutions included provincial, Western Canadian and a number of U15 comparators from across the country. The analysis was conducted using online course catalogues and conducting a comparison of relative weightings of each subject (by contact hours). In addition, innovative delivery ideas were also sought out.

Findings from this analysis show that the proposed program will:

- move from below average to well above average, in terms of contact hours, on subjects such as Professionalism, Design and Communication;
- provide an enhanced focus on transferable skills that employers are actively looking for;
- bring us in line with other Canadian institutions with the inclusion of computer programming to first year;

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- provide a more balanced inclusion of the fundamentals of engineering science between mechanics, electrical circuits and process engineering, an improvement over both our current first year program and other programs in Canada;
- provide students with an opportunity to experience five engineering disciplines through meaningful one day experiences as part of the Engineering Discipline Experience course prior to submitting their discipline choices for acceptance into a major at the end of first year;
- allow for a calculated reduction in the percentage of overall hours spent directly on math due to the integrated curriculum and the fact that math skills will be immediately applied in other courses;
- allow for increased confidence in students’ understanding of the basics, as a result of competency-based assessment, as they transition to upper years;
- provide a calculated reduction in subjects like business, humanities and social sciences by deferring them until upper years when students will likely make a more informed choice of elective(s); and
- introduce a new course that contextualizes the profession in Indigenous Culture in a way that appears to be unique in Canada.

Many of the changes to the Common First Year curriculum will make it distinct in Canada. The proposed changes also see a program that is “modular, allowing for intentional uses of time during the academic year. Course duration and intensity vary and are selected to best serve student learning, rather than conform to the traditional academic schedule”\(^3\). For a more detailed description of the structure please see the paper in Appendix D.

### 2. Admissions

**College admission**

The College of Engineering offers direct entry into the Bachelor of Science in Engineering program. High school, post-secondary, and special (mature) applicants apply for admission into an undeclared first year of engineering studies. Students are then required to apply into one of eight upper-year majors at the end of their first year of engineering studies. They are ranked based on an average generated from a set of first-year courses. In turn, they are admitted into upper-year majors on a competitive basis.

The proposed redesign of the Common First Year curriculum does not suggest changing any aspects of College admission policies, procedures, or criteria.

The proposal does, however, recognize that the students arriving to first year are not homogenous, and have different qualities, depths, and breadths of training. The proposal

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introduces online “Summer Top Ups”, which will set an attainable minimum standard for basic knowledge and skills across a number of fields i.e. algebra, physics, writing, reading, chemistry, and Indigenous People’s histories. Those at or above the standard will quickly and easily be able to show their readiness for first year. For those with one or more areas of weakness, they will have an opportunity to develop competence so that first year instructors can proceed knowing that all students have the same base knowledge and skills in those areas.

The College of Engineering Strategic Enrolment Management Plan (2018-2023) written by the Strategic Enrolment Management Project Steering Committee listed this first year redesign as one of the medium term strategic priorities for the College. The proposed program has been developed with the College’s enrollment goals in mind, such as increased gender diversity, indigenous representation, and internationalization in the undergraduate student body.

“Our goal is to provide a welcoming learning environment in which students of any gender, race, ethnicity, religion, identity or background can work hard and succeed in becoming an engineer”.4

Program admission

It can be expected that the proposed redesign of the Common First Year curriculum will lead to changes in the program admission requirements.

Current program admission policy requires its departments define which suite of courses will be used in generating a program admission average. Following the receipt of all applications to the engineering disciplines, the College of Engineering will rank undergraduate applications, on the basis of a program admission average, from highest to lowest.

In establishing a departmental program admission policy, departments within the College of Engineering are required to identify a minimum of 24 credit units that will be used to calculate a program admission average for students wishing to gain entry into an engineering discipline. The following eight courses have been used to generate a program admission average and rank prospective students for admission into the eight engineering programs: CHEM 114, GE 111, GE 121, GE 124, GE 125, MATH 123, MATH 124, and PHYS 155.

This set of eight courses will be replaced with new courses. Use of these courses for program admission will be established by the departments as per the Program Admission Policy:

Defining Entrance Requirements For Engineering Disciplines, for the minimum number of credit units that will be used to calculate the a program admission requirement.

Once the departmental program admission policy (or criteria) has been identified, and to ensure transparency, the College of Engineering will ensure that the program admission policies are formalized and made accessible to the public.

Communications/Recruitment

Discussions have taken place within the College and with the UofS Central Recruitment team regarding a communications and recruitment plan regarding the redesign of the first year curriculum. A brief overview of the plan can be seen in Appendix E. In addition, a search is currently underway for a Recruitment Officer (24 month term with possibility of extension). This position is joint with Central Student Recruitment and it will focus strategically on initiatives and activities related to the recruitment of domestic, international and Indigenous undergraduate Engineering students, maximizing stakeholder awareness of the benefits of an Engineering degree and the college’s unique first-year Engineering program design.

3. Description of the program

Ultimately “the overarching learning objective is to better prepare students to make a good vocational choice, whether that be engineering generally, or their discipline, specifically”. The curricular objectives of the Common First Year curriculum are to prepare the students to transition to second year and their major “well-equipped with knowledge (facts and concepts), skills (demonstrable abilities), experiences (meaningful applications of skills), and attitudes/beliefs (adoptable philosophies), or KSEA.” The redesign of the Common First Year curriculum consists of three phases:

- Phase I - determine the required first year graduate attributes (complete)
- Phase II – development of program/curriculum structure and delivery methods (nearing completion)
- Phase III – detailed course design (in progress).

To read in detail about the process to determine the required first year graduate attributes please see Appendix C. Two types of learning outcomes were identified for the redesign Common First Year curriculum: Course Learning Outcomes, specific to each course and more technical in nature, and Program Learning Outcomes, which cut across multiple courses and are more transferable in nature. To see examples of Program Learning Outcomes please see Appendix F. The technical content in the proposed curriculum remains fairly similar to the


existing curriculum and is well defined by Canadian engineering accreditation requirements. The proposed curriculum will include elements of interest to all 8 disciplines/majors and will better prepare students for summer jobs after the first year of study.

The redesign of the Common First Year has resulted in a curriculum that is more modular, collaborative, and experiential in nature. The general teaching philosophy is one of deep integration. This will manifest itself in students learning prerequisite skills in one course (just) before they need them in another. It will involve linking courses through assignments, formats of problem solving, standards of performance, and terminology/systems of assessment. Appendix B shows the Structural Model for the proposed Common First Year. This structure has facilitated several design objectives such as a strategic sequencing of learning allowing for integration and reinforcement of essential skills, multiple and individualized opportunities for students to stumble and recover, a focus on holistic balancing of content and student well-being, and comprehensive exposure to the wide range of programmatic choices for students.\(^7\)

The mission for the First Year Redesign Project includes multiple references to encouraging and helping facilitate a healthy life balance, both physically and psychologically, for students. Throughout the design process this has been incorporated in various aspects such as:

- Summer Top Ups provide entering students an opportunity to start their program feeling better prepared academically and Fall and Winter Top Ups allow students additional opportunities to demonstrate competence on key learning outcomes so that they can recover from minor academic stumbles;
- End of day “tutorials” provide specific support for those students who need it occasionally or a structured space to study and complete assignments for those that find that valuable;
- Assessment research indicates the approach taken by the redesigned first-year program is supportive of increased student wellness (see Appendix H);
- The daily schedule of lectures and labs runs from 8:30 to 4, providing a predictable schedule familiar to students entering the program directly from high-school and the shared lunch break allows for student group meetings, physical activity, etc.;
- Physical and social activities will be encouraged through an extracurricular passport concept;
- Considerable hours are dedicated to providing students with a tool kit for success in engineering in GE102, including developing a growth mindset, self-assessment, time management, study skills, and awareness of support services available (academic, career and personal).

The proposed program is designed to holistically prepare students for the challenges to come in later years.\(^8\)


Sustainability has also been carefully considered and integrated into the proposed program where possible. The introduction to the profession courses (GE 102 and GE 103) introduce students to the impact the profession has on society (touching on all three pillars of sustainability) and to the Code of Ethics they must follow, which holds paramount the health and welfare of the public and the environment. The two design courses also introduce the idea of sustainability as an ever-important design objective to the students. The College of Engineering wishes to provide their first-year students with broad exposure to four of the Natural Science disciplines in the College of Arts and Science (Biology, Chemistry, Geological Sciences, and Physics). This is to be achieved through short (1 cu) courses in each of these disciplines. Each of the four courses will be delivered in the Fall term. The four Science courses would seek some commonality in the topics delivered and so these courses will have a common theme about the “environment” and “climate change”, at least in the first few years as the theme can be shifted as needed. Finally, where possible, specific classes will utilize examples from sustainability. For example, Process Engineering may have some sort of focus on “green industry” to offset climate anxiety or a group design project in Circuits II might focus on building a small, renewable power system (likely solar).

The assessment system for the proposed redesigned Engineering courses will use a competency-based approach. Students will be required to show competency in foundational material and basic problem solving in all areas. They will be given multiple opportunities to do so. Their learning will also be tracked against course learning outcomes, which will be the basis for grade determinations. The new courses from the College of Arts and Science will use the standard assessment system for the first year of the new Common First Year; however, Arts and Science faculty will to continue to work with Engineering to adopt this new system in year two of the new Common First Year.

The proposed redesign of the Common First Year curriculum actively incorporates aspects of all five of the Learning Pursuits from the University Learning Charter. These are intertwined to ensure that students will possess all twelve of the graduate attributes required by the Canadian Engineering Accreditation Board for an accredited program. This can be clearly seen in the Vision, Mission, Values and Delivery Strategy for the project (Appendix A).

The College of Engineering has a strong student advising program in place with a number of successful initiatives already offered specifically for first year students. These include programs/services such as transition and extended orientation programs, weekly facilitated study sessions, integrated advising and coaching for first year students, Engineering Learning Communities and the Student Advise Recommender Agent (SARA). In addition they are working on a dedicated pro-active/at-risk advising program for their students. These specific initiatives targeted at first year students will be revised to fit into the proposed redesigned curriculum and new opportunities will be explored leading up to and beyond the implementation of the proposed curriculum changes.

As is the case now, students will be able to enter the new First Year from other programs. Indeed, they will be able to receive more specific credit for courses already taken. However,
there will be some unique courses that may not be available in other programs. As such, there will be a “half-speed” entry option where students can take a year to adjust to student life at UofS, while finishing the remaining elements of first year. In fact, if a student coming directly from high school (or coming from the working world, in the case of mature students), wants to “ramp up” to University life, they too can take first year in two stages. We anticipate that this will increase the likelihood of retention for such students.

Conversely, there is the issue of transferring out of the new first year. Through discussions with the College of Arts and Science, there is now agreement on course equivalencies for those who exit Engineering at the end of the Fall or Winter term in first year. Overall, the ability of students to retain credit for prior work will not be significantly worse or better than it is currently, although it will be slightly different. If a student exits at the end of the Fall term, there will be limited transfer credits available to them. If a student exits at the end of the Winter term, there will be significantly more transfer credits available to them. Computer Science and Business are a couple of options that tend to be more popular with students transferring out of Engineering and into other UofS programs. For these, prior to the Fall 2021 launch, we will develop materials that show how the proposed first year courses will likely count towards these options. Also, please see Appendix G for more information on course equivalencies.

It is our expectation that our new Common First Year curriculum will better prepare students for subsequent Engineering courses and work. To assess whether this expectation is met, and to what extent, we will begin assessing the current cohort of first year students against a wide variety of first year knowledge, skills, experiences, and attitudes, this year. We will repeat this assessment next year with the Fall 2020 cohort. We will continue doing this assessment indefinitely, while the new program is running. In this way, we plan to monitor how the new first year is more effective in preparing our students. We will also be able to monitor if any subsequent curriculum improvements are meeting their goals.

All eight Bachelor of Engineering programs at the University of Saskatchewan are accredited by the Canadian Engineering Accreditation Board. This has been looked at closely through the process of redesigning the Common First Year curriculum, ensuring that the changes still allow each program to meet the requirements. Changes to the Common First Year will also allow the College to track progress towards many of the twelve graduate attributes in a more comprehensive format through the Program Learning Outcomes mentioned above. These twelve graduate attributes form an important component of the accreditation process.

A significant amount of research, consultation, thought and iteration has gone into the process of redesigning the proposed new Common First Year curriculum for the College of Engineering (Please see Appendix H for a memo from Manager, Curriculum and Professional Development, Gwenna Moss Centre for Teaching and Learning). This redesign should better prepare students both technically and holistically and provide them with better bridging for the transition to their major.
4. Consultation

The intent of the proposed change is for the University of Saskatchewan’s College of Engineering to have the most effective first year engineering curriculum in Canada. The first year curriculum will excite, engage and inspire the students, and will holistically prepare them for the challenges to come in later years. Ultimately, it will also serve to enhance the reputation of the College and the University.

The College of Engineering consulted various stakeholders and governing bodies as part of the endorsement process for this proposal. It also conducted an analysis of 17 other first year engineering programs across Canada in the early stages of the process.

Within the College, there were extensive consultations with the faculty, staff and students in various forms, from department and faculty presentations, to town halls, to surveys, to specially formed committees. Internal consultation started with Phase I in 2017 with a focus on content and what everyone wants out of first year (the “first year graduate attributes”). This phase included several rounds of consultation with College faculty, staff and students. In Phase II (2018-2019) the focus was on the structural model and Phase III (2019-2021) is focused on actual course design and development.

Given that the proposal for curricular change affects other academic units on campus, the College of Arts and Science and the Edwards School of Business were consulted as part of the development of this proposal. The College of Arts and Science will play an integral role in the redesign, as they will deliver a number of courses, such as Math, Chemistry, Physics, and Computer Programming. The Edwards School of Business will no longer be involved in the first year Engineering curriculum.

For the past two years, the proposal has also been presented at the Canadian Engineering Education Association annual conference to validate the progress, solicit feedback and provoke national interest.

The following summarizes the breadth and depth of consultation completed to date.

**College of Engineering**

The proposed curricular changes were shared with faculty, staff and students in the College of Engineering in a variety of ways.

The College included students in the planning process and relied on their input collected through surveys and town hall meetings and presentations. Selected students in good standing participated in the Committee of the Student Advisors on Curriculum Development (CSACD).
The Design Committee organized and delivered a number of presentations and workshops. For example, in summer and fall 2019, the team conducted a round of departmental meetings (see Appendix I for sample presentation):

August 23, 2019  Department of Civil, Geological and Environmental Engineering
August 27, 2019  Department of Mechanical Engineering
Department of Chemical and Biological Engineering
September 3, 2019  Department of Electrical and Computer Engineering
Ron and Jane Graham School of Professional Development

Feedback and questions were collected and responded to either on the spot or in follow-up emails or reports with more details (see Appendix J). These meetings were in addition to numerous smaller meetings with Departmental and Undergraduate Chairs, and other pedagogical leaders in each program.

In 2019, a special Change Management Committee (CMC) was formed (with representatives from the Colleges of Engineering and Arts and Science, and the Gwenna Moss Center for Teaching and Learning). It has been chaired by a Special Advisor to the Provost to handle timelines, resources, and other issues related to implementing the new curriculum (Letter from the CMC Chair is attached as Appendix K). The Design Committee remains focused on learning outcomes, integration, and student needs. The Change Management and Design Committees have frequent and clear communication with each other, as do both colleges. Please see Appendix L for the Core and Extended Project Team structure and membership.

The timeline of the approval processes within the College of Engineering was the following:

February 10, 2020  Undergraduate Academic Planning Committee (UAPC) information meeting and discussion
March 9, 2020  UAPC vote
March 9, 2020  Faculty Council info meeting and discussion
April 15, 2020  UAPC meeting (for revisions)
May 12, 2020  Faculty Council vote.

**College of Arts & Science**

The proposal is based on the renewed cooperation with the College of Arts and Science (Letter from the Vice-Dean, Academic is attached as Appendix M). Leadership of the College of Arts and Science is involved in the Executive Committee and Change Management Committee. Dedicated faculty members from six departments are involved in the development of the courses that will be taught by the College of Arts and Science. The following departments were consulted and involved in the proposal: Physics and Engineering Physics, Geology, Biology, Chemistry, Mathematics and Statistics, and Computer Science.
In addition, a pair of facilitated retreats were held in early 2019 with leadership and key stakeholders from both Colleges. The retreats led to the creation of the Change Management Committee (CMC), separate from those individuals working on the design of the curriculum, but including the leadership from both Colleges. Through Fall 2019 a number of individual and small group meetings and a design workshop (in November) were held to work on the development of the Arts & Science syllabi related to this redesign (the multiple presentation packages for this design workshop can be shared upon request).

The Arts and Science courses are going through a separate approval process i.e. department approval is followed by the College challenge process. The approval for the Arts and Science courses was obtained in January 2020, and was confirmed by the Director of the Programs Office for the College (Appendix N).

**Edwards School Business**

The new first year engineering curriculum will no longer include the COMM 102: Introduction to Business Management course. That will have an impact on the Edwards School’s tuition revenue. The Edwards School of Business acknowledges the implications, but understands the change is in the interest of the students (Letter from the Associate Dean, Students and Degree Programs is attached as Appendix O). Consultation with the Edwards School of Business is ongoing to identify new opportunities for engineering students to enhance their business-related skills.

**University of Saskatchewan**

Considering the impact of the proposal on the operational costs of several Colleges, student tuition, space requirements, and logistical constraints, the College of Engineering has consulted with the Registrar’s Office on various topics and worked closely with the Senior Coordinator of Scheduling regarding the classroom space needs. The College has also requested feedback from the University Planning and Priorities Committee (see Appendix P for letter received). This feedback has been reviewed and additional information incorporated into this proposal to address the items raised.

The Office of the University Registrar was consulted as a part of the proposal approval process. In particular, a Consultation with the Registrar (CWR) form was drafted on March 18, 2020 and signed via email on March 25, 2020 (please Appendix Q for the CWR form). This process involved consultation with the University Registrar, the Senior Coordinator of Academic Programs and Catalogue, and a Functional Analyst from Student Information Systems.

The Office of the University Secretary was consulted during the development of this proposal. In particular, the Academic Programs & Student Appeals Coordinator was consulted to confirm approval timelines and details of the process of this proposal, which requires the approval of the Academic and Programs Committee and Board of Governors.
5. Budget

Budgetary implications of the proposed change are obviously significant, and not just due to its scale and uniqueness. That is why the budget analysis was done with special care, and included extensive discussions with department(s) responsible for delivery of the new modules regarding revisions that will be made to the teaching assignments, proposed credit units, lecture/lab balance, lab sizes, TA budgets, section overlaps, etc.

For budgetary projections presented here, the College of Engineering assumes enrolment of 600 first-year students, of which 15% are international; these numbers align with targets set in the College’s recent Strategic Enrolment Management Plan. Considering the current enrolment numbers (presented in the Appendix R) those assumptions are realistic and attainable. The financial projections also assume a retention rate of 80% for first year students, and 95% for upper year students, both of which are consistent with recent student performance statistics.

Scenario analyses for lower (as low as 300) and higher (650) first year enrolments were also conducted. These analyses demonstrated that the program is sustainable over the full range of possible enrolment levels; however, in keeping with our Strategic plan and efforts to diversify and grow our student body, we have used 600 first-year undergraduate students as the baseline level for the purpose of this proposal.

Summary of Changes

The proposal translates into the following projected net changes in tuition revenue for the College of Engineering, College of Arts and Science and Edwards School of Business:

Table 1: Budget summary of the proposed program (per College) based on 600 first-year students

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<th>Incremental Tuition Revenue</th>
<th>Engineering</th>
<th>Arts &amp; Science</th>
<th>Edwards</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$1,261,794</td>
<td>$568,787</td>
<td>$(365,060)</td>
<td>$1,465,522</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Incremental Costs</th>
<th>Engineering</th>
<th>Arts &amp; Science</th>
<th>Edwards</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salary Costs =</td>
<td>$ 521,600</td>
<td>$ -</td>
<td>$ -</td>
<td>$ 521,600</td>
</tr>
<tr>
<td>Operational Costs =</td>
<td>$ 251,997</td>
<td>$ 50,529</td>
<td>$(3,000)</td>
<td>$ 299,526</td>
</tr>
<tr>
<td>Total Incremental Costs =</td>
<td>$ 773,597</td>
<td>$ 50,529</td>
<td>$(3,000)</td>
<td>$ 821,126</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Incremental Net Revenue</th>
<th>Engineering</th>
<th>Arts &amp; Science</th>
<th>Edwards</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$488,197</td>
<td>$518,259</td>
<td>$(362,060)</td>
<td>$644,396</td>
</tr>
</tbody>
</table>
The College of Engineering and the College of Arts and Science have also discussed and agreed to a plan for one-time transition cost funding for the new courses in the College of Arts and Science related to staff (~200K) and equipment (~180K). Funding for this has been secured through the Provost’s Office and donor funds in the College of Engineering. Discussions are also in progress regarding the allocation of THORV 212 as lab space to the Department of Chemistry and possible renovation costs related to this.

The proposed changes to the first year curriculum will result in changes to the total tuition charged for all eight engineering programs, as summarized in Table 2 below:

Table 2: Tuition total per student and tuition total revenue per program

<table>
<thead>
<tr>
<th>Program</th>
<th>Total tuition per student</th>
<th>Effective Tuition Revenue*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Current Program</td>
<td>New Program</td>
</tr>
<tr>
<td>CHE</td>
<td>$33,444</td>
<td>$35,000</td>
</tr>
<tr>
<td>CE</td>
<td>$34,610</td>
<td>$35,738</td>
</tr>
<tr>
<td>CME</td>
<td>$32,093</td>
<td>$34,200</td>
</tr>
<tr>
<td>EE</td>
<td>$32,086</td>
<td>$34,192</td>
</tr>
<tr>
<td>EP</td>
<td>$34,427</td>
<td>$36,716</td>
</tr>
<tr>
<td>ENVE</td>
<td>$34,325</td>
<td>$35,578</td>
</tr>
<tr>
<td>GEOE</td>
<td>$35,172</td>
<td>$36,299</td>
</tr>
<tr>
<td>ME</td>
<td>$34,761</td>
<td>$36,317</td>
</tr>
</tbody>
</table>

*Note: Effective tuition revenue is based on the participation factors based on the 5-year average, as well as the upper year attrition
The proposed redesign of the Common First Year program curriculum requires hiring new teaching staff in the College of Engineering. Other costs, such as TA/MA costs, as well as consumable materials, diagnostic placement test costs, automated assessment software costs and contingency will increase in both the College of Engineering and the College of Arts & Science:

Table 3: Breakdown of incremental costs

<table>
<thead>
<tr>
<th>Item</th>
<th>College of Engineering</th>
<th>College of Arts &amp; Science</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Existing Program</td>
<td>Redesigned Program</td>
</tr>
<tr>
<td>APA Position #1</td>
<td>-</td>
<td>$ 129,155</td>
</tr>
<tr>
<td>APA Position #2</td>
<td>-</td>
<td>$ 121,256</td>
</tr>
<tr>
<td>Lecturer Position #1</td>
<td>-</td>
<td>$ 90,372</td>
</tr>
<tr>
<td>Lecturer Position #2</td>
<td>-</td>
<td>$ 90,372</td>
</tr>
<tr>
<td>Lab Tech Position (ASPA)</td>
<td>-</td>
<td>$ 90,445</td>
</tr>
<tr>
<td>Total Salary Cost</td>
<td>-</td>
<td>$ 521,600</td>
</tr>
<tr>
<td>TA/MA Budget</td>
<td>$ 142,168</td>
<td>$ 283,065</td>
</tr>
<tr>
<td>Other Operational Costs</td>
<td>$ 3,400</td>
<td>$ 114,500</td>
</tr>
<tr>
<td>Total Operational Costs</td>
<td>$145,568</td>
<td>$397,565</td>
</tr>
</tbody>
</table>

Total lecture, lab and tutorial hours are all expected to increase, which further explains the need for additional staff and increased teaching assistants/marketing assistants budget. With the introduction of Summer, Fall and Winter Top Ups, tutorial hours are expected to increase significantly (from 48 to 236.5), along with the commensurate increases in the success of first-year students and retention rates at the College of Engineering.
Table 4: Contact hours and CUs of the new First Year curriculum

<table>
<thead>
<tr>
<th>Course</th>
<th>Lecture</th>
<th>Lab</th>
<th>Total Lecture + Lab</th>
<th>Assigned CU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Term 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Introduction to Engineering I (GE102)</strong></td>
<td>27</td>
<td>21</td>
<td>48</td>
<td>2</td>
</tr>
<tr>
<td><strong>Engineering Communication I (GE132)</strong></td>
<td>15</td>
<td>13.5</td>
<td>28.5</td>
<td>1</td>
</tr>
<tr>
<td><strong>Engineering Discipline Experience (GE112)</strong></td>
<td>15</td>
<td>15</td>
<td>30</td>
<td>1</td>
</tr>
<tr>
<td>Natural Science</td>
<td>36</td>
<td>24</td>
<td>60</td>
<td>4</td>
</tr>
<tr>
<td><strong>Intro to Computer Science</strong></td>
<td>25.5</td>
<td>18</td>
<td>43.5</td>
<td>3</td>
</tr>
<tr>
<td><strong>Engineering Math I</strong></td>
<td>48</td>
<td>15</td>
<td>63</td>
<td>4</td>
</tr>
<tr>
<td><strong>Mechanics I (GE122)</strong></td>
<td>22.5</td>
<td>12</td>
<td>34.5</td>
<td>2</td>
</tr>
<tr>
<td><strong>Design I (GE142)</strong></td>
<td>16.5</td>
<td>9</td>
<td>25.5</td>
<td>2</td>
</tr>
<tr>
<td><strong>Electrical Circuits I (GE152)</strong></td>
<td>16.5</td>
<td>9</td>
<td>25.5</td>
<td>1</td>
</tr>
<tr>
<td>Total 1</td>
<td>525</td>
<td>259.5</td>
<td>784.5</td>
<td>44</td>
</tr>
<tr>
<td>Term 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Introduction to Engineering II (GE103)</strong></td>
<td>13.5</td>
<td>10.5</td>
<td>24</td>
<td>1</td>
</tr>
<tr>
<td><strong>Engineering Communication II (GE133)</strong></td>
<td>45</td>
<td>15</td>
<td>60</td>
<td>2</td>
</tr>
<tr>
<td><strong>Physics</strong></td>
<td>34.5</td>
<td>12</td>
<td>46.5</td>
<td>3</td>
</tr>
<tr>
<td><strong>Chemistry</strong></td>
<td>34.5</td>
<td>27</td>
<td>61.5</td>
<td>3</td>
</tr>
<tr>
<td><strong>Engineering Math II</strong></td>
<td>33</td>
<td>13.5</td>
<td>46.5</td>
<td>3</td>
</tr>
<tr>
<td><strong>Mechanics II (GE123)</strong></td>
<td>34.5</td>
<td>12</td>
<td>46.5</td>
<td>3</td>
</tr>
<tr>
<td><strong>Design II (GE143)</strong></td>
<td>21</td>
<td>21</td>
<td>42</td>
<td>2</td>
</tr>
<tr>
<td><strong>Electrical Circuits II (GE153)</strong></td>
<td>22.5</td>
<td>6</td>
<td>28.5</td>
<td>2</td>
</tr>
<tr>
<td><strong>Process Engineering (GE163)</strong></td>
<td>22.5</td>
<td>6</td>
<td>28.5</td>
<td>2</td>
</tr>
<tr>
<td><strong>Bridge Course</strong></td>
<td>42</td>
<td>0</td>
<td>42</td>
<td>3</td>
</tr>
<tr>
<td>(Lecture and Lab hours per bridge course vary by specific bridge course)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total 2</td>
<td>525</td>
<td>259.5</td>
<td>784.5</td>
<td>44</td>
</tr>
</tbody>
</table>

*Civil, Environmental and Geological Engineering programs will not participate in Design II course.
**Bridge course in Civil, Environmental and Geological Engineering programs is 2 CUs.

The number of credit units in the common first year curriculum is going to increase (from the current 34) due to a number of new courses that have been created (to a proposed 44). The increased number of CUs in the first year will influence the changes in the upper years of the engineering programs, and lead to the increase in the total number of CUs in the programs: by 10 in Computer, Electrical Engineering and Engineering Physics; by 5 new CUs in Civil, Environmental and Geological (as these programs will not participate in GE 143 course, and the bridge course for these programs is only 2 CUs); and 7 CUs in Chemical and Mechanical Engineering (For details please see Appendix S).
Although consideration was given to the creation of new tuition categories for the new engineering course, the current plan is that the new engineering courses will fall under the existing Tuition Category 7 (currently $243.2 per CU). Existing tuition categories were also assumed for the new Arts & Science courses (Category 3 for Computer Science courses, Category 8 for Mathematics, and Category 14 for Natural Science courses). Based on those assumptions, Table 5 describes the projected effective revenue in the eight engineering programs, including an allowance for expected participation rates in first year courses (to account for incoming students with some transfer credits), as well as attrition in each year of the programs:

### Table 5: Student tuition by program

<table>
<thead>
<tr>
<th>Program</th>
<th>Year</th>
<th>Effective Tuition Revenue (includes allowance for 1st year participation rates &amp; upper year attrition)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Engineering</td>
</tr>
<tr>
<td>Chemical</td>
<td>1</td>
<td>$6,028.96</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>$3,733.98</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>$5,613.49</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>$5,733.96</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$21,110.39</td>
</tr>
<tr>
<td>Civil</td>
<td>1</td>
<td>$5,408.80</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>$5,218.32</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>$6,220.58</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>$6,321.25</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$23,168.95</td>
</tr>
<tr>
<td>Computer</td>
<td>1</td>
<td>$5,391.28</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>$3,949.42</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>$5,262.01</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>$4,971.08</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$19,573.19</td>
</tr>
<tr>
<td>Electrical</td>
<td>1</td>
<td>$5,391.28</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>$4,386.46</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>$5,677.20</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>$4,971.08</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$20,426.01</td>
</tr>
<tr>
<td>Engineering Physics</td>
<td>1</td>
<td>$5,555.44</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>$3,049.06</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>$2,096.27</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>$2,364.41</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$13,065.17</td>
</tr>
<tr>
<td>Environmental</td>
<td>1</td>
<td>$5,408.80</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>$5,218.32</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>$6,231.70</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>$5,096.71</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$21,955.52</td>
</tr>
<tr>
<td>Geological</td>
<td>1</td>
<td>$5,408.80</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>$5,206.62</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>$5,651.66</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>$5,393.34</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$21,660.42</td>
</tr>
<tr>
<td>Mechanical</td>
<td>1</td>
<td>$6,028.96</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>$5,206.62</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>$6,653.95</td>
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<tr>
<td></td>
<td>4</td>
<td>$5,497.85</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$23,387.38</td>
</tr>
</tbody>
</table>
College Statement
Memorandum

To: Dr. Susan Detmer, Chair, Academic Programs Committee of Council
From: Dr. Bruce Sparling, Associate Dean Academic
Date: May 12, 2020
Subject: College Statement Regarding Proposed Revision to First-Year Engineering Curriculum

Dr. Detmer:

We are excited to present the proposal for a revised first-year engineering curriculum. When the College started working on this idea almost four years ago, we started from a blank piece of paper, allowing us to be creative and bold. In the meantime, in our Strategic Plan 2018-2025 we have committed ourselves to implementing a first-year curriculum that will be recognized as the most innovative and effective program in Canada.

The consultation process leading up to this point has been extensive, as outlined in the proposal. On March 9, 2020 the Undergraduate Academic Programs Committee in the College of Engineering carried a motion to recommend to Faculty Council the approval of this proposal. The Engineering Faculty Council voted to approve the proposal on May 12, 2020. As such I am writing to inform the Academic Programs Committee of Council of these recently approved curricular changes in the College of Engineering. I am additionally writing to express my support for these changes and to request that they be further reviewed and considered for final approval at the university-level.

All of this has required an unprecedented level of cooperation and consultation with partners from across campus, for which we are very grateful, and in particular would like to thank the College of Arts and Science for their ongoing collaboration on this project. I also wish to certify that the senior leadership team in the College of Engineering has reviewed and is in support of this proposal.

Please do not hesitate to contact me directly should you have any further comments, questions, or concerns.

Sincerely,

Bruce Sparling, Ph.D., P. Eng., FCSCE
Associate Dean Academic
College of Engineering
Email: engr.academicdean@usask.ca
Phone: 306-966-4190
Catalogue Entry
Engineering First Year

Common First Year

First-Year Common Core

All undergraduate students admitted to the College of Engineering are required to complete a common first-year of undeclared studies (known as the first-year common core). Prior to applying for admission into an upper-year program.

The first year curriculum features a modular structure, with well-integrated content across courses to reinforce program learning objectives and develop the skills and attitudes that will promote student success. A competency-based assessment approach, supported by daily help sessions, provides students with multiple opportunities to demonstrate mastery of fundamental concepts. Near the end of the Winter Term in first year, students will select a major and will be placed in the appropriate bridging courses to facilitate their transition into the upper year programs.

Prospective students who begin their studies in a college other than the College of Engineering are encouraged to consult an Academic Advisor within the Engineering Student Centre on a regular basis to plan their program of study, choose courses (including electives), and monitor their academic progress.

Recommended Science Electives

Undeclared students who intend to register in the Chemical Engineering program are advised to complete CHEM 115.3 General Chemistry II Chemical Processes in their first year; otherwise, they must take the course in the first term of their second year.

Undeclared students who intend to register in the Civil Engineering, Geological Engineering, or Environmental Engineering programs are advised to complete GEOL 121.3 Earth Processes in their first year; otherwise, they must take the course in the first term of their second year.

Undergraduate students registered in the Environmental Engineering program must complete BIOL 120.3 The Nature of Life, CHEM 115.3 General Chemistry II Chemical Processes, and GEOL 121.3 Earth Processes by the end of their second year.
Year 1 (41-4434 credit units depending on major)

Fall Term

*The start and end dates of the courses vary, as the duration of the courses varies from 4 to 12 weeks.

- CHEM 114.3 General Chemistry for Engineers
- COMM 102.3 Introduction to Business Management
- GE 101.1 Introduction to the Engineering Profession
- GE 111.3 Engineering Problem Solving
- GE 124.3 Engineering Mechanics I
- MATH 123.3 Calculus I for Engineers
- GE 102.2 Introduction to Engineering I
- GE 112.1 Engineering Discipline Experience
- GE 122.2 Engineering Mechanics I
- GE 132.1 Engineering Communication I
- GE 142.2 Design I
- GE 152.1 Electrical Circuits I
- CMPT 142.3 Introduction to Computer Science for Engineers
- MATH 133.4 Engineering Math I
- Natural Science Series (must take all):
  - PHYS 152.1 Introduction to Atoms and Nuclei for Engineering
  - CHEM 142.1 The Global Impact of Chemistry for Engineering
  - GEOL 102.1 Introduction to Geology for Engineering
  - BIOL 102.1 Nature for Engineering

Winter Term

* The start and end dates of the courses vary, as the duration of the courses varies from 4 to 12 weeks.

- GE 121.3 Engineering Design
- GE 125.3 Engineering Mechanics II
- MATH 124.3 Calculus II for Engineers
- PHYS 155.3 Introduction to Electricity and Magnetism
• 3 credit units Science Elective

• GE 103.1 Introduction to Engineering II
• GE 123.3 Engineering Mechanics II
• GE 133.2 Engineering Communication II
• GE 143.2 Design II (Please note: This course is not taken by students entering Civil, Geological and Environmental Engineering majors.)
• GE 153.2 Electrical Circuits II
• GE 163.2 Process Engineering
• CHEM 146.3 General Chemistry for Engineering
• MATH 134.3 Engineering Math II
• PHYS 156.3 Electromagnetism and Waves for Engineering

Discipline Bridge Course (depends on selected major):
  o CMPT 146.3 Principles of Computer Science for Engineers (Computer and Electrical Engineering, and Engineering Physics)
  o ME 113.3 Engineering Analysis I (Mechanical Engineering)
  o CHE 113.3 Unit Operations in Chemical Process Engineering (Chemical Engineering)
  o CE 271.2 Spring Surveying Camp (Civil, Geological and Environmental Engineering)

Fall Term or Winter Term

3 credit units Junior Humanities or Social Science Elective

Electives

Science Elective

BIOL 120.3 The Nature of Life

CHEM 115.3 General Chemistry II Chemical Processes

GEOL 121.3 Earth Processes

PHYS 125.3 Physics and Technology

Junior Humanities or Social Science Elective

ANTH 111.3 One World Many Peoples Introduction to Cultural Anthropology
ARCH 112.3  The Human Journey: Introduction to Archaeology and Biological Anthropology

ARCH 116.3  Introduction to Near Eastern and Classical Archaeology

CLAS 110.3  Greek Civilization

CLAS 111.3  Roman Civilization

CMRS 110.3  The Graeco-Roman Tradition: Evolution and Reception

CMRS 111.3  Medieval and Renaissance Civilization

ECON 111.3  Introductory Microeconomics

ECON 114.3  Introductory Macroeconomics

GEOG 130.3  Environment, Health, and Planning

HIST 110.3

HIST 111.3

HIST 115.2  History Matters: Ideas and Culture

HIST 121.3

HIST 122.3

HIST 125.2  History Matters: Indigenous, Colonial, and Post-Colonial Histories

HIST 135.3  History Matters: Gender, Sex, and Society

HIST 145.2  History Matters: War, Violence, and Politics

HIST 155.3  History Matters: Science and Environment

HIST 165.3  History Matters: Health and Society

HIST 175.2  History Matters: Identities and Communities in Transition

INDG 107.3  Introduction to Canadian Indigenous Studies

LING 111.2  Structure of Language

LING 112.3  Dynamics of Language
PHIL 120.3 Knowledge Mind and Existence

PHIL 133.3 Introduction to Ethics and Values

PHIL 140.3 Critical Thinking

POLS 111.3 Democratic Citizenship in Canada

POLS 112.3 Justice and Injustice in Politics and Law

PSY 120.3 Biological and Cognitive Bases of Psychology

PSY 121.3 Social Clinical Cultural and Developmental Bases of Psychology

SOC 111.3 Foundations in Sociology Society Structure Process

SOC 112.3 Foundations in Sociology Social Construction of Everyday Life

WGST 112.3 Introduction to Womens and Gender Studies
Appendices

Appendix A - Vision, Mission, Values and Delivery Strategy
College of Engineering First Year Redesign Project

Vision:
The University of Saskatchewan’s College of Engineering will have the most effective first year engineering program in Canada. The first year program will excite, engage and inspire our students, and it will holistically prepare them for the challenges to come in later years. Ultimately, it will also serve to enhance the reputation of the College and the University.

Mission:
Our mission is to implement a first year engineering program that

- attracts a diverse set of students well-suited for the work and challenges of engineering,
- effectively bridges the curricular and socio-cultural transition into engineering student life,
- allows students to make a well informed decision as to whether engineering is for them,
- shows students career possibilities in the profession and available educational pathways,
- encourages students to engage in self-directed, life-long learning, including extracurricular activities,
- develops every student’s knowledge, skills, experiential base, and attitudes/beliefs in ways that effectively prepare them for the challenges to come in their academic careers, and beyond,
- sequences material and organizes learning and skill development progressively and thoughtfully,
- integrates knowledge and skills from different subject areas in realistic and stimulating scenarios,
- develops a sense of professional ethical responsibility and behaviour,
- respects and values diversity and inclusion,
- applies formative and summative methods of student assessment that accurately evaluate student performance and/or growth, and that support further improvement, and
- encourages and helps facilitate a healthy life balance, both physically and psychologically.

Values:
In our delivery of the mission, we will be guided by our desire to be informed, consultative, holistic, innovative, inclusive, and responsive.

Delivery Strategy:
We will fulfill the mission by

- consulting stakeholders, including prospective students, current students, alumni, College staff, departments/programs, College leadership, the CEAB, and APEGs,
- studying and adopting appropriate best practices from first year programs across Canada and abroad,
- ensuring curriculum content is relevant, appropriate, and current,
- embracing and adopting proven best practices in pedagogy to facilitate deep, intrinsically motivated, and self-directed learning,
- exploring novel content, delivery methods, delivery structures, and evaluation methods, as appropriate,
- removing any identifiable and unnecessary barriers to success for current and prospective students,
- presenting, developing an appreciation for, and applying Indigenous perspectives in engineering and design,
- adopting a holistic approach to education that considers the student as a complete person, and
- developing methods of receiving timely feedback on important program metrics to facilitate continuous improvement.
Appendix B - Structural Model (v33)
Weeks

<table>
<thead>
<tr>
<th>Months</th>
<th>Apr - Aug</th>
<th>Sept</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
</tr>
</thead>
</table>

**Summer Top Ups (Online)**
- Key Grade Concepts in Math, Chemistry, Physics, English, Reading Comprehension, Indigenous Culture

**Fall Mid-term Break**
- Fall Top Ups**
  - MATH 133.4 Engineering Math I 63.5 Hours
  - GE 132.1 Engineering Communication I 28.5 Hours
  - GE 152.1 Design I 25.5 Hours
  - GE 142.2 Cont’d

**Fall Top Ups**
- 49.5 Hours
- Fall Top Ups**
- 46.5 Hours

**Holiday Break**
- 30.0

**Winter Mid-term Break**
- Winter Top Ups**
- 38 hours

**Winter Top Ups**
- 19.5 Hours
- 46.5 Hours

**Discipline Bridge Course**
- 42 Hours

**Discipline Choices**
- 3 Discipline Choices
- Final Discipline Assignment

**Estimated mandatory contact hours per week (excludes end-of-day and Top up help sessions)**

<table>
<thead>
<tr>
<th>Phys 152.1* Intro. To Atoms and Nuclei for Engineering 15 Hours</th>
<th>Chem 142.1* The Global Impact of Chemistry for Engineering 15 Hours</th>
<th>GE 102.1* Intro. To Geology for Engineering 15 Hours</th>
<th>Biological 102.1* Intro. To Biology for Engineering 15 Hours</th>
<th>GE 112.1 Engineering Disciplines Experience 30 Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>12.0</td>
<td>27.0</td>
<td>27.0</td>
<td>27.0</td>
<td>27.0</td>
</tr>
<tr>
<td>24.0</td>
<td>19.5</td>
<td>27.0</td>
<td>25.5</td>
<td>27.0</td>
</tr>
<tr>
<td>27.0</td>
<td>25.5</td>
<td>27.0</td>
<td>25.5</td>
<td>12.0</td>
</tr>
<tr>
<td>0.0</td>
<td>18.0</td>
<td>30.0</td>
<td>30.0</td>
<td>28.5</td>
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<tr>
<td>28.5</td>
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<tr>
<td>0.0</td>
<td>28.5</td>
<td>28.5</td>
<td>28.5</td>
<td>25.5</td>
</tr>
<tr>
<td>24.0</td>
<td>19.5</td>
<td>30.0</td>
<td>24.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

**The four natural science courses are each offered 4 times in series with 1/4 of the students taking each class at each time.**

**Summer, Fall and Winter Top Hours include only optional help sessions.**

**GE 143.2 Design II taken by CHE, CME, EE, EP and ME students.**

**Hours listed for all courses are the total mandatory contact hours, including both lectures and labs where applicable.**

**Discipline Bridge Course:**
- CHEM 146.3 Chemical Engineering Unit Operations and Plant Design taken by CHE Students.
- GE 271.2 Spring Surveying Camp taken by CE, EnvE and Geol Students.
Appendix C - Design of a Completely New First Year Engineering Program at the University of Saskatchewan
Abstract – The rapidly evolving role of the engineering profession in society requires an engineering graduate with a more diverse and robust skill set than ever before. To answer this challenge, the University of Saskatchewan’s College of Engineering has embarked upon a complete redesign of its first year program. This project essentially started from a “blank slate” and posed the question, “If we could design any first year program that we wanted, what would we create?” The outcome of this endeavor is intended to be an extremely effective first year program that excites, engages and inspires students, and that holistically prepares them for the challenges to come in later years. In this paper, we review the broad learning objectives of our new first year, and the values that we applied to our decision making during its design.

The overall project consists of three distinct phases: determination of required first year graduate attributes, development of program structure and delivery methods, and detailed course design. Phase I has been completed. It has left us with a detailed inventory of knowledge, skills, experiences, and attitudes, distributed across 23 content categories, that the College wants students to internalize by the end of their first year of study.

We will outline the methods that we used to compile and refine this attribute inventory, including multiple approaches aimed at meaningful stakeholder engagement, surveys of existing first year programs across Canada, and an analysis of gaps and redundancies between the Saskatchewan high school curriculum and our existing first year program. We will also describe the 23 content categories used to organize the graduate attributes of the proposed first year program and how these categories are weighted in relative terms.

We share some of our key learnings from Phase I of the project, including which consultation strategies worked most effectively, why we focused on first year graduate attributes and not content, and key elements that will be emphasized in our new program. We will also briefly describe the process by which we are starting to develop the program structure and delivery methods i.e. Phase II.

Keywords: first year, engineering, program, design, curriculum, planning, graduate attributes, Saskatchewan

1. INTRODUCTION

Curriculum change in higher education is known to be challenging [1]. Incremental improvement is a common strategy for most academic program development and, as an optimization process, it can work very well. However, given the passage of enough time combined with enough change in the service environment, the best “solution” to the current incarnation of the first year pedagogical “problem” might not be found using this approach. This is akin to seeking an energy minima in a distributed energy field [2]. We do not want to get trapped in a local minima from which we will never escape. However, this can happen using incremental optimization. This strategy can prevent us from finding a better way (a global minima). To avoid this fate, periodic leaps are sometimes necessary to thoroughly explore the “pedagogical energy landscape”.

This was the rationale that led the University of Saskatchewan’s College of Engineering to undertake a redesign of its first year, starting from a blank sheet of paper. This approach allowed for a wide-angle view of the landscape to see where a first year engineering program could best meet the needs of the present and near future, given the current environment as characterized by student attitudes, preparation, motivations, needs, and skills.

The work began with a committee looking at different structural models for a new first year program. It soon became clear that the volume of work required for the redesign demanded more than volunteer effort. Last year, a full-time curriculum developer was hired, and a small management and advisory team engaged more intensively with the project. We identified the main phases to the project, as well as a clear vision of what we were trying to accomplish and a mission by which the vision could be achieved. Taking a technical-rational approach [3], a focus on the quality of the innovation informed by diverse expertise, iteratively examined by stakeholders, adjusted and refined in combination with reasoned planning for implementation, can create the change envisioned.

The vision for the redesign was simply to attract excellent students to our College from Saskatchewan, Canada and beyond, and to excite, engage and inspire our students, while preparing them holistically for the challenges to come in later years. While retention is a common concern and a driver for change in higher education, this curriculum design process intentionally
focuses on the qualities of the learning experience that engage and empower students. There is a well-founded expectation that retention impact will be positive when the quality of the learning experience is enhanced [4].

Informed by research on effective instruction in undergraduate science and engineering [5], research-based principles for teaching and learning in higher education [6,7], and research on policies and practices known to support student success [8], the mission for this curriculum would involve:

- attracting a diverse set of students well-suited for the work and challenges of engineering,
- effectively bridging the transition into engineering student life,
- allowing students to make a well informed decision as to whether engineering is for them,
- encouraging students to engage in self-directed lifelong learning, including extracurricular activities,
- showing students career possibilities and available paths through the College,
- facilitating student development in terms of knowledge, skills and attitudes/beliefs in ways that effectively prepare every student for the challenges to come in their engineering degree, and beyond,
- sequencing learning material progressively and thoughtfully,
- integrating knowledge and skills in different areas in realistic scenarios,
- applying formative and summative methods of student assessment that accurately evaluate student performance as well as encourage growth,
- helping and encouraging students to be healthy and strong, physically and psychologically, and
- providing them with sound academic guidance as they consider their career path.

We would do this by:

- consulting all stakeholders,
- studying best practices for first year programs across Canada and around the world,
- ensuring curriculum content is relevant, appropriate, and up-to-date,
- embracing proven best practices in pedagogy to facilitate deep, intrinsically motivated, and self-directed learning,
- exploring novel content delivery methods and structures, where appropriate,
- removing unnecessary barriers to success for under-represented groups of students,
- presenting, and developing an appreciation for, Indigenous perspectives in engineering and design,
- adopting a holistic approach to education that considers the experience of the student as a complete person, and
- developing methods of receiving timely feedback on important program metrics to facilitate continuous improvement.

The project was broken into three phases:

- Phase I - determination of required first year graduate attributes,
- Phase II - development of program structure and delivery methods, and
- Phase III - development of course material.

Phase I has been largely completed and is the focus of this paper, while Phase II is currently underway.

2. PHASE I METHODOLOGY

2.1. First Year Graduate Attributes

The focus of Phase I was the determination of required first year graduate attributes. It began as the identification of content in first year. However, it was quickly realized that attributes and content are not equivalent concepts and the differences between them became pivotal to our overall program design approach.

In this work, content defines what is in the program. Graduate attributes define, most simply, what the students leave the program with. Examining the notion of attributes at completion of first year has helped us to come to explicit terms with the fundamental purposes of the first year program for student learning [9]. Not all students enter the program in the same state of preparedness and not all progress through the material at the same speed and with the same degree of success. Nevertheless, students are expected to leave first year well-equipped with knowledge (facts and concepts), skills (demonstrable abilities), experiences (meaningful applications of skills), and attitudes/beliefs (adoptable philosophies), or KSEA [10]. This is the primary basis for being considered “prepared” for second year and beyond. Sometimes these expectations are explicit, but we learned that, oftentimes, they are not.

In Phase I, it became readily apparent that we needed to be explicit about all of these expectations, where relatively few had ever been so. Moreover, if the “output” of first year (students having these “graduate attributes”) was to meet some minimum standards, then by definition, the first year would have to effectively adapt to differences among student preparedness, success rates, and speeds of learning. This insight became a major design parameter for the structure and delivery models in Phase II.

In Phase I though, the idea of “graduate attributes” clarified what information we were seeking and how we would manage it. Ultimately, we gathered information in 23 distinct topical categories spanning the breadth of all that we could imagine might be included in first year. Collectively, preparing students with these attributes would meet the specifications of our vision and mission.

The following four sub-sections describe how we gathered these first year graduate attributes.
2.2. Analysis of Existing Programs (Internal)

The first step of Phase I was the determination of the content and learning objectives currently included in first year engineering at the University of Saskatchewan. Less than half of the courses taken by engineering students enrolled in the full first year program are taught within the College. Therefore, this first step required consultation across campus.

We began by gathering the most recent syllabus for each course and extracted and categorized what we believed to be the most important knowledge, skills and attitudes aspired to in each course (the idea of experiences being a separate and distinct type of attribute had not yet emerged). These lists were then shared with course coordinators and instructors for feedback on the accuracy of our interpretations. This feedback, as well as meetings with instructors, and hours spent reading over course notes and lab manuals, resulted in the most detailed itemization of the first year curriculum that the College has had in recent memory.

Anecdotal evidence gathered from discussions with first year instructors led us to believe that certain existing courses contained a large amount of material which was potentially redundant with prerequisite Saskatchewan high school courses. As a result, we also conducted a brief analysis of the learning outcomes of these high school courses to identify where, on paper at least, there was significant overlap. The courses evaluated included Pre-Calculus 30, Calculus 30, Chemistry 30, and Physics 30.

2.3. Analysis of Existing Programs (External)

An analysis of 17 other first year engineering programs across Canada was conducted, including UofA, UofC, UBC, UofM, McGill, McMaster, Dalhousie, Queens, Western, UofT (TrackOne), UofR, Victoria, Carleton, Guelph, York, Ryerson and Waterloo. Utilizing online course catalogs for each school, a comparison of relative weightings of each subject (by contact hours) at each institution was performed. For programs with direct entry into each discipline (a non-common first year), the first year program experienced by mechanical engineering students was chosen for comparison, due to the relatively broad applicability of a mechanical engineering program. This survey of the Canadian engineering education landscape also presented an opportunity to seek out innovative ideas in content delivery being implemented across the country.

2.4. College Staff and Faculty Engagement

While informal discussions with staff and faculty in the College helped to socialize, normalize and inform the development of the project, we sought to formalize the input process. This was done through the use of surveys. It was decided that these initial surveys should remain internal to the College as, in alignment with the concept of engineering being a self-regulating profession, the members of the College should be in the best position to determine the ideal attributes of our students. Moreover, the staff and faculty of the various programs within the College are key stakeholders in this project, as the effects of success or failure to effectively prepare the students for upper year study have enormous implications on them.

The first faculty and staff survey (FSS1) asked the respondents to determine what KSEA attributes all students should have by the end of their first year, across all 23 graduate attribute categories listed in Table 1 (see Section 3). It did not ask respondents what KSEA attributes they believed the students do develop as a result of our existing program. Program undergraduate chairs were asked to consider what attributes the ideal student entering their particular program would have. FSS1 also included a 24th category of “Other”, but responses received under this category were easily included in one of the 23 prescribed categories after subsequent analysis.

The results of FSS1 were compared against the list of learning objectives arising from our existing program (the compilation described in Section 2.2). This comparison generated a list of content that is currently covered in first year, but was not noted as being needed by any respondents in FSS1. This list was then disseminated to the College faculty and staff in the form of a second survey (FSS2) asking which, if any, of these identified content items should be retained. Since these items were not foremost in any respondent’s mind during the first survey, we also asked for a justification for retention.

The results of FSS2 were used to finalize a draft first year graduate attributes proposal. This exhaustive list of KSEA attributes for each of the 23 categories was shared with department heads and undergraduate chairs in each engineering program in the College. As well, relevant external programs (Mathematics and Statistics, Chemistry, Physics, Biology, Geology, and Business) were also consulted for input. The project team held meetings with representatives from each internal and external department to discuss the generated attribute lists most pertinent to each department.

Useful feedback was received from subject matter experts (SMEs) in every meeting, with the needs and/or interests of their respective programs kept as the focus of the conversation. Post-meeting, departments were asked to provide further written feedback as well as a list of core concepts and threshold concepts appropriate for first year study for their respective field. Threshold concepts are transformative and troublesome concepts, an understanding of which forever changes a student’s perspective on the respective field of study [11]. We requested these lists from SMEs to allow for the prioritization of attributes once we begin allocating contact hours for each category in Phase II of the project.
2.5. Student Engagement

It is not the norm to involve students early on and with frequency in first year curriculum design, yet there is great potential and value for their strategic and appropriate involvement [12]. Informed by the notion of students-as-partners [13], substantive student engagement was incorporated into Phase 1. In November of 2017, we drafted a student engagement strategy and reached out with a student survey (SS1) focused on Fall term curriculum content. Current first year students were surveyed on their general experience in first year, including their feeling of academic preparedness, their sense of belonging, and supports offered by the College. They were also asked to rate their experience in each of their first term courses and to identify any content in each course which was not new to them. This could reveal materials that were possibly redundant.

A separate version of SS1 was sent out to all upper year students in the College. This survey asked students to identify core concepts they took away from each existing first year course and to rate how prepared they were for the demands placed on them by their program in second year in each of the 23 content categories.

In March – April of 2018, a second student survey (SS2) was sent out to all current first year students asking similar questions to SS1, but focusing on the Winter term first year courses.

To facilitate more meaningful student engagement, we also created a Committee of Student Advisors on Curriculum Development (CSACD). The first members of this committee consisted of 21 students with representation from every year of study and each of the 8 upper year programs offered by the College. Program diversity was the main selection factor for this first group (there were over 70 interested applicants), but students were also chosen for having different backgrounds and life situations to be sure that as diverse a voice as possible was represented by the committee.

The committee became active in January, 2018 with anticipation of continued engagement over the summer and renewed membership in the Fall of 2018. The committee has met monthly to provide feedback to the project team on curriculum proposals. We have evolved the engagement philosophy beyond simple consultation into a more co-creative environment, by providing opportunities for the student advisors to provide ideas for the new program and to assist in conducting research into best practices.

This broad and varied strategy for student engagement has yielded some very meaningful insights for the project team and will most certainly result in the development of a more robust and accessible program [12].

3. FIRST YEAR GRADUATE ATTRIBUTES

The stakeholder engagement described above yielded a first year graduate attributes proposal with almost 1800 individual line items describing the desired KSEA attributes in the 23 categories listed in alphabetical order in Table 1. Table 1 also shows the percentage of line items attributed to a given category. It should be noted that not all line items in the proposal represent the same number of contact hours or credit units, but it is interesting to compare the relative detail included for each.

Obviously, the full list of attributes cannot be included here. However, interesting elements will be discussed and related to the points in the project mission statement to which they contribute.

Table 1: Proposed first year KSEA graduate attributes categories and the relative proportion of each category.

<table>
<thead>
<tr>
<th>Attribute Category</th>
<th>% of Proposal</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Biology and Environmental Engineering</td>
<td>2%</td>
</tr>
<tr>
<td>2. Business, Economics and Entrepreneurship</td>
<td>2%</td>
</tr>
<tr>
<td>3. Chemistry and Chemical Engineering</td>
<td>12%</td>
</tr>
<tr>
<td>4. Communication (Oral, Written and Graphical)</td>
<td>7%</td>
</tr>
<tr>
<td>5. Computing, Software, Programming and Computer Engineering</td>
<td>7%</td>
</tr>
<tr>
<td>6. Design</td>
<td>5%</td>
</tr>
<tr>
<td>7. Electricity, Magnetism and Electrical Engineering</td>
<td>6%</td>
</tr>
<tr>
<td>8. Geology, Civil Engineering and Geological Engineering</td>
<td>4%</td>
</tr>
<tr>
<td>9. Health, Safety and Risk Management</td>
<td>2%</td>
</tr>
<tr>
<td>10. Humanities and Social Sciences</td>
<td>2%</td>
</tr>
<tr>
<td>11. Integration Between Subject Areas</td>
<td>1%</td>
</tr>
<tr>
<td>12. Intro. to the Profession, Ethics and Inclusivity</td>
<td>4%</td>
</tr>
<tr>
<td>13. Leadership and Group Dynamics</td>
<td>3%</td>
</tr>
<tr>
<td>14. Math: Algebra</td>
<td>5%</td>
</tr>
<tr>
<td>15. Math: Calculus</td>
<td>7%</td>
</tr>
<tr>
<td>16. Mechanical Engineering and Mechanics: Dynamics</td>
<td>6%</td>
</tr>
<tr>
<td>17. Mechanics: Statics</td>
<td>5%</td>
</tr>
<tr>
<td>18. Physics and Engineering Physics (excluding mechanics, electricity and magnetism)</td>
<td>8%</td>
</tr>
<tr>
<td>19. Project Management</td>
<td>2%</td>
</tr>
<tr>
<td>20. Research (Students conducting research)</td>
<td>2%</td>
</tr>
<tr>
<td>21. Study Skills, Life Skills and Self-Assessment</td>
<td>5%</td>
</tr>
<tr>
<td>22. Teaching (Teaching students to teach, mentor and tutor)</td>
<td>2%</td>
</tr>
<tr>
<td>23. The University/Institution (U of S history, policies, infrastructure and services)</td>
<td>1%</td>
</tr>
</tbody>
</table>
3.1. Better Preparing Students

When it comes to the “hard” technical content in the proposed curriculum, there are few, if any, major surprises. The core technical expertise required by a burgeoning engineering student is well defined by Canadian engineering accreditation requirements [14] and is well covered by the proposed attributes. The review of first year programs across Canada showed little variation in the basic philosophy of the content covered. An average distribution of contact hours for the Canadian institutions studied can be seen in Figure 1 in the middle column. This distribution is similar to that seen in previous surveys and is similar to the distribution for major US schools, although many often delay linear algebra and some physics content until second year [15,16].

Relatively unique elements identified in the existing University of Saskatchewan first year engineering program included a 3 credit unit (CU) business class, a lack of any computer programming, and a choice of natural science elective between physics, biology, geology or an additional chemistry class. A full comparison of the distribution of contact hours for the existing U of S program, the Canadian average distribution, and the proposed U of S program can be seen in Figure 1. The proportions represented for the proposed program are based on the number of line items in the proposal, which do not fully correlate with the contact hours that will eventually be associated with them. It can be seen that computer programming will make up a sizable proportion of the new first year program. It should also be noted that the apparent decrease in math and mechanics content is not precisely indicative of what the final program will include. These are areas of study well defined at the U of S and stakeholders did not feel the need to itemize these topics in as much detail as some other topics.

The proposed program will do away with the existing natural science elective and will replace it with a strong introduction to each of the four core sciences (chemistry, physics, geology, biology). The learning objectives in each of the four areas will be the same: appreciate each in relation to the others, compare and contrast with each other and with respective engineering disciplines (e.g. chemistry versus chemical engineering), and develop a skill that can be applied to virtually any branch of engineering. These science experiences will involve hands-on lab activities.

Similarly, each of the 8 engineering programs will be introduced to all of the first year students in an intensive multi-hour format with similar learning objectives i.e. appreciate each in relation to the others, compare and contrast with each other, and develop a skill that can be applied to all of the other branches of engineering. This will give them all a better sense of the breadth of the engineering profession.

As well, instead of a standard social science or humanities course, students will take part in a new type of arts course that will orient them to the various fields in the social sciences and humanities, while linking them to engineering. In this way, when they do select subsequent arts electives, those choices will be informed and relevant and will provide a more meaningful experience [17].

The overarching learning objective is to better prepare students to make a good vocational choice, whether that be engineering generally, or their discipline, specifically.

The proposed program will also ensure appropriate preparation in areas such as mathematics and mechanics, while better preparing all first year students in electrical circuits, physics, CAD, computer programming, technical communication, and engineering design. Design will be more deeply integrated with other course material, and will include elements of interest to every discipline.

The curriculum will also focus on better preparing students to acquire an engineering-related summer job after their first year of study. They will be proficient in at least one programming language, will have basic first aid, CPR and WHMIS training, and will have an understanding of an engineer’s professional obligation for health and safety. They will have solid design and CAD skills, and will be able to apply the basics of project management.

We also intend to equip students with a better sense of intuition in their fields. The proposed program includes experiences in several categories that focus on seeing or feeling the major concepts, not just reading about them. For example, students will develop an intuition for what 10 N feels like, what 30 ml looks like, and how circuits behave.

![Figure 1. First year curriculum comparison.](image)

3.2. Bridging the Transition into Engineering

The proposed curriculum places a strong emphasis on bridging students into the program, both academically and socially. Important contributors to a sense of belonging on campus, including an awareness of the supports available, are explicitly identified in the proposal.

The proposal does list many math concepts and skills, such as logarithms, graphing, taking limits and basic differentiation, which have all been identified to be redundant with College pre-requisites. A similar situation exists with chemistry. The proposal includes items such as
basic atomic structure, the periodic table, and types of molecular bonds. These items remain, as they cannot be neglected should a student not have a basic competency. These are KSEAs that a student should have by the end of first year. However, if they enter the program with them, they should not have to spend time reviewing them. We will explore options, such as challenges-for-credit, to allow better prepared students to minimize redundancy.

General life skills will also be addressed to better facilitate a smooth transition into the College. This transition support will include ensuring basic competency with word processors and spreadsheets, as well as study skills, time management, exam writing strategies, learning styles, critical thinking, and group dynamics/teamwork training.

Finally, we will explicitly address the reasons they came into engineering. This includes a robust introduction to the scope of the profession and to available career paths. In addition to an awareness of traditional careers in industry, students will acquire a better understanding of the scientific method and how discovery research plays a role in engineering. They will learn the key similarities and differences between discovery research and engineering design. Students will also learn how to apply effective teaching methods to teach, mentor and tutor their peers, to develop an understanding that teaching is often the most effective way to improve one’s own understanding of a concept. Business content in first year will become more focused on an awareness of entrepreneurship and how that can relate to design.

3.3. Sequencing and Integration of Material

While sequencing of the content in the program is beyond the scope of Phase I, it is anticipated that various elements of the program can be integrated, meaningfully and purposefully, with mutual benefit. One example is the application of computer programming. If programming is covered early in the year, it can be applied to many other subjects, such as in the solving of systems of linear equations in algebra. Building linkages between course materials in different topic areas will be a key part of the revised first year.

3.4. Encouraging Good Health and Growth

Good physical and mental health are qualities that we don’t just hope to facilitate in the program; they will be explicitly supported by several learning objectives. These include an awareness of mental and physical health indicators, practice in implementing effective methods for stress management, an internalization of Carol Dweck’s Growth Mindset [18], and how to deal with failure. We want our students to be physically, mentally, and socially healthy. The first year content focused on these goals will be facilitated and enhanced by program structure and delivery methods.

3.5. Attracting and Maintaining Diversity

An understanding and appreciation of the importance of respect, diversity, and inclusivity are specific line items in the proposal. There are also items outlining an Indigenous cultural contextualization and the integration of Indigenous content into the curriculum. This aligns with the University of Saskatchewan Strategic Framework and Narrative for 2025 [19]. Our goal is to provide a welcoming learning environment in which students of any gender, race, ethnicity, religion, identity or background can work hard and succeed in becoming an engineer.

4. LESSONS LEARNED

We have learned much from this (ongoing) program design process, and specifically from the first phase that has focused on first year graduate attributes.

An early lesson was found in the design process that we adopted. Most design processes involve the determination of constraints before coming up with alternative solutions. We are applying constraints at the end of our process. This works in this case because of the composite nature of the curriculum “solution” that we are striving for i.e. it won’t all be acceptable or unacceptable. Parts will or will not be. Given the nature of the creation/ideation process that we used, we knew that at least most of the ideas would be deemed acceptable by our College and accreditation bodies. So we adopted open-ended ideation without constraints to prevent the inhibition of new and less conventional ideas. This worked for at least some of our stakeholders, such that we were able to gather a broad swath of suggestions, some of the more novel of which may be acceptable to accreditation bodies within the context of the whole program.

Another design lesson was borrowed from the design axiom “fail early, fail often” [20]. In our context, that meant running our ideas by a wide variety of different people. With intent, we started with more “friendly” audiences whose goals were in close alignment with those of the project. When early “fails” were noted, they were remedied before they could become big and serious fails in front of more challenging audiences. Notably, this strategy has become more important as we have moved into Phase II (Program Structure and Delivery).

A very important lesson we learned was that of placing our focus on first year “graduate attributes” as opposed to content, following the framework of constructive alignment [21]. As noted earlier, we have a variable input (incoming students), variable processing of those inputs (progress through first year), and a fairly constrained definition of our “minimum viable product” (first year graduates). Non-adaptive first year content simply cannot deliver this product due to the variability in inputs and processing. By shifting the focus to graduate attributes, this makes clear what the desired outcomes are, while leaving the methods to achieve those outcomes as flexible.
as possible. For example, it highlights the importance of admissions criteria. It also suggests that not all students should go through all the same courses, in the same way.

Yet another design axiom was highlighted during our experiences with Phase I of this project, that being “don’t get married to your first solution”. Ultimately, the details of any solution do matter. But they don’t matter too much, yet. The key take-away at this stage is the big picture perspective of what topic areas should be addressed by the end of first year, and for what reasons should they be addressed. The ever-present temptation to focus on how material would be delivered is a short-circuiting process that distracts from these key questions. In this design process, “how” comes later, and must be ignored in this first phase of the program design.

Design engineers also know that one should always take input from stakeholders with a grain of salt. While the perception of a need may always be valid, the actual need may not always be so. That is, we must process input from clients and users through a filter that serves to address our design objectives. If we were told by a stakeholder that effective writing skills were not an important first year graduate attribute (because those skills weren’t very relevant to that stakeholder), that might be true for that stakeholder, but it wouldn’t necessarily be true for the program, given the goals of the program. We learned to treat feedback differently depending on the investment of the feedback provider. Indeed, we learned to only seek feedback from stakeholders on topics that were important to them and/or that they were knowledgeable about. The clearest way in which we addressed this point was by specifically asking stakeholders what outcomes they wanted from first year, and not what outcomes they didn’t want from first year.

Indeed, we learned that survey feedback often required follow-up interpretive discussions in order to contextualize comments properly. Some respondents, especially those involved in compiling the content of the existing first year, just entered the attributes of the existing class with which they were involved. While a valid response, it remained unclear if this was the path of least resistance or whether this was actually tantamount to saying, “I feel every detail covered in this class is crucial for all engineering students to absorb by the end of first year.” Later conversations with those instructors facilitated a better understanding of why they answered the way they did.

Another key recognition for us, and more especially for our stakeholders, was the idea of pre/co-requisite courses for their program. We have a common first year leading into disciplinary programs in years two, three and four. Oftentimes, we heard the cry “we need that course for our upper year courses”. However, when pushed (vigorously, in some cases) everyone conceded that they needed the learnings of a course, not the course itself. And when pressed further, it became clear that they didn’t require all of the learnings coming out of a course. They just needed some of them. When everyone adopted this perspective, it provided us with clarity on what specific first year content didn’t directly lead anywhere in subsequent courses. These situations provided some opportunities for dropping non-critical course materials.

A similar concept involved “just-in-time learning” [22]. In several cases, we were told that first year material was needed for third and fourth year courses. However, pedagogical theory, as well as many students, pointed out that students forgot that material by the time they needed to use it. Early on, we adopted the philosophy that if the only need for some part of the existing first year was in third and fourth year, then first year was not the time to introduce it in the expectation that it would be retained by third or fourth year.

5. CONTINUING WORK

Phase I was largely completed by January 2018. However, a failure to secure detailed feedback of a consistent and similar nature from all stakeholders (especially the engineering programs) left some work remaining. As Phase II began in early 2018, our concern over this issue diminished. In the spirit of iterative design, we are going through a number of design cycles which refine what will be taught, when it will be taught, and how it will be taught. We are forming an advisory committee consisting of representatives from every academic program with a stake in the first year, and these individuals are helping us in this data collection/refinement/clarification process.

We have adopted a design process that is analogous to sculpting. It is very compatible with the conventional North American design process that moves from conceptual to configuration to detailed design. In this analogy, imagine that you are a sculptor and that the final design will be the finished sculpture. One begins with the rough outline of the shape. Then there is refinement of the parts. Finally, there is detailing of the minutiae to finish the design. Phase I provided us with the clay and other building materials for our sculpture. Phase II is taking us through the rough outline of the shape of the program, in increasing detail. We are putting our design ideas through various filters such as teaching space availability, staffing, tutorial assistance, accreditation, and transferability. At every stage, we are cycling back to earlier design decisions to refine them. The sculpture is gradually taking shape, in increasing levels of detail. This approach is working well with the tried and tested “fail early, fail often” design philosophy.

Acknowledgements

Joel Frey is funded by the University of Saskatchewan’s Curriculum Innovation Fund. We want to thank Sheryl Mills, formerly of the Gwenna Moss Center for Teaching and Learning, who played an important advisory role in
Phase I of the project. We want to thank all of the members of the Committee of Student Advisors on Curriculum Development (CSACD), as well as all of the staff and faculty who have provided input to the project thus far.

References


Appendix D – Design of a Completely New First Year Engineering Program at the University of Saskatchewan – Part II
Design of a Completely New First Year Engineering Program at the University of Saskatchewan – Part II
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University of Saskatchewan
Corresponding Author: sean.maw@usask.ca

Abstract – Over the last three years, the University of Saskatchewan’s College of Engineering has embarked upon a complete redesign of its first year common program. This project started from a blank slate and posed the question, “If we could design any first year program that we wanted, what would we create?” The goal is to offer a first year program that excites, engages, inspires, and holistically prepares students for learning in subsequent years. At CEEA 2018, Phase I of this project was reviewed with a focus on the content of the new first year. This year, the focus is on the structure of the proposed program and how it aims to satisfy programmatic design objectives.

The proposed first year program is highly modular, allowing for more intentional uses of time during the academic year. Course duration and intensity vary and are selected to best serve student learning, rather than conform to the traditional academic schedule. To provide more timely and targeted feedback, summative assessments occur throughout each term allowing course scheduling to extend into the traditional end-of-term final exam period. This paper presents the current structural design of the new first year and the rationale for its significant features.

Some of the program design objectives that have been facilitated by this structure include:

• strategic sequencing of learning with opportunities to integrate and reinforce essential skills,
• multiple, individualized opportunities for students to stumble and recover,
• holistic balancing of content and pacing for better student wellbeing, and
• comprehensive, well-timed exposure to wide-ranging programmatic choices for students.

Throughout this project, the program structure has evolved continuously. This paper will describe the development process, the challenges faced in that process, and the lessons learned. The paper will conclude by describing the current status of the project, and the focus of work currently being undertaken to prepare for implementation.

Keywords: first year, engineering, program, design, integrated curriculum, planning, accelerated courses, Saskatchewan

1. INTRODUCTION

For the past three years, the University of Saskatchewan’s College of Engineering has been steadily working towards the implementation of a completely new first year program (FYP). The vision for the redesigned FYP is to attract excellent students to our College from Saskatchewan, Canada and beyond, and to excite, engage and inspire our students, while preparing them holistically for the challenges to come in later years.

The project has been broken into three phases:

• Phase I - determination of first year graduate attributes,
• Phase II - development of program structure and delivery methods, and
• Phase III - development of course material.

At CEEA 2018 [1], we reported on the results of Phase I and the process by which the desired first year graduate attributes were determined. This involved reviews and comparisons of first year engineering programs across Canada and detailed consultation of students, faculty and staff within the College of Engineering and across the University of Saskatchewan campus. The final deliverable of Phase I was a 100+ page document outlining the knowledge, skills, experiences and attitudes/beliefs (KSEA), across 23 categories, that the new program would be designed to develop in students by the end of first year.

While Phase I focused on the “what” of first year engineering, Phase II of the project has focused on the “how”. More specifically, Phase II has focused on the development and refinement of an innovative delivery model for the content identified in Phase I. This model allows for the intentional sequencing and integration of material and experiences that has not been seen with traditional delivery models.

The process employed in Phase II, and the resulting model, constitute the focus of this paper.

2. PHASE II METHODOLOGY

The focus of Phase II has been determining an effective delivery model for the new FYP, including both the weekly schedule and the arrangement of courses by semester, or what we have taken to calling the “structure” of the program.
2.1. Initial Assumptions

We have maintained our project design philosophy of starting each design cycle from as much of a “blank slate” as possible. Phase I of the project yielded the desired first year graduate attributes and this list became the clay from which we began sculpting the program structure. We set out with the objective of including all topics identified as necessary by the stakeholders, with time allotments approximately proportionate to the distribution of the number of graduate attributes identified for each topic. We also sought to keep weekly contact hours at or below those of the existing first year program. Otherwise, we initially did not impose any constraints and viewed the fall and winter semesters as two blank canvases upon which we could arrange delivery of the necessary topics as we saw fit to best facilitate student learning outcomes. To be clear, “no constraints” meant that we did not initially consider any of the following potential restrictions:

- Scheduling constraints (no requirement for 13 week courses followed by a final exam period, and no assumptions on duration or intensity of individual courses),
- Physical/Facility constraints (classrooms, laboratory space, and equipment),
- Personnel constraints (assignment of duties, restrictions imposed by collective agreements),
- Assessment constraints (the need for final exams, timing of reporting of grades),
- Financial constraints (tuition and/or fees), and
- Academic constraints (accreditation, credit units, transfer programs).

While it may seem foolish to ignore these important considerations, many of these constraints are often the factors that prevent real change and program improvement from occurring, or even from being considered. Our approach allowed for a design based purely on what would work best pedagogically and that would best realize the goals of the program (discussed in Section 3).

2.2. Structural Refinement

The existing FYP at USask features traditionally paced courses which run 12-13 weeks, with a break week near the midpoint, and finishes with a roughly 3 week exam period. In contrast to this, early versions of the proposed program structure featured very intensive, accelerated courses, which included a similar number of contact hours as a traditional course, condensed to a duration of only 3-6 weeks. This allowed for a minimum number of concurrent subjects and logical sequencing of material, leading to immediate application of mathematical and scientific concepts in engineering science and design courses (just-in-time learning [2]).

To continue with the sculpting analogy, a sculptor may begin with a beautiful mental model which, for example, may have a very narrow base and an asymmetrical design. When realized physically, the creation topples over due to the practical constraint of gravity and must be refined, compromising on some ideals. This mirrors the experience of our design team as we began consulting stakeholders and applying various constraint fillers, such as facility and personnel availability, to the proposed structure. Facility and personnel constraints were analyzed by completing detailed scheduling of the entire curriculum, while the other constraints listed above were introduced through multiple rounds of consultation with academic, administrative, and regulatory stakeholders.

During this process, many of these constraints led to refinements of the program structure. The most profound impact came from facility constraints. To meet our objective of maximizing active learning opportunities such as group work and laboratory experiments for the entire expected first year cohort (600 students), most courses became drawn out in duration with a corresponding reduction in intensity. However, many constraints, such as the existing tuition model and the assessment philosophy requiring a final exam period, were challenged during this process and it was found that some of these “constraints” were not as rigid as initially assumed. Various units on campus have collaborated to steadily work toward creative solutions to allow the program to best serve the students. This has validated our “blank slate” design process. Simply asking, “What would work best?”, instead of asking, “What would work best within the system we all take for granted?”, has afforded the design team creativity that would have otherwise been stifled.

As high-level course development work has begun, engagement of instructors and subject matter experts from all academic departments involved has led to further refinements of the program’s structural details. Changes get smaller and more specific with each round of consultation as we approach a steady-state. The revisions implemented as we have “failed early and failed often” [3] have created a more robust and implementable design.

3. PROPOSED PROGRAM STRUCTURE

Figures 1 and 2 on the following pages illustrate the latest evolution of the structural design for the new FYP. Tables 1 and 2 describe some of the salient course details. The top two rows of the schedules show weeks and months. Below that, labeled horizontal bands represent the modular courses. The width of a band (course) reflects the period of time over which the course runs. For example, in Fig. 1, Linear Algebra runs from Week 9 through Week 14. The height of a band reflects the intensity of a course. The height of an average band (e.g. Calculus I) represents approximately 7 hrs/wk of class time, including lectures, labs, and tutorials. Programming is double the standard intensity, and the Engineering Discipline Labs are approximately 4 times that intensity.
**Figure 1.** Proposed program structure for first term.

**Table 1:** Contact hours and basic details for first term courses in the proposed FYP.

<table>
<thead>
<tr>
<th>Course</th>
<th>Contact Hours</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calculus I</td>
<td>31.5 Lect.</td>
<td>An introduction to differential and integral calculus at the conceptual level.</td>
</tr>
<tr>
<td>Communication I (Written)</td>
<td>15</td>
<td>A written technical communications course supporting completion of deliverables in Design I. Small class sizes allow lectures to be used as labs when needed.</td>
</tr>
<tr>
<td>Design I</td>
<td>12</td>
<td>An introduction to design with a common project for all students; includes elements of entrepreneurship, project management, leadership, and group dynamics.</td>
</tr>
<tr>
<td>Drawing &amp; Sketching</td>
<td>0</td>
<td>A manual graphical communication course where labs serve as instructional time.</td>
</tr>
<tr>
<td>Electrical Circuits I</td>
<td>15</td>
<td>An introduction to basic electrical circuits, supporting the electrical and computer engineering components of the Engineering Discipline Labs.</td>
</tr>
<tr>
<td>Engineering Discipline Labs</td>
<td>24</td>
<td>Intensive, one day introductions to each USask Engineering program, i.e. students rotate through all 8 programs over the 8 days.</td>
</tr>
<tr>
<td>Fall Top Ups</td>
<td>0</td>
<td>Optional tutorial time used by students to achieve competence in learning outcomes missed during courses or to improve marks when competence was achieved, thereby promoting skills in self-directed learning.</td>
</tr>
<tr>
<td>Indigenous Cultural Contextualization</td>
<td>7.5</td>
<td>A cultural foundation course that will allow for contextualized subsequent inclusion of Indigenous examples in the curriculum and an introduction to the importance of inclusivity and intercultural competencies in engineering.</td>
</tr>
<tr>
<td>Introduction to the Profession I</td>
<td>7.5</td>
<td>An orientation to the College, University, and profession, as well as study skills, life skills, professionalism, ethics, and some health and safety training.</td>
</tr>
<tr>
<td>Introduction to the Profession II</td>
<td>6</td>
<td>A course featuring more depth on the topics covered in Introduction to the Profession I, with some opportunity for reflection.</td>
</tr>
<tr>
<td>Linear Algebra</td>
<td>19.5</td>
<td>An applied introductory linear algebra course that builds on the Programming and Matlab courses, allowing students to use programming to solve a variety of types of linear algebra problems including systems of linear equations.</td>
</tr>
<tr>
<td>MatLab</td>
<td>0</td>
<td>A short and intense introduction to the fundamentals of Matlab, that builds on the Programming course. Labs serve as instructional time.</td>
</tr>
<tr>
<td>Mechanics I (Dynamics)</td>
<td>22.5</td>
<td>A first year particle dynamics course that builds on the Physics Summer Top Up and high school physics (projectile motion).</td>
</tr>
<tr>
<td>Natural Science</td>
<td>36</td>
<td>A unique survey course of the physical sciences (Chemistry, Biology, Physics, Geology) lasting 3 weeks (18 contact hours) per science, to compare and contrast between the sciences and each related engineering discipline.</td>
</tr>
<tr>
<td>Programming</td>
<td>22.5</td>
<td>An introductory computer programming course for engineers, using Python.</td>
</tr>
<tr>
<td>Summer Top Ups</td>
<td>0</td>
<td>Online, mastery-model modules covering key high school-level concepts in Calculus, Algebra, Chemistry, Physics, Writing, Reading Comprehension and Indigenous History. To be completed by students before September, with some support time for completion during the first few weeks of school.</td>
</tr>
</tbody>
</table>
Figure 2. Proposed program structure for second term.

<table>
<thead>
<tr>
<th>Course</th>
<th>Contact Hours</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Lect.</td>
<td>Lab.</td>
</tr>
<tr>
<td>CAD</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>Calculus II</td>
<td>33</td>
<td>15</td>
</tr>
<tr>
<td>Chemistry</td>
<td>48</td>
<td>27</td>
</tr>
<tr>
<td>Communication II (Oral &amp; Teaching)</td>
<td>19.5</td>
<td>0</td>
</tr>
<tr>
<td>Communication III (Poster)</td>
<td>12</td>
<td>0</td>
</tr>
<tr>
<td>Design II</td>
<td>16.5</td>
<td>18</td>
</tr>
<tr>
<td>Design III</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>Discipline Bridge Course</td>
<td>39</td>
<td>0</td>
</tr>
<tr>
<td>Electric Circuits II</td>
<td>25.5</td>
<td>6</td>
</tr>
<tr>
<td>Electricity &amp; Magnetism</td>
<td>21</td>
<td>9</td>
</tr>
<tr>
<td>Health &amp; Safety</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>Introduction to the Profession III</td>
<td>7.5</td>
<td>3</td>
</tr>
<tr>
<td>Introduction to the Profession IV</td>
<td>4.5</td>
<td>0</td>
</tr>
<tr>
<td>Mechanics II (Statics)</td>
<td>34.5</td>
<td>10.5</td>
</tr>
<tr>
<td>Physics</td>
<td>30</td>
<td>0</td>
</tr>
<tr>
<td>Research</td>
<td>16.5</td>
<td>6</td>
</tr>
<tr>
<td>Winter Top Ups</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
3.1. A Coordinated and Integrated Curriculum

The modular approach of the new FYP facilitates a truly coordinated and integrated curriculum, both in terms of intentionally sequenced material and integration of concepts and applications between concurrent courses. While there is little research comparing the learning outcomes of traditionally paced courses and modular, accelerated courses in engineering specifically, there is a wealth of information available for other subjects [4,5] including the natural sciences [6]. Most studies have found that outcomes from accelerated courses are at least on par with those of courses of traditional length [7,8,9].

Some studies indicate that students in accelerated courses do exhibit an advantage in recall of course concepts immediately after the course when compared with students taking the same course over a longer time period [10]. This is an intuitive result, as the information would be fresh in the minds of the students in the accelerated courses. It was found that this advantage, when observed, faded when students were tested several months after the course [11]. However, the just-in-time learning philosophy we have adopted [2] has led to a sequencing of subjects which is well positioned to promote deep learning, making use of prior learning before it has been forgotten.

One of the best examples of this progressive sequencing is computer programming. Students begin the year with an intensive programming course in Python. Students can then translate their skills into another programming language by immediately jumping into Matlab. Then, with these new skills, students can apply them in virtually every other technical course for the rest of the year. In this way, program-level learning outcomes can be much higher level than those of any one course.

Another example of purposeful sequencing appears in our efforts to respond to institutional and professional priorities related to Indigenization and reconciliation [12]. A cultural contextualization will be established to appropriately set the stage for respectful inclusion of Indigenous content. By placing this course early in the first term, students are prepared for examples of Indigenous design and technologies to be incorporated to greater extents into the rest of the first year curriculum.

Across the FYP, concepts will be purposefully linked to also allow for direct integration between concurrent courses. Concepts in Calculus I will be introduced as needed for application in Dynamics and examples of applications of calculus can be taken directly from Dynamics. Technical communication concepts will be directly tied to concurrent courses, e.g. Communication III with Research. Design II will take advantage of the fact that students will already be placed in disciplines to facilitate the most motivating choices of design projects. Several other opportunities for such integration are embedded in the program structure.

It is worth noting that such a coordinated effort will require an integrated core team of instructors, communicating continuously, between departments and colleges, both during the development of the program and during its delivery.

3.2. Bridging In and Out of First Year

The transition to university can be daunting and it is a recognized factor in attrition [13]. Likewise, the jump to disciplinary programs in second year can be abrupt, as students in a common FYP may still be uncertain what discipline they will enter by the end of first year classes. This situation can create prerequisite challenges for engineering programs if students have not taken the “right” electives in first year that match with their ultimate programmatic destinations. A modular program structure can help address these challenges.

Students arriving to first year are not homogeneous. They have different qualities, depths, and breadths of training. So why treat them all the same way by having everyone take the same introductory courses that start at the most introductory levels? With the online “Summer Top Ups”, we will set an attainable minimum standard for basic knowledge and skills across a number of fields, i.e. calculus, algebra, physics, writing, reading, chemistry, and Indigenous People’s histories. Those at or above the standard will easily be able to show their readiness for first year. For those with one or more areas of weakness, they will have an opportunity to develop competence so that first year instructors can proceed knowing that all students have the same base knowledge and skills in those areas. As such, instructors can avoid boring better prepared students with these materials, and also avoid overwhelming lesser prepared students. Largely consisting of online resources and automated assessments, the Summer Top Ups will help set expectations and prepare all students for a strong start to first year engineering.

Introduction to the Profession courses will address general life skills to better facilitate a smooth transition into the College. This transition support will include ensuring basic competency with word processors and spreadsheets, as well as study skills, time management, stress management, exam writing strategies, learning styles, critical thinking, group dynamics training, dealing with failure, and an internalization of a growth mindset [14].

The bridge out of first year empowers students to succeed in their discipline. Students will have confirmation of their discipline by the end of Week 31. This timing allows students to become excited about, and better prepared for, second year. Design II will feature discipline specific design projects and the Discipline Bridge Course will be a full course in each student’s discipline. While one major goal is to generate enthusiasm for second year among students, the Discipline Bridge Course has turned out to have a very important secondary effect. It is allowing departments to streamline their multi-
year program offerings. For example, by having their students take another programming course at the end of the FYP, Computer Engineering can include more advanced programming courses in the 2nd and 3rd year of the program. Civil, Geological and Environmental Engineering students will complete Survey Camp before the end of first year.

3.3. More Informed Decision Making

We aspire to have zero attrition due to academic failure in our new FYP. However, we ironically aspire to maximize attrition among those who may realize that engineering ultimately is not for them. Instead of having this kind of attrition in 2nd or 3rd year, we want it to happen at the end of the first term, ideally, and by the end of the first year at the latest. We also want to facilitate better decision making in discipline and elective course selection.

Empowering more informed decisions will be accomplished by spending significant time in the first term showing students the features of various engineering disciplines, and comparing and contrasting them with the related physical sciences. The existing FYP does not expose students to a selection of physical sciences until the 2nd term. Furthermore, most students only see a 20 minute sales pitch for each engineering discipline. In the proposed FYP, students will spend an entire day with every engineering discipline before the end of Term 1, concluding with advising sessions in each discipline for those students strongly interested. They will also see every physical science, as well as computer science and mathematics. In those cases, they will explicitly learn about the relationships and differences between related fields, such as chemistry and chemical engineering, engineering physics and physics, and so on. The explicit goal for the Natural Science survey course in Term 1 will be to excite and inspire the students, and to empower them with a skill that bridges disciplines.

By the end of first term, students who remain in engineering will hopefully have a higher level of confidence in their chosen vocation and a better sense of what their disciplinary choice will be. Indeed, in the new curriculum, students will be exposed to course materials in more areas of engineering by the time they need to make their choices in late March.

3.4. Empowering Life Long Learning

The Fall and Winter Top Ups will operate in a similar fashion to the Summer Top Ups, insofar as they will allow students multiple chances to “stumble and recover”. That is, if students are unable to demonstrate competency in certain learning outcomes in certain courses, they will be given the time, opportunity, and support to address those areas of weakness before there are any permanent repercussions.

While not evident in the structure of the program, it is an important programmatic objective that higher levels of competency be achieved by students in the new first year. Indeed, we frequently refer to “first year graduate attributes”. The Top Ups allow for this approach. But they will also allow students who have met the basic competencies to achieve better results, if they so choose. This will involve self-assessments of strengths and weaknesses, prioritization, and time management skills, all of which are important competencies for life-long learning.

3.5. Enhancing Diversity and Inclusion

Students from ALL backgrounds should feel welcome in engineering. While engineering is known to attract those strong in the maths and sciences (sometimes by default), it also needs to more broadly attract those interested in solving problems to help people. A more diverse curriculum can do a better job of showing that side of the profession. The curriculum will be more applied insofar as students can see how theory is expressed in practice in all subjects. The FYP will show the many possible career paths of engineers, including heavy industry, tech innovation, research, and teaching. The program will include diversity in projects that students can pursue in design and research and it will embrace different ways of knowing, e.g. oral traditions, which will be seamlessly woven into the curriculum.

Another aspect of inclusion is respect (knowing what it is and how to live it). That will be a recurring theme in the Indigenous Cultural Contextualization and in the Introduction to the Profession courses. From a structural standpoint, enhancing diversity and inclusion means eliminating needless barriers to different groups of potential students. Figure 3 illustrates a major structural aspect of the new FYP; a consistent weekly schedule. What students do week to week will vary, but the timing will remain the same. This will facilitate time management for family, jobs, teams, and other responsibilities by eliminating the possibility of evening or weekend courses.

<table>
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Figure 3. Proposed weekly/daily schedule.
3.6. Enhanced Life Balance

Figure 3 is a touchstone for another major theme of the program: enhanced life balance. Engineering is known to be a demanding field. We continue to seek to develop the requisite grit and resilience characteristic of the profession. But that need not preclude happiness, enjoyment, and physical and mental health. The blank spots in Fig. 3 represent breaks. Starting at 11:30 am, there are lunch breaks each day for the entire first year cohort, to facilitate social activities of all types, including events, clubs, games, and physical activity. Likewise, the afternoon breaks build in time for students to work together and help each other, to take a real break, and/or to head home early. Tutorials will be daily occurrences, focused on specific courses, but they will also be optional. Again, self-assessment skills will be developed in terms of judging when help is needed.

Exams illustrate another element of this focus on life balance. Rather than the traditional intensive exam period at the end of term, exams will be staggered throughout the year, and there will be the opportunity to review exams and make them formative evaluations.

It is worth noting that the design objective of reducing weekly contact hours has been met. The existing FYP at USask includes roughly 10% more contact time than the average for the first year programs at many other major Canadian universities. The proposed program reduces mandatory contact hours (which excludes tutorials and Top Ups) from 26.5 hours to 26 in the first term and from 30 hours to 28 in the second term.

4. LESSONS LEARNED

Continuous cycles of refinement of the program proposal have yielded many important lessons for anyone hoping to undertake a similar curriculum renewal project. Much of the learning experienced during Phase II of this project has centered on stakeholder engagement. Appropriate and rigorous stakeholder engagement is a key factor for success on any project, but interactions with some stakeholders on this project have revealed some key lessons worth sharing.

A lesson repeated from our experiences in Phase I of the project is that the inclusion of students as major stakeholders, and consulting with them early in the design process, can provide many benefits to the program development process. Our Committee of Student Advisors on Curriculum Development (CSACD), a group of 20+ students representing all years of undergraduate study and engineering disciplines, has provided unique insights into the impact any curricular changes will have on the student experience. The Committee has identified risks, as seen from the student perspective, associated with a non-conventional timetable. Examples include the fact that missed time in an accelerated course due to an illness may be more difficult to make up than in a traditionally scheduled course. Student concerns around this issue have helped us to focus on finding solutions through the optional tutorial time and Top Up courses. The CSACD has also recently formed sub-committees focused on determining the optimal timing of end-of-day tutorials, topics to be included in the Health and Safety course, and what types of extra-curricular activities can be integrated with the program to improve students’ work-life balance.

Another important insight into stakeholder engagement was illuminated when we met with representatives from the eight engineering programs offered at USask. Attempting to better prepare students for study in all of those eight programs with a common first year program is a difficult task. Proper preparation for each of the programs and an easy transition out of first year was one of the filters we applied to our initial constraint-free designs. To do this, we considered the program maps of each of the eight programs. However, upon meeting with representatives of each program, including undergraduate chairs, we found that many were considering the renewed first year an opportunity to update their own programs, including second year courses. These discussions loosened some of the design constraints we had applied, reiterating the importance of early and broad dissemination of project information and follow-up with stakeholders.

We also learned an important communication lesson: understand your stakeholder’s communication preferences. As engineers consulting with many non-engineers in various math and science departments in the College of Arts and Science at USask, we relied upon communication tools common to the engineering profession, such as the graphical representation of ideas for discussion. We believed that we had clearly represented our intentions to consult meaningfully and that the draft representations, such as those shown in Figures 1 and 2, were just tools to facilitate discussion. We found out late in the process that many non-engineers believed the commitment of ideas to paper signaled that plans were already finalized and the consultation process was really just a one-way conveyance of information. This partial breakdown in communication of intent may have eroded trust between partners and it necessitated renewed inter-college communication to move the project forward.

In order to align the goals and understanding of both colleges involved in the project, a pair of facilitated retreats were held in early 2019 with leadership and key stakeholders from both Colleges, as well as key administrative units on campus, such as the Registrar’s Office. The outcome of these retreats was a common understanding of the goals and challenges of the new FYP in engineering and a shared sense of responsibility to overcome the challenges. This has led to the creation of a Change Management Committee (CMC), separate from those individuals working on the design of the program. The CMC includes leadership from both Colleges and representation from the Office of the Vice-Provost Teaching, Learning and Student Experience. The CMC
will work with the project Design Committee to solve resourcing challenges, including facility, personnel, and financial constraints, and to facilitate the successful implementation of the program.

5. CONTINUING WORK

Work on Phase II of the project began in early 2018. This work has resulted in the proposed program structure presented here. However, it would be remiss to say that Phase II is complete. The iterative design process we have embraced demands that past work be constantly revisited and updated. Putting the “what” of Phase I together with the “how” of Phase II has not only impacted the deliverables of Phase II, but has led to revisions of the deliverables completed in Phase I. Furthermore, as the Change Management Committee works to identify resources and solutions to logistical challenges, they may come up against constraints that are incompatible with the current design. For example, the current schedule relies on the availability of large classrooms (300+ seats) at certain times. If these rooms are simply not available when needed, the program schedule and structure will need to be revised accordingly.

Preliminary work on Phase III of the project is also underway. Representatives from all academic departments involved will begin meeting this summer to develop learning outcomes and high-level syllabi for each course. This work will also be iterative and collaborative, as course developers will have to communicate often and openly to unlock the all of the benefits of the coordinated and integrated curriculum we have planned. And of course, developments in the detailed course design process may necessitate revisions to the overall program structure. The sculpture continues to gain finer details and features with every passing revision.

Acknowledgements

Joel Frey has been funded by the University of Saskatchewan’s Curriculum Innovation Fund. We want to thank all of the members of the Committee of Student Advisors on Curriculum Development (CSACD), as well as all of the staff and faculty who have provided input to the project thus far.

References


Appendix E - Communications and Recruitment Overview
Overview – Marketing USask Engineering’s First-Year Redesign

The primary audiences for promotion of the College of Engineering’s newly redesigned first-year engineering program are high school students, their parents, and high school counsellors and educators throughout Saskatchewan and in key communities in surrounding provinces.

Among high schools students, we will target our materials to speak to not only students with an aptitude for math and science, but those who may not initially consider engineering, including leaders who enjoy directing and motivating others, world-changers who want to impact the greater good, and curious/creative thinkers who like to think outside the box. Additional student audience segments include young women, Indigenous people and international high school students. Secondary audiences will include alumni, donors and partners of the college (e.g. co-op employers, professional organizations), to build awareness, understanding and support for the program.

In promoting the program, we will describe how key elements of the first year have been changed, including scheduling and length of classes, assessment and skills taught. The marketing materials will also describe the value of the program for student learning, success and well-being. Beyond this, we will also provide the research and the evidence that support why we’ve transformed the program.

Regarding the specific events and preparation of materials, COVID-19 has added some uncertainty to our plans, particularly surrounding high school career fairs, college-based events (e.g. Open House, What is Engineering) and school visits. Where we can, we will adapt these activities to an online presence until we are able to resume them in future years. In the meantime, social media (including paid campaigns) will be key in promoting the redesign. We can drive our audiences to a dedicated, engaging website that will be home to the materials we develop for students, parents and educators, including infographics, videos, student and faculty profiles, potentially podcast-style interviews. We will also provide updated information for the USask admission webpages. Once we learn whether school will resume, we will be able to determine what printed materials are required (viewbook, posters, etc.) – if schools are open, we’ll be able to circulate these, in addition to posting them online. We tentatively plan to host a media event to officially unveil the program and launch recruitment in the fall.

Initial recruiting and marketing efforts will focus on Saskatchewan and Western Canada, though there will be national awareness of the program due to media coverage and general buzz among alumni and the engineering education community.

Additional Note:
Appendix F – Examples of Program Learning Outcomes
Examples of Program Learning Outcomes

1) Demonstrate problem solving skills
2) Identify and classify types of problems and their important features
3) Identify and construct equivalent systems
4) Build and analyze models of systems
5) Apply engineering principles to real-life problems
6) Take in and interpret technical information (written, oral and graphical)
7) Transmit technical information (written, oral and graphical)
8) Design
9) Demonstrate safety skills and safe behaviour
10) Design, execute, and analyze the results of experiments
11) Quantify and minimize environmental impact
12) Identify and consider social impact
13) Reflect upon, draw lessons from, and provide feedback based on lived experience
Appendix G - Course Equivalencies (Information from New Course Forms)
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<th>Assigned CU</th>
<th>Identified Course Equivalencies</th>
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<td>1</td>
<td><em>Introduction to Engineering I (GE102)</em></td>
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<td><em>Engineering Communication I (GE132)</em></td>
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<td>Please note students must complete GE132 and GE 142 to be equivalent to GE121.</td>
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<td><em>Engineering Discipline Experience (GE112)</em></td>
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<td></td>
<td><em>Natural Science Courses (BIOL102.1; CHEM142.1; GEOL102.1; PHYS152.1)</em></td>
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<td>None</td>
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<td>Students with credit for all four will receive 3 credit units of elective credit in Arts &amp; Science B.Sc. programs or 3 credit units of “science” or “elective” credit in B.A., B.F.A., or B. Mus. Programs. Students who do not pass all four courses will receive no credit in Arts &amp; Science programs.</td>
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<td><em>Intro to Computer Science for Engineers (CMPT142)</em></td>
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<td>CMPT141</td>
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<td><em>Engineering Math I (MATH133)</em></td>
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<td>Students with credit for MATH133 will be considered to have completed a program requirement for MATH110, MATH121, or MATH125. Also please note that students with credit for MATH133 may not subsequently receive credit for MATH101, MATH102, MATH104, MATH110, MATH121, MATH125, MATH150 and MATH176.</td>
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<td><em>Mechanics I (GE122)</em></td>
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<td>GE125</td>
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<td></td>
<td><em>Design I (GE142)</em></td>
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<td>Please note students must complete GE132 and GE 142 to be equivalent to GE121.</td>
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<tr>
<td></td>
<td><em>Electrical Circuits I (GE152)</em></td>
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<td>EE204</td>
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Please note students must complete GE152 and GE 153 to be equivalent to EE204.

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<th>Course</th>
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<th>Equivalent</th>
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<td>Engineering Communication II (GE133)</td>
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<td>Electromagnetism and Waves for Engineering (PHYS156)</td>
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<td>Please note that students with credit for PHYS156 may not subsequently receive credit for PHYS115 (or vice versa).</td>
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<tr>
<td>General Chemistry for Engineering (CHEM146)</td>
<td>3</td>
<td>CHEM 115</td>
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<tr>
<td>Engineering Math II (MATH134)</td>
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<td>Students with credit for MATH134 will be considered to have completed a program requirement for MATH116. Also please note that students with credit for MATH134 may not subsequently receive credit for MATH101, MATH102, MATH104, MATH110, MATH116, MATH121, MATH125, MATH150, MATH176 and MATH177.</td>
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<td>Mechanics II (GE123)</td>
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<td>Design II (GE143)</td>
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<td>Electrical Circuits II (GE153)</td>
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<td>EE204</td>
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<tr>
<td>Please note students must complete GE152 and GE 153 to be equivalent to EE204.</td>
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<tr>
<td>Process Engineering (GE163)</td>
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<td>Bridge Course (Lecture and Lab hours per bridge course vary by specific bridge course)</td>
<td>3</td>
<td>CMPT146 is being used as a Bridge Course for certain programs and will be equivalent to CMPT145.</td>
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**Total = 44**

*Please note that the above represent the standard course equivalencies of proposed first-year courses as listed in the New Course Forms. More detailed transfer credit evaluation will be completed as a part of the admission process, and will take into account full student record, historical data and institutional expertise to determine equivalencies in individual cases.*
Appendix H- Memo from Manager of Curriculum and Professional Development, Gwenna Moss Centre for Teaching and Learning
Dear Academic Programs Committee:

I am delighted to write this letter of support for the College of Engineering’s redesigned common first year. I have been excited to see the new first year program taking shape in the College and am grateful the Gwenna Moss Centre for Teaching and Learning (GMCTL) has been deeply embedded in the process of designing first year engineering courses, scope and sequence, and assessment. Dr. Nancy Turner, our director, and the other four of us supporting the program development and change management process are delighted to see a planned program that embodies so many research-supported processes in higher education teaching and assessment.

The newly redesigned program is consistent with the university’s goals to increase retention and support greater diversity within the student population. The focus on integration in courses and careful examination of course outcomes will provide students with a more coherent and supportive program, and the focus on competency-based assessment will be particularly helpful. Although competency-based systems are becoming increasingly common in educational institutions, they are relatively new at our university, except within colleges whose accreditation processes require them. The choice to focus on ensuring as many students as possible achieve the thresholds for competency through the planned top ups and grading processes represents a transition to evidence-based assessment practices that embodies the educator commitments in the renewed version of Our Learning Charter (2018) and assessment priority of the Learning, Teaching, and Student Experience Plan (2019). The opportunity to partner with the College in providing a model for joint curriculum and assessment development processes has been positive and informative for all partners, and will provide a model for similar strategic work with other colleges on campus.
Competency-based assessment requires that programs establish clear, skills-based outcomes, and develop multiple opportunities for students to demonstrate those outcomes over time. Competency-based processes utilize the best and most recent assessment evidence to determine student grades, so that a grade is representative of the students’ current levels of skill and understanding, rather than an uncertain mix of practice, early attempts, and summative assessments. The College’s planned top-ups, overt A, B, and C classifications for thresholds, and careful examination of each course syllabus against the College’s assessment principles and course outcomes have generated designs consistent with the intent and process of competency-based systems, and the students will be the beneficiaries of that careful planning. While some students will be successful regardless of course and assessment design or teaching philosophy, assessment research strongly indicates that the approach in the College of Engineering’s new first year program is more likely to yield appropriate skill level and understanding in a broader student body. It is also supportive of increased student wellness and growth mindset, aligning it well with academic wellness initiatives on campus. I would like to congratulate the College on selecting the assessment system most likely to meet the College’s collective goals, and appreciate the ongoing opportunity to work with Engineering in adapting evidence-based assessment to the College’s needs.

Sincerely,

Wendy James, PhD
Manager, Curriculum and Professional Development
Gwenna Moss Centre for Teaching and Learning
Appendix I – Sample Engineering Departmental Presentation
Proposed New First Year Engineering Program at the University of Saskatchewan

Department of Electrical and Computer Engineering
September 3, 2019
Project History

- 4 years ago we mused about redesigning first year from the ground up (from a blank sheet of paper)

- about 2.5 to 3 years ago, that project became “official”

- 2 years ago, Joel was hired as a curriculum developer
Project History

- Phase I (2017) focused on content: **what** would be in 1\textsuperscript{st} year (which became a focus on 1\textsuperscript{st} year “graduate attributes”)
  - Involved several rounds of consultation with College faculty, staff and students
  - Resulted in a 100 page list of Knowledge, Skill, Experience and Attitude Attributes students should have by the end of first year
Phase II (2018 – 2019) has focused on the *structural model* of 1st year

- Initially assumed no constraints to develop a program that worked best pedagogically
- A review of literature on accelerated courses has shown the possibility of better learning outcomes vs traditional, 16 week courses
- Just-in-time learning takes advantage of this to immediately apply these better-retained knowledge and skills
- Over multiple rounds of revision, logistical constraints have been integrated in the design
Project History

- Phase III (2019 – 2021) is focused on the course development
  - Course syllabi sufficient for the approval process needed by December 2019
  - Detailed course design can continue up until implementation (Fall 2021)
Project History

- The proposed program will feature a truly integrated curriculum
- To ensure effective collaboration across colleges (Engineering and Arts & Science), two retreats were held in early 2019
- This led to the formation of the following team structure
Core Project Team

Change Management Committee Executive
- Vince Bruni-Bossio
- Peta Bonham-Smith
- Suzanne Kresta
- Bruce Sparling
- Gordon DesBrisay

Design Committee (DC)
- Sean Maw
- Joel Frey
- Jim Bugg
- Susan Bens
- Ryan Banow
- Andrea Eccleston

Change Management Committee (CMC)
- Vince Bruni-Bossio
- Suzanne Kresta
- Gordon DesBrisay
- Jim Bugg
- Matthew Paige
- Nancy Turner
# Extended Project Team

## Engineering
- Jim Bugg (Mechanical Engineering)
- Richard Evitts (Chemical Engineering)
- Andrew Kostiuk (Electrical and Computer Engineering)
- Ian Fleming (Civil Engineering)
- Chris Hawkes (Geological Engineering)
- Warren Helgason (Environmental Engineering)
- Adam Bourassa (Engineering Physics)
- Rebekah Bennetch (Technical Communication)
- Sarah Gauthier (Inclusivity)
- Brad Schmid (Graphics and CAD)
- Kristin Cutting (Careers)

## Arts & Science
- Ian Burgess (Chemistry)
- Joyce McBeth (Geology)
- Tracy Marchant (Biology)
- Rainer Dick (Physics)
- Gary Au (Mathematics and Statistics)
- Michael Horsch (Computer Science)

## Gwenna Moss Centre
- Wendy James
- Stryker Calvez
- Rose Roberts
- Nazreen Beaulieu
The University of Saskatchewan’s College of Engineering will have the most effective first year engineering program in Canada. The first year program will excite, engage and inspire our students, and it will holistically prepare them for the challenges to come in later years. Ultimately, it will also serve to enhance the reputation of the College.
# The Structural Model (v26)

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 |
| **Apr-Aug** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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## Summer Top Ups

- **Introduction to the Profession I**
- **Engineering Math I**
- **Drawing and Sketching**
- **Comm. I**
- **MatLab**
- **Design I**
- **Course**
- **Indig. Cultural Contextualization**

## Fall Top Ups

- **Mechanics I (Dynamics)**
- **Electrical Circuits I**

## Engineering Discipline Labs

- **Intro. to the Profession II**
- **Communication II**
- **CAD**
- **Physics and E&M**
- **Chemistry**

## Winter Top Ups

- **Mechanics II (Statics)**
- **Engineering Math II**
- **Health & Safety**

## Fall Top Ups (Online)

- **Natural Science**
- **Programming (Python)**
- **Communication III**
- **Research**
- **Process Engineering**
- **Discipline Bridge Course**

## Discipline Assignment

- **Students Select Top 3 Discipline Choices**
Design Themes

- also regarded as programmatic design objectives
  a) better bridging in/out of first year, including better employment outcomes
  b) better informing student decision making
  c) coordinating/sequencing/integrating curriculum
  d) empowering life long learning
  e) promoting ethics and professionalism
  f) timely and formative assessment and feedback
  g) enhancing diversity and inclusion
  h) enhancing life balance
# The Weekly Schedule

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Project Timeline

- Basic Course Development – Generation of course syllabi suitable for the course approval process
  - Complete by December 2019
- Course/Program Approvals
  - January 2020 – Summer 2020
- Detailed Course Development
  - January 2020 – August 2021
- Full Implementation
  - September 2021
- Continuous Improvement
  - Ongoing after implementation
First Year Learning Outcomes

2 Types:

1) Course Learning Outcomes
   • Specific to each course
   • More technical in nature

2) Program Learning Outcomes
   • Cut across multiple courses
   • More transferable in nature
Examples of Program Learning Outcomes

1) Demonstrate problem solving skills
2) Identify and classify types of problems and their important features
3) Identify and construct equivalent systems
4) Build and analyze models of systems
5) Apply engineering principles to real-life problems
6) Take in and interpret technical information (written, oral and graphical)
7) Transmit technical information (written, oral and graphical)
Examples of Program Learning Outcomes

8) Design

9) Demonstrate safety skills and safe behaviour

10) Design, execute, and analyze the results of experiments

11) Quantify and minimize environmental impact

12) Identify and consider social impact

13) Reflect upon, draw lessons from, and provide feedback based on experience
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*Notes:*
- CAD: Computer-Aided Design
- Research: Research Methods
- Physics and E&M: Physics and Electricity & Magnetism
- Electrical Circuits II: Advanced Electrical Circuits
- Intro. to the Profession IV: Advanced Introduction to the Profession
- Design II: Advanced Design
- Discipline Bridge Course: Disciplinary Bridge Course
- Indig. Cultural Contextualization: Indigenous Cultural Contextualization
- Programming (Python): Programming in Python
- Drawing and Sketching: Drawing and Sketching
- MatLab: MatLab Programming
- Design I: Design Fundamentals
- Electrical Circuits I: Electrical Circuits Fundamentals
- Health & Safety: Health and Safety
- Mechanics II (Statics): Statics Mechanics
- Engineering Math II: Advanced Engineering Math
Thank you.
Please direct all additional input, feedback and questions to: andrea.eccleston@usask.ca
Appendix J – Questions from Department Meetings_Fall 2019
In order asked:

- **Question:** Who will be responsible for teaching this new curriculum?
  - **Response:** APA and new APA hire, lecturer hires. By and large a specific team will be teaching the majority of the Engineering First Year so that they can keep in touch to help with the integration across courses and so the students get familiar and comfortable with them.

- **Question:** What will be in the CAD course?
  - **Response:** We are just starting work with Brad on this to determine the outline.

- **Question:** With consideration to the CEAB requirements, how does the change with the Math and Science courses affect accreditation?
  - **Response:** We will still meet the requirements laid out and still use math and science professors to teach these courses. We will be doing an AU count against the new program to ensure we still meet these in the new program. We are not changing the nature of the math and science courses but plan to use more relevant examples to the field of engineering.

- **Question:** GEOL 121 – now covered by the Geology component in the Natural Science Lab-Based course and a 2 cu course Geology is creating for 2nd year. What can be cut to keep GEOL 121 equivalent in the 1st year?
  - **Response:** There are other pieces from 2nd year now in 1st year so need to look at this to see if things perhaps balance already.

- **Question:** ENVE needs all 3 science electives. Does this mean we have to take all three in 2nd year?
  - **Response:** This is something that will need to be looked at and discussed in more depth between the Design Committee and ENVE.

- **Question:** What happens if someone is away sick for an extended period of time? (Ex: 2-3 weeks)
  - **Response:** The top ups will be important in cases like these.

- **Question:** Turnaround time for students on assignments?
  - **Response:** We’ll be using automated assessment technology to help provide rapid and high quality feedback.

- **Question:** Will changes to 2nd year be required as a result of the new 1st year?
  - **Response:** Many departments are looking at this as an opportunity to revise 2nd year. It is possible some changes will be required and discussions will be required with each program.

- **Question:** Have you thought about how this affects 2nd through 4th years of the programs?
  - **Response:** the new first year program is being created as competency-based learning. This will require students to master certain basics and should make them more prepared for 2nd year.

- **Question:** Will moving from an unconventional 1st year to a conventional 2nd year be harder for the students than current program?
  - **Response:** We have softened the step but students should be better prepared for 2nd year in the new program than the current first year.

- **Question:** Is this harder or easier than the current version?
- **Question:** Could we have GEOL in Design II instead of Design?
  - **Response:** Likely yes. Let’s talk about it.

- **Response:** There are views from across the college on both sides. The Design Committee is hoping for average.
In order asked:

- **Question: Physics Summer Top Up – how does this work and how does it help prospective students.**
  - **Response:** Talked about the concept of the Summer Tops Ups; ALEKS.com; help to ensure students understand the high school basics coming into the program. If a student doesn’t have the admissions requirements this won’t meet those.

- **Question: Accreditation – relationship with complementary studies**
  - **Response:** Technical Communications courses; Intro to Professional (III or IV) will learn briefly about the various humanities so they can make an informed choice about their elective in 2nd year.

- Jim talked about the 2 options currently being discussed for ME discipline bridge course at end of Year 1.

- Mehdi talked about options currently being discussed for CHE for discipline bridge course at end of Year 1.

- **Question: What software will be used in the CAD course?**
  - **Response:** Leaning towards AutoCAD (as opposed to SolidWorks)

- **Question: Have you considered the needs of the higher curriculum past 1st year?**
  - **Response:** Yes, for links to second year, and remain open to considering changes base on this as we move forward. Started in Phase I. Ex: Math Taylor Series. Continue to consult with departments. Will be sending around learning outcomes for Statics and Dynamics in the next few weeks. Are focused on “Just In Time” Learning.
  - Some departments (CME and CHE as examples) are looking at their 2nd-4th years of their programs to make changes based on the revisions to 1st year.

- **Question: Question on course titled “Physics and E&M”**
  - **Response:** talked about how this course is being developed and what they have started to talk about the content being.

- **Question:**
  - **Response:** ex: Significant Digits – cross multiple classes; It will be a team approach and we need people talk about same concepts in similar fashion across courses.

- **Question:** Around the schedule on courses of varying length and intensity and is there a way to see if there is a correlation to success of student?
  - **Response:** different cu for courses and sort of three general types of courses. Participation courses, courses that are more like our traditional courses, then the in-between courses (quiz, assignment or 2 but not a major exam).

- **Question: How will grades work….5 business days past end of class….when will they get their marks.**
  - **Response:** Some will be ready shortly after each class ends, some will have to wait for Top Up marks. Marks end of fall and end of winter. Course marks and program learning outcome marks.

- **Question: What’s transferable? (Sean raised this question)**
  - **Response:** if they have done drawing and sketching but not Communication they will get credit for the one but take the other.

- **Question: Scheduling problems – do you have to pass all of first year before you proceed with second year.**
- Question: What happens if you are sick for an extended period? (Sean raised this question)
  
  o Response: This is another way that the Top Up courses could help students move through the program.

- Question: You mentioned learning to be a student? For CHE jump from 1st year to 2nd year. Is this going to make that jump that much more difficult from unconventional to traditional learning styles?
  
  o Response: Variations have come up on this question. This is the stepping stone but yes a different system. Have built in some periods with multiple exams at same time to simulate exam time. If we have done a better job with first year they will also have better skills for the transition and 2nd year on.

- Note: Joel shared that the committee has discussed and is looking at a reduced work load option.
In order asked:

- **Question:** Is this program finalized or a proposal?
  - **Response:** It’s still a proposal until it goes through the approval process likely starting in January 2020. For launch in Fall 2021.

- **Question:** Summer Top Ups mandatory or required? How much time?
  - **Response:** This is still being worked out but if a student has the knowledge they wouldn’t have to go through that content. Sort of test through and spend additional study time/questions on what they struggle with. Amount of time unknown at present (closer to 5 days than 3 months).

- **Question:** Could the Summer Top Ups be a detriment to students applying and enrolling in Engineering?
  - **Response:** We would do all we can not to make them a detriment.

- **Question:** So the last 3 weeks the students are in their discipline?
  - **Response:** Yes, and for ECE (CME and EE) the course will focus on programming.

- **Question:** How does the Structural Model work? How is it evaluated?
  - **Response:** We have more information on types of courses and evaluation a little later in the presentation. 3 types of classes: Participatory (P/F), Traditional, Hybrid.

- **Question:** What happens if you fail a course? If you fail Communication II can you take Communication III?
  - **Response:** This is where the Top Ups come in. It approaches more of a mastery model. So students are solid on the basics. It could happen that someone would have to re-take all or parts of the first year.

- **Question:** You should consider spreading the Programming (Python) course out over both terms.
  - **Response:** The skills learned in Programming will be applied in other courses throughout the first year.

- **Question:** How is this mathematics content comparable to current first year?
  - **Response:** It will be a mix of topics. For example some calculus and linear algebra in term 1 but then more complex in term 2. Stats a brief intro in Term 2 and applied in the Research course later in term 2. Discrete math, algebra, etc. The math spine runs pretty much through the entire first year. They will know integration by the time they need it.

- **Question:** For EE if they are weak in math they will not do very well in the program. Provide structure for math.
  - **Response:** Math will be a large part of the summer top ups. ALEKS.

- **Question:** A question about the research block and time line.
  - **Response:** Research is a course. Each block on the diagram is a course. Courses are made up of modules. The amount of time for each course determines the number of modules. Some short courses may only have one module. The Research course will allow Engineering to have a course that is like the FYRE program on campus (First Year Research Experience) but specific to the field of Engineering. Data sets from each program would be used and the students would work to solve a problem with it.

- **Question:** What is the difference between Natural Science and Chemistry and Physics?
Response: The Natural Science course is 4 - 1cu courses one in each of Physics, Geology, Chemistry and Biology so they understand the difference between each and the link to Engineering.

- Question: Statics is after Dynamics?
  - Response: Based on the fact that what they learn in High School is similar to Dynamics so if we start there before they go into a new area. Dynamics first is a better stepping stone. We could do a swap in future years if it doesn’t work.

- Question: What’s the difference between Drawing and Sketching and CAD?
  - Response: By hand and with the computer.

- Question: How will students register for this?
  - Response: It will likely be a block registration. Students would just get their timetable. That said we are still working out the details.

- Question: Is it possible to fail a module?
  - Response: Yes, but then the tops ups are there to help them catch up.

- Question: Many universities have discipline specific programs for first year. Why don’t we?
  - Response: We were given the scope of a common first year not discipline specific for this project.

- Question: Please don’t call it Intro to the Profession I. Call it something fun like Orientation week.
  - Response: We will. The Intro to Profession courses bookend both terms.

- Question: Who is teaching this new first year program?
  - Response: The engineering portion of the new program will, for the vast majority of it, be taught by a small dedicated team. Sean, Joel, new APA. A&S will still deliver the A&S courses and there will be regular meetings of the instructors to ensure integration.

- Question: How are departments being made aware of what is in the first year so they can adjust the 2nd year (or other year) content?
  - Response: DH said that once we know the content of the first year they will review 2nd year and upper years and adjusting as needed.

- Question: What will the Mechs do for the Bridge Course?
  - Response: They are looking at two different ideas.

- Question: What’s the progression for the short slices of Introduction to the Profession?
  - Response: We are working on that now. A list of small things including student reflection on what is working, what did I get out of studying that way, etc.

- Question: What is CrowdMark?
First Year Redesign – Design Committee and SOPD Department Meeting
Tuesday September 3, 2019 at 9:30am
Questions/Feedback

In order asked:
- Question: Top Ups – to shore up topics. But what happens if you struggle with a math concept and how that would then affect other courses, are the Tops Ups there in time for this?
  o Response: Yes, they are there as soon a student struggles with any concept. They can also assist if a student is sick for a period of time.
- Question: Can we use CrowdMark this term in our classes?
  o Response: Yes, it can be used for any Engineering courses this term.
- Question: How do we get access and training to CrowdMark?
  o Response: Sean will send the information to SOPD Faculty.
- Deb Shared Following Note: Learning outcomes – The CPC program is looking at doing something similar with course learning outcomes and program learning outcomes. They are planning to meet later this term regarding this. May be able to share information back and forth on this.
- Question: With the modules how do you know what they have if they fail out at Christmas to transfer?
  o Response: The first term is difficult to quantify but they will have 1cu in each of the four natural sciences, possibly up to 4cu of math, 2 or 3 of mechanics, etc. This needs to be finalized by December when the syllabi start going through the approval process.
  o We can do a better job of transfer credit for incoming students with the new system because we will be able to be more specific about what they have and what it counts for. For outgoing students it may not work the same.
  o There is a half speed option if a student wants to take it slower and complete over 2 years. It’s not ideal but it is an option if needed.
  o If they change colleges at the end of first year they would have more 3cu equivalencies to certain Arts and Science courses such as Chemistry, Physics, etc.
- Question: What types of grades do they get for each course?
  o Response: Regular grades. 3 types of courses: participatory (likely P/F), traditional, and a hybrid (perhaps not a summative final exam but more assignments and quizzes). They will also have the Program Learning Outcomes which will either be P/F or a grade.
- Question: Programming and Drawing and Sketching have links to the Communications classes as well. Will those be made to the students?
  o Response: Yes, to the best of our ability in particular with the programming.
- Question: What happens if all students struggle with a concept? Would the faculty re-visit this in class or would it fall to the Top Ups?
  o Response: Depends on where in the class this falls. If early the prof could revisit and the Top Ups could assist. If at the end of the class it may have to fall to the Top Ups but likely the prof would try to help.
- Question: See two big issues – this is giving the students the background that we already assume they have. If we add rhetoric to first year this could have bigger implications for RCM 300…but then we might have to have different sections or courses for Engineering students and AgBio students.
  o Response: They won’t have done this extensively but they will have been introduced to some things and would have been able to ruminate on it between first year and RCM
300. Wait to see the content when we send it out and provide feedback. Will consider combining Comm II and Comm III.
First Year Redesign – Design Committee and General All Department and Staff Meeting
Thursday October 3, 2019 at 4:00pm
Questions/Feedback

In Attendance: Kristen Cutting, Ian MacPhedran, Donella Hoffman, Jeanie Wills

In order asked:
- Question: What is drawing and sketching?
  o Response: It is currently contained in GE 121 and is a useful skill for Engineers.
- Question: What is the Fall Top Ups
  o Response: These are not scheduled classes.
- Question: ~35 hours for classes a week?
  o Response: This 35 hours is not all lecture. It is broken into lecture, labs and tutorials. The tutorials are optional.
- Question: Is any of this content from 2nd year?
  o Response: Yes, more details to come later in the presentation. Programming now in 1st year. Comp studies elective moving to second year. Others.
- Question: How will you evaluate top ups and some other things?
  o Response: Top ups will be online, mastery model. Automated assessment systems are being looked into. Well-trained TAs are also part of the project.
- Question: How much do you think people will need to Top Up before starting the program?
  o Response: Likely quite a bit. Anecdotally we are hearing this from some of the departments.
- Question: Engineering Labs – they will see 5 of 7? But all 7 are being offered?
  o Response: Yes all 7 are being offered but the students will rank and we will do our best to give all their top 5.
- Question: Thank you for having the Top Up and the Indigenous Cultural Contextualization courses. This will help with some of the other courses in later years. Can I sit in on this course?
  o Response: Yes.
- Question: What are you going to do about gender?
  o Response: Starting in January we will start looking into how to deliver these courses. Including 30% diversity content in the curriculum so in examples, etc.
- Question: Do you have any definitions of indigenization?
  o Response: There is no one definition. More discussion.
- Question: Has there been student feedback after the initial survey?
  o Response: Yes, CSCAD (acronym?) is a student committee with representation through the years and disciplines and they have been involved. Will be re-instituted this year and started again soon with updated membership.
- Question: How much awareness is there at other engineering schools about this redesign? Is there interest?
  o Response: Yes and lots. People asked when we presented at CEEA we were asked if we were hiring.
- Question: What are the risks? What can cause this to fail?
  o Response: Logistical risks such as space and getting the rooms we need to run this schedule as well as other logistical issues already mentioned. If the faculty teaching the courses don’t coordinate. TA support will be vital – need TAs or can be effective and will need to be well trained. The Assessment system – falls apart if the systems can’t keep up. Another risk to meet our goals is how this is marketed.
Appendix K – Memo from Chair, Engineering/Arts and Science Curriculum Change Management Committee and Strategic Project Advisor and Support to the Provost Office
April 13, 2020

University of Saskatchewan
University Council - Academic Programs Committee
ATTN: Amanda Storey, Academic Programs Coordinator
E290 Administration Building
105 Administration Place
Saskatoon SK S7N 5A2

Dear Academic Programs Committee:

I am writing you today as the Strategic Project Advisor and Support to the Provost Office and as the Chair of the Engineering/Arts and Science Curriculum Change Management Committee (CMC) for the Engineering First Year Redesign Project in support for the major program revision proposal package. This committee was established, at the request of both Dean Suzanne Kresta and Dean Peta Bonham-Smith, in March 2019 to coordinate change management processes for this project. Provost Tony Vannelli asked me to chair the CMC committee as part of my role in the Provost office. The committee reviews and oversees timelines, resources, and other issues related to the implementation of the redesigned first-year Engineering curriculum. It continues to meet regularly.

The CMC includes representatives from both Colleges and from the Gwenna Moss Centre for Teaching and Learning. The CMC is guided by principles that ensure that the strategic directions and values of both Colleges as well as student learning and collegiality are prioritized in all decisions. The needs, wellbeing and experiences of the people impacted by this program change are also key drivers in how decisions are made.

An Executive to the Change Committee meets as needed to oversee the decisions and process of the committee. The Executive has final authority on all decisions regarding timelines and implementation of the program and consists of the Deans and Associate/Vice Dean, Academics and the Chair. Working groups and advisors are utilized by the Change Committee as needed throughout the process.

Since being created, the CMC has worked diligently to bridge any gaps or misunderstandings between the two Colleges. This has included meeting with department heads and faculty as needed. Working with both Colleges, the CMC has assisted with funding challenges, space challenges, curriculum development challenges and others such issues.

The CMC also interacts regularly with the Design Committee for this project to ensure that the design of the program aligns with the change processes and to ensure that the CMC can assist with any challenges the Design Committee has encountered. Overall, the Design Committee has been the engine of this project, meeting weekly and working endless hours to design an
integrated curriculum. I cannot express how much work this committee has done over the past years.

This collaborative project should be celebrated at our University for two reasons. First, the curriculum is authentically integrated so that each course builds on the next to ensure students are increasing their understanding of Engineering skills and have a firm understanding of the basics before proceeding. The program is also the first of its kind in Engineering and will position our University as a leader in Engineering education. Second, it is rare to witness the collaboration of two colleges at the level needed to build an integrated curriculum. The leaders and faculty of these college should be commended for providing an example of how we can all work together to transcend structural barriers. This type of collaboration aligns well the desire by our university to explore ways to embrace interdisciplinary opportunities and enrich disciplines.

In my role as Chair of the CMC, I have witnessed first-hand the hard work it has taken for this large-scale curricular change to move forward. I can attest that this project is only effective because of the successful efforts demonstrated by all involved in the Engineering First Year Redesign project. I feel compelled to emphasize the extraordinary level of good will that is evident (and was required) for the success of this project. As chair of the CMC I am proud to have been a part of a diligent group of people who continue to demonstrate their value in assisting all parties involved in this project to work together efficiently and develop innovative solutions to issues as they arise.

Sincerely,

Vince Bruni-Bossio
Chair, Engineering/Arts and Science Curriculum Change Management Committee
Strategic Project Advisor and Support to the Provost Office
Associate Professor, Edwards School of Business, University of Saskatchewan
Appendix L - Core and Extended Project Team Structure and Membership
Core Project Team

Change Management Committee Executive
• Vince Bruni-Bossio
• Peta Bonham-Smith
• Suzanne Kresta
• Bruce Sparling
• Gordon DesBrisay

Design Committee (DC)
• Sean Maw
• Joel Frey
• Jim Bugg
• Susan Bens
• Ryan Banow
• Andrea Eccleston
• Shaobo Huang
• Noreen Predicala

Change Management Committee (CMC)
• Vince Bruni-Bossio
• Suzanne Kresta
• Gordon DesBrisay
• Jim Bugg
• Matthew Paige
• Nancy Turner

Extended Project Team

Engineering
• Jim Bugg (Mech Eng)
• Richard Evitts (Chem Eng)
• Andrew Kostiuk (Elec and Computer Eng)
• Ian Fleming (Civil Eng)
• Chris Hawkes (Geol Eng)
• Warren Helgason (Enviro Eng)
• Adam Bourassa (Engineering Physics)
• Rebekah Bennetch (Technical Communication)
• Sarah Gauthier (Inclusivity)
• Brad Schmid (Graphics and CAD)
• Kristin Cutting (Careers)

Arts & Science
• Ian Burgess (Chemistry)
• Joyce McBeth (Geology)
• Tracy Marchant (Biology)
• Rainer Dick (Physics)
• Gary Au (Mathematics and Statistics)
• Michael Horsch (Computer Science)

Gwenna Moss Centre
• Wendy James
• Stryker Calvez
• Rose Roberts
• Nazreen Beanlieu
April 13, 2020

University of Saskatchewan
University Council - Academic Programs Committee
ATTN: Amanda Storey, Academic Programs Coordinator

Dear Academic Programs Committee:

I represent the College of Arts and Science on the joint Executive and Change committees helping to oversee development of the new first year Engineering curriculum, which involves the design or re-design of a number of Arts and Science STEM classes. This is a critical venture for both colleges, one which stands to benefit future cohorts of students for many years to come. The College of Engineering’s bold vision and collaborative approach to this project are to be commended. The College of Arts and Science fully supports this initiative.

Arts and Science has approved ten new courses for use in the Engineering redesign first year curriculum. At each stage of the development of these courses, equivalencies and transfer implications were taken into account. We now foresee no difficulties on that front.

The same can be said with regard to the assignment of duties within the Arts and Science departments concerned. The new and revised courses were developed by faculty chosen by their department heads in the expectation that they would also teach the class going forward. The colleges have cooperated with each other and with the Gwenna Moss Centre and the Provost’s Office to ensure that staffing and resourcing will not be a barrier to the rollout of the redesigned program in Fall 2021 (pending all required approvals), when start-up costs will peak. We are confident that revenue flows from teaching activity will make these courses independently viable thereafter.

A high level of collaboration and coordination between our two colleges has been a hallmark of this project of redesign and renewal and bodes very well for its success.

Sincerely,

Gordon DesBrisay
Associate Professor and Vice-Dean, Academic
College of Arts and Science, University of Saskatchewan
The Academic Programs Committee (B.Sc.) has approved the proposals for the following courses, at the college-level, on behalf of the College of Arts & Science:

BIOL 102.1 Nature of Engineering
CHEM 142.1 The Global Impact of Chemistry for Engineering
CHEM 146.3 General Chemistry for Engineering
CMPT 142.3 Introduction to Computer Science for Engineers
CMPT 146.3 Principles of Computer Science for Engineers
GEOL 102.1 Introduction to Geology for Engineering
MATH 133.4 Engineering Mathematics I
MATH 134.3 Engineering Mathematics II
PHYS 152.1 Introduction to Atoms and Nuclei for Engineering
PHYS 156.3 Electromagnetism and Waves for Engineering

The College of Arts & Science Faculty Council will be informed of the approval of these courses in the Items for Information document submitted by the committee, to the February 4, 2020 meeting.

Pending approval of the program revisions by the College of Engineering, the College of Arts & Science will collaborate with your college to submit a joint proposal to the Academic Programs Committee of Council, such that the new program and the constituent courses proceed through the university-level approval processes concurrently.
Appendix O – Edwards School of Business Memo
TO: Dr. Bruce Sparling  
Associate Dean, Academic

FROM: Noreen Mahoney  
Associate Dean, Students & Degree Programs

DATE: February 13, 2020

RE: College of Engineering First Year Redesign

The Edwards School of Business is in full support of the College of Engineering’s redesign of their first-year curriculum. We understand the need to provide programming that meets the needs of a diverse student population and the ever-changing demands of the workforce. Business education is an essential skillset for future engineers, and we support the College in their desire to continue to include business principles in their refreshed curriculum.

Although the College has indicated they will continue to provide business competencies in their distributed curricula, we anticipate that students wishing to enhance their Engineering degree with a Certificate in Business or a Certificate in Entrepreneurship will have the opportunity and space in their program to access business courses as electives.

We look forward to working with the College of Engineering to ensure students who wish to augment their studies with business continue to have the opportunity to do so.

Sincerely,

Noreen Mahoney, CPA, CA, MBA  
Associate Dean, Students & Degree Programs  
Edwards School of Business  
PotashCorp Centre - 25 Campus Drive  
Saskatoon, SK, CA S7N 5A7
Appendix P - Response from Planning and Priorities Committee of Council
MEMORANDUM

TO: Suzanne Kresta, Dean, College of Engineering
    Bruce Sparling, Associate Dean, Academic, College of Engineering
    Sean Maw, Associate Professor, College of Engineering
    Joel Frey, Assistant Professor, College of Engineering

FROM: Darrell Mousseau, Chair, Planning and Priorities Committee (PPC) of Council

DATE: February 25, 2020

RE: Proposed First Year Engineering Redesign

On behalf of the planning and priorities committee of Council, I would like to begin by thanking Drs. Sparling, Maw, and Frey for attending the PPC meeting of February 12, 2020 to discuss the proposed Engineering First Year Redesign.

The committee commends the college for their work. The material was comprehensive, clear and compelling.

The committee members agreed that the degree pathways from first-year engineering need to be clearly defined and communicated to students. The course equivalencies should be pre-determined so that students will know that if they finish a set of courses, what will be the equivalent. This will empower students to know that they have options. This needs to be done in addition to ensuring that there is proper student advising. This should be explicit in the program redesign documentation.

Detailed information should be provided on the strategies that have been developed for faculty assignment of duties in Arts & Science to accommodate the proposed modular approach. The members of the committee also wondered whether there was a wellness component built into the program design.

There were also a few suggestions for your consideration.

- In the documentation, there should be more discussion of how the redesign fits into the Canadian scene in engineering education.
- Please identify which metrics will be used to measure progress towards EDI goals.
- A communications plan is needed for national and local recruitment, and to ensure continual consultation with the students.
• Articulate briefly where/how sustainability is integrated into the curriculum.

Thank you for your work on this program’s redesign. We encourage you to consider this feedback in the next iteration of the proposal that is presented to APC.

Please do not hesitate to contact me if you have any questions.

Kind regards,

Darrell Mousseau
Chair, Planning and Priorities Committee
University of Saskatchewan
tel: (306) 966-8824

Andrew Grosvenor, Planning and Priorities Committee
Vince Bruni-Bossio, Planning and Priorities Committee
Anthony Vannelli, Provost and Vice-President Academic
Russ Isinger, University Registrar
Chelsea Willness, University Secretary and Chief Governance Officer
Susan Detmer, chair, Academic Programs Committee of Council
### Consultation with the Registrar Form

This form is to be completed by the Registrar (or his/her designate) during an in-person consultation with the faculty member responsible for the proposal. Please consider the questions on this form prior to the meeting.

#### Section 1: New Degree / Diploma / Certificate Information or Renaming of Existing

1. Is this a new degree, diploma, or certificate?  
   - Yes [ ]  
   - No [X]  

2. Is an existing degree, diploma, or certificate being renamed?  
   - Yes [ ]  
   - No [X]  

If you've answered NO to each of the previous two questions, please continue on to the next section.

3. What is the name of the new degree, diploma, or certificate?  

4. What is the credential of this new degree, diploma, or certificate? [Example - D.M.D. = Doctor of Dental Medicine]  

5. If you have renamed an existing degree, diploma, or certificate, what is the current name?  

6. Does this new or renamed degree / diploma / certificate require completion of degree level courses or non-degree level courses, thus implying the attainment of either a degree level or non-degree level standard of achievement?  

7. If this is a new degree level certificate, can a student take it at the same time as pursuing another degree level program?  
   - Yes [X]  
   - No [ ]  

8. If YES, a student attribute will be created and used to track students who are in this certificate alongside another program. The attribute code will be:  

9. Which College is responsible for the awarding of this degree, diploma, or certificate?  

10. Is there more than one program to fulfill the requirements for this degree, diploma, or certificate? If yes, please list these programs.  

11. Are there any new majors, minors, or concentrations associated with this new degree / diploma / certificate? Please list the name(s) and whether it is a major, minor, or concentration, along with the sponsoring department.  
   - One major is required on all programs [4 characters for code and 30 characters for description]  

12. If this is a new graduate degree, is it thesis-based, course-based, or project-based?
**Section 2: New / Revised Program for Existing or New Degree / Diploma / Certificate Information**

1. Is this a new program?  
   Yes [ ]  No [X]  
   Is an existing program being revised?  
   Yes [X]  No [ ]  
   If you've answered NO to each of the previous two questions, please continue on to the next section.

2. If YES, what degree, diploma, or certificate does this new/revised program meet requirements for?  
   **Bachelor of Sc Engineering [BE]** - current degree description/code

3. What is the name of this new/revised program?  
   **Bachelor of Sc Engineering [BE]** - existing program description/code - with the following attached majors / departments:  
   - Civil Engineering [CE] / Civil Geol and Environ Engnrng [CGEE] - major / department  
   - Chemical Engineering [CHE] / Chemical and Biological Engin [CHBI] - major / department  
   - Computer Engineering [CME] / Electrical and Cmptr Engin [ECE] - major / department  
   - Electrical Engineering [EE] / Electrical and Cmptr Engin [ECE] - major / department  
   - Environmental Engineering [ENVE] / Civil Geol and Enviro Engnrng [CGEE] - major / department  
   - Mechanical Engineering [ME] / Mechanical Engienering [ME] - major / department

4. What other program(s) currently exist that will also meet the requirements for this same degree(s)?  
   **EN Professional Intern Prog [EPIP]**

5. What College/Department is the academic authority for this program?  
   n/a

6. Is this a replacement for a current program?  
   Yes [X]  No [ ]

7. If YES, will students in the current program complete that program or be grandfathered?  

8. If this is a new graduate program, is it thesis-based, course-based, or project-based?  
   n/a

9. If this is a new non-degree or undergraduate level program, what is the expected completion time?  

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Section 3: Mobility

Mobility is the ability to move freely from one jurisdiction to another and to gain entry into an academic institution or to participate in a learning experience without undue obstacles or hindrances.

1 Does the proposed degree, program, major, minor, concentration, or course involve mobility?
   Yes ☒ No ☐

2 Please indicate the mobility type (refer to Nomenclature for definitions).
   Joint Program ☐
   Joint Degree ☐
   Dual Degree ☐
   Professional Internship Program ☐
   Faculty-Led Course Abroad ☐
   Term Abroad Program ☐

3 The U of S enters into partnerships or agreements with external partners for the above mobility types in order to allow students collaborative opportunities for research, studies, or activities. Has an agreement been signed?
   Yes ☐ No ☒

4 Please state the full name of the agreement that the U of S is entering into.

5 What is the name of the external partner?

6 What is the jurisdiction for the external partner?
Section 4: New / Revised Major, Minor, or Concentration for Existing Degree Information (Undergraduate)

1. Is this a new or revised major, minor, or concentration attached to an existing degree program?  
   Yes ☐ No ☒ Revised ☒
   If you've answered NO, please continue on to the next section.

2. If YES, please specify whether it is a major, minor, or concentration. If it is more than one, please fill out a separate form for each.

3. What is the name of this new / revised major, minor, or concentration?

4. Which department is the authority for this major, minor, or concentration? If this is a cross-College relationship, please state the Jurisdictional College and the Adopting College.

5. Which current program(s), degree(s), and/or program type(s) is this new / revised major, minor, or concentration attached to?

Section 5: New / Revised Disciplinary Area for Existing Degree Information (Graduate)

1. Is this a new or revised disciplinary area attached to an existing graduate degree program?  
   Yes ☐ No ☒ Revised ☒
   If you've answered NO, please continue on to the next section.

2. If YES, what is the name of this new / revised disciplinary area?

3. Which Department / School is the authority for this new / revised disciplinary area? (NOTE - if this disciplinary area is being offered by multiple departments see question below.)

4. Which multiple Departments / Schools are the authority for this new / revised disciplinary area?

4a. Of the multiple Departments / Schools who are the authority for this new / revised disciplinary area and what allocation percentage is assigned to each? (Note - must be whole numbers and must equal 100.)

4b. Of the multiple Departments / Schools who is the primary department? The primary department specifies which department / school policies will be followed in academic matters (ex. late adds, re-read policies, or academic misconduct). If no department / school is considered the primary, please indicate that. (In normal circumstances, a department / school with a greater percentage of responsibility - see question above - will be designated the primary department.)

5. Which current program(s) and / or degree(s) is this new / revised disciplinary area attached to?
Section 6: New College / School / Center / Department or Renaming of Existing

1. Is this a new college, school, center, or department?  
   Yes [ ] No [X]
2. Is an existing college, school, center, or department being renamed?  
   Yes [ ] No [X]
3. Is an existing college, school, center, or department being deleted?  
   Yes [ ] No [X]

If you've answered NO to each of the previous two questions, please continue on to the next section.

2. What is the name of the new (or renamed or deleted) college, school, center, or department?

3. If you have renamed an existing college, school, center, or department, what is the current name?

4. What is the effective term of this new (renamed or deleted) college, school, center, or department?

5. Will any programs be created, changed, or moved to a new authority, removed, relabelled?

6. Will any courses be created, changed, or moved to a new authority, removed, relabelled?

7. Are there any ceremonial consequences for Convocation (i.e. New degree hood, adjustment to parchments, etc.)?
Section 7: Course Information - as per current set-up

1 Is there a new subject area(s) of course offering proposed for this new degree? If so, what is the subject area(s) and the suggested four (4) character abbreviation(s) to be used in course listings?

2 If there is a new subject area(s) of offerings what College / Department is the academic authority for this new subject area?

3 Have the subject area identifier and course number(s) for new and revised courses been cleared by the Registrar?

4 Does the program timetable use standard class time slots, terms, and sessions? Yes  No
   If NO, please describe.

5 Does this program, due to pedagogical reasons, require any special space or type or rooms? Yes  No
   If YES, please describe.

NOTE: Please remember to submit a new “Course Creation Form” for every new course required for this new program / major. Attached completed “Course Creation Forms” to this document would be helpful.
### Section 8: Admissions, Recruitment, and Quota Information - as per current set-up

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Will students apply on-line? If not, how will they apply?</td>
<td></td>
</tr>
<tr>
<td>2. What term(s) can students be admitted to?</td>
<td></td>
</tr>
<tr>
<td>3. Does this impact enrollment?</td>
<td></td>
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<tr>
<td>4. How should Marketing and Student Recruitment handle initial inquiries about this proposal before official approval?</td>
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<tr>
<td>5. Can classes towards this program be taken at the same time as another program?</td>
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<td>6. What is the application deadline?</td>
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<td>7. What are the admission qualifications? (IE. High school transcript required, grade 12 standing, minimum average, any required courses, etc.)</td>
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</tr>
<tr>
<td>8. What is the selection criteria? (IE. If only average then 100% weighting; if other factors such as interview, essay, etc. what is the weighting of each of these in the admission decision.)</td>
<td></td>
</tr>
<tr>
<td>9. What are the admission categories and admit types? (IE. High school students and transfer students or one group? Special admission? Aboriginal equity program?)</td>
<td></td>
</tr>
<tr>
<td>10. What is the application process? (IE. Online application and supplemental information (required checklist items) through the Admissions Office or sent to the College/Department?)</td>
<td></td>
</tr>
<tr>
<td>11. Who makes the admission decision? (IE. Admissions Office or College/Department/Other?)</td>
<td></td>
</tr>
<tr>
<td>12. Letter of acceptance - are there any special requirements for communication to newly admitted students?</td>
<td></td>
</tr>
<tr>
<td>13. Will the standard application fee apply?</td>
<td></td>
</tr>
<tr>
<td>14. Will all applicants be charged the fee or will current, active students be exempt?</td>
<td></td>
</tr>
<tr>
<td>15. Are international students admissible to this program?</td>
<td></td>
</tr>
</tbody>
</table>
Section 9: Government Loan Information - as per current set-up

NOTE: Federal / provincial government loan programs require students to be full-time in order to be eligible for funding. The University of Saskatchewan defines full-time as enrollment in a minimum of 9 credit units (operational) in the fall and/or winter term(s) depending on the length of the loan.

1 If this is a change to an existing program, will the program change have any impact on student loan eligibility?

2 If this is a new program, do you intend that students be eligible for student loans?

Section 10: Convocation Information (only for new degrees)

1 Are there any ‘ceremonial consequences’ of this proposal (ie. New degree hood, special convocation, etc.)?

2 If YES, has the Office of the University Secretary been notified?

3 When is the first class expected to graduate?

4 What is the maximum number of students you anticipate/project will graduate per year (please consider the next 5-10 years)?

Section 11: Schedule of Implementation Information

1 What is the start term?

   202109 [September 2021]

2 Are students required to do anything prior to the above date (in addition to applying for admission)?
   Yes [ ] No [X]

   If YES, what and by what date?
Section 12: Registration Information - as per current set-up

1 What year in program is appropriate for this program (NA or a numeric year)?
   (General rule = NA for programs and categories of students not working toward a degree level qualification.)

2 Will students register themselves?
   Yes [ ] No [ ]
   If YES, what priority group should they be in?

Section 13: Academic History Information - as per current set-up

1 Will instructors submit grades through self-serve?
   Yes [ ] No [ ]

2 Who will approve grades (Department Head, Assistant Dean, etc.)?

Section 14: T2202 Information (tax form) - as per current set-up

1 Should classes count towards T2202s?
   Yes [ ] No [ ]

Section 15: Awards Information - as per current set-up

1 Will terms of reference for existing awards need to be amended?
   Yes [ ] No [ ]

2 If this is a new undergraduate program, will students in this program be eligible for College-specific awards?

Section 16: Government of Saskatchewan Graduate Retention (Tax) Program - as per current set-up

1 Will this program qualify for the Government of Saskatchewan graduate retention (tax) program?
   Yes [ ] No [ ]
   To qualify the program must meet the following requirements:
   - be equivalent to at least 6 months of full-time study, and
   - result in a certificate, diploma, or undergraduate degree.
**Section 17: Program Termination**

1. Is this a program termination?  
   - Yes: [ ]  No: [X]  
   - If yes, what is the name of the program?  

2. What is the effective date of this termination?  

3. Will there be any courses closed as a result of this termination?  
   - Yes: [ ]  No: [ ]  
   - If yes, what courses?  

4. Are there currently any students enrolled in the program?  
   - Yes: [ ]  No: [ ]  
   - If yes, will they be able to complete the program?  

5. If not, what alternate arrangements are being made for these students?  

6. When do you expect the last student to complete this program?  

7. Is there mobility associated with this program termination?  
   - Yes: [ ]  No: [ ]  
   - If yes, please select one of the following mobility activity types.  
     - Dual Degree Program  
     - Joint Degree Program  
     - Internship Abroad Program  
     - Term Abroad Program  
     - Taught Abroad Course  
     - Student Exchange Program  

   Partnership agreements, coordinated by the International Office, are signed for these types of mobility activities. Has the International Office been informed of this program termination?  
   - Yes: [ ]  No: [ ]
**Section 18: Proposed Tuition and Student Fees Information - as per current set-up**

1. How will tuition be assessed?

   - Standard Undergraduate per credit
   - Standard Graduate per credit
   - Standard Graduate per term
   - Non standard per credit*
   - Non standard per term*
   - Other *
   - Program Based*  

   * See attached documents for further details

2. If fees are per credit, do they conform to existing categories for per credit tuition? If YES, what category or rate?

3. If program based tuition, how will it be assessed? By credit unit? By term? Elsehow?

4. Does proponent’s proposal contain detailed information regarding requested tuition? If NO, please describe.

5. What is IPA’s recommendation regarding tuition assessment? When is it expected to receive approval?

6. IPA Additional comments?

7. Will students outside the program be allowed to take the classes?

8. If YES, what should they be assessed? (This is especially important for program based.)

9. Do standard student fee assessment criteria apply (full-time, part-time, on-campus versus off-campus)?

10. Do standard cancellation fee rules apply?

11. Are there any additional fees (e.g. materials, excursion)? If yes, see NOTE below.

12. Are you moving from one tuition code (TC) to another tuition code? If YES, from which tuition code to which tuition code?

13. Are international students admissible to the program? If yes, will they pay the international tuition differential?
NOTE: Please remember to submit a completed "Application for New Fee or Fee Change Form" for every new course with additional fees.
Section 19: TLSE - Information Dissemination (internal for TLSE use only)

1 Has TLSE, Marketing and Student Recruitment, been informed about this new / revised program?  
   Yes [ ] No [ ]

2 Has TLSE, Admissions, been informed about this new / revised program?  
   Yes [ ] No [ ]

3 Has TLSE, Student Finance and Awards, been informed about this new / revised program?  
   Yes [ ] No [ ]

4 Has CGPS been informed about this new / revised program?  
   Yes [ ] No [ ]

5 Has TLSE, Transfer Credit, been informed about any new / revised courses?  
   Yes [ ] No [ ]

6 Has ICT-Data Services been informed about this new or revised degree / program / major / minor / concentration?  
   Yes [ ] No [ ]

7 Has the Library been informed about this new / revised program?  
   Yes [ ] No [ ]

8 Has ISA been informed of the CIP code for new degree / program / major?  
   Yes [ ] No [ ]

9 Has Room Scheduling/Scheduling Hub/Senior Coordinator of Scheduling been informed of unique space requirements for the new courses and/or informed of program, course, college, and department changes?  
   Yes [ ] No [ ]

10 Has the Convocation Coordinator been notified of a new degree?  
    Yes [ ] No [ ]

11 What is the highest level of financial approval required for this submission? Check all that apply.
   a. None - as it has no financial implications  
      OR
   b. Fee Review Committee
   c. Institutional Planning and Assessment (IPA)
   d. Provost's Committee on Integrated Planning (PCIP)
   e. Board of Governors
   f. Other

SIGNED

Date: 

Registrar (Russell Isinger): 

College / Department Representative(s): 

IPA Representative(s):
Thank you, Lucy!

Amanda, please let me know if you need anything else from us,

Seanine

Hi all,

This form is approved from my end.

Thanks,

L

Excellent.

Thank you everyone for your efforts in keeping this initiative moving ahead. That is very much appreciated.

Bruce
Hello everyone,

Thanks for steering this through uncharted waters.

Yes, I approve of the CWR form that was circulated.

All the best,

Bruce
Appendix R – Current Enrollment Numbers
## Accepted Current Academic Year

### Major College: All

### Program Entry Type: Direct

<table>
<thead>
<tr>
<th>Major College</th>
<th>International Student</th>
<th>Student Type</th>
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<th>2017/2018</th>
<th>2018/2019</th>
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<td>1</td>
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<tr>
<td></td>
<td></td>
<td>External Transfer</td>
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<td>52</td>
<td>55</td>
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<td>332</td>
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<td>Provisional Admission</td>
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<td>8</td>
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<tr>
<td></td>
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<td>Returning Student</td>
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<td>27</td>
<td>17</td>
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<td>Special (Mature) Student</td>
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<td></td>
<td>Visiting Student</td>
<td>5</td>
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<td>1</td>
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<td></td>
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<td></td>
<td></td>
<td>Internal Transfer</td>
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<td>18</td>
<td>9</td>
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<td></td>
<td></td>
<td>New First Time</td>
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<td>36</td>
<td>64</td>
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<td></td>
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</tr>
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<td></td>
<td></td>
<td>Returning Student</td>
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<td>3</td>
<td>2</td>
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<td></td>
<td></td>
<td>Transfer Former</td>
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<td>20</td>
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<td></td>
<td></td>
<td><strong>International Student Total</strong></td>
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<td>Unknown</td>
<td>1</td>
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<tr>
<td></td>
<td><strong>Engineering Total</strong></td>
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<td>528</td>
<td>565</td>
<td>589</td>
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<th>TERM NAME</th>
<th>TERM DEFINITION</th>
<th>A</th>
<th>T</th>
<th>C</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>International Student</td>
<td>Residency status in Canada differentiating between domestic</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Major College</td>
<td>The college that has academic authority over the studentâ€™s</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
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<td>Reporting Year</td>
<td>The academic year (May 1 through April 31) by which enrolment is</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Student Type</td>
<td>The classification of students’ prior education during the admission</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
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</table>
Appendix S – Credit Unit Breakdown by Program (2\textsuperscript{nd}, 3\textsuperscript{rd}, 4\textsuperscript{th} years)
### Chemical Engineering - New

#### 2nd Year:

<table>
<thead>
<tr>
<th>Term</th>
<th>Course</th>
<th>CU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
<td>CHE 220</td>
<td>3</td>
</tr>
<tr>
<td>Fall</td>
<td>CHEM 2xx</td>
<td>3</td>
</tr>
<tr>
<td>Fall</td>
<td>CHEM 250</td>
<td>3</td>
</tr>
<tr>
<td>Fall</td>
<td>GE 213</td>
<td>3</td>
</tr>
<tr>
<td>Fall</td>
<td>MATH 223</td>
<td>3</td>
</tr>
<tr>
<td>Winter</td>
<td>Group A</td>
<td>3</td>
</tr>
<tr>
<td>Winter</td>
<td>CHE 223</td>
<td>3</td>
</tr>
<tr>
<td>Winter</td>
<td>CHEM 221</td>
<td>3</td>
</tr>
<tr>
<td>Winter</td>
<td>Hum. / Soc. Sci.</td>
<td>3</td>
</tr>
<tr>
<td>Winter</td>
<td>GE 210</td>
<td>3</td>
</tr>
<tr>
<td>Fall or Winter</td>
<td>MATH 224</td>
<td>3</td>
</tr>
<tr>
<td>Total =</td>
<td>Total CU's =</td>
<td>33</td>
</tr>
</tbody>
</table>

#### 3rd Year:

<table>
<thead>
<tr>
<th>Term</th>
<th>Course</th>
<th>CU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
<td>CHE 323</td>
<td>3</td>
</tr>
<tr>
<td>Fall</td>
<td>CHE 325</td>
<td>3</td>
</tr>
<tr>
<td>Fall</td>
<td>CHEM 231</td>
<td>3</td>
</tr>
<tr>
<td>Fall</td>
<td>GE 210</td>
<td>3</td>
</tr>
<tr>
<td>Winter</td>
<td>CHE 315</td>
<td>3</td>
</tr>
<tr>
<td>Winter</td>
<td>CHE 322</td>
<td>3</td>
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<tr>
<td>Winter</td>
<td>CHE 324</td>
<td>3</td>
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<tr>
<td>Winter</td>
<td>CHE 326</td>
<td>3</td>
</tr>
<tr>
<td>Winter</td>
<td>CHE 333</td>
<td>2</td>
</tr>
<tr>
<td>Fall or Winter</td>
<td>Comp. Studies</td>
<td>3</td>
</tr>
<tr>
<td>Fall or Winter</td>
<td>GE 348</td>
<td>3</td>
</tr>
<tr>
<td>Fall or Winter</td>
<td>RCM 300</td>
<td>3</td>
</tr>
<tr>
<td>Total =</td>
<td>Total CU's =</td>
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</table>

#### 4th Year:

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<tr>
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<th>CU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
<td>CHE 411</td>
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</tr>
<tr>
<td>Fall</td>
<td>CHE 414</td>
<td>2</td>
</tr>
<tr>
<td>Fall</td>
<td>CHE 421</td>
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<tr>
<td>Fall</td>
<td>CHE 423</td>
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</tr>
<tr>
<td>Fall</td>
<td>CHE 470</td>
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</tbody>
</table>

### Civil Engineering - New

#### 2nd Year:

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<th>Course</th>
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</tr>
</thead>
<tbody>
<tr>
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<td>GEOL 121</td>
<td>3</td>
</tr>
<tr>
<td>Fall</td>
<td>CE 212</td>
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<tr>
<td>Fall</td>
<td>GE 210</td>
<td>3</td>
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<tr>
<td>Winter</td>
<td>GEOE 218</td>
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<td>Fall</td>
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<td>Winter</td>
<td>CE 225</td>
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<tr>
<td>Winter</td>
<td>CE 295</td>
<td>3</td>
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<tr>
<td>Fall</td>
<td>Hum. / Soc. Sci.</td>
<td>3</td>
</tr>
<tr>
<td>Winter</td>
<td>GE 213</td>
<td>3</td>
</tr>
<tr>
<td>Winter</td>
<td>MATH 224</td>
<td>3</td>
</tr>
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<td>Fall or Winter</td>
<td>Sci. Elective</td>
<td>3</td>
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<td>Fall or Winter</td>
<td>RCM 300</td>
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<tr>
<td>Spring/Summer</td>
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<tr>
<td>Total =</td>
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#### 3rd Year:

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<thead>
<tr>
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<th>Course</th>
<th>CU</th>
</tr>
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<td>Fall</td>
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<tr>
<td>Fall</td>
<td>CE 318</td>
<td>3</td>
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<td>Fall</td>
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<td>Fall</td>
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<td>Fall</td>
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<tr>
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</tr>
<tr>
<td>Fall or Winter</td>
<td>Hum. / Soc. Sci</td>
<td>3</td>
</tr>
<tr>
<td>Total =</td>
<td>Total CU's =</td>
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#### 4th Year:

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<thead>
<tr>
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<tbody>
<tr>
<td>Fall &amp; Winter</td>
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<td>3</td>
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<td>Course/Group</td>
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<td>---------</td>
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<tr>
<td>Winter</td>
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<tr>
<td>Winter</td>
<td>GE 449</td>
<td>3</td>
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</tr>
<tr>
<td>Fall or Winter</td>
<td>Group B</td>
<td>3</td>
</tr>
<tr>
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<td>Group B</td>
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<td>Fall &amp; Winter</td>
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Grand Total CU's = 103

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<td>Gr. W, G, S, R</td>
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<tr>
<td>Winter</td>
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Grand Total CU's = 108
## Computer Engineering - New

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<tr>
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**Total = 34 CU's**

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## Electrical Engineering - New

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**Total = 34 CU's**

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**Total = 33 CU's**

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Total = 33

Grand Total CU's = 100
# Engineering Physics - New

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## Environmental Engineering - New

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**Total =** Total CU's = 36

**Grand Total CU's = 110**
### Geological Engineering - New

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Total = Total CU's = 36

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Total = Total CU's = 42

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### Mechanical Engineering - New

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Total = Total CU's = 36

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<tr>
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<tr>
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<td>Fall or Winter</td>
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Total = Total CU's = 36

#### 4th Year:

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<tr>
<th>Term</th>
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<tr>
<td>Fall &amp; Winter</td>
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<tr>
<td>Fall</td>
<td>ME 417</td>
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<tr>
<td>Fall</td>
<td>GE 449</td>
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<tr>
<td>Fall</td>
<td>GEOE 412</td>
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<tr>
<td>Fall</td>
<td>GEOE 414</td>
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<td>Winter</td>
<td>GEOE 466</td>
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<tr>
<td>Fall &amp; Winter</td>
<td>GEOE 495</td>
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<tr>
<td>Fall or Winter</td>
<td>Group A or C</td>
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<tr>
<td>Fall or Winter</td>
<td>Group C</td>
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<tr>
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<td>Total CU's =</td>
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<tr>
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<th>Course</th>
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<tr>
<td>Fall or Winter</td>
<td>Tech. &amp; Design</td>
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<td>Fall or Winter</td>
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<td>Tech. &amp; Design</td>
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<td>Comp. Studies</td>
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<tr>
<td>Fall or Winter</td>
<td>Hum. / Soc. Sci.</td>
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<tr>
<td>Winter</td>
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<tr>
<td>Total =</td>
<td>Total CU's =</td>
<td>36</td>
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</table>

Grand Total CU's = 111
Course Overviews for the new First Year Engineering

Fall Term

Introduction to Engineering I (GE 102.2)

This course is divided into 2 modules: Module 1 focuses on an introduction to the engineering profession, life as an engineering student and strategies for success therein. Module 2 focuses on contextualizing the engineering profession in the culture, worldviews, and communities of Indigenous Peoples of Canada. The modules run concurrently, covering independent but interrelated topics.

Module 1: Strategies for Success in Engineering will serve as an orientation to first year engineering at the University of Saskatchewan. Students will learn how to navigate the first year program, including the learning management system, the classroom response system, the assessment system, and technology resources available to them. At the start of the semester, students will be introduced to theory about wellbeing, group dynamics, conflict resolution, time management, goal setting, planning, studying, and problem solving. At the end of the semester, students will have the opportunity to reflect upon their experiences over the semester, and plan for improvement in all of these areas moving forward. Students will be exposed at a high-level to what engineering is and will be expected to protect their academic integrity as a future professional. As a part of this module, students will join working groups for the semester, in which they will develop supports and complete work on a comparative assignment relating to their experiences in other courses. Students will also receive lab safety training to prepare them to complete work in natural science laboratories in other courses.

Module 2: Indigenous Cultural Contextualization will discuss the importance of diversity and inclusion to the professional of engineering. Through the associated Summer Top Up, the module will expose students to important aspects of the culture and worldviews of Indigenous Peoples of Canada, resilience against colonization, and reconciliation. The mutual importance of Indigenous culture and the engineering profession to one another will be highlighted by studying the legal and moral duty of engineers to engage in good faith consultation with Indigenous communities affected by engineering projects and examples of historical and contemporary influences of Indigenous worldviews on technology and engineering design. This module will set the stage for such examples to be woven into the rest of the first year engineering program.

Engineering Communication I (GE 132.1)

This course consists of two modules (Technical Communication I and Drawing & Sketching). They both involve communication skills for engineers, but they will largely be taught and assessed separately in this course. In both cases, instructors will use a competency-based assessment (CBA) system. Students will be expected to demonstrate basic skills in a competent manner by the end of the course. In general, if competency is not demonstrated earlier in the course, there will be at least one opportunity (for a given block of subject matter) to demonstrate it again later in the course.

The Technical Communication I module will introduce students to technical communication, with a focus on developing students’ communication awareness in the areas of proper referencing methods, building coherent written arguments, and participating in self- and peer-editing exercises.
The **Drawing & Sketching** module will introduce students to technical drawing and sketching. Students will become familiar with basic drawing and sketching tools, terms, and concepts. They will develop basic skills in drawing 2D and 3D primitives and composite objects. This will include isometric and orthographic drawings, and the ability to translate between these drawing types. Students will develop basic skills in dimensioning and scaling, they will be able to interpret sectioning and auxiliary views, and they will become familiar with different types of technical drawings from a variety of engineering disciplines. By the end of the module, students who pass the module will be competent drawers and sketchers for basic technical drawing tasks.

**Engineering Discipline Experience (GE 112.1)**

This course will provide students with an opportunity to take an in-depth look at engineering programs offered at the University of Saskatchewan. The University’s eight engineering programs are provided by the Departments of Chemical Engineering, Civil, Geological and Environmental Engineering, Electrical & Computer Engineering, Engineering Physics, and Mechanical Engineering. Students will spend one day with each of five programs. Students will rank the eight programs according to their preferences in GE 102 in September and they will then be assigned to five programs, one program per day, to make up this course’s “engineering discipline experience”. Best efforts will be made to give each student their top preferences. Students will attend lectures, seminars, and/or laboratory experiences for a total of 6 hours per day. Students will work individually and/or in groups to perform course activities. Students are responsible to follow the rules for the laboratories in different programs.

**Mechanics I (GE 122.2)**

This course considers particle dynamics and begins with particle kinematics under arbitrary acceleration. Particle kinetics is then addressed including force-acceleration, work-energy, and impulse-momentum principles. A series of practical laboratories are designed to help the student apply the principles of dynamics to practical problems.

**Design I (GE 142.2)**

This course will introduce students to Engineering Design, and specifically to the early stages characterized by problem identification, acceptance, definition, and characterization. This will include the determination of design criteria/objectives and constraints/requirements. This module will also introduce the idea of entrepreneurial tech innovation as a path for engineering designers. Students will engage in a group project to identify and characterize an engineering design problem of their choosing. This will involve interactions with potential clients and/or users, and significant literature research. Students will also be introduced to the later stages of design, as a preview of what is to come in Design II.

**Electrical Circuits I (GE 152.1)**

This course is divided into 2 modules: Module 1 focuses on resistive direct-current circuit analysis and makes up the lecture portion of the course. Module 2 focuses on programming and computation using Matlab and makes up the laboratory portion of the course. The modules run concurrently, but cover independent topics. The content covered in the lectures will not directly relate to the content covered in the labs each week.
Module 1: Electrical Circuits I will introduce students to the analysis of basic, resistive direct-current (DC) electrical circuits. Students will learn the basic terminology, units and symbols used when analyzing resistive DC circuits. Students will analyze various resistive DC circuit networks by applying, Kirchoff’s current law, Kirchoff’s voltage law, Ohm’s law, mesh analysis, node analysis and superposition. This will include the application of Matlab to solve systems of linear equations arising from circuit analysis. Students will learn the basic concepts of electrical power and how to analyze power flow in resistive DC circuits. Students will practice creating equivalent representations of circuits, including combining sources and resistive elements/networks and applying Thevenin’s theorem and Norton’s theorem. By the end of the module, students will become competent in interpreting and representing information in circuit diagrams and applying various methods of analyzing resistive DC circuits.

Module 2: Matlab will introduce students to Matlab, and to programming in Matlab. Students will learn how to orient themselves in Matlab and how to navigate the Matlab environment for the purposes of command line interaction. They will become familiar with the matrix organization of Matlab and how to set up, modify, and operate on matrix data types. Students will learn how to set up and solve linear systems, plot 2D and 3D data, and conduct file I/O in Matlab. Building on their knowledge of Python, students will review basic programming constructs (loops, decision making structures, functions) and implement them in Matlab. They will learn about the Matlab/Simulink world and how to find and use resources to continue their professional development in Matlab programming. Students will complete a number of programming problems from a variety of engineering and natural science disciplines, as they learn how to program in Matlab. By the end of the module, students will become competent users of Matlab and competent basic Matlab.

Winter Term

Introduction to Engineering II (GE 103.1)

This course serves as a brief introduction to the winter semester of the first year engineering program. Within the course, students will reflect upon their experience from the fall semester and plan to move forward in a positive way. This includes preparing to make their choice of engineering discipline. This course will provide students with the history of the engineering profession and will discuss the privilege of belonging to a self-governing profession and what it means to be a learned professional. Students will be introduced to ethical frameworks and will be expected to apply those frameworks to analyze engineering case studies. Students will reflect upon the impact of the engineering profession on society.

In this course, students will be exposed to the academic options available to them in their undergraduate program, such as co-op experiences, certificates and course electives. Students will be expected to determine their career goals and reflect upon how their academic options can support them in achieving those goals. In the laboratory portion of the course, students will complete health and safety training relevant to engineering practice.

Engineering Communication II (GE 133.2)

This course consists of four modules (Technical Communication II and III, CAD and Research). They all involve communication skills for engineers, but they will largely be taught and assessed separately in this
course. In all cases, instructors will use a competency-based assessment (CBA) system. Students will be expected to demonstrate basic skills in a competent manner by the end of the course. In general, if competency is not demonstrated earlier in the course, there will be at least one opportunity (for a given block of subject matter) to demonstrate it again later in the course.

The **Technical Communication II** module will introduce students to oral communication in a technical context, including the design of Powerpoint™ and group presentations. Students will also be introduced to self- and peer-teaching strategies, including conceptual and delivery models to assist in simplifying concepts for peers. They will systematically reflect upon feedback provided to them by instructors and peers, and incorporate such feedback into their evolving communication skills.

The **Technical Communication III** module will introduce students to research report writing, ethical considerations in technical communication, and poster design. Students will learn and apply core concepts in the visual design of posters, and they will get the opportunity to present and defend a poster based on their work in the Research module. As in Technical Communication II, they will continue to reflect upon peer and instructor feedback, and incorporate it into their work.

The **CAD** module will introduce students to Computer-Aided Design through the use of AutoCAD. After a brief review of key concepts and terms from Drawing & Sketching, students will learn how to orient themselves in the AutoCAD system and set up drawings. They will develop basic skills in drawing and modifying 2D and 3D objects in CAD. This will include properly laying out, annotating, and dimensioning drawings. By the end of the module, students who pass the module will be competent users of AutoCAD for basic technical drawing tasks.

The **Research** module will introduce students to research methods in engineering disciplines. In groups, students will select real-world data sets from faculty research labs and analyze and interpret the data sets after conducting a literature review. They will ultimately present their work in a poster session. Students will become familiar with the procedures of research activities, review and evaluation of research literature, statistical concepts for research in engineering, and selection and interpretation of statistical analyses. By the end of the module, students should be able to assist a research study with supervision.

**Mechanics II (GE 123.3)**

This course is an introduction to statics for particles and rigid bodies in two and three dimensions. Applications involving the analyses of simple trusses, frames, and machines are introduced. Dry friction is also introduced. A series of practical laboratories are designed to help the student apply the principles of statics to practical problems.

**Electrical Circuits II (GE 153.2)**

This course begins with a brief review of direct-current (DC) electrical circuit analysis, including resistive, capacitive and inductive elements. The focus of the course then shifts to the analysis of single-phase alternating-current (AC) electrical circuits. This includes characterizing AC waveforms and converting to phasor representations to carry out circuit analysis involving complex impedance, both manually and by applying electrical circuit simulation software. AC power is explored, including the concepts of real, reactive and apparent power, power factor and power factor correction.
The course also provides an overview of electrical engineering topics of interest to a broad audience, including electrical safety, power distribution systems, batteries and energy storage, electrical generators and motors, and renewable power generation systems. The course includes a design project, in which students will design a renewable power generation and storage system to meet a specific need.

**Design II (GE 143.2)**

This course will take students through an entire cycle of an engineering design process. This will include problem definition/characterization, ideation, concept evaluation, and concept selection. Students will select a disciplinary-focused design project topic and will work in groups to complete it. They will apply basic project management techniques as they proceed through the course. Students will come to understand and apply key design concepts such as DFX, proofs of concept, prototypes, pairwise comparison charts, Pugh matrices, and decision matrices. The course concludes with the submission of a project proposal report.

**Process Engineering (GE 163.2)**

In this course students will learn the basic principles of process engineering. The course starts with an overview of process engineering. Then, unit systems, dimensional homogeneity and dimensionless quantities are presented. The concepts of process streams and process blocks are then described so that block diagrams of processes can be developed. Conservation equations are described. Scaling of systems, along with the concept of basis are introduced followed by variable specification (design variables), equation independence, and Degree of Freedom analysis. Module test 1 is then given.

In the second half of the module, multi-block systems are described and analyzed. Degree of Freedom analysis is revisited and then bookkeeping of these systems is presented as a methodology to develop solution strategies for process design. The concepts of processes with single and multi-rate equations, along with selectivity and yield are introduced. The effects of sources and sinks are discussed. Module test 2 is then given.

Throughout the course examples are presented from a wide range of areas including, but not limited to: general population balances; health care process systems; biological systems; food processing system; financial processes; manufacturing systems; bioremediation; water treatment; leaching; and unit operations. There are five assignments and also two laboratories, in which a simple and a complex process will be developed. Matlab will be incorporated into some assignments and both laboratories.

**Bridge Courses**

**Mechanical Engineering**

**Engineering Analysis I (ME 113.3)**

This course introduces mathematical tools and techniques used to solve mechanical engineering problems. Topics include: intermediate linear algebra, numerical methods for linear systems of equations, solving nonlinear equations, and numerical integration and differentiation. Centre of gravity and centroids, moments of inertia, and vibrations are also introduced. Applications to engineering problems are stressed. The laboratory content consists of two components: numerical modelling and introductory training in parametric solid modelling software.
Electrical, Computer, Engineering Physics

Principles of Computer Science for Engineers (CMPT 146.3)

Introduces computer science principles and strategies for writing correct, efficient, robust, maintainable software. Presents principles and implementations of linear data structures including stacks, queues, and linked-lists, as well as recursive data structures including binary trees, and binary search trees. Introduces algorithm analysis to determine time and space requirements, including best-case and worst-case behaviour. Presents abstract data types as implemented using object-oriented programming. Emphasizes principles of software design, development, and testing, and practical development strategies, including defensive programming, version control, and good coding style.

Chemical Engineering

Unit Operations in Chemical Process Engineering (ChE 113.3)

This bridge course will present Chemical Engineering Unit Operations at both bench-scale and full-scale. These Unit Operations comprise the Chemical Engineering Toolkit that enables the Chemical Engineer to design full-scale chemical process operations.

Six experiments, developed and provided by The Department of Chemistry, will be used to explore the concepts and theory behind unit operations and combinations thereof, at the bench-scale. These experiments may be used to develop a bench-scale batch operational plant (for example, bioethanol), or they may represent individual unit operations (for example, froth flotation).

The lecture, or Chemical Engineering component of the course, will be used to illustrate how unit operations are developed for full-scale processes. Emphasis will be on the unit’s purpose, operation, and key design and control parameters. Several processes, taken from the Chemical Process Industry (CPI), will be developed as Process Flow Diagrams. A field trip to a large-scale CPI plant will occur.

Civil, Geological, and Environmental Engineering

Spring Surveying Camp (CE 271.2)

Spring Surveying Camp is designed to introduce the basic elements of surveying both in the classroom and in the field using standard surveying techniques. The theory behind surveying is presented so the student can understand why and how surveying is carried out in the field. Manually-operated and more advanced electronic equipment are introduced and used in practicum sessions. The course is intended to give the student a skill set which can be used during summer jobs and to build upon during a career in civil, geological or environmental engineering.
New Course Proposal & Creation Form

1. Approval by Department Head or Dean
   1.1 College or School with academic authority: College of Engineering
   1.2 Department with academic authority: Associate Dean, Academic Office
   1.3 Term from which the course is effective: 202105

2. Information required for the Catalogue
   2.1 Label & Number of course: GE 102
   2.2 Academic credit units: 2
   2.3 Course Long Title (maximum 100 characters): Introduction to Engineering I
       Course Short Title (maximum 30 characters): Introduction to Engineering I
   2.4 Total Hours: Lecture 27 Seminar Lab 21 Tutorial Other
   2.5 Weekly Hours: Lecture Seminar Lab Tutorial Other
   2.6 Term in which it will be offered: T1 T2 T1 or T2 T1 and T2
   2.7 Prerequisite:
       If there is a prerequisite waiver, who is responsible for signing it?
       D – Instructor/Dept Approval
       H – Department Approval (Associate Dean, Academic)
       I – Instructor Approval
   2.8 Catalogue description (150 words or less):
       This course includes two concurrent modules. Module 1 introduces students to the profession of
       engineering and life as an engineering student. The course will allow students to learn, apply and
       reflect upon strategies for success in engineering in areas including: wellbeing, group dynamics,
       conflict resolution, time management, goal setting, planning, studying, problem solving and
       academic honesty. Module 2 introduces students to important aspects of the culture and
       worldviews of Indigenous Peoples and contextualizes the engineering profession within those
       worldviews. The course will introduce students to the engineer’s legal and moral duty to consult
       with affected communities and examples of historical and contemporary influences of Indigenous
       worldviews on technology and engineering design. There is also discussion about the importance
       of inclusion of, and respect for, all people.

   2.9 Do you allow this course to be repeated for credit? No

3. Please list rationale for introducing this course: This is part of the integrated curriculum in the
   redesigned first year program.
4. Please list the learning objectives for this course:

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<tr>
<th>Module 1: Strategies for Success in Engineering</th>
<th>67% of overall course grade</th>
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<tbody>
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<td><strong>Learning Outcome Number</strong></td>
<td><strong>By the end of Module 1, students will be expected to:</strong></td>
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<tr>
<td>1.1</td>
<td>identify and employ supports and strategies for success in engineering in the areas of academics, wellbeing, group work, and productivity,</td>
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<tr>
<td>1.2</td>
<td>reflect upon experiences in order to plan for the future,</td>
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<tr>
<td>1.3</td>
<td>set and refine goals and plans to achieve those goals,</td>
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<tr>
<td>1.4</td>
<td>create a personal code of ethics which incorporates the importance of protecting one's academic integrity,</td>
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<tr>
<td>1.5</td>
<td>recognize and apply a systematic, step-wise method of solving problems,</td>
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<tr>
<td>1.6</td>
<td>identify applicable safety procedures for laboratory work, and</td>
</tr>
<tr>
<td>1.7</td>
<td>compare and contrast the focus and perspectives of biology, chemistry, physics, geology, mathematics and computer science.</td>
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<table>
<thead>
<tr>
<th>Module 2: Indigenous Cultural Contextualization</th>
<th>33% of overall course grade</th>
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<tbody>
<tr>
<td><strong>Learning Outcome Number</strong></td>
<td><strong>By the end of Module 2, students will be expected to:</strong></td>
</tr>
<tr>
<td>2.1</td>
<td>describe important aspects of the culture and worldviews of Indigenous Peoples of Canada, and how they contribute to resilience against colonization and promotion of reconciliation,</td>
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<tr>
<td>2.2</td>
<td>reflect upon self and positionality in Canada's commitment to reconciliation and building an inclusive society and how this will relate to a future as a professional engineer,</td>
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</table>
2.3 identify and explain the Truth and Reconciliation Commission’s Calls to Action and the elements of the United Nation’s Declaration on the Rights of Indigenous Peoples relevant to the engineering profession, 15%

2.4 explain the legal, ethical and social importance of free, prior and informed consent of affected Indigenous peoples before proceeding with economic development projects, and 25%

2.5 identify positive influences of Indigenous worldviews on technology and design. 15%

5. **Impact of this course**
   Are the programs of other departments or Colleges affected by this course? No
   If so, were these departments consulted? (Include correspondence)
   Were any other departments asked to review or comment on the proposal? Yes, within the College and we worked with the Gwenna Moss Centre for Teaching and Learning.

6. **Other courses or program affected** (please list course titles as well as numbers)
   6.1 Courses to be deleted? GE 101, GE 111, GE 121, GE 124, GE 125 (for Fall 2021)
   6.2 Courses for which this course will be a prerequisite?
   Any changes to the course prerequisites in the programs will be submitted in future UCC.
   6.3 Is this course to be required by your majors, or by majors in another program? Required for Engineering Students as part of the Common First Year.

7. **Course outline**
   (Weekly outline of lectures or include a draft of the course information sheet.)
   See attached syllabus.

8. **Enrolment**
   8.1 Expected enrollment: up to 600
   8.2 From which colleges? Engineering

9. **Student evaluation**
   Give approximate weighting assigned to each indicator (assignments, laboratory work, mid-term test, final examination, essays or projects, etc.)
   Please see syllabus.

9.1 How should this course be graded?
   C – Completed Requirements
   (Grade options for instructor: Completed Requirements, Fail, IP In Progress)
   N – Numeric/Percentage
   (Grade options for instructor: grade of 0% to 100%, IP in Progress)
P – Pass/Fail  
(Grade options for instructor: Pass, Fail, In Progress)  
S – Special  
(Grade options for instructor: NA – Grade Not Applicable) If other, please specify:

9.2 Is the course exempt from the final examination? Yes

10. Required text  
Include a bibliography for the course: N/A

11. Resources  
11.1 Proposed instructor: Engineering Faculty  
11.2 How does the department plan to handle the additional teaching or administrative workload? Within College/department budget – these courses will be replacing others.  
11.3 Are sufficient library or other research resources available for this course? Yes, Course notes and references to other online resources will constitute the required reference materials. The Library will also put useful reference materials and texts on reserve.  
11.4 Are any additional resources required (library, audio-visual, technology, etc.)? N/A

12. Tuition  
12.1 Will this course attract tuition charges? If so, how much? (use tuition category) TC07  
12.2 Does this course require non-standard fees, such as materials or excursion fees? If so, please include an approved “Application for New Fee or Fee Change Form”  
http://www.usask.ca/sesd/info-for-instructors/program-course-preparation.php#course-fees  
No

Detailed Course Information

1. Schedule Types  
Please choose the Schedule Types that can be used for sections that fall under this course:

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<tr>
<th>Code</th>
<th>Description</th>
<th>Code</th>
<th>Description</th>
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<tbody>
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<td>CL</td>
<td>Clinical</td>
<td>PRB</td>
<td>Problem Session</td>
</tr>
<tr>
<td>COO</td>
<td>Coop Class</td>
<td>RDG</td>
<td>Reading Class</td>
</tr>
<tr>
<td>FLD</td>
<td>Field Trip</td>
<td>RES</td>
<td>Research</td>
</tr>
<tr>
<td>ICR</td>
<td>Internet Chat Relay</td>
<td>ROS</td>
<td>Roster (Dent Only)</td>
</tr>
<tr>
<td>IHP</td>
<td>Internet Help</td>
<td>SEM</td>
<td>Seminar</td>
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<tr>
<td>IN1</td>
<td>Internship - Education</td>
<td>SSI</td>
<td>Supervised Self Instruction</td>
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<tr>
<td>IN2</td>
<td>Internship - CMPT &amp; EPIP</td>
<td>STU</td>
<td>Studio</td>
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<tr>
<td>IN3</td>
<td>Internship - General</td>
<td>SUP</td>
<td>Teacher Supervision</td>
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<tr>
<td>IND</td>
<td>Independent Studies</td>
<td>TEL</td>
<td>Televised Class</td>
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<td>LAB</td>
<td>Laboratory</td>
<td>TUT</td>
<td>Tutorial</td>
</tr>
<tr>
<td>LC</td>
<td>Lecture/Clinical (Dent Only)</td>
<td>WEB</td>
<td>Web Based Class</td>
</tr>
<tr>
<td>LEC</td>
<td>Lecture</td>
<td>XCH</td>
<td>Exchange Program</td>
</tr>
</tbody>
</table>
2. Course Attributes
Please highlight the attributes that should be attached to the course (they will apply to all sections):

2.1 NOAC No Academic Credit
0 Credit Unit courses that possess “deemed” CUs (Called Operational Credit Units). NOAC causes the system to roll 0 academic credit units to academic history.

2.2 For the College of Arts and Science only: To which program type does this course belong?
   - FNAR Fine Arts
   - HUM Humanities
   - SCIE Science
   - SOCS Social Science
   - ARNP No Program Type (Arts and Science)

3. Registration Information (Note: multi-term courses cannot be automated as corequisites)
   - 3.1 Permission Required: No
   - 3.2 Restriction(s): course only open to students in a specific college, program/degree, major, year in program
     - College of Engineering only
   - 3.3 Prerequisite(s): course(s) that must be completed prior to the start of this course
   - 3.4 Prerequisite(s) or Corequisite(s): course(s) that can be completed prior to or taken at the same time as this course
     - BIOL 102.1 – Nature for Engineering
     - GEOL 102.1 – Introduction to Geology for Engineering
     - PHYS 152.1 – Introduction to Atoms and Nuclei for Engineering
     - CHEM 142.1 – The Global Impact of Chemistry for Engineering
   - 3.5 Corequisite(s): course(s) that must be taken at the same time as this course
   - 3.6 Notes: recommended courses, repeat restrictions/content overlap, other additional information

4. List Equivalent Course(s) here:
An equivalent course can be used in place of the course for which this form is being completed, specifically for the purposes of prerequisite and degree audit checking. Credit will be given for only one of the equivalent courses.

4.1 If this is a recently-repurposed course number, please list the courses that are no longer considered to be equivalent:

*Please note: If the equivalent courses carry an UNEQUAL number of credit units, DegreeWorks will automatically enforce the following, unless otherwise stated:

- If a 3 credit unit course is considered to be equivalent to a 6 credit unit course, it will fulfill the 6 credit unit requirement and the student will not have to complete another 3 credit units toward the overall number of required credit units for the program.
• If a 6 credit unit course is considered to be equivalent to a 3 credit unit course, ALL 6 of the credit units may be used to fulfill the 3 credit unit requirement.

5. List Mutually-Exclusive Course(s) here:  
Mutually exclusive courses have similar content such that students cannot receive credit for both.

5.1 If this is a recently-repurposed course number, please list the courses that are no longer considered to be mutually exclusive:

*Please note: SiRIUS cannot enforce a situation where the exclusion goes only one way.

6. Additional Notes:
GE 102.2
Introduction to Engineering I
Fall 2021

Land Acknowledgement
At the University of Saskatchewan, we acknowledge we are on Treaty Six Territory and the Homeland of the Métis. We pay our respect to the First Nation and Métis ancestors of this place and reaffirm our relationship with one another.

Instructors and Teaching Assistants:
Name: TBD
Office: TBD
Phone: TBD
Email: TBD

Office Hours: TBD

Lectures:
Module 1:
Weeks: 1-2 and 14-15
Classes: A total of thirteen 1.5 hr classes

Module 2:
Weeks: 1-3
Classes: A total of five 1.5 hr classes

Laboratories:
Module 1:
Weeks: 1-2
Labs: A total of eight 1.5 hr Labs

Module 2:
Weeks: 2-4
Classes: A total of three 3 hr classes

Website:
Assignments, solutions, lab schedules, general course information, and announcements will be posted on the course website (PAWS/Blackboard). Students are responsible for keeping up-to-date with the information on the course website. https://bblearn.usask.ca/

End-of-Day Help Sessions
End of day help session sessions will be offered by the College of Engineering for the Common First Year and will provide support for all courses.

Description:
This course includes two concurrent modules. Module 1 introduces students to the profession of engineering and life as an engineering student. The course will allow students to learn, apply and reflect upon strategies for success in engineering in areas including: wellbeing, group
dynamics, conflict resolution, time management, goal setting, planning, studying, problem solving and academic honesty. Module 2 introduces students to important aspects of the culture and worldviews of Indigenous Peoples and contextualizes the engineering profession within those worldviews. The course will introduce students to the engineer’s legal and moral duty to consult with affected communities and examples of historical and contemporary influences of Indigenous worldviews on technology and engineering design. There is also discussion about the importance of inclusion of, and respect for, all people.

Pre or co-requisites:

BIOL 102.1 – Nature for Engineering
GEOL 102.1 – Introduction to Geology for Engineering
PHYS 152.1 – Introduction to Atoms and Nuclei for Engineering
CHEM 142.1 – The Global Impact of Chemistry for Engineering

Course Reference Numbers (CRNs):

TBD
Available from the Dynamic Schedule once courses are built
(https://pawss.usask.ca/ban/bwckschd.p_disp_dyn_sched)

Course Learning Outcomes:

<table>
<thead>
<tr>
<th>Learning Outcome Number</th>
<th>Module 1: Strategies for Success in Engineering</th>
<th>67% of overall course grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>By the end of Module 1, students will be expected to: identify and employ supports and strategies for success in engineering in the areas of academics, wellbeing, group work, and productivity,</td>
<td>Outcome Weight (By Module)</td>
</tr>
<tr>
<td>1.2</td>
<td>reflect upon experiences in order to plan for the future,</td>
<td>25%</td>
</tr>
<tr>
<td>1.3</td>
<td>set and refine goals and plans to achieve those goals,</td>
<td>20%</td>
</tr>
<tr>
<td>1.4</td>
<td>create a personal code of ethics which incorporates the importance of protecting one’s academic integrity,</td>
<td>10%</td>
</tr>
<tr>
<td>1.5</td>
<td>recognize and apply a systematic, step-wise method of solving problems,</td>
<td>5%</td>
</tr>
<tr>
<td>1.6</td>
<td>identify applicable safety procedures for laboratory work, and</td>
<td>15%</td>
</tr>
<tr>
<td>1.7</td>
<td>compare and contrast the focus and perspectives of biology, chemistry, physics, geology, mathematics and computer science.</td>
<td>10%</td>
</tr>
</tbody>
</table>
Module 2: Indigenous Cultural Contextualization

<table>
<thead>
<tr>
<th>Learning Outcome Number</th>
<th>By the end of Module 2, students will be expected to:</th>
<th>Outcome Weight (By Module)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1</td>
<td>describe important aspects of the culture and worldviews of Indigenous Peoples of Canada, and how they contribute to resilience against colonization and promotion of reconciliation,</td>
<td>25%</td>
</tr>
<tr>
<td>2.2</td>
<td>reflect upon self and positionality in Canada’s commitment to reconciliation and building an inclusive society and how this will relate to a future as a professional engineer,</td>
<td>20%</td>
</tr>
<tr>
<td>2.3</td>
<td>identify and explain the Truth and Reconciliation Commission’s Calls to Action and the elements of the United Nation’s Declaration on the Rights of Indigenous Peoples relevant to the engineering profession,</td>
<td>15%</td>
</tr>
<tr>
<td>2.4</td>
<td>explain the legal, ethical and social importance of free, prior and informed consent of affected Indigenous peoples before proceeding with economic development projects, and</td>
<td>25%</td>
</tr>
<tr>
<td>2.5</td>
<td>identify positive influences of Indigenous worldviews on technology and design.</td>
<td>15%</td>
</tr>
</tbody>
</table>

**Assessment:**

This course employs a competency-based assessment system. Students must demonstrate competence in certain skills in each module. These skills can be divided into three types (A/B/C).

Type A skills are the most basic and granular for a subject area. In general, this includes the ability to define, recall, recognize, compare, and contrast key terms and concepts. It also includes basic calculations and procedural steps, as appropriate.

Type B skills are basic integrative skills. These include basic types of questions that have been covered in class.

Type C skills are integrative skills that depend on the ability to extend the application of what has been learned in class, into new domains.

Note that the final course grade will be a weighted average of the achieved grades in each module. See **Course Learning Outcomes** for relative weights of each module.

**Competence Thresholds**

**Type A Competence**
Competence in Type A knowledge and skills is demonstrated by achieving at least 70% on any Type A assessment for each of the checklist items below before the end date of the module. Each item in the Type A checklist will be assessed through in-class quizzes. If students do not reach the 70% threshold on these initial assessments, they may “Top Up” their grade in each skill by attending a proctored Type A quiz at an end-of-day help session or during optional Top Up Help Sessions. At this session, they may take quizzes on one or more Type A checklist items. All questions on these quizzes are Type A questions. No explicit Type A questions appear on Type B/C assessments in the module although Type A knowledge and skills figure prominently in Type B and Type C questions.

A checklist will be maintained on the Student Dashboard where students can monitor their progress in completing these requirements. **Failure to complete all checklist items before the end of the module will result in a maximum grade of 49% for the module. Beyond this requirement, quiz results do not contribute to the Module Grade.**

The list of Type A Knowledge and Skills for this course is as follows:

<table>
<thead>
<tr>
<th>Module</th>
<th>Type A Knowledge &amp; Skills Checklist</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Identify key features of the first year program</td>
</tr>
<tr>
<td></td>
<td>Identify own personality traits and strengths</td>
</tr>
<tr>
<td></td>
<td>Perform basic tasks in Microsoft Office</td>
</tr>
<tr>
<td></td>
<td>Identify stages of group formation</td>
</tr>
<tr>
<td></td>
<td>Identify conflict resolution strategies</td>
</tr>
<tr>
<td></td>
<td>Identify tools for stress management</td>
</tr>
<tr>
<td></td>
<td>Identify personal support resources available</td>
</tr>
<tr>
<td></td>
<td>Identify study practices best suited to different types of assessments</td>
</tr>
<tr>
<td></td>
<td>Identify academic support resources available</td>
</tr>
<tr>
<td></td>
<td>Provide feedback on a course</td>
</tr>
<tr>
<td></td>
<td>Identify opportunities to reframe failure as a lesson</td>
</tr>
<tr>
<td></td>
<td>Define academic honesty</td>
</tr>
<tr>
<td></td>
<td>Qualify skills as transferable or technical</td>
</tr>
<tr>
<td></td>
<td>Identify the steps involved in solving engineering problems</td>
</tr>
<tr>
<td></td>
<td>Identify how to apply natural science laboratory safety protocols and procedures</td>
</tr>
<tr>
<td></td>
<td>Recognize elements of the WHMIS</td>
</tr>
<tr>
<td></td>
<td>Describe important aspects of the culture and worldviews of Indigenous Peoples of Canada, resilience against colonization, and reconciliation</td>
</tr>
<tr>
<td></td>
<td>Identify characteristics of discriminatory behavior and how to respond</td>
</tr>
<tr>
<td></td>
<td>Identify the legal and moral requirements for consultation</td>
</tr>
</tbody>
</table>
**Type B/C Competence**

Performance on the Type B questions in each module is subject to a minimum level of competence. By the end of the module, students must achieve a Type B Running Average of at least 70%. **Failure to do so will result in a maximum grade of 49% for the module.**

All Type B/C assessments will use a descriptive rubric to determine competence. Achievement at a level above competence will be qualified as evidence of Type C skills. Achievement at this level will result in a higher grade, but is not required to pass the module, i.e. there will be no minimum performance threshold for Type C skills.

**Grade Calculations**

To calculate the grade for Type B skills in each module, Type B grades from questions on each assessment in that module will be applied against the respective learning outcome(s) they each assess. After each assessment, a student’s Type B Running Average for each learning outcome is recalculated. If the Type B skills for a given learning outcome are assessed on the current assessment, and the grade achieved is greater than the Type B Running Average for that learning outcome, it becomes the new Type B Running Average for that learning outcome. If the Type B skills for a given learning outcome are assessed on the current assessment, and the achieved grade is less than the Type B Running Average for that learning outcome, the new Type B Running Average for that learning outcome is a simple mean of the current Running Average and the Type B grade on the current assessment.

To calculate the grade for Type C skills, the Type C grades from each assessment within each module are averaged. They cannot be Topped Up. Instead, a Type C percentage will be established for each learning outcome that has Type C assessments. Applying the weights of each learning outcome, a final Type C percentage score for the module will be calculated.

If a student achieves at least 70% in the Type A and B skills in both modules, their course mark will be a weighted average of the two module marks. If a student fails to achieve “basic competence” in one module, they will fail the course, receiving an overall grade of 49%, or their calculated grade, whichever is lower. However, if they choose to redo the course in the future, they will be given credit for the module they did pass (at the discretion of the instructor), with the passing mark that they did achieve (unless they want to redo the module for a better mark). If a
student fails to achieve “basic competence” in both modules, they will fail the course and will be required to redo both modules in the future.

**Keeping Track of Grades**
Throughout each module in the course, students will be able to monitor their progress in four complementary respects, for each module:

- **Assessments**: A summary of grades obtained on each assessment (assignment, lab, etc.).
- **Learning Outcomes**: A summary of current grades for each learning outcome.
- **Type A Checklist**: A checklist indicating which Type A knowledge and skills have been demonstrated.
- **Type B Running Average**: The current Type B Running Average.

The Student Grades Dashboard will include automated notifications to students if they are lagging behind in clearing Type A checklist items in a timely fashion. It will also advise students to attend module-specific end-of-day help sessions if their Type B Running Average is lagging.

**Assessments**

**Module 1: Strategies for Success in Engineering**
Type A skills are vital to any success in navigating the first year engineering program and practicing reflection upon one’s experience in the program.

Type B skills include applying a systematic process to solving engineering problems, planning for success and reflecting upon experiences in the program. Reflections should connect observations to plans for next steps.

Type C skills include reflecting upon experiences in the program using detailed, insightful observations, prioritizing areas for attention, and developing detailed and realistic plans for the future.

**Type A**

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Week Out</th>
<th>Week Due</th>
<th>Top Up Opp.</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quiz 1</td>
<td>1</td>
<td>1</td>
<td>Help/Top Up Sessions</td>
<td>Program Details</td>
</tr>
<tr>
<td>Lab Quiz 1</td>
<td>1</td>
<td>1</td>
<td>Help/Top Up Sessions</td>
<td>Self-Assessment</td>
</tr>
<tr>
<td>Quiz 2</td>
<td>1</td>
<td>1</td>
<td>Help/Top Up Sessions</td>
<td>MS Office</td>
</tr>
<tr>
<td>Quiz 3</td>
<td>1</td>
<td>1</td>
<td>Help/Top Up Sessions</td>
<td>Group Dynamics</td>
</tr>
<tr>
<td>Quiz 4</td>
<td>1</td>
<td>1</td>
<td>Help/Top Up Sessions</td>
<td>Conflict Resolution</td>
</tr>
<tr>
<td>--------</td>
<td>---</td>
<td>---</td>
<td>----------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>Assign 1</td>
<td>1</td>
<td>2</td>
<td>Help/Top Up Sessions</td>
<td>Academic Honesty</td>
</tr>
<tr>
<td>Lab Quiz 3</td>
<td>2</td>
<td>2</td>
<td>Help/Top Up Sessions</td>
<td>Transferable Skills</td>
</tr>
<tr>
<td>Lab Quiz 4</td>
<td>2</td>
<td>2</td>
<td>Help/Top Up Sessions</td>
<td>Problem Solving</td>
</tr>
<tr>
<td>Lab Quiz 5</td>
<td>2</td>
<td>2</td>
<td>Help/Top Up Sessions</td>
<td>Natural Science Lab Safety</td>
</tr>
<tr>
<td>Assign 3</td>
<td>2</td>
<td>2</td>
<td>Help/Top Up Sessions</td>
<td>WHMIS</td>
</tr>
<tr>
<td>Lab Quiz 6</td>
<td>2</td>
<td>2</td>
<td>Help/Top Up Sessions</td>
<td>Wellbeing</td>
</tr>
<tr>
<td>Lab Quiz 7</td>
<td>2</td>
<td>2</td>
<td>Help/Top Up Sessions</td>
<td>Study Skills</td>
</tr>
<tr>
<td>Lab Quiz 8</td>
<td>2</td>
<td>2</td>
<td>Help/Top Up Sessions</td>
<td>Academic Supports</td>
</tr>
<tr>
<td>Lab Quiz 9</td>
<td>2</td>
<td>2</td>
<td>Help/Top Up Sessions</td>
<td>SLEQs</td>
</tr>
<tr>
<td>Quiz 8</td>
<td>15</td>
<td>15</td>
<td>Help/Top Up Sessions</td>
<td>Defining Success</td>
</tr>
</tbody>
</table>

### Type B/C

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Week Out</th>
<th>Week Due</th>
<th>Top Up Opp.</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lab Quiz 2</td>
<td>1</td>
<td>1</td>
<td>Quiz 7</td>
<td>Self-Assessment</td>
</tr>
<tr>
<td>Quiz 5</td>
<td>1</td>
<td>1</td>
<td>Quiz 7</td>
<td>Reflection</td>
</tr>
<tr>
<td>Quiz 6</td>
<td>2</td>
<td>2</td>
<td>Assign 5</td>
<td>Planning</td>
</tr>
<tr>
<td>Assign 2</td>
<td>2</td>
<td>2</td>
<td>Help/Top Up Sessions</td>
<td>Problem Solving</td>
</tr>
<tr>
<td>Assign 4</td>
<td>2</td>
<td>3</td>
<td>Help/Top Up Sessions</td>
<td>Code of Ethics</td>
</tr>
<tr>
<td>Assign 5</td>
<td>2</td>
<td>3</td>
<td>Assign 7</td>
<td>Planning</td>
</tr>
<tr>
<td>Quiz 7</td>
<td>14</td>
<td>14</td>
<td>Assign 6</td>
<td>Reflection on self, wellbeing and growth</td>
</tr>
<tr>
<td>Assign 6</td>
<td>2</td>
<td>14</td>
<td>Quiz 10</td>
<td>Recreation Passport</td>
</tr>
<tr>
<td>Project</td>
<td>1</td>
<td>15</td>
<td>Quiz 9</td>
<td>Natural Science Comparison</td>
</tr>
<tr>
<td>Quiz 9</td>
<td>15</td>
<td>15</td>
<td>Quiz 10</td>
<td>Reflection on other courses</td>
</tr>
<tr>
<td>Quiz 10</td>
<td>15</td>
<td>15</td>
<td>Help/Top Up Sessions</td>
<td>Reflection on group work and conflict resolution</td>
</tr>
<tr>
<td>Assign 7</td>
<td>15</td>
<td>15</td>
<td>Help/Top Up Sessions</td>
<td>Reflection on Goals and Planning</td>
</tr>
</tbody>
</table>

### Module 2: Indigenous Cultural Contextualization

Type A skills are vital to any success in relating Indigenous culture and worldviews to engineering and include identifying and describing
important aspects of the culture and worldviews of Indigenous Peoples of Canada.

Type B skills include creating a personal land acknowledgement statement and reflecting upon one’s own privilege and how engineering and Indigenous communities and culture can be mutually beneficial. Reflections should connect observations to plans for next steps.

Type C skills include reflections using detailed, insightful observations, prioritizing areas for attention, and developing detailed and realistic plans for the future.

**Type A**

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Week Out</th>
<th>Week Due</th>
<th>Top Up Opp.</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summer Top Up</td>
<td>0</td>
<td>2</td>
<td>Help/Top Up Sessions</td>
<td>Pursuit of Reconciliation</td>
</tr>
<tr>
<td>Quiz 1</td>
<td>2</td>
<td>2</td>
<td>Help/Top Up Sessions</td>
<td>Diversity and Inclusion</td>
</tr>
<tr>
<td>Quiz 2</td>
<td>3</td>
<td>3</td>
<td>Help/Top Up Sessions</td>
<td>Legal and Moral Requirements for Consultation</td>
</tr>
</tbody>
</table>

**Type B/C**

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Week Out</th>
<th>Week Due</th>
<th>Top Up Opp.</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assign 1</td>
<td>0</td>
<td>2</td>
<td>Assign 4</td>
<td>Privilege/Land Acknowledgement</td>
</tr>
<tr>
<td>Assign 2</td>
<td>2</td>
<td>3</td>
<td>Assign 4</td>
<td>Legal and Moral Requirements for Consultation</td>
</tr>
<tr>
<td>Lab Assign 1</td>
<td>3</td>
<td>3</td>
<td>Assign 3</td>
<td>Stakeholders and Consultation</td>
</tr>
<tr>
<td>Assign 3</td>
<td>3</td>
<td>4</td>
<td>Assign 4</td>
<td>Legal and Moral Requirements for Consultation</td>
</tr>
<tr>
<td>Lab Assign 2</td>
<td>4</td>
<td>4</td>
<td>Help/Top Up Sessions</td>
<td>Influence of Indigenous Worldviews on Technology and Design</td>
</tr>
<tr>
<td>Assign 4</td>
<td>4</td>
<td>15</td>
<td>Help/Top Up Sessions</td>
<td>Land Acknowledgement</td>
</tr>
</tbody>
</table>

**Attendance and Participation:** Attendance and participation is encouraged/expected, and students will be responsible for what happens in classes e.g. quizzes. However, attendance will not be mandatory (or marked).
Criteria That Must Be Met to Pass: See Assessment (Competence Thresholds), above.

Final Grades: The final grades will be consistent with the “literal descriptors” specified in the university's grading system (at the link below, click on “for undergraduate students”).

https://students.usask.ca/academics/grading/grading-system.php

For information regarding appeals of final grades or other academic matters, please visit the Student Conduct and Appeals section of the University Secretary's website:


Academic Courses Policy: More information on the Academic Courses Policy on course delivery, examinations and assessment of student learning can be found at:

http://policies.usask.ca/policies/academic-affairs/academic-courses.php

Learning Charter: The University of Saskatchewan Learning Charter is intended to define aspirations about the learning experience that the University aims to provide, and the roles to be played in realizing these aspirations by students, instructors and the institution. A copy of the Learning Charter can be found at: https://teaching.usask.ca/about/policies/learning-charter.php

Course Overview:

This course is divided into 2 modules: Module 1 focuses on an introduction to the engineering profession, life as an engineering student, and strategies for success therein. Module 2 focuses on contextualizing the engineering profession in the culture, worldviews, and communities of Indigenous Peoples of Canada. The modules run concurrently, covering independent but interrelated topics.

Module 1: Strategies for Success in Engineering will serve as an orientation to first year engineering at the University of Saskatchewan. Students will learn how to navigate the first year program, including the learning management system, the classroom response system, the assessment system, and technology resources available to them. At the start of the semester, students will be introduced to theory about wellbeing, group dynamics, conflict resolution, time management, goal setting, planning, studying, and problem solving. At the end of the semester, students will have the opportunity to reflect upon their experiences over the semester and plan for improvement in all of these areas moving forward. Students will be exposed at a high-level to what engineering is and will be expected to protect their academic integrity, and the integrity of the profession, as a future professional. As a part of this module, students will join working groups for the semester, in which they will develop supports and complete work on a comparative assignment relating to their experiences in
other courses. Students will also receive lab safety training to prepare them to complete work in natural science laboratories in other courses.

**Module 2: Indigenous Cultural Contextualization** will discuss the importance of diversity and inclusion to the professional of engineering. Through the associated Summer Top Up, the module will expose students to important aspects of the culture and worldviews of Indigenous Peoples of Canada, resilience against colonization, and reconciliation. The mutual importance of Indigenous culture and the engineering profession to one another will be highlighted by studying the legal and moral duty of engineers to engage in good faith consultation with Indigenous communities affected by engineering projects and examples of historical and contemporary influences of Indigenous worldviews on technology and engineering design. This module will set the stage for such examples to be woven into the rest of the first year engineering program.

<table>
<thead>
<tr>
<th>WEEK of Program</th>
<th>Lecture Number (1.5 hours)</th>
<th>Lecture Topic</th>
<th>Lab Number (1.5 hours)</th>
<th>Lab Topic</th>
</tr>
</thead>
</table>
| WEEK 1          | 1                           | 1. Introduction to First Year Engineering  
1.1 Schedule  
1.2 Assessment System | 1           | 1. Self-Assessment  
1.1 Personality  
1.2 Strengths |

LAB QUIZ 1 (IN CLASS)
<table>
<thead>
<tr>
<th>WEEK 2</th>
<th></th>
<th>2. Introduction to First Year Engineering Cont’d</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>2.1 Classroom Response System</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.2 Active Learning</td>
</tr>
<tr>
<td></td>
<td></td>
<td>QUIZ 1 (IN CLASS)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LAB QUIZ 2 (IN CLASS)</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>2. Growth Mindset</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>3. Technology Resources</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3.1 Computer Labs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3.2 VLab</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3.3 Microsoft Office</td>
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<td>4. Group Work</td>
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<td>4.1 Stages of Formation</td>
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<td>4.2 Conflict Resolution</td>
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<td>4.3 Learning Groups</td>
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<td>5. Formats for Reflective Practice</td>
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<td>QUIZ 5 (IN CLASS)</td>
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<td>6. Tools for Time Management and Enhancing Productivity</td>
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<td>QUIZ 6 (IN CLASS)</td>
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<td>3</td>
<td>3. Transferable Skills and Problem Solving</td>
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<td>3.1 Types of Skills</td>
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<td>3.2 Strategies for Solving Engineering Problems</td>
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<td>LAB QUIZ 3 (IN CLASS)</td>
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<td>7</td>
<td>7. Introduction to the Profession</td>
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<td>7.1 APEGs</td>
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<td>7.3 Professional Relationships</td>
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<td>8</td>
<td>8. Goal Setting and Planning</td>
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<td>8.1 Setting Goals</td>
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<td>8.2 Planning for the Week</td>
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<td>8.3 Planning for the Semester</td>
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<td>5</td>
<td>5. Natural Science Laboratory Safety</td>
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<td>6. Natural Science Laboratory Safety Cont’d</td>
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<td>7. Tools for Wellbeing</td>
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<td>7.2 Support Services</td>
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<td>7.3 Extra-curricular Options</td>
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<td>8</td>
<td>8. Study Skills</td>
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<td>8.1 Exam Wrappers</td>
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<td>8.2 Academic Support Services</td>
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<tr>
<td>WEEK 3</td>
<td>ASSIGNMENT 4- DUE</td>
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<td>WEEKS 4 - 13</td>
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<tr>
<td>WEEK 14</td>
<td>9</td>
<td>9. Natural Science Project Work Time</td>
</tr>
<tr>
<td>WEEK of Program</td>
<td>Lecture Number (1.5 hours)</td>
<td>Lecture Topic</td>
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<tr>
<td>WEEK 1</td>
<td>1</td>
<td><strong>1. Diversity and Inclusion</strong>&lt;br&gt;1.1 College/University Policies&lt;br&gt;1.2 Land Acknowledgement Statement</td>
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<td>WEEK 2</td>
<td>2</td>
<td><strong>2. Duty to Consult</strong>&lt;br&gt;2.1 Canadian Legal Requirements&lt;br&gt;2.2 Moral Requirements&lt;br&gt;2.3 TRC Report&lt;br&gt;2.4 UNDRIP</td>
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<tr>
<td>WEEK</td>
<td>ASSIGNMENT 1 – DUE</td>
<td>ASSIGNMENT 2 – DUE</td>
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<td>3</td>
<td>3. Engineering in Indigenous Communities</td>
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<td>QUIZ 2 (IN CLASS)</td>
<td>SUMMER TOP UP – DUE</td>
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<td>4</td>
<td>4. Engineering in Indigenous Communities Cont’d</td>
<td>2. Stakeholders and Consultation</td>
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<td>2.1 Stakeholder Identification</td>
<td>2.2 Consultation</td>
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<tr>
<td>5</td>
<td>5. Engineering in Indigenous Communities Cont’d</td>
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<td></td>
<td>5.1 Guest Speaker</td>
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<td>LAB ASSIGNMENT 1 (IN CLASS)</td>
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</tbody>
</table>

Assignments:  (see Assessment)

Quizzes:  (see Assessment)

Missing Quizzes:
Missed quizzes (for any reason) receive a mark of zero. However, quizzes can be Topped Up during End-of-Day Help Sessions or Top Up Help Sessions.

Late Assignments:
Late assignments and lab assignments receive a mark of zero. However, assignments and lab assignments can be Topped Up by subsequent assignments and lab assignments or through direct Top Up assessments. Top Ups subsequent to the course will be permitted at the instructors’ discretion.
In the case of sickness, bereavement or other excusable absences, students will not be penalized for late submissions although they may be required to complete a variation on the original assignment. They can alternatively choose to treat a missed assignment as a Late Assignment.

**Module Tests:**

This course will not have examinations or Module Tests.

**Required Activities Outside of Class Time**

Proctored reassessment of work that does not meet the competence threshold may be conducted outside of regularly scheduled class time. This includes rewriting in-class quizzes, redoing other work completed, and submitted, during class time and rewriting module tests. This reassessment will occur during designated Top Up Help Sessions during the day or during course-specific help sessions (see End-of-Day Help Sessions). Students are encouraged to avoid making prior travel, employment, or other commitments at these times to ensure availability to take advantage of these additional opportunities to demonstrate competence in the course learning outcomes.

**Experiential Learning**

Students will be engaging in problem solving and group work in class and in the labs.

**Important Dates:**

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
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<tbody>
<tr>
<td>Sept x, 2021</td>
<td>First day of Fall classes</td>
</tr>
<tr>
<td>Sept y, 2021</td>
<td>Last day for making changes in registration for first-term courses (100% tuition credit).</td>
</tr>
<tr>
<td>Nov zz, 2021</td>
<td>Fall Break (Week 11)</td>
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<tr>
<td>Nov xx, 2021</td>
<td>Last day to withdraw from Fall classes</td>
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<tr>
<td>Thanksgiving</td>
<td>Holidays</td>
</tr>
<tr>
<td>Dec yy, 2021</td>
<td>Last day of classes</td>
</tr>
</tbody>
</table>

**Required Resources**

**Required Textbook:**

None.

**Other Required Materials:**

A laptop computer which conforms to the Usask First Year Engineering Laptop Specifications.
Course notes and references to other online resources will constitute the required reference materials. The Library will also put useful reference materials and texts on reserve.

**Electronic Resources:**
None.

**Policies on Academic Dishonesty, Academic Appeals and Course Delivery:**
Students are expected to undertake all aspects of their academic work in an ethical manner. Students are expected to submit their own individual work for academic credit, properly cite the work of others, and to follow all rules for examinations. Academic misconduct, plagiarism, and cheating will not be tolerated. Students are responsible for understanding the university’s policies on academic integrity and academic misconduct. If any form of academic misconduct is discovered, appropriate disciplinary action will be taken.


Additional policies and procedures related to student conduct and appeals are provided on the University Secretariat website ([www.usask.ca/secretariat/student-conduct-appeals](http://www.usask.ca/secretariat/student-conduct-appeals)) and on the University website ([http://www.usask.ca/integrity/](http://www.usask.ca/integrity/)).

A summary of University of Saskatchewan policies relating to academic courses is provided in the document: Academic Courses Policy on Class Delivery, Examinations, and Assessment of Student Learning ([http://policies.usask.ca/policies/academic-affairs/academic-courses.php](http://policies.usask.ca/policies/academic-affairs/academic-courses.php)).

**Integrity Defined (from the Office of the University Secretary)**
The University of Saskatchewan is committed to the highest standards of academic integrity and honesty. Students are expected to be familiar with these standards regarding academic honesty and to uphold the policies of the University in this respect. Students are particularly urged to familiarize themselves with the provisions of the Student Conduct & Appeals section of the University Secretary Website and avoid any behavior that could potentially result in suspicions of cheating, plagiarism, misrepresentation of facts and/or participation in an offence. Academic dishonesty is a serious offence and can result in suspension or expulsion from the University.

For more information on what academic integrity means for students see the Academic Integrity section of the University Library Website at: https://library.usask.ca/academic-integrity#AboutAcademicIntegrity

You are encouraged to complete the Academic Integrity Help session to understand the fundamental values of academic integrity and how to be a responsible scholar and member of the USask community - https://library.usask.ca/academic-integrity.php#AcademicIntegrityHelp session

**Safety:**
Safety is of paramount importance in the College of Engineering. Students are expected to work in a safe and responsible manner, to follow all safety instructions, and use any specified personal protective equipment. Students failing to behave in a safe manner will be asked to leave.

**Emergency Response Plan:**
Preparing for emergencies protects our lives and property. An emergency response plan (ERP) posting is located in each classroom and lab near the main door of the room. Students are advised to review and be familiar with the College ERP and be aware that when an alarm sounds for more than 10 seconds, the building must be evacuated. Muster point locations are posted at each entrance of the Engineering Building. For more details about the ERP, please visit the following website: https://engineering.usask.ca/documents/facilities/ERP%20-%20ENG%20-%20v%20205%20-%2009_01_2017.pdf

**Recording Lectures:**
Lectures will be recorded, when possible, and made available to students in Blackboard so students can rewatch them as needed for study purposes.

**Copyright:**
Course materials are provided to students based on their registration in a class. Any materials created by course instructors is the intellectual property of the instructors. This includes exams, tests, PowerPoint/PDF slides and other course notes. Additionally, other copyright-protected materials created by textbook publishers and authors may be provided to students based on license terms and educational exceptions in the Canadian Copyright Act (see http://laws-lois.justice.gc.ca/eng/acts/C-42/index.html).

Before copying or distributing others’ copyright-protected materials, students need to ensure that their use of materials is covered under the University’s Fair Dealing Copyright Guidelines available at http://www.usask.ca/copyright/basics/copyright-policy/fair-dealing-guidelines/index.php. For example, posting others’ copyright-protected materials on the internet is not covered under the University’s Fair Dealing Copyright Guidelines; doing so requires permission from the copyright holder. For more information about copyright, please visit http://www.usask.ca/copyright/students/rights/index.php or contact the University’s Copyright Coordinator at copyright.coordinator@usask.ca.

Students should be aware that a violation of the university’s copyright policies could be an instance of non-academic misconduct. For example, the practice of uploading or posting copyright-protected materials to course-sharing websites, depositaries, or “drop boxes”, without the permission of the copyright holder, could result in a charge of non-academic misconduct under the university’s “Standard of Student Conduct in Non-Academic Matters”, found at the following location: https://secretariat.usask.ca/student-conduct-appeals/non-academic-misconduct.php.
**Student Conduct:**
Ethical behaviour is an important part of engineering practice. Each professional engineering association has a Code of Ethics, which its members are expected to follow. Since students are in the process of becoming Professional Engineers, it is expected that students will conduct themselves in an ethical manner.

The APEGS (Association of Professional Engineers and Geoscientists of Saskatchewan) Code of Ethics states that engineers shall “conduct themselves with fairness, courtesy and good faith towards clients, colleagues, employees and others; give credit where it is due and accept, as well as give, honest and fair professional criticism” (Section 20(e), The Engineering and Geoscience Professions Regulatory Bylaws, 1997).

The first part of this statement discusses an engineer's relationships with their colleagues. One of the ways in which engineering students can demonstrate courtesy to their colleagues is by helping to maintain an atmosphere that is conducive to learning, and minimizing disruptions in class. This includes arriving on time for lectures, turning cell phones and other electronic devices off during lectures, not leaving or entering the class at inopportune times, and refraining from talking to others while the instructor is talking.

**Access and Equity Services (AES) for Students**
Students who have disabilities (learning, medical, physical, or mental health) are strongly encouraged to register with Access and Equity Services (AES) if they have not already done so. Students who suspect they may have disabilities should contact AES for advice and referrals at any time. Those students who are registered with AES with mental health disabilities and who anticipate that they may have responses to certain course materials or topics, should discuss course content with their instructors prior to course add / drop dates. In order to access AES programs and supports, students must follow AES policy and procedures. For more information or advice, visit [https://students.usask.ca/health/centres/access-equity-services.php](https://students.usask.ca/health/centres/access-equity-services.php), or contact AES at 306-966-7273 or [aes@usask.ca](mailto:aes@usask.ca).

Students registered with AES may request alternative arrangements for mid-term and final examinations or module tests. Students must arrange such accommodations through AES by the stated deadlines. Instructors shall provide the examinations for students who are being accommodated by the deadlines established by AES.

**Support Services for Engineering Students:**
- Engineering Student Centre (Rm. 2A05 Engineering Building)
  - Email: [esc@usask.ca](mailto:esc@usask.ca); Phone: 306-966-5274; [https://engineering.usask.ca/contact_info/esc-office.php](https://engineering.usask.ca/contact_info/esc-office.php)

End-of-day help session sessions will be offered by the College of Engineering for the Common First Year and will provide support for all courses. Please see [End-of-day Help Sessions](#) for more details.

**Student Learning Services**
Student Learning Services (SLS) offers assistance to U of S undergrad and graduate students. For information on specific services, please see the SLS web site [https://library.usask.ca/studentlearning/](https://library.usask.ca/studentlearning/).

**Teaching, Learning and Student Experience**
The Teaching, Learning and Student Experience Unit (TLSE) focuses on providing developmental and support services and programs to students and the university community. For more information, see [https://students.usask.ca/](https://students.usask.ca/). Specific resources include:

- Student Wellness Centre (3rd & 4th Floors, Place Riel): [https://students.usask.ca/health/](https://students.usask.ca/health/)
- Financial Services: [https://students.usask.ca/money/](https://students.usask.ca/money/)

**College of Engineering Attribute Mapping:**
This information shows the relationship of the learning outcomes of this course to the graduate attributes intended upon students’ completion of the degree program. This information is used for accreditation purposes.

<table>
<thead>
<tr>
<th>Learning Outcome</th>
<th>Attribute†</th>
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<tbody>
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</table>

†Attributes:
A1 A knowledge base for engineering
A2 Problem analysis
A3 Investigation
A4 Design
A5 Use of engineering tools
A6 Individual and team work
A7 Communication skills
A8 Professionalism
A9 Impact of engineering on society and the environment
A10 Ethics and equity
A11 Economics and project management
A12 Life-long learning

‡Instructional Level:
**Introduced (I)** – Students learn the working vocabulary of the area of content, along with some of the major underlying concepts.

**Developed (D)** – Students use their working vocabulary and major fundamental concepts to probe more deeply, to read the literature, and to deepen their exploration of the concepts. They may begin to practice, extend, or refine knowledge in familiar contexts.

**Applied (A)** – Students approach mastery in the area of content. They explore deeply into the discipline and experience the controversies, debate, and uncertainties that characterize the leading edges of any field. They practice, extend, or refine knowledge in unfamiliar contexts.

**Accreditation Unit (AU) Mapping:** (% of total class AU)

<table>
<thead>
<tr>
<th>Math</th>
<th>Natural Science</th>
<th>Complementary Studies</th>
<th>Engineering Science</th>
<th>Engineering Design</th>
</tr>
</thead>
<tbody>
<tr>
<td>0%</td>
<td>0%</td>
<td>100%</td>
<td>0%</td>
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</table>

**Accreditation Data Collection and Privacy:**
Undergraduate programs in the College of Engineering are accredited by the Canadian Engineering Accreditation Board. Student performance data may be collected in this course to support accreditation and continuous program improvement processes. Anonymous samples of
student work may also be collected for accreditation purposes. All data provided to the accreditation body or external entities is anonymized and reported in aggregate form to protect your information and identity. If you have any concerns about how your personal information is used or maintained, please contact the Associate Dean Academic, College of Engineering.
New Course Proposal & Creation Form

1. Approval by Department Head or Dean
   1.1 College or School with academic authority: College of Engineering
   1.2 Department with academic authority: Associate Dean, Academic Office
   1.3 Term from which the course is effective: 202105

2. Information required for the Catalogue
   2.1 Label & Number of course: GE 103
   2.2 Academic credit units: 1
   2.3 Course Long Title (maximum 100 characters): Introduction to Engineering II
       Course Short Title (maximum 30 characters): Introduction to Engineering II
   2.4 Total Hours: Lecture 13.5  Seminar  Lab 10.5  Tutorial  Other
   2.5 Weekly Hours: Lecture  Seminar  Lab  Tutorial  Other
   2.6 Term in which it will be offered: T1  T2  T1 or T2  T1 and T2
   2.7 Prerequisite:

       If there is a prerequisite waiver, who is responsible for signing it?
       D – Instructor/Dept Approval
       H – Department Approval (Associate Dean, Academic)
       I – Instructor Approval

   2.8 Catalogue description (150 words or less):

       This course introduces the history and scope of the engineering profession, including the concepts
       of professionalism and ethics. Students will discover the academic and career options available to
       them and will set out their career goals and a plan to reach them. Students will also complete
       health and safety training relevant to engineering practice.

   2.9 Do you allow this course to be repeated for credit? No

3. Please list rationale for introducing this course: This is part of the integrated curriculum in the
   redesigned first year program.

4. Please list the learning objectives for this course:

<table>
<thead>
<tr>
<th>Learning Outcome Number</th>
<th>By the end of this course, students will be expected to:</th>
<th>Outcome Weight</th>
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</thead>
</table>

164
1. explain the impact of engineering on society and the professional responsibility to hold paramount the health and welfare of the public and the environment, 20%

2. identify best practices in workplace safety, 15%

3. identify important aspects of professionalism and belonging to a self-governing profession, 10%

4. apply ethical and legal standards and frameworks to reflect upon and revise a personal code of ethics as a student in the College of Engineering, and 20%

5. incorporate an understanding of degree options, engineering program choices and complementary studies electives to create a set of academic and professional goals and a plan to achieve them. 35%

5. **Impact of this course**
   Are the programs of other departments or Colleges affected by this course? No
   If so, were these departments consulted? (Include correspondence)
   Were any other departments asked to review or comment on the proposal? Yes, within the College and we worked with the Gwenna Moss Centre for Teaching and Learning.

6. **Other courses or program affected** (please list course titles as well as numbers)
   6.1 Courses to be deleted? GE 101, GE 111, GE 121, GE 124, GE 125 (for Fall 2021)
   6.2 Courses for which this course will be a prerequisite?
   Any changes to the course prerequisites in the programs will be submitted in future UCC.
   6.3 Is this course to be required by your majors, or by majors in another program? Required for Engineering Students as part of the Common First Year.

7. **Course outline**
   (Weekly outline of lectures or include a draft of the course information sheet.)

   See attached syllabus.

8. **Enrolment**
   8.1 Expected enrollment: up to 600
   8.2 From which colleges? Engineering

9. **Student evaluation**
   Give approximate weighting assigned to each indicator (assignments, laboratory work, mid-term test, final examination, essays or projects, etc.)

   Please see syllabus.

   9.1 How should this course be graded?
C – Completed Requirements  
(Grade options for instructor: Completed Requirements, Fail, IP In Progress)

N – Numeric/Percentage  
(Grade options for instructor: grade of 0% to 100%, IP in Progress)

P – Pass/Fail  
(Grade options for instructor: Pass, Fail, In Progress)

S – Special  
(Grade options for instructor: NA – Grade Not Applicable) If other, please specify:

9.2 Is the course exempt from the final examination? Yes

10. Required text
Include a bibliography for the course: N/A

11. Resources
11.1 Proposed instructor: Engineering Faculty
11.2 How does the department plan to handle the additional teaching or administrative workload? Within College/department budget – these courses will be replacing others.
11.3 Are sufficient library or other research resources available for this course? Yes, Course notes and references to other online resources will constitute the required reference materials. The Library will also put useful reference materials and texts on reserve.
11.4 Are any additional resources required (library, audio-visual, technology, etc.)? N/A

12. Tuition
12.1 Will this course attract tuition charges? If so, how much? (use tuition category) TC07
12.2 Does this course require non-standard fees, such as materials or excursion fees? If so, please include an approved “Application for New Fee or Fee Change Form”
http://www.usask.ca/sesd/info-for-instructors/program-course-preparation.php#course-fees
No

Detailed Course Information

1. Schedule Types
Please choose the Schedule Types that can be used for sections that fall under this course:

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Code</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>CL</td>
<td>Clinical</td>
<td>PRB</td>
<td>Problem Session</td>
</tr>
<tr>
<td>COO</td>
<td>Coop Class</td>
<td>RDG</td>
<td>Reading Class</td>
</tr>
<tr>
<td>FLD</td>
<td>Field Trip</td>
<td>RES</td>
<td>Research</td>
</tr>
<tr>
<td>ICR</td>
<td>Internet Chat Relay</td>
<td>ROS</td>
<td>Roster (Dent Only)</td>
</tr>
<tr>
<td>IHP</td>
<td>Internet Help</td>
<td>SEM</td>
<td>Seminar</td>
</tr>
<tr>
<td>IN1</td>
<td>Internship - Education</td>
<td>SSI</td>
<td>Supervised Self Instruction</td>
</tr>
<tr>
<td>IN2</td>
<td>Internship - CMPT &amp; EPIP</td>
<td>STU</td>
<td>Studio</td>
</tr>
<tr>
<td>IN3</td>
<td>Internship - General</td>
<td>SUP</td>
<td>Teacher Supervision</td>
</tr>
</tbody>
</table>
2. Course Attributes
Please highlight the attributes that should be attached to the course (they will apply to all sections):

2.1 NOAC No Academic Credit
0 Credit Unit courses that possess “deemed” CUs (Called Operational Credit Units). NOAC causes the system to roll 0 academic credit units to academic history.

2.2 For the College of Arts and Science only: To which program type does this course belong?
FNAR Fine Arts
HUM Humanities
SCIE Science
SOCS Social Science
ARNP No Program Type (Arts and Science)

3. Registration Information (Note: multi-term courses cannot be automated as corequisites)
3.1 Permission Required: No
3.2 Restriction(s): course only open to students in a specific college, program/degree, major, year in program
   College of Engineering only
3.3 Prerequisite(s): course(s) that must be completed prior to the start of this course
3.4 Prerequisite(s) or Corequisite(s): course(s) that can be completed prior to or taken at the same time as this course
   GE 102 – Introduction to Engineering I
3.5 Corequisite(s): course(s) that must be taken at the same time as this course
3.6 Notes: recommended courses, repeat restrictions/content overlap, other additional information

4. List Equivalent Course(s) here:
An equivalent course can be used in place of the course for which this form is being completed, specifically for the purposes of prerequisite and degree audit checking. Credit will be given for only one of the equivalent courses.

4.1 If this is a recently-repurposed course number, please list the courses that are no longer considered to be equivalent:

*Please note: If the equivalent courses carry an UNEQUAL number of credit units, DegreeWorks will automatically enforce the following, unless otherwise stated:

- If a 3 credit unit course is considered to be equivalent to a 6 credit unit course, it will fulfill the 6 credit unit requirement and the student will not have to complete another 3 credit units toward the overall number of required credit units for the program.
• If a 6 credit unit course is considered to be equivalent to a 3 credit unit course, ALL 6 of the credit units may be used to fulfill the 3 credit unit requirement.

5. List Mutually-Exclusive Course(s) here:
Mutually exclusive courses have similar content such that students cannot receive credit for both.

5.1 If this is a recently-repurposed course number, please list the courses that are no longer considered to be mutually exclusive:

*Please note: SiRIUS cannot enforce a situation where the exclusion goes only one way.

6. Additional Notes:
Land Acknowledgement
At the University of Saskatchewan, we acknowledge we are on Treaty Six Territory and the Homeland of the Métis. We pay our respect to the First Nation and Métis ancestors of this place and reaffirm our relationship with one another.

Instructors and Teaching Assistants:
Name: TBD
Office: TBD
Phone: TBD
Email: TBD

Office Hours: TBD

Lectures:
Weeks: 18-19 and 30-31
Classes: A total of nine 1.5 hr classes

Laboratories:
Weeks: 18-20
Labs: A total of seven 1.5 hr Labs

Website:
Assignments, solutions, lab schedules, general course information, and announcements will be posted on the course website (PAWS/Blackboard). Students are responsible for keeping up-to-date with the information on the course website. https://bblearn.usask.ca/

End-of-Day Help Sessions
End of day help session sessions will be offered by the College of Engineering for the Common First Year and will provide support for all courses.

Description:
This course introduces the history and scope of the engineering profession, including the concepts of professionalism and ethics. Students will discover the academic and career options available to them and will set out their career goals and a plan to reach them. Students will also complete health and safety training relevant to engineering practice.

Pre or co-requisites:
GE 102.2 – Introduction to Engineering I

Course Reference Numbers (CRNs):
TBD
Available from the Dynamic Schedule once courses are built (https://pawnss.usask.ca/ban/bwckschd.p_disp_dyn_sched)
# Course Learning Outcomes:

<table>
<thead>
<tr>
<th>Learning Outcome Number</th>
<th>By the end of this course, students will be expected to:</th>
<th>Outcome Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>explain the impact of engineering on society and the professional responsibility to hold paramount the health and welfare of the public and the environment,</td>
<td>20%</td>
</tr>
<tr>
<td>2</td>
<td>identify best practices in workplace safety,</td>
<td>15%</td>
</tr>
<tr>
<td>3</td>
<td>identify important aspects of professionalism and belonging to a self-governing profession,</td>
<td>10%</td>
</tr>
<tr>
<td>4</td>
<td>apply ethical and legal standards and frameworks to reflect upon and revise a personal code of ethics as a student in the College of Engineering, and</td>
<td>20%</td>
</tr>
<tr>
<td>5</td>
<td>incorporate an understanding of degree options, engineering program choices and complementary studies electives to create a set of academic and professional goals and a plan to achieve them.</td>
<td>35%</td>
</tr>
</tbody>
</table>

## Assessment:

This course employs a competency-based assessment system. Students must demonstrate competence in certain skills. These skills can be divided into three types (A/B/C).

Type A skills are the most basic and granular for a subject area. In general, this includes the ability to define, recall, recognize, compare, and contrast key terms and concepts. It also includes basic calculations and procedural steps, as appropriate.

Type B skills are basic integrative skills. These include basic types of questions that have been covered in class.

Type C skills are integrative skills that depend on the ability to extend the application of what has been learned in class, into new domains.

Note that the final course grade will be a weighted average of the achieved grades in each learning outcome. See Course Learning Outcomes for relative weights of each learning outcome.

## Competence Thresholds

### Type A Competence

Competence in Type A knowledge and skills is demonstrated by achieving at least 70% on any Type A assessment for each of the checklist items below before the end date of the course. Each item in the Type A checklist will be assessed through in-class quizzes or out-of-class assignments. If students do not reach the 70% threshold on these initial assessments, they may “Top Up” their grade in each skill by attending a
proctored Type A quiz at an end-of-day help session or during optional Top Up Help Sessions. At this session, they may take quizzes on one or more Type A checklist items. All questions on these quizzes are Type A questions. No explicit Type A questions appear on Type B/C assessments in the course although Type A knowledge and skills figure prominently in Type B and Type C questions.

A checklist will be maintained on the Student Dashboard where students can monitor their progress in completing these requirements. **Failure to complete all checklist items before the end of the course will result in a maximum grade of 49% for the course. Beyond this requirement, quiz results do not contribute to the Course Grade.**

The list of Type A Knowledge and Skills for this course is as follows:

<table>
<thead>
<tr>
<th>Type A Knowledge &amp; Skills Checklist</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recognize an engineer’s responsibility for health and safety issues</td>
</tr>
<tr>
<td>Identify key aspects of the governing bodies of engineering in SK</td>
</tr>
<tr>
<td>Identify the impact of engineering on society</td>
</tr>
<tr>
<td>Identify types of law relevant to engineering</td>
</tr>
<tr>
<td>Identify best practices in workplace safety</td>
</tr>
<tr>
<td>Identify key aspects of professionalism</td>
</tr>
<tr>
<td>Identify aspects of an appropriate online presence</td>
</tr>
<tr>
<td>Define various ethical frameworks</td>
</tr>
<tr>
<td>Identify the focus of various humanities and social science fields</td>
</tr>
<tr>
<td>Identify available degree options</td>
</tr>
</tbody>
</table>

**Type B/C Competence**

Performance on the Type B questions is subject to a minimum level of competence. By the end of the course, students must achieve a Type B Running Average of at least 70%. **Failure to do so will result in a maximum grade of 49% for the course.**

All Type B/C assessments will use a descriptive rubric to determine competence. Achievement at a level above competence will be qualified as evidence of Type C skills. Achievement at this level will result in a higher grade, but is not required to pass the course, i.e. there will be no minimum performance threshold for Type C skills.

**Grade Calculations**

To calculate the grade for Type B skills, Type B grades from questions on each assessment in the course will be applied against the respective learning outcome(s) they each assess. After each assessment, a student’s Type B Running Average for each learning outcome is recalculated. If the Type B skills for a given learning outcome are assessed on the current assessment, and the achieved grade is greater than the Type B Running
Average for that learning outcome, it becomes the new Type B Running Average for that learning outcome. If the Type B skills for a given learning outcome are assessed on the current assessment, and the achieved grade is less than the Type B Running Average for that learning outcome, the new Type B Running Average for that learning outcome is a simple mean of the current Running Average and the Type B grade on the current assessment.

To calculate the grade for Type C skills, the Type C grades from each assessment within the course are averaged. They cannot be Topped Up. Instead, a Type C percentage will be established for each learning outcome that has Type C assessments. Applying the weights of each learning outcome, a final Type C percentage score for the course will be calculated.

If a student achieves at least 70% in the Type A and B skills, their course mark will be their earned mark, as weighted by the course learning outcomes. If a student fails to achieve “basic competence”, they will fail the course, receiving an overall grade of 49%, or their calculated grade, whichever is lower.

**Keeping Track of Grades**
Throughout each module in the course, students will be able to monitor their progress in four complementary respects, for each module:

- **Assessments**: A summary of grades obtained on each assessment (assignment, lab, etc.).
- **Learning Outcomes**: A summary of current grades for each learning outcome.
- **Type A Checklist**: A checklist indicating which Type A knowledge and skills have been demonstrated.
- **Type B Running Average**: The current Type B Running Average.

The Student Grades Dashboard will include automated notifications to students if they are lagging behind in clearing Type A checklist items in a timely fashion. It will also advise students to attend module-specific end-of-day help sessions if their Type B Running Average is lagging.

**Assessments**

Type A skills are vital to any success in planning for a future as an engineering student and, later, as a professional engineer. These include identifying degree and career options and recognizing key aspects of the engineering profession and professionalism.
Type B skills include applying knowledge of the profession and academic options to reflect upon experiences in the program and create career goal and plans. Reflections should connect observations to plans for next steps.

Type C skills include reflecting upon experiences in the program using detailed, insightful observations, prioritizing areas for attention, and developing detailed and realistic plans for the future.

**Type A**

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Week Out</th>
<th>Week Due</th>
<th>Top Up Opp.</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quiz 1</td>
<td>18</td>
<td>18</td>
<td>Help/Top Up</td>
<td>Health and Safety</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sessions</td>
<td></td>
</tr>
<tr>
<td>Quiz 2</td>
<td>18</td>
<td>18</td>
<td>Help/Top Up</td>
<td>Governing Bodies of Engineering</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sessions</td>
<td></td>
</tr>
<tr>
<td>Quiz 3</td>
<td>18</td>
<td>18</td>
<td>Help/Top Up</td>
<td>Impact of Engineering on Society</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sessions</td>
<td></td>
</tr>
<tr>
<td>Quiz 4</td>
<td>19</td>
<td>19</td>
<td>Help/Top Up</td>
<td>Ethical Frameworks</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sessions</td>
<td></td>
</tr>
<tr>
<td>Quiz 5</td>
<td>19</td>
<td>19</td>
<td>Help/Top Up</td>
<td>Law</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sessions</td>
<td></td>
</tr>
<tr>
<td>Quiz 7</td>
<td>19</td>
<td>19</td>
<td>Help/Top Up</td>
<td>Professionalism</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sessions</td>
<td></td>
</tr>
<tr>
<td>Quiz 8</td>
<td>19</td>
<td>19</td>
<td>Help/Top Up</td>
<td>Online Presence</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sessions</td>
<td></td>
</tr>
<tr>
<td>Lab Assign 1</td>
<td>18</td>
<td>20</td>
<td>Help/Top Up</td>
<td>Health and Safety</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sessions</td>
<td></td>
</tr>
<tr>
<td>Quiz 9</td>
<td>30</td>
<td>30</td>
<td>Help/Top Up</td>
<td>Degree Options</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sessions</td>
<td></td>
</tr>
<tr>
<td>Assign 5</td>
<td>30</td>
<td>31</td>
<td>None</td>
<td>Humanities and Social Sciences</td>
</tr>
</tbody>
</table>

**Type B/C**

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Week Out</th>
<th>Week Due</th>
<th>Top Up Opp.</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assign 1</td>
<td>18</td>
<td>19</td>
<td>Assign 2</td>
<td>Reflection on Engineering Discipline Experience</td>
</tr>
<tr>
<td>Assign 2</td>
<td>18</td>
<td>19</td>
<td>Assign 6</td>
<td>Goals and Planning</td>
</tr>
<tr>
<td>Assign 3</td>
<td>18</td>
<td>19</td>
<td>Assign 4</td>
<td>Impact of Engineering on Society</td>
</tr>
<tr>
<td>Quiz 6</td>
<td>19</td>
<td>19</td>
<td>Assign 4</td>
<td>Ethical Frameworks</td>
</tr>
<tr>
<td>Assign 4</td>
<td>19</td>
<td>20</td>
<td>Help/Top Up</td>
<td>Codes of Ethics</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sessions</td>
<td></td>
</tr>
<tr>
<td>Assign 6</td>
<td>18</td>
<td>30</td>
<td>Quiz 10</td>
<td>Recreation Passport</td>
</tr>
</tbody>
</table>
Attendance and Participation: Attendance and participation is encouraged/expected, and students will be responsible for what happens in classes e.g. quizzes. However, attendance will not be mandatory (or marked).

Criteria That Must Be Met to Pass: See Assessment (Competence Thresholds), above.

Final Grades: The final grades will be consistent with the “literal descriptors” specified in the university's grading system (at the link below, click on “for undergraduate students”).

https://students.usask.ca/academics/grading/grading-system.php

For information regarding appeals of final grades or other academic matters, please visit the Student Conduct and Appeals section of the University Secretary’s website:


Academic Courses Policy: More information on the Academic Courses Policy on course delivery, examinations and assessment of student learning can be found at:

http://policies.usask.ca/policies/academic-affairs/academic-courses.php

Learning Charter: The University of Saskatchewan Learning Charter is intended to define aspirations about the learning experience that the University aims to provide, and the roles to be played in realizing these aspirations by students, instructors and the institution. A copy of the Learning Charter can be found at: https://teaching.usask.ca/about/policies/learning-charter.php

Course Overview:

This course serves as a brief introduction to the winter term of the first year engineering program. Within the course, students will reflect upon their experience from the fall term and plan to move forward in a positive way. This includes preparing to make their choice of engineering discipline. This course will provide students with the history of the engineering profession and will discuss the privilege of belonging to a self-governing profession and what it means to be a learned professional. Students will be introduced to ethical frameworks and will be expected to apply those frameworks to analyze engineering case studies. Students will reflect upon the impact of the engineering profession on society.

In this course, students will be exposed to the academic options available to them in their undergraduate program, such as co-op experiences, certificates and course electives.
Students will be expected to determine their career goals and reflect upon how their academic options can support them in achieving those goals. In the laboratory portion of the course, students will complete health and safety training relevant to engineering practice.

<table>
<thead>
<tr>
<th>WEEK of Program</th>
<th>Lecture Number (1.5 hours)</th>
<th>Lecture Topic</th>
<th>Lab Number (1.5 hours)</th>
<th>Lab Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>WEEK 18</td>
<td>1</td>
<td>1. Introduction to First Year Engineering – Term 2 1.1 Schedule 1.2 Health and Safety Labs</td>
<td>1</td>
<td>1. Online Health and Safety Training</td>
</tr>
<tr>
<td></td>
<td></td>
<td>QUIZ 1 (IN CLASS)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>2. Reflection on Engineering Discipline Experience</td>
<td>2</td>
<td>2. Online Health and Safety Training Cont’d</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>3. The Engineering Profession 3.1 History 3.2 The Iron Ring 3.3 APEGs 3.4 EGP Act 3.5 Engineers Canada 3.6 CEAB</td>
<td>3</td>
<td>3. Online Health and Safety Training Cont’d</td>
</tr>
<tr>
<td></td>
<td></td>
<td>QUIZ 2 (IN CLASS)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>4. Impact of Engineering on Society</td>
<td>4</td>
<td>4. Online Health and Safety Training Cont’d</td>
</tr>
<tr>
<td></td>
<td></td>
<td>QUIZ 3 (IN CLASS)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WEEK 19</td>
<td>5</td>
<td>5. Professionalism 5.1 Ethical Frameworks 5.2 Legal Aspects of Engineering</td>
<td>5</td>
<td>5. Online Health and Safety Training Cont’d</td>
</tr>
<tr>
<td></td>
<td></td>
<td>QUIZ 4 (IN CLASS)  QUIZ 5 (IN CLASS)  QUIZ 6 (IN CLASS)</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>ASSIGNMENT 1 - DUE</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>6. Professionalism Cont’d 6.1 Online Presence 6.2 Codes of Ethics</td>
<td>6</td>
<td>6. Online Health and Safety Training Cont’d</td>
</tr>
<tr>
<td></td>
<td></td>
<td>QUIZ 7 (IN CLASS)  QUIZ 8 (IN CLASS)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>ASSIGNMENT 2 - DUE  ASSIGNMENT 3 - DUE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WEEK</td>
<td>ASSIGNMENT</td>
<td>7. Online Health and Safety Training Cont’d</td>
<td></td>
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</tr>
<tr>
<td>--------</td>
<td>------------</td>
<td>-------------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>ASSIGNMENT 4 - DUE</td>
<td>LAB ASSIGNMENT 1 - DUE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WEEKS</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>21-29</td>
<td></td>
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<tr>
<td>WEEK 30</td>
<td>7</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>ASSIGNMENT 5 - DUE</td>
<td>ASSIGNMENT 6 - DUE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WEEK 31</td>
<td>8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>QUIZ 10 (IN CLASS)</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>ASSIGNMENT 7 - DUE</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Assignments:  (see Assessment)

Quizzes:  (see Assessment)

Missing Quizzes:
Missed quizzes (for any reason) receive a mark of zero. However, quizzes can be Topped Up during End-of-Day Help Sessions or Top Up Help Sessions.

Late Assignments:
Late assignments and lab assignments receive a mark of zero. However, assignments and lab assignments can be Topped Up by subsequent assignments and lab assignments or through direct Top Up assessments. Top Ups subsequent to the course will be permitted at the instructors’ discretion.

In the case of sickness, bereavement or other excusable absences, students will not be penalized for late submissions although they may be required to complete a variation on the original assignment. They can alternatively choose to treat a missed assignment as a Late Assignment.
Module Tests:
This course will not have examinations or Module Tests.

Required Activities Outside of Class Time
Proctored reassessment of work that does not meet the competence threshold may be conducted outside of regularly scheduled class time. This includes rewriting in-class quizzes, redoing other work completed, and submitted, during class time and rewriting module tests. This reassessment will occur during designated Top Up Help Sessions during the day or during course-specific help sessions (see End-of-Day Help Sessions). Students are encouraged to avoid making prior travel, employment, or other commitments at these times to ensure availability to take advantage of these additional opportunities to demonstrate competence in the course learning outcomes.

Experiential Learning
Students will be engaging in analysis of case studies and group work in class and in the labs.

Important Dates:

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sept x, 2021</td>
<td>First day of Fall classes</td>
</tr>
<tr>
<td>Sept y, 2021</td>
<td>Last day for making changes in registration for first-term courses (100% tuition credit).</td>
</tr>
<tr>
<td>Nov zz, 2021</td>
<td>Fall Break (Week 11)</td>
</tr>
<tr>
<td>Nov xx, 2021</td>
<td>Last day to withdraw from Fall classes</td>
</tr>
<tr>
<td>Thanksgiving</td>
<td>Holidays</td>
</tr>
<tr>
<td>Dec yy, 2021</td>
<td>Last day of classes</td>
</tr>
</tbody>
</table>

Required Resources

**Required Textbook:**
None.

**Other Required Materials:**
A laptop computer which conforms to the Usask First Year Engineering Laptop Specifications.

Course notes and references to other online resources will constitute the required reference materials. The Library will also put useful reference materials and texts on reserve.

**Electronic Resources:**
None.
Policies on Academic Dishonesty, Academic Appeals and Course Delivery:
Students are expected to undertake all aspects of their academic work in an ethical manner. Students are expected to submit their own individual work for academic credit, properly cite the work of others, and to follow all rules for examinations. Academic misconduct, plagiarism, and cheating will not be tolerated. Students are responsible for understanding the university's policies on academic integrity and academic misconduct. If any form of academic misconduct is discovered, appropriate disciplinary action will be taken.


For information regarding appeals of a final grade or other academic matters, please consult the University Council document on Student Appeals of Evaluation, Grading and Academic Standing (http://policies.usask.ca/policies/student-affairs-and-activities/student-appeals.php).

Additional policies and procedures related to student conduct and appeals are provided on the University Secretariat website (www.usask.ca/secretariat/student-conduct-appeals) and on the University website http://www.usask.ca/integrity/.

A summary of University of Saskatchewan polices relating to academic courses is provided in the document: Academic Courses Policy on Class Delivery, Examinations, and Assessment of Student Learning (http://policies.usask.ca/policies/academic-affairs/academic-courses.php).

Integrity Defined (from the Office of the University Secretary)
The University of Saskatchewan is committed to the highest standards of academic integrity and honesty. Students are expected to be familiar with these standards regarding academic honesty and to uphold the policies of the University in this respect. Students are particularly urged to familiarize themselves with the provisions of the Student Conduct & Appeals section of the University Secretary Website and avoid any behavior that could potentially result in suspicions of cheating, plagiarism, misrepresentation of facts and/or participation in an offence. Academic dishonesty is a serious offence and can result in suspension or expulsion from the University.

All students should read and be familiar with the Regulations on Academic Student Misconduct (https://secretariat.usask.ca/student-conduct-appeals/academic-misconduct.php) as well as the Standard of Student Conduct in Non-Academic Matters and Procedures for Resolution of Complaints and Appeals (https://secretariat.usask.ca/student-conduct-appeals/academic-misconduct.php#IXXIAPPEALS)

For more information on what academic integrity means for students see the Academic Integrity section of the University Library Website at: https://library.usask.ca/academic-integrity#AboutAcademicIntegrity

You are encouraged to complete the Academic Integrity Help session to understand the fundamental values of academic integrity and how to be a responsible scholar and member of the USask community - https://library.usask.ca/academic-integrity.php#AcademicIntegrityHelpSession
Safety:
Safety is of paramount importance in the College of Engineering. Students are expected to work in a safe and responsible manner, to follow all safety instructions, and use any specified personal protective equipment. Students failing to behave in a safe manner will be asked to leave.

Emergency Response Plan:
Preparing for emergencies protects our lives and property. An emergency response plan (ERP) posting is located in each classroom and lab near the main door of the room. Students are advised to review and be familiar with the College ERP and be aware that when an alarm sounds for more than 10 seconds, the building must be evacuated. Muster point locations are posted at each entrance of the Engineering Building. For more details about the ERP, please visit the following website: https://engineering.usask.ca/documents/facilities/ERP%20-%20ENG%20-%20v%205%20-%202009_01_2017.pdf

Recording Lectures:
Lectures will be recorded, when possible, and made available to students in Blackboard so students can rewatch them as needed for study purposes.

Copyright:
Course materials are provided to students based on their registration in a class. Any materials created by course instructors is the intellectual property of the instructors. This includes exams, tests, PowerPoint/PDF slides and other course notes. Additionally, other copyright-protected materials created by textbook publishers and authors may be provided to students based on license terms and educational exceptions in the Canadian Copyright Act (see http://laws-lois.justice.gc.ca/eng/acts/C-42/index.html).

Before copying or distributing others’ copyright-protected materials, students need to ensure that their use of materials is covered under the University’s Fair Dealing Copyright Guidelines available at http://www.usask.ca/copyright/basics/copyright-policy/fair-dealing-guidelines/index.php. For example, posting others’ copyright-protected materials on the internet is not covered under the University’s Fair Dealing Copyright Guidelines; doing so requires permission from the copyright holder. For more information about copyright, please visit http://www.usask.ca/copyright/students/rights/index.php or contact the University’s Copyright Coordinator at copyright.coordinator@usask.ca.

Students should be aware that a violation of the university’s copyright policies could be an instance of non-academic misconduct. For example, the practice of uploading or posting copyright-protected materials to course-sharing websites, depositories, or “drop boxes”, without the permission of the copyright holder, could result in a charge of non-academic misconduct under the university’s “Standard of Student Conduct in Non-Academic Matters”, found at the following location: https://secretariat.usask.ca/student-conduct-appeals/non-academic-misconduct.php.

Student Conduct:
Ethical behaviour is an important part of engineering practice. Each professional engineering association has a Code of Ethics, which its members are expected to follow. Since students are in the process of becoming Professional Engineers, it is expected that students will conduct themselves in an ethical manner.

The APEGs (Association of Professional Engineers and Geoscientists of Saskatchewan) Code of Ethics states that engineers shall “conduct themselves with fairness, courtesy and good faith
towards clients, colleagues, employees and others; give credit where it is due and accept, as well as give, honest and fair professional criticism” (Section 20(e), The Engineering and Geoscience Professions Regulatory Bylaws, 1997).

The first part of this statement discusses an engineer’s relationships with their colleagues. One of the ways in which engineering students can demonstrate courtesy to their colleagues is by helping to maintain an atmosphere that is conducive to learning, and minimizing disruptions in class. This includes arriving on time for lectures, turning cell phones and other electronic devices off during lectures, not leaving or entering the class at inopportune times, and refraining from talking to others while the instructor is talking.

Access and Equity Services (AES) for Students
Students who have disabilities (learning, medical, physical, or mental health) are strongly encouraged to register with Access and Equity Services (AES) if they have not already done so. Students who suspect they may have disabilities should contact AES for advice and referrals at any time. Those students who are registered with AES with mental health disabilities and who anticipate that they may have responses to certain course materials or topics, should discuss course content with their instructors prior to course add / drop dates. In order to access AES programs and supports, students must follow AES policy and procedures. For more information or advice, visit https://students.usask.ca/health/centres/access-equity-services.php, or contact AES at 306-966-7273 or aes@usask.ca.

Students registered with AES may request alternative arrangements for mid-term and final examinations or module tests. Students must arrange such accommodations through AES by the stated deadlines. Instructors shall provide the examinations for students who are being accommodated by the deadlines established by AES.

Support Services for Engineering Students:
- Engineering Student Centre (Rm. 2A05 Engineering Building)
  - Email: esc@usask.ca; Phone: 306-966-5274; https://engineering.usask.ca/contact_info/esc-office.php

End-of-day help session sessions will be offered by the College of Engineering for the Common First Year and will provide support for all courses. Please see End-of-day Help Sessions for more details.

Student Learning Services
Student Learning Services (SLS) offers assistance to U of S undergrad and graduate students. For information on specific services, please see the SLS web site https://library.usask.ca/studentlearning/.

Teaching, Learning and Student Experience
The Teaching, Learning and Student Experience Unit (TLSE) focuses on providing developmental and support services and programs to students and the university community. For more information, see https://students.usask.ca/. Specific resources include:
- Student Wellness Centre (3rd & 4th Floors, Place Riel): https://students.usask.ca/health/
- Financial Services: https://students.usask.ca/money/

College of Engineering Attribute Mapping:
This information shows the relationship of the learning outcomes of this course to the graduate attributes intended upon students’ completion of the degree program. This information is used for accreditation purposes.

**Instructional Level**

<table>
<thead>
<tr>
<th>Learning Outcome</th>
<th>A1</th>
<th>A2</th>
<th>A3</th>
<th>A4</th>
<th>A5</th>
<th>A6</th>
<th>A7</th>
<th>A8</th>
<th>A9</th>
<th>A10</th>
<th>A11</th>
<th>A12</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I</td>
<td>I</td>
<td>I</td>
<td></td>
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<tr>
<td>2</td>
<td>I</td>
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<tr>
<td>4</td>
<td>I</td>
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<td>5</td>
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<td>I</td>
<td>I</td>
<td>I</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Attributes:
A1 A knowledge base for engineering
A2 Problem analysis
A3 Investigation
A4 Design
A5 Use of engineering tools
A6 Individual and team work
A7 Communication skills
A8 Professionalism
A9 Impact of engineering on society and the environment
A10 Ethics and equity
A11 Economics and project management
A12 Life-long learning

*Instructional Level:
Introduced (I) – Students learn the working vocabulary of the area of content, along with some of the major underlying concepts.
Developed (D) – Students use their working vocabulary and major fundamental concepts to probe more deeply, to read the literature, and to deepen their exploration of the concepts. They may begin to practice, extend, or refine knowledge in familiar contexts.
Applied (A) – Students approach mastery in the area of content. They explore deeply into the discipline and experience the controversies, debate, and uncertainties that characterize the leading edges of any field. They practice, extend, or refine knowledge in unfamiliar contexts.

**Accreditation Unit (AU) Mapping:** (% of total class AU)

<table>
<thead>
<tr>
<th>Math</th>
<th>Natural Science</th>
<th>Complementary Studies</th>
<th>Engineering Science</th>
<th>Engineering Design</th>
</tr>
</thead>
<tbody>
<tr>
<td>0%</td>
<td>0%</td>
<td>100%</td>
<td>0%</td>
<td>0%</td>
</tr>
</tbody>
</table>

**Accreditation Data Collection and Privacy:**
Undergraduate programs in the College of Engineering are accredited by the Canadian Engineering Accreditation Board. Student performance data may be collected in this course to support accreditation and continuous program improvement processes. Anonymous samples of student work may also be collected for accreditation purposes. All data provided to the accreditation body or external entities is anonymized and reported in aggregate form to protect your information and identity. If you have any concerns about how your personal information is used or maintained, please contact the Associate Dean Academic, College of Engineering.
1. **Approval by Department Head or Dean**
   1.1 College or School with academic authority: College of Engineering
   1.2 Department with academic authority: Associate Dean, Academic Office
   1.3 Term from which the course is effective: 202105

2. **Information required for the Catalogue**
   2.1 Label & Number of course: GE 112
   2.2 Academic credit units: 1
   2.3 Course Long Title (maximum 100 characters): Engineering Discipline Experience
      Course Short Title (maximum 30 characters): En Discipline Experience
   2.4 Total Hours: Lecture 15  Seminar  Lab 15  Tutorial  Other
   2.5 Weekly Hours: Lecture 15  Seminar  Lab 15  Tutorial  Other
   2.6 Term in which it will be offered: T1  T2  T1 or T2  T1 and T2
   2.7 Prerequisite:
      If there is a prerequisite waiver, who is responsible for signing it? D – Instructor/Dept Approval
      H – Department Approval  (Associate Dean, Academic)
      I – Instructor Approval
   2.8 Catalogue description (150 words or less):
      This course will provide students with an opportunity to have a meaningful experience for
      engineering programs offered at the University of Saskatchewan. Students will attend lectures,
      seminars, and/or laboratory experiences for a total of 6 hours per day for each of the five days.
      Students will work individually and/or in groups to perform course activities.
   2.9 Do you allow this course to be repeated for credit?  No

3. **Please list rationale for introducing this course:**
   This is part of the integrated curriculum in the redesigned first year program.

4. **Please list the learning objectives for this course:**
   By the end of this course, students should be able to:
   1. describe the key features of the five engineering program labs that they attended; and
   2. reflect on what they have learned about the set of disciplines whose labs they attended.
5. **Impact of this course**
   Are the programs of other departments or Colleges affected by this course? No
   If so, were these departments consulted? (Include correspondence)
   Were any other departments asked to review or comment on the proposal? Yes, within the College and we worked with the Gwenna Moss Centre for Teaching and Learning.

6. **Other courses or program affected** (please list course titles as well as numbers)
   6.1 Courses to be deleted? GE 101, GE 111, GE 121, GE 124, GE 125 (for Fall 2021)
   6.2 Courses for which this course will be a prerequisite?
   Any changes to the course prerequisites in the programs will be submitted in future UCC.
   6.3 Is this course to be required by your majors, or by majors in another program? Required for Engineering Students as part of the Common First Year.

7. **Course outline**
   (Weekly outline of lectures or include a draft of the course information sheet.)
   See attached syllabus.

8. **Enrolment**
   8.1 Expected enrollment: up to 600
   8.2 From which colleges? Engineering

9. **Student evaluation**
   Give approximate weighting assigned to each indicator (assignments, laboratory work, mid-term test, final examination, essays or projects, etc.)

   This is a Pass/Fail course. The intent is for students to attend and participate in five one-day, hands-on, engineering disciplinary experiences. As such, attendance is the primary grading criterion. Secondarily, students will hand in a deliverable by the end of each day in the course. This is also a requirement for passing the course. Course instructors reserve the right to fail students for inappropriate behaviors. Inappropriate behaviors include, but are not limited to, distracting others during course activities, failing to attend all sessions of the course content for the day, and/or unsafe lab practices.

   9.1 How should this course be graded?
   C – Completed Requirements
   *(Grade options for instructor: Completed Requirements, Fail, IP In Progress)*
   N – Numeric/Percentage
   *(Grade options for instructor: grade of 0% to 100%, IP in Progress)*
   P – Pass/Fail
   *(Grade options for instructor: Pass, Fail, In Progress)*
   S – Special
   *(Grade options for instructor: NA – Grade Not Applicable)* If other, please specify:

   9.2 Is the course exempt from the final examination? Yes
10. **Required text**
Include a bibliography for the course: N/A

11. **Resources**
11.1 Proposed instructor: Engineering Faculty
11.2 How does the department plan to handle the additional teaching or administrative workload? Within College/department budget.
11.3 Are sufficient library or other research resources available for this course? Yes, they may closer to the 2021 launch inquire to see if certain textbooks can be added to hold on reserve in the library if they are not already in the collection?
11.4 Are any additional resources required (library, audio-visual, technology, etc.)? N/A

12. **Tuition**
12.1 Will this course attract tuition charges? If so, how much? (use tuition category) TC07
12.2 Does this course require non-standard fees, such as materials or excursion fees? If so, please include an approved “Application for New Fee or Fee Change Form”
http://www.usask.ca/sesd/info-for-instructors/program-course-preparation.php#course-fees
No

---

**Detailed Course Information**

1. **Schedule Types**

Please choose the Schedule Types that can be used for sections that fall under this course:

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CL</td>
<td>Clinical</td>
<td>PRB</td>
<td>Problem Session</td>
</tr>
<tr>
<td>COO</td>
<td>Coop Class</td>
<td>RDG</td>
<td>Reading Class</td>
</tr>
<tr>
<td>FLD</td>
<td>Field Trip</td>
<td>RES</td>
<td>Research</td>
</tr>
<tr>
<td>ICR</td>
<td>Internet Chat Relay</td>
<td>ROS</td>
<td>Roster (Dent Only)</td>
</tr>
<tr>
<td>IHP</td>
<td>Internet Help</td>
<td>SEM</td>
<td>Seminar</td>
</tr>
<tr>
<td>IN1</td>
<td>Internship - Education</td>
<td>SSI</td>
<td>Supervised Self Instruction</td>
</tr>
<tr>
<td>IN2</td>
<td>Internship - CMPT &amp; EPIP</td>
<td>STU</td>
<td>Studio</td>
</tr>
<tr>
<td>IN3</td>
<td>Internship - General</td>
<td>SUP</td>
<td>Teacher Supervision</td>
</tr>
<tr>
<td>IND</td>
<td>Independent Studies</td>
<td>TEL</td>
<td>Televised Class</td>
</tr>
<tr>
<td>LAB</td>
<td>Laboratory</td>
<td>TUT</td>
<td>Tutorial</td>
</tr>
<tr>
<td>LC</td>
<td>Lecture/Clinical (Dent Only)</td>
<td>WEB</td>
<td>Web Based Class</td>
</tr>
<tr>
<td>LEC</td>
<td>Lecture</td>
<td>XCH</td>
<td>Exchange Program</td>
</tr>
<tr>
<td>LL</td>
<td>Lecture/Laboratory (Dent Only)</td>
<td>XGN</td>
<td>Ghost Schedule Type Not Applicable</td>
</tr>
<tr>
<td>MM</td>
<td>Multimode</td>
<td>XHS</td>
<td>High School Class</td>
</tr>
<tr>
<td>PCL</td>
<td>Pre-Clinical (Dent Only)</td>
<td>XNA</td>
<td>Schedule Type Not Applicable</td>
</tr>
<tr>
<td>PRA</td>
<td>Practicum</td>
<td>XNC</td>
<td>No Academic Credit</td>
</tr>
</tbody>
</table>
2. Course Attributes
Please highlight the attributes that should be attached to the course (they will apply to all sections):

2.1 NOAC No Academic Credit
0 Credit Unit courses that possess “deemed” CUs (Called Operational Credit Units). NOAC causes the system to roll 0 academic credit units to academic history.

2.2 For the College of Arts and Science only: To which program type does this course belong?
   - FNAR Fine Arts
   - HUM Humanities
   - SCIE Science
   - SOCS Social Science
   - ARNP No Program Type (Arts and Science)

3. Registration Information (Note: multi-term courses cannot be automated as corequisites)
   3.1 Permission Required: No
   3.2 Restriction(s): course only open to students in a specific college, program/degree, major, year in program: College of Engineering only
   3.3 Prerequisite(s): course(s) that must be completed prior to the start of this course
   3.4 Prerequisite(s) or Corequisite(s): course(s) that can be completed prior to or taken at the same time as this course
      - GE 102 – Introduction to Engineering I
   3.5 Corequisite(s): course(s) that must be taken at the same time as this course
   3.6 Notes: recommended courses, repeat restrictions/content overlap, other additional information

4. List Equivalent Course(s) here:
An equivalent course can be used in place of the course for which this form is being completed, specifically for the purposes of prerequisite and degree audit checking. Credit will be given for only one of the equivalent courses.

   4.1 If this is a recently-repurposed course number, please list the courses that are no longer considered to be equivalent:

*Please note: If the equivalent courses carry an UNEQUAL number of credit units, DegreeWorks will automatically enforce the following, unless otherwise stated:

- If a 3 credit unit course is considered to be equivalent to a 6 credit unit course, it will fulfill the 6 credit unit requirement and the student will not have to complete another 3 credit units toward the overall number of required credit units for the program.
- If a 6 credit unit course is considered to be equivalent to a 3 credit unit course, ALL 6 of the credit units may be used to fulfill the 3 credit unit requirement.

5. List Mutually-Exclusive Course(s) here:
Mutually exclusive courses have similar content such that students cannot receive credit for both.

   5.1 If this is a recently-repurposed course number, please list the courses that are no longer considered to be mutually exclusive:

*Please note: SiRIUS cannot enforce a situation where the exclusion goes only one way.
6. Additional Notes:
GE 112.1
Engineering Discipline Experience
Fall 2021

Land Acknowledgement
At the University of Saskatchewan, we acknowledge we are on Treaty Six Territory and the Homeland of the Métis. We pay our respect to the First Nation and Métis ancestors of this place and reaffirm our relationship with one another.

Instructors and Teaching Assistants:
Name: TBD
Office: TBD
Phone: TBD
Email: TBD

Office Hours: TBD

Lectures and Laboratories
Weeks: 15-16, See Course Content/Schedule

Website:
Assignments, solutions, lab schedules, general course information, and announcements will be posted on the course website (PAWS/Blackboard). Students are responsible for keeping up-to-date with the information on the course website. https://bblearn.usask.ca/

End-of-Day Help Sessions
End of day help sessions will be offered by the College of Engineering for the Common First Year and will provide support for all courses. For the Engineering Discipline Experience course, end-of-day help sessions will take place after classes each day at the discretion of programs. These will be advising sessions for those interested in learning more about a specific discipline.

Description:
This course will provide students with an opportunity to have a meaningful experience for engineering programs offered at the University of Saskatchewan. Students will attend lectures, seminars, and/or laboratory experiences for a total of 6 hours per day for each of the five days. Students will work individually and/or in groups to perform course activities.

Pre or Co-requisites:
GE 102.1—Introduction to Engineering I

Course Reference Numbers (CRNs):
TBD
Available from the Dynamic Schedule once courses are built (https://pawnnss.usask.ca/ban/bwckschd.p_disp_dyn_sched)
Course Learning Outcomes: By the end of this course, students should be able to:
  1. describe the key features of the five engineering program labs that they attended; and
  2. reflect on what they have learned about the set of disciplines whose labs they attended.

Assessment: This is a Pass/Fail course. The intent is for students to attend and participate in five one-day, hands-on, engineering disciplinary experiences. As such, attendance is the primary grading criterion. Secondarily, students will hand in a deliverable by the end of each day in the course. This is also a requirement for passing the course. Course instructors reserve the right to fail students for inappropriate behaviors. Inappropriate behaviors include, but are not limited to, distracting others during course activities, failing to attend all sessions of the course content for the day, and/or unsafe lab practices.

Attendance and Participation: See Assessment.

Criteria That Must Be Met to Pass:

Absences: In the case of sickness, bereavement or other excusable absences, students will not be penalized for being absent. However, they will be required to conduct an independent study on the program(s) they were absent from, and to submit a research essay (2-3 pages in length, per program missed). For any other absences, the students will need to submit a research essay (5-6 pages in length, per program missed) and interview at least one professional engineer in the same field of any missed program by the last day of the current semester. Some programs may have specific requirements for the research essay.

Final Grades: The final grades will be consistent with the “literal descriptors” specified in the university’s grading system (at the link below, click on “for undergraduate students”).

https://students.usask.ca/academics/grading/grading-system.php

For information regarding appeals of final grades or other academic matters, please visit the Student Conduct and Appeals section of the University Secretary’s website:


Academic Courses Policy: More information on the Academic Courses Policy on course delivery, examinations and assessment of student learning can be found at:
Learning Charter:
The University of Saskatchewan Learning Charter is intended to define aspirations about the learning experience that the University aims to provide, and the roles to be played in realizing these aspirations by students, instructors and the institution. A copy of the Learning Charter can be found at: [https://teaching.usask.ca/about/policies/learning-charter.php](https://teaching.usask.ca/about/policies/learning-charter.php)

Course Overview:
This course will provide students with an opportunity to have a meaningful experience for engineering programs offered at the University of Saskatchewan. The University’s eight engineering programs are provided by the Departments of Chemical Engineering, Civil, Geological and Environmental Engineering, Electrical and Computer Engineering, Engineering Physics, and Mechanical Engineering. Students will spend one day with each of five programs. Based on rank preferences, students will be assigned to five of the eight programs. Best efforts will be made to give each student their top preferences.

Students will attend lectures, seminars, and/or laboratory experiences for a total of 6 hours per day for each of the five days. Students will work individually and/or in groups to perform course activities. Students are responsible to follow the rules for the laboratories in different programs.

Course Content/Schedule:

<table>
<thead>
<tr>
<th>Programs*</th>
<th>Daily Schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemical Engineering</td>
<td>8:30 AM - 10:00 AM Lecture 1/Tour of CHE labs</td>
</tr>
<tr>
<td></td>
<td>10:00 AM - 3:00 PM 2 hours field trip to local chemical process industry facility</td>
</tr>
<tr>
<td></td>
<td>3:30 PM - 5:30 PM Lecture 2/Discussion</td>
</tr>
<tr>
<td>Civil Engineering</td>
<td>9:00 AM - 10:00 AM Lecture (Preparation for the lab)</td>
</tr>
<tr>
<td></td>
<td>10:00 AM - 12:00 PM Lab experience for all</td>
</tr>
<tr>
<td></td>
<td>1:00 PM - 2:00 PM Lab experience for all (cont.)</td>
</tr>
<tr>
<td></td>
<td>2:00 PM - 3:00 PM Seminar</td>
</tr>
<tr>
<td></td>
<td>3:00 PM - 5:00 PM Lab experience for all (cont.)</td>
</tr>
<tr>
<td>Computer Engineering</td>
<td>8:30 AM - 10:00 AM Lecture 1 for Group 1</td>
</tr>
<tr>
<td></td>
<td>10:00 AM - 11:30 AM Lab experience 1 for Group 1 &amp; Lecture 1 for Group 2</td>
</tr>
<tr>
<td></td>
<td>11:30 AM - 1:00 PM Lab experience 1 for Group 2</td>
</tr>
<tr>
<td></td>
<td>2:30 PM - 4:00 PM Lab experience 2 for Group 1 &amp; Lecture 2 for Group 2</td>
</tr>
<tr>
<td></td>
<td>4:00 PM - 5:30 PM Lab experience 2 for Group 2</td>
</tr>
<tr>
<td>Electrical Engineering</td>
<td>8:30 AM - 10:00 AM Lecture 1 for Group 1</td>
</tr>
<tr>
<td></td>
<td>10:00 AM - 11:30 AM Lab experience 1 for Group 1 &amp; Lecture 1 for Group 2</td>
</tr>
<tr>
<td></td>
<td>11:30 AM - 1:00 PM Lab experience 1 for Group 2</td>
</tr>
<tr>
<td></td>
<td>2:30 PM - 4:00 PM Lab experience 2 for Group 1 &amp; Lecture 2 for Group 2</td>
</tr>
<tr>
<td></td>
<td>4:00 PM - 5:30 PM Lab experience 2 for Group 2</td>
</tr>
</tbody>
</table>
### Engineering
**Physics**
- 8:30 AM - 10:00 AM: Lecture 1 for Group 1
- 10:00 AM - 1:00 PM: Lab experience for all
- 3:00 PM - 4:30 PM: Lecture 2 (Intro to professional and presentation from industry)

### Environmental Engineering
**Environmental Engineering**
- 8:30 AM - 9:30 AM: Lecture 1
- 9:30 AM - 12:00 PM: Lab experience 1 for all
- 1:00 PM - 2:00 PM: Lecture 2
- 2:00 PM - 4:00 PM: Lab experience 2 for all

### Geological Engineering
**Geological Engineering**
- 8:30 AM - 9:15 AM: Lecture (Introduction to the profession)
- 9:15 AM - 11:15 AM: Lab experience 1 for all
- 11:15 AM - 12:00 PM: Presentation from industry
- 12:00 PM - 1:00 PM: Meet and greet with industry & 4th years & Pizza lunch
- 1:00 PM - 1:45 PM: Presentation from industry (Cont.)
- 1:45 PM - 2:30 PM: Case Studies in Geological Engineering
- 2:30 PM - 4:30 PM: Lab experience 2 for all

### Mechanical Engineering
**Mechanical Engineering**
- 8:30 AM - 10:00 AM: Lecture 1
- 10:00 AM - 1:00 PM: Lab experience for Group 1
- 1:00 PM - 4:00 PM: Lab experience for Group 2
- 4:00 PM - 5:30 PM: Lecture 2/Work period (Discussions & calculations)

*In alphabetical order*

### Experiential Learning
Students will engage in hands-on activities in class.

### Important Dates:

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sept x, 2021</td>
<td>First day of Fall classes</td>
</tr>
<tr>
<td>Sept y, 2021</td>
<td>Last day for making changes in registration for first-term courses (100% tuition credit).</td>
</tr>
<tr>
<td>Nov zz, 2021</td>
<td>Fall Break (Week 11)</td>
</tr>
<tr>
<td>Nov xx, 2021</td>
<td>Last day to withdraw from Fall classes</td>
</tr>
<tr>
<td>Thanksgiving</td>
<td>Holidays</td>
</tr>
<tr>
<td>Dec yy, 2021</td>
<td>Last day of classes</td>
</tr>
</tbody>
</table>

### Required Resources
**READINGS/TEXTBOOKS**
There will be no text for this course.

**OTHER REQUIRED MATERIALS**
First Year Laptop

### Policies on Academic Dishonesty, Academic Appeals and Course Delivery:

Students are expected to undertake all aspects of their academic work in an ethical manner. Students are expected to submit their own individual work for academic credit, properly cite the work of others, and to follow all rules for examinations. Academic misconduct, plagiarism, and cheating will not be tolerated. Students are responsible for understanding the university's policies.
on academic integrity and academic misconduct. If any form of academic misconduct is discovered, appropriate disciplinary action will be taken.


For information regarding appeals of a final grade or other academic matters, please consult the University Council document on Student Appeals of Evaluation, Grading and Academic Standing (http://policies.usask.ca/policies/student-affairs-and-activities/student-appeals.php).

Additional policies and procedures related to student conduct and appeals are provided on the University Secretariat website (www.usask.ca/secretariat/student-conduct-appeals) and on the University website http://www.usask.ca/integrity/.

A summary of University of Saskatchewan polices relating to academic courses is provided in the document: Academic Courses Policy on Class Delivery, Examinations, and Assessment of Student Learning (http://policies.usask.ca/policies/academic-affairs/academic-courses.php).

**Integrity Defined (from the Office of the University Secretary)**

The University of Saskatchewan is committed to the highest standards of academic integrity and honesty. Students are expected to be familiar with these standards regarding academic honesty and to uphold the policies of the University in this respect. Students are particularly urged to familiarize themselves with the provisions of the Student Conduct & Appeals section of the University Secretary Website and avoid any behavior that could potentially result in suspicions of cheating, plagiarism, misrepresentation of facts and/or participation in an offence. Academic dishonesty is a serious offence and can result in suspension or expulsion from the University.

All students should read and be familiar with the Regulations on Academic Student Misconduct (https://secretariat.usask.ca/student-conduct-appeals/academic-misconduct.php) as well as the Standard of Student Conduct in Non-Academic Matters and Procedures for Resolution of Complaints and Appeals (https://secretariat.usask.ca/student-conduct-appeals/academic-misconduct.php#IXXIIAPPEALS)

For more information on what academic integrity means for students see the Academic Integrity section of the University Library Website at: https://library.usask.ca/academic-integrity#AboutAcademicIntegrity

You are encouraged to complete the Academic Integrity Tutorial to understand the fundamental values of academic integrity and how to be a responsible scholar and member of the USask community - https://library.usask.ca/academic-integrity.php#AcademicIntegrityTutorial

**Safety:**

Safety is of paramount importance in the College of Engineering. Students are expected to work in a safe and responsible manner, to follow all safety instructions, and use any specified personal protective equipment. Students failing to behave in a safe manner will be asked to leave.

**Emergency Response Plan:**
Preparing for emergencies protects our lives and property. An emergency response plan (ERP) posting is located in each classroom and lab near the main door of the room. Students are advised to review and be familiar with the College ERP and be aware that when an alarm sounds for more than 10 seconds, the building must be evacuated. Muster point locations are posted at each entrance of the Engineering Building. For more details about the ERP, please visit the following website: https://engineering.usask.ca/documents/facilities/ERP%20-%20ENG%20-%20v%2005%20-%2009%20_01_2017.pdf

**Recording Lectures:**
Lectures will be recorded, when possible, and made available to students in Blackboard so students can rewatch them as needed for study purposes.

**Copyright:**
Course materials are provided to students based on their registration in a class. Any materials created by course instructors is the intellectual property of the instructors. This includes exams, tests, PowerPoint/PDF slides and other course notes. Additionally, other copyright-protected materials created by textbook publishers and authors may be provided to students based on license terms and educational exceptions in the Canadian Copyright Act (see [http://laws-lois.justice.gc.ca/eng/acts/C-42/index.html](http://laws-lois.justice.gc.ca/eng/acts/C-42/index.html)).

Before copying or distributing others’ copyright-protected materials, students need to ensure that their use of materials is covered under the University's Fair Dealing Copyright Guidelines available at [http://www.usask.ca/copyright/basics/copyright-policy/fair-dealing-guidelines/index.php](http://www.usask.ca/copyright/basics/copyright-policy/fair-dealing-guidelines/index.php). For example, posting others’ copyright-protected materials on the internet is not covered under the University's Fair Dealing Copyright Guidelines; doing so requires permission from the copyright holder. For more information about copyright, please visit [http://www.usask.ca/copyright/students/rights/index.php](http://www.usask.ca/copyright/students/rights/index.php) or contact the University's Copyright Coordinator at copyright.coordinator@usask.ca.

Students should be aware that a violation of the university’s copyright policies could be an instance of non-academic misconduct. For example, the practice of uploading or posting copyright-protected materials to course-sharing websites, depositories, or “drop boxes”, without the permission of the copyright holder, could result in a charge of non-academic misconduct under the university's “Standard of Student Conduct in Non-Academic Matters”, found at the following location: [https://secretariat.usask.ca/student-conduct-appeals/non-academic-misconduct.php](https://secretariat.usask.ca/student-conduct-appeals/non-academic-misconduct.php).

**Student Conduct:**
Ethical behaviour is an important part of engineering practice. Each professional engineering association has a Code of Ethics, which its members are expected to follow. Since students are in the process of becoming Professional Engineers, it is expected that students will conduct themselves in an ethical manner.

The APEGS (Association of Professional Engineers and Geoscientists of Saskatchewan) Code of Ethics states that engineers shall “conduct themselves with fairness, courtesy and good faith towards clients, colleagues, employees and others; give credit where it is due and accept, as well as give, honest and fair professional criticism” (Section 20(e), The Engineering and Geoscience Professions Regulatory Bylaws, 1997).

The first part of this statement discusses an engineer's relationships with their colleagues. One of the ways in which engineering students can demonstrate courtesy to their colleagues is by helping to maintain an atmosphere that is conducive to learning, and minimizing disruptions in class. This
includes arriving on time for lectures, turning cell phones and other electronic devices off during lectures, not leaving or entering the class at inopportune times, and refraining from talking to others while the instructor is talking.

Access and Equity Services (AES) for Students

Students who have disabilities (learning, medical, physical, or mental health) are strongly encouraged to register with Access and Equity Services (AES) if they have not already done so. Students who suspect they may have disabilities should contact AES for advice and referrals at any time. Those students who are registered with AES with mental health disabilities and who anticipate that they may have responses to certain course materials or topics, should discuss course content with their instructors prior to course add / drop dates. In order to access AES programs and supports, students must follow AES policy and procedures. For more information or advice, visit https://students.usask.ca/health/centres/access-equity-services.php, or contact AES at 306-966-7273 or aes@usask.ca.

Students registered with AES may request alternative arrangements for mid-term and final examinations or module tests. Students must arrange such accommodations through AES by the stated deadlines. Instructors shall provide the examinations for students who are being accommodated by the deadlines established by AES.

Support Services for Engineering Students:

- Engineering Student Centre (Rm. 2A05 Engineering Building)
  - Email: esc@usask.ca; Phone: 306-966-5274; https://engineering.usask.ca/contact_info/esc-office.php

End-of-day help sessions will be offered by the College of Engineering for the Common First Year and will provide support for all courses. Please see End-of-day Help Sessions for more details.

Student Learning Services

Student Learning Services (SLS) offers assistance to U of S undergrad and graduate students. For information on specific services, please see the SLS web site https://library.usask.ca/studentlearning/.

Teaching, Learning and Student Experience

The Teaching, Learning and Student Experience Unit (TLSE) focuses on providing developmental and support services and programs to students and the university community. For more information, see https://students.usask.ca/. Specific resources include:

- Student Wellness Centre (3rd & 4th Floors, Place Riel): https://students.usask.ca/health/
- Financial Services: https://students.usask.ca/money/

College of Engineering Attribute Mapping:

This information shows the relationship of the learning outcomes of this course to the graduate attributes intended upon students’ completion of the degree program. This information is used for accreditation purposes.

<table>
<thead>
<tr>
<th>Learning Outcome</th>
<th>A1</th>
<th>A2</th>
<th>A3</th>
<th>A4</th>
<th>A5</th>
<th>A6</th>
<th>A7</th>
<th>A8</th>
<th>A9</th>
<th>A10</th>
<th>A11</th>
<th>A12</th>
</tr>
</thead>
</table>

Instructional Level
Attributes:
A1  A knowledge base for engineering
A2  Problem analysis
A3  Investigation
A4  Design
A5  Use of engineering tools
A6  Individual and team work
A7  Communication skills
A8  Professionalism
A9  Impact of engineering on society and the environment
A10 Ethics and equity
A11 Economics and project management
A12 Life-long learning

Instructional Level:
Introduced (I) – Students learn the working vocabulary of the area of content, along with some of the major underlying concepts.
Developed (D) – Students use their working vocabulary and major fundamental concepts to probe more deeply, to read the literature, and to deepen their exploration of the concepts. They may begin to practice, extend, or refine knowledge in familiar contexts.
Applied (A) – Students approach mastery in the area of content. They explore deeply into the discipline and experience the controversies, debate, and uncertainties that characterize the leading edges of any field. They practice, extend, or refine knowledge in unfamiliar contexts.

Accreditation Unit (AU) Mapping: (% of total class AU)

<table>
<thead>
<tr>
<th>Math</th>
<th>Natural Science</th>
<th>Complementary Studies</th>
<th>Engineering Science</th>
<th>Engineering Design</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100%</td>
</tr>
</tbody>
</table>

Accreditation Data Collection and Privacy:
Undergraduate programs in the College of Engineering are accredited by the Canadian Engineering Accreditation Board. Student performance data may be collected in this course to support accreditation and continuous program improvement processes. Anonymous samples of student work may also be collected for accreditation purposes. All data provided to the accreditation body or external entities is anonymized and reported in aggregate form to protect your information and identity. If you have any concerns about how your personal information is used or maintained, please contact the Associate Dean Academic, College of Engineering.
1. Approval by Department Head or Dean
   1.1 College or School with academic authority: College of Engineering
   1.2 Department with academic authority: Associate Dean, Academic Office
   1.3 Term from which the course is effective: 202105

2. Information required for the Catalogue
   2.1 Label & Number of course: GE 122
   2.2 Academic credit units: 2
   2.3 Course Long Title (maximum 100 characters): Engineering Mechanics I
       Course Short Title (maximum 30 characters): Mechanics I
   2.4 Total Hours: Lecture 22.5 Seminar Lab 12 Tutorial Other
   2.5 Weekly Hours: Lecture Seminar Lab Tutorial Other
   2.6 Term in which it will be offered: T1 T2 T1 or T2 T1 and T2
   2.7 Prerequisite:
       If there is a prerequisite waiver, who is responsible for signing it?
       D – Instructor/Dept Approval
       H – Department Approval (Associate Dean, Academic)
       I – Instructor Approval
   2.8 Catalogue description (150 words or less):
       This course considers particle dynamics and begins with particle kinematics under arbitrary
       acceleration. Particle kinetics is then addressed including force-acceleration, work-energy, and
       impulse-momentum principles. A series of practical laboratories are designed to help the student
       apply the principles of dynamics to practical problems.
   2.9 Do you allow this course to be repeated for credit? No

3. Please list rationale for introducing this course: This is part of the integrated curriculum in the
   redesigned first year program.

4. Please list the learning objectives for this course:
   This course consists of two modules: The learning outcomes for each module are as follows:
   
   **Module 1: Particle Kinematics**
5. Impact of this course
Are the programs of other departments or Colleges affected by this course? No
If so, were these departments consulted? (Include correspondence)
Were any other departments asked to review or comment on the proposal? Yes, within the
College and we worked with the Gwenna Moss Centre for Teaching and Learning.

6. Other courses or program affected (please list course titles as well as numbers)
6.1 Courses to be deleted? GE 101, GE 111, GE 121, GE 124, GE 125 (for Fall 2021)
6.2 Courses for which this course will be a prerequisite?
Any changes to the course prerequisites in the programs will be submitted in future UCC.
6.3 Is this course to be required by your majors, or by majors in another program? Required for
Engineering Students as part of the Common First Year.

7. Course outline
(Weekly outline of lectures or include a draft of the course information sheet.)

See attached syllabus.
8. Enrolment
   8.1 Expected enrollment: up to 600
   8.2 From which colleges? Engineering

9. Student evaluation
   Give approximate weighting assigned to each indicator (assignments, laboratory work, mid-term test, final examination, essays or projects, etc.)

   Please see syllabus.

   9.1 How should this course be graded?
   C – Completed Requirements
   (Grade options for instructor: Completed Requirements, Fail, IP In Progress)
   N – Numeric/Percentage
   (Grade options for instructor: grade of 0% to 100%, IP in Progress)
   P – Pass/Fail
   (Grade options for instructor: Pass, Fail, In Progress)
   S – Special
   (Grade options for instructor: NA – Grade Not Applicable) If other, please specify:

   9.2 Is the course exempt from the final examination? Yes

10. Required text
    Include a bibliography for the course:


11. Resources
    11.1 Proposed instructor: Engineering Faculty
    11.2 How does the department plan to handle the additional teaching or administrative workload? Within College/department budget.
    11.3 Are sufficient library or other research resources available for this course? Yes. The University Bookstore carries the textbook as an eText packaged with a MasteringEngineering access code. MasteringEngineering is the publisher’s online assignment tool.
    11.4 Are any additional resources required (library, audio-visual, technology, etc.)? N/A

12. Tuition
    12.1 Will this course attract tuition charges? If so, how much? (use tuition category) TC07
    12.2 Does this course require non-standard fees, such as materials or excursion fees? If so, please include an approved “Application for New Fee or Fee Change Form”
    http://www.usask.ca/sesd/info-for-instructors/program-course-preparation.php#course-fees
    No
Detailed Course Information

1. Schedule Types
Please choose the Schedule Types that can be used for sections that fall under this course:

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CL</td>
<td>Clinical</td>
<td>PRB</td>
<td>Problem Session</td>
</tr>
<tr>
<td>COO</td>
<td>Coop Class</td>
<td>RDG</td>
<td>Reading Class</td>
</tr>
<tr>
<td>FLD</td>
<td>Field Trip</td>
<td>RES</td>
<td>Research</td>
</tr>
<tr>
<td>ICR</td>
<td>Internet Chat Relay</td>
<td>ROS</td>
<td>Roster (Dent Only)</td>
</tr>
<tr>
<td>IHP</td>
<td>Internet Help</td>
<td>SEM</td>
<td>Seminar</td>
</tr>
<tr>
<td>IN1</td>
<td>Internship - Education</td>
<td>SSI</td>
<td>Supervised Self Instruction</td>
</tr>
<tr>
<td>IN2</td>
<td>Internship - CMPT &amp; EPIP</td>
<td>STU</td>
<td>Studio</td>
</tr>
<tr>
<td>IN3</td>
<td>Internship - General</td>
<td>SUP</td>
<td>Teacher Supervision</td>
</tr>
<tr>
<td>IND</td>
<td>Independent Studies</td>
<td>TEL</td>
<td>Televised Class</td>
</tr>
<tr>
<td>LAB</td>
<td>Laboratory</td>
<td>TUT</td>
<td>Tutorial</td>
</tr>
<tr>
<td>LC</td>
<td>Lecture/Clinical (Dent Only)</td>
<td>WEB</td>
<td>Web Based Class</td>
</tr>
<tr>
<td>LEC</td>
<td>Lecture</td>
<td>XCH</td>
<td>Exchange Program</td>
</tr>
<tr>
<td>LL</td>
<td>Lecture/Laboratory (Dent Only)</td>
<td>XGN</td>
<td>Ghost Schedule Type Not Applicable</td>
</tr>
<tr>
<td>MM</td>
<td>Multimode</td>
<td>XHS</td>
<td>High School Class</td>
</tr>
<tr>
<td>PCL</td>
<td>Pre-Clinical (Dent Only)</td>
<td>XNA</td>
<td>Schedule Type Not Applicable</td>
</tr>
<tr>
<td>PRA</td>
<td>Practicum</td>
<td>XNC</td>
<td>No Academic Credit</td>
</tr>
</tbody>
</table>

2. Course Attributes
Please highlight the attributes that should be attached to the course (they will apply to all sections):

2.1 NOAC No Academic Credit
0 Credit Unit courses that possess “deemed” CUs (Called Operational Credit Units). NOAC causes the system to roll 0 academic credit units to academic history.

2.2 For the College of Arts and Science only: To which program type does this course belong?

- FNAR Fine Arts
- HUM Humanities
- SCIE Science
- SOCS Social Science
- ARNP No Program Type (Arts and Science)

3. Registration Information (Note: multi-term courses cannot be automated as corequisites)

3.1 Permission Required: No
3.2 Restriction(s): course only open to students in a specific college, program/degree, major, year in program
College of Engineering only
3.3 Prerequisite(s): course(s) that must be completed prior to the start of this course
3.4 Prerequisite(s) or Corequisite(s): course(s) that can be completed prior to or taken at the same time as this course
GE 102 – Introduction to Engineering I, MATH 133 – Engineering Mathematics I
3.5 Corequisite(s): course(s) that must be taken at the same time as this course
3.6 Notes: recommended courses, repeat restrictions/content overlap, other additional information
4. List Equivalent Course(s) here:  GE 125
An equivalent course can be used in place of the course for which this form is being completed, specifically for the purposes of prerequisite and degree audit checking. Credit will be given for only one of the equivalent courses.

4.1 If this is a recently-repurposed course number, please list the courses that are no longer considered to be equivalent:

*Please note: If the equivalent courses carry an UNEQUAL number of credit units, DegreeWorks will automatically enforce the following, unless otherwise stated:

- If a 3 credit unit course is considered to be equivalent to a 6 credit unit course, it will fulfill the 6 credit unit requirement and the student will not have to complete another 3 credit units toward the overall number of required credit units for the program.
- If a 6 credit unit course is considered to be equivalent to a 3 credit unit course, ALL 6 of the credit units may be used to fulfill the 3 credit unit requirement.

5. List Mutually-Exclusive Course(s) here:
Mutually exclusive courses have similar content such that students cannot receive credit for both.

5.1 If this is a recently-repurposed course number, please list the courses that are no longer considered to be mutually exclusive:

*Please note: SiRIUS cannot enforce a situation where the exclusion goes only one way.

6. Additional Notes:
Land Acknowledgement
At the University of Saskatchewan, we acknowledge we are on Treaty Six Territory and the Homeland of the Métis. We pay our respect to the First Nation and Métis ancestors of this place and reaffirm our relationship with one another.

Instructor: TBA
Office Hours: TBA
Lectures: Days, Times, Location TBA
Laboratory: Days, Times, Location TBA
Website: Assignments, solutions, lab schedules, general course information, and announcements will be posted on the course LMS site. Students are responsible for keeping up-to-date with the information on this site.
End of Day Tutorials: End of day tutorial sessions will be offered by the College of Engineering for the Common First Year and will provide support for all courses. Please see TBA for more details.

Description: This course considers particle dynamics and begins with particle kinematics under arbitrary acceleration. Particle kinetics is then addressed including force-acceleration, work-energy, and impulse-momentum principles. A series of practical laboratories are designed to help the student apply the principles of dynamics to practical problems.

Prerequisites: None
Pre- or Co-requisites: MATH 133.3 Engineering Mathematics I, GE 102 Engineering I
Course Reference Numbers (CRNs): TBA (lectures), TBA (laboratory)
Course Learning Outcomes: This course consists of two modules: The learning outcomes for each module are as follows:

**Module 1: Particle Kinematics**

<table>
<thead>
<tr>
<th>Weight (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
</tr>
<tr>
<td>20</td>
</tr>
</tbody>
</table>

By the end of this module, students will be expected to:

1.1 add and subtract vectors using the parallelogram law, triangle method, and Cartesian components;
1.2 derive kinematic equations of motion;
1.3 manipulate kinematic equations of motion to solve 1D and 2D rectilinear particle kinematics problems;  
1.4 manipulate kinematic equations of motion to solve 2D curvilinear particle kinematics problems; and  
1.5 calculate absolute, dependent, and relative motion of two particles in planar motion.

**Module 2: Introductory Particle Kinetics**

By the end of this module, students will be expected to:

<table>
<thead>
<tr>
<th>Weight (%)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1 15</td>
<td>manipulate kinetic equations of motion to solve 1D and 2D rectilinear particle motion problems;</td>
</tr>
<tr>
<td>2.2 15</td>
<td>manipulate kinetic equations of motion to solve 2D curvilinear particle motion problems;</td>
</tr>
<tr>
<td>2.3 15</td>
<td>solve problems involving forces, velocities, and displacements of particles in 1D and 2D using work and energy principles, and energy conservation;</td>
</tr>
<tr>
<td>2.4 15</td>
<td>solve simple particle motion problems involving power and efficiency;</td>
</tr>
<tr>
<td>2.5 20</td>
<td>apply the principle of linear impulse and momentum for one or two particles in 1D or 2D; and</td>
</tr>
<tr>
<td>2.6 20</td>
<td>evaluate impacts between two particles in 1D and 2D.</td>
</tr>
</tbody>
</table>

**Assessment System:**
This course uses a competency-based assessment system resulting in a final numeric grade (percentage). It requires that students demonstrate a minimum level of competence in key knowledge and skills and basic integrative skills in order to obtain a passing grade.

**Course Grades**
Course grades are calculated from a weighted average of module grades according to the following weights. In addition, if any module grade is less than 50%, the final course grade will be a maximum of 49%.

<table>
<thead>
<tr>
<th>Module</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>40</td>
</tr>
<tr>
<td>2</td>
<td>60</td>
</tr>
</tbody>
</table>

**Question Types**
Each question on each assessment will be clearly indicated as being one of the following three Question Types:

**Type A:** These are key knowledge and very basic skills vital to success in the module. They are the building blocks required for success in performing the more integrative skills in the module.

**Type B:** These questions require that Type A knowledge and skills be applied in an integrative manner to basic questions that should be familiar to the student.
Type C: These questions require an ability to apply the knowledge and skills of each module in an advanced integrative manner to questions that may not be familiar to the student.

To achieve a passing grade in a module, students must demonstrate competence in Type A and Type B questions. There are no minimum requirements for Type C questions.

**Type A Competence**

Competence in Type A knowledge and skills is demonstrated by achieving at least 70% on any Type A quiz for each of the checklist items below before the end date of the module. Students may self-evaluate at any time by accessing practice quiz questions available on the LMS. When they are ready, they attend a proctored Type A quiz at any end-of-day Quiz Session. At this session, they may take quizzes on one or more Type A checklist items. All questions on these quizzes are Type A questions. No explicit Type A questions appear on other assessments in the module although Type A knowledge and skills figure prominently in Type B and Type C questions.

A checklist will be maintained on the Student Dashboard where students can monitor their progress in completing these requirements. **Failure to complete all checklist items before the end of the module will result in a maximum grade of 49% for the module. Beyond this requirement, quiz results do not contribute to the Module Grade.**

The list of Type A Knowledge and Skills for this course is as follows:

<table>
<thead>
<tr>
<th>Module</th>
<th>Type A Knowledge &amp; Skills Checklist</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Express numbers to a given number of significant figures</td>
</tr>
<tr>
<td></td>
<td>Express answers in appropriate units</td>
</tr>
<tr>
<td></td>
<td>Add vectors using the parallelogram law and triangle method</td>
</tr>
<tr>
<td></td>
<td>Add vectors using Cartesian components</td>
</tr>
<tr>
<td></td>
<td>Plot simple functions</td>
</tr>
<tr>
<td>2</td>
<td>Convert from mass to weight in appropriate units</td>
</tr>
<tr>
<td></td>
<td>Extract Given information from a problem statement</td>
</tr>
<tr>
<td></td>
<td>Identify what is requested in a problem statement</td>
</tr>
<tr>
<td></td>
<td>Identify appropriate Assumptions relevant to particle dynamics</td>
</tr>
<tr>
<td></td>
<td>Express Conclusions in an English sentence</td>
</tr>
</tbody>
</table>

**Assessments**

The assessments and their respective weights in each module are listed below. All assessments will have a maximum grade of 100.

<table>
<thead>
<tr>
<th>Module</th>
<th>Assessment</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Assignment 1.1</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Assignment 1.2</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Assignment 1.3</td>
<td>5</td>
</tr>
</tbody>
</table>
All questions/parts of these assessments will be identified as Type B or Type C. The relative proportions of Type B and Type C questions on each assessment will be at the instructor’s discretion.

When developing assessments, the instructor will endeavor to design questions that achieve the Learning Outcome Weights indicated in the Course Learning Outcomes section on an aggregate basis for the entire module. Each assessment will clearly indicate the weighting of each learning outcome.

**Type B Competence**

Performance on the Type B questions in each module is subject to a minimum level of competence. By the end of the module, students must achieve a Type B Running Average of at least 70%. **Failure to do so will result in a maximum grade of 49% for the module.**

After each assessment, a student’s Type B Running Average is recalculated. If the Type B Grade on the current assessment is **greater than** the Running Average, it becomes the new Running Average. If the Type B Grade on the current assessment is **less than** the Running Average, the new Running Average is a simple mean of the current Running Average and the Type B grade on the current assessment.

**Final Module Grades**

At the end of each module, Module Grades are calculated by applying the final Type B Running Average to **all Type B questions** throughout the module. Type C questions are unadjusted. This yields a raw module grade. If the final Type B Running Average is at least 70% and all Type A checklist items have been cleared, this becomes the final Module Grade. Otherwise, the maximum final Module Grade will be 49%.

**Top Ups**

After each module, students will be able to clear deficiencies in their Type B Running Average by successfully completing a Top Up on that module. Top Ups consist of online study materials, topic-specific tutorials, and proctored Type B re-test opportunities for each module. Information on the Top Up schedule will be posted on the LMS for this course.
### Student Grades Dashboard

On an ongoing basis throughout each module, students may monitor their progress on the LMS in three complementary respects:

- **Assessments:** A summary of grades obtained on each assessment (assignment, lab, etc.).
- **Learning Outcomes:** A summary of current grades for each learning outcome.
- **Type A Checklist:** A checklist indicating which Type A knowledge and skills have been demonstrated.
- **Type B Running Average:** The current Type B Running Average.

The Student Grades Dashboard will include automated notifications to students if they are lagging behind in clearing Type A checklist items in a timely fashion. It will also advise students to attend module-specific end-of-day tutorials if their Type B Running Average is lagging.

### Final Grades

The final grades will be consistent with the Literal Descriptors specified in the university’s grading system (at the link below, click on “for undergraduate students”).

[https://students.usask.ca/academics/grading/grading-system.php](https://students.usask.ca/academics/grading/grading-system.php)

For information regarding appeals of final grades or other academic matters, please visit the Student Conduct and Appeals section of the University Secretary’s website:


### Module Exemptions

Students repeating the course must repeat both modules regardless of the grade obtained in the modules.

---

**Attendance and Participation:** Students are strongly encouraged to attend all lectures and are responsible for what happens in during lectures (e.g. quizzes). However, attendance is not mandatory or marked.

**Criteria That Must Be Met to Pass:** All three experimental laboratories are mandatory. If all three labs are not completed, the maximum grade in the course is 49%.

The Assessment System described above also specifies minimum levels of competence that must be achieved in order to obtain a passing grade.

**Academic Courses Policy:** More information on the Academic Courses Policy on course delivery, examinations and assessment of student learning can be found at:

[http://policies.usask.ca/policies/academic-affairs/academic-courses.php](http://policies.usask.ca/policies/academic-affairs/academic-courses.php)

**Learning Charter:** The University of Saskatchewan Learning Charter is intended to define aspirations about the learning experience that the University aims to provide, and the roles to be played in realizing these aspirations by students, instructors...
and the institution. A copy of the Learning Charter can be found at: https://teaching.usask.ca/about/policies/learning-charter.php

Course Content/Schedule:

<table>
<thead>
<tr>
<th>Topic</th>
<th>Textbook Sections</th>
<th>Approximate Lecture Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MODULE 1 – PARTICLE KINEMATICS</strong></td>
<td></td>
<td>10.5</td>
</tr>
<tr>
<td>1.1 Introduction, Rectilinear Kinematics</td>
<td>12.1, 12.2</td>
<td>1.5</td>
</tr>
<tr>
<td>1.2 Rectilinear Kinematics, Curvilinear Motion</td>
<td>12.3-12.5</td>
<td>3</td>
</tr>
<tr>
<td>1.3 Rectangular, Normal-Tangential Coordinates</td>
<td>12.6, 12.7</td>
<td>3</td>
</tr>
<tr>
<td>1.4 Dependent and Relative Motion</td>
<td>12.9, 12.10</td>
<td>3</td>
</tr>
<tr>
<td><strong>MODULE 2 – PARTICLE KINETICS</strong></td>
<td></td>
<td>15</td>
</tr>
<tr>
<td>2.1 Newton’s Second Law, Equations of Motion in 2-D</td>
<td>13.1-13.5</td>
<td>3</td>
</tr>
<tr>
<td>2.2 Principle of Work and Energy</td>
<td>14.1, 14.2</td>
<td>1.5</td>
</tr>
<tr>
<td>2.3 Power and efficiency</td>
<td>14.3, 14.4</td>
<td>1.5</td>
</tr>
<tr>
<td>2.4 Conservation of Energy</td>
<td>14.5, 14.6</td>
<td>3</td>
</tr>
<tr>
<td>2.5 Impulse and Momentum</td>
<td>15.1, 15.2</td>
<td>3</td>
</tr>
<tr>
<td>2.6 Conservation of Momentum and Impact</td>
<td>15.3, 15.4</td>
<td>3</td>
</tr>
</tbody>
</table>

**Assignments:**

Most assignments will be done using an online Homework Management System (e.g. MasteringEngineering from Pearson Education Inc.). These assignments are graded based only on the answer provided (no partial marks for method).

Selected assignments, or portions of assignments, will require students to hand in detailed solutions that conform to the Solution Requirements that are posted on the LMS. These Solution Requirements should be followed for all work in this course including the module tests.

All assignments submitted after the deadline will be given a grade of zero. Solutions will be posted after the due date.

**Laboratory:**

There will be three experimental laboratories. Check the laboratory schedule on the LMS. The topics of the laboratories are as follow:

1. Trajectory of a Projectile (Module 1)
2. Completely Inelastic Collision (Module 2)
3. Two-body Collision in Two Dimensions (Module 2)

A teaching assistant (TA) will be present during scheduled laboratory times to provide help. No manual need be purchased for the experimental laboratories. Laboratory materials will be posted on the LMS before each experimental laboratory begins.

If you miss an experimental laboratory for medical or compassionate reasons, contact TBA with appropriate evidence. It is mandatory to complete all four experimental laboratories.

Before each of the three experimental laboratories, each student will be required to complete an online pre-lab quiz. The quizzes are designed to ensure that students understand the laboratory theory, data collection, analysis, and safety instructions that are described in each lab instruction file. The pre-lab quizzes will count for 20% of the student's laboratory grade. Students who are granted a complete experimental lab exemption do not need to complete these quizzes.

Please note the following points regarding laboratory exemptions:
1. The exemption will only be granted if the laboratories were completed in the previous three offerings of the course.
2. The student must have earned an average grade of at least 70% on the experimental laboratories.
3. An exemption can only be granted one time for this course.
4. The student must agree to accept the laboratory grade received previously.
5. The student remains responsible for the learning that takes place in the laboratory.
6. In the event that the content of the laboratories changes significantly from previous years, the student may be required to complete the new/modified lab or labs.
7. To inquire about an exemption, contact TBA.

Note that attendance and submission of laboratory reports is mandatory. Failure to meet these requirements will result in a final grade of less than 50% for the course.

Module Tests:
- This course is comprised of three modules. Each module will end with a 1.5 hr module test conducted as a required, outside-of-class activity. The module tests will only assess the content of that specific module. The schedule for the Module Tests is:
  - Module 1: Particle Kinematics: Date & Time
  - Module 2: Particle Kinetics: Date & Time
- Students should avoid making prior travel, employment, or other commitments at these times. If a student is unable to write a module test through no fault of their own for medical or other acceptable reasons, documentation must be provided and an opportunity to write the missed module test may be given. Students are encouraged to review all examination policies and procedures: http://students.usask.ca/academics/exams.php
- Alternate times to write Module Tests will not be considered except in the case of acceptable reasons, such as illness, bereavement, etc., or a conflict with other university related activities.
- The use of electronic devices, including calculators, phones and watches, with document storage and/or communication capabilities is prohibited during exams for this course.
- Students planning on registering with the office for Access and Equity Services for Students (AES) must do so in accordance with AES procedures and deadlines.
- The module tests are closed book. A standardized formula sheet will be provided for all module tests.

Required Activities Outside of Class Time
The Module Tests are written outside of class time. See the Module Test Policy section above.

Important Dates

| TBA | First day of classes |
| TBA | Last day for making changes in registration for Fall Term courses (100% tuition credit). |
| TBA | Module 1 Test |
| TBA | Fall Mid-term Break |
| TBA | Last day to withdraw from Fall Term classes |
| TBA | Holidays TBA |
| TBA | Last day of classes. |
| TBA | Module 2 Test |
Required Resources


- The University Bookstore carries this book as an eText packaged with a MasteringEngineering access code. MasteringEngineering is the publisher’s online assignment tool. https://bookstore.usask.ca/students.php#MyTextbooks
- All course assignments will be done using the MasteringEngineering website. Be careful buying a second-hand version of the textbook. Make sure it has an unused access code. If it does not, you will need to buy an access code directly from the publisher.
- If you want a paper copy of the textbook (loose leaf version), it can be purchased directly from the publisher once you register with MasteringEngineering.

There is no Laboratory Manual to be purchased. Materials will be posted on the LMS prior to each laboratory.

Policies on Academic Dishonesty, Academic Appeals and Course Delivery:
Students are expected to undertake all aspects of their academic work in an ethical manner. Students are expected to submit their own individual work for academic credit, properly cite the work of others, and to follow all rules for examinations. Academic misconduct, plagiarism, and cheating will not be tolerated. Students are responsible for understanding the university’s policies on academic integrity and academic misconduct. If any form of academic misconduct is discovered, appropriate disciplinary action will be taken.


For information regarding appeals of a final grade or other academic matters, please consult the University Council document on Student Appeals of Evaluation, Grading and Academic Standing (http://policies.usask.ca/policies/student-affairs-and-activities/student-appeals.php).

Additional policies and procedures related to student conduct and appeals are provided on the University Secretariat website (www.usask.ca/secretariat/student-conduct-appeals) and on the University website http://www.usask.ca/integrity/.

A summary of University of Saskatchewan polices relating to academic courses is provided in the document: Academic Courses Policy on Class Delivery, Examinations, and Assessment of Student Learning (http://policies.usask.ca/policies/academic-affairs/academic-courses.php).

Integrity Defined (from the Office of the University Secretary)
The University of Saskatchewan is committed to the highest standards of academic integrity and honesty. Students are expected to be familiar with these standards regarding academic honesty and to uphold the policies of the University in this respect. Students are particularly urged to familiarize themselves with the provisions of the Student Conduct & Appeals section of the University Secretary Website and avoid any behavior that could potentially result in suspicions of cheating, plagiarism, misrepresentation of facts and/or participation in an offence. Academic dishonesty is a serious offence and can result in suspension or expulsion from the University.

For more information on what academic integrity means for students see the Academic Integrity section of the University Library Website at: [https://library.usask.ca/academic-integrity#AboutAcademicIntegrity](https://library.usask.ca/academic-integrity#AboutAcademicIntegrity)

You are encouraged to complete the Academic Integrity Tutorial to understand the fundamental values of academic integrity and how to be a responsible scholar and member of the USask community - [https://library.usask.ca/academic-integrity.php#AcademicIntegrityTutorial](https://library.usask.ca/academic-integrity.php#AcademicIntegrityTutorial)

**Safety:**
The APEGs Code of Ethics also states that Professional Engineers shall "hold paramount the safety, health and welfare of the public and the protection of the environment and promote health and safety within the workplace" (Section 20(a), The Engineering and Geoscience Professions Regulatory Bylaws, 1997).

Safety is of paramount importance in the College. Students are expected to work in a safe and responsible manner, to follow all safety instructions, and use any specified personal protective equipment. Students failing to behave in a safe manner will be asked to leave.

Preparing for emergencies protects our lives and property. An emergency response plan (ERP) posting is located in each classroom and lab near the main door of the room. Students are advised to review and be familiar with the College ERP and be aware that when an alarm sounds for more than 10 seconds, the building must be evacuated. Muster point locations are posted at each entrance of the Engineering Building. To view the full ERP, please visit the following website: [https://engineering.usask.ca/documents/facilities/ERP%20-%20ENG%20-%20v%205%200%20-%2009_01_2017.pdf](https://engineering.usask.ca/documents/facilities/ERP%20-%20ENG%20-%20v%205%200%20-%2009_01_2017.pdf)

**Recording Lectures:**
When possible, lectures will be recorded and made available to students in the LMS. Video and/or audio recording of lectures is not allowed. Students with approval from AES may record lectures for their own use with the permission of the instructor.

**Copyright:**
Course materials are provided to students based on their registration in a class. Any materials created by course instructors is the intellectual property of the instructors. This includes exams, tests, PowerPoint/PDF slides and other course notes. Additionally, other copyright-protected materials created by textbook publishers and authors may be provided to students based on license terms and educational exceptions in the Canadian Copyright Act (see [http://laws-lois.justice.gc.ca/eng/acts/C-42/index.html](http://laws-lois.justice.gc.ca/eng/acts/C-42/index.html)).

Before copying or distributing others' copyright-protected materials, students need to ensure that their use of the materials is covered under the University's Fair Dealing Copyright Guidelines available at [http://www.usask.ca/copyright/basics/copyright-policy/fair-dealing-guidelines/index.php](http://www.usask.ca/copyright/basics/copyright-policy/fair-dealing-guidelines/index.php). For example, posting others' copyright-protected materials on the internet is not covered under the University's Fair Dealing Copyright Guidelines; doing so requires permission from the copyright holder. For more information about copyright, please visit [http://www.usask.ca/copyright/students/rights/index.php](http://www.usask.ca/copyright/students/rights/index.php) or contact the University’s Copyright Coordinator at copyright.coordinator@usask.ca.

Students should be aware that a violation of the university’s copyright policies could be an instance of non-academic misconduct. For example, the practice of uploading or posting copyright-
protected materials to course-sharing websites, depositories, or “drop boxes”, without the permission of the copyright holder, could result in a charge of non-academic misconduct under the university’s “Standard of Student Conduct in Non-Academic Matters”, found at the following location: https://secretariat.usask.ca/student-conduct-appeals/non-academic-misconduct.php.

**Student Conduct:**
Ethical behaviour is an important part of engineering practice. Each professional engineering association has a Code of Ethics, which its members are expected to follow. Since students are in the process of becoming Professional Engineers, it is expected that students will conduct themselves in an ethical manner.

The APEG (Association of Professional Engineers and Geoscientists of Saskatchewan) Code of Ethics states that engineers shall “conduct themselves with fairness, courtesy and good faith towards clients, colleagues, employees and others; give credit where it is due and accept, as well as give, honest and fair professional criticism” (Section 20(e), The Engineering and Geoscience Professions Regulatory Bylaws, 1997).

The first part of this statement discusses an engineer’s relationships with their colleagues. One of the ways in which engineering students can demonstrate courtesy to their colleagues is by helping to maintain an atmosphere that is conducive to learning, and minimizing disruptions in class. This includes arriving on time for lectures, turning cell phones and other electronic devices off during lectures, not leaving or entering the class at inopportune times, and refraining from talking to others while the instructor is talking.

**Access and Equity Services (AES) for Students:**
Students who have disabilities (learning, medical, physical, or mental health) are strongly encouraged to register with Access and Equity Services (AES) if they have not already done so. Students who suspect they may have disabilities should contact AES for advice and referrals at any time. Those students who are registered with AES with mental health disabilities and who anticipate that they may have responses to certain course materials or topics, should discuss course content with their instructors prior to course add / drop dates. In order to access AES programs and supports, students must follow AES policy and procedures. For more information or advice, visit https://students.usask.ca/health/centres/access-equity-services.php, or contact AES at 306-966-7273 or aes@usask.ca.

Students registered with AES may request alternative arrangements for module tests. Students must arrange such accommodations through AES by the stated deadlines. Instructors shall provide the examinations for students who are being accommodated by the deadlines established by AES.

**Support Services for Engineering Students:**
- Engineering Student Centre (Rm. 2A05 Engineering Building)
  - Email: esc@usask.ca; Phone: 306-966-5274; https://engineering.usask.ca/contact_info/esc-office.php

End of day tutorial sessions will be offered by the College of Engineering for the Common First Year and will provide support for all courses. Please see X for more details.

**Student Learning Services:**
Student Learning Services (SLS) offers assistance to U of S undergrad and graduate students. For information on specific services, please see the SLS web site https://library.usask.ca/studentlearning/.

**Teaching, Learning and Student Experience:**
The Teaching, Learning and Student Experience Unit (TLSE) focuses on providing developmental and support services and programs to students and the university community. For more information, see https://students.usask.ca/. Specific resources include:

- Student Wellness Centre (3rd & 4th Floors, Place Riel): https://students.usask.ca/health/
- Financial Services: https://students.usask.ca/money/

**College of Engineering Graduate Attribute Mapping:**
This information shows the relationship of the learning outcomes of this course to the graduate attributes intended upon students' completion of the degree program. This information is used for accreditation purposes.

<table>
<thead>
<tr>
<th>Instructional Level‡</th>
<th>Attribute†</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A1  A2  A3</td>
</tr>
<tr>
<td>1.1</td>
<td>D    D</td>
</tr>
<tr>
<td>1.2</td>
<td>D    D</td>
</tr>
<tr>
<td>1.3</td>
<td>D    D</td>
</tr>
<tr>
<td>1.4</td>
<td>D    D</td>
</tr>
<tr>
<td>1.5</td>
<td>D    D</td>
</tr>
<tr>
<td>1.6</td>
<td>D    D</td>
</tr>
<tr>
<td>2.1</td>
<td>D    D</td>
</tr>
<tr>
<td>2.2</td>
<td>D    D</td>
</tr>
<tr>
<td>2.3</td>
<td>D    D</td>
</tr>
<tr>
<td>2.4</td>
<td>D    D</td>
</tr>
<tr>
<td>2.5</td>
<td>D    D</td>
</tr>
<tr>
<td>2.6</td>
<td>D    D</td>
</tr>
</tbody>
</table>

†**Attributes:**
- **A1** A knowledge base for engineering
- **A2** Problem analysis
- **A3** Investigation
- **A4** Design
- **A5** Use of engineering tools
- **A6** Individual and team work
- **A7** Communication skills
- **A8** Professionalism
- **A9** Impact of engineering on society and the environment
- **A10** Ethics and equity
- **A11** Economics and project management
- **A12** Life-long learning

‡**Instructional Level:**
- **Introduced (I)** – Students learn the working vocabulary of the area of content, along with some of the major underlying concepts.
- **Developed (D)** – Students use their working vocabulary and major fundamental concepts to probe more deeply, to read the literature, and to deepen their exploration of the concepts. They may begin to practice, extend, or refine knowledge in familiar contexts.
- **Applied (A)** – Students approach mastery in the area of content. They explore deeply into the discipline and experience the controversies, debate, and uncertainties that characterize the leading edges of any field. They practice, extend, or refine knowledge in unfamiliar contexts.

**Accreditation Unit (AU) Mapping:** (% of total class AU)

<table>
<thead>
<tr>
<th>Math</th>
<th>Natural Science</th>
<th>Complementary Studies</th>
<th>Engineering Science</th>
<th>Engineering Design</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100%</td>
</tr>
</tbody>
</table>

**Accreditation Data Collection and Privacy:**
Undergraduate programs in the College of Engineering are accredited by the Canadian Engineering Accreditation Board. Student performance data may be collected in this course to support accreditation and continuous program improvement processes. Anonymous samples of
student work may also be collected for accreditation purposes. All data provided to the accreditation body or external entities is anonymized and reported in aggregate form to protect your information and identity. If you have any concerns about how your personal information is used or maintained, please contact the Associate Dean Academic, College of Engineering.
1. **Approval by Department Head or Dean**
   1.1 College or School with academic authority: College of Engineering
   1.2 Department with academic authority: Associate Dean, Academic Office
   1.3 Term from which the course is effective: 202105

2. **Information required for the Catalogue**
   2.1 Label & Number of course: GE 123
   2.2 Academic credit units: 3
   2.3 Course Long Title (maximum 100 characters): Engineering Mechanics II
   2.4 Total Hours: Lecture 34.5  Seminar Lab 12  Tutorial Other
   2.5 Weekly Hours: Lecture  Seminar Lab Tutorial Other
   2.6 Term in which it will be offered:  T1  T2  T1 or T2  T1 and T2
   2.7 Prerequisite:

If there is a prerequisite waiver, who is responsible for signing it?
D – Instructor/Dept Approval
H – Department Approval (Associate Dean, Academic)
I – Instructor Approval

2.8 Catalogue description (150 words or less):
This course is an introduction to statics for particles and rigid bodies in two and three dimensions. Applications involving the analyses of simple trusses, frames, and machines are introduced. Dry friction is also introduced. A series of practical laboratories are designed to help the student apply the principles of statics to practical problems.

2.9 Do you allow this course to be repeated for credit? No

3. **Please list rationale for introducing this course:** This is part of the integrated curriculum in the redesigned first year program.

4. **Please list the learning objectives for this course:**

   This course consists of three modules: The learning outcomes for each module are as follows:

   **Module 1: Particle Statics**
By the end of this module, students will be expected to:

<table>
<thead>
<tr>
<th>Weight (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1 define terms relevant to particle equilibrium; 20</td>
</tr>
<tr>
<td>1.2 describe the concept of particle equilibrium; 20</td>
</tr>
<tr>
<td>1.3 draw free body diagrams of particles in two and three dimensions; 20</td>
</tr>
<tr>
<td>1.4 calculate the dot product of vectors in two and three dimensions and understand their usefulness; and 20</td>
</tr>
<tr>
<td>1.5 apply the equations of equilibrium to calculate unknown forces in particle equilibrium problems in two and three dimensions. 20</td>
</tr>
</tbody>
</table>

**Module 2: Introductory Rigid Body Statics**

By the end of this module, students will be expected to:

<table>
<thead>
<tr>
<th>Weight (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1 describe the concept of rigid body equilibrium; 16</td>
</tr>
<tr>
<td>2.2 draw free body diagrams of rigid bodies in two and three dimensions; 20</td>
</tr>
<tr>
<td>2.3 calculate the cross product of vectors in two and three dimensions and understand their usefulness; 16</td>
</tr>
<tr>
<td>2.4 calculate the moment created by a force about a point or an axis in two and three dimensions, using vector and scalar formulations; 16</td>
</tr>
<tr>
<td>2.5 characterize and apply couples in moment calculations; and 16</td>
</tr>
<tr>
<td>2.6 apply the equations of equilibrium to calculate unknown forces in introductory rigid body equilibrium problems in two and three dimensions. 16</td>
</tr>
</tbody>
</table>

**Module 3: Intermediate Rigid Body Statics**

By the end of this module, students will be expected to:

<table>
<thead>
<tr>
<th>Weight (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1 calculate the forces in members and supports of two-dimensional trusses using the method of joints and method of sections; 20</td>
</tr>
<tr>
<td>3.2 calculate forces acting on members and supports of two-dimensional frames and machines; 20</td>
</tr>
<tr>
<td>3.3 identify two- and three-force members, redundant and improper constraints, and static determinacy in rigid body equilibrium problems; 20</td>
</tr>
<tr>
<td>3.4 solve for unknown forces in dry friction problems; and 20</td>
</tr>
<tr>
<td>3.5 assess the equilibrium of a rigid body subjected to dry friction resulting in no movement or impending movement in the form of tipping or slipping. 20</td>
</tr>
</tbody>
</table>

5. **Impact of this course**

Are the programs of other departments or Colleges affected by this course? No. If so, were these departments consulted? (Include correspondence)
Were any other departments asked to review or comment on the proposal? Yes, within the College and we worked with the Gwenna Moss Centre for Teaching and Learning.

6. **Other courses or program affected** (please list course titles as well as numbers)
6.1 Courses to be deleted? GE 101, GE 111, GE 121, GE 124, GE 125 (for Fall 2021)
6.2 Courses for which this course will be a prerequisite?
Any changes to the course prerequisites in the programs will be submitted in future UCC.
6.3 Is this course to be required by your majors, or by majors in another program? Required for Engineering Students as part of the Common First Year.

7. **Course outline**
(Weekly outline of lectures or include a draft of the course information sheet.)
See attached syllabus.

8. **Enrolment**
8.1 Expected enrollment: up to 600
8.2 From which colleges? Engineering

9. **Student evaluation**
Give approximate weighting assigned to each indicator (assignments, laboratory work, mid-term test, final examination, essays or projects, etc.)
Please see syllabus.

9.1 How should this course be graded?
C – Completed Requirements
*(Grade options for instructor: Completed Requirements, Fail, IP In Progress)*
N – Numeric/Percentage
*(Grade options for instructor: grade of 0% to 100%, IP in Progress)*
P – Pass/Fail
*(Grade options for instructor: Pass, Fail, In Progress)*
S – Special
*(Grade options for instructor: NA – Grade Not Applicable)* If other, please specify:

9.2 Is the course exempt from the final examination? Yes

10. **Required text**
Include a bibliography for the course:

11. **Resources**
11.1 Proposed instructor: Engineering Faculty
11.2 How does the department plan to handle the additional teaching or administrative workload? Within College/department budget.
11.3 Are sufficient library or other research resources available for this course? Yes. The University Bookstore carries the textbook as an eText packaged with a MasteringEngineering access code. MasteringEngineering is the publisher’s online assignment tool.

11.4 Are any additional resources required (library, audio-visual, technology, etc.)? N/A

12. Tuition
12.1 Will this course attract tuition charges? If so, how much? (use tuition category) TC07
12.2 Does this course require non-standard fees, such as materials or excursion fees? If so, please include an approved “Application for New Fee or Fee Change Form” http://www.usask.ca/sesd/info-for-instructors/program-course-preparation.php#course-fees
No

Detailed Course Information

1. Schedule Types
Please choose the Schedule Types that can be used for sections that fall under this course:

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CL</td>
<td>Clinical</td>
<td>PRB</td>
<td>Problem Session</td>
</tr>
<tr>
<td>COO</td>
<td>Coop Class</td>
<td>RDG</td>
<td>Reading Class</td>
</tr>
<tr>
<td>FLD</td>
<td>Field Trip</td>
<td>RES</td>
<td>Research</td>
</tr>
<tr>
<td>ICR</td>
<td>Internet Chat Relay</td>
<td>ROS</td>
<td>Roster (Dent Only)</td>
</tr>
<tr>
<td>IHP</td>
<td>Internet Help</td>
<td>SEM</td>
<td>Seminar</td>
</tr>
<tr>
<td>IN1</td>
<td>Internship - Education</td>
<td>SSI</td>
<td>Supervised Self Instruction</td>
</tr>
<tr>
<td>IN2</td>
<td>Internship - CMPT &amp; EPIP</td>
<td>STU</td>
<td>Studio</td>
</tr>
<tr>
<td>IN3</td>
<td>Internship - General</td>
<td>SUP</td>
<td>Teacher Supervision</td>
</tr>
<tr>
<td>IND</td>
<td>Independent Studies</td>
<td>TEL</td>
<td>Televised Class</td>
</tr>
<tr>
<td>LAB</td>
<td>Laboratory</td>
<td>TUT</td>
<td>Tutorial</td>
</tr>
<tr>
<td>LC</td>
<td>Lecture/Clinical (Dent Only)</td>
<td>WEB</td>
<td>Web Based Class</td>
</tr>
<tr>
<td>LEC</td>
<td>Lecture</td>
<td>XCH</td>
<td>Exchange Program</td>
</tr>
<tr>
<td>LL</td>
<td>Lecture/Laboratory (Dent Only)</td>
<td>XGN</td>
<td>Ghost Schedule Type Not Applicable</td>
</tr>
<tr>
<td>MM</td>
<td>Multimode</td>
<td>XHS</td>
<td>High School Class</td>
</tr>
<tr>
<td>PCL</td>
<td>Pre-Clinical (Dent Only)</td>
<td>XNA</td>
<td>Schedule Type Not Applicable</td>
</tr>
<tr>
<td>PRA</td>
<td>Practicum</td>
<td>XNC</td>
<td>No Academic Credit</td>
</tr>
</tbody>
</table>

2. Course Attributes
Please highlight the attributes that should be attached to the course (they will apply to all sections):

2.1 NOAC No Academic Credit
0 Credit Unit courses that possess “deemed” CUs (Called Operational Credit Units). NOAC causes the system to roll 0 academic credit units to academic history.

2.2 For the College of Arts and Science only: To which program type does this course belong?
FNAR Fine Arts
3. Registration Information (Note: multi-term courses cannot be automated as corequisites)

3.1 Permission Required: No
3.2 Restriction(s): course only open to students in a specific college, program/degree, major, year in program: College of Engineering only
3.3 Prerequisite(s): course(s) that must be completed prior to the start of this course  GE122.3 Engineering Mechanics I (taken)
3.4 Prerequisite(s) or Corequisite(s): course(s) that can be completed prior to or taken at the same time as this course  MATH 134.3 Engineering Mechanics II
3.5 Corequisite(s): course(s) that must be taken at the same time as this course
3.6 Notes: recommended courses, repeat restrictions/content overlap, other additional information

4. List Equivalent Course(s) here: GE 124
An equivalent course can be used in place of the course for which this form is being completed, specifically for the purposes of prerequisite and degree audit checking. Credit will be given for only one of the equivalent courses.

4.1 If this is a recently-repurposed course number, please list the courses that are no longer considered to be equivalent:

*Please note: If the equivalent courses carry an UNEQUAL number of credit units, DegreeWorks will automatically enforce the following, unless otherwise stated:

- If a 3 credit unit course is considered to be equivalent to a 6 credit unit course, it will fulfill the 6 credit unit requirement and the student will not have to complete another 3 credit units toward the overall number of required credit units for the program.
- If a 6 credit unit course is considered to be equivalent to a 3 credit unit course, ALL 6 of the credit units may be used to fulfill the 3 credit unit requirement.

5. List Mutually-Exclusive Course(s) here:
Mutually exclusive courses have similar content such that students cannot receive credit for both.

5.1 If this is a recently-repurposed course number, please list the courses that are no longer considered to be mutually exclusive:

*Please note: SiRIUS cannot enforce a situation where the exclusion goes only one way.

6. Additional Notes:
GE 123.3
Engineering Mechanics II
Winter 2021-22

Land Acknowledgement
At the University of Saskatchewan, we acknowledge we are on Treaty Six Territory and the Homeland of the Métis. We pay our respect to the First Nation and Métis ancestors of this place and reaffirm our relationship with one another.

Instructor: TBA
Office Hours: TBA
Lectures: Days, Times, Location TBA
Laboratory: Days, Times, Location TBA
Website: Assignments, solutions, lab schedules, general course information, and announcements will be posted on the course LMS site. Students are responsible for keeping up-to-date with the information on this site.

End of Day Tutorials: End of day tutorial sessions will be offered by the College of Engineering for the Common First Year and will provide support for all courses. Please see TBA for more details.

Description: This course is an introduction to statics for particles and rigid bodies in two and three dimensions. Applications involving the analyses of simple trusses, frames, and machines are introduced. Dry friction is also introduced. A series of practical laboratories are designed to help the student apply the principles of statics to practical problems.

Prerequisites: GE 122.3 Engineering Mechanics I (taken)
Pre-or Co-requisites: MATH 134.3 Engineering Mathematics II
Course Reference Numbers (CRNs): TBA (lectures), TBA (laboratory)
Course Learning Outcomes: This course consists of three modules: The learning outcomes for each module are as follows:

Module 1: Particle Statics

By the end of this module, students will be expected to:

1.1 define terms relevant to particle equilibrium; 20

Weight (%)
1.2 describe the concept of particle equilibrium; 20
1.3 draw free body diagrams of particles in two and three dimensions; 20
1.4 calculate the dot product of vectors in two and three dimensions and understand their usefulness; and 20
1.5 apply the equations of equilibrium to calculate unknown forces in particle equilibrium problems in two and three dimensions. 20

Module 2: Introductory Rigid Body Statics

By the end of this module, students will be expected to:

<table>
<thead>
<tr>
<th>Weight (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
</tr>
<tr>
<td>20</td>
</tr>
<tr>
<td>16</td>
</tr>
<tr>
<td>16</td>
</tr>
<tr>
<td>16</td>
</tr>
</tbody>
</table>

2.1 describe the concept of rigid body equilibrium; 16
2.2 draw free body diagrams of rigid bodies in two and three dimensions; 20
2.3 calculate the cross product of vectors in two and three dimensions and understand their usefulness; 16
2.4 calculate the moment created by a force about a point or an axis in two and three dimensions, using vector and scalar formulations; 16
2.5 characterize and apply couples in moment calculations; and 16
2.6 apply the equations of equilibrium to calculate unknown forces in introductory rigid body equilibrium problems in two and three dimensions. 16

Module 3: Intermediate Rigid Body Statics

By the end of this module, students will be expected to:

<table>
<thead>
<tr>
<th>Weight (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
</tr>
<tr>
<td>20</td>
</tr>
<tr>
<td>20</td>
</tr>
<tr>
<td>20</td>
</tr>
<tr>
<td>20</td>
</tr>
</tbody>
</table>

3.1 calculate the forces in members and supports of two-dimensional trusses using the method of joints and method of sections; 20
3.2 calculate forces acting on members and supports of two-dimensional frames and machines; 20
3.3 identify two- and three-force members, redundant and improper constraints, and static determinacy in rigid body equilibrium problems; 20
3.4 solve for unknown forces in dry friction problems; and 20
3.5 assess the equilibrium of a rigid body subjected to dry friction resulting in no movement or impending movement in the form of tipping or slipping. 20

Assessment System:

This course uses a competency-based assessment system resulting in a final numeric grade (percentage). It requires that students demonstrate a minimum level of competence in key knowledge and skills and basic integrative skills in order to obtain a passing grade.

Course Grades

Course grades are calculated from a weighted average of module grades according to the following weights. In addition, if any module grade is less that 50%, the final course grade will be a maximum of 49%.
Question Types

Each question on each assessment will be clearly indicated as being one of the following three Question Types:

Type A: These are key knowledge and very basic skills vital to success in the module. They are the building blocks required for success in performing the more integrative skills in the module.

Type B: These questions require that Type A knowledge and skills be applied in an integrative manner to basic questions that should be familiar to the student.

Type C: These questions require an ability to apply the knowledge and skills of each module in an advanced integrative manner to questions that may not be familiar to the student.

To achieve a passing grade in a module, students must demonstrate competence in Type A and Type B questions. There are no minimum requirements for Type C questions.

Type A Competence

Competence in Type A knowledge and skills is demonstrated by achieving at least 70% on any Type A quiz for each of the checklist items below before the end date of the module. Students may self-evaluate at any time by accessing practice quiz questions available on the LMS. When they are ready, they attend a proctored Type A quiz at any end-of-day Quiz Session. At this session, they may take quizzes on one or more Type A checklist items. All questions on these quizzes are Type A questions. No explicit Type A questions appear on other assessments in the module although Type A knowledge and skills figure prominently in Type B and Type C questions.

A checklist will be maintained on the Student Dashboard where students can monitor their progress in completing these requirements. Failure to complete all checklist items before the end of the module will result in a maximum grade of 49% for the module. Beyond this requirement, quiz results do not contribute to the Module Grade.

The list of Type A Knowledge and Skills for this course is as follows:

<table>
<thead>
<tr>
<th>Module</th>
<th>Type A Knowledge &amp; Skills Checklist</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Define basic terms relevant to particle equilibrium</td>
</tr>
<tr>
<td></td>
<td>Take the dot product of two vectors in 3-D</td>
</tr>
<tr>
<td></td>
<td>Express position and force vectors in 3-D</td>
</tr>
<tr>
<td>2</td>
<td>Define basic terms relevant to rigid body equilibrium</td>
</tr>
<tr>
<td></td>
<td>Take the cross product of two vectors in 3-D</td>
</tr>
<tr>
<td></td>
<td>Calculate the moment created by a force about a point</td>
</tr>
<tr>
<td></td>
<td>Calculate the moment created by a force about a axis</td>
</tr>
<tr>
<td></td>
<td>Identify and characterize support reactions</td>
</tr>
<tr>
<td>3</td>
<td>Define basic terms relevant to trusses, frames, and machines</td>
</tr>
</tbody>
</table>
**Assessments**

The assessments and their respective weights in each module are listed below. All assessments will have a maximum grade of 100.

<table>
<thead>
<tr>
<th>Module</th>
<th>Assessment</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Assignment 1.1</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Assignment 1.2</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Assignment 1.3</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Lab 1.1</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Module Test 1</td>
<td>65</td>
</tr>
<tr>
<td></td>
<td><strong>Module 1 Total</strong></td>
<td><strong>100</strong></td>
</tr>
<tr>
<td>2</td>
<td>Assignment 2.1</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Assignment 2.2</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Assignment 2.3</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Assignment 2.4</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Assignment 2.5</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Lab 2.1</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>Module Test 2</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td><strong>Module 2 Total</strong></td>
<td><strong>100</strong></td>
</tr>
<tr>
<td>3</td>
<td>Assignment 3.1</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Assignment 3.2</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Assignment 3.3</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Assignment 3.4</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Lab 3.1</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Lab 3.2</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Module Test 3</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td><strong>Module 3 Total</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

All questions/parts of these assessments will be identified as Type B or Type C. The relative proportions of Type B and Type C questions on each assessment will be at the instructors discretion.

When developing assessments, the instructor will endeavor to design questions that achieve the Learning Outcome Weights indicated in the Course Learning Outcomes section on an aggregate basis for the entire module. Each assessment will clearly indicate the weighting of each learning outcome.

**Type B Competence**

Performance on the Type B questions in each module is subject to a minimum level of competence. By the end of the module, students must achieve a Type B Running Average of at least 70%. **Failure to do so will result in a maximum grade of 49% for the module.**

After each assessment, a student’s Type B Running Average is recalculated. If the Type B Grade on the current assessment is **greater than** the Running Average, it becomes the new Running Average. If the Type B Grade on the current assessment is **less than** the Running Average, the new Running
Average is a simple mean of the current Running Average and the Type B grade on the current assessment.

**Final Module Grades**

At the end of each module, Module Grades are calculated by applying the final Type B Running Average to **all Type B questions** throughout the module. Type C questions are unadjusted. This yields a raw module grade. If the final Type B Running Average is at least 70% and all Type A checklist items have been cleared, this becomes the final Module Grade. Otherwise, the maximum final Module Grade will be 49%.

**Top Ups**

After each module, students will be able to clear deficiencies in their Type B Running Average by successfully completing a Top Up on that module. Top Ups consist of online study materials, topic-specific tutorials, and proctored Type B re-test opportunities for each module. Information on the Top Up schedule will be posted on the LMS for this course.

**Student Grades Dashboard**

On an ongoing basis throughout each module, students may monitor their progress on the LMS in three complementary respects:

- **Assessments:** A summary of grades obtained on each assessment (assignment, lab, etc.).
- **Learning Outcomes:** A summary of current grades for each learning outcome.
- **Type A Checklist:** A checklist indicating which Type A knowledge and skills have been demonstrated.
- **Type B Running Average:** The current Type B Running Average.

The Student Grades Dashboard will include automated notifications to students if they are lagging behind in clearing Type A checklist items in a timely fashion. It will also advise students to attend module-specific end-of-day tutorials if their Type B Running Average is lagging.

**Final Grades**

The final grades will be consistent with the Literal Descriptors specified in the university's grading system (at the link below, click on "for undergraduate students").

[https://students.usask.ca/academics/grading/grading-system.php](https://students.usask.ca/academics/grading/grading-system.php)

For information regarding appeals of final grades or other academic matters, please visit the Student Conduct and Appeals section of the University Secretary's website:


**Module Exemptions**

Students repeating the course must repeat both modules regardless of the grade obtained in the modules.
**Attendance and Participation:** Students are strongly encouraged to attend all lectures and are responsible for what happens in during lectures (e.g. quizzes). However, attendance is not mandatory or marked.

**Criteria That Must Be Met to Pass:** All four experimental laboratories are mandatory. If all four labs are not completed, the maximum grade in the course is 49%. The Assessment System described above also specifies minimum levels of competence that must be achieved in order to obtain a passing grade.

**Academic Courses Policy:** More information on the Academic Courses Policy on course delivery, examinations and assessment of student learning can be found at: [http://policies.usask.ca/policies/academic-affairs/academic-courses.php](http://policies.usask.ca/policies/academic-affairs/academic-courses.php)

**Learning Charter:** The University of Saskatchewan Learning Charter is intended to define aspirations about the learning experience that the University aims to provide, and the roles to be played in realizing these aspirations by students, instructors and the institution. A copy of the Learning Charter can be found at: [https://teaching.usask.ca/about/policies/learning-charter.php](https://teaching.usask.ca/about/policies/learning-charter.php)

**Course Content/Schedule:**

<table>
<thead>
<tr>
<th>Topic</th>
<th>Textbook Sections</th>
<th>Approximate Lecture Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MODULE 1 – PARTICLE STATICS</strong></td>
<td></td>
<td>9</td>
</tr>
<tr>
<td>1.1 General principles, Review, Dot product</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.2 Particle equilibrium</td>
<td>3.1</td>
<td>1.5</td>
</tr>
<tr>
<td>1.3 Free body diagrams (FBDs) for particles</td>
<td>3.2</td>
<td>3</td>
</tr>
<tr>
<td>1.4 Coplanar and three-dimensional forces</td>
<td>3.3-3.4</td>
<td>1.5</td>
</tr>
<tr>
<td><strong>MODULE 2 – INTRODUCTORY RIGID BODY STATICS</strong></td>
<td></td>
<td>15</td>
</tr>
<tr>
<td>2.1 Moments (scalar and vector formulation), Cross products</td>
<td>4.1-4.5</td>
<td>3</td>
</tr>
<tr>
<td>2.2 Couples, Distributed loads</td>
<td>4.6, 4.9</td>
<td>3</td>
</tr>
<tr>
<td>2.3 2-D rigid body equilibrium, Supports, FBDs for rigid bodies</td>
<td>5.1-5.3</td>
<td>3</td>
</tr>
<tr>
<td>2.4 Two- and three-force members, 3D equilibrium</td>
<td>5.4-5.6</td>
<td>3</td>
</tr>
<tr>
<td>2.5 Constraints and statical determinacy, Review</td>
<td>5.7</td>
<td>3</td>
</tr>
<tr>
<td><strong>MODULE 3 – INTERMEDIATE RIGID BODY STATICS</strong></td>
<td></td>
<td>10.5</td>
</tr>
<tr>
<td>3.1 Trusses, method of joints, zero-force members,</td>
<td>6.1-6.3</td>
<td>3</td>
</tr>
<tr>
<td>3.2 Method of sections, Frames and machines,</td>
<td>6.4, 6.6</td>
<td>3</td>
</tr>
<tr>
<td>3.3 Dry friction</td>
<td>8.1-8.2</td>
<td>3</td>
</tr>
<tr>
<td>3.4 Review</td>
<td></td>
<td>1.5</td>
</tr>
</tbody>
</table>

**Assignments:**
Most assignments will be done using an online Homework Management System (e.g. MasteringEngineering from Pearson Education Inc.). These assignments are graded based only on the answer provided (no partial marks for method).

Selected assignments, or portions of assignments, will require students to hand in detailed solutions that conform to the Solution Requirements that are posted on the LMS. These Solution Requirements should be followed for all work in this course including the module tests.
All assignments submitted after the deadline will be given a grade of zero. Solutions will be posted after the due date.

**Laboratory:**
There will be three experimental laboratories. Check the laboratory schedule on the LMS. The topics of the laboratories are as follow:

1. 3-D Particle Equilibrium (Module 1)
2. 2-D Rigid Body Equilibrium (Module 2)
3. Friction (Module 3)
4. Trusses (Module 4)

A teaching assistant (TA) will be present during scheduled laboratory times to provide help. No manual need be purchased for the experimental laboratories. Laboratory materials will be posted on the LMS before each experimental laboratory begins.

If you miss an experimental laboratory for medical or compassionate reasons, contact TBA with appropriate evidence. It is mandatory to complete all four experimental laboratories.

Before each of the four experimental laboratories, each student will be required to complete an online pre-lab quiz. The quizzes are designed to ensure that students understand the laboratory theory, data collection, analysis, and safety instructions that are described in each lab instruction file. The pre-lab quizzes will count for 20% of the student’s laboratory grade. Students who are granted a complete experimental lab exemption do not need to complete these quizzes.

Please note the following points regarding laboratory exemptions:

1. The exemption will only be granted if the laboratories were completed in the previous three offerings of the course.
2. The student must have earned an average grade of at least 70% on the experimental laboratories.
3. An exemption can only be granted one time for this course.
4. The student must agree to accept the laboratory grade received previously.
5. The student remains responsible for the learning that takes place in the laboratory.
6. In the event that the content of the laboratories changes significantly from previous years, the student may be required to complete the new/modified lab or labs.
7. To inquire about an exemption, contact TBA.

Note that **attendance and submission** of laboratory reports is **mandatory**. Failure meet these requirements will result in a final grade of less than 50% for the course.

**Module Tests:**

- This course is comprised of three modules. Each module will end with a 1.5 hr module test conducted as a required, outside-of-class activity. The module tests will only assess the content of that specific module. The schedule for the Module Tests is:
  - Module 1: Particle Statics: Date & Time
  - Module 2: Introductory Rigid Body Statics: Date & Time
  - Module 3: Intermediate Rigid Body Statics: Date & Time

- Students should avoid making prior travel, employment, or other commitments at these times. If a student is unable to write a module test through no fault of their own for medical or other acceptable reasons, documentation must be provided and an opportunity to write the missed module test may be given. Students are encouraged to review all examination policies and procedures: [http://students.usask.ca/academics/exams.php](http://students.usask.ca/academics/exams.php)

- Alternate times to write Module Tests will not be considered except in the case of acceptable reasons, such as illness, bereavement, etc., or a conflict with other university related activities.
The use of electronic devices, including calculators, phones and watches, with document storage and/or communication capabilities is prohibited during exams for this course.

Students planning on registering with the office for Access and Equity Services for Students (AES) must do so in accordance with AES procedures and deadlines.

The module tests are closed book. A standardized formula sheet will be provided for all module tests.

Required Activities Outside of Class Time
The Module Tests are written outside of class time. See the Module Test Policy section above.

Important Dates

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>TBA</td>
<td>First day of classes</td>
</tr>
<tr>
<td>TBA</td>
<td>Last day for making changes in registration for Winter Term courses (100% tuition credit).</td>
</tr>
<tr>
<td>TBA</td>
<td>Module 1 Test</td>
</tr>
<tr>
<td>TBA</td>
<td>Winter Mid-term Break</td>
</tr>
<tr>
<td>TBA</td>
<td>Last day to withdraw from Winter Term classes</td>
</tr>
<tr>
<td>TBA</td>
<td>Module 2 Test</td>
</tr>
<tr>
<td>TBA</td>
<td>Holidays TBA</td>
</tr>
<tr>
<td>TBA</td>
<td>Last day of classes.</td>
</tr>
<tr>
<td>TBA</td>
<td>Module 3 Test</td>
</tr>
</tbody>
</table>

Required Resources


- The University Bookstore carries this book as an eText packaged with a MasteringEngineering access code. MasteringEngineering is the publisher's online assignment tool. [https://bookstore.usask.ca/students.php#MyTextbooks](https://bookstore.usask.ca/students.php#MyTextbooks)
- All course assignments will be done using the MasteringEngineering website. Be careful buying a second-hand version of the textbook. Make sure it has an unused access code. If it does not, you will need to buy an access code directly from the publisher.
- If you want a paper copy of the textbook (loose leaf version), it can be purchased directly from the publisher once you register with MasteringEngineering.

There is no Laboratory Manual to be purchased. Materials will be posted on the LMS prior to each laboratory.

Policies on Academic Dishonesty, Academic Appeals and Course Delivery:
Students are expected to undertake all aspects of their academic work in an ethical manner. Students are expected to submit their own individual work for academic credit, properly cite the work of others, and to follow all rules for examinations. Academic misconduct, plagiarism, and cheating will not be tolerated. Students are responsible for understanding the university's policies on academic integrity and academic misconduct. If any form of academic misconduct is discovered, appropriate disciplinary action will be taken.

For more information on what constitutes academic misconduct, please consult the University Council Regulations on Student Academic Misconduct ([https://secretariat.usask.ca/student-conduct-appeals/academic-misconduct.php](https://secretariat.usask.ca/student-conduct-appeals/academic-misconduct.php)) as well as the...


Additional policies and procedures related to student conduct and appeals are provided on the University Secretariat website ([www.usask.ca/secretariat/student-conduct-appeals](http://www.usask.ca/secretariat/student-conduct-appeals)) and on the University website ([http://www.usask.ca/integrity/](http://www.usask.ca/integrity/)).

A summary of University of Saskatchewan polices relating to academic courses is provided in the document: Academic Courses Policy on Class Delivery, Examinations, and Assessment of Student Learning ([http://policies.usask.ca/policies/academic-affairs/academic-courses.php](http://policies.usask.ca/policies/academic-affairs/academic-courses.php)).

### Integrity Defined (from the Office of the University Secretary)

The University of Saskatchewan is committed to the highest standards of academic integrity and honesty. Students are expected to be familiar with these standards regarding academic honesty and to uphold the policies of the University in this respect. Students are particularly urged to familiarize themselves with the provisions of the Student Conduct & Appeals section of the University Secretary Website and avoid any behavior that could potentially result in suspicions of cheating, plagiarism, misrepresentation of facts and/or participation in an offence. Academic dishonesty is a serious offence and can result in suspension or expulsion from the University.


For more information on what academic integrity means for students see the Academic Integrity section of the University Library Website at: [https://library.usask.ca/academic-integrity#AboutAcademicIntegrity](https://library.usask.ca/academic-integrity#AboutAcademicIntegrity)

You are encouraged to complete the Academic Integrity Tutorial to understand the fundamental values of academic integrity and how to be a responsible scholar and member of the USask community - [https://library.usask.ca/academic-integrity.php#AcademicIntegrityTutorial](https://library.usask.ca/academic-integrity.php#AcademicIntegrityTutorial)

### Safety:

The APEGS Code of Ethics also states that Professional Engineers shall "hold paramount the safety, health and welfare of the public and the protection of the environment and promote health and safety within the workplace" (Section 20(a), The Engineering and Geoscience Professions Regulatory Bylaws, 1997).

Safety is of paramount importance in the College. Students are expected to work in a safe and responsible manner, to follow all safety instructions, and use any specified personal protective equipment. Students failing to behave in a safe manner will be asked to leave.

Preparing for emergencies protects our lives and property. An emergency response plan (ERP) posting is located in each classroom and lab near the main door of the room. Students are advised to review and be familiar with the College ERP and be aware that when an alarm sounds for more than 10 seconds, the building must be evacuated. Muster point locations are posted at each entrance of the Engineering Building. To view the full ERP, please visit the following website:
Recording Lectures:
When possible, lectures will be recorded and made available to students in the LMS. **Video and/or audio recording of lectures is not allowed.** Students with approval from AES may record lectures for their own use with the permission of the instructor.

Copyright:
Course materials are provided to students based on their registration in a class. Any materials created by course instructors is the intellectual property of the instructors. This includes exams, tests, PowerPoint/PDF slides and other course notes. Additionally, other copyright-protected materials created by textbook publishers and authors may be provided to students based on license terms and educational exceptions in the Canadian Copyright Act (see [http://laws-lois.justice.gc.ca/eng/acts/C-42/index.html](http://laws-lois.justice.gc.ca/eng/acts/C-42/index.html)).

Before copying or distributing others' copyright-protected materials, students need to ensure that their use of the materials is covered under the University's Fair Dealing Copyright Guidelines available at [http://www.usask.ca/copyright/basics/copyright-policy/fair-dealing-guidelines/index.php](http://www.usask.ca/copyright/basics/copyright-policy/fair-dealing-guidelines/index.php). For example, posting others' copyright-protected materials on the internet is not covered under the University's Fair Dealing Copyright Guidelines; doing so requires permission from the copyright holder. For more information about copyright, please visit [http://www.usask.ca/copyright/students/rights/index.php](http://www.usask.ca/copyright/students/rights/index.php) or contact the University’s Copyright Coordinator at copyright.coordinator@usask.ca.

Students should be aware that a violation of the university’s copyright policies could be an instance of non-academic misconduct. For example, the practice of uploading or posting copyright-protected materials to course-sharing websites, depositories, or “drop boxes”, without the permission of the copyright holder, could result in a charge of non-academic misconduct under the university’s “Standard of Student Conduct in Non-Academic Matters”, found at the following location: [https://secretariat.usask.ca/student-conduct-appeals/non-academic-misconduct.php](https://secretariat.usask.ca/student-conduct-appeals/non-academic-misconduct.php).

Student Conduct:
Ethical behaviour is an important part of engineering practice. Each professional engineering association has a Code of Ethics, which its members are expected to follow. Since students are in the process of becoming Professional Engineers, it is expected that students will conduct themselves in an ethical manner.

The APEGs (Association of Professional Engineers and Geoscientists of Saskatchewan) Code of Ethics states that engineers shall “conduct themselves with fairness, courtesy and good faith towards clients, colleagues, employees and others; give credit where it is due and accept, as well as give, honest and fair professional criticism” (Section 20(e), The Engineering and Geoscience Professions Regulatory Bylaws, 1997).

The first part of this statement discusses an engineer’s relationships with their colleagues. One of the ways in which engineering students can demonstrate courtesy to their colleagues is by helping to maintain an atmosphere that is conducive to learning, and minimizing disruptions in class. This includes arriving on time for lectures, turning cell phones and other electronic devices off during lectures, not leaving or entering the class at inopportune times, and refraining from talking to others while the instructor is talking.

Access and Equity Services (AES) for Students:
Students who have disabilities (learning, medical, physical, or mental health) are strongly encouraged to register with Access and Equity Services (AES) if they have not already done so. Students who suspect they may have disabilities should contact AES for advice and referrals at any
time. Those students who are registered with AES with mental health disabilities and who anticipate that they may have responses to certain course materials or topics, should discuss course content with their instructors prior to course add / drop dates. In order to access AES programs and supports, students must follow AES policy and procedures. For more information or advice, visit [https://students.usask.ca/health/centres/access-equity-services.php](https://students.usask.ca/health/centres/access-equity-services.php), or contact AES at 306-966-7273 or aes@usask.ca.

Students registered with AES may request alternative arrangements for module tests. Students must arrange such accommodations through AES by the stated deadlines. Instructors shall provide the examinations for students who are being accommodated by the deadlines established by AES.

Support Services for Engineering Students:
- Engineering Student Centre (Rm. 2A05 Engineering Building)
  - Email: esc@usask.ca; Phone: 306-966-5274; [https://engineering.usask.ca/contact_info/esc-office.php](https://engineering.usask.ca/contact_info/esc-office.php)

End of day tutorial sessions will be offered by the College of Engineering for the Common First Year and will provide support for all courses. Please see X for more details.

Student Learning Services:
Student Learning Services (SLS) offers assistance to U of S undergrad and graduate students. For information on specific services, please see the SLS web site [https://library.usask.ca/studentlearning/](https://library.usask.ca/studentlearning/).

Teaching, Learning and Student Experience:
The Teaching, Learning and Student Experience Unit (TLSE) focuses on providing developmental and support services and programs to students and the university community. For more information, see [https://students.usask.ca/](https://students.usask.ca/). Specific resources include:
- Student Wellness Centre (3rd & 4th Floors, Place Riel): [https://students.usask.ca/health/](https://students.usask.ca/health/)
- Financial Services: [https://students.usask.ca/money/](https://students.usask.ca/money/)

College of Engineering Graduate Attribute Mapping:
This information shows the relationship of the learning outcomes of this course to the graduate attributes intended upon students’ completion of the degree program. This information is used for accreditation purposes.

<table>
<thead>
<tr>
<th>Learning Outcome</th>
<th>A1</th>
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†Attributes:
A1  A knowledge base for engineering
A2  Problem analysis
A3  Investigation
A4  Design
A5  Use of engineering tools
A6  Individual and team work
A7  Communication skills
A8  Professionalism
A9  Impact of engineering on society and the environment
A10 Economics and project management
A11 Life-long learning

‡Instructional Level:
Introduced (I) – Students learn the working vocabulary of the area of content, along with some of the major underlying concepts.
Developed (D) – Students use their working vocabulary and major fundamental concepts to probe more deeply, to read the literature, and to deepen their exploration of the concepts. They may begin to practice, extend, or refine knowledge in familiar contexts.
Applied (A) – Students approach mastery in the area of content. They explore deeply into the discipline and experience the controversies, debate, and uncertainties that characterize the leading edges of any field. They practice, extend, or refine knowledge in unfamiliar contexts.

Accreditation Unit (AU) Mapping: (% of total class AU)

<table>
<thead>
<tr>
<th>Math</th>
<th>Natural Science</th>
<th>Complementary Studies</th>
<th>Engineering Science</th>
<th>Engineering Design</th>
</tr>
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<tbody>
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<td>100%</td>
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</tbody>
</table>

Accreditation Data Collection and Privacy:
Undergraduate programs in the College of Engineering are accredited by the Canadian Engineering Accreditation Board. Student performance data may be collected in this course to support accreditation and continuous program improvement processes. Anonymous samples of student work may also be collected for accreditation purposes. All data provided to the accreditation body or external entities is anonymized and reported in aggregate form to protect your information and identity. If you have any concerns about how your personal information is used or maintained, please contact the Associate Dean Academic, College of Engineering.
1. Approval by Department Head or Dean
   1.1 College or School with academic authority: College of Engineering
   1.2 Department with academic authority: Associate Dean, Academic Office
   1.3 Term from which the course is effective: 202105

2. Information required for the Catalogue
   2.1 Label & Number of course: GE 132
   2.2 Academic credit units: 1
   2.3 Course Long Title (maximum 100 characters): Engineering Communications I
   Course Short Title (maximum 30 characters): Engineering Communications I
   2.4 Total Hours: Lecture 15 Seminar Lab 13.5 Tutorial Other
   2.5 Weekly Hours: Lecture Seminar Lab Tutorial Other
   2.6 Term in which it will be offered: T1 T2 T1 or T2 T1 and T2
   2.7 Prerequisite:
   If there is a prerequisite waiver, who is responsible for signing it?
   D – Instructor/Dept Approval
   H – Department Approval (Associate Dean, Academic)
   I – Instructor Approval
   2.8 Catalogue description (150 words or less):
   This course introduces students to written Technical Communication and to Drawing & Sketching. The Technical Communication I module focuses on developing students’ communication awareness in the areas of referencing, coherency, and editing. The Drawing & Sketching module focuses on 2D and 3D isometric and orthographic drawings, as well as dimensioning and scaling.
   2.9 Do you allow this course to be repeated for credit? No

3. Please list rationale for introducing this course: This is part of the integrated curriculum in the redesigned first year program.

4. Please list the learning objectives for this course:
   The course consists of two modules: Technical Communication I, and Drawing & Sketching. By the end of this course, students will be able to:
1.0 Technical Communication I
1.1 - identify the needs of an audience,
1.2 - organize communication to persuade a specific audience,
1.3 - use sources appropriately for audience and context, and
1.4 - adapt & refine a document based on peer/expert feedback.

2.0 Drawing & Sketching
2.1 - define, recognize, recall, and compare key terms and features in technical drawing and sketching,
2.2 - sketch basic 2D technical drawings,
2.3 - sketch basic 3D technical drawings, and
2.4 - translate between 2D and 3D representations of an object.

5. Impact of this course
Are the programs of other departments or Colleges affected by this course? No
If so, were these departments consulted? (Include correspondence)
Were any other departments asked to review or comment on the proposal? Yes, within the College and we worked with the Gwenna Moss Centre for Teaching and Learning.

6. Other courses or program affected (please list course titles as well as numbers)
6.1 Courses to be deleted? GE 101, GE 111, GE 121, GE 124, GE 125 (for Fall 2021)
6.2 Courses for which this course will be a prerequisite?
Any changes to the course prerequisites in the programs will be submitted in future UCC.
6.3 Is this course to be required by your majors, or by majors in another program? Required for Engineering Students as part of the Common First Year.

7. Course outline
(Weekly outline of lectures or include a draft of the course information sheet.)
See attached syllabus.

8. Enrolment
8.1 Expected enrollment: up to 600
8.2 From which colleges? Engineering

9. Student evaluation
Give approximate weighting assigned to each indicator (assignments, laboratory work, mid-term test, final examination, essays or projects, etc.)
Please see syllabus.

9.1 How should this course be graded?
C – Completed Requirements
(Grade options for instructor: Completed Requirements, Fail, IP In Progress)
N – Numeric/Percentage
(Grade options for instructor: grade of 0% to 100%, IP in Progress)
P – Pass/Fail
Required text
Include a bibliography for the course.

Technical Communication I
This module will use the following open text: TBD. Course notes will supply other required reference materials. The Library will also put useful reference materials and texts on reserve.

Students will require a laptop computer which conforms to the USask First Year Engineering Laptop Specifications, as well as writing paper and a pen/pencil.

Drawing & Sketching
There will be no textbook for this module. Course notes and references to other online resources will constitute the required reference materials. The Library will also put useful reference materials and texts on reserve.

Resources
11.1 Proposed instructor: Engineering Faculty
11.2 How does the department plan to handle the additional teaching or administrative workload? Within College/department budget – these courses will be replacing others.
11.3 Are sufficient library or other research resources available for this course? Yes, they may closer to the 2021 launch inquire to see if certain textbooks can be added to hold on reserve in the library if they are not already in the collection.
11.4 Are any additional resources required (library, audio-visual, technology, etc.)? N/A

Tuition
12.1 Will this course attract tuition charges? If so, how much? (use tuition category) TC07
12.2 Does this course require non-standard fees, such as materials or excursion fees? If so, please include an approved “Application for New Fee or Fee Change Form”
http://www.usask.ca/sesd/info-for-instructors/program-course-preparation.php#course-fees
No

Detailed Course Information

1. Schedule Types
Please choose the Schedule Types that can be used for sections that fall under this course:

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
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<tbody>
<tr>
<td>CL</td>
<td>Clinical</td>
<td>PRB</td>
<td>Problem Session</td>
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<tr>
<td>COO</td>
<td>Coop Class</td>
<td>RDG</td>
<td>Reading Class</td>
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</tbody>
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2. Course Attributes
Please highlight the attributes that should be attached to the course (they will apply to all sections):

2.1 NOAC No Academic Credit
0 Credit Unit courses that possess “deemed” CUs (Called Operational Credit Units). NOAC causes
the system to roll 0 academic credit units to academic history.

2.2 For the College of Arts and Science only: To which program type does this course belong?
   FNAR Fine Arts  SCIE Science
   HUM Humanities  SOCS Social Science
   ARNP No Program Type (Arts and Science)

3. Registration Information (Note: multi-term courses cannot be automated as corequisites)
3.1 Permission Required: No
3.2 Restriction(s): course only open to students in a specific college, program/degree, major,
year in program: College of Engineering only
3.3 Prerequisite(s): course(s) that must be completed prior to the start of this course
3.4 Prerequisite(s) or Corequisite(s): course(s) that can be completed prior to or taken at the
same time as this course  GE 102 – Introduction to Engineering I
3.5 Corequisite(s): course(s) that must be taken at the same time as this course
3.6 Notes: recommended courses, repeat restrictions/content overlap, other additional
information

4. List Equivalent Course(s) here:  GE121
An equivalent course can be used in place of the course for which this form is being completed, specifically
for the purposes of prerequisite and degree audit checking. Credit will be given for only one of the
equivalent courses.

4.1 If this is a recently-repurposed course number, please list the courses that are no longer
considered to be equivalent:
*Please note: If the equivalent courses carry an UNEQUAL number of credit units, DegreeWorks will automatically enforce the following, unless otherwise stated:

- If a 3 credit unit course is considered to be equivalent to a 6 credit unit course, it will fulfill the 6 credit unit requirement and the student will not have to complete another 3 credit units toward the overall number of required credit units for the program.
- If a 6 credit unit course is considered to be equivalent to a 3 credit unit course, ALL 6 of the credit units may be used to fulfill the 3 credit unit requirement.

5. List Mutually-Exclusive Course(s) here:
Mutually exclusive courses have similar content such that students cannot receive credit for both.

5.1 If this is a recently-repurposed course number, please list the courses that are no longer considered to be mutually exclusive:

*Please note: SiRIUS cannot enforce a situation where the exclusion goes only one way.

6. Additional Notes:
**GE 132.1**  
**Engineering Communication I**  
**Fall 2021**

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**Land Acknowledgement**  
At the University of Saskatchewan, we acknowledge we are on Treaty Six Territory and the Homeland of the Métis. We pay our respect to the First Nation and Métis ancestors of this place and reaffirm our relationship with one another.

**Instructors and Teaching Assistants:**  
Name: TBD  
Office: TBD  
Phone: TBD  
Email: TBD

**Office Hours:**  
TBD

**Lectures:**  
**Technical Communication I**  
Weeks: 8-14 (excluding 11)  
Classes: Two 1.5 hr lectures per week, in Weeks 8, 10, 12, and 14 and one 1.5 hr lecture per week, in Weeks 9 and 13 (a total of 10 lectures)

**Laboratories:**  
**Drawing & Sketching**  
Weeks: 6-15 (excluding 11)  
Classes: One 1.5 hr lab per week (a total of 9 labs)

**Website:**  
Assignments, solutions, lab schedules, general course information, and announcements will be posted on the course website (PAWS/Blackboard). Students are responsible for keeping up-to-date with the information on the course website. [https://bbelearn.usask.ca/](https://bbelearn.usask.ca/)

**End-of-Day Help Sessions**  
End of day help sessions will be offered by the College of Engineering for the Common First Year and will provide support for all courses.

**Technical Communication I** and **Drawing & Sketching** will each have an end-of-day help session once a week on Mondays in Weeks 8, 9, 10, 12, 13, and 14.

**Description:**  
This course introduces students to written Technical Communication and to Drawing & Sketching. The **Technical Communication I** module focuses on developing students’ communication awareness in the areas of referencing, coherency, and editing. The **Drawing & Sketching** module focuses on 2D and 3D isometric and orthographic drawings, as well as dimensioning and scaling.
Pre or co-requisites: GE 102 – Introduction to Engineering I

Course Reference Numbers (CRNs): TBD
Available from the Dynamic Schedule once courses are built (https://pawnss.usask.ca/ban/bwckschd.p_disp_dyn_sched)

Course Learning Outcomes: The course consists of two modules: Technical Communication I and Drawing & Sketching. By the end of this course, students will be expected to:

1.0 Technical Communication I Module Grade Weights
1.1 - identify the needs of an audience, 30%
1.2 - organize communication to persuade a specific audience, 30%
1.3 - use sources appropriately for audience and context, and 20%
1.4 - adapt & refine a document based on peer/expert feedback. 20%

2.0 Drawing & Sketching Module Grade Weights
2.1 - define, recognize, recall, and compare key terms and features in technical drawing and sketching, 15%
2.2 - sketch basic 2D technical drawings, 30%
2.3 - sketch basic 3D technical drawings, and 30%
2.4 - translate between 2D and 3D representations of an object. 25%

Note that half of the final course grade for this course will come from the Technical Communication I module and half will come from the Drawing & Sketching module.

Assessment: This course employs a competency-based assessment system. Students must demonstrate competence in certain skills in each module. These skills can be divided into three types (A/B/C).

Type A skills are the most basic and granular for a subject area. In general, this includes the ability to define, recall, recognize, compare, and contrast key terms and concepts. It also includes basic calculations and procedural steps, as appropriate.

Type B skills are basic integrative skills. These include basic types of questions that have been covered in class.

Type C skills are integrative skills that depend on the ability to extend the application of what has been learned in class into new domains.
For this class, students will be expected to perform at a 70% success level or higher in Type A and B materials to be considered competent. There will be no minimum performance threshold for Type C material.

As part of competency-based assessment, students will be given more than one opportunity to display competence. Thus, for Type A and B skills, there will be at least two opportunities to exhibit basic competence. These opportunities may be manifested as portions of later assignments replacing performance on earlier assignments (that cover similar skill sets) and/or “Top Up” opportunities. Top Ups will be proctored opportunities to demonstrate skills during optional course-specific help sessions (see End-of-Day Help Sessions) or during optional Top Up help sessions, which are spread throughout the term’s schedule. They may also include supplementary assignments.

**Technical Communication I**

Type A materials include knowledge and very basic skills vital to any success in written technical communication. Type A skills for this module include implementing basic grammar rules, basic document formatting, rudimentary sequencing of paragraphs, and implementing common referencing and citation formats.

Type B skills include conducting a basic audience analysis, improving a clearly flawed document through editing, basic proposal writing, and appropriately incorporating common sources into written argumentation.

Type C skills will focus on abilities related to providing meaningful and constructive feedback, and paraphrasing.

**Type A**

- 10-15 Minute in-class Quizzes (Weeks 9, 10, 12, 14)
- Assignment 2: out Week 10, due Week 12 (quoting, summarizing, paraphrasing - individual)
- Assignment 3: done in class Week 13 (peer-editing exercise - individual)

*Top Up opportunities (any Technical Communication I Help Session or Top Up Help Session)*

**Type B**

- Assignment 1: out Week 8, due Week 9 (write an email to 3 different audiences, same purpose - individual)
- Assignment 2: out Week 10, due Week 12 (quoting, summarizing, paraphrasing - individual)
- Assignment 3: done in class Week 13 (peer-editing exercise - individual)
Top Up opportunities (after assignments are handed back, there will be one opportunity per assignment to Top Up Type B assignment material)

Type C

- Assignment 2: out Week 10, due Week 12 (quoting, summarizing, paraphrasing - individual)
- Assignment 3: done in class Week 13 (peer-editing exercise - individual)

Top Up opportunities (none)

Drawing & Sketching

Type A materials include knowledge and very basic skills vital to any success in performing the more integrative drawing and sketching skills. Type A skills for drawing and sketching include abilities to define, recognize, recall, and compare key terms and drawing features.

Type B skills include basic drawing and sketching skills such as the abilities to draw different types of lines, 2D and 3D primitives, simple instances of different types of drawings (e.g. oblique, perspective, isometric, orthographic), and simple composite figures.

Type C skills will focus on abilities related to drawing challenging isometric/orthographic translations.

Type A

- 10-15 Minute in-class Quizzes (Weeks 7, 9, 12, 14)

Top Up opportunities (any D&S Help Session or Top Up Help Session)

Type B

- Assignment 1: out Week 7, due Week 8 (lines, simple primitives, and drawing types - individual)
- Assignment 2: out Week 9, due Week 10 (simple isometric/orthographic drawings - individual)
- Assignment 3: out Week 12, due Week 13 (composite isometric drawings - individual)

Top Up opportunities (Assignments 2/3/4 for Assignment 1, Assignment 3/4 for Assignment 2, Assignment 4 for Assignment 3)

Type C

- Assignment 4: done in class Week 15 (translating difficult isometric/orthographic drawings - individual)

Top Up opportunities (none)

Competency Thresholds

A “module mark” (out of 100) will be calculated for each of the two modules (Technical Communication I and Drawing & Sketching). For each module, students must achieve at least 70% overall in the Type A material and at least 70% overall in the Type B material in order to
pass the module with a level of “basic competence”. If a student achieves at least 70% in a module’s Type A materials and in a module’s Type B materials, their module mark will be calculated as per the following section. If a student fails to achieve at least 70% in either or both of the Type A and B materials, they will receive a maximum grade of 49% for module.

If a student achieves at least 70% in the Type A and B materials in both modules, their course mark will be an average of the two module marks. If a student fails to achieve “basic competence” in one module, they will fail the course, receiving an overall grade of 49%, or their calculated grade, whichever is lower. However, if they choose to redo the course in the future, they will be given credit for the module they did pass (at the new instructor’s discretion), with the passing mark that they did achieve (unless they want to redo the module for a better mark).

**Technical Communication I Grade Calculations**

All assessments will be marked on a percentage scale, by type (A/B/C) and by learning outcome e.g. Assignment 1 will have 2 sub-marks (one Type B mark for each of LO1 and LO2). Each percentage mark will be accompanied by a competency descriptor (exemplary, proficient, basic competency, almost competent, not yet competent).

To arrive at a final mark for Type A skills, note that each Quiz has equal weight in grade calculations. The collective weight of the Type A components of Assignments 2 and 3 are equal to two Quizzes. Performance on a Type A Top Up (for a specific Quiz) will replace the corresponding Quiz mark if the Top Up result is better, or it will be averaged with the current Quiz mark, otherwise. The Type A portion of a Top Up for Assignment 2 will replace the original Type A mark for Assignment 2 if is higher, or it will be averaged with prior marks otherwise. This pattern continues with a) Assignment 3’s Type A material and b) any Top Up of Assignment 3.

To arrive at a final mark for Type B skills, start with Assignment 1. Assignment 1 has two Type B components corresponding to performance against LO1 and LO2. Only an Assignment 1 Top Up can improve those marks. Assignment 2 has one Type B component corresponding to LO3. Only an Assignment 2 Top Up can improve that mark. Assignment 3 has one Type B component corresponding to LO4. Only an Assignment 3 Top Up can improve that mark. Any Type B component of a Top Up attempt will either replace earlier marks that are lower (for a specific LO), or it will be averaged with prior marks (for a specific LO) that are higher.
To arrive at a final mark for the Type C skills, the Type C scores from Assignments 2 and 3 will be used. Type C material cannot be Topped Up. If Top Ups of Assignment 2 and/or 3 take place, only the Type A/B material will be assessed.

**Drawing & Sketching Grade Calculations**
All assessments will be marked on a percentage scale, by type (A/B/C) and by learning outcome e.g. Assignment 2 will have 3 sub-marks (one Type B mark for each of LO2, LO3, and LO4). Each percentage mark will be accompanied by a competency descriptor (exemplary, proficient, basic competency, almost competent, not yet competent).

To arrive at a final mark for Type A skills, each Quiz will be given equal weighting in grade calculations. Performance on a Type A Top Up will replace the corresponding Quiz mark if the Top Up result is better, or it will be averaged with the current Quiz mark, otherwise.

To arrive at a final mark for Type B skills, start with Assignment 1. Assignment 1’s mark will be broken into two parts, corresponding to performance against LO2 and LO3. Any subsequent assignment that is evaluated against LO2 will either replace earlier marks for LO2 that are lower, or it will be averaged with prior marks that are higher. Assignment 2 can replace Assignment 1 marks for LO2 and LO3. Assignment 3 can replace Assignment 1 and 2 marks for LO3. Assignment 4 can replace Assignment 1 and 2 marks for LO2, Assignment 1, 2 and 3 marks for LO3, and Assignment 2 marks for LO4.

To arrive at a final mark for the Type C skills, the Type C score from Assignment 4 will be used. It cannot be Topped Up.

**Keeping Track of Grades**
Throughout the Technical Communication I and Drawing & Sketching modules, students will be able to monitor their progress in three complementary respects, for each module:

a) marks on deliverables – students will see how they do on each assignment/quiz
b) marks on Type A/B/C work – students will see how they are doing at each level of material difficulty in the course, and
c) marks on Learning Outcomes – students will see how they are doing against each of the learning outcomes for each module, as they complete elements of them.

**Attendance and Participation:** Attendance and participation is encouraged/expected, and students will be responsible for what happens in classes e.g. quizzes. However, attendance will not be mandatory (or marked).
Criteria That Must Be Met to Pass:

See Assessment (Competency Thresholds), above.

Final Grades:
The final grades will be consistent with the “literal descriptors” specified in the university’s grading system (at the link below, click on “for undergraduate students”).
https://students.usask.ca/academics/grading/grading-system.php

For information regarding appeals of final grades or other academic matters, please visit the Student Conduct and Appeals section of the University Secretary’s website:

Academic Courses Policy:
More information on the Academic Courses Policy on course delivery, examinations and assessment of student learning can be found at:
http://policies.usask.ca/policies/academic-affairs/academic-courses.php

Learning Charter:
The University of Saskatchewan Learning Charter is intended to define aspirations about the learning experience that the University aims to provide, and the roles to be played in realizing these aspirations by students, instructors and the institution. A copy of the Learning Charter can be found at: https://teaching.usask.ca/about/policies/learning-charter.php

Course Overview:
This course consists of two modules (Technical Communication I and Drawing & Sketching). They both involve communication skills for engineers, but they will largely be taught and assessed separately in this course. In both cases, instructors will use a competency-based assessment system. Students will be expected to demonstrate basic skills in a competent manner by the end of the course. In general, if competence is not demonstrated earlier in the course, there will be at least one opportunity (for a given block of subject matter) to demonstrate it again later in the course.

Course Content/Schedule:
The Technical Communication I module will introduce students to technical communication, with a focus on developing students’ communication awareness in the areas of proper referencing methods, building coherent written arguments, and participating in self- and peer-editing exercises.

The Drawing & Sketching module will introduce students to technical drawing and sketching. Students will become familiar with basic drawing and sketching tools, terms, and concepts. They will develop basic skills in
drawing 2D and 3D primitives and composite objects. This will include isometric and orthographic drawings, and the ability to translate between these drawing types. Students will develop basic skills in dimensioning and scaling, they will be able to interpret sectioning and auxiliary views, and they will become familiar with different types of technical drawings from a variety of engineering disciplines. By the end of the module, students who pass the module will be competent drawers and sketchers for basic technical drawing tasks.

### Technical Communication I

<table>
<thead>
<tr>
<th>Week</th>
<th>Description</th>
<th>Lecture Hours</th>
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<tbody>
<tr>
<td>1.</td>
<td>TERM WEEK 8 Course intro/overview, Technical Communication as problem solving, types of technical communication, document formats, appropriateness in recognizing tone, context, and constraints</td>
<td>3</td>
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<tr>
<td>2.</td>
<td>TERM WEEK 9 Building coherence in written communication, introduction to SIDCRA format, audience analysis in written communication, self-editing checklists, Quiz 1</td>
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<tr>
<td>3.</td>
<td>TERM WEEK 10 Role of research in engineering, integrating sources, APA introduction, assessing sources for credibility, academic integrity workshop, voice in technical communication, sentence structure, Quiz 2</td>
<td>3</td>
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<tr>
<td>4.</td>
<td>TERM WEEK 12 Grammar workshop, using MS Word tools, technical report formats, peer-editing tools &amp; techniques, Quiz 3</td>
<td>3</td>
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<tr>
<td>5.</td>
<td>TERM WEEK 13 Assignment 3: in-class peer-editing exercise</td>
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<tr>
<td>6.</td>
<td>TERM WEEK 14 Role of reflection in professional communication practice, modes of appeal for written communication, Quiz 4, responding to job advertisements: adapting purpose to context/audience, looking ahead to Tech Com II and III</td>
<td>3</td>
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</table>

### Drawing & Sketching

<table>
<thead>
<tr>
<th>Week</th>
<th>Description</th>
<th>Lecture Hours</th>
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<tr>
<td>1.</td>
<td>TERM WEEKS 6 &amp; 7 Sketching re: basic constructs (line types/weights), 2D primitives (circles, quadrilaterals, triangles, ellipses), types of drawings (isometric, orthographic, oblique, one- and two-point perspective), and minimal dimensioning, sketching 2D primitives and composite bodies, Quiz 1</td>
<td>3</td>
</tr>
</tbody>
</table>
2. **TERM WEEKS 8 & 9**  
   isometric and orthographic drawing theory, projections, scaling, reading dimensioning, hidden lines/shapes, holes, smooth curves, center lines, applying Class 3 knowledge to skills work, Quiz 2

3. **TERM WEEKS 10 & 12**  
   sketching 3D primitives (spheres, cylinders, prisms) and simple composites as isometrics (adding/removing primitives), sketching 3D primitives and composite bodies as isometrics, Quiz 3

4. **TERM WEEKS 13 & 14**  
   translating isometric/orthographic drawings including missing lines/views, incorrect lines, and challenging isometric/orthographic translations, discipline-specific drawing types, section/auxiliary views, isometric/orthographic translation problems and drawing exercises, Quiz 4

5. **TERM WEEK 15**  
   Assignment 4 (in-class)

<table>
<thead>
<tr>
<th>Assignments:</th>
<th>(see Assessment)</th>
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<tr>
<td>Quizzes:</td>
<td>(see Assessment)</td>
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</table>

**Late Assignments/Missed Quizzes:**  
Late assignments/missed quizzes will receive a mark of zero. However, Quizzes can be Topped Up during help sessions, and late assignments can usually be Topped Up by subsequent assignments (see above). Type B Top Ups subsequent to the course will be permitted at the discretion of the instructor.

In the case of sickness, bereavement or other excusable absences, students will not be penalized for late submissions although they may be required to complete a variation on the original assignment. They can alternatively choose to treat a missed assignment as a Late Assignment.

**Examinations/Module Tests:**  
This course will not have examinations or Module Tests.

**Required Activities Outside of Class Time**  
This course will not have required activities outside of class time. However, Top Up assessments will be available in optional end-of-day course-specific help sessions (see **End-of-Day Help Sessions**), if students wish to use them.

**Experiential Learning**  
Students will be engaging in drawing and sketching activities in class, as well as technical writing.
Important Dates:

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
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<tbody>
<tr>
<td>Sept x, 2021</td>
<td>First day of Fall classes</td>
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<tr>
<td>Sept y, 2021</td>
<td>Last day for making changes in registration for first-term courses (100% tuition credit).</td>
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<tr>
<td>Nov zz, 2021</td>
<td>Fall Break (Week 11)</td>
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<tr>
<td>Nov xx, 2021</td>
<td>Last day to withdraw from Fall classes</td>
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<tr>
<td>Thanksgiving</td>
<td>Holidays</td>
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<tr>
<td>Dec yy, 2021</td>
<td>Last day of classes</td>
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</table>

Required Resources

**Technical Communication I**
This module will use the following open text: xxxxxxxxxxxxxx

Course notes will supply other required reference materials. The Library will also put useful reference materials and texts on reserve.

Students will require a laptop computer which conforms to the USask First Year Engineering Laptop Specifications, as well as writing paper and a pen/pencil.

**Drawing & Sketching**
There will be no textbook for this module. Course notes and references to other online resources will constitute the required reference materials. The Library will also put useful reference materials and texts on reserve.

Students will be required to have:

- Two 4H Pencils
- Two 2H Pencils
- Engineering paper
- A First Year Laptop
- A Faber-Castell Plastic Eraser
- A Staedtler Xcellence Math Set

**Policies on Academic Dishonesty, Academic Appeals and Course Delivery:**
Students are expected to undertake all aspects of their academic work in an ethical manner. Students are expected to submit their own individual work for academic credit, properly cite the work of others, and to follow all rules for examinations. Academic misconduct, plagiarism, and cheating will not be tolerated. Students are responsible for understanding the university's policies on academic integrity and academic misconduct. If any form of academic misconduct is discovered, appropriate disciplinary action will be taken.

For information regarding appeals of a final grade or other academic matters, please consult the University Council document on Student Appeals of Evaluation, Grading and Academic Standing (http://policies.usask.ca/policies/student-affairs-and-activities/student-appeals.php).

Additional policies and procedures related to student conduct and appeals are provided on the University Secretariat website (www.usask.ca/secretariat/student-conduct-appeals) and on the University website http://www.usask.ca/integrity/.

A summary of University of Saskatchewan polices relating to academic courses is provided in the document: Academic Courses Policy on Class Delivery, Examinations, and Assessment of Student Learning (http://policies.usask.ca/policies/academic-affairs/academic-courses.php).

Integrity Defined (from the Office of the University Secretary)
The University of Saskatchewan is committed to the highest standards of academic integrity and honesty. Students are expected to be familiar with these standards regarding academic honesty and to uphold the policies of the University in this respect. Students are particularly urged to familiarize themselves with the provisions of the Student Conduct & Appeals section of the University Secretary Website and avoid any behavior that could potentially result in suspicions of cheating, plagiarism, misrepresentation of facts and/or participation in an offence. Academic dishonesty is a serious offence and can result in suspension or expulsion from the University.

All students should read and be familiar with the Regulations on Academic Student Misconduct (https://secretariat.usask.ca/student-conduct-appeals/academic-misconduct.php) as well as the Standard of Student Conduct in Non-Academic Matters and Procedures for Resolution of Complaints and Appeals (https://secretariat.usask.ca/student-conduct-appeals/academic-misconduct.php#IXXIIAPPEALS)

For more information on what academic integrity means for students see the Academic Integrity section of the University Library Website at: https://library.usask.ca/academic-integrity#AboutAcademicIntegrity

You are encouraged to complete the Academic Integrity Tutorial to understand the fundamental values of academic integrity and how to be a responsible scholar and member of the USask community - https://library.usask.ca/academic-integrity.php#AcademicIntegrityTutorial

Safety:
Safety is of paramount importance in the College of Engineering. Students are expected to work in a safe and responsible manner, to follow all safety instructions, and use any specified personal protective equipment. Students failing to behave in a safe manner will be asked to leave.

Emergency Response Plan:
Preparing for emergencies protects our lives and property. An emergency response plan (ERP) posting is located in each classroom and lab near the main door of the room. Students are advised to review and be familiar with the College ERP and be aware that when an alarm sounds for more than 10 seconds, the building must be evacuated. Muster point locations are posted at each entrance of the Engineering Building. For more details about the ERP, please visit the following website: https://engineering.usask.ca/documents/facilities/ERP%20-%20ENG%20-%20v%205%20-%2009_01_2017.pdf
Recording Lectures:
Lectures will be recorded, when possible, and made available to students in Blackboard so students can rewatch them as needed for study purposes.

Copyright:
Course materials are provided to students based on their registration in a class. Any materials created by course instructors is the intellectual property of the instructors. This includes exams, tests, PowerPoint/PDF slides and other course notes. Additionally, other copyright-protected materials created by textbook publishers and authors may be provided to students based on license terms and educational exceptions in the Canadian Copyright Act (see http://laws-lois.justice.gc.ca/eng/acts/C-42/index.html).

Before copying or distributing others' copyright-protected materials, students need to ensure that their use of materials is covered under the University's Fair Dealing Copyright Guidelines available at http://www.usask.ca/copyright/basics/copyright-policy/fair-dealing-guidelines/index.php. For example, posting others’ copyright-protected materials on the internet is not covered under the University's Fair Dealing Copyright Guidelines; doing so requires permission from the copyright holder. For more information about copyright, please visit http://www.usask.ca/copyright/students/rights/index.php or contact the University's Copyright Coordinator at copyright.coordinator@usask.ca.

Students should be aware that a violation of the university's copyright policies could be an instance of non-academic misconduct. For example, the practice of uploading or posting copyright-protected materials to course-sharing websites, depositories, or “drop boxes”, without the permission of the copyright holder, could result in a charge of non-academic misconduct under the university's “Standard of Student Conduct in Non-Academic Matters”, found at the following location: https://secretariat.usask.ca/student-conduct-appeals/non-academic-misconduct.php.

Student Conduct:
Ethical behaviour is an important part of engineering practice. Each professional engineering association has a Code of Ethics, which its members are expected to follow. Since students are in the process of becoming Professional Engineers, it is expected that students will conduct themselves in an ethical manner.

The APEGs (Association of Professional Engineers and Geoscientists of Saskatchewan) Code of Ethics states that engineers shall “conduct themselves with fairness, courtesy and good faith towards clients, colleagues, employees and others; give credit where it is due and accept, as well as give, honest and fair professional criticism” (Section 20(e), The Engineering and Geoscience Professions Regulatory Bylaws, 1997).

The first part of this statement discusses an engineer’s relationships with their colleagues. One of the ways in which engineering students can demonstrate courtesy to their colleagues is by helping to maintain an atmosphere that is conducive to learning, and minimizing disruptions in class. This includes arriving on time for lectures, turning cell phones and other electronic devices off during lectures, not leaving or entering the class at inopportune times, and refraining from talking to others while the instructor is talking.

Access and Equity Services (AES) for Students
Students who have disabilities (learning, medical, physical, or mental health) are strongly encouraged to register with Access and Equity Services (AES) if they have not already done so.
Students who suspect they may have disabilities should contact AES for advice and referrals at any time. Those students who are registered with AES with mental health disabilities and who anticipate that they may have responses to certain course materials or topics, should discuss course content with their instructors prior to course add / drop dates. In order to access AES programs and supports, students must follow AES policy and procedures. For more information or advice, visit [https://students.usask.ca/health/centres/access-equity-services.php](https://students.usask.ca/health/centres/access-equity-services.php), or contact AES at 306-966-7273 or [aes@usask.ca](mailto:aes@usask.ca).

Students registered with AES may request alternative arrangements for mid-term and final examinations or module tests. Students must arrange such accommodations through AES by the stated deadlines. Instructors shall provide the examinations for students who are being accommodated by the deadlines established by AES.

**Support Services for Engineering Students:**
- Engineering Student Centre  (Rm. 2A05 Engineering Building)
  - Email: esc@usask.ca; Phone: 306-966-5274;
  - [https://engineering.usask.ca/contact_info/esc-office.php](https://engineering.usask.ca/contact_info/esc-office.php)

End-of-day help sessions will be offered by the College of Engineering for the Common First Year and will provide support for all courses. Please see [End-of-day Help Sessions](https://students.usask.ca/health/) for more details.

**Student Learning Services**
Student Learning Services (SLS) offers assistance to U of S undergrad and graduate students. For information on specific services, please see the SLS web site [https://library.usask.ca/studentlearning/](https://library.usask.ca/studentlearning/).

**Teaching, Learning and Student Experience**
The Teaching, Learning and Student Experience Unit (TLSE) focuses on providing developmental and support services and programs to students and the university community. For more information, see [https://students.usask.ca/](https://students.usask.ca/). Specific resources include:
- Student Wellness Centre  (3rd & 4th Floors, Place Riel): [https://students.usask.ca/health/](https://students.usask.ca/health/)
- Financial Services: [https://students.usask.ca/money/](https://students.usask.ca/money/)
College of Engineering Attribute Mapping:
This information shows the relationship of the learning outcomes of this course to the graduate attributes intended upon students' completion of the degree program. This information is used for accreditation purposes.

<table>
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<th>Learning Outcome</th>
<th>A1</th>
<th>A2</th>
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Attributes:
A1 A knowledge base for engineering
A2 Problem analysis
A3 Investigation
A4 Design
A5 Use of engineering tools
A6 Individual and team work
A7 Communication skills
A8 Professionalism
A9 Impact of engineering on society and the environment
A10 Ethics and equity
A11 Economics and project management
A12 Life-long learning

\*Instructional Level:
Introduced (I) – Students learn the working vocabulary of the area of content, along with some of the major underlying concepts.
Developed (D) – Students use their working vocabulary and major fundamental concepts to probe more deeply, to read the literature, and to deepen their exploration of the concepts. They may begin to practice, extend, or refine knowledge in familiar contexts.
Applied (A) – Students approach mastery in the area of content. They explore deeply into the discipline and experience the controversies, debate, and uncertainties that characterize the leading edges of any field. They practice, extend, or refine knowledge in unfamiliar contexts.

Accreditation Unit (AU) Mapping: (% of total class AU)

<table>
<thead>
<tr>
<th>Math</th>
<th>Natural Science</th>
<th>Complementary Studies</th>
<th>Engineering Science</th>
<th>Engineering Design</th>
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<td></td>
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</table>

Accreditation Data Collection and Privacy:
Undergraduate programs in the College of Engineering are accredited by the Canadian Engineering Accreditation Board. Student performance data may be collected in this course to support accreditation and continuous program improvement processes. Anonymous samples of student work may also be collected for accreditation purposes. All data provided to the accreditation body or external entities is anonymized and reported in aggregate form to protect your information and identity. If you have any concerns about how your personal information is used or maintained, please contact the Associate Dean Academic, College of Engineering.
1. Approval by Department Head or Dean
   1.1 College or School with academic authority: College of Engineering
   1.2 Department with academic authority: Associate Dean, Academic Office
   1.3 Term from which the course is effective: 202105

2. Information required for the Catalogue
   2.1 Label & Number of course: GE 133
   2.2 Academic credit units: 2
   2.3 Course Long Title (maximum 100 characters): Engineering Communication II
       Course Short Title (maximum 30 characters): Engineering Communication II
   2.4 Total Hours: Lecture 45   Seminar   Lab 15   Tutorial   Other
   2.5 Weekly Hours: Lecture   Seminar   Lab   Tutorial   Other
   2.6 Term in which it will be offered: T1  T2  T1 or T2  T1 and T2
   2.7 Prerequisite:

   If there is a prerequisite waiver, who is responsible for signing it?
   D – Instructor/Dept Approval
   H – Department Approval (Associate Dean, Academic)
   I – Instructor Approval

   2.8 Catalogue description (150 words or less):

   This course introduces students to oral technical communication (including teaching), CAD, poster presentations, and technical research. The Technical Communication II module focuses on developing oral communication skills and self/peer teaching abilities. The CAD module introduces students to AuotCAD and basic CAD skills. The Technical Communication III module focuses on report editing and technical poster presentation, while the Research module introduces students to literature reviews, and basic data analyses of data sets from real research labs.

   2.9 Do you allow this course to be repeated for credit? No

3. Please list rationale for introducing this course: This is part of the integrated curriculum in the redesigned first year program.

4. Please list the learning objectives for this course:
The course consists of four modules: Technical Communication II, CAD, Technical Communication III, and Research. By the end of this course, students will be expected to:

1.0 Technical Communication II
1.1 - use key terms and concepts in teaching and learning, and oral communication technique, 15%
1.2 - organize and present oral communication to a specific audience, 25%
1.3 - reflect on how to improve their oral communication techniques, 15%
1.4 - provide feedback to peers to promote a growth mindset, and 20%
1.5 - select and distill content to facilitate understanding for a specific audience in oral com/teaching, 25%

2.0 CAD
2.1 - define, recognize, recall, and compare key terms and features in CAD, 10%
2.2 - set up a drawing in CAD, 15%
2.3 - draw and modify 2D objects in CAD, 25%
2.4 - dimension, layout and annotate 2D and 3D drawings in CAD, and 25%
2.5 - draw and modify 3D objects in CAD. 25%

3.0 Technical Communication III
3.1 - use key terms and concepts in communication ethics, editing technique, referencing/citing, and poster layout/organization, 10%
3.2 - select, organize and adapt the visual features of a technical poster, 25%
3.3 - select, organize and adapt the content of a technical poster, 25%
3.4 - adapt and refine a technical document based on peer/expert feedback, and 25%
3.5 - represent research findings in a balanced & ethical manner. 15%

4.0 Research
4.1 - define, recognize, recall, and compare key terms and concepts involved in conducting research and writing research papers, 10%
4.2 - search in databases, journals, and other online resources to locate relevant literature and information on specific topics, 15%
4.3 - prepare a systematic literature review by summarizing the published studies, and critiquing them, 25%
4.4 - apply appropriate statistical analyses to analyze given data, 15%
4.5 - interpret and report the results to address the research questions, and 20%
4.6 - present technical research using a poster. 15%

Note that one quarter of the final course grade for this course will come from each of the Technical Communication II, CAD, Technical Communication III, and Research modules.
5. **Impact of this course**
   Are the programs of other departments or Colleges affected by this course? No
   If so, were these departments consulted? (Include correspondence)
   Were any other departments asked to review or comment on the proposal? Yes, within the
   College and we worked with the Gwenna Moss Centre for Teaching and Learning.

6. **Other courses or program affected** (please list course titles as well as numbers)
   6.1 Courses to be deleted? GE 101, GE 111, GE 121, GE 124, GE 125 (for Fall 2021)
   6.2 Courses for which this course will be a prerequisite?
   Any changes to the course prerequisites in the programs will be submitted in future UCC.
   6.3 Is this course to be required by your majors, or by majors in another program? Required for
   Engineering Students as part of the Common First Year.

7. **Course outline**
   (Weekly outline of lectures or include a draft of the course information sheet.)

   See attached syllabus.

8. **Enrolment**
   8.1 Expected enrollment: up to 600
   8.2 From which colleges? Engineering

9. **Student evaluation**
   Give approximate weighting assigned to each indicator (assignments, laboratory work, mid-term
   test, final examination, essays or projects, etc.)

   Please see syllabus.

   9.1 How should this course be graded?
   C – Completed Requirements
   (Grade options for instructor: Completed Requirements, Fail, IP In Progress)

<table>
<thead>
<tr>
<th></th>
<th>Grade options for instructor: grade of 0% to 100%, IP in Progress</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>Numeric/Percentage</td>
</tr>
<tr>
<td>P</td>
<td>Pass/Fail</td>
</tr>
</tbody>
</table>
   (Grade options for instructor: Pass, Fail, In Progress) |
   S   | Special                                                          |
   (Grade options for instructor: NA – Grade Not Applicable) If other, please specify:

   9.2 Is the course exempt from the final examination? Yes

10. **Required text**
    Include a bibliography for the course.

    **Technical Communication II and III**
    These modules will use the following open text: TBD. Course notes will supply other required
    reference materials. The Library will also put useful reference materials and texts on reserve.
There will be no textbook for this module. Course notes and references to other online resources will constitute the required reference materials. The Library will also put useful reference materials and texts on reserve.

Students will require a laptop computer which conforms to the USask First Year Engineering Laptop Specifications. The Specifications include the installation of the (free) AutoCAD vx software.

There will be no textbook for this module. Course notes and references to other online resources will constitute the required reference materials. The Library will also put useful reference materials and texts on reserve.

11. Resources
11.1 Proposed instructor: Engineering Faculty
11.2 How does the department plan to handle the additional teaching or administrative workload? Within College/department budget – these courses will be replacing others.
11.3 Are sufficient library or other research resources available for this course? Yes, they may closer to the 2021 launch inquire to see if certain textbooks can be added to hold on reserve in the library if they are not already in the collection.
11.4 Are any additional resources required (library, audio-visual, technology, etc.)? N/A

12. Tuition
12.1 Will this course attract tuition charges? If so, how much? (use tuition category) TC07
12.2 Does this course require non-standard fees, such as materials or excursion fees? If so, please include an approved “Application for New Fee or Fee Change Form”
http://www.usask.ca/sesd/info-for-instructors/program-course-preparation.php#course-fees
No

Detailed Course Information

1. Schedule Types
Please choose the Schedule Types that can be used for sections that fall under this course:

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CL</td>
<td>Clinical</td>
<td>PRB</td>
<td>Problem Session</td>
</tr>
<tr>
<td>COO</td>
<td>Coop Class</td>
<td>RDG</td>
<td>Reading Class</td>
</tr>
<tr>
<td>FLD</td>
<td>Field Trip</td>
<td>RES</td>
<td>Research</td>
</tr>
<tr>
<td>ICR</td>
<td>Internet Chat Relay</td>
<td>ROS</td>
<td>Roster (Dent Only)</td>
</tr>
<tr>
<td>IHP</td>
<td>Internet Help</td>
<td>SEM</td>
<td>Seminar</td>
</tr>
<tr>
<td>IN1</td>
<td>Internship - Education</td>
<td>SSI</td>
<td>Supervised Self Instruction</td>
</tr>
<tr>
<td>IN2</td>
<td>Internship - CMPT &amp; EPIP</td>
<td>STU</td>
<td>Studio</td>
</tr>
<tr>
<td>IN3</td>
<td>Internship - General</td>
<td>SUP</td>
<td>Teacher Supervision</td>
</tr>
</tbody>
</table>
2. Course Attributes

Please highlight the attributes that should be attached to the course (they will apply to all sections):

2.1 NOAC No Academic Credit
0 Credit Unit courses that possess “deemed” CUs (Called Operational Credit Units). NOAC causes the system to roll 0 academic credit units to academic history.

2.2 For the College of Arts and Science only: To which program type does this course belong?
FNAR Fine Arts
HUM Humanities
SCIE Science
SOCS Social Science
ARNP No Program Type (Arts and Science)

3. Registration Information (Note: multi-term courses cannot be automated as corequisites)

3.1 Permission Required: No
3.2 Restriction(s): course only open to students in a specific college, program/degree, major, year in program
College of Engineering only
3.3 Prerequisite(s): course(s) that must be completed prior to the start of this course
3.4 Prerequisite(s) or Corequisite(s): course(s) that can be completed prior to or taken at the same time as this course
GE 103 – Introduction to Engineering II, GE 132 – Engineering Communication I
3.5 Corequisite(s): course(s) that must be taken at the same time as this course
3.6 Notes: recommended courses, repeat restrictions/content overlap, other additional information

4. List Equivalent Course(s) here:
An equivalent course can be used in place of the course for which this form is being completed, specifically for the purposes of prerequisite and degree audit checking. Credit will be given for only one of the equivalent courses.

4.1 If this is a recently-repurposed course number, please list the courses that are no longer considered to be equivalent:

*Please note: If the equivalent courses carry an UNEQUAL number of credit units, DegreeWorks will automatically enforce the following, unless otherwise stated:
• If a 3 credit unit course is considered to be equivalent to a 6 credit unit course, it will fulfill the 6 credit unit requirement and the student will not have to complete another 3 credit units toward the overall number of required credit units for the program.
• If a 6 credit unit course is considered to be equivalent to a 3 credit unit course, ALL 6 of the credit units may be used to fulfill the 3 credit unit requirement.

5. List Mutually-Exclusive Course(s) here:
Mutually exclusive courses have similar content such that students cannot receive credit for both.

5.1 If this is a recently-repurposed course number, please list the courses that are no longer considered to be mutually exclusive:

*Please note: SiRIUS cannot enforce a situation where the exclusion goes only one way.

6. Additional Notes:
Land Acknowledgement
At the University of Saskatchewan, we acknowledge we are on Treaty Six Territory and the Homeland of the Métis. We pay our respect to the First Nation and Métis ancestors of this place and reaffirm our relationship with one another.

Instructors and Teaching Assistants:
Name: TBD
Office: TBD
Phone: TBD
Email: TBD

Office Hours: TBD

Lectures and Laboratories:
Technical Communication II
Weeks: 19-24
Classes: Two 1.5 hr lectures per week (for a total of 12 lectures)

Computer Aided Design (CAD)
Weeks: 20-24
Classes: Two 1.5 hr labs per week (a total of 10 labs)

Technical Communication III
Weeks: 26-31
Classes: Two 1.5 hr lectures in Week 26, followed by one 1.5 hr lecture per week (for a total of 7 lectures)

Research
Weeks: 26-31
Classes: Two 1.5 hr lectures per week, in Weeks 26-30, plus one 1.5 hr lecture in Week 31 (for a total of 11 lectures)

Website:
Assignments, solutions, lab schedules, general course information, and announcements will be posted on the course website (PAWS/Blackboard). Students are responsible for keeping up-to-date with the information on the course website. https://bblearn.usask.ca/

End-of-Day Help Sessions
End of day help sessions will be offered by the College of Engineering for the Common First Year and will provide support for all courses. Technical Communication II will have an end-of-day help session once a week on Mondays in Weeks 19-24. CAD will have them once a week on Wednesdays in Weeks 20-24. Technical Communication III and Research will have them once a week on Wednesdays in Weeks 26-31.
### Description:
This course introduces students to oral technical communication (including teaching), CAD, poster presentations, and technical research. The **Technical Communication II** module focuses on developing oral communication skills and self/peer teaching abilities. The **CAD** module introduces students to AutoCAD and basic CAD skills. The **Technical Communication III** module focuses on report editing and technical poster presentation, while the **Research** module introduces students to literature reviews, and to basic analyses of data sets from real research labs.

### Pre or co-requisites:
GE 103 – Introduction to Engineering II, GE 132 – Engineering Communication I

### Course Reference Numbers (CRNs):
TBD
Available from the Dynamic Schedule once courses are built [here](https://pawss.usask.ca/ban/bwckschd.p_disp_dyn sched)

### Course Learning Outcomes:
The course consists of four modules: **Technical Communication II**, **CAD**, **Technical Communication III**, and **Research**. By the end of this course, students will be expected to:

#### 1.0 Technical Communication II

<table>
<thead>
<tr>
<th>Module Grade Weights</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1 - use key terms and concepts in teaching and learning, and oral communication techniques</td>
<td>15%</td>
</tr>
<tr>
<td>1.2 - organize and present oral communication to a specific audience</td>
<td>25%</td>
</tr>
<tr>
<td>1.3 - reflect on how to improve their oral communication techniques</td>
<td>15%</td>
</tr>
<tr>
<td>1.4 - provide feedback to peers to promote a growth mindset, &amp;</td>
<td>20%</td>
</tr>
<tr>
<td>1.5 - select and distill content to facilitate understanding for a specific audience in oral communication/teaching</td>
<td>25%</td>
</tr>
</tbody>
</table>

#### 2.0 CAD

<table>
<thead>
<tr>
<th>Module Grade Weights</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1 - define, recognize, recall, and compare key terms and features in CAD</td>
<td>10%</td>
</tr>
<tr>
<td>2.2 - set up a drawing in CAD</td>
<td>15%</td>
</tr>
<tr>
<td>2.3 - draw and modify 2D objects in CAD</td>
<td>25%</td>
</tr>
<tr>
<td>2.4 - dimension, layout and annotate 2D and 3D drawings in CAD, and</td>
<td>25%</td>
</tr>
<tr>
<td>2.5 - draw and modify 3D objects in CAD</td>
<td>25%</td>
</tr>
</tbody>
</table>
3.0 Technical Communication III

Module Grade Weights

3.1 - use key terms and concepts in communication ethics, editing technique, referencing/citing, and poster layout/organization, 10%
3.2 - select, organize and adapt the visual features of a technical poster, 25%
3.3 - select, organize and adapt the content of a technical poster, 25%
3.4 - adapt and refine a technical document based on peer/expert feedback, and 25%
3.5 - represent research findings in a balanced & ethical manner. 15%

4.0 Research

Module Grade Weights

4.1 - define, recognize, recall, and compare key terms and concepts involved in conducting research and writing research papers, 10%
4.2 - search in databases, journals, and other online resources to locate relevant literature and information on specific topics, 15%
4.3 - prepare a systematic literature review by summarizing published studies, and critiquing them, 25%
4.4 - apply appropriate statistical analyses to analyze given data, 15%
4.5 - interpret and report the results to address the research questions, and 20%
4.6 - present technical research using a poster. 15%

Note that one quarter of the final course grade for this course will come from each of the Technical Communication II, CAD, Technical Communication III, and Research modules.

Assessment:

This course employs a competency-based assessment system. Students must demonstrate competence in certain skills in each module. These skills can be divided into three types (A/B/C).

Type A skills are the most basic and granular for a subject area. In general, this includes the ability to define, recall, recognize, compare, and contrast key terms and concepts. It also includes basic calculations and procedural steps, as appropriate.

Type B skills are basic integrative skills. These include basic types of questions that have been covered in class.

Type C skills are integrative skills that depend on the ability to extend the application of what has been learned in class into new domains.

For this class, students will be expected to perform at a 70% success level or higher in Type A and B materials to be considered competent. There will be no minimum performance threshold for Type C material.
As part of competency-based assessment, students will be given more than one opportunity to display competence. Thus, for Type A and B skills, there will be at least two opportunities to exhibit basic competence. These opportunities may be manifested as portions of later assignments replacing performance on earlier assignments (that cover similar skill sets) and/or “Top Up” opportunities. Top Up opportunities will be proctored opportunities to demonstrate skills during optional course-specific help sessions (see End-of-Day Help Sessions) or during optional Top Up help sessions, which are spread throughout the term’s schedule. They may also include supplementary assignments.

Technical Communication II
Type A materials include knowledge and very basic skills vital to any success in oral technical communication. Type A skills for this module include defining, recognizing, recalling, comparing, and contrasting key terms and concepts in teaching and learning, reflection, and oral communication technique.

Type B skills include conducting a basic audience analysis, focusing one’s self, preparing and organizing a basic group presentation, listening actively, and appropriately incorporating common references/sources into oral argumentation.

Type C skills will focus on abilities related to providing meaningful and constructive feedback, extracting deep insights from experiences, and mentoring peers effectively.

Type A
- 10-15 Minute in-class Quizzes (Weeks 19, 20, 22, 23)
- Top Up opportunities (any Technical Communication II Help Session or Top Up Help Session)

Type B/C
- Assignment 1: out Week 19, due Week 21 (in-class peer mentoring exercise – individual)
- Assignment 2: out Week 21, due Week 22 (self-reflection on peer feedback & mentoring - individual)
- Assignment 3: done in class Week 24 (presentation – group)

Type B Top Up opportunities (Assignment 3 can Top Up Assignment 1 Type B material, and one Top Up will be offered for Assignment 2 Type B material after the Module’s classes are over)

Type C Top Up opportunities (none)

CAD
Type A materials include knowledge and very basic skills vital to any success in performing the more integrative CAD skills. Type A skills for
CAD include abilities to define, recognize, recall, and compare key terms and CAD features.

Type B skills include basic CAD skills such as the ability to navigate a CAD system, set up a drawing, draw basic 2D and 3D objects, and apply simple dimensioning and annotations.

Type C skills will focus on abilities related to drawing, dimensioning and annotating more challenging 2D and 3D objects.

**Type A**
- 10-15 Minute in-class Quizzes (Weeks 20, 21, 22, 23)
*Top Up opportunities (any CAD Help Session or Top Up Help Session)*

**Type B**
- Assignment 1: out Week 20, due Week 21 (setting up and drawing a simple 2D object - individual)
- Assignment 2: out Week 21, due Week 22 (setting up and drawing a more challenging 2D object, and applying simple dimensioning and annotations - individual)
- Assignment 3: out Week 22, due Week 23 (setting up and drawing a simple 3D object, and applying dimensioning, layout and annotations - individual)
*Top Up opportunities (after Assignment 1, each subsequent assignment can Top Up different learning outcomes from earlier assignments, as per instructions on the Assignments themselves)*

**Type C**
- Assignment 4: done in class Week 24 (setting up and drawing a more challenging 3D object, and applying dimensioning, layout and annotations - individual)
*Top Up opportunities (none)*

**Technical Communication III**
Type A materials include knowledge and very basic skills vital to any success in preparing and presenting a technical poster, and in editing a technical document. Type A skills for this module include defining, recognizing, recalling, comparing, and contrasting key terms and concepts in poster design and presentation, as well as technical editing.

Type B skills include the basic layout and design of a poster, both visually and content-wise, including judicious selection of key features. They also include the identification of major ethical missteps in the communication of research findings, and the improvement of basic features of a technical document based on feedback.
Type C skills include abilities related to adapting poster design elements to expected audiences, and altering documents in substantial ways based on difficult but valuable feedback.

**Type A**
- 10-15 Minute in-class Quizzes (Weeks 26, 29)

*Top Up opportunities (any Technical Communication III Help Session or Top Up Help Session)*

**Type B/C**
- Assignment 1: out Week 26, due Week 27 (peer editing of a literature review - group)
- Assignment 2: out Week 27, due Week 29 (fixing ethical violations in technical writing - individual)
- Assignment 3: out Week 27, due Week 31 (draft/final research poster - group)

*Type B Top Up opportunities (Assignment 3 can Top Up Assignment 1 Type B material, and one Top Up will be offered for Assignment 2 Type B material after the Module's classes are over; peer comments on draft posters in Week 31 in the Research Module, make Assignment 3 a de facto Top Up)*

*Type C Top Up opportunities (none)*

**Research**

Type A materials include knowledge and very basic skills relevant to conducting and reporting research. Type A skills for this module include abilities to define, recall, recognize, and compare key terms and concepts in research practice, as well as procedures for carrying out basic literature searches.

Type B skills include abilities to summarize key information from the literature, distinguish very good from very poor research studies, identify major types of data analysis methods and trends, identify major classes of filters, apply statistical tools to basic data analyses, illustrate the results of basic data analyses, and design research posters.

Type C skills will focus on abilities related to more deeply integrating all of the Type A and B skills in order to derive deeper insights into the research literature, data sets, and interpretation of results.

**Type A**
- 10-15 Minute in-class Quizzes (Weeks 27, 28, 29, 30)

*Top Up opportunities (any Research Help Session or Top Up Help Session)*
Type B/C

- Assignment 1: out Week 26, due Week 27 (paper outline, lit review plan, identify key sources - group)
- Assignment 2: out Week 26, due Week 28 (literature review - group)
- Assignment 3: out Week 28, due Week 29 (methods and analyses - group)
- Assignment 4: out Week 29, due Week 30 (results, conclusions, recommendations/future work - individual)
- Assignment 5: out Week 27, due Week 31 (poster - group)

Type B Top Up opportunities (Assignment 2 can Top Up Assignment 1, Assignment 5 can Top Up Assignments 3 and 4, and one Top Up will be offered for Assignment 5 Type B material after the Module’s classes are over)

Type C Top Up opportunities (none)

Competency Thresholds

A “module mark” (out of 100) will be calculated for each of the four modules (Technical Communication II, CAD, Technical Communication III and Research). For each module, students must achieve at least 70% overall in the Type A material and at least 70% overall in the Type B material in order to pass the module with a level of “basic competence”. If a student achieves at least 70% in a module’s Type A materials and in a module’s Type B materials, their module mark will be calculated as per the following section. If a student fails to achieve at least 70% in either or both of the Type A and B materials, they will receive a maximum grade of 49% for module.

If a student achieves at least 70% in the Type A and B materials in all four modules, their course mark will be an average of the four module marks. If a student fails to achieve “basic competence” in one or more modules, they will fail the course, receiving an overall grade of 49%, or their calculated grade, whichever is lower. However, if they choose to redo the course in the future, they will be given credit for the modules they did pass (at the new instructor’s discretion), with the passing mark that they did achieve (unless they want to redo the module for a better mark).

Technical Communication II Grade Calculations

All assessments will be marked on a percentage scale, by type (A/B/C) and by learning outcome e.g. Assignment 2 will have 2 sub-marks (one each for Type B and C work for LO3). Each percentage mark will be accompanied by a competency descriptor (exemplary, proficient, basic competency, almost competent, not yet competent).
To arrive at a final mark for Type A skills, each Quiz will be given equal weighting in grade calculations. Performance on a Type A Top Up Quiz will replace the corresponding Quiz mark if the Top Up result is better, or it will be averaged with the current Quiz mark, otherwise.

To arrive at a final mark for Type B skills, start with Assignment 1. It has three Type B components corresponding to performance against LO2, LO4, and LO5. These elements are reassessed in Assignment 3. Where the elements receive a better mark, the Assignment 3 marks replace the corresponding Assignment 1 marks. Where they do not, they are averaged with the corresponding Assignment 1 marks. Assignment 2 has one Type B component corresponding to LO3. The only opportunity to Top Up this Type B mark will be through a special Top Up after the Module is over, where students can complete an assignment similar to Assignment 2, but applied to the group presentation of Assignment 3. If the Top Up Type B material gets a better mark, it replaces the Assignment 2 mark. Otherwise, it is averaged with the Assignment 2 mark.

To arrive at a final mark for the Type C skills, the Type C scores from Assignments 1, 2 and 3 will be used. They cannot be Topped Up. If Top Ups of Assignment 2 and/or 3 take place, only the Type B material will be assessed.

**CAD Grade Calculations**

All assessments will be marked on a percentage scale, by type (A/B/C) and by learning outcome e.g. Assignment 2 will have 3 sub-marks (one for each of LO2, LO3, and LO4 Type B material). Each percentage mark will be accompanied by a competency descriptor (exemplary, proficient, basic competency, almost competent, not yet competent).

To arrive at a final mark for Type A skills, each Quiz will be given equal weighting in grade calculations. Performance on a Type A Top Up will replace the corresponding Quiz mark if the Top Up result is better, or it will be averaged with the current Quiz mark, otherwise.

To arrive at a final mark for Type B skills, start with Assignment 1. Assignment 1’s mark will be broken into two parts, corresponding to performance against LO2 and LO3. Any subsequent assignment that is evaluated against LO2 will either replace earlier marks for LO2 that are lower, or it will be averaged with prior marks that are higher. Assignment 2 can replace Assignment 1 marks for LO2 and LO3. Assignment 3 can replace Assignment 1 and 2 marks for LO2, and Assignment 2 marks for LO4. Assignment 4 can replace Assignment 1, 2 and 3 marks for LO2, Assignment 1 and 2 marks for LO3, Assignment 2 and 3 marks for LO4, and Assignment 3 marks for LO5.
To arrive at a final mark for the Type C skills, the Type C score from Assignment 4 will be used. It cannot be Topped Up.

**Technical Communication III Grade Calculations**
All assessments will be marked on a percentage scale, by type (A/B/C) and by learning outcome e.g. Assignment 1 will have 4 sub-marks (one Type B and C mark for each of LO4 and LO5). Each percentage mark will be accompanied by a competency descriptor (exemplary, proficient, basic competency, almost competent, not yet competent).

To arrive at a final mark for Type A skills, each Quiz will be given equal weighting in grade calculations. Performance on a Type A Top Up will replace the corresponding Quiz mark if the Top Up result is better, or it will be averaged with current the Quiz mark, otherwise.

To arrive at a final mark for Type B skills, start with Assignment 1. Assignment 1’s Type B marks will be broken into two parts, corresponding to performance against LO4 and LO5. Assignment 2 will also have a Type B LO5 mark. If it is higher than the corresponding Assignment 1 Type B LO5 mark, then the Assignment 2 mark will replace the corresponding Assignment 1 mark. If not, the two marks will be averaged. Assignment 3 has four Type B marks, corresponding to performance against LO2, LO3, LO4, and LO5. For LO4 and LO5, if the Assignment 3 Type B mark is higher than earlier marks, it replaces earlier marks. The LO2 and LO3 Type B marks come directly from Assignment 3.

To arrive at a final mark for the Type C skills, the Type C scores from Assignments 1 to 3 will be used. They cannot be Topped Up.

**Research Grade Calculations**
All assessments will be marked on a percentage scale, by type (A/B/C) and by learning outcome e.g. Assignment 2 will have 4 sub-marks (a Type B and C mark for each of LO2 and LO3). Each percentage mark will be accompanied by a competency descriptor (exemplary, proficient, basic competency, almost competent, not yet competent).

To arrive at a final mark for Type A skills, each Quiz will be given equal weighting in grade calculations. Performance on a Type A Top Up will replace the corresponding Quiz mark if the Top Up result is better, or it will be averaged with current the Quiz mark, otherwise.

To arrive at a final mark for Type B skills, start with Assignment 1. Assignment 1’s marks will correspond to performance against LO2 and LO3. This is also true for Assignment 2 except that there will be specific
Type B marks for LO2 and LO3. If either is greater than the corresponding Assignment 1 mark, it will replace the corresponding Assignment 1 mark. If not, it will be averaged with the corresponding Assignment 1 mark. Assignment 3 will have a Type B component for LO4, and Assignment 4 will have a Type B component for LO5. Assignment 5 will have Type B components for LO4, LO5, and LO6. If any are better than the existing Type B marks for those LO’s, they will replace them. Otherwise, they will be averaged.

To arrive at a final mark for the Type C skills, the Type C scores from Assignment 2 to 5 will be used. They cannot be Topped Up. If a Top Up of Assignment 5 takes place, only the Type B material will be assessed.

**Keeping Track of Grades**
Throughout the **Technical Communication I, CAD, Technical Communication III** and **Research** modules, students will be able to monitor their progress in three complementary respects, for each module:

a) marks on deliverables – students will see how they do on each assignment/quiz
b) marks on Type A/B/C work – students will see how they are doing at each level of material difficulty in the course, and
c) marks on Learning Outcomes – students will see how they are doing against each of the learning outcomes for each module, as they complete elements of them.

**Attendance and Participation:**
Attendance and participation is encouraged/expected, and students will be responsible for what happens in classes e.g. quizzes. However, attendance will not be mandatory (or marked).

**Criteria That Must Be Met to Pass:**
See **Assessment** (Competency Thresholds), above.

**Final Grades:**
The final grades will be consistent with the “literal descriptors” specified in the university’s grading system (at the link below, click on “for undergraduate students”).

[https://students.usask.ca/academics/grading/grading-system.php](https://students.usask.ca/academics/grading/grading-system.php)

For information regarding appeals of final grades or other academic matters, please visit the Student Conduct and Appeals section of the University Secretary’s website:


**Academic Courses Policy:**
More information on the Academic Courses Policy on course delivery, examinations and assessment of student learning can be found at:
Learning Charter:
The University of Saskatchewan Learning Charter is intended to define aspirations about the learning experience that the University aims to provide, and the roles to be played in realizing these aspirations by students, instructors and the institution. A copy of the Learning Charter can be found at: [https://teaching.usask.ca/about/policies/learning-charter.php](https://teaching.usask.ca/about/policies/learning-charter.php)

Course Overview:
This course consists of four modules (Technical Communication II, CAD, Technical Communication III and Research). They all involve communication skills for engineers, but they will largely be taught and assessed separately in this course. In all cases, instructors will use a competency-based assessment system. Students will be expected to demonstrate basic skills in a competent manner by the end of the course. In general, if competence is not demonstrated earlier in the course, there will be at least one opportunity (for a given block of subject matter) to demonstrate it again later in the course.

Course Content/Schedule:
The Technical Communication II module will introduce students to oral communication in a technical context, including the design of PowerPoint™ and group presentations. Students will also be introduced to self- and peer-teaching strategies, including conceptual and delivery models to assist in simplifying concepts for peers. They will systematically reflect upon feedback provided to them by instructors and peers, and incorporate such feedback into their evolving communication skills.

The CAD module will introduce students to Computer-Aided Design through the use of AutoCAD. After a brief review of key concepts and terms from Drawing & Sketching, students will learn how to orient themselves in the AutoCAD system and set up drawings. They will develop basic skills in drawing and modifying 2D and 3D objects in CAD. This will include properly laying out, annotating, and dimensioning drawings. By the end of the module, students who pass the module will be competent users of AutoCAD for basic technical drawing tasks.

The Technical Communication III module will introduce students to research report writing, ethical considerations in technical communication, and poster design. Students will learn and apply core concepts in the visual design of posters, and they will get the opportunity to present and defend a poster based on their work in the Research module. As in Technical Communication II, they will continue to reflect upon peer and instructor feedback, and incorporate it into their work.
The Research module will introduce students to research methods in engineering disciplines. In groups, students will select real-world data sets from faculty research labs and analyze and interpret the data sets after conducting a literature review relevant to the experimental data. Students will ultimately present their work in a poster session. Students will become familiar with the procedures of research activities, review and evaluation of research literature, statistical concepts for research in engineering, and selection and interpretation of statistical analyses. By the end of the module, students should be able to productively assist a research program with supervision.

<table>
<thead>
<tr>
<th>Technical Communication II</th>
<th>Approximate Lecture Hours</th>
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<tbody>
<tr>
<td>1. <strong>TERM WEEK 19</strong></td>
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<tr>
<td>review of Tech Com I materials/clarity in communication, fixed vs growth mindsets, metacognition and learning, deep vs surface learning, setting personal learning goals, Quiz 1</td>
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<tr>
<td>2. <strong>TERM WEEK 20</strong></td>
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<tr>
<td>threshold concepts, essential ideas, selecting content for audiences, peer mentoring workshop, providing constructive feedback in oral presentations, Quiz 2</td>
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<td>3. <strong>TERM WEEK 21</strong></td>
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<tr>
<td>in-class assignment — mentoring peers, modes of appeal for oral communication, role of reflection in professional communication practice, differences between oral &amp; written communication, types of oral communication</td>
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<td>4. <strong>TERM WEEK 22</strong></td>
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<tr>
<td>how to structure oral communication, selecting content &amp; sequencing ideas, using sources in oral communication, visual aids: how to use PowerPoint™, assignment – reflection on feedback &amp; mentoring experience, Quiz 3</td>
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<tr>
<td>5. <strong>TERM WEEK 23</strong></td>
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<td>speech delivery and practice strategies, non-verbal communication in oral communication, relaxation techniques, group presentations: sharing roles &amp; responsibilities, managing group dynamics, active listening: extracting information from oral presentations, adapting communication/consulting with diverse communities, Quiz 4</td>
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<td>6. <strong>TERM WEEK 24</strong></td>
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<td>in-class assignment – group presentations</td>
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<tr>
<th>CAD</th>
<th>Approximate Lab Hours</th>
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<td>1. <strong>TERM WEEK 20</strong></td>
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<tr>
<td>review of the Drawing &amp; Sketching module (knowledge and skills), AutoCAD orientation/navigation, drawing basic shapes, Quiz 1</td>
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## Technical Communication III

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<tr>
<td><strong>1. TERM WEEK 26</strong></td>
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<tr>
<td>revisit TC II concepts, revisit SIDCRA elements (research report focus), review APA/integrating sources/referencing/citing, editing techniques for technical reports, Quiz 1</td>
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<tr>
<td><strong>2. TERM WEEK 27</strong></td>
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<tr>
<td>in-class assignment – peer edit of Research course’s Literature Review</td>
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<td><strong>3. TERM WEEK 28</strong></td>
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<td>communication code of ethics, distilling content for different mediums</td>
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<td><strong>4. TERM WEEK 29</strong></td>
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<td>posters: layout strategies, design tools, and integration of oral, written, and graphical information, Quiz 2</td>
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<td><strong>5. TERM WEEK 30</strong></td>
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<td>poster design workshop</td>
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<td><strong>6. TERM WEEK 31</strong></td>
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<td>poster design class feedback session, module wrap-up</td>
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## Research

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<th>Term Week</th>
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<tr>
<td>introducing research as an engineering career path, literature reviews, critiquing research, selection of data sets, research questions and hypotheses, introduction to codes and standards</td>
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<tr>
<td><strong>2. TERM WEEK 27</strong></td>
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<td>fundamental statistical concepts &amp; data analyses in case studies, pre-processing of data, Quiz 1</td>
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<tr>
<td><strong>3. TERM WEEK 28</strong></td>
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<tr>
<td>using R, Matlab and Excel for statistics, collection and analysis methods for quantitative data, Quiz 2</td>
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</tbody>
</table>
4. **TERM WEEK 29**  
   collection and analysis methods for qualitative data, experimental design, Quiz 3  
   
   3

5. **TERM WEEK 30**  
   interpretation of results in case studies including ethical issues, presentation of data using graphs and charts, Quiz 4  
   
   3

6. **TERM WEEK 31**  
   poster design day (approvals to print, top ups, design consultation)  
   
   1.5

Assignments:  
(see Assessment)

Quizzes:  
(see Assessment)

**Late Assignments/Missed Quizzes:**  
Late assignments/missed quizzes will receive a mark of zero. However, Quizzes can be Topped Up during help sessions, and late assignments can usually be Topped Up by subsequent assignments (see above). Type B Top Ups subsequent to the course will be permitted at the discretion of the instructor.

In the case of sickness, bereavement or other excusable absences, students will not be penalized for late submissions although they may be required to complete a variation on the original assignment. They can alternatively choose to treat a missed assignment as a Late Assignment.

**Examinations/Module Tests:**  
This course will not have examinations or Module Tests.

**Required Activities Outside of Class Time**  
This course will have one required activity outside of class time, that being the First Year Poster Presentation at the end of Week 31 (day/time TBD). Also, Top Up assessments will be available in optional end-of-day module-specific help sessions (see End-of-Day Help Sessions), if students wish to use them.

**Experiential Learning**  
Students will be engaging in technical communication, CAD and research activities in class.

**Important Dates:**

<table>
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<tr>
<th>Date</th>
<th>Event</th>
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<tr>
<td>Jan x, 2022</td>
<td>First day of Winter classes</td>
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<td>Jan y, 2022</td>
<td>Last day for making changes in registration for second-term courses (100% tuition credit).</td>
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<tr>
<td>Feb zz, 2022</td>
<td>Winter Break (Week 25)</td>
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</table>
Feb xx, 2022 | Last day to withdraw from Winter classes
---|---
Easter | Holidays
Apr yy, 2022 | Last day of classes

### Required Resources

**Technical Communication II and III**  
These modules will use the following open text: xxxxxxxxxxxxx

Course notes will supply other required reference materials. The Library will also put useful reference materials and texts on reserve.

Students will require a laptop computer which conforms to the USask First Year Engineering Laptop Specifications, as well as writing paper and a pen/pencil.

**CAD**  
There will be no textbook for this module. Course notes and references to other online resources will constitute the required reference materials. The Library will also put useful reference materials and texts on reserve.

Students will require a laptop computer which conforms to the USask First Year Engineering Laptop Specifications. The Specifications include the installation of the (free) AutoCAD vx software.

**Research**  
There will be no textbook for this module. Course notes and references to other online resources will constitute the required reference materials. The Library will also put useful reference materials and texts on reserve.

Students will be required to have a laptop computer which conforms to the USask First Year Engineering Laptop Specifications.

### Policies on Academic Dishonesty, Academic Appeals and Course Delivery:

Students are expected to undertake all aspects of their academic work in an ethical manner. Students are expected to submit their own individual work for academic credit, properly cite the work of others, and to follow all rules for examinations. Academic misconduct, plagiarism, and cheating will not be tolerated. Students are responsible for understanding the university’s policies on academic integrity and academic misconduct. If any form of academic misconduct is discovered, appropriate disciplinary action will be taken.

For information regarding appeals of a final grade or other academic matters, please consult the University Council document on Student Appeals of Evaluation, Grading and Academic Standing (http://policies.usask.ca/policies/student-affairs-and-activities/student-appeals.php).

Additional policies and procedures related to student conduct and appeals are provided on the University Secretariat website (www.usask.ca/secretariat/student-conduct-appeals) and on the University website http://www.usask.ca/integrity/.

A summary of University of Saskatchewan polices relating to academic courses is provided in the document: Academic Courses Policy on Class Delivery, Examinations, and Assessment of Student Learning (http://policies.usask.ca/policies/academic-affairs/academic-courses.php).

**Integrity Defined (from the Office of the University Secretary)**
The University of Saskatchewan is committed to the highest standards of academic integrity and honesty. Students are expected to be familiar with these standards regarding academic honesty and to uphold the policies of the University in this respect. Students are particularly urged to familiarize themselves with the provisions of the Student Conduct & Appeals section of the University Secretary Website and avoid any behavior that could potentially result in suspicions of cheating, plagiarism, misrepresentation of facts and/or participation in an offence. Academic dishonesty is a serious offence and can result in suspension or expulsion from the University.

All students should read and be familiar with the Regulations on Academic Student Misconduct (https://secretariat.usask.ca/student-conduct-appeals/academic-misconduct.php) as well as the Standard of Student Conduct in Non-Academic Matters and Procedures for Resolution of Complaints and Appeals (https://secretariat.usask.ca/student-conduct-appeals/academic-misconduct.php#IXXIIAPPEALS)

For more information on what academic integrity means for students see the Academic Integrity section of the University Library Website at: https://library.usask.ca/academic-integrity#AboutAcademicIntegrity

You are encouraged to complete the Academic Integrity Tutorial to understand the fundamental values of academic integrity and how to be a responsible scholar and member of the USask community - https://library.usask.ca/academic-integrity.php#AcademicIntegrityTutorial

**Safety:**
Safety is of paramount importance in the College of Engineering. Students are expected to work in a safe and responsible manner, to follow all safety instructions, and use any specified personal protective equipment. Students failing to behave in a safe manner will be asked to leave.

**Emergency Response Plan:**
Preparing for emergencies protects our lives and property. An emergency response plan (ERP) posting is located in each classroom and lab near the main door of the room. Students are advised to review and be familiar with the College ERP and be aware that when an alarm sounds for more than 10 seconds, the building must be evacuated. Muster point locations are posted at each entrance of the Engineering Building. For more details about the ERP, please visit the following website: https://engineering.usask.ca/documents/facilities/ERP%20-%20ENG20-%20v%202009%20-01_2017.pdf
Recording Lectures:
Lectures will be recorded, when possible, and made available to students in Blackboard so students can rewatch them as needed for study purposes.

Copyright:
Course materials are provided to students based on their registration in a class. Any materials created by course instructors is the intellectual property of the instructors. This includes exams, tests, PowerPoint/PDF slides and other course notes. Additionally, other copyright-protected materials created by textbook publishers and authors may be provided to students based on license terms and educational exceptions in the Canadian Copyright Act (see http://laws-lois.justice.gc.ca/eng/acts/C-42/index.html).

Before copying or distributing others' copyright-protected materials, students need to ensure that their use of materials is covered under the University's Fair Dealing Copyright Guidelines available at http://www.usask.ca/copyright/basics/copyright-policy/fair-dealing-guidelines/index.php. For example, posting others’ copyright-protected materials on the internet is not covered under the University's Fair Dealing Copyright Guidelines; doing so requires permission from the copyright holder. For more information about copyright, please visit http://www.usask.ca/copyright/students/rights/index.php or contact the University's Copyright Coordinator at copyright.coordinator@usask.ca.

Students should be aware that a violation of the university’s copyright policies could be an instance of non-academic misconduct. For example, the practice of uploading or posting copyright-protected materials to course-sharing websites, depositories, or “drop boxes”, without the permission of the copyright holder, could result in a charge of non-academic misconduct under the university's “Standard of Student Conduct in Non-Academic Matters”, found at the following location: https://secretariat.usask.ca/student-conduct-appeals/non-academic-misconduct.php.

Student Conduct:
Ethical behaviour is an important part of engineering practice. Each professional engineering association has a Code of Ethics, which its members are expected to follow. Since students are in the process of becoming Professional Engineers, it is expected that students will conduct themselves in an ethical manner.

The APEGs (Association of Professional Engineers and Geoscientists of Saskatchewan) Code of Ethics states that engineers shall “conduct themselves with fairness, courtesy and good faith towards clients, colleagues, employees and others; give credit where it is due and accept, as well as give, honest and fair professional criticism” (Section 20(e), The Engineering and Geoscience Professions Regulatory Bylaws, 1997).

The first part of this statement discusses an engineer’s relationships with their colleagues. One of the ways in which engineering students can demonstrate courtesy to their colleagues is by helping to maintain an atmosphere that is conducive to learning, and minimizing disruptions in class. This includes arriving on time for lectures, turning cell phones and other electronic devices off during lectures, not leaving or entering the class at inopportune times, and refraining from talking to others while the instructor is talking.

Access and Equity Services (AES) for Students
Students who have disabilities (learning, medical, physical, or mental health) are strongly encouraged to register with Access and Equity Services (AES) if they have not already done so.
Students who suspect they may have disabilities should contact AES for advice and referrals at any time. Those students who are registered with AES with mental health disabilities and who anticipate that they may have responses to certain course materials or topics, should discuss course content with their instructors prior to course add / drop dates. In order to access AES programs and supports, students must follow AES policy and procedures. For more information or advice, visit https://students.usask.ca/health/centres/access-equity-services.php, or contact AES at 306-966-7273 or aes@usask.ca.

Students registered with AES may request alternative arrangements for mid-term and final examinations or module tests. Students must arrange such accommodations through AES by the stated deadlines. Instructors shall provide the examinations for students who are being accommodated by the deadlines established by AES.

**Support Services for Engineering Students:**
- Engineering Student Centre (Rm. 2A05 Engineering Building)
  - Email: esc@usask.ca; Phone: 306-966-5274; https://engineering.usask.ca/contact_info/esc-office.php

End-of-day help sessions will be offered by the College of Engineering for the Common First Year and will provide support for all courses. Please see End-of-day Help Sessions for more details.

**Student Learning Services**
Student Learning Services (SLS) offers assistance to U of S undergrad and graduate students. For information on specific services, please see the SLS web site https://library.usask.ca/studentlearning/.

**Teaching, Learning and Student Experience**
The Teaching, Learning and Student Experience Unit (TLSE) focuses on providing developmental and support services and programs to students and the university community. For more information, see https://students.usask.ca/. Specific resources include:
- Student Wellness Centre (3rd & 4th Floors, Place Riel): https://students.usask.ca/health/
- Financial Services: https://students.usask.ca/money/
College of Engineering Attribute Mapping:
This information shows the relationship of the learning outcomes of this course to the graduate attributes intended upon students’ completion of the degree program. This information is used for accreditation purposes.

<table>
<thead>
<tr>
<th>Learning Outcome</th>
<th>A1</th>
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†Attributes:
A1 A knowledge base for engineering
A2 Problem analysis
A3 Investigation
A4 Design
A5 Use of engineering tools
A6 Individual and team work
A7 Communication skills
A8 Professionalism
A9 Impact of engineering on society and the environment
A10 Ethics and equity
A11 Economics and project management
A12 Life-long learning

‡Instructional Level:
Introduced (I) – Students learn the working vocabulary of the area of content, along with some of the major underlying concepts.
Developed (D) – Students use their working vocabulary and major fundamental concepts to probe more deeply, to read the literature, and to deepen their exploration of the concepts. They may begin to practice, extend, or refine knowledge in familiar contexts.
Applied (A) – Students approach mastery in the area of content. They explore deeply into the discipline and experience the controversies, debate, and uncertainties that characterize the leading edges of any field. They practice, extend, or refine knowledge in unfamiliar contexts.

Accreditation Unit (AU) Mapping: (% of total class AU)

<table>
<thead>
<tr>
<th>Math</th>
<th>Natural Science</th>
<th>Complementary Studies</th>
<th>Engineering Science</th>
<th>Engineering Design</th>
</tr>
</thead>
<tbody>
<tr>
<td>100%</td>
<td></td>
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</tbody>
</table>
**Accreditation Data Collection and Privacy:**
Undergraduate programs in the College of Engineering are accredited by the Canadian Engineering Accreditation Board. Student performance data may be collected in this course to support accreditation and continuous program improvement processes. Anonymous samples of student work may also be collected for accreditation purposes. All data provided to the accreditation body or external entities is anonymized and reported in aggregate form to protect your information and identity. If you have any concerns about how your personal information is used or maintained, please contact the Associate Dean Academic, College of Engineering.
1. Approval by Department Head or Dean
   1.1 College or School with academic authority: College of Engineering
   1.2 Department with academic authority: Associate Dean, Academic Office
   1.3 Term from which the course is effective: 202105

2. Information required for the Catalogue
   2.1 Label & Number of course: GE 142
   2.2 Academic credit units: 2
   2.3 Course Long Title (maximum 100 characters): Design I
   Course Short Title (maximum 30 characters): Design I
   2.4 Total Hours: Lecture 16.5 Seminar Lab 9 Tutorial Other
   2.5 Weekly Hours: Lecture Seminar Lab Tutorial Other
   2.6 Term in which it will be offered: T1 T2 T1 or T2 T1 and T2
   2.7 Prerequisite:

   If there is a prerequisite waiver, who is responsible for signing it?
   D – Instructor/Dept Approval
   H – Department Approval (Associate Dean, Academic)
   I – Instructor Approval
   2.8 Catalogue description (150 words or less):

   This course introduces students to Engineering Design. The Design I course focuses on the early stages of design characterized by problem identification, acceptance, definition, and characterization. This will include the determination of design functions, criteria/objectives and constraints/requirements. Students will engage in a group project to identify and characterize an engineering design problem of their own choosing.

   2.9 Do you allow this course to be repeated for credit? No

3. Please list rationale for introducing this course: This is part of the integrated curriculum in the redesigned first year program.

4. Please list the learning objectives for this course:

   The course consists of one module: Design I. By the end of this course, students will be expected to:
5. Impact of this course
Are the programs of other departments or Colleges affected by this course? No
If so, were these departments consulted? (Include correspondence)
Were any other departments asked to review or comment on the proposal? Yes, within the College and we worked with the Gwenna Moss Centre for Teaching and Learning.

6. Other courses or program affected (please list course titles as well as numbers)
6.1 Courses to be deleted? GE 101, GE 111, GE 121, GE 124, GE 125 (for Fall 2021)
6.2 Courses for which this course will be a prerequisite?
Any changes to the course prerequisites in the programs will be submitted in future UCC.
6.3 Is this course to be required by your majors, or by majors in another program? Required for Engineering Students as part of the Common First Year.

7. Course outline
(Weekly outline of lectures or include a draft of the course information sheet.)
See attached syllabus.

8. Enrolment
8.1 Expected enrollment: up to 600
8.2 From which colleges? Engineering

9. Student evaluation
Give approximate weighting assigned to each indicator (assignments, laboratory work, mid-term test, final examination, essays or projects, etc.)
Please see syllabus.

9.1 How should this course be graded?
C – Completed Requirements
(Grade options for instructor: Completed Requirements, Fail, IP In Progress)
N – Numeric/Percentage
(Grade options for instructor: grade of 0% to 100%, IP in Progress)
P – Pass/Fail
(Grade options for instructor: Pass, Fail, In Progress)
S – Special

1.0 Design I
Module Grade Weights
1.1 - define/recognize/compare key terms and concepts in Engineering Design, 20%
1.2 - identify, develop, and characterize a basic engineering design problem, 35%
1.3 - make a case to undertake a specific engineering design problem, 20%
1.4 - maintain an effective design logbook, and 15%
1.5 - reflect on how to improve their design work & experiences. 10%
9.2 Is the course exempt from the final examination? Yes

10. **Required text**
Include a bibliography for the course: N/A

11. **Resources**
11.1 Proposed instructor: Engineering Faculty
11.2 How does the department plan to handle the additional teaching or administrative workload? Within College/department budget – these courses will be replacing others.
11.3 Are sufficient library or other research resources available for this course? Yes, Course notes and references to other online resources will constitute the required reference materials. The Library will also put useful reference materials and texts on reserve.
11.4 Are any additional resources required (library, audio-visual, technology, etc.)? N/A

12. **Tuition**
12.1 Will this course attract tuition charges? If so, how much? (use tuition category) TC07
12.2 Does this course require non-standard fees, such as materials or excursion fees? If so, please include an approved “Application for New Fee or Fee Change Form” http://www.usask.ca/sesd/info-for-instructors/program-course-preparation.php#course-fees
No

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**Detailed Course Information**

1. **Schedule Types**
Please choose the Schedule Types that can be used for sections that fall under this course:

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CL</td>
<td>Clinical</td>
<td>PRB</td>
<td>Problem Session</td>
</tr>
<tr>
<td>COO</td>
<td>Coop Class</td>
<td>RDG</td>
<td>Reading Class</td>
</tr>
<tr>
<td>FLD</td>
<td>Field Trip</td>
<td>RES</td>
<td>Research</td>
</tr>
<tr>
<td>ICR</td>
<td>Internet Chat Relay</td>
<td>ROS</td>
<td>Roster (Dent Only)</td>
</tr>
<tr>
<td>IHP</td>
<td>Internet Help</td>
<td>SEM</td>
<td>Seminar</td>
</tr>
<tr>
<td>IN1</td>
<td>Internship - Education</td>
<td>SSI</td>
<td>Supervised Self Instruction</td>
</tr>
<tr>
<td>IN2</td>
<td>Internship - CMPT &amp; EPIP</td>
<td>STU</td>
<td>Studio</td>
</tr>
<tr>
<td>IN3</td>
<td>Internship - General</td>
<td>SUP</td>
<td>Teacher Supervision</td>
</tr>
<tr>
<td>IND</td>
<td>Independent Studies</td>
<td>TEL</td>
<td>Televised Class</td>
</tr>
<tr>
<td>LAB</td>
<td>Laboratory</td>
<td>TUT</td>
<td>Tutorial</td>
</tr>
<tr>
<td>LC</td>
<td>Lecture/Clinical (Dent Only)</td>
<td>WEB</td>
<td>Web Based Class</td>
</tr>
<tr>
<td>LEC</td>
<td>Lecture</td>
<td>XCH</td>
<td>Exchange Program</td>
</tr>
<tr>
<td>LL</td>
<td>Lecture/Laboratory (Dent Only)</td>
<td>XGN</td>
<td>Ghost Schedule Type Not Applicable</td>
</tr>
<tr>
<td>MM</td>
<td>Multimode</td>
<td>XHS</td>
<td>High School Class</td>
</tr>
<tr>
<td>PCL</td>
<td>Pre-Clinical (Dent Only)</td>
<td>XNA</td>
<td>Schedule Type Not Applicable</td>
</tr>
</tbody>
</table>
2. Course Attributes
Please highlight the attributes that should be attached to the course (they will apply to all sections):

2.1 NOAC No Academic Credit
0 Credit Unit courses that possess “deemed” CUs (Called Operational Credit Units). NOAC causes the system to roll 0 academic credit units to academic history.

2.2 For the College of Arts and Science only: To which program type does this course belong?
- FNAR Fine Arts
- HUM Humanities
- SCIE Science
- SOCS Social Science
- ARNP No Program Type (Arts and Science)

3. Registration Information (Note: multi-term courses cannot be automated as corequisites)

3.1 Permission Required: No
3.2 Restriction(s): course only open to students in a specific college, program/degree, major, year in program

- College of Engineering only
3.3 Prerequisite(s): course(s) that must be completed prior to the start of this course
3.4 Prerequisite(s) or Corequisite(s): course(s) that can be completed prior to or taken at the same time as this course
- GE 102 – Introduction to Engineering I, GE132 Engineering Communication I
3.5 Corequisite(s): course(s) that must be taken at the same time as this course
3.6 Notes: recommended courses, repeat restrictions/content overlap, other additional information

4. List Equivalent Course(s) here: GE121
An equivalent course can be used in place of the course for which this form is being completed, specifically for the purposes of prerequisite and degree audit checking. Credit will be given for only one of the equivalent courses.

4.1 If this is a recently-repurposed course number, please list the courses that are no longer considered to be equivalent:

*Please note: If the equivalent courses carry an UNEQUAL number of credit units, DegreeWorks will automatically enforce the following, unless otherwise stated:

- If a 3 credit unit course is considered to be equivalent to a 6 credit unit course, it will fulfill the 6 credit unit requirement and the student will not have to complete another 3 credit units toward the overall number of required credit units for the program.
- If a 6 credit unit course is considered to be equivalent to a 3 credit unit course, ALL 6 of the credit units may be used to fulfill the 3 credit unit requirement.

5. List Mutually-Exclusive Course(s) here:
Mutually exclusive courses have similar content such that students cannot receive credit for both.
5.1 If this is a recently-repurposed course number, please list the courses that are no longer considered to be mutually exclusive:

*Please note: SiRIUS cannot enforce a situation where the exclusion goes only one way.

6. Additional Notes:
Land Acknowledgement
At the University of Saskatchewan, we acknowledge we are on Treaty Six Territory and the Homeland of the Métis. We pay our respect to the First Nation and Métis ancestors of this place and reaffirm our relationship with one another.

Instructors and Teaching Assistants:
Name: TBD
Office: TBD
Phone: TBD
Email: TBD

Office Hours: TBD

Lectures:
Weeks: 7-14 (excluding 11)
Classes: One 1.5 hr lecture per week, in Weeks 7-10, followed by two, three, and two 1.5 hr lectures, respectively, in Weeks 12-14 (for a total of 11 lectures)

Laboratories:
Weeks: 12-14
Labs: One 3 hr lab per week (for a total of 3 labs)

Website:
Assignments, solutions, lab schedules, general course information, and announcements will be posted on the course website (PAWS/Blackboard). Students are responsible for keeping up-to-date with the information on the course website. https://bblearn.usask.ca/

End-of-Day Help Sessions
End-of-day help sessions will be offered by the College of Engineering for the Common First Year and will provide support for all courses.

Design I will have an end-of-day help session once a week on Fridays in Weeks 7, 8, 9, 10, 12, 13, and 14.

Description:
This course introduces students to Engineering Design. The course focuses on the early stages of design including problem identification, acceptance, definition, and characterization. This will include the determination of design functions, criteria/objectives and constraints/requirements. Students will engage in a group project to identify and characterize an engineering design problem of their own choosing.

Pre or co-requisites:
GE 102 – Introduction to Engineering I, GE 132 - Engineering Communication I
Course Reference Numbers (CRNs): TBD Available from the Dynamic Schedule once courses are built (https://pawnss.usask.ca/ban/bwckschd.p_disp_dyn_sched)

Course Learning Outcomes: The course consists of one module: **Design I**. By the end of this course, students will be expected to:

1.0 **Design I**

<table>
<thead>
<tr>
<th>Module Grade Weights</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1 - define/recognize/compar key terms and concepts in Engineering Design, 20%</td>
</tr>
<tr>
<td>1.2 - identify, develop, and characterize a basic engineering design problem, 35%</td>
</tr>
<tr>
<td>1.3 - present a case to undertake a specific engineering design problem, 20%</td>
</tr>
<tr>
<td>1.4 - maintain an effective design logbook, and 15%</td>
</tr>
<tr>
<td>1.5 - reflect on how to improve their design work. 10%</td>
</tr>
</tbody>
</table>

Assessment: This course employs a competency-based assessment system. Students must demonstrate competence in certain skills. These skills can be divided into three types (A/B/C).

Type A skills are the most basic and granular for a subject area. In general, this includes the ability to define, recall, recognize, compare, and contrast key terms and concepts. It also includes basic calculations and procedural steps, as appropriate.

Type B skills are basic integrative skills. These include basic types of questions that have been covered in class, and basic execution of more complex skills like project management planning.

Type C skills are integrative skills that depend on the ability to extend the application of what has been learned in class into new domains.

For this class, students will be expected to perform at a 70% success level or higher in Type A and B materials to be considered competent. There will be no minimum performance threshold for Type C material.

As part of competency-based assessment, students will be given more than one opportunity to display competence. Thus, for Type A and B skills, there will be at least two opportunities to exhibit basic competence. These opportunities may be manifested as portions of later assignments replacing performance on earlier assignments (that...
cover similar skill sets) and/or “Top Up” opportunities. Top Ups will be proctored opportunities to demonstrate skills during optional course-specific help sessions (see **End-of-Day Help Sessions**) or during optional Top Up help sessions, which are spread throughout the term’s schedule. They may also include supplementary assignments.

For this course, Type A materials include knowledge and very basic skills relevant to engineering design. Type A skills for this module include abilities to define, recognize, and compare key terms and concepts, as well as knowledge of the procedures to carry out basic project management and ideation processes.

Type B skills include basic design skills such as sound logbook maintenance, identifying major features of simple design problems, constructing basic project management tools, generating ideas using ideation techniques, and recognizing basic justifications for undertaking a design problem.

Type C skills will focus on abilities that more deeply integrate all of the Type A and B skills in order to derive deeper insights into design problems and reflect upon them.

**Type A**
- 10-15 Minute in-class Quizzes (Weeks 12, 13, 14)  
  *Top Up opportunities (any Design I Help Session or Top Up Help Session)*

**Type B**
- Assignment 1: out Week 8, due Week 10 (log submission - individual)  
- Assignment 2: out Week 9, due Week 12 (initial problem definition - individual)  
- Assignment 3: out Week 9, due Week 14 (problem proposal - group)  
- Assignment 4: out Week 9, due Week 14 (log submission with reflection - individual)  
  *Top Up opportunities (after Assignment 1, each subsequent assignment can Top Up different learning outcomes from earlier assignments, as per instructions on the Assignments themselves)*

**Type C**
- Assignment 2: out Week 9, due Week 12 (initial problem definition - individual)  
- Assignment 3: out Week 9, due Week 14 (problem proposal - group)  
- Assignment 4: out Week 9, due Week 14 (log submission with reflection - individual)  
  *Top Up opportunities (none)*
Competence Thresholds
For this course, students must achieve at least 70% overall in the Type A material and at least 70% overall in the Type B material in order to pass the course with a level of “basic competence”. If a student achieves at least 70% in the Type A materials and in the Type B materials, their course mark will be calculated as per the following section (Grade Calculations). If a student fails to achieve at least 70% in either or both of the Type A and B materials, they will receive a maximum grade of 49% for the course.

Grade Calculations
All assessments will be marked on a percentage scale, by type (A/B/C) and by learning outcome e.g. Assignment 4 will have 3 sub-marks (one for LO4 Type B work and one each for Type B and C work for LO5). Each percentage mark will be accompanied by a competence descriptor (exemplary, proficient, basic competency, almost competent, not yet competent).

To arrive at a final mark for Type A skills, each Quiz will be given equal weighting in grade calculations. Performance on a Type A Top Up will replace the corresponding Quiz mark if the Top Up result is better, or it will be averaged with the current Quiz mark, otherwise.

To arrive at a final mark for Type B skills, Assignment 1’s marks will correspond to performance against LO2 and LO4. Assignment 2’s Type B LO2 mark will replace Assignment 1’s Type B LO2 mark if it is higher. It will be averaged with Assignment 1’s Type B LO2 mark otherwise. Assignment 3’s Type B LO2 mark will replace the current Type B LO2 mark if it is higher. It will be averaged with the current Type B LO2 mark otherwise. Assignment 3’s Type B LO3 mark can only be Topped Up after the Design I course at the discretion of the instructor. Assignment 4’s Type B LO4 mark will replace the current Type B LO4 mark if it is higher. Otherwise, it will be averaged with the current Type B LO4 mark.

To arrive at a final mark for the Type C skills, the Type C scores from Assignments 2, 3 and 4 will be used. They cannot be Topped Up.

Keeping Track of Grades
Throughout the Design I course, students will be able to monitor their progress in three complementary respects:

a) marks on deliverables – students will see how they do on each quiz,
b) marks on Type A/B/C work – students will see how they are doing at each level of material difficulty in the course, and
Attendance and Participation:

Attendance and participation is encouraged/expected, and students will be responsible for what happens in classes e.g. quizzes. However, attendance will not be mandatory (or marked).

Criteria That Must Be Met to Pass:

See Assessment (Competency Thresholds), above.

Final Grades:

The final grades will be consistent with the “literal descriptors” specified in the university's grading system (at the link below, click on “for undergraduate students”).

https://students.usask.ca/academics/grading/grading-system.php

For information regarding appeals of final grades or other academic matters, please visit the Student Conduct and Appeals section of the University Secretary’s website:


Academic Courses Policy:

More information on the Academic Courses Policy on course delivery, examinations and assessment of student learning can be found at:

http://policies.usask.ca/policies/academic-affairs/academic-courses.php

Learning Charter:

The University of Saskatchewan Learning Charter is intended to define aspirations about the learning experience that the University aims to provide, and the roles to be played in realizing these aspirations by students, instructors and the institution. A copy of the Learning Charter can be found at: https://teaching.usask.ca/about/policies/learning-charter.php

Course Overview:

The Design I course consists of one module. This module will introduce students to Engineering Design, and specifically to the early stages of design including problem identification, acceptance, definition, and characterization. This will include the determination of design functions, criteria/objectives and constraints/requirements. This module will also introduce the idea of entrepreneurial technology innovation as a career path for engineering students, and sustainability as an ever-important design objective. Students will engage in a group project to identify and characterize an engineering design problem of their own choosing. This will involve the application of basic group dynamics principles, project management skills, interactions with potential clients and/or users, and

c) marks on Learning Outcomes – students will see how they are doing against each of the five learning outcomes as they complete elements of them.
literature/market research. Students will also be introduced to the later stages of design, as a preview of the Design II course.

**Course Content/Schedule:**

<table>
<thead>
<tr>
<th>Design I</th>
<th>Approximate Lecture (Lab) Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. TERM WEEKS 7 &amp; 8</strong>&lt;br&gt;motivating the value of design, motivating the value of problem definition, identifying “good” problems</td>
<td>3</td>
</tr>
<tr>
<td><strong>2. TERM WEEKS 9 &amp; 10</strong>&lt;br&gt;accepting and researching a design problem, logs, the various aspects of problem definition (problem statements, scope, criteria/objectives, constraints/requirements/specs), Assignment 1</td>
<td>3</td>
</tr>
<tr>
<td><strong>3. TERM WEEK 12</strong>&lt;br&gt;problem definition exercises, group formation/dynamics exercises, group dynamics, work breakdown structures, linear responsibility charts, initial problem definition for group projects, Assignment 2, Quiz 1</td>
<td>3 (+3 Lab Hrs)</td>
</tr>
<tr>
<td><strong>4. TERM WEEK 13</strong>&lt;br&gt;introduction to ideation (for problem definition, and solution generation), tech innovation/tech entrepreneurship, introduction to lean design, DFX (sustainability), proposals, risk assessment, cost/benefit analyses, Quiz 2</td>
<td>4.5 (+3 Lab Hrs)</td>
</tr>
<tr>
<td><strong>5. TERM WEEK 14</strong>&lt;br&gt;peer evaluation of proposals, reflection on Design I Module activities, peer evaluations within groups, preview of Design II Module, final design exercise, Assignments 3/4, Quiz 3</td>
<td>3 (+3 Lab Hrs)</td>
</tr>
</tbody>
</table>

**Assignments:** (see Assessment)

**Quizzes:** (see Assessment)

**Late Assignments/Missed Quizzes:**

Late assignments/missed quizzes will receive a mark of zero. However, Quizzes can be Topped Up during help sessions, and late assignments can usually be Topped Up by subsequent assignments (see above). Type B Top Ups subsequent to the course will be permitted at the discretion of the instructor.

In the case of sickness, bereavement or other excusable absences, students will not be penalized for late submissions although they may be required to complete a variation on the original assignment. They can alternatively choose to treat a missed assignment as a Late Assignment.
Examinations/Module Tests:
This course will not have examinations or Module Tests.

Required Activities Outside of Class Time
This course will not have required activities outside of class time. However, Top Up assessments will be available in optional end-of-day course-specific help sessions (see End-of-Day Help Sessions), if students wish to use them.

Experiential Learning
Students will be engaging in design activities in class.

Important Dates:

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
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<tbody>
<tr>
<td>Sept x, 2021</td>
<td>First day of Fall classes</td>
</tr>
<tr>
<td>Sept y, 2021</td>
<td>Last day for making changes in registration for first-term courses (100% tuition credit).</td>
</tr>
<tr>
<td>Nov zz, 2021</td>
<td>Fall Break (Week 11)</td>
</tr>
<tr>
<td>Nov xx, 2021</td>
<td>Last day to withdraw from Fall classes</td>
</tr>
<tr>
<td>Thanksgiving</td>
<td>Holidays</td>
</tr>
<tr>
<td>Dec yy, 2021</td>
<td>Last day of classes</td>
</tr>
</tbody>
</table>

Required Resources
There will be no textbook for this course. Course notes and references to other online resources will constitute the required reference materials. The Library will also put useful reference materials and texts on reserve.

Students will be required to have: a logbook (as specified in class), and a laptop computer which conforms to the USask First Year Engineering Laptop Specifications.

Policies on Academic Dishonesty, Academic Appeals and Course Delivery:
Students are expected to undertake all aspects of their academic work in an ethical manner. Students are expected to submit their own individual work for academic credit, properly cite the work of others, and to follow all rules for examinations. Academic misconduct, plagiarism, and cheating will not be tolerated. Students are responsible for understanding the university’s policies on academic integrity and academic misconduct. If any form of academic misconduct is discovered, appropriate disciplinary action will be taken.


Additional policies and procedures related to student conduct and appeals are provided on the University Secretariat website ([www.usask.ca/secretariat/student-conduct-appeals](http://www.usask.ca/secretariat/student-conduct-appeals)) and on the University website [http://www.usask.ca/integrity/](http://www.usask.ca/integrity/).

A summary of University of Saskatchewan policies relating to academic courses is provided in the document: *Academic Courses Policy on Class Delivery, Examinations, and Assessment of Student Learning* ([http://policies.usask.ca/policies/academic-affairs/academic-courses.php](http://policies.usask.ca/policies/academic-affairs/academic-courses.php)).

**Integrity Defined (from the Office of the University Secretary)**

The University of Saskatchewan is committed to the highest standards of academic integrity and honesty. Students are expected to be familiar with these standards regarding academic honesty and to uphold the policies of the University in this respect. Students are particularly urged to familiarize themselves with the provisions of the Student Conduct & Appeals section of the University Secretary Website and avoid any behavior that could potentially result in suspicions of cheating, plagiarism, misrepresentation of facts and/or participation in an offence. Academic dishonesty is a serious offence and can result in suspension or expulsion from the University.


For more information on what academic integrity means for students see the Academic Integrity section of the University Library Website at: [https://library.usask.ca/academic-integrity#AboutAcademicIntegrity](https://library.usask.ca/academic-integrity#AboutAcademicIntegrity)

You are encouraged to complete the Academic Integrity Tutorial to understand the fundamental values of academic integrity and how to be a responsible scholar and member of the USask community - [https://library.usask.ca/academic-integrity.php#AcademicIntegrityTutorial](https://library.usask.ca/academic-integrity.php#AcademicIntegrityTutorial)

**Safety:**

Safety is of paramount importance in the College of Engineering. Students are expected to work in a safe and responsible manner, to follow all safety instructions, and use any specified personal protective equipment. Students failing to behave in a safe manner will be asked to leave.

**Emergency Response Plan:**

Preparing for emergencies protects our lives and property. An emergency response plan (ERP) posting is located in each classroom and lab near the main door of the room. Students are advised to review and be familiar with the College ERP and be aware that when an alarm sounds for more than 10 seconds, the building must be evacuated. Muster point locations are posted at each entrance of the Engineering Building. For more details about the ERP, please visit the following website: [https://engineering.usask.ca/documents/facilities/ERP%20-%20ENG%20-%20v%2005%20-%2009_01_2017.pdf](https://engineering.usask.ca/documents/facilities/ERP%20-%20ENG%20-%20v%2005%20-%2009_01_2017.pdf)
**Recording Lectures:**
Lectures will be recorded, when possible, and made available to students in Blackboard so students can rewatch them as needed for study purposes.

**Copyright:**
Course materials are provided to students based on their registration in a class. Any materials created by course instructors is the intellectual property of the instructors. This includes exams, tests, PowerPoint/PDF slides and other course notes. Additionally, other copyright-protected materials created by textbook publishers and authors may be provided to students based on license terms and educational exceptions in the Canadian Copyright Act (see http://laws-lois.justice.gc.ca/eng Acts/C-42/index.html).

Before copying or distributing others' copyright-protected materials, students need to ensure that their use of materials is covered under the University's Fair Dealing Copyright Guidelines available at http://www.usask.ca/copyright/basics/copyright-policy/fair-dealing-guidelines/index.php. For example, posting others' copyright-protected materials on the internet is not covered under the University's Fair Dealing Copyright Guidelines; doing so requires permission from the copyright holder. For more information about copyright, please visit http://www.usask.ca/copyright/students/rights/index.php or contact the University's Copyright Coordinator at copyright.coordinator@usask.ca.

Students should be aware that a violation of the university’s copyright policies could be an instance of non-academic misconduct. For example, the practice of uploading or posting copyright-protected materials to course-sharing websites, depositories, or “drop boxes”, without the permission of the copyright holder, could result in a charge of non-academic misconduct under the university's “Standard of Student Conduct in Non-Academic Matters”, found at the following location: https://secretariat.usask.ca/student-conduct-appeals/non-academic-misconduct.php.

**Student Conduct:**
Ethical behaviour is an important part of engineering practice. Each professional engineering association has a Code of Ethics, which its members are expected to follow. Since students are in the process of becoming Professional Engineers, it is expected that students will conduct themselves in an ethical manner.

The APEGS (Association of Professional Engineers and Geoscientists of Saskatchewan) Code of Ethics states that engineers shall “conduct themselves with fairness, courtesy and good faith towards clients, colleagues, employees and others; give credit where it is due and accept, as well as give, honest and fair professional criticism” (Section 20(e), The Engineering and Geoscience Professions Regulatory Bylaws, 1997).

The first part of this statement discusses an engineer’s relationships with their colleagues. One of the ways in which engineering students can demonstrate courtesy to their colleagues is by helping to maintain an atmosphere that is conducive to learning, and minimizing disruptions in class. This includes arriving on time for lectures, turning cell phones and other electronic devices off during lectures, not leaving or entering the class at inopportune times, and refrain from talking to others while the instructor is talking.

**Access and Equity Services (AES) for Students**
Students who have disabilities (learning, medical, physical, or mental health) are strongly encouraged to register with Access and Equity Services (AES) if they have not already done so.
Students who suspect they may have disabilities should contact AES for advice and referrals at any time. Those students who are registered with AES with mental health disabilities and who anticipate that they may have responses to certain course materials or topics, should discuss course content with their instructors prior to course add / drop dates. In order to access AES programs and supports, students must follow AES policy and procedures. For more information or advice, visit https://students.usask.ca/health/centres/access-equity-services.php, or contact AES at 306-966-7273 or aes@usask.ca.

Students registered with AES may request alternative arrangements for mid-term and final examinations or module tests. Students must arrange such accommodations through AES by the stated deadlines. Instructors shall provide the examinations for students who are being accommodated by the deadlines established by AES.

Support Services for Engineering Students:
- Engineering Student Centre (Rm. 2A05 Engineering Building)
  - Email: esc@usask.ca; Phone: 306-966-5274;
  - https://engineering.usask.ca/contact_info/esc-office.php

End-of-day help sessions will be offered by the College of Engineering for the Common First Year and will provide support for all courses. Please see End-of-day Help Sessions for more details.

Student Learning Services
Student Learning Services (SLS) offers assistance to U of S undergrad and graduate students. For information on specific services, please see the SLS web site https://library.usask.ca/studentlearning/.

Teaching, Learning and Student Experience
The Teaching, Learning and Student Experience Unit (TLSE) focuses on providing developmental and support services and programs to students and the university community. For more information, see https://students.usask.ca/. Specific resources include:
- Student Wellness Centre (3rd & 4th Floors, Place Riel): https://students.usask.ca/health/
- Financial Services: https://students.usask.ca/money/
College of Engineering Attribute Mapping:
This information shows the relationship of the learning outcomes of this course to the graduate attributes intended upon students’ completion of the degree program. This information is used for accreditation purposes.

<table>
<thead>
<tr>
<th>Instructional Level</th>
<th>A1</th>
<th>A2</th>
<th>A3</th>
<th>A4</th>
<th>A5</th>
<th>A6</th>
<th>A7</th>
<th>A8</th>
<th>A9</th>
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<tr>
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<tr>
<td>1.2</td>
<td>D</td>
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<td>D</td>
<td>I</td>
<td>I</td>
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</tr>
</tbody>
</table>

†Attributes:
A1 A knowledge base for engineering
A2 Problem analysis
A3 Investigation
A4 Design
A5 Use of engineering tools
A6 Individual and team work
A7 Communication skills
A8 Professionalism
A9 Impact of engineering on society and the environment
A10 Ethics and equity
A11 Economics and project management
A12 Life-long learning

‡Instructional Level:
Introduced (I) – Students learn the working vocabulary of the area of content, along with some of the major underlying concepts.
Developed (D) – Students use their working vocabulary and major fundamental concepts to probe more deeply, to read the literature, and to deepen their exploration of the concepts. They may begin to practice, extend, or refine knowledge in familiar contexts.
Applied (A) – Students approach mastery in the area of content. They explore deeply into the discipline and experience the controversies, debate, and uncertainties that characterize the leading edges of any field. They practice, extend, or refine knowledge in unfamiliar contexts.

Accreditation Unit (AU) Mapping: (% of total class AU)

<table>
<thead>
<tr>
<th>Math</th>
<th>Natural Science</th>
<th>Complementary Studies</th>
<th>Engineering Science</th>
<th>Engineering Design</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100%</td>
</tr>
</tbody>
</table>

Accreditation Data Collection and Privacy:
Undergraduate programs in the College of Engineering are accredited by the Canadian Engineering Accreditation Board. Student performance data may be collected in this course to support accreditation and continuous program improvement processes. Anonymous samples of student work may also be collected for accreditation purposes. All data provided to the accreditation body or external entities is anonymized and reported in aggregate form to protect your information and identity. If you have any concerns about how your personal information is used or maintained, please contact the Associate Dean Academic, College of Engineering.
1. Approval by Department Head or Dean
   1.1 College or School with academic authority: College of Engineering
   1.2 Department with academic authority: Associate Dean, Academic Office
   1.3 Term from which the course is effective: 202105

2. Information required for the Catalogue
   2.1 Label & Number of course: GE 143
   2.2 Academic credit units: 2
   2.3 Course Long Title (maximum 100 characters): Design II
       Course Short Title (maximum 30 characters): Design II
   2.4 Total Hours: Lecture 21 Seminar Lab 21 Tutorial Other
   2.5 Weekly Hours: Lecture Seminar Lab Tutorial Other
   2.6 Term in which it will be offered: T1 T2 T1 or T2 T1 and T2
   2.7 Prerequisite:

   If there is a prerequisite waiver, who is responsible for signing it?
   D – Instructor/Dept Approval
   H – Department Approval (Associate Dean, Academic)
   I – Instructor Approval

2.8 Catalogue description (150 words or less):

   This course introduces students to Engineering Design, building on the Design I course. Design II
   focuses on the later stages of conceptual design characterized by ideation, concept evaluation,
   and concept selection. In groups, students will undertake one of a set of design problems from a
   variety of engineering disciplines, including multidisciplinary problems. Ultimately, students will
   implement a proof of concept of their solution, and they will present their progress in a Design
   Recommendation Report.

   2.9 Do you allow this course to be repeated for credit? No

3. Please list rationale for introducing this course: This is part of the integrated curriculum in the
   redesigned first year program.

4. Please list the learning objectives for this course:
The course consists of one module: **Design II**. By the end of this course, students will be expected to:

**1.0 Design II**

<table>
<thead>
<tr>
<th>Module Grade Weights</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1 - define/recognize/compare key terms and concepts in Engineering Design, 15%</td>
</tr>
<tr>
<td>1.2 - develop and characterize a basic engineering design problem, 10%</td>
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<td>1.3 - develop feasible conceptual solutions to basic engineering design problems, 20%</td>
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<tr>
<td>1.5 - maintain an effective design logbook, 15%</td>
</tr>
<tr>
<td>1.6 - construct basic project management documents/systems, and 10%</td>
</tr>
<tr>
<td>1.7 - reflect on how to improve their design work &amp; experiences. 10%</td>
</tr>
</tbody>
</table>

5. **Impact of this course**

Are the programs of other departments or Colleges affected by this course? No

If so, were these departments consulted? (Include correspondence)

Were any other departments asked to review or comment on the proposal? Yes, within the College and we worked with the Gwenna Moss Centre for Teaching and Learning.

6. **Other courses or program affected** (please list course titles as well as numbers)

6.1 Courses to be deleted? GE 101, GE 111, GE 121, GE 124, GE 125 (for Fall 2021)

6.2 Courses for which this course will be a prerequisite?

Any changes to the course prerequisites in the programs will be submitted in future UCC.

6.3 Is this course to be required by your majors, or by majors in another program? Required for Engineering Students as part of the Common First Year.

7. **Course outline**

(Weekly outline of lectures or include a draft of the course information sheet.)

See attached syllabus.

8. **Enrolment**

8.1 Expected enrollment: up to 600

8.2 From which colleges? Engineering

9. **Student evaluation**

Give approximate weighting assigned to each indicator (assignments, laboratory work, mid-term test, final examination, essays or projects, etc.)

Please see syllabus.

9.1 How should this course be graded?

C – Completed Requirements
9.2 Is the course exempt from the final examination? Yes

10. **Required text**
Include a bibliography for the course: N/A

11. **Resources**
11.1 Proposed instructor: Engineering Faculty
11.2 How does the department plan to handle the additional teaching or administrative workload? Within College/department budget – these courses will be replacing others.
11.3 Are sufficient library or other research resources available for this course? Yes, Course notes and references to other online resources will constitute the required reference materials. The Library will also put useful reference materials and texts on reserve.
11.4 Are any additional resources required (library, audio-visual, technology, etc.)? N/A

12. **Tuition**
12.1 Will this course attract tuition charges? If so, how much? (use tuition category) TC07
12.2 Does this course require non-standard fees, such as materials or excursion fees? If so, please include an approved “Application for New Fee or Fee Change Form”
http://www.usask.ca/sesd/info-for-instructors/program-course-preparation.php#course-fees
No

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**Detailed Course Information**

1. **Schedule Types**
Please choose the Schedule Types that can be used for sections that fall under this course:

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CL</td>
<td>Clinical</td>
<td>PRB</td>
<td>Problem Session</td>
</tr>
<tr>
<td>COO</td>
<td>Coop Class</td>
<td>RDG</td>
<td>Reading Class</td>
</tr>
<tr>
<td>FLD</td>
<td>Field Trip</td>
<td>RES</td>
<td>Research</td>
</tr>
<tr>
<td>ICR</td>
<td>Internet Chat Relay</td>
<td>ROS</td>
<td>Roster (Dent Only)</td>
</tr>
<tr>
<td>IHP</td>
<td>Internet Help</td>
<td>SEM</td>
<td>Seminar</td>
</tr>
<tr>
<td>IN1</td>
<td>Internship - Education</td>
<td>SSI</td>
<td>Supervised Self Instruction</td>
</tr>
<tr>
<td>IN2</td>
<td>Internship - CMPT &amp; EPIP</td>
<td>STU</td>
<td>Studio</td>
</tr>
<tr>
<td>IN3</td>
<td>Internship - General</td>
<td>SUP</td>
<td>Teacher Supervision</td>
</tr>
<tr>
<td>IND</td>
<td>Independent Studies</td>
<td>TEL</td>
<td>Televised Class</td>
</tr>
</tbody>
</table>

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2. Course Attributes
Please highlight the attributes that should be attached to the course (they will apply to all sections):

2.1 NOAC No Academic Credit
0 Credit Unit courses that possess “deemed” CUs (Called Operational Credit Units). NOAC causes the system to roll 0 academic credit units to academic history.

2.2 For the College of Arts and Science only: To which program type does this course belong?
   FNAR Fine Arts
   HUM Humanities
   SCIE Science
   SOCS Social Science
   ARNP No Program Type (Arts and Science)

3. Registration Information (Note: multi-term courses cannot be automated as corequisites)
   3.1 Permission Required: No
   3.2 Restriction(s): course only open to students in a specific college, program/degree, major, year in program
       College of Engineering only
   3.3 Prerequisite(s): course(s) that must be completed prior to the start of this course
   3.4 Prerequisite(s) or Corequisite(s): course(s) that can be completed prior to or taken at the same time as this course
       GE 103- Introduction to Engineering II, GE 133 – Engineering Communication II, GE 142 – Design I
   3.5 Corequisite(s): course(s) that must be taken at the same time as this course
   3.6 Notes: recommended courses, repeat restrictions/content overlap, other additional information

4. List Equivalent Course(s) here:
An equivalent course can be used in place of the course for which this form is being completed, specifically for the purposes of prerequisite and degree audit checking. Credit will be given for only one of the equivalent courses.

4.1 If this is a recently-repurposed course number, please list the courses that are no longer considered to be equivalent:

*Please note: If the equivalent courses carry an UNEQUAL number of credit units, DegreeWorks will automatically enforce the following, unless otherwise stated:

- If a 3 credit unit course is considered to be equivalent to a 6 credit unit course, it will fulfill the 6 credit unit requirement and the student will not have to complete another 3 credit units toward the overall number of required credit units for the program.
• If a 6 credit unit course is considered to be equivalent to a 3 credit unit course, ALL 6 of the credit units may be used to fulfill the 3 credit unit requirement.

5. List Mutually-Exclusive Course(s) here:
Mutually exclusive courses have similar content such that students cannot receive credit for both.

5.1 If this is a recently-repurposed course number, please list the courses that are no longer considered to be mutually exclusive:

*Please note: SiRIUS cannot enforce a situation where the exclusion goes only one way.

6. Additional Notes:
Land Acknowledgement
At the University of Saskatchewan, we acknowledge we are on Treaty Six Territory and the Homeland of the Métis. We pay our respect to the First Nation and Métis ancestors of this place and reaffirm our relationship with one another.

Instructors and Teaching Assistants:
- Name: TBD
- Office: TBD
- Phone: TBD
- Email: TBD

Office Hours: TBD

Lectures:
- Weeks: 32-34
- Classes:
  - Week 32: six 1.5 hr lectures
  - Week 33: four 1.5 hr lectures
  - Week 34: four 1.5 hr lectures
  (for a total of 14 lectures)

Laboratories:
- Weeks: 32-34
- Labs:
  - Week 32: two 3 hr labs
  - Week 33: two 3 hr labs
  - Week 34: three 3 hr labs
  (for a total of 7 labs)

Website:
Assignments, solutions, lab schedules, general course information, and announcements will be posted on the course website (PAWS/Blackboard). Students are responsible for keeping up-to-date with the information on the course website. https://bblearn.usask.ca/

End-of-Day Help Sessions
End-of-day help sessions will be offered by the College of Engineering for the Common First Year and will provide support for all courses.

Design II will have an end-of-day help session twice a week on Tuesdays and Thursdays in Weeks 32, 33, and 34.

Description:
This course introduces students to Engineering Design, building on the Design I course. This course focuses on the later stages of conceptual design characterized by ideation, concept evaluation, and concept
In groups, students will undertake one of a set of design problems from a variety of engineering disciplines, including multidisciplinary problems. Ultimately, students will implement a proof of concept of their solution, and they will present their progress in a Design Recommendation Report.

**Pre or co-requisites:**
- GE 103 – Introduction to Engineering II
- GE 133 – Engineering Communication II
- GE 142 – Design I

**Course Reference Numbers (CRNs):**
TBD
Available from the Dynamic Schedule once courses are built
(https://pawnss.usask.ca/ban/bwckschd.p Disp_dyn_sched)

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**Course Learning Outcomes:**
The course consists of one module: **Design II.** By the end of this course, students will be expected to:

1.0 Design II

<table>
<thead>
<tr>
<th>Module Grade Weights</th>
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<td>1.7 - reflect on how to improve their design work. 10%</td>
</tr>
</tbody>
</table>

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**Assessment:**
This course employs a competency-based assessment system. Students must demonstrate competence in certain skills. These skills can be divided into three types (A/B/C).

Type A skills are the most basic and granular for a subject area. In general, this includes the ability to define, recall, recognize, compare, and contrast key terms and concepts. It also includes basic calculations and procedural steps, as appropriate.

Type B skills are basic integrative skills. These include basic types of questions that have been covered in class, and basic execution of more complex skills like project management planning.
Type C skills are integrative skills that depend on the ability to extend the application of what has been learned in class into new domains.

For this class, students will be expected to perform at a 70% success level or higher in Type A and B materials to be considered competent. There will be no minimum performance threshold for Type C material.

As part of competency-based assessment, students will be given more than one opportunity to display competence. Thus, for Type A and B skills, there will be at least two opportunities to exhibit basic competence. These opportunities may be manifested as portions of later assignments replacing performance on earlier assignments (that cover similar skill sets) and/or “Top Up” opportunities. Top Ups will be proctored opportunities to demonstrate skills during optional course-specific help sessions (see End-of-Day Help Sessions) or during optional Top Up help sessions, which are spread throughout the term’s schedule. They may also include supplementary assignments.

For this course, Type A materials include knowledge and very basic skills relevant to engineering design. Type A skills for this module include abilities to define, recognize, and compare key terms and concepts, as well as knowledge of the procedures to carry out basic project management, ideation, evaluation & decision making processes.

Type B skills include basic design skills such as sound logbook maintenance, identifying major features of simple design problems, constructing basic project management tools, generating ideas using ideation techniques, implementing design decision making methods correctly, and making useful proof of concept models.

Type C skills will focus on abilities that more deeply integrate all of the Type A and B skills in order to derive deeper insights into design issues and reflect upon them.

Type A
- 10-15 Minute in-class Quizzes (Weeks 32, 33, 34)
- Top Up opportunities (any Design II Help Session or Top Up Help Session)

Type B/C
- Assignment 1: out Week 32, due Week 32 (problem statement, Gantt/LRC - group)
- Assignment 2: out Week 32, due Week 32 (initial problem definition - group)
- Assignment 3: out Week 32, due Week 33 (concept selection justification - group)
• Assignment 4: out Week 32, due Week 34 (log submission with reflection - individual)
• Assignment 5: out Week 32, due Week 34 (Design Recommendation Report - group)

Type B Top Up opportunities (after Assignment 1, each subsequent assignment can Top Up different learning outcomes from earlier assignments, except for Assignment 4; one Top Up will be offered for Assignment 4 Type B material after the course’s classes are over)

Type C Top Up opportunities (none)

Competence Thresholds
For this course, students must achieve at least 70% overall in the Type A material and at least 70% overall in the Type B material in order to pass the course with a level of “basic competence”. If a student achieves at least 70% in the Type A materials and in the Type B materials, their course mark will be calculated as per the following section (Grade Calculations). If a student fails to achieve at least 70% in either or both of the Type A and B materials, they will receive a maximum grade of 49% for the course.

Grade Calculations
All assessments will be marked on a percentage scale, by type (A/B/C) and by learning outcome e.g. Assignment 4 will have 3 sub-marks (one for LO5 Type B work and one each for Type B and C work for LO7). Each percentage mark will be accompanied by a competency descriptor (exemplary, proficient, basic competency, almost competent, not yet competent).

To arrive at a final mark for Type A skills, each Quiz will be given equal weighting in grade calculations. Performance on a Type A Top Up Quiz will replace the corresponding Quiz mark if the Top Up result is better, or it will be averaged with the current Quiz mark, otherwise.

To arrive at a final mark for Type B skills, start with Assignment 1. Assignment 1’s Type B marks will correspond to performance against LO2 and LO6. Assignment 2’s Type B LO2 mark will replace Assignment 1’s Type B LO2 mark if it is higher. It will be averaged with Assignment 1’s Type B mark otherwise. Assignment 3’s Type B marks will correspond to performance against LO3 and LO4. Likewise, Assignment 4’s Type B marks will correspond to performance against LO5 and LO7. Assignment 5 has Type B elements corresponding to performance against LO2, LO3, LO4, and LO6. For each of these elements, if the mark exceeds Type B marks on earlier assignments for the corresponding LO’s, then Assignment 5’s Type B mark will replace the earlier one. Otherwise, it will be averaged with the earlier one. If a Top Up of
Assignment 4 is needed after the last day of classes for the course, the Top Up will be treated just as Assignment 5 is to earlier assignments.

To arrive at a final mark for the Type C skills, the Type C scores from Assignments 1 to 5 will be used. They cannot be Topped Up.

**Keeping Track of Grades**
Throughout the **Design II** course, students will be able to monitor their progress in three complementary respects:

a) marks on deliverables – students will see how they do on each quiz,
b) marks on Type A/B/C work – students will see how they are doing at each level of material difficulty in the course, and
c) marks on Learning Outcomes – students will see how they are doing against each of the seven learning outcomes as they complete elements of them.

**Attendance and Participation:** Attendance and participation is encouraged/expected, and students will be responsible for what happens in classes e.g. quizzes. However, attendance will not be mandatory (or marked).

**Criteria That Must Be Met to Pass:** See **Assessment (Competency Thresholds)**, above.

**Final Grades:** The final grades will be consistent with the “literal descriptors” specified in the university’s grading system (at the link below, click on “for undergraduate students”).

https://students.usask.ca/academics/grading/grading-system.php

For information regarding appeals of final grades or other academic matters, please visit the Student Conduct and Appeals section of the University Secretary's website:


**Academic Courses Policy:** More information on the Academic Courses Policy on course delivery, examinations and assessment of student learning can be found at:

http://policies.usask.ca/policies/academic-affairs/academic-courses.php

**Learning Charter:** The University of Saskatchewan Learning Charter is intended to define aspirations about the learning experience that the University aims to provide, and the roles to be played in realizing these aspirations by students, instructors and the institution. A copy of the Learning Charter can be found at: https://teaching.usask.ca/about/policies/learning-charter.php
Course Overview:

This Design II course consists of one module. This module will continue to introduce students to Engineering Design, and specifically to the later stages of conceptual design characterized by ideation, concept evaluation, and concept selection. In groups, students will undertake one of a set of design problems from a variety of engineering disciplines, including multidisciplinary problems. They will revisit problem identification, acceptance, definition, and characterization, and then they will move through the remaining stages. Iteration of the design process will take place. Ultimately, students will implement a proof of concept of their solution, and they will present their progress in a Design Recommendation Report. An intensive reflection exercise will conclude the design experience.

Course Content/Schedule:

<table>
<thead>
<tr>
<th>Design I</th>
<th>Approximate Lecture (Lab) Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. TERM WEEK 32</strong></td>
<td>reviewing the value of design, revisiting design processes and logs, introduction to projects, team selection, team assignments, group dynamics, project management review (WBS/LRC) plus Gantt charts, the various aspects of problem definition (problem statements, scope, criteria/objectives, constraints/requirements/specs), initial problem definition, research, Gantt chart/WBS/LRC, researching the design problem, ranking and weighting design objectives, ideation techniques reviewed, design documentation, refine problem definition, ideation, Assignments 1 and 2, Quiz 1</td>
</tr>
<tr>
<td><strong>2. TERM WEEK 33</strong></td>
<td>refine problem definition, ideation, logs and Gantt charts revisited, evaluating concepts (STARE), modeling, decision making methods, decision making methods, proofs of concept, prototypes, concept selection, peer evaluations, intermediate/preliminary/configuration design, iteration in design within and between levels, fail early fail often at this stage, redoing the initial stages, proof of concept design, introduction to Design Proposal Reports, Assignment 3, Quiz 2</td>
</tr>
<tr>
<td><strong>3. TERM WEEK 34</strong></td>
<td>redo design from start, proof of concept design, Design Recommendation Reports, intellectual property primer, proof of concept building, peer editing, learnings from proof of concept models, incorporating into reports, editing session, Report hand-in, proof of concept displays, reflection, Assignments 4 and 5, Quiz 3</td>
</tr>
</tbody>
</table>

Assignments: (see Assessment)
Quizzes: (see Assessment)

Late Assignments/Missed Quizzes:
Late assignments/missed quizzes will receive a mark of zero. However, Quizzes can be Topped Up during help sessions, and late assignments can usually be Topped Up by subsequent assignments (see above). Type B Top Ups subsequent to the course will be permitted at the discretion of the instructor.

In the case of sickness, bereavement or other excusable absences, students will not be penalized for late submissions although they may be required to complete a variation on the original assignment. They can alternatively choose to treat a missed assignment as a Late Assignment.

Examinations/Module Tests:
This course will not have examinations or Module Tests.

Required Activities Outside of Class Time
This course will not have required activities outside of class time. However, Top Up assessments will be available in optional end-of-day course-specific help sessions (see End-of-Day Help Sessions), if students wish to use them.

Experiential Learning
Students will be engaging in design activities in class.

Important Dates:

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan x, 2022</td>
<td>First day of Winter classes</td>
</tr>
<tr>
<td>Jan y, 2022</td>
<td>Last day for making changes in registration for second-term courses (100% tuition credit).</td>
</tr>
<tr>
<td>Feb zz, 2022</td>
<td>Winter Break (Week 25)</td>
</tr>
<tr>
<td>Feb xx, 2022</td>
<td>Last day to withdraw from Winter classes</td>
</tr>
<tr>
<td>Easter</td>
<td>Holidays</td>
</tr>
<tr>
<td>Apr yy, 2022</td>
<td>Last day of classes</td>
</tr>
</tbody>
</table>

Required Resources
There will be no textbook for this course. Course notes and references to other online resources will constitute the required reference materials. The Library will also put useful reference materials and texts on reserve.

Students will be required to have: a logbook (as specified in class), and a laptop computer which conforms to the USask First Year Engineering Laptop Specifications.
Policies on Academic Dishonesty, Academic Appeals and Course Delivery:
Students are expected to undertake all aspects of their academic work in an ethical manner. Students are expected to submit their own individual work for academic credit, properly cite the work of others, and to follow all rules for examinations. Academic misconduct, plagiarism, and cheating will not be tolerated. Students are responsible for understanding the university's policies on academic integrity and academic misconduct. If any form of academic misconduct is discovered, appropriate disciplinary action will be taken.


For information regarding appeals of a final grade or other academic matters, please consult the University Council document on Student Appeals of Evaluation, Grading and Academic Standing (http://policies.usask.ca/policies/student-affairs-and-activities/student-appeals.php).

Additional policies and procedures related to student conduct and appeals are provided on the University Secretariat website (www.usask.ca/secretariat/student-conduct-appeals) and on the University website http://www.usask.ca/integrity/.

A summary of University of Saskatchewan polices relating to academic courses is provided in the document: Academic Courses Policy on Class Delivery, Examinations, and Assessment of Student Learning (http://policies.usask.ca/policies/academic-affairs/academic-courses.php).

Integrity Defined (from the Office of the University Secretary)
The University of Saskatchewan is committed to the highest standards of academic integrity and honesty. Students are expected to be familiar with these standards regarding academic honesty and to uphold the policies of the University in this respect. Students are particularly urged to familiarize themselves with the provisions of the Student Conduct & Appeals section of the University Secretary Website and avoid any behavior that could potentially result in suspicions of cheating, plagiarism, misrepresentation of facts and/or participation in an offence. Academic dishonesty is a serious offence and can result in suspension or expulsion from the University.

All students should read and be familiar with the Regulations on Academic Student Misconduct (https://secretariat.usask.ca/student-conduct-appeals/academic-misconduct.php) as well as the Standard of Student Conduct in Non-Academic Matters and Procedures for Resolution of Complaints and Appeals (https://secretariat.usask.ca/student-conduct-appeals/academic-misconduct.php#IXXIIAPPEALS)

For more information on what academic integrity means for students see the Academic Integrity section of the University Library Website at: https://library.usask.ca/academic-integrity#AboutAcademicIntegrity

You are encouraged to complete the Academic Integrity Tutorial to understand the fundamental values of academic integrity and how to be a responsible scholar and member of the USask community - https://library.usask.ca/academic-integrity.php#AcademicIntegrityTutorial
Safety:
Safety is of paramount importance in the College of Engineering. Students are expected to work in a safe and responsible manner, to follow all safety instructions, and use any specified personal protective equipment. Students failing to behave in a safe manner will be asked to leave.

Emergency Response Plan:
Preparing for emergencies protects our lives and property. An emergency response plan (ERP) posting is located in each classroom and lab near the main door of the room. Students are advised to review and be familiar with the College ERP and be aware that when an alarm sounds for more than 10 seconds, the building must be evacuated. Muster point locations are posted at each entrance of the Engineering Building. For more details about the ERP, please visit the following website: https://engineering.usask.ca/documents/facilities/ERP%20-%20ENG%20-%20v%205%20-%2009_01_2017.pdf

Recording Lectures:
Lectures will be recorded, when possible, and made available to students in Blackboard so students can rewatch them as needed for study purposes.

Copyright:
Course materials are provided to students based on their registration in a class. Any materials created by course instructors is the intellectual property of the instructors. This includes exams, tests, PowerPoint/PDF slides and other course notes. Additionally, other copyright-protected materials created by textbook publishers and authors may be provided to students based on license terms and educational exceptions in the Canadian Copyright Act (see http://laws-lois.justice.gc.ca/eng/acts/C-42/index.html).

Before copying or distributing others’ copyright-protected materials, students need to ensure that their use of materials is covered under the University’s Fair Dealing Copyright Guidelines available at http://www.usask.ca/copyright/basics/copyright-policy/fair-dealing-guidelines/index.php. For example, posting others’ copyright-protected materials on the internet is not covered under the University’s Fair Dealing Copyright Guidelines; doing so requires permission from the copyright holder. For more information about copyright, please visit http://www.usask.ca/copyright/students/rights/index.php or contact the University’s Copyright Coordinator at copyright.coordinator@usask.ca.

Students should be aware that a violation of the university’s copyright policies could be an instance of non-academic misconduct. For example, the practice of uploading or posting copyright-protected materials to course-sharing websites, depositories, or “drop boxes”, without the permission of the copyright holder, could result in a charge of non-academic misconduct under the university’s “Standard of Student Conduct in Non-Academic Matters”, found at the following location: https://secretariat.usask.ca/student-conduct-appeals/non-academic-misconduct.php.

Student Conduct:
Ethical behaviour is an important part of engineering practice. Each professional engineering association has a Code of Ethics, which its members are expected to follow. Since students are in the process of becoming Professional Engineers, it is expected that students will conduct themselves in an ethical manner.

The APEGs (Association of Professional Engineers and Geoscientists of Saskatchewan) Code of Ethics states that engineers shall “conduct themselves with fairness, courtesy and good faith
towards clients, colleagues, employees and others; give credit where it is due and accept, as well as
give, honest and fair professional criticism” (Section 20(e), The Engineering and Geoscience
Professions Regulatory Bylaws, 1997).

The first part of this statement discusses an engineer's relationships with their colleagues. One
of the ways in which engineering students can demonstrate courtesy to their colleagues is by helping
to maintain an atmosphere that is conducive to learning, and minimizing disruptions in class. This
includes arriving on time for lectures, turning cell phones and other electronic devices off during
lectures, not leaving or entering the class at inopportune times, and refraining from talking to others
while the instructor is talking.

Access and Equity Services (AES) for Students
Students who have disabilities (learning, medical, physical, or mental health) are strongly
couraged to register with Access and Equity Services (AES) if they have not already done so. Students who suspect they may have disabilities should contact AES for advice and referrals at any
time. Those students who are registered with AES with mental health disabilities and who anticipate
that they may have responses to certain course materials or topics, should discuss course content
with their instructors prior to course add / drop dates. In order to access AES programs and
supports, students must follow AES policy and procedures. For more information or advice, visit
https://students.usask.ca/health/centres/access-equity-services.php, or contact AES at 306-966-7273 or aes@usask.ca.

Students registered with AES may request alternative arrangements for mid-term and final
examinations or module tests. Students must arrange such accommodations through AES by the
stated deadlines. Instructors shall provide the examinations for students who are being
accommodated by the deadlines established by AES.

Support Services for Engineering Students:
- Engineering Student Centre (Rm. 2A05 Engineering Building)
  - Email: esc@usask.ca; Phone: 306-966-5274;
  - https://engineering.usask.ca/contact_info/esc-office.php

End-of-day help sessions will be offered by the College of Engineering for the Common First Year
and will provide support for all courses. Please see End-of-day Help Sessions for more details.

Student Learning Services
Student Learning Services (SLS) offers assistance to U of S undergrad and graduate students. For
information on specific services, please see the SLS web site
https://library.usask.ca/studentlearning/.

Teaching, Learning and Student Experience
The Teaching, Learning and Student Experience Unit (TLSE) focuses on providing developmental
and support services and programs to students and the university community. For more
information, see https://students.usask.ca/. Specific resources include:
- Student Wellness Centre (3rd & 4th Floors, Place Riel): https://students.usask.ca/health/
- Financial Services: https://students.usask.ca/money/
College of Engineering Attribute Mapping:
This information shows the relationship of the learning outcomes of this course to the graduate
attributes intended upon students’ completion of the degree program. This information is used for
accreditation purposes.

<table>
<thead>
<tr>
<th>Learning Outcome</th>
<th>A1</th>
<th>A2</th>
<th>A3</th>
<th>A4</th>
<th>A5</th>
<th>A6</th>
<th>A7</th>
<th>A8</th>
<th>A9</th>
<th>A10</th>
<th>A11</th>
<th>A12</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>I</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>1.2</td>
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<td>D</td>
<td>D</td>
<td>D</td>
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<td></td>
</tr>
<tr>
<td>1.3</td>
<td>I</td>
<td>I</td>
<td>I</td>
<td>D</td>
<td>I</td>
<td>I</td>
<td>I</td>
<td>I</td>
<td>I</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.4</td>
<td>I</td>
<td>I</td>
<td>D</td>
<td>D</td>
<td>I</td>
<td>I</td>
<td>I</td>
<td>I</td>
<td>I</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.5</td>
<td>D</td>
<td>D</td>
<td>D</td>
<td>D</td>
<td>D</td>
<td>D</td>
<td>D</td>
<td>D</td>
<td>D</td>
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</tr>
<tr>
<td>1.6</td>
<td>I</td>
<td>I</td>
<td>I</td>
<td>D</td>
<td>I</td>
<td>D</td>
<td>I</td>
<td>D</td>
<td>D</td>
<td>I,D</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.7</td>
<td>I</td>
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</tr>
</tbody>
</table>

†Attributes:
A1 A knowledge base for engineering
A2 Problem analysis
A3 Investigation
A4 Design
A5 Use of engineering tools
A6 Individual and team work
A7 Communication skills
A8 Professionalism
A9 Impact of engineering on society and the environment
A10 Ethics and equity
A11 Economics and project management
A12 Life-long learning

‡Instructional Level:
Introduced (I) – Students learn the working vocabulary of the area of content, along with some of the major underlying concepts.
Developed (D) – Students use their working vocabulary and major fundamental concepts to probe more deeply, to read the literature, and to deepen their exploration of the concepts. They may begin to practice, extend, or refine knowledge in familiar contexts.
Applied (A) – Students approach mastery in the area of content. They explore deeply into the discipline and experience the controversies, debate, and uncertainties that characterize the leading edges of any field. They practice, extend, or refine knowledge in unfamiliar contexts.

Accreditation Unit (AU) Mapping: (% of total class AU)

<table>
<thead>
<tr>
<th>Math</th>
<th>Natural Science</th>
<th>Complementary Studies</th>
<th>Engineering Science</th>
<th>Engineering Design</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>100%</td>
<td></td>
</tr>
</tbody>
</table>

Accreditation Data Collection and Privacy:
Undergraduate programs in the College of Engineering are accredited by the Canadian Engineering Accreditation Board. Student performance data may be collected in this course to support accreditation and continuous program improvement processes. Anonymous samples of student work may also be collected for accreditation purposes. All data provided to the accreditation body or external entities is anonymized and reported in aggregate form to protect your information and identity. If you have any concerns about how your personal information is used or maintained, please contact the Associate Dean Academic, College of Engineering.
1. Approval by Department Head or Dean
   1.1 College or School with academic authority: College of Engineering
   1.2 Department with academic authority: Associate Dean, Academic Office
   1.3 Term from which the course is effective: 202105

2. Information required for the Catalogue
   2.1 Label & Number of course: GE 152
   2.2 Academic credit units: 1
   2.3 Course Long Title (maximum 100 characters): Electrical Circuits I
       Course Short Title (maximum 30 characters): Electrical Circuits I
   2.4 Total Hours: Lecture 16.5  Seminar  Lab 9  Tutorial  Other
   2.5 Weekly Hours: Lecture  Seminar  Lab  Tutorial  Other
   2.6 Term in which it will be offered: T1  T2  T1 or T2  T1 and T2
   2.7 Prerequisite:

If there is a prerequisite waiver, who is responsible for signing it?
D – Instructor/Dept Approval
H – Department Approval (Associate Dean, Academic)
I – Instructor Approval

2.8 Catalogue description (150 words or less):

This course includes two concurrent modules. Module 1 introduces students to basic properties of direct-current electrical circuits: voltage, current, resistance and power. Students will learn to analyze series and parallel resistive direct-current circuits by applying: Kirchoff’s laws, Ohm’s law, mesh and node analysis, superposition and Thevenin’s and Norton’s Theorems. Module 2 introduces students to computation and programming using Matlab. Students will learn the Matlab interface and how to conduct I/O, plot data in 2 and 3 dimensions and solve linear systems using matrix data types. Students will apply programming skills to create programs and user-defined functions. Students will be introduced to advanced features available in Matlab.

2.9 Do you allow this course to be repeated for credit? No

3. Please list rationale for introducing this course: This is part of the integrated curriculum in the redesigned first year program.

4. Please list the learning objectives for this course:
### Module 1: Electrical Circuits I

<table>
<thead>
<tr>
<th>Learning Outcome Number</th>
<th>By the end of Module 1, students will be expected to:</th>
<th>Outcome Weight (By Module)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>identify and define fundamental electrical circuit concepts,</td>
<td>5%</td>
</tr>
<tr>
<td>1.2</td>
<td>draw and interpret resistive direct-current (DC) circuit diagrams,</td>
<td>10%</td>
</tr>
<tr>
<td>1.3</td>
<td>apply Kirchoff’s Voltage Law, Kirchoff’s Current Law and Ohm’s Law to Conduct Basic Resistive DC Circuit Analysis</td>
<td>30%</td>
</tr>
<tr>
<td>1.4</td>
<td>calculate Electrical Power Flow in Simple Resistive DC Circuits, and</td>
<td>15%</td>
</tr>
<tr>
<td>1.5</td>
<td>apply node analysis, mesh analysis, the principle of superposition, Thevenin’s theorem and Norton’s theorem to Conduct Intermediate Resistive DC Circuit Analysis</td>
<td>40%</td>
</tr>
</tbody>
</table>

### Module 2: Matlab

<table>
<thead>
<tr>
<th>Learning Outcome Number</th>
<th>By the end of Module 1, students will be expected to:</th>
<th>Outcome Weight (By Module)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1</td>
<td>define, recognize, and compare key terms and features in Matlab,</td>
<td>10%</td>
</tr>
<tr>
<td>2.2</td>
<td>navigate the Matlab interface and use it as a powerful calculator,</td>
<td>5%</td>
</tr>
<tr>
<td>2.3</td>
<td>plot 2D and 3D data (in code and using Wizards),</td>
<td>10%</td>
</tr>
<tr>
<td>2.4</td>
<td>implement display and file I/O,</td>
<td>10%</td>
</tr>
<tr>
<td>2.5</td>
<td>create user-defined functions, and</td>
<td>10%</td>
</tr>
<tr>
<td>2.6</td>
<td>code basic programs in Matlab.</td>
<td>55%</td>
</tr>
</tbody>
</table>

5. **Impact of this course**

Are the programs of other departments or Colleges affected by this course? No
If so, were these departments consulted? (Include correspondence)
Were any other departments asked to review or comment on the proposal? Yes, within the College and we worked with the Gwenna Moss Centre for Teaching and Learning.

6. **Other courses or program affected** (please list course titles as well as numbers)
   6.1 Courses to be deleted? GE 101, GE 111, GE 121, GE 124, GE 125 (for Fall 2021)
   6.2 Courses for which this course will be a prerequisite?
Any changes to the course prerequisites in the programs will be submitted in future UCC.
6.3 Is this course to be required by your majors, or by majors in another program? Required for Engineering Students as part of the Common First Year.

7. **Course outline**
(Weekly outline of lectures or include a draft of the course information sheet.)

See attached syllabus.

8. **Enrolment**
   8.1 Expected enrollment: up to 600
   8.2 From which colleges? Engineering

9. **Student evaluation**
Give approximate weighting assigned to each indicator (assignments, laboratory work, mid-term test, final examination, essays or projects, etc.)

Please see syllabus.

9.1 How should this course be graded?
   C – Completed Requirements
   *(Grade options for instructor: Completed Requirements, Fail, IP In Progress)*
   N – Numeric/Percentage
   *(Grade options for instructor: grade of 0% to 100%, IP in Progress)*
   P – Pass/Fail
   *(Grade options for instructor: Pass, Fail, In Progress)*
   S – Special
   *(Grade options for instructor: NA – Grade Not Applicable) If other, please specify:

9.2 Is the course exempt from the final examination? Yes

10. **Required text**
Include a bibliography for the course:

    **Module 1: Electrical Circuits I**


    **Module 2: Matlab**
11. Resources
11.1 Proposed instructor: Engineering Faculty
11.2 How does the department plan to handle the additional teaching or administrative workload? Within College/department budget – these courses will be replacing others.
11.3 Are sufficient library or other research resources available for this course? Yes, course notes and references to other online resources will constitute the required reference materials. The Library will also put useful reference materials and texts on reserve.
11.4 Are any additional resources required (library, audio-visual, technology, etc.)? N/A

12. Tuition
12.1 Will this course attract tuition charges? If so, how much? (use tuition category) TC07
12.2 Does this course require non-standard fees, such as materials or excursion fees? If so, please include an approved “Application for New Fee or Fee Change Form”
http://www.usask.ca/sesd/info-for-instructors/program-course-preparation.php#course-fees
No

Detailed Course Information

1. Schedule Types
Please choose the Schedule Types that can be used for sections that fall under this course:

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CL</td>
<td>Clinical</td>
<td>PRB</td>
<td>Problem Session</td>
</tr>
<tr>
<td>COO</td>
<td>Coop Class</td>
<td>RDG</td>
<td>Reading Class</td>
</tr>
<tr>
<td>FLD</td>
<td>Field Trip</td>
<td>RES</td>
<td>Research</td>
</tr>
<tr>
<td>ICR</td>
<td>Internet Chat Relay</td>
<td>ROS</td>
<td>Roster (Dent Only)</td>
</tr>
<tr>
<td>IHP</td>
<td>Internet Help</td>
<td>SEM</td>
<td>Seminar</td>
</tr>
<tr>
<td>IN1</td>
<td>Internship - Education</td>
<td>SSI</td>
<td>Supervised Self Instruction</td>
</tr>
<tr>
<td>IN2</td>
<td>Internship - CMPT &amp; EPIP</td>
<td>STU</td>
<td>Studio</td>
</tr>
<tr>
<td>IN3</td>
<td>Internship - General</td>
<td>SUP</td>
<td>Teacher Supervision</td>
</tr>
<tr>
<td>IND</td>
<td>Independent Studies</td>
<td>TEL</td>
<td>Televised Class</td>
</tr>
<tr>
<td>LAB</td>
<td>Laboratory</td>
<td>TUT</td>
<td>Tutorial</td>
</tr>
<tr>
<td>LC</td>
<td>Lecture/Clinical (Dent Only)</td>
<td>WEB</td>
<td>Web Based Class</td>
</tr>
<tr>
<td>LEC</td>
<td>Lecture</td>
<td>XCH</td>
<td>Exchange Program</td>
</tr>
<tr>
<td>LL</td>
<td>Lecture/Laboratory (Dent Only)</td>
<td>XGN</td>
<td>Ghost Schedule Type Not Applicable</td>
</tr>
<tr>
<td>MM</td>
<td>Multimode</td>
<td>XHS</td>
<td>High School Class</td>
</tr>
<tr>
<td>PCL</td>
<td>Pre-Clinical (Dent Only)</td>
<td>XNA</td>
<td>Schedule Type Not Applicable</td>
</tr>
<tr>
<td>PRA</td>
<td>Practicum</td>
<td>XNC</td>
<td>No Academic Credit</td>
</tr>
</tbody>
</table>

2. Course Attributes
Please highlight the attributes that should be attached to the course (they will apply to all sections):
2.1 NOAC No Academic Credit
0 Credit Unit courses that possess “deemed” CUs (Called Operational Credit Units). NOAC causes the system to roll 0 academic credit units to academic history.

2.2 For the College of Arts and Science only: To which program type does this course belong?
   - FNAR Fine Arts
   - HUM Humanities
   - SCIE Science
   - SOCS Social Science
   - ARNP No Program Type (Arts and Science)

3. Registration Information (Note: multi-term courses cannot be automated as corequisites)
   3.1 Permission Required: No
   3.2 Restriction(s): course only open to students in a specific college, program/degree, major, year in program
   College of Engineering only
   3.3 Prerequisite(s): course(s) that must be completed prior to the start of this course
   3.4 Prerequisite(s) or Corequisite(s): course(s) that can be completed prior to or taken at the same time as this course
   - GE 102 – Introduction to Engineering I
   - MATH 133- Engineering Math I
   - CMPT 142- Introduction to Computer Science for Engineers
   3.5 Corequisite(s): course(s) that must be taken at the same time as this course
   3.6 Notes: recommended courses, repeat restrictions/content overlap, other additional information

4. List Equivalent Course(s) here: EE204
An equivalent course can be used in place of the course for which this form is being completed, specifically for the purposes of prerequisite and degree audit checking. Credit will be given for only one of the equivalent courses.

4.1 If this is a recently-repurposed course number, please list the courses that are no longer considered to be equivalent:

*Please note: If the equivalent courses carry an UNEQUAL number of credit units, DegreeWorks will automatically enforce the following, unless otherwise stated:

- If a 3 credit unit course is considered to be equivalent to a 6 credit unit course, it will fulfill the 6 credit unit requirement and the student will not have to complete another 3 credit units toward the overall number of required credit units for the program.
- If a 6 credit unit course is considered to be equivalent to a 3 credit unit course, ALL 6 of the credit units may be used to fulfill the 3 credit unit requirement.

5. List Mutually-Exclusive Course(s) here:
Mutually exclusive courses have similar content such that students cannot receive credit for both.

5.1 If this is a recently-repurposed course number, please list the courses that are no longer considered to be mutually exclusive:

*Please note: SiRIUS cannot enforce a situation where the exclusion goes only one way.
6. Additional Notes:
GE 152.1
Electrical Circuits I
Fall 2021

Land Acknowledgement
At the University of Saskatchewan, we acknowledge we are on Treaty Six Territory and the Homeland of the Métis. We pay our respect to the First Nation and Métis ancestors of this place and reaffirm our relationship with one another.

Instructors and Teaching Assistants:
Name: TBD
Office: TBD
Phone: TBD
Email: TBD

Office Hours: TBD

Lectures: Electrical Circuits
Weeks: 8-14 (excluding 11)
Classes: One 1.5 hr class in Week 8, Two 1.5 hr classes per week, in Weeks 9-14 (a total of 11 classes)

Laboratories: Matlab
Weeks: 8-14 (excluding 11)
Classes: One 1.5 hr class per week, in Weeks 8-14 (a total of 6 classes)

Website: Assignments, solutions, lab schedules, general course information, and announcements will be posted on the course website (PAWS/Blackboard). Students are responsible for keeping up-to-date with the information on the course website. [https://bblearn.usask.ca/](https://bblearn.usask.ca/)

End-of-Day Help Sessions
End of day help session sessions will be offered by the College of Engineering for the Common First Year and will provide support for all courses.

**Electrical Circuits** and **Matlab** each have an end-of-day help session once a week on Wednesdays in Weeks 8, 9, 10, 12, 13, and 14.

Description:
This course includes two concurrent modules. Module 1 introduces students to basic properties of direct-current electrical circuits: voltage, current, resistance and power. Students will learn to analyze series and parallel resistive direct-current circuits by applying: Kirchhoff’s laws, Ohm’s law, mesh and node analysis, superposition and Thevenin’s and Norton’s Theorems. Module 2 introduces students to computation and programming using **Matlab**. Students will learn the Matlab interface and how to conduct I/O, plot data in 2 and 3
dimensions and solve linear systems using matrix data types. Students will apply programming skills to create programs and user-defined functions. Students will be introduced to advanced features available in Matlab.

**Pre or co-requisites:**
- GE 102 – Introduction to Engineering I
- MATH 133 – Engineering Math I
- CMPT 142 – Introduction to Computer Science for Engineers

**Course Reference Numbers (CRNs):** TBD
Available from the Dynamic Schedule once courses are built (https://pawnss.usask.ca/ban/bwckschd.p_disp_dyn_sched)

---

### Module 1: Electrical Circuits I

<table>
<thead>
<tr>
<th>Learning Outcome Number</th>
<th>By the end of Module 1, students will be expected to:</th>
<th>Outcome Weight (By Module)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>identify and define fundamental electrical circuit concepts,</td>
<td>5%</td>
</tr>
<tr>
<td>1.2</td>
<td>draw and interpret resistive direct-current (DC) circuit diagrams,</td>
<td>10%</td>
</tr>
<tr>
<td>1.3</td>
<td>apply Kirchhoff’s Voltage Law, Kirchhoff’s Current Law and Ohm’s Law to Conduct Basic Resistive DC Circuit Analysis,</td>
<td>30%</td>
</tr>
<tr>
<td>1.4</td>
<td>calculate Electrical Power Flow in Simple Resistive DC Circuits, and</td>
<td>15%</td>
</tr>
<tr>
<td>1.5</td>
<td>apply node analysis, mesh analysis, the principle of superposition, Thevenin’s theorem and Norton’s theorem to Conduct Intermediate Resistive DC Circuit Analysis.</td>
<td>40%</td>
</tr>
</tbody>
</table>

**Course Learning Outcomes:**

**Module 2: Matlab**

<table>
<thead>
<tr>
<th>Learning Outcome Number</th>
<th>By the end of Module 1, students will be expected to:</th>
<th>Outcome Weight (By Module)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1</td>
<td>define, recognize, and compare key terms and features in Matlab,</td>
<td>10%</td>
</tr>
<tr>
<td>2.2</td>
<td>navigate the Matlab interface and use it as a powerful calculator,</td>
<td>5%</td>
</tr>
<tr>
<td>2.3</td>
<td>plot 2D and 3D data (in code and using Wizards),</td>
<td>10%</td>
</tr>
<tr>
<td>2.4</td>
<td>implement display and file I/O,</td>
<td>10%</td>
</tr>
</tbody>
</table>

67% of overall course grade

33% of overall course grade
<table>
<thead>
<tr>
<th>2.5</th>
<th>create user-defined functions, and</th>
<th>10%</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.6</td>
<td>code basic programs in Matlab.</td>
<td>55%</td>
</tr>
</tbody>
</table>

**Assessment:** This course employs a competency-based assessment scheme. Students must demonstrate competence in certain skills in each module. These skills can be divided into three types (A/B/C).

Type A skills are the most basic and granular for a subject area. In general, this includes the ability to define, recall, recognize, compare, and contrast key terms and concepts. It also includes basic calculations and procedural steps.

Type B skills are basic integrative skills. These include basic types of questions that have been covered in class.

Type C skills are integrative skills that depend on the ability to extend the application of what has been learned in class, into new domains.

For this class, students will be expected to perform at a 70% success level or higher in Type A and B skills to be considered competent. There will be no minimum performance threshold for Type C skills.

As part of competency-based assessment, students will be given more than one opportunity to display competence. Thus, for Type A and B skills, there will be at least two opportunities to exhibit basic competence. These opportunities may be manifested as portions of later assignments replacing performance on earlier assignments (that cover similar skill sets) and/or “Top Up” opportunities. Top Ups will be proctored opportunities to demonstrate skills during optional course-specific help sessions (see End-of-Day Help Sessions) or during optional Top Up Help Sessions, which are spread throughout the term’s schedule.

Note that the final course grade will be a weighted average of the achieved grades in each module. See Course Learning Outcomes for relative weights of each module.

**Module 1: Electrical Circuits**
Type A skills are vital to any success in analyzing resistive DC circuits. Type A skills for this module include recognizing relevant terms, symbols and units and performing isolated calculations involving Ohm’s law and Kirchhoff’s laws.
Type B skills include conducting analysis of simple circuits by applying Ohm’s law, Kirchhoff’s laws, voltage and current dividers, node analysis, mesh analysis and superposition.

Type C skills include conducting analysis of more complex circuits by applying Ohm’s law, Kirchhoff’s laws, voltage and current dividers, node analysis, mesh analysis, superposition, Thevenin’s Theorem and Norton’s Theorem.

Type A
- Assignment 1: out Week 8, Due Week 9 -> Topped up by Quiz 1 (Week 9) (Electrical properties, symbols, terms, units)
- Assignment 2: out Week 9, Due Week 10 -> Topped up by Quiz 2 (Week 10) (Ohm’s law, Kirchhoff’s Laws, Circuit Diagrams)
- Assignment 3: out Week 10, Due Week 12 -> Topped up by Quiz 3 (Week 12) (Equivalent Sources, Voltage/Current Divider)
- Assignment 4: out Week 12, Due Week 13 -> Topped up by Quiz 4 (Week 13) (Power Terms and Units)

*Type A portion of all Quizzes can be Topped Up during End-of-Day Help Sessions or Top Up Help Sessions.*

Type B
- Assignment 2: out Week 9, Due Week 10 -> Topped up by Quiz 2 (Week 10) (Application of Ohm’s law, Kirchhoff’s Laws)
- Assignment 3: out Week 10, Due Week 12 -> Topped up by Quiz 3 (Week 12) (Basic Circuit Analysis)
- Assignment 4: out Week 12, Due Week 13 -> Topped up by Quiz 4 (Week 13) (Power Flow, Equivalent Resistances/Circuits)
- Assignment 5: out Week 13, Due Week 14 -> Topped up by Quiz 5 (Week 14) (Mesh and Node Analysis, Superposition, Thevenin’s and Norton’s Theorem)
- Module Test: Week 15 (Basic and Intermediate Circuit Analysis, Power Flow Analysis – Type B/C)

*Type B portion of all Quizzes can be Topped Up during End-of-Day Help Sessions or Top Up Help Sessions. One Type B Top Up for the Module Test will be announced subsequent to classes ending in the course.*

Type C
- Assignment 3: out Week 10, Due Week 12 (Basic circuit analysis)
- Assignment 4: out Week 12, Due Week 13 (Power Flow, Equivalent Resistances/Circuits)
- Assignment 5: out Week 13, Due Week 14 (Mesh and Node Analysis, Superposition, Thevenin’s and Norton’s Theorem)
Module 2: Matlab

Type A skills are vital to any success in using Matlab as a computational tool and/or a programming environment. Type A skills for Matlab include abilities to define, recognize, and compare key terms and Matlab features, as well as abilities to navigate the Matlab interface and use Matlab as a command-line computational tool.

Type B skills include basic Matlab programming skills such as abilities to iterate and make decisions, plot data (in code or using Wizards), import or export data from/to files or the screen, and create user-defined functions.

Type C skills will focus on abilities to integrate all of the Type A and B skills in order to solve more complex and practical problems.

Type A

- 10 Minute Quizzes (Weeks 9, 10, 12, 13)
- Assignment 1: out Week 8, due Week 9 (online, Type A, covering Matlab navigation, the Matlab GUI, and basic command-line computation)

*Top Up opportunities (any Matlab Help session or Top Up Help session)*

Type B

- Assignment 2: out Week 9, due Week 10 (Type B; basic programming questions using logic, iteration and decision making)
- Assignment 3: out Week 10, due Week 12 (Type B/C; mix of basic and more challenging programming involving random numbers and linear systems)
- Assignment 4: out Week 12, due Week 13 (Type B/C; mix of basic and more challenging programming involving display of input/output and file I/O)
- Module Test: an evening in Week 15 (Type B/C; mix of basic and more challenging programming involving anything covered in the course, including 2D/3D plotting)

*Top Up opportunities (after Assignment 2, subsequent assignments and MT can Top Up different learning outcomes from earlier assignments, as per instructions on the Assignments themselves). One Type B Top Up for the Module Test will be announced subsequent to classes ending in the course.*
Type C

- Assignment 3: out Week 10, due Week 12 (Type B/C; mix of basic and more challenging programming involving random numbers and linear systems)
- Assignment 4: out Week 12, due Week 13 (Type B/C; mix of basic and more challenging programming involving display of input/output and file I/O)
- Module Test: an evening in Week 15 (Type B/C; mix of basic and more challenging programming involving anything covered in the course, including 2D/3D plotting)

Top Up opportunities (none)

Competence Thresholds
A “module mark” (out of 100) will be calculated for each of the modules in the course. For each module, students must achieve at least 70% overall in the Type A skills and at least 70% overall in the Type B skills in order to pass the module with a level of “basic competence”. If a student achieves at least 70% in a module’s Type A skills and in a module’s Type B skills, their module mark will be calculated as per the following section (Grade Calculations). If a student fails to achieve at least 70% in either or both of the Type A and B skills, they will receive a maximum grade of 49% for the module.

If a student achieves at least 70% in the Type A and B skills in both modules, their course mark will be a weighted average of the two module marks. If a student fails to achieve “basic competence” in one module, they will fail the course, receiving an overall grade of 49%, or their calculated grade, whichever is lower. However, if they choose to redo the course in the future, they will be given credit for the module they did pass (at the discretion of the instructor), with the passing mark that they did achieve (unless they want to redo the module for a better mark). If a student fails to achieve "basic competence" in both modules, they will fail the course and will be required to redo both modules in the future.

Electrical Circuits Grade Calculations
All assessments will be marked on a percentage scale, by type (A/B/C) and by learning outcome e.g. Assignment 2 will have 3 sub-marks (one for each of LO1.2 (Type A) and LO1.3 (1 Type A and 1 Type B)). Each percentage mark will be accompanied by a competency descriptor (exemplary, proficient, basic competence, almost competent, not yet competent).

To calculate the grade for Type A skills, Type A grades from questions on Assignments 1 through 4 will be applied against the respective
learning outcome(s) they each assess. After each assessment, a student’s Type A Running Average for each learning outcome is recalculated. If the Type A skills for a given learning outcome are assessed on the current assessment, and the achieved grade is greater than the Type A Running Average for that learning outcome, it becomes the new Type A Running Average for that learning outcome. If the Type A skills for a given learning outcome are assessed on the current assessment, and the grade achieved is less than the Type A Running Average for that learning outcome, the new Type A Running Average for that learning outcome is a simple mean of the current Running Average and the Type A grade on the current assessment. The repetition of material on the weekly assignments in the following week’s quizzes allows for predictable weekly Top Up opportunities on all Type A skills. Type A content on quizzes can be Topped Up in end-of-day help sessions and Top Up help sessions and Type A grades in those Top Ups are further applied as described above.

The grade for Type B skills is calculated in the same manner as described for Type A skills, but they will be assessed on Assignments 2 through 5 and their respective follow-up quizzes. Type B content on quizzes can be Topped Up in end-of-day help sessions and Top Up help sessions and Type B grades in those Top Ups are further applied as described above. The module test will also include Type B questions which provides an additional opportunity for students to improve their grade on Type B content for learning outcomes that include Type B assessments. Type B content covered on the module test can be further Topped Up after the course ends, if required. Only one opportunity to Top Up the Type B content on the module test will be permitted.

To calculate the grade for Type C skills, the Type C scores from Assignments 3, 4 and 5 and the Module Test will be used. They cannot be Topped Up (quizzes will only include Type A and B questions). Instead, a Type C percentage will be established for each learning outcome that has Type C assessments. Applying the weights of each learning outcome, a final Type C percentage score for the module will be calculated.

**Matlab Grade Calculations**
All assessments will be marked on a percentage scale, by type (A/B/C) and by learning outcome e.g. Assignment 4 will have 4 sub-marks (one for each of LO2.4 and LO2.5, and two for LO2.6 – one part Type B, one part Type C). Each percentage mark will be accompanied by a competency descriptor (exemplary, proficient, basic competence, almost competent, not yet competent).
To arrive at a final mark for Type A skills, note that all Type A skills are covered in Quizzes and Assignment 1, and that Quizzes and Assignment 1 only cover Type A skills. Also, each Quiz has equal weight in grade calculations and Assignment 1 will have the weight of one Quiz. Performance on a Type A Top Up (for a specific Quiz or Assignment 1) will replace the corresponding Quiz/Assignment 1 mark if the Top Up result is better, or it will be averaged with the current Quiz/Assignment 1 mark, otherwise.

To arrive at a final mark for Type B skills, first note that Assignment 2’s mark will correspond to performance against LO6. Any subsequent assignment with a Type B assessment that is evaluated against LO6 will either replace earlier marks for LO2.6 that are lower, or the Type B marks will be averaged with prior marks that are higher. For example, the Type B mark from Assignment 3 will replace Assignment 2’s marks for LO2.6 if the Type B mark from Assignment 3 is higher, or it will be averaged with the Assignment 2 mark if it is lower. Assignment 4 contains parts that correspond to performance against LO2.4, LO2.5 and LO2.6. Similar to Assignment 3, Assignment 4’s Type B LO2.6 component can therefore replace Assignment 2’s and/or 3’s marks for LO2.6 if it is higher, or the Type B mark will be averaged with the Assignment 2 and 3 (Type B) marks if it is lower. The same would be true for the Type B LO2.6 portion of the Module Test.

To arrive at a final mark for the Type C skills, the Type C scores from Assignments 3 and 4 and the Module Test will be used. They cannot be Topped Up. Instead, a Type C percentage will be established for each Learning Outcome that has Type C assessments. Applying the weights of each Learning Outcome, a final Type C percentage score will be calculated.

**Keeping Track of Grades**

Throughout each module in the course, students will be able to monitor their progress in three complementary respects, for each module:

- marks on deliverables – students will see how they did on each assignment/quiz
- marks on Type A/B/C work – students will see how they are doing at each level of skill difficulty in the course, and
- marks on Learning Outcomes – students will see how they are doing against each of the learning outcomes for each module, as they complete elements of them.

**Attendance and Participation:** Attendance and participation is encouraged/expected, and students will be responsible for what happens in classes e.g. quizzes. However, attendance will not be mandatory (or marked).
Criteria That Must Be Met to Pass:

See Assessment (Competence Thresholds), above.

Final Grades:
The final grades will be consistent with the “literal descriptors” specified in the university’s grading system (at the link below, click on “for undergraduate students”).

https://students.usask.ca/academics/grading/grading-system.php

For information regarding appeals of final grades or other academic matters, please visit the Student Conduct and Appeals section of the University Secretary’s website:


Academic Courses Policy:
More information on the Academic Courses Policy on course delivery, examinations and assessment of student learning can be found at:

http://policies.usask.ca/policies/academic-affairs/academic-courses.php

Learning Charter:
The University of Saskatchewan Learning Charter is intended to define aspirations about the learning experience that the University aims to provide, and the roles to be played in realizing these aspirations by students, instructors and the institution. A copy of the Learning Charter can be found at:  https://teaching.usask.ca/about/policies/learning-charter.php

Course Overview:

This course is divided into 2 modules: Module 1 focuses on resistive direct-current circuit analysis and makes up the lecture portion of the course. Module 2 focuses on programming and computation using Matlab and makes up the laboratory portion of the course. The modules run concurrently, but cover independent topics. The content covered in the lectures will not directly relate to the content covered in the labs each week.

Module 1: Electrical Circuits will introduce students to the analysis of basic, resistive direct-current (DC) electrical circuits. Students will learn the basic terminology, units and symbols used when analyzing resistive DC circuits. Students will analyze various resistive DC circuit networks by applying, Kirchhoff’s current law, Kirchhoff’s voltage law, Ohm’s law, mesh analysis, node analysis and superposition. This will include the application of Matlab to solve systems of linear equations arising from circuit analysis. Students will learn the basic concepts of electrical power and how to analyze power flow in resistive DC circuits. Students will practice creating equivalent representations of circuits, including combining sources and resistive elements/networks and applying Thevenin’s theorem and Norton’s theorem. By the end of the module, students will become competent in interpreting and representing information in circuit diagrams and applying various methods of analyzing resistive DC circuits.
Module 2: Matlab will introduce students to Matlab, and to programming in Matlab. Students will learn how to orient themselves in Matlab and how to navigate the Matlab environment for the purposes of command line interaction. They will become familiar with the matrix organization of Matlab and how to set up, modify, and operate on matrix data types. Students will learn how to set up and solve linear systems, plot 2D and 3D data, and conduct file I/O in Matlab. Building on their knowledge of Python, students will review basic programming constructs (loops, decision making structures, functions) and implement them in Matlab. They will learn about the Matlab/Simulink world and how to find and use resources to continue their professional development in Matlab programming. Students will complete a number of programming problems from a variety of engineering and natural science disciplines, as they learn how to program in Matlab. By the end of the module, students will become competent users of Matlab and competent basic Matlab programmers.

<table>
<thead>
<tr>
<th>WEEK of Program</th>
<th>Lecture Topic – Module 1 (Circuits)</th>
<th>Approx. Lecture Hours</th>
<th>Lab Topic – Module 2 (Matlab)</th>
<th>Approx. Lab Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>WEEK 8</td>
<td>1. Properties of Electrical Circuits 1.1 Terminology 1.2 Symbols 1.3 Units 2. Electrical Sources and Loads 2.1 Voltage 2.2 Current 2.3 Resistance</td>
<td>1.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1. Introduction to Matlab 1.1 User Environment 1.2 Graphical User Interface 1.3 Command-line Computation 2. Creating and Addressing Arrays 2.1 Vectors 2.2 Matrices</td>
<td>1.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. Programming Constructs in Matlab 3.1 Relational Operators 3.2 Logical Operators 3.3 Iterative Control Structures 3.4 Decision-making Control Structures</td>
<td>1.5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

ASSIGNMENT 1- DUE
QUIZ 1 (In Class)
LAB ASSIGNMENT 1- DUE
LAB QUIZ 1 (In Class)
| WEEK 10 | 5. Types of Electrical Sources  
5.1 Combining Sources  
6. Basic Resistive DC Circuit Analysis 2  
6.1 Current Dividers  
6.2 Voltage Dividers  
7. Basic Resistive DC Circuit Analysis 3  
7.1 Application and Practice | 4. Array Mathematics  
4.1 Strings  
4.2 Element Operations  
4.3 Solving Systems of Linear Equations  
4.4 Random Number Generation | 3.0 | 1.5 |
| Assignment 2-DUE | LAB ASSIGNMENT 2-DUE | LAB QUIZ 2 (IN CLASS) |
| WEEK 12 | 8. Equivalent Resistances  
8.1 Combining series and parallel resistor networks  
9. Electrical Power and Energy | 5. Inputs and Outputs (I/O)  
5.1 Display I/O  
5.2 File I/O  
6. User-Defined Functions | 3.0 | 1.5 |
| Assignment 3-DUE | LAB ASSIGNMENT 3-DUE | LAB QUIZ 3 (IN CLASS) |
| WEEK 13 | 10. Intermediate Resistive DC Circuit Analysis  
10.1 Node Analysis  
10.2 Mesh Analysis  
10.3 Superposition | 7. Plotting Data  
7.1 2D  
7.2 3D | 3.0 | 1.5 |
| Assignment 4-DUE | LAB ASSIGNMENT 4-DUE | LAB QUIZ 4 (IN CLASS) |
| WEEK 14 | 11. One-Port Network Simplification  
11.1 Thevenin’s Theorem  
11.2 Norton’s Theorem  
11.3 Maximum Power Transfer Theorem | 8. Advanced Features  
8.1 Functions  
8.2 Data Types  
8.3 Toolboxes  
8.4 SimuLink | 3.0 | 1.5 |
| Assignment 5-DUE | LAB QUIZ 5 (IN CLASS) |
| WEEK 15 | Module Test 1 | Module Test 2 |

Assignments: (see Assessment)  
Quizzes: (see Assessment)
Missing Quizzes:
Missed quizzes (for any reason) receive a mark of zero. However, quizzes can be Topped Up during End-of-Day Help Sessions or Top Up Help Sessions.

Late Assignments:
Late assignments receive a mark of zero. However, for Electrical Circuits, assignments can be Topped Up by the following week’s quiz. For Matlab, assignments can be Topped Up by subsequent assignments.

In the case of sickness, bereavement or other excusable absences, students will not be penalized for late submissions although they may be required to complete a variation on the original assignment. They can alternatively choose to treat a missed assignment as a Late Assignment.

Module Tests:

- This course is comprised of 2 modules. Each module will end with a module test conducted outside of class time as a required activity outside class time. The module test will only assess the content of that specific module. The schedule for the Module Tests is:
  - Module 1: Electrical Circuits: Week 15, Day and Time TBD
    - 1.5 hrs, covering only content from Module 1: Electrical Circuits
    - Closed book, 1 formula sheet allowed
    - No electronic devices, including calculators, phones and watches, with document storage and/or communication capabilities allowed
  - Module 2: Matlab: Week 15, Day and Time TBD
    - 1.5 hrs, covering only content from Module 2: Matlab
    - Closed book
    - Laptops are allowed but all external internet capabilities will be disabled
    - No other electronic devices, including calculators, phones and watches, with document storage and/or communication capabilities allowed

- Students should avoid making prior travel, employment, or other commitments at these times. If a student is unable to write a module test through no fault of their own for medical or other acceptable reasons, documentation must be provided and an opportunity to write the missed module test may be given. Students are encouraged to review all examination policies and procedures: http://students.usask.ca/academics/exams.php

- Alternate times to write Module Tests will not be considered except in the case of acceptable reasons, such as illness, bereavement, etc, or a conflict with other university related activities.
- Students planning on registering with the office for Access and Equity Services for Students (AES) must do so in accordance with AES procedures and deadlines.

**Required Activities Outside of Class Time**

The Module Tests are written outside of class time (see Module Test).

Proctored reassessment of work that does not meet the competence threshold may be conducted outside of regularly scheduled class time. This includes rewriting in-class quizzes, redoing other work completed, and submitted, during class time and rewriting module tests. This reassessment will occur during designated Top Up Help Sessions during the day or during course-specific help sessions (see End-of-Day Help Sessions). Students are encouraged to avoid making prior travel, employment, or other commitments at these times to ensure availability to take advantage of these additional opportunities to demonstrate competence in the course learning outcomes.

**Experiential Learning**

Students will be engaging in programming and problem solving in class.

**Important Dates:**

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sept x, 2021</td>
<td>First day of Fall classes</td>
</tr>
<tr>
<td>Sept y, 2021</td>
<td>Last day for making changes in registration for first-term courses (100% tuition credit).</td>
</tr>
<tr>
<td>Nov zz, 2021</td>
<td>Fall Break (Week 11)</td>
</tr>
<tr>
<td>Nov xx, 2021</td>
<td>Last day to withdraw from Fall classes</td>
</tr>
<tr>
<td>Thanksgiving</td>
<td>Holidays</td>
</tr>
<tr>
<td>Dec yy, 2021</td>
<td>Last day of classes</td>
</tr>
</tbody>
</table>

**Required Resources**

**Module 1: Electrical Circuits I**

**Required Textbook:**


Textbooks are available from the University of Saskatchewan Bookstore: [https://bookstore.usask.ca/students.php#MyTextbooks](https://bookstore.usask.ca/students.php#MyTextbooks)

**Other Required Materials:**

A laptop computer which conforms to the Usask First Year Engineering Laptop Specifications.
Course notes and references to other online resources will constitute the required reference materials. The Library will also put useful reference materials and texts on reserve.

**Module 2: Matlab**

**Required Textbook:**

Textbooks are available from the University of Saskatchewan Bookstore: https://bookstore.usask.ca/students.php#MyTextbooks

**Other Required Materials:**

A laptop computer which conforms to the Usask First Year Engineering Laptop Specifications.

Course notes and references to other online resources will constitute the required reference materials. The Library will also put useful reference materials and texts on reserve.

**Electronic Resources:**

Matlab 2021a

**Policies on Academic Dishonesty, Academic Appeals and Course Delivery:**

Students are expected to undertake all aspects of their academic work in an ethical manner. Students are expected to submit their own individual work for academic credit, properly cite the work of others, and to follow all rules for examinations. Academic misconduct, plagiarism, and cheating will not be tolerated. Students are responsible for understanding the university's policies on academic integrity and academic misconduct. If any form of academic misconduct is discovered, appropriate disciplinary action will be taken.


For information regarding appeals of a final grade or other academic matters, please consult the University Council document on Student Appeals of Evaluation, Grading and Academic Standing (http://policies.usask.ca/policies/student-affairs-and-activities/student-appeals.php).

Additional policies and procedures related to student conduct and appeals are provided on the University Secretariat website (www.usask.ca/secretariat/student-conduct-appeals) and on the University website http://www.usask.ca/integrity/.
A summary of University of Saskatchewan polices relating to academic courses is provided in the document: *Academic Courses Policy on Class Delivery, Examinations, and Assessment of Student Learning* ([http://policies.usask.ca/policies/academic-affairs/academic-courses.php](http://policies.usask.ca/policies/academic-affairs/academic-courses.php)).

**Integrity Defined (from the Office of the University Secretary)**
The University of Saskatchewan is committed to the highest standards of academic integrity and honesty. Students are expected to be familiar with these standards regarding academic honesty and to uphold the policies of the University in this respect. Students are particularly urged to familiarize themselves with the provisions of the Student Conduct & Appeals section of the University Secretary Website and avoid any behavior that could potentially result in suspicions of cheating, plagiarism, misrepresentation of facts and/or participation in an offence. Academic dishonesty is a serious offence and can result in suspension or expulsion from the University.


For more information on what academic integrity means for students see the Academic Integrity section of the University Library Website at: [https://library.usask.ca/academic-integrity#AboutAcademicIntegrity](https://library.usask.ca/academic-integrity#AboutAcademicIntegrity).

You are encouraged to complete the Academic Integrity Help session to understand the fundamental values of academic integrity and how to be a responsible scholar and member of the USask community - [https://library.usask.ca/academic-integrity.php#AcademicIntegrityHelp session](https://library.usask.ca/academic-integrity.php#AcademicIntegrityHelp session).

**Safety:**
Safety is of paramount importance in the College of Engineering. Students are expected to work in a safe and responsible manner, to follow all safety instructions, and use any specified personal protective equipment. Students failing to behave in a safe manner will be asked to leave.

**Emergency Response Plan:**
Preparing for emergencies protects our lives and property. An emergency response plan (ERP) posting is located in each classroom and lab near the main door of the room. Students are advised to review and be familiar with the College ERP and be aware that when an alarm sounds for more than 10 seconds, the building must be evacuated. Muster point locations are posted at each entrance of the Engineering Building. For more details about the ERP, please visit the following website: [https://engineering.usask.ca/documents/facilities/ERP%20-%20ENG%20-%20v%2005%2000%20-%202009_01_2017.pdf](https://engineering.usask.ca/documents/facilities/ERP%20-%20ENG%20-%20v%2005%2000%20-%202009_01_2017.pdf).

**Recording Lectures:**
Lectures will be recorded, when possible, and made available to students in Blackboard so students can rewatch them as needed for study purposes.

**Copyright:**
Course materials are provided to students based on their registration in a class. Any materials created by course instructors is the intellectual property of the instructors. This includes exams, tests, PowerPoint/PDF slides and other course notes. Additionally, other copyright-protected materials created by textbook publishers and authors may be provided to students based on license.
Before copying or distributing others’ copyright-protected materials, students need to ensure that their use of materials is covered under the University’s Fair Dealing Copyright Guidelines available at [http://www.usask.ca/copyright/basics/copyright-policy/fair-dealing-guidelines/index.php](http://www.usask.ca/copyright/basics/copyright-policy/fair-dealing-guidelines/index.php). For example, posting others’ copyright-protected materials on the internet is not covered under the University’s Fair Dealing Copyright Guidelines; doing so requires permission from the copyright holder. For more information about copyright, please visit [http://www.usask.ca/copyright/students/rights/index.php](http://www.usask.ca/copyright/students/rights/index.php) or contact the University’s Copyright Coordinator at copyright.coordinator@usask.ca.

Students should be aware that a violation of the university’s copyright policies could be an instance of non-academic misconduct. For example, the practice of uploading or posting copyright-protected materials to course-sharing websites, depositories, or “drop boxes”, without the permission of the copyright holder, could result in a charge of non-academic misconduct under the university’s “Standard of Student Conduct in Non-Academic Matters”, found at the following location: [https://secretariat.usask.ca/student-conduct-appeals/non-academic-misconduct.php](https://secretariat.usask.ca/student-conduct-appeals/non-academic-misconduct.php).

**Student Conduct:**
Ethical behaviour is an important part of engineering practice. Each professional engineering association has a Code of Ethics, which its members are expected to follow. Since students are in the process of becoming Professional Engineers, it is expected that students will conduct themselves in an ethical manner.

The APEGs (Association of Professional Engineers and Geoscientists of Saskatchewan) Code of Ethics states that engineers shall “conduct themselves with fairness, courtesy and good faith towards clients, colleagues, employees and others; give credit where it is due and accept, as well as give, honest and fair professional criticism” (Section 20(e), The Engineering and Geoscience Professions Regulatory Bylaws, 1997).

The first part of this statement discusses an engineer’s relationships with their colleagues. One of the ways in which engineering students can demonstrate courtesy to their colleagues is by helping to maintain an atmosphere that is conducive to learning, and minimizing disruptions in class. This includes arriving on time for lectures, turning cell phones and other electronic devices off during lectures, not leaving or entering the class at inopportune times, and refraining from talking to others while the instructor is talking.

**Access and Equity Services (AES) for Students**
Students who have disabilities (learning, medical, physical, or mental health) are strongly encouraged to register with Access and Equity Services (AES) if they have not already done so. Students who suspect they may have disabilities should contact AES for advice and referrals at any time. Those students who are registered with AES with mental health disabilities and who anticipate that they may have responses to certain course materials or topics, should discuss course content with their instructors prior to course add / drop dates. In order to access AES programs and supports, students must follow AES policy and procedures. For more information or advice, visit [https://students.usask.ca/health/centres/access-equity-services.php](https://students.usask.ca/health/centres/access-equity-services.php), or contact AES at 306-966-7273 or aes@usask.ca.

Students registered with AES may request alternative arrangements for mid-term and final examinations or module tests. Students must arrange such accommodations through AES by the
stated deadlines. Instructors shall provide the examinations for students who are being accommodated by the deadlines established by AES.

Support Services for Engineering Students:
- Engineering Student Centre (Rm. 2A05 Engineering Building)
  - Email: esc@usask.ca; Phone: 306-966-5274; https://engineering.usask.ca/contact_info/esc-office.php

End-of-day help session sessions will be offered by the College of Engineering for the Common First Year and will provide support for all courses. Please see End-of-day Help Sessions for more details.

Student Learning Services
Student Learning Services (SLS) offers assistance to U of S undergrad and graduate students. For information on specific services, please see the SLS web site https://library.usask.ca/studentlearning/.

Teaching, Learning and Student Experience
The Teaching, Learning and Student Experience Unit (TLSE) focuses on providing developmental and support services and programs to students and the university community. For more information, see https://students.usask.ca/. Specific resources include:
- Student Wellness Centre (3rd & 4th Floors, Place Riel): https://students.usask.ca/health/
- Financial Services: https://students.usask.ca/money/

College of Engineering Attribute Mapping:
This information shows the relationship of the learning outcomes of this course to the graduate attributes intended upon students’ completion of the degree program. This information is used for accreditation purposes.

<table>
<thead>
<tr>
<th>Learning Outcome</th>
<th>Attribute†</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A1</td>
</tr>
<tr>
<td>1.1</td>
<td>I</td>
</tr>
<tr>
<td>1.2</td>
<td>I</td>
</tr>
<tr>
<td>1.3</td>
<td>I</td>
</tr>
<tr>
<td>1.4</td>
<td>I</td>
</tr>
<tr>
<td>1.5</td>
<td>I</td>
</tr>
<tr>
<td>2.1</td>
<td></td>
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<tr>
<td>2.2</td>
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<td>2.3</td>
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<td>2.4</td>
<td></td>
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<tr>
<td>2.5</td>
<td></td>
</tr>
<tr>
<td>2.6</td>
<td></td>
</tr>
</tbody>
</table>

†Attributes:
A1 A knowledge base for engineering
A2 Problem analysis
A3 Investigation
A4 Design
A5 Use of engineering tools
A6 Individual and team work
A7 Communication skills
A8 Professionalism

‡Instructional Level:
Introduced (I) – Students learn the working vocabulary of the area of content, along with some of the major underlying concepts.
Developed (D) – Students use their working vocabulary and major fundamental concepts to probe more deeply, to read the literature, and to deepen their exploration of the concepts. They may begin to practice, extend, or refine knowledge in familiar contexts.
A9  Impact of engineering on society and the environment
A10  Ethics and equity
A11  Economics and project management
A12  Life-long learning

Applied (A) – Students approach mastery in the area of content. They explore deeply into the discipline and experience the controversies, debate, and uncertainties that characterize the leading edges of any field. They practice, extend, or refine knowledge in unfamiliar contexts.

Accreditation Unit (AU) Mapping: (% of total class AU)

<table>
<thead>
<tr>
<th>Math</th>
<th>Natural Science</th>
<th>Complementary Studies</th>
<th>Engineering Science</th>
<th>Engineering Design</th>
</tr>
</thead>
<tbody>
<tr>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>100%</td>
<td>0%</td>
</tr>
</tbody>
</table>

Accreditation Data Collection and Privacy:
Undergraduate programs in the College of Engineering are accredited by the Canadian Engineering Accreditation Board. Student performance data may be collected in this course to support accreditation and continuous program improvement processes. Anonymous samples of student work may also be collected for accreditation purposes. All data provided to the accreditation body or external entities is anonymized and reported in aggregate form to protect your information and identity. If you have any concerns about how your personal information is used or maintained, please contact the Associate Dean Academic, College of Engineering.
1. Approval by Department Head or Dean
   1.1 College or School with academic authority: College of Engineering
   1.2 Department with academic authority: Associate Dean, Academic Office
   1.3 Term from which the course is effective: 202105

2. Information required for the Catalogue
   2.1 Label & Number of course: GE 153
   2.2 Academic credit units: 2
   2.3 Course Long Title (maximum 100 characters): Electrical Circuits II
       Course Short Title (maximum 30 characters): Electrical Circuits II
   2.4 Total Hours: Lecture 22.5  Seminar  Lab 6  Tutorial  Other
   2.5 Weekly Hours: Lecture  Seminar  Lab  Tutorial  Other
   2.6 Term in which it will be offered:  T1  T2  T1 or T2  T1 and T2
   2.7 Prerequisite:
       If there is a prerequisite waiver, who is responsible for signing it?
       D – Instructor/Dept Approval
       H – Department Approval (Associate Dean, Academic)
       I – Instructor Approval
   2.8 Catalogue description (150 words or less):
       This course focuses on the analysis of basic alternating-current (AC) electrical circuits and the
       calculation of the flow of real, reactive and apparent power. There is also exploration of other
       electrical engineering topics, including electrical safety, power distribution systems, batteries and
       energy storage, electric motors and generators, and renewable power generation systems.
   2.9 Do you allow this course to be repeated for credit?  No

3. Please list rationale for introducing this course: This is part of the integrated curriculum in the
   redesigned first year program.

4. Please list the learning objectives for this course:

<table>
<thead>
<tr>
<th>Module 1: AC Electrical Circuit Analysis</th>
<th>50% of overall course grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning Outcome Number</td>
<td>By the end of Module 1, students will be expected to:</td>
</tr>
<tr>
<td>-------------------------</td>
<td>-------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>1.1</td>
<td>analyze steady-state DC circuits including resistive, capacitive and inductive elements,</td>
</tr>
<tr>
<td>1.2</td>
<td>characterize AC signals and convert between time-domain and phasor representations,</td>
</tr>
<tr>
<td>1.3</td>
<td>draw and interpret AC circuit diagrams,</td>
</tr>
<tr>
<td>1.4</td>
<td>determine the complex impedance of a circuit containing resistive, capacitive and inductive</td>
</tr>
<tr>
<td></td>
<td>components at different frequencies,</td>
</tr>
<tr>
<td>1.5</td>
<td>analyze basic single-phase AC circuits,</td>
</tr>
<tr>
<td>1.6</td>
<td>calculate real, reactive and apparent power, and power factor, in single-phase AC circuits,</td>
</tr>
<tr>
<td></td>
<td>and</td>
</tr>
<tr>
<td>1.7</td>
<td>apply circuit simulation software to analyze AC circuits.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Learning Outcome Number</th>
<th>By the end of Module 2, students will be expected to:</th>
<th>Outcome Weight (By Module)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1</td>
<td>draw and interpret AC circuit diagrams,</td>
<td>5%</td>
</tr>
<tr>
<td>2.2</td>
<td>analyze ideal transformers in single-phase AC electrical circuits,</td>
<td>10%</td>
</tr>
<tr>
<td>2.3</td>
<td>identify the purpose of elements of practical power transmission and distribution systems,</td>
<td>10%</td>
</tr>
<tr>
<td>2.4</td>
<td>analyze the operation of AC/DC and DC/AC converters,</td>
<td>10%</td>
</tr>
<tr>
<td>2.5</td>
<td>characterize energy storage requirements for a system,</td>
<td>10%</td>
</tr>
<tr>
<td>2.6</td>
<td>design a renewable power generation and storage system,</td>
<td>35%</td>
</tr>
<tr>
<td>2.7</td>
<td>model the operation of simple electric motors and generators, and</td>
<td>10%</td>
</tr>
</tbody>
</table>

Module 2: Selected Topics in Electrical Systems |

<table>
<thead>
<tr>
<th>Learning Outcome Number</th>
<th>By the end of Module 2, students will be expected to:</th>
<th>Outcome Weight (By Module)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1</td>
<td>draw and interpret AC circuit diagrams,</td>
<td>5%</td>
</tr>
<tr>
<td>2.2</td>
<td>analyze ideal transformers in single-phase AC electrical circuits,</td>
<td>10%</td>
</tr>
<tr>
<td>2.3</td>
<td>identify the purpose of elements of practical power transmission and distribution systems,</td>
<td>10%</td>
</tr>
<tr>
<td>2.4</td>
<td>analyze the operation of AC/DC and DC/AC converters,</td>
<td>10%</td>
</tr>
<tr>
<td>2.5</td>
<td>characterize energy storage requirements for a system,</td>
<td>10%</td>
</tr>
<tr>
<td>2.6</td>
<td>design a renewable power generation and storage system,</td>
<td>35%</td>
</tr>
<tr>
<td>2.7</td>
<td>model the operation of simple electric motors and generators, and</td>
<td>10%</td>
</tr>
</tbody>
</table>
2.8 identify safety precautions necessary when working with electricity. 10%

5. **Impact of this course**
   Are the programs of other departments or Colleges affected by this course? No
   If so, were these departments consulted? (Include correspondence)
   Were any other departments asked to review or comment on the proposal? Yes, within the College and we worked with the Gwenna Moss Centre for Teaching and Learning.

6. **Other courses or program affected** (please list course titles as well as numbers)
   6.1 Courses to be deleted? GE 101, GE 111, GE 121, GE 124, GE 125 (for Fall 2021)
   6.2 Courses for which this course will be a prerequisite?
   Any changes to the course prerequisites in the programs will be submitted in future UCC.
   6.3 Is this course to be required by your majors, or by majors in another program? Required for Engineering Students as part of the Common First Year.

7. **Course outline**
   (Weekly outline of lectures or include a draft of the course information sheet.)
   See attached syllabus.

8. **Enrolment**
   8.1 Expected enrollment: up to 600
   8.2 From which colleges? Engineering

9. **Student evaluation**
   Give approximate weighting assigned to each indicator (assignments, laboratory work, mid-term test, final examination, essays or projects, etc.)
   Please see syllabus.

   9.1 How should this course be graded?
   C – Completed Requirements
   (Grade options for instructor: Completed Requirements, Fail, IP In Progress)
   N – Numeric/Percentage
   (Grade options for instructor: grade of 0% to 100%, IP in Progress)
   P – Pass/Fail
   (Grade options for instructor: Pass, Fail, In Progress)
   S – Special
   (Grade options for instructor: NA – Grade Not Applicable) If other, please specify:

   9.2 Is the course exempt from the final examination? Yes

10. **Required text**
    Include a bibliography for the course:
11. **Resources**
   11.1 Proposed instructor: Engineering Faculty
   11.2 How does the department plan to handle the additional teaching or administrative workload? Within College/department budget – these courses will be replacing others.
   11.3 Are sufficient library or other research resources available for this course? Yes.
   11.4 Are any additional resources required (library, audio-visual, technology, etc.)? Circuit Simulation Package TBD, Matlab 2021a

12. **Tuition**
   12.1 Will this course attract tuition charges? If so, how much? (use tuition category) TC07
   12.2 Does this course require non-standard fees, such as materials or excursion fees? If so, please include an approved “Application for New Fee or Fee Change Form”
   http://www.usask.ca/sesd/info-for-instructors/program-course-preparation.php#course-fees
   No

---

**Detailed Course Information**

1. **Schedule Types**
   Please choose the Schedule Types that can be used for sections that fall under this course:

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CL</td>
<td>Clinical</td>
<td>PRB</td>
<td>Problem Session</td>
</tr>
<tr>
<td>COO</td>
<td>Coop Class</td>
<td>RDG</td>
<td>Reading Class</td>
</tr>
<tr>
<td>FLD</td>
<td>Field Trip</td>
<td>RES</td>
<td>Research</td>
</tr>
<tr>
<td>ICR</td>
<td>Internet Chat Relay</td>
<td>ROS</td>
<td>Roster (Dent Only)</td>
</tr>
<tr>
<td>IHP</td>
<td>Internet Help</td>
<td>SEM</td>
<td>Seminar</td>
</tr>
<tr>
<td>IN1</td>
<td>Internship - Education</td>
<td>SSI</td>
<td>Supervised Self Instruction</td>
</tr>
<tr>
<td>IN2</td>
<td>Internship - CMPT &amp; EPIP</td>
<td>STU</td>
<td>Studio</td>
</tr>
<tr>
<td>IN3</td>
<td>Internship - General</td>
<td>SUP</td>
<td>Teacher Supervision</td>
</tr>
<tr>
<td>IND</td>
<td>Independent Studies</td>
<td>TEL</td>
<td>Tevised Class</td>
</tr>
<tr>
<td>LAB</td>
<td>Laboratory</td>
<td>TUT</td>
<td>Tutorial</td>
</tr>
<tr>
<td>LC</td>
<td>Lecture/Clinical (Dent Only)</td>
<td>WEB</td>
<td>Web Based Class</td>
</tr>
<tr>
<td>LEC</td>
<td>Lecture</td>
<td>XCH</td>
<td>Exchange Program</td>
</tr>
<tr>
<td>LL</td>
<td>Lecture/Laboratory (Dent Only)</td>
<td>XGN</td>
<td>Ghost Schedule Type Not Applicable</td>
</tr>
<tr>
<td>MM</td>
<td>Multimode</td>
<td>XHS</td>
<td>High School Class</td>
</tr>
<tr>
<td>PCL</td>
<td>Pre-Clinical (Dent Only)</td>
<td>XNA</td>
<td>Schedule Type Not Applicable</td>
</tr>
<tr>
<td>PRA</td>
<td>Practicum</td>
<td>XNC</td>
<td>No Academic Credit</td>
</tr>
</tbody>
</table>

2. **Course Attributes**
   Please highlight the attributes that should be attached to the course (they will apply to all sections):

   2.1 NOAC No Academic Credit
0 Credit Unit courses that possess “deemed” CUs (Called Operational Credit Units). NOAC causes the system to roll 0 academic credit units to academic history.

2.2 For the College of Arts and Science only: To which program type does this course belong?
- FNAR  Fine Arts
- HUM  Humanities
- SCIE  Science
- SOCS  Social Science
- ARNP  No Program Type (Arts and Science)

3. Registration Information (Note: multi-term courses cannot be automated as corequisites)
   3.1 Permission Required: No
   3.2 Restriction(s): course only open to students in a specific college, program/degree, major, year in program: College of Engineering only
   3.3 Prerequisite(s): course(s) that must be completed prior to the start of this course
   3.4 Prerequisite(s) or Corequisite(s): course(s) that can be completed prior to or taken at the same time as this course
   GE 152- Electrical Circuits I, MATH 134- Engineering Math II, PHYS 156- Electromagnetism and Waves for Engineers
   3.5 Corequisite(s): course(s) that must be taken at the same time as this course
   3.6 Notes: recommended courses, repeat restrictions/content overlap, other additional information

4. List Equivalent Course(s) here: EE204
An equivalent course can be used in place of the course for which this form is being completed, specifically for the purposes of prerequisite and degree audit checking. Credit will be given for only one of the equivalent courses.

   4.1 If this is a recently-repurposed course number, please list the courses that are no longer considered to be equivalent:

*Please note: If the equivalent courses carry an UNEQUAL number of credit units, DegreeWorks will automatically enforce the following, unless otherwise stated:

- If a 3 credit unit course is considered to be equivalent to a 6 credit unit course, it will fulfill the 6 credit unit requirement and the student will not have to complete another 3 credit units toward the overall number of required credit units for the program.
- If a 6 credit unit course is considered to be equivalent to a 3 credit unit course, ALL 6 of the credit units may be used to fulfill the 3 credit unit requirement.

5. List Mutually-Exclusive Course(s) here:
Mutually exclusive courses have similar content such that students cannot receive credit for both.

   5.1 If this is a recently-repurposed course number, please list the courses that are no longer considered to be mutually exclusive:

*Please note: SiRIUS cannot enforce a situation where the exclusion goes only one way.

6. Additional Notes:
### Land Acknowledgement
At the University of Saskatchewan, we acknowledge we are on Treaty Six Territory and the Homeland of the Métis. We pay our respect to the First Nation and Métis ancestors of this place and reaffirm our relationship with one another.

### Instructors and Teaching Assistants:
Name: TBD  
Office: TBD  
Phone: TBD  
Email: TBD  

### Office Hours:
TBD  

### Lectures:
- **Weeks:** 27-31  
- **Classes:** Three 1.5 hr classes per week (a total of 15 classes)

### Laboratories:
- **Weeks:** 27-31  
- **Labs:** One 1.5 hr lab per week (a total of 5 labs)

### Website:
Assignments, solutions, lab schedules, general course information, and announcements will be posted on the course website (PAWS/Blackboard). Students are responsible for keeping up-to-date with the information on the course website. [https://bblearn.usask.ca/](https://bblearn.usask.ca/)

### End-of-Day Help Sessions
End of day help session sessions will be offered by the College of Engineering for the Common First Year and will provide support for all courses.

**Electrical Circuits II** has an end-of-day help session twice per week on Mondays and Fridays in Weeks 27, 28, 29, 30, and 31.

### Description:
This course focuses on the analysis of basic alternating-current (AC) electrical circuits and the calculation of real, reactive, and apparent power. Other electrical engineering topics, including electrical safety, power distribution systems, batteries and energy storage, electric motors and generators, and renewable power generation systems are also explored.

### Pre or co-requisites:
- GE 152.1 – Electrical Circuits I  
- MATH 134.3 – Engineering Math II  
- PHYS 156.3 – Electromagnetism and Waves for Engineers
## Course Reference Numbers (CRNs):

TBD
Available from the Dynamic Schedule once courses are built
(https://pawnss.usask.ca/ban/bwckschd.p_disp_dyn_sched)

### Module 1: AC Electrical Circuit Analysis

<table>
<thead>
<tr>
<th>Learning Outcome Number</th>
<th>By the end of Module 1, students will be expected to:</th>
<th>50% of overall course grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>analyze steady-state DC circuits including resistive, capacitive, and inductive elements,</td>
<td>5%</td>
</tr>
<tr>
<td>1.2</td>
<td>characterize AC signals and convert between time-domain and phasor representations,</td>
<td>10%</td>
</tr>
<tr>
<td>1.3</td>
<td>draw and interpret AC circuit diagrams,</td>
<td>5%</td>
</tr>
<tr>
<td>1.4</td>
<td>determine the complex impedance of a circuit containing resistive, capacitive and inductive components at different frequencies,</td>
<td>10%</td>
</tr>
<tr>
<td>1.5</td>
<td>analyze basic single-phase AC circuits,</td>
<td>40%</td>
</tr>
<tr>
<td>1.6</td>
<td>calculate real, reactive and apparent power, and power factor, in single-phase AC circuits, and</td>
<td>10%</td>
</tr>
<tr>
<td>1.7</td>
<td>apply circuit simulation software to analyze AC circuits.</td>
<td>20%</td>
</tr>
</tbody>
</table>

### Module 2: Selected Topics in Electrical Systems

<table>
<thead>
<tr>
<th>Learning Outcome Number</th>
<th>By the end of Module 2, students will be expected to:</th>
<th>50% of overall course grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1</td>
<td>draw and interpret AC circuit diagrams,</td>
<td>5%</td>
</tr>
<tr>
<td>2.2</td>
<td>analyze ideal transformers in single-phase AC electrical circuits,</td>
<td>10%</td>
</tr>
<tr>
<td>2.3</td>
<td>identify the purpose of elements of practical power transmission and distribution systems,</td>
<td>10%</td>
</tr>
<tr>
<td>2.4</td>
<td>analyze the operation of AC/DC and DC/AC converters,</td>
<td>10%</td>
</tr>
<tr>
<td>2.5</td>
<td>characterize energy storage requirements for a system,</td>
<td>10%</td>
</tr>
<tr>
<td>2.6</td>
<td>design a renewable power generation and storage system,</td>
<td>35%</td>
</tr>
<tr>
<td>2.7</td>
<td>model the operation of simple electric motors and generators, and</td>
<td>10%</td>
</tr>
<tr>
<td>2.8</td>
<td>identify safety precautions necessary when working with electricity.</td>
<td>10%</td>
</tr>
</tbody>
</table>
**Assessment:**
This course employs a competency-based assessment system. Students must demonstrate competence in certain skills in each module. These skills can be divided into three types (A/B/C).

Type A skills are the most basic and granular for a subject area. In general, this includes the ability to define, recall, recognize, compare, and contrast key terms and concepts. It also includes basic calculations and motor skills, as appropriate.

Type B skills are basic integrative skills. These include basic types of questions that have been covered in class.

Type C skills are integrative skills that depend on the ability to extend the application of what has been learned in class, into new domains.

For this class, students will be expected to perform at a 70% success level or higher in Type A and B skills to be considered competent. There will be no minimum performance threshold for Type C skills.

As part of competency-based assessment, students will be given more than one opportunity to display competence. Thus, for Type A and B skills, there will be at least two opportunities to exhibit basic competence. These opportunities may be manifested as portions of later assignments replacing performance on earlier assignments (that cover similar skill sets) and/or “Top Up” opportunities. Top Ups will be proctored opportunities to demonstrate skills during optional course-specific help sessions (see End-of-Day Help Sessions) or during optional Top Up Help Sessions, which are spread throughout the term’s schedule.

Note that the final course grade will be a weighted average of the achieved grades in each module. See Course Learning Outcomes for relative weights of each module.

**Module 1: AC Electrical Circuit Analysis**
Type A skills are vital to any success in analyzing AC electrical circuits. Type A skills for this module include converting time-domain electrical signals into phasor notation and calculating complex impedance values as a function of frequency.

Type B skills include conducting analysis of simple AC electrical circuits, including real, reactive and apparent power, using phasor notation and applying Ohm’s law, Kirchhoff’s laws, voltage and current dividers, node analysis, and mesh analysis.
Type C skills include conducting analysis of more complex circuits by applying Ohm’s law, Kirchhoff’s laws, voltage and current dividers, node analysis, and mesh analysis, and conducting power factor correction calculations.

**Type A**

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Week Out</th>
<th>Week Due</th>
<th>Top Up Opp.</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lab Assign 1</td>
<td>27</td>
<td>27</td>
<td>Help/Top Up Sessions</td>
<td>Simulation Software</td>
</tr>
<tr>
<td>Assign 1</td>
<td>27</td>
<td>28</td>
<td>Quiz 2</td>
<td>AC Signals, RMS, Phasors</td>
</tr>
<tr>
<td>Quiz 2</td>
<td>28</td>
<td>28</td>
<td>Help/Top Up Sessions</td>
<td>AC Signals, RMS, Phasors</td>
</tr>
<tr>
<td>Assign 2</td>
<td>28</td>
<td>29</td>
<td>Module Test 1</td>
<td>Complex Impedance, AC Circuit Diagrams</td>
</tr>
<tr>
<td>Module Test 1</td>
<td>29</td>
<td>29</td>
<td>Help/Top Up Sessions</td>
<td>AC Signals, RMS, Phasors, Complex Impedance</td>
</tr>
</tbody>
</table>

*One Type A Top Up for the Module Test will be announced subsequent to classes ending in the course.*

**Type B**

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Week Out</th>
<th>Week Due</th>
<th>Top Up Opp.</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quiz 1</td>
<td>27</td>
<td>27</td>
<td>Help/Top Up Sessions</td>
<td>Review of Resistive DC Circuit Analysis</td>
</tr>
<tr>
<td>Assign 1</td>
<td>27</td>
<td>28</td>
<td>Quiz 2</td>
<td>Steady-state RL and RC Circuits</td>
</tr>
<tr>
<td>Quiz 2</td>
<td>28</td>
<td>28</td>
<td>Help/Top Up Sessions</td>
<td>Steady-state RL and RC Circuits</td>
</tr>
<tr>
<td>Lab Assign 2</td>
<td>28</td>
<td>28</td>
<td>Lab Assign 3</td>
<td>AC Circuit Simulation</td>
</tr>
<tr>
<td>Assign 2</td>
<td>28</td>
<td>29</td>
<td>Module Test 1</td>
<td>AC Circuit Analysis, AC Circuit Diagrams, AC Power</td>
</tr>
<tr>
<td>Lab Assign 3</td>
<td>29</td>
<td>29</td>
<td>Help/Top Up Sessions</td>
<td>AC Circuit Simulation incl. AC Power</td>
</tr>
<tr>
<td>Module Test 1</td>
<td>29</td>
<td>29</td>
<td>Help/Top Up Sessions</td>
<td>Steady-state DC RL and RC Circuits, AC Circuit Analysis, AC Power</td>
</tr>
</tbody>
</table>

*One Type B Top Up for the Module Test will be announced subsequent to classes ending in the course.*
### Type C

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Week Out</th>
<th>Week Due</th>
<th>Top Up Opp.</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assign 1</td>
<td>27</td>
<td>28</td>
<td>None</td>
<td>Steady-state RL and RC Circuits</td>
</tr>
<tr>
<td>Lab Assign 2</td>
<td>28</td>
<td>28</td>
<td>None</td>
<td>AC Circuit Simulation</td>
</tr>
<tr>
<td>Assign 2</td>
<td>28</td>
<td>29</td>
<td>None</td>
<td>AC Circuit Analysis, AC Circuit Diagrams, AC Power</td>
</tr>
<tr>
<td>Lab Assign 3</td>
<td>29</td>
<td>29</td>
<td>None</td>
<td>AC Circuit Simulation incl. AC Power</td>
</tr>
<tr>
<td>Module Test 1</td>
<td>29</td>
<td>29</td>
<td>None</td>
<td>Steady-state DC RL and RC Circuits, AC Circuit Analysis, AC Power</td>
</tr>
</tbody>
</table>

### Module 2: Selected Topics in Electrical Systems

Type A skills include identification of, and explaining conceptually, various elements in residential and industrial power systems, including transformers, AC/DC conversion, batteries, 3-phase power distribution, renewable power generation, electric motors and generators and electrical safety.

Type B skills include basic circuit analysis and modeling of systems that include components such as idealized transformers, motors and generators, rectifiers, inverters and energy storage elements.

Type C skills will focus on abilities to integrate all of the Type A and B skills in order to solve more complex and practical problems, such as the theoretical design of a renewable power generation and storage system.

### Type A

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Week Out</th>
<th>Week Due</th>
<th>Top Up Opp.</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assign 3</td>
<td>29</td>
<td>30</td>
<td>Quiz 3</td>
<td>Purpose of elements in power distribution systems – transformers, batteries</td>
</tr>
<tr>
<td>Quiz 3</td>
<td>30</td>
<td>30</td>
<td>Help/Top Up Sessions</td>
<td>Purpose of elements in power distribution systems – transformers, batteries</td>
</tr>
<tr>
<td>Assign 4</td>
<td>30</td>
<td>31</td>
<td>Quiz 4</td>
<td>Purpose of elements in power</td>
</tr>
</tbody>
</table>
### Type A

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Week Out</th>
<th>Week Due</th>
<th>Top Up Opp.</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assign 3</td>
<td>29</td>
<td>30</td>
<td>Quiz 3</td>
<td>AC circuit analysis with transformers, AC/DC and DC/AC conversion, battery specifications</td>
</tr>
<tr>
<td>Quiz 3</td>
<td>30</td>
<td>30</td>
<td>Help/Top Up Sessions</td>
<td>AC circuit analysis with transformers, AC/DC and DC/AC conversion, battery specifications</td>
</tr>
<tr>
<td>Assign 5</td>
<td>31</td>
<td>31</td>
<td>Module Test 2</td>
<td>AC circuit analysis of simple models of motors and generators</td>
</tr>
<tr>
<td>Group Project</td>
<td>27</td>
<td>31</td>
<td>Module Test 2</td>
<td>Theoretical Design of a Renewable Power Generation and Storage System</td>
</tr>
<tr>
<td>Lab Assign 4</td>
<td>31</td>
<td>31</td>
<td>Module Test 2</td>
<td>Motor and Generator Modeling</td>
</tr>
<tr>
<td>Module Test 2</td>
<td>32</td>
<td>32</td>
<td>Help/Top Up Sessions</td>
<td>AC circuit analysis with transformers, AC/DC and DC/AC conversion, battery specifications, motor and generator modeling</td>
</tr>
</tbody>
</table>

**One Type A Top Up for the Module Test will be announced subsequent to classes ending in the course.**

### Type B

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Week Out</th>
<th>Week Due</th>
<th>Top Up Opp.</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assign 3</td>
<td>29</td>
<td>30</td>
<td>Quiz 3</td>
<td>AC circuit analysis with transformers, AC/DC and DC/AC conversion, battery specifications</td>
</tr>
<tr>
<td>Quiz 3</td>
<td>30</td>
<td>30</td>
<td>Help/Top Up Sessions</td>
<td>AC circuit analysis with transformers, AC/DC and DC/AC conversion, battery specifications</td>
</tr>
<tr>
<td>Assign 5</td>
<td>31</td>
<td>31</td>
<td>Module Test 2</td>
<td>AC circuit analysis of simple models of motors and generators</td>
</tr>
<tr>
<td>Group Project</td>
<td>27</td>
<td>31</td>
<td>Module Test 2</td>
<td>Theoretical Design of a Renewable Power Generation and Storage System</td>
</tr>
<tr>
<td>Lab Assign 4</td>
<td>31</td>
<td>31</td>
<td>Module Test 2</td>
<td>Motor and Generator Modeling</td>
</tr>
<tr>
<td>Module Test 2</td>
<td>32</td>
<td>32</td>
<td>Help/Top Up Sessions</td>
<td>AC circuit analysis with transformers, AC/DC and DC/AC conversion, battery specifications, motor and generator modeling</td>
</tr>
</tbody>
</table>
One Type B Top Up for the Module Test will be announced subsequent to classes ending in the course.

### Type C

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Week Out</th>
<th>Week Due</th>
<th>Top Up Opp.</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assign 3</td>
<td>29</td>
<td>30</td>
<td>None</td>
<td>AC circuit analysis with transformers, AC/DC and DC/AC conversion, battery specifications</td>
</tr>
<tr>
<td>Assign 5</td>
<td>31</td>
<td>31</td>
<td>None</td>
<td>AC circuit analysis of simple models of motors and generators</td>
</tr>
<tr>
<td>Group Project</td>
<td>27</td>
<td>31</td>
<td>None</td>
<td>Theoretical Design of a Renewable Power Generation and Storage System</td>
</tr>
<tr>
<td>Lab Assign 4</td>
<td>31</td>
<td>31</td>
<td>None</td>
<td>Motor and Generator Modeling</td>
</tr>
<tr>
<td>Module Test 2</td>
<td>32</td>
<td>32</td>
<td>None</td>
<td>AC circuit analysis with transformers, AC/DC and DC/AC conversion, battery specifications, motor and generator modeling</td>
</tr>
</tbody>
</table>

### Competence Thresholds

A “module mark” (out of 100) will be calculated for each of the modules in the course. For each module, students must achieve at least 70% overall in the Type A skills and at least 70% overall in the Type B skills in order to pass the module with a level of “basic competence”. If a student achieves at least 70% in a module’s Type A skills and in a module’s Type B skills, their module mark will be calculated as per the following section (Grade Calculations). If a student fails to achieve at least 70% in either or both of the Type A and B skills, they will receive a maximum grade of 49% for the module.

If a student achieves at least 70% in the Type A and B skills in both modules, their course mark will be a weighted average of the two module marks. If a student fails to achieve “basic competence” in one module, they will fail the course, receiving an overall grade of 49%, or their calculated grade, whichever is lower. However, if they choose to redo the course in the future, they will be given credit for the module they did pass (at the discretion of the instructor), with the passing mark that they did achieve (unless they want to redo the module for a better mark). If a student fails to achieve “basic competence” in both modules,
they will fail the course and will be required to redo both modules in the future.

**Grade Calculations**

All assessments will be marked on a percentage scale, by type (A/B/C) and by learning outcome e.g. Assignment 1 will have 3 sub-marks (two for LO1.1 (1 Type B and 1 Type C) and one for LO1.2 (Type A)). Each percentage mark will be accompanied by a competency descriptor (exemplary, proficient, basic competence, almost competent, not yet competent).

To calculate the grade for Type A skills in each module, Type A grades from questions on each assessment in that module will be applied against the respective learning outcome(s) they each assess. After each assessment, a student’s Type A Running Average for each learning outcome is recalculated. If the Type A skills for a given learning outcome are assessed on the current assessment, and the achieved grade is greater than the Type A Running Average for that learning outcome, it becomes the new Type A Running Average for that learning outcome. If the Type A skills for a given learning outcome are assessed on the current assessment, and the achieved grade is less than the Type A Running Average for that learning outcome, the new Type A Running Average for that learning outcome is a simple mean of the current Running Average and the Type A grade on the current assessment. The repetition of material on the weekly assignments in the following week’s quizzes allows for predictable weekly Top Up opportunities on all Type A skills. Type A content on quizzes can be Topped Up in end-of-day help sessions and Top Up help sessions and Type A grades in those Top Ups are further applied as described above.

The module tests will also include Type A questions where assessment scheduling does not allow for a Quiz to be conducted between the due date of an assignment and the writing of a module test.

The grade for Type B skills is calculated in the same manner as described for Type A skills, but using the Type B questions on each assessment in each module. Type B content on quizzes can be Topped Up in end-of-day help sessions and Top Up help sessions and Type B grades in those Top Ups are further applied as described above.

The module test will also include Type B questions which provides an additional opportunity for students to improve their grade on Type B content for learning outcomes that include Type B assessments. Type B content covered on the module test can be further Topped Up after the course ends, if required. Only one opportunity to Top Up the Type B content on the module test will be permitted.
To calculate the grade for Type C skills, the Type C scores from each assessment within each module are averaged. They cannot be Topped Up (quizzes will only include Type A and B questions). Instead, a Type C percentage will be established for each learning outcome that has Type C assessments. Applying the weights of each learning outcome, a final Type C percentage score for the module will be calculated.

**Important note:** LO1.3 and LO2.1 are the same: “draw and interpret AC circuit diagrams”. At the discretion of the instructor, improved performance on assessments under LO2.1 during Module 2 may be used to overwrite previous evidence of LO1.3, if it benefits the student.

**Keeping Track of Grades**
Throughout each module in the course, students will be able to monitor their progress in three complementary respects, for each module:

- marks on deliverables – students will see how they did on each assignment/quiz
- marks on Type A/B/C work – students will see how they are doing at each level of skill difficulty in the course, and
- marks on Learning Outcomes – students will see how they are doing against each of the learning outcomes for each module, as they complete elements of them.

**Attendance and Participation:**
Attendance and participation is encouraged/expected, and students will be responsible for what happens in classes e.g. quizzes. However, attendance will not be mandatory (or marked).

**Criteria That Must Be Met to Pass:**
See Assessment (Competence Thresholds), above.

**Final Grades:**
The final grades will be consistent with the “literal descriptors” specified in the university’s grading system (at the link below, click on “for undergraduate students”).

https://students.usask.ca/academics/grading/grading-system.php

For information regarding appeals of final grades or other academic matters, please visit the Student Conduct and Appeals section of the University Secretary’s website:


**Academic Courses Policy:**
More information on the Academic Courses Policy on course delivery, examinations and assessment of student learning can be found at:

http://policies.usask.ca/policies/academic-affairs/academic-courses.php
Learning Charter: The University of Saskatchewan Learning Charter is intended to define aspirations about the learning experience that the University aims to provide, and the roles to be played in realizing these aspirations by students, instructors and the institution. A copy of the Learning Charter can be found at: https://teaching.usask.ca/about/policies/learning-charter.php

Course Overview:

This course is divided into 2 sequential modules: Module 1 focuses on analysis of alternating-current (AC) electrical circuits. Module 2 focuses on practical elements found in various power generation, transmission, and utilization systems.

Module 1: AC Electrical Circuit Analysis begins with a brief review of direct-current (DC) electrical circuit analysis, including resistive, capacitive, and inductive elements. The focus of the course then shifts to the analysis of single-phase alternating-current (AC) electrical circuits. This includes characterizing AC waveforms and converting to phasor representations to carry out circuit analysis involving complex impedance, both manually and by applying electrical circuit simulation software. AC power is explored, including the concepts of real, reactive and apparent power, power factor and power factor correction.

Module 2: Selected Topics in Electrical Systems provides an overview of electrical engineering topics, including electrical safety, power distribution systems, batteries and energy storage, electric motors and generators, and renewable power generation systems. The course includes a group design project, in which students will design a renewable power generation and storage system to meet a specific need.

<table>
<thead>
<tr>
<th>WEEK of Program</th>
<th>Lecture Topic</th>
<th>Approx. Lecture Hours</th>
<th>Lab Topic</th>
<th>Approx. Lab Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>WEEK 27 Module 1</td>
<td>1. Review of DC Circuits 1.1 Resistive DC Circuit Analysis 1.2 RLC DC Circuit Steady-State Operation 2. Intro to AC Circuits 2.1 AC vs DC 2.2 Properties of AC signals 2.3 Phasors 2.4 AC Impedance</td>
<td>4.5</td>
<td>1. Introduction to Circuit Simulation 1.1 Software Interface and Functions 1.2 DC Circuit Simulation</td>
<td>1.5</td>
</tr>
<tr>
<td></td>
<td>QUIZ 1 (IN CLASS)</td>
<td></td>
<td>LAB ASSIGNMENT 1- DUE</td>
<td></td>
</tr>
<tr>
<td>WEEK 28 Module 1</td>
<td>3. Basic AC Circuit Analysis 3.1 AC Circuit Diagrams 3.2 Application of Circuit Analysis Techniques and Phasor Notation</td>
<td>4.5</td>
<td>2. AC Circuit Simulation 1</td>
<td>1.5</td>
</tr>
<tr>
<td>WEEK 29</td>
<td>Module 1/2</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>---------</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>4. AC Power</strong>&lt;br&gt;4.1 Real, Reactive, Apparent Power</td>
<td><strong>ASSIGNMENT 1 - DUE</strong>&lt;br&gt;<strong>QUIZ 2 (IN CLASS)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>LAB ASSIGNMENT 2 - DUE</strong></td>
<td><strong>LAB ASSIGNMENT 3 - DUE</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>4. AC Power, cont’d</strong>&lt;br&gt;4.2 Power Factor Correction</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Start of Module 2 Content in Lectures</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>5. Ideal Transformers</strong>&lt;br&gt;5.1 Purpose in Electrical Systems&lt;br&gt;5.2 Simple Model&lt;br&gt;5.3 Analysis of AC Circuits</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>6. AC/DC Conversion</strong>&lt;br&gt;6.1 Inverters&lt;br&gt;6.2 Rectifiers</td>
<td><strong>3. AC Circuit Simulation 2</strong>&lt;br&gt;<strong>4.5</strong>&lt;br&gt;<strong>1.5</strong></td>
<td></td>
<td></td>
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<tr>
<td><strong>7. Batteries and Energy Storage</strong>&lt;br&gt;7.1 Methods of Storing Energy&lt;br&gt;7.2 Battery Specifications</td>
<td><strong>ASSIGNMENT 2 - DUE</strong>&lt;br&gt;<strong>MODULE TEST 1 (EVENING)</strong></td>
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### WEEK 30

**Module 2**

<table>
<thead>
<tr>
<th>Topic</th>
<th>Assignments/DUE</th>
<th>Quiz (In Class)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8. Renewable Power Generation and Systems</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.1 Solar</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.2 Wind</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.3 Hydro</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.4 Other</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Practical Electrical Concepts</td>
<td>ASSIGNMENT 3 - DUE</td>
<td>QUIZ 3 (IN CLASS)</td>
</tr>
<tr>
<td>9.1 3-phase Power</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.2 Household Power</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.3 Canadian Electrical Code</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.4 Electrical Safety</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Renewable Power Generation and Systems</td>
<td>Start of Module 2 Content in Labs</td>
<td></td>
</tr>
<tr>
<td>4.1 Specifications of System Components</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Project Work Time – no deliverable)</td>
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<td></td>
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</tbody>
</table>

### WEEK 31

**Module 2**

<table>
<thead>
<tr>
<th>Topic</th>
<th>Assignments/DUE</th>
<th>Quiz (In Class)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10. Electric Generators</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.1 Basic Operation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.2 Simple Model</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Electric Motors</td>
<td>ASSIGNMENT 4 - DUE</td>
<td>QUIZ 4 (IN CLASS)</td>
</tr>
<tr>
<td>11.1 Types</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11.2 Basic Operation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11.3 Simple Models</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11.4 Applications</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Modeling of Electric Motors and Generators</td>
<td>LAB ASSIGNMENT 4 - DUE</td>
<td></td>
</tr>
<tr>
<td>5.1 Voltage/Torque</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### WEEK 32

<table>
<thead>
<tr>
<th>Topic</th>
<th>Assignments/DUE</th>
<th>Quiz (In Class)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Module Test 2 (Evening)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Assignments:
(see Assessment)

### Quizzes:
(see Assessment)

### Missing Quizzes:
Missed quizzes (for any reason) receive a mark of zero. However, quizzes can be Topped Up during End-of-Day Help Sessions or Top Up Help Sessions.

### Late Assignments:
Late assignments and lab assignments receive a mark of zero. However, assignments can be Topped Up by the following week's quiz. Lab assignments can either be Topped Up by subsequent lab assignments or through direct Top Up assessments.
In the case of sickness, bereavement or other excusable absences, students will not be penalized for late submissions although they may be required to complete a variation on the original assignment. They can alternatively choose to treat a missed assignment as a **Late Assignment**.

---

**Module Tests:**

- This course is comprised of 2 modules. Each module will end with a module test conducted outside of class time as a required activity outside class time. The module test will only assess the content of that specific module. The schedule for the Module Tests is:
  - Module 1: AC Electrical Circuit Analysis: Week 29, Day and Time TBD
    - 1.5 hrs, covering only content from Module 1: AC Electrical Circuit Analysis
    - Closed book, 1 formula sheet allowed
    - No electronic devices with document storage and/or communication capabilities allowed, including calculators, phones and watches
  - Module 2: Selected Topics in Electrical Systems: Week 32, Day and Time TBD
    - 1.5 hrs, covering only content from Module 2: Selected Topics in Electrical Systems
    - Closed book, 1 formula sheet allowed
    - No electronic devices with document storage and/or communication capabilities allowed, including calculators, phones and watches

- Students should avoid making prior travel, employment, or other commitments at these times. If a student is unable to write a module test through no fault of their own for medical or other acceptable reasons, documentation must be provided and an opportunity to write the missed module test may be given. Students are encouraged to review all examination policies and procedures: [http://students.usask.ca/academics/exams.php](http://students.usask.ca/academics/exams.php)

- Alternate times to write Module Tests will not be considered except in the case of acceptable reasons, such as illness, bereavement, etc, or a conflict with other university related activities.

- Students planning on registering with the office for Access and Equity Services for Students (AES) must do so in accordance with AES procedures and deadlines.

---

**Required Activities Outside of Class Time**

The Module Tests are written outside of class time (see **Module Test**).

Proctored reassessment of work that does not meet the competence threshold may be conducted outside of regularly scheduled class time.
This includes rewriting in-class quizzes, redoing other work completed, and submitted, during class time and rewriting module tests. This reassessment will occur during designated Top Up Help Sessions during the day or during course-specific help sessions (see End-of-Day Help Sessions). Students are encouraged to avoid making prior travel, employment, or other commitments at these times to ensure availability to take advantage of these additional opportunities to demonstrate competence in the course learning outcomes.

Experiential Learning
Students will be engaging in problem solving in class and modeling and simulation in the labs.

Important Dates:

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sept x, 2021</td>
<td>First day of Fall classes</td>
</tr>
<tr>
<td>Sept y, 2021</td>
<td>Last day for making changes in registration for first-term courses (100% tuition credit).</td>
</tr>
<tr>
<td>Nov zz, 2021</td>
<td>Fall Break (Week 11)</td>
</tr>
<tr>
<td>Nov xx, 2021</td>
<td>Last day to withdraw from Fall classes</td>
</tr>
<tr>
<td>Thanksgiving</td>
<td>Holidays</td>
</tr>
<tr>
<td>Dec yy, 2021</td>
<td>Last day of classes</td>
</tr>
</tbody>
</table>

Required Resources

Required Textbook:

Textbooks are available from the University of Saskatchewan Bookstore: https://bookstore.usask.ca/students.php#MyTextbooks

Other Required Materials:
A laptop computer which conforms to the Usask First Year Engineering Laptop Specifications.

Course notes and references to other online resources will constitute the required reference materials. The Library will also put useful reference materials and texts on reserve.

Electronic Resources:
Circuit Simulation Package TBD
Matlab 2021a
Policies on Academic Dishonesty, Academic Appeals and Course Delivery:
Students are expected to undertake all aspects of their academic work in an ethical manner. Students are expected to submit their own individual work for academic credit, properly cite the work of others, and to follow all rules for examinations. Academic misconduct, plagiarism, and cheating will not be tolerated. Students are responsible for understanding the university’s policies on academic integrity and academic misconduct. If any form of academic misconduct is discovered, appropriate disciplinary action will be taken.


For information regarding appeals of a final grade or other academic matters, please consult the University Council document on Student Appeals of Evaluation, Grading and Academic Standing (http://policies.usask.ca/policies/student-affairs-and-activities/student-appeals.php).

Additional policies and procedures related to student conduct and appeals are provided on the University Secretariat website (www.usask.ca/secretariat/student-conduct-appeals) and on the University website http://www.usask.ca/integrity/.

A summary of University of Saskatchewan polices relating to academic courses is provided in the document: Academic Courses Policy on Class Delivery, Examinations, and Assessment of Student Learning (http://policies.usask.ca/policies/academic-affairs/academic-courses.php).

Integrity Defined (from the Office of the University Secretary)
The University of Saskatchewan is committed to the highest standards of academic integrity and honesty. Students are expected to be familiar with these standards regarding academic honesty and to uphold the policies of the University in this respect. Students are particularly urged to familiarize themselves with the provisions of the Student Conduct & Appeals section of the University Secretary Website and avoid any behavior that could potentially result in suspicions of cheating, plagiarism, misrepresentation of facts and/or participation in an offence. Academic dishonesty is a serious offence and can result in suspension or expulsion from the University.


For more information on what academic integrity means for students see the Academic Integrity section of the University Library Website at: https://library.usask.ca/academic-integrity#AboutAcademicIntegrity

You are encouraged to complete the Academic Integrity Help session to understand the fundamental values of academic integrity and how to be a responsible scholar and member of the USask community - https://library.usask.ca/academic-integrity.php#AcademicIntegrityHelp session
Safety:
Safety is of paramount importance in the College of Engineering. Students are expected to work in a safe and responsible manner, to follow all safety instructions, and use any specified personal protective equipment. Students failing to behave in a safe manner will be asked to leave.

Emergency Response Plan:
Preparing for emergencies protects our lives and property. An emergency response plan (ERP) posting is located in each classroom and lab near the main door of the room. Students are advised to review and be familiar with the College ERP and be aware that when an alarm sounds for more than 10 seconds, the building must be evacuated. Muster point locations are posted at each entrance of the Engineering Building. For more details about the ERP, please visit the following website: https://engineering.usask.ca/documents/facilities/ERP%20-%20ENG%20-%20v%205%20-%2009_01_2017.pdf

Recording Lectures:
Lectures will be recorded, when possible, and made available to students in Blackboard so students can rewatch them as needed for study purposes.

Copyright:
Course materials are provided to students based on their registration in a class. Any materials created by course instructors is the intellectual property of the instructors. This includes exams, tests, PowerPoint/PDF slides and other course notes. Additionally, other copyright-protected materials created by textbook publishers and authors may be provided to students based on license terms and educational exceptions in the Canadian Copyright Act (see http://laws-lois.justice.gc.ca/eng/acts/C-42/index.html).

Before copying or distributing others’ copyright-protected materials, students need to ensure that their use of materials is covered under the University's Fair Dealing Copyright Guidelines available at http://www.usask.ca/copyright/basics/copyright-policy/fair-dealing-guidelines/index.php. For example, posting others’ copyright-protected materials on the internet is not covered under the University’s Fair Dealing Copyright Guidelines; doing so requires permission from the copyright holder. For more information about copyright, please visit http://www.usask.ca/copyright/students/rights/index.php or contact the University’s Copyright Coordinator at copyright.coordinator@usask.ca.

Students should be aware that a violation of the university’s copyright policies could be an instance of non-academic misconduct. For example, the practice of uploading or posting copyright-protected materials to course-sharing websites, depositories, or “drop boxes”, without the permission of the copyright holder, could result in a charge of non-academic misconduct under the university’s “Standard of Student Conduct in Non-Academic Matters”, found at the following location: https://secretariat.usask.ca/student-conduct-appeals/non-academic-misconduct.php.

Student Conduct:
Ethical behaviour is an important part of engineering practice. Each professional engineering association has a Code of Ethics, which its members are expected to follow. Since students are in the process of becoming Professional Engineers, it is expected that students will conduct themselves in an ethical manner.

The APEGs (Association of Professional Engineers and Geoscientists of Saskatchewan) Code of Ethics states that engineers shall “conduct themselves with fairness, courtesy and good faith
towards clients, colleagues, employees and others; give credit where it is due and accept, as well as
give, honest and fair professional criticism” (Section 20(e), The Engineering and Geoscience
Professions Regulatory Bylaws, 1997).

The first part of this statement discusses an engineer’s relationships with their colleagues. One
of the ways in which engineering students can demonstrate courtesy to their colleagues is by helping
to maintain an atmosphere that is conducive to learning, and minimizing disruptions in class. This
includes arriving on time for lectures, turning cell phones and other electronic devices off during
lectures, not leaving or entering the class at inopportune times, and refraining from talking to others
while the instructor is talking.

Access and Equity Services (AES) for Students
Students who have disabilities (learning, medical, physical, or mental health) are strongly
encouraged to register with Access and Equity Services (AES) if they have not already done so.
Students who suspect they may have disabilities should contact AES for advice and referrals at any
time. Those students who are registered with AES with mental health disabilities and who anticipate
that they may have responses to certain course materials or topics, should discuss course content
with their instructors prior to course add / drop dates. In order to access AES programs and
supports, students must follow AES policy and procedures. For more information or advice, visit
https://students.usask.ca/health/centres/access-equity-services.php, or contact AES at 306-966-7273 or aes@usask.ca.

Students registered with AES may request alternative arrangements for mid-term and final
examinations or module tests. Students must arrange such accommodations through AES by the
stated deadlines. Instructors shall provide the examinations for students who are being
accommodated by the deadlines established by AES.

Support Services for Engineering Students:
- Engineering Student Centre (Rm. 2A05 Engineering Building)
  - Email: esc@usask.ca; Phone: 306-966-5274;
  - https://engineering.usask.ca/contact_info/esc-office.php

End-of-day help session sessions will be offered by the College of Engineering for the Common First
Year and will provide support for all courses. Please see End-of-day Help Sessions for more details.

Student Learning Services
Student Learning Services (SLS) offers assistance to U of S undergrad and graduate students. For
information on specific services, please see the SLS web site https://library.usask.ca/studentlearning/.

Teaching, Learning and Student Experience
The Teaching, Learning and Student Experience Unit (TLSE) focuses on providing developmental
and support services and programs to students and the university community. For more
information, see https://students.usask.ca/. Specific resources include:
- Student Wellness Centre (3rd & 4th Floors, Place Riel): https://students.usask.ca/health/
- Financial Services: https://students.usask.ca/money/

College of Engineering Attribute Mapping:
This information shows the relationship of the learning outcomes of this course to the graduate attributes intended upon students’ completion of the degree program. This information is used for accreditation purposes.

### Instructional Level

<table>
<thead>
<tr>
<th>Learning Outcome</th>
<th>Attribute†</th>
<th>A1</th>
<th>A2</th>
<th>A3</th>
<th>A4</th>
<th>A5</th>
<th>A6</th>
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<th>A9</th>
<th>A10</th>
<th>A11</th>
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</table>

†Attributes:
- A1 A knowledge base for engineering
- A2 Problem analysis
- A3 Investigation
- A4 Design
- A5 Use of engineering tools
- A6 Individual and team work
- A7 Communication skills
- A8 Professionalism
- A9 Impact of engineering on society and the environment
- A10 Ethics and equity
- A11 Economics and project management
- A12 Life-long learning

‡Instructional Level:
- Introduced (I) – Students learn the working vocabulary of the area of content, along with some of the major underlying concepts.
- Developed (D) – Students use their working vocabulary and major fundamental concepts to probe more deeply, to read the literature, and to deepen their exploration of the concepts. They may begin to practice, extend, or refine knowledge in familiar contexts.
- Applied (A) – Students approach mastery in the area of content. They explore deeply into the discipline and experience the controversies, debate, and uncertainties that characterize the leading edges of any field. They practice, extend, or refine knowledge in unfamiliar contexts.

### Accreditation Unit (AU) Mapping (% of total class AU)

<table>
<thead>
<tr>
<th>Math</th>
<th>Natural Science</th>
<th>Complementary Studies</th>
<th>Engineering Science</th>
<th>Engineering Design</th>
</tr>
</thead>
<tbody>
<tr>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>100%</td>
<td>0%</td>
</tr>
</tbody>
</table>

### Accreditation Data Collection and Privacy:
Undergraduate programs in the College of Engineering are accredited by the Canadian Engineering Accreditation Board. Student performance data may be collected in this course to support accreditation and continuous program improvement processes. Anonymous samples of student work may also be collected for accreditation purposes. All data provided to the accreditation body or external entities is anonymized and reported in aggregate form to protect your information and identity. If you have any concerns about how your personal information is used or maintained, please contact the Associate Dean Academic, College of Engineering.
1. Approval by Department Head or Dean
   1.1 College or School with academic authority: College of Engineering
   1.2 Department with academic authority: Associate Dean, Academic Office
   1.3 Term from which the course is effective: 202105

2. Information required for the Catalogue
   2.1 Label & Number of course: GE 163
   2.2 Academic credit units: 2
   2.3 Course Long Title (maximum 100 characters): Process Engineering
       Course Short Title (maximum 30 characters): Process Engineering
   2.4 Total Hours: Lecture 22.5 Seminar Lab 6 Tutorial Other
   2.5 Weekly Hours: Lecture Seminar Lab Tutorial Other
   2.6 Term in which it will be offered: T1 T2 T1 or T2 T1 and T2
   2.7 Prerequisite:
       If there is a prerequisite waiver, who is responsible for signing it?
       D – Instructor/Dept Approval
       H – Department Approval (Associate Dean, Academic)
       I – Instructor Approval
   2.8 Catalogue description (150 words or less):
       This course presents the concepts of process engineering and applies them to a wide array of
       systems. Basic process engineering tools are developed in the first half of the course that are then
       used to solve complex process systems in the second half. The course is designed to appeal to
       many sectors of the engineering profession. Examples are taken from many process systems
       including, but not limited to: manufacturing; geological systems; health care; food production;
       environmental systems; financial systems; biological systems; water treatment; and unit
       operations.
   2.9 Do you allow this course to be repeated for credit? No

3. Please list rationale for introducing this course: This is part of the integrated curriculum in the
   redesigned first year program.
4. Please list the learning objectives for this course:

<table>
<thead>
<tr>
<th>Module 1: Single-Block Processes</th>
<th>50% of overall course grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning Outcome Number</td>
<td>By the end of Module 1, students will be expected to:</td>
</tr>
<tr>
<td>1.1</td>
<td>convert units between systems, considering dimensional homogeneity,</td>
</tr>
<tr>
<td>1.2</td>
<td>draw and interpret block diagrams and flowcharts, and</td>
</tr>
<tr>
<td>1.3</td>
<td>characterize and solve single-block processes by conducting degree of freedom analyses.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Module 2: Multi-Block Processes</th>
<th>50% of overall course grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning Outcome Number</td>
<td>By the end of Module 2, students will be expected to:</td>
</tr>
<tr>
<td>2.1</td>
<td>draw and interpret block diagrams and flowcharts,</td>
</tr>
<tr>
<td>2.2</td>
<td>characterize and solve single-block processes by conducting degree of freedom analyses, and</td>
</tr>
<tr>
<td>2.3</td>
<td>model and develop a solution strategy for complex processes.</td>
</tr>
</tbody>
</table>

5. Impact of this course
   Are the programs of other departments or Colleges affected by this course? No
   If so, were these departments consulted? (Include correspondence)
   Were any other departments asked to review or comment on the proposal? Yes, within the College and we worked with the Gwenna Moss Centre for Teaching and Learning.

6. Other courses or program affected (please list course titles as well as numbers)
   6.1 Courses to be deleted? GE 101, GE 111, GE 121, GE 124, GE 125 (for Fall 2021)
   6.2 Courses for which this course will be a prerequisite?
   Any changes to the course prerequisites in the programs will be submitted in future UCC.
   6.3 Is this course to be required by your majors, or by majors in another program? Required for Engineering Students as part of the Common First Year.

7. Course outline
   (Weekly outline of lectures or include a draft of the course information sheet.)
   See attached syllabus.
8. **Enrolment**
   8.1 Expected enrollment: up to 600
   8.2 From which colleges? Engineering

9. **Student evaluation**
   Give approximate weighting assigned to each indicator (assignments, laboratory work, mid-term test, final examination, essays or projects, etc.)

   Please see syllabus.

9.1 How should this course be graded?
   C – Completed Requirements
   *(Grade options for instructor: Completed Requirements, Fail, IP In Progress)*

   N – Numeric/Percentage
   *(Grade options for instructor: grade of 0% to 100%, IP in Progress)*

   P – Pass/Fail
   *(Grade options for instructor: Pass, Fail, In Progress)*

   S – Special
   *(Grade options for instructor: NA – Grade Not Applicable)* If other, please specify:

9.2 Is the course exempt from the final examination? Yes

10. **Required text**
   Include a bibliography for the course: Looking for a suitable open textbook.

11. **Resources**
   11.1 Proposed instructor: Engineering Faculty
   11.2 How does the department plan to handle the additional teaching or administrative workload? Within College/department budget – these courses will be replacing others.
   11.3 Are sufficient library or other research resources available for this course? Yes, Course notes and references to other online resources will constitute the required reference materials. The Library will also put useful reference materials and texts on reserve.
   11.4 Are any additional resources required (library, audio-visual, technology, etc.)? Matlab 2021a

12. **Tuition**
   12.1 Will this course attract tuition charges? If so, how much? *(use tuition category)* TC07
   12.2 Does this course require non-standard fees, such as materials or excursion fees? If so, please include an approved “Application for New Fee or Fee Change Form”
   http://www.usask.ca/sesd/info-for-instructors/program-course-preparation.php#course-fees
   No
Detailed Course Information

1. Schedule Types
Please choose the Schedule Types that can be used for sections that fall under this course:

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CL</td>
<td>Clinical</td>
<td>PRB</td>
<td>Problem Session</td>
</tr>
<tr>
<td>COO</td>
<td>Coop Class</td>
<td>RDG</td>
<td>Reading Class</td>
</tr>
<tr>
<td>FLD</td>
<td>Field Trip</td>
<td>RES</td>
<td>Research</td>
</tr>
<tr>
<td>ICR</td>
<td>Internet Chat Relay</td>
<td>ROS</td>
<td>Roster (Dent Only)</td>
</tr>
<tr>
<td>IHP</td>
<td>Internet Help</td>
<td>SEM</td>
<td>Seminar</td>
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<tr>
<td>IN1</td>
<td>Internship - Education</td>
<td>SSI</td>
<td>Supervised Self Instruction</td>
</tr>
<tr>
<td>IN2</td>
<td>Internship - CMPT &amp; EPIP</td>
<td>STU</td>
<td>Studio</td>
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<tr>
<td>IN3</td>
<td>Internship - General</td>
<td>SUP</td>
<td>Teacher Supervision</td>
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<td>IND</td>
<td>Independent Studies</td>
<td>TEL</td>
<td>Televised Class</td>
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<td>LAB</td>
<td>Laboratory</td>
<td>TUT</td>
<td>Tutorial</td>
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<td>LC</td>
<td>Lecture/Clinical (Dent Only)</td>
<td>WEB</td>
<td>Web Based Class</td>
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<td>Lecture</td>
<td>XCH</td>
<td>Exchange Program</td>
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<td>Ghost Schedule Type Not Applicable</td>
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<td>PRA</td>
<td>Practicum</td>
<td>XNC</td>
<td>No Academic Credit</td>
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</table>

2. Course Attributes
Please highlight the attributes that should be attached to the course (they will apply to all sections):

2.1 NOAC No Academic Credit
0 Credit Unit courses that possess “deemed” CUs (Called Operational Credit Units). NOAC causes the system to roll 0 academic credit units to academic history.

2.2 For the College of Arts and Science only: To which program type does this course belong?
- FNAR Fine Arts
- HUM Humanities
- SCIE Science
- SOCS Social Science
- ARNP No Program Type (Arts and Science)

3. Registration Information (Note: multi-term courses cannot be automated as corequisites)

3.1 Permission Required: No
3.2 Restriction(s): course only open to students in a specific college, program/degree, major, year in program
   - College of Engineering only
3.3 Prerequisite(s): course(s) that must be completed prior to the start of this course
3.4 Prerequisite(s) or Corequisite(s): course(s) that can be completed prior to or taken at the same time as this course
GE 152.1 – Electrical Circuits I
MATH 134.3 – Engineering Math II
CHEM 146.3 – General Chemistry for Engineering

3.5 Corequisite(s): course(s) that must be taken at the same time as this course
3.6 Notes: recommended courses, repeat restrictions/content overlap, other additional information

4. List Equivalent Course(s) here:
An equivalent course can be used in place of the course for which this form is being completed, specifically for the purposes of prerequisite and degree audit checking. Credit will be given for only one of the equivalent courses.

4.1 If this is a recently-repurposed course number, please list the courses that are no longer considered to be equivalent:

*Please note: If the equivalent courses carry an UNEQUAL number of credit units, DegreeWorks will automatically enforce the following, unless otherwise stated:

- If a 3 credit unit course is considered to be equivalent to a 6 credit unit course, it will fulfill the 6 credit unit requirement and the student will not have to complete another 3 credit units toward the overall number of required credit units for the program.
- If a 6 credit unit course is considered to be equivalent to a 3 credit unit course, ALL 6 of the credit units may be used to fulfill the 3 credit unit requirement.

5. List Mutually-Exclusive Course(s) here:
Mutually exclusive courses have similar content such that students cannot receive credit for both.

5.1 If this is a recently-repurposed course number, please list the courses that are no longer considered to be mutually exclusive:

*Please note: SiRIUS cannot enforce a situation where the exclusion goes only one way.

6. Additional Notes:
Land Acknowledgement
At the University of Saskatchewan, we acknowledge we are on Treaty Six Territory and the Homeland of the Métis. We pay our respect to the First Nation and Métis ancestors of this place and reaffirm our relationship with one another.

Instructors and Teaching Assistants:
Name: TBD
Office: TBD
Phone: TBD
Email: TBD

Office Hours: TBD

Lectures:
Weeks: 27-31
Classes: Three 1.5 hr classes per week (a total of 15 classes)

Laboratories:
Weeks: 29-30
Labs: One 3 hr lab per week (a total of 2 labs)

Website:
Assignments, solutions, lab schedules, general course information, and announcements will be posted on the course website (PAWS/Blackboard). Students are responsible for keeping up-to-date with the information on the course website. https://bblearn.usask.ca/

End-of-Day Help Sessions
End of day help session sessions will be offered by the College of Engineering for the Common First Year and will provide support for all courses.

Process Engineering has an end-of-day help session twice per week on Mondays and Fridays in Weeks 27, 28, 29, 30, and 31.

Description:
This course presents the concepts of process engineering and applies them to a wide array of systems. Basic process engineering tools are developed in the first half of the course that are then used to solve complex process systems in the second half. The course is designed to appeal to many sectors of the engineering profession. Examples are taken from many process systems including, but not limited to: manufacturing; geological systems; health care; food production; environmental systems; financial systems; biological systems; water treatment; and unit operations.
Pre or co-requisites: GE 152.1 – Electrical Circuits I
MATH 134.3 – Engineering Math II
CHEM 146.3 – General Chemistry for Engineering

Course Reference Numbers (CRNs): TBD
Available from the Dynamic Schedule once courses are built (https://pawnss.usask.ca/ban/bwckschd.p_disp_dyn_sched)

Module 1: Single-Block Processes

<table>
<thead>
<tr>
<th>Learning Outcome Number</th>
<th>By the end of Module 1, students will be expected to:</th>
<th>Outcome Weight (By Module)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>convert units between systems, considering dimensional homogeneity,</td>
<td>10%</td>
</tr>
<tr>
<td>1.2</td>
<td>draw and interpret block diagrams and flowcharts, and</td>
<td>20%</td>
</tr>
<tr>
<td>1.3</td>
<td>characterize and solve single-block processes by conducting degree of freedom analyses.</td>
<td>70%</td>
</tr>
</tbody>
</table>

Module 2: Multi-Block Processes

<table>
<thead>
<tr>
<th>Learning Outcome Number</th>
<th>By the end of Module 2, students will be expected to:</th>
<th>Outcome Weight (By Module)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1</td>
<td>draw and interpret block diagrams and flowcharts,</td>
<td>20%</td>
</tr>
<tr>
<td>2.2</td>
<td>characterize and solve single-block processes by conducting degree of freedom analyses, and</td>
<td>60%</td>
</tr>
<tr>
<td>2.3</td>
<td>model and develop a solution strategy for complex processes.</td>
<td>20%</td>
</tr>
</tbody>
</table>

Assessment: This course employs a competency-based assessment system. Students must demonstrate competence in certain skills in each module. These skills can be divided into three types (A/B/C).

Type A skills are the most basic and granular for a subject area. In general, this includes the ability to define, recall, recognize, compare, and contrast key terms and concepts. It also includes basic calculations and motor skills, as appropriate.

Type B skills are basic integrative skills. These include basic types of questions that have been covered in class.

Type C skills are integrative skills that depend on the ability to extend the application of what has been learned in class, into new domains.
For this class, students will be expected to perform at a 70% success level or higher in Type A and B skills to be considered competent. There will be no minimum performance threshold for Type C skills.

As part of competency-based assessment, students will be given more than one opportunity to display competence. Thus, for Type A and B skills, there will be at least two opportunities to exhibit basic competence. These opportunities may be manifested as portions of later assignments replacing performance on earlier assignments (that cover similar skill sets) and/or “Top Up” opportunities. Top Ups will be proctored opportunities to demonstrate skills during optional course-specific help sessions (see End-of-Day Help Sessions) or during optional Top Up Help Sessions, which are spread throughout the term’s schedule.

Note that the final course grade will be a weighted average of the achieved grades in each module. See Course Learning Outcomes for relative weights of each module.

Module 1: Single-Block Processes
Type A skills are vital to any success in analyzing processes. Type A skills for this module include converting between unit systems, identifying process variables and types of processes, and interpreting information from block diagrams and flowcharts.

Type B skills include creating block diagrams and flowcharts, conducting degree of freedom analysis, determining appropriate basis for calculations, scaling systems and analyzing simple single-block processes.

Type C skills will focus on abilities to integrate all of the Type A and B skills in order to solve more complex and practical problems.

Type A
- Quiz 1: Week 27 (Unit Conversions)
- Assignment 1: out Week 27, Due Week 28 -> Topped up by Quiz 2 (Week 28) (Processes, Process Variables, Stream Compositions)
- Assignment 2: out Week 28, Due Week 29 -> Topped up by Quiz 3 (Week 29) (Block Diagrams, Types of Processes, Conservation Equations)
- Assignment 3: out Week 29, Due Week 30 -> Topped up by Module Test 1 (Week 30) (Flowcharts, Basis, Scaling)
- Module Test 1: Week 30 (Flowcharts, Basis, Scaling)
Type A portion of all Quizzes can be Topped Up during End-of-Day Help Sessions or Top Up Help Sessions. Module Test 1 provides Top Up Opportunity for Type A content on Assignment 3.

Type B
- Assignment 2: out Week 28, Due Week 29 -> Topped up by Quiz 3 (Week 29) (Block Diagrams)
- Lab Assignment 1: Week 29 -> Topped up by Lab Assignment 2 (Week 30) (Block Diagrams, Flowcharts, Sets of Equations)
- Assignment 3: out Week 29, Due Week 30 -> Topped up by Module Test 1 (Week 30) (Flowcharts, Basis, Scaling, Sets of Equations, Degree of Freedom Analysis)
- Module Test 1: Week 30 (Block Diagrams, Flowcharts, Basis, Scaling, Sets of Equations, Degree of Freedom Analysis)

Type B portion of all Quizzes can be Topped Up during End-of-Day Help Sessions or Top Up Help Sessions. One Type B Top Up for the Module Test will be announced subsequent to classes ending in the course. Lab Assignment 1 can be Topped Up by Lab Assignment 2.

Type C
- Assignment 3: out Week 29, Due Week 30 (Degree of Freedom Analysis)
- Module Test 1: Week 30 (Degree of Freedom Analysis)

Top Up opportunities - none

Module 2: Multi-Block Processes
Type A skills include interpreting information from block diagrams and flowcharts, calculating rates of generation or loss within a process, and identifying rate limiting variables.

Type B skills include applying degree of freedom analysis and bookkeeping techniques to analyze multi-block processes, selecting the appropriate type of process to solve a practical problem, and modeling real-world systems as processes.

Type C skills will focus on abilities to integrate all of the Type A and B skills in order to solve more complex and practical problems.

Type A
- Assignment 5: out Week 31, Due Week 31 -> Topped up by Module Test 2 (Week 32) (Rates of Generation/Loss, Rate Limiting Variables)
- Module Test 2: Week 32 (Rates of Generation/Loss, Rate Limiting Variables)
Module Test 2 provides Top Up Opportunity for Type A content on Assignment 5.

Type B

- Assignment 4: out Week 30, Due Week 31 -> Topped up by Quiz 4 (Week 31) (Multi-Block Degree of Freedom Analysis, Bookkeeping, Solution Strategies, Special Units and Blocks)
- Lab Assignment 2: Week 30 (Solving System of Equations from a Multi-Block Process using Matlab)
- Assignment 5: out Week 31, Due Week 31 -> Topped up by Module Test 2 (Week 32) (Multi-Block Processes with Rates of Change, Degree of Freedom Updating Tables)
- Module Test 2: Week 32 (Block Diagrams, Flowcharts, Multi-Block Degree of Freedom Analysis, Bookkeeping, Solution Strategies, Special Units and Blocks, Rates of Change, Degree of Freedom Updating Tables)

Type B portion of all Quizzes can be Topped Up during End-of-Day Help Sessions or Top Up Help Sessions. One Type B Top Up for the Module Test will be announced subsequent to classes ending in the course. Lab 2 can be Topped Up during End-of-Day Help Sessions or Top Up Help Sessions.

Type C

- Assignment 4: out Week 30, Due Week 31 (Multi-Block Degree of Freedom Analysis, Bookkeeping, Solution Strategies, Special Units and Blocks)
- Lab Assignment 2: Week 30 (Solving System of Equations from a Multi-Block Process using Matlab)
- Assignment 5: out Week 31, Due Week 31 (Multi-Block Processes with Rates of Change, Degree of Freedom Updating Tables)
- Module Test 2: Week 32 (Block Diagrams, Flowcharts, Multi-Block Degree of Freedom Analysis, Bookkeeping, Solution Strategies, Special Units and Blocks, Rates of Change, Degree of Freedom Updating Tables)

Top Up opportunities (none)

Competence Thresholds

A “module mark” (out of 100) will be calculated for each of the modules in the course. For each module, students must achieve at least 70% overall in the Type A skills and at least 70% overall in the Type B skills in order to pass the module with a level of “basic competence”. If a student achieves at least 70% in a module’s Type A skills and in a module’s Type B skills, their module mark will be calculated as per the following section (Grade Calculations). If a student fails to achieve at
least 70% in either or both of the Type A and B skills, they will receive a maximum grade of 49% for the module.

If a student achieves at least 70% in the Type A and B skills in both modules, their course mark will be a weighted average of the two module marks. If a student fails to achieve “basic competence” in one module, they will fail the course, receiving an overall grade of 49%, or their calculated grade, whichever is lower. However, if they choose to redo the course in the future, they will be given credit for the module they did pass (at the discretion of the instructor), with the passing mark that they did achieve (unless they want to redo the module for a better mark). If a student fails to achieve “basic competence” in both modules, they will fail the course and will be required to redo both modules in the future.

Grade Calculations
All assessments will be marked on a percentage scale, by type (A/B/C) and by learning outcome e.g. Assignment 2 will have 3 sub-marks (two for LO1.2 (1 Type A and 1 Type B) and one for LO1.3 (Type A)). Each percentage mark will be accompanied by a competency descriptor (exemplary, proficient, basic competence, almost competent, not yet competent).

To calculate the grade for Type A skills in each module, Type A grades from questions on each assessment in that module will be applied against the respective learning outcome(s) they each assess. After each assessment, a student’s Type A Running Average for each learning outcome is recalculated. If the Type A skills for a given learning outcome are assessed on the current assessment, and the achieved grade is greater than the Type A Running Average for that learning outcome, it becomes the new Type A Running Average for that learning outcome. If the Type A skills for a given learning outcome are assessed on the current assessment, and the achieved grade is less than the Type A Running Average for that learning outcome, the new Type A Running Average for that learning outcome is a simple mean of the current Running Average and the Type A grade on the current assessment. The repetition of material on the weekly assignments in the following week’s quizzes allows for predictable weekly Top Up opportunities on all Type A skills. Type A content on quizzes can be Topped Up in end-of-day help sessions and Top Up help sessions and Type A grades in those Top Ups are further applied as described above.

The module tests will also include Type A questions where assessment scheduling does not allow for a Quiz to be conducted between the due date of an assignment and the writing of a module test.
The grade for Type B skills is calculated in the same manner as described for Type A skills, but using the Type B questions on each assessment in each module. Type B content on quizzes can be Topped Up in end-of-day help sessions and Top Up help sessions and Type B grades in those Top Ups are further applied as described above.

The module test will also include Type B questions which provides an additional opportunity for students to improve their grade on Type B content for learning outcomes that include Type B assessments. Type B content covered on the module test can be further Topped Up after the course ends, if required. Only one opportunity to Top Up the Type B content on the module test will be permitted.

To calculate the grade for Type C skills, the Type C scores from each assessment within each module are averaged. They cannot be Topped Up (quizzes will only include Type A and B questions). Instead, a Type C percentage will be established for each learning outcome that has Type C assessments. Applying the weights of each learning outcome, a final Type C percentage score for the module will be calculated.

**Important note**: LO1.2 and LO2.1 are the same: “draw and interpret block diagrams and flowcharts”. At the discretion of the instructor, improved performance on assessments under LO2.1 during Module 2 may be used to overwrite previous evidence of LO1.2, if it benefits the student. Furthermore, as LO2.2 is a continuation of LO1.3, “characterize and solve single-block processes by conducting degree of freedom analyses” which extends to more complex, multi-block processes, improved performance on assessments under LO2.2 during Module 2 may be used to overwrite previous evidence of LO1.3, if it benefits the student.

**Keeping Track of Grades**
Throughout each module in the course, students will be able to monitor their progress in three complementary respects, for each module:
- marks on deliverables – students will see how they do on each assignment/quiz
- marks on Type A/B/C work – students will see how they are doing at each level of skill difficulty in the course, and
- marks on Learning Outcomes – students will see how they are doing against each of the learning outcomes for each module, as they complete elements of them.

**Attendance and Participation:** Attendance and participation is encouraged/expected, and students will be responsible for what happens in classes e.g. quizzes. However, attendance will not be mandatory (or marked).
Criteria That Must Be Met to Pass:

See Assessment (Competence Thresholds), above.

Final Grades: The final grades will be consistent with the “literal descriptors” specified in the university’s grading system (at the link below, click on “for undergraduate students”).

https://students.usask.ca/academics/grading/grading-system.php

For information regarding appeals of final grades or other academic matters, please visit the Student Conduct and Appeals section of the University Secretary’s website:


Academic Courses Policy: More information on the Academic Courses Policy on course delivery, examinations and assessment of student learning can be found at:

http://policies.usask.ca/policies/academic-affairs/academic-courses.php

Learning Charter: The University of Saskatchewan Learning Charter is intended to define aspirations about the learning experience that the University aims to provide, and the roles to be played in realizing these aspirations by students, instructors and the institution. A copy of the Learning Charter can be found at: https://teaching.usask.ca/about/policies/learning-charter.php

Course Overview:

In this course students will learn the basic principles of process engineering. This course is divided into 2 sequential modules: Module 1 focuses on analysis of single-block processes. Module 2 focuses on analysis of multi-block processes.

Module 1: Single-Block Processes starts with an overview of process engineering. Then, unit systems, dimensional homogeneity and dimensionless quantities are presented. The concepts of process streams and process blocks are then described so that block diagrams of processes can be developed. Conservation equations are described. Scaling of systems, along with the concept of basis are introduced followed by variable specification (design variables), equation independence, and Degree of Freedom analysis.

Module 2: Multi-Block Processes describes and analyzes multi-block systems. Degree of Freedom analysis is revisited and then bookkeeping of these systems is presented as a methodology to develop solution strategies for process design. The concepts of processes with single and multi-rate equations, along with selectivity and yield are introduced. The effects of sources and sinks are discussed.

Throughout the course, examples are presented from a wide range of areas including, but not limited to: general population balances; health care process systems; biological systems;
food processing system; financial processes; manufacturing systems; bioremediation; water treatment; leaching; and unit operations. There are five assignments and also two laboratories, in which a simple and a complex process will be developed. Matlab will be used to solve systems in some assignments and both laboratories.

<table>
<thead>
<tr>
<th>WEEK of Program</th>
<th>Lecture Topic</th>
<th>Approx. Lecture Hours</th>
<th>Lab Topic</th>
<th>Approx. Lab Hours</th>
</tr>
</thead>
</table>
| WEEK 27 Module 1| **1. Introduction**  
1.1 What is Process Engineering? | 4.5 | | |
| | **2. Units**  
2.1 Derived Units  
2.2 Dimensional Homogeneity  
2.3 Dimensionless Units | | | |
| | **3. Processes**  
3.1 Process Variables  
3.2 Rates  
3.3 Process Stream Composition  
3.4 Process Types | | | |
| | **QUIZ 1 (IN CLASS)** | | | |
| WEEK 28 Module 1| **4. Process Blocks** | | | |
| | **5. Conservation Equations**  
5.1 Examples: Population Balance, Distillation | 4.5 | | |
| | **6. Flowcharts**  
6.1 Examples: Fast Food Operation, Combustion System, Bacterial Incubator/Bioremediation Unit | | | |
<p>| | <strong>ASSIGNMENT 1- DUE</strong> | | | |
| | <strong>QUIZ 2 (IN CLASS)</strong> | | | |</p>
<table>
<thead>
<tr>
<th>WEEK 29</th>
<th>Module 1/2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>7. Basis and Scaling</td>
</tr>
<tr>
<td></td>
<td>8. Independent Process Balance Equations</td>
</tr>
<tr>
<td></td>
<td>8.1 Example: Equation Independence of a Simple Mixer</td>
</tr>
<tr>
<td></td>
<td>9. Degrees of Freedom</td>
</tr>
<tr>
<td></td>
<td>9.1 Example: Degrees of Freedom of a Simple Mixer</td>
</tr>
<tr>
<td></td>
<td>10. Specifying a Process for Solution</td>
</tr>
<tr>
<td></td>
<td>10.1 Example: Textiles Dying System</td>
</tr>
<tr>
<td></td>
<td>Start of Module 2 Content in Lectures</td>
</tr>
<tr>
<td></td>
<td>11. Degree of Freedom for Multi-Unit Processes</td>
</tr>
<tr>
<td></td>
<td>11.1 Example: Two-Unit Separation Manufacturing Scheme</td>
</tr>
</tbody>
</table>

| ASSIGNMENT 2 - DUE |
| QUIZ 3 (IN CLASS) |

| 1. Modeling of a Single-Unit Process | |
| 4.5 | |

| LAB ASSIGNMENT 1 - DUE |
| 3 | |
### WEEK 30
**Module 2**

<table>
<thead>
<tr>
<th>Topic</th>
<th>Description</th>
<th>Section</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>13. Special Units and Blocks</td>
<td>13.1 Examples: Distillation Column with Recycles</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>MODULE TEST 1 (IN CLASS)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>ASSIGNMENT 3 - DUE</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>LAB ASSIGNMENT 2 - DUE</strong></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

### WEEK 31
**Module 2**

<table>
<thead>
<tr>
<th>Topic</th>
<th>Description</th>
<th>Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>15. Degree of Freedom Updating Tables</td>
<td>15.1 Example: Metabolism</td>
<td></td>
</tr>
<tr>
<td>16. Multiple Rate Processes</td>
<td>16.1 Selectivity 16.2 Conversion and Yield of Variables 16.3 Examples: GeoE Leaching Problem, ChE Reactor Problem 16.3 Bookkeeping with Multiple Sources and Sinks</td>
<td></td>
</tr>
<tr>
<td><strong>ASSIGNMENT 4 - DUE</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>QUIZ 4 (IN CLASS)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>ASSIGNMENT 5 - DUE</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### WEEK 32
**Module Test 2 (Evening)**

**Assignments:**  (see Assessment)

**Quizzes:**  (see Assessment)

**Missing Quizzes:**
Missed quizzes (for any reason) receive a mark of zero. However, quizzes can be Topped Up during End-of-Day Help Sessions or Top Up Help Sessions.

**Late Assignments:**

Late assignments and lab assignments receive a mark of zero. However, assignments can be Topped Up by the following week’s quiz. Lab assignments can either be Topped Up by subsequent lab assignments or through direct Top Up assessments.

In the case of sickness, bereavement or other excusable absences, students will not be penalized for late submissions although they may be required to complete a variation on the original assignment. They can alternatively choose to treat a missed assignment as a Late Assignment.

---

**Module Tests:**

- This course is comprised of 2 modules. Each module will end with a module test conducted outside of class time as a required activity outside class time. The module test will only assess the content of that specific module. The schedule for the Module Tests is:
  - Module 1: Single-Block Processes: Week 30, Day and Time TBD
    - 1.5 hrs, covering only content from Module 1: Single-Block Processes
    - Closed book, 1 formula sheet allowed
    - No electronic devices, including calculators, phones and watches, with document storage and/or communication capabilities allowed
  - Module 2: Multi-Block Processes: Week 32, Day and Time TBD
    - 1.5 hrs, covering only content from Module 2: Multi-Block Processes
    - Closed book, 1 formula sheet allowed
    - No electronic devices, including calculators, phones and watches, with document storage and/or communication capabilities allowed
- Students should avoid making prior travel, employment, or other commitments at these times. If a student is unable to write a module test through no fault of their own for medical or other acceptable reasons, documentation must be provided and an opportunity to write the missed module test may be given. Students are encouraged to review all examination policies and procedures: [http://students.usask.ca/academics/exams.php](http://students.usask.ca/academics/exams.php)
- Alternate times to write Module Tests will not be considered except in the case of acceptable reasons, such as illness, bereavement, etc, or a conflict with other university related activities.
• Students planning on registering with the office for Access and Equity Services for Students (AES) must do so in accordance with AES procedures and deadlines.

**Required Activities Outside of Class Time**
The Module Tests are written outside of class time (see **Module Test**).

Proctored reassessment of work that does not meet the competence threshold may be conducted outside of regularly scheduled class time. This includes rewriting in-class quizzes, redoing other work completed, and submitted, during class time and rewriting module tests. This reassessment will occur during designated Top Up Help Sessions during the day or during course-specific help sessions (see **End-of-Day Help Sessions**). Students are encouraged to avoid making prior travel, employment, or other commitments at these times to ensure availability to take advantage of these additional opportunities to demonstrate competence in the course learning outcomes.

**Experiential Learning**
Students will be engaging in problem solving in class and modeling in the labs.

**Important Dates:**

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sept x, 2021</td>
<td>First day of Fall classes</td>
</tr>
<tr>
<td>Sept y, 2021</td>
<td>Last day for making changes in registration for first-term courses (100% tuition credit).</td>
</tr>
<tr>
<td>Nov zz, 2021</td>
<td>Fall Break (Week 11)</td>
</tr>
<tr>
<td>Nov xx, 2021</td>
<td>Last day to withdraw from Fall classes</td>
</tr>
<tr>
<td>Thanksgiving</td>
<td>Holidays</td>
</tr>
<tr>
<td>Dec yy, 2021</td>
<td>Last day of classes</td>
</tr>
</tbody>
</table>

**Required Resources**

**Required Textbook:**
This course will use the following open text: xxxxxxxxxxxxxx

Textbooks are available from the University of Saskatchewan Bookstore: https://bookstore.usask.ca/students.php#MyTextbooks

**Other Required Materials:**
A laptop computer which conforms to the Usask First Year Engineering Laptop Specifications.
Course notes and references to other online resources will constitute the required reference materials. The Library will also put useful reference materials and texts on reserve.

**Electronic Resources:**

Matlab 2021a

**Policies on Academic Dishonesty, Academic Appeals and Course Delivery:**
Students are expected to undertake all aspects of their academic work in an ethical manner. Students are expected to submit their own individual work for academic credit, properly cite the work of others, and to follow all rules for examinations. Academic misconduct, plagiarism, and cheating will not be tolerated. Students are responsible for understanding the university's policies on academic integrity and academic misconduct. If any form of academic misconduct is discovered, appropriate disciplinary action will be taken.


Additional policies and procedures related to student conduct and appeals are provided on the University Secretariat website ([www.usask.ca/secretariat/student-conduct-appeals](http://www.usask.ca/secretariat/student-conduct-appeals)) and on the University website [http://www.usask.ca/integrity/](http://www.usask.ca/integrity/).

A summary of University of Saskatchewan polices relating to academic courses is provided in the document: *Academic Courses Policy on Class Delivery, Examinations, and Assessment of Student Learning* ([http://policies.usask.ca/policies/academic-affairs/academic-courses.php](http://policies.usask.ca/policies/academic-affairs/academic-courses.php)).

**Integrity Defined (from the Office of the University Secretary)**
The University of Saskatchewan is committed to the highest standards of academic integrity and honesty. Students are expected to be familiar with these standards regarding academic honesty and to uphold the policies of the University in this respect. Students are particularly urged to familiarize themselves with the provisions of the Student Conduct & Appeals section of the University Secretary Website and avoid any behavior that could potentially result in suspicions of cheating, plagiarism, misrepresentation of facts and/or participation in an offence. Academic dishonesty is a serious offence and can result in suspension or expulsion from the University.

For more information on what academic integrity means for students see the Academic Integrity section of the University Library Website at: https://library.usask.ca/academic-integrity#AboutAcademicIntegrity

You are encouraged to complete the Academic Integrity Help session to understand the fundamental values of academic integrity and how to be a responsible scholar and member of the USask community - https://library.usask.ca/academic-integrity.php#AcademicIntegrityHelp session

Safety:
Safety is of paramount importance in the College of Engineering. Students are expected to work in a safe and responsible manner, to follow all safety instructions, and use any specified personal protective equipment. Students failing to behave in a safe manner will be asked to leave.

Emergency Response Plan:
Preparing for emergencies protects our lives and property. An emergency response plan (ERP) posting is located in each classroom and lab near the main door of the room. Students are advised to review and be familiar with the College ERP and be aware that when an alarm sounds for more than 10 seconds, the building must be evacuated. Muster point locations are posted at each entrance of the Engineering Building. For more details about the ERP, please visit the following website: https://engineering.usask.ca/documents/facilities/ERP%20-%20ENG%20-%20v%2005%20-%2009_01_2017.pdf

Recording Lectures:
Lectures will be recorded, when possible, and made available to students in Blackboard so students can rewatch them as needed for study purposes.

Copyright:
Course materials are provided to students based on their registration in a class. Any materials created by course instructors is the intellectual property of the instructors. This includes exams, tests, PowerPoint/PDF slides and other course notes. Additionally, other copyright-protected materials created by textbook publishers and authors may be provided to students based on license terms and educational exceptions in the Canadian Copyright Act (see http://laws-lois.justice.gc.ca/eng/acts/C-42/index.html).

Before copying or distributing others’ copyright-protected materials, students need to ensure that their use of materials is covered under the University's Fair Dealing Copyright Guidelines available at http://www.usask.ca/copyright/basics/copyright-policy/fair-dealing-guidelines/index.php. For example, posting others’ copyright-protected materials on the internet is not covered under the University's Fair Dealing Copyright Guidelines; doing so requires permission from the copyright holder. For more information about copyright, please visit http://www.usask.ca/copyright/students/rights/index.php or contact the University’s Copyright Coordinator at copyright.coordinator@usask.ca.

Students should be aware that a violation of the university’s copyright policies could be an instance of non-academic misconduct. For example, the practice of uploading or posting copyright-protected materials to course-sharing websites, depositories, or “drop boxes”, without the permission of the copyright holder, could result in a charge of non-academic misconduct under the university’s "Standard of Student Conduct in Non-Academic Matters", found at the following location: https://secretariat.usask.ca/student-conduct-appeals/non-academic-misconduct.php.
**Student Conduct:**
Ethical behaviour is an important part of engineering practice. Each professional engineering association has a Code of Ethics, which its members are expected to follow. Since students are in the process of becoming Professional Engineers, it is expected that students will conduct themselves in an ethical manner.

The APEGs (Association of Professional Engineers and Geoscientists of Saskatchewan) Code of Ethics states that engineers shall “conduct themselves with fairness, courtesy and good faith towards clients, colleagues, employees and others; give credit where it is due and accept, as well as give, honest and fair professional criticism” (Section 20(e), The Engineering and Geoscience Professions Regulatory Bylaws, 1997).

The first part of this statement discusses an engineer’s relationships with their colleagues. One of the ways in which engineering students can demonstrate courtesy to their colleagues is by helping to maintain an atmosphere that is conducive to learning, and minimizing disruptions in class. This includes arriving on time for lectures, turning cell phones and other electronic devices off during lectures, not leaving or entering the class at inopportune times, and refraining from talking to others while the instructor is talking.

**Access and Equity Services (AES) for Students**
Students who have disabilities (learning, medical, physical, or mental health) are strongly encouraged to register with Access and Equity Services (AES) if they have not already done so. Students who suspect they may have disabilities should contact AES for advice and referrals at any time. Those students who are registered with AES with mental health disabilities and who anticipate that they may have responses to certain course materials or topics, should discuss course content with their instructors prior to course add / drop dates. In order to access AES programs and supports, students must follow AES policy and procedures. For more information or advice, visit [https://students.usask.ca/health/centres/access-equity-services.php](https://students.usask.ca/health/centres/access-equity-services.php), or contact AES at 306-966-7273 or aes@usask.ca.

Students registered with AES may request alternative arrangements for mid-term and final examinations or module tests. Students must arrange such accommodations through AES by the stated deadlines. Instructors shall provide the examinations for students who are being accommodated by the deadlines established by AES.

**Support Services for Engineering Students:**
- Engineering Student Centre (Rm. 2A05 Engineering Building)
  - Email: esc@usask.ca; Phone: 306-966-5274; [https://engineering.usask.ca/contact_info/esc-office.php](https://engineering.usask.ca/contact_info/esc-office.php)

End-of-day help session sessions will be offered by the College of Engineering for the Common First Year and will provide support for all courses. Please see [End-of-day Help Sessions](#) for more details.

**Student Learning Services**
Student Learning Services (SLS) offers assistance to U of S undergrad and graduate students. For information on specific services, please see the SLS web site [https://library.usask.ca/studentlearning/](https://library.usask.ca/studentlearning/).

**Teaching, Learning and Student Experience**
The Teaching, Learning and Student Experience Unit (TLSE) focuses on providing developmental and support services and programs to students and the university community. For more information, see [https://students.usask.ca/](https://students.usask.ca/). Specific resources include:

- Student Wellness Centre (3rd & 4th Floors, Place Riel): [https://students.usask.ca/health/](https://students.usask.ca/health/)
- Financial Services: [https://students.usask.ca/money/](https://students.usask.ca/money/)

**College of Engineering Attribute Mapping:**
This information shows the relationship of the learning outcomes of this course to the graduate attributes intended upon students' completion of the degree program. This information is used for accreditation purposes.

<table>
<thead>
<tr>
<th>Learning Outcome</th>
<th>Attribute†</th>
<th>Instructional Level‡</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A1</td>
<td>A2</td>
</tr>
<tr>
<td>1.1</td>
<td>I</td>
<td></td>
</tr>
<tr>
<td>1.2</td>
<td>I</td>
<td>I</td>
</tr>
<tr>
<td>1.3</td>
<td>I</td>
<td>I</td>
</tr>
<tr>
<td>2.1</td>
<td>I</td>
<td>I</td>
</tr>
<tr>
<td>2.2</td>
<td>I</td>
<td>D</td>
</tr>
<tr>
<td>2.3</td>
<td>I</td>
<td>D</td>
</tr>
</tbody>
</table>

†Attributes:
- A1 A knowledge base for engineering
- A2 Problem analysis
- A3 Investigation
- A4 Design
- A5 Use of engineering tools
- A6 Individual and team work
- A7 Communication skills
- A8 Professionalism
- A9 Impact of engineering on society and the environment
- A10 Ethics and equity
- A11 Economics and project management
- A12 Life-long learning

‡Instructional Level:
- Introduced (I) – Students learn the working vocabulary of the area of content, along with some of the major underlying concepts.
- Developed (D) – Students use their working vocabulary and major fundamental concepts to probe more deeply, to read the literature, and to deepen their exploration of the concepts. They may begin to practice, extend, or refine knowledge in familiar contexts.
- Applied (A) – Students approach mastery in the area of content. They explore deeply into the discipline and experience the controversies, debate, and uncertainties that characterize the leading edges of any field. They practice, extend, or refine knowledge in unfamiliar contexts.

**Accreditation Unit (AU) Mapping:** (% of total class AU)

<table>
<thead>
<tr>
<th>Math</th>
<th>Natural Science</th>
<th>Complementary Studies</th>
<th>Engineering Science</th>
<th>Engineering Design</th>
</tr>
</thead>
<tbody>
<tr>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>100%</td>
<td>0%</td>
</tr>
</tbody>
</table>

**Accreditation Data Collection and Privacy:**
Undergraduate programs in the College of Engineering are accredited by the Canadian Engineering Accreditation Board. Student performance data may be collected in this course to support accreditation and continuous program improvement processes. Anonymous samples of student work may also be collected for accreditation purposes. All data provided to the accreditation body or external entities is anonymized and reported in aggregate form to protect your information and identity. If you have any concerns about how your personal information is used or maintained, please contact the Associate Dean Academic, College of Engineering.
1. Approval by Department Head or Dean
   1.1 College or School with academic authority: College of Engineering
   1.2 Department with academic authority: Associate Dean, Academic Office
   1.3 Term from which the course is effective: 202105

2. Information required for the Catalogue
   2.1 Label & Number of course: CHE 113
   2.2 Academic credit units: 3
   2.3 Course Long Title (maximum 100 characters): Unit Operations in Chemical Process Engineering
   Course Short Title (maximum 30 characters): Unit Ops in Chem Process Eng
   2.4 Total Hours: Lecture 24  Seminar  Lab 18  Tutorial  Other
   2.5 Weekly Hours: Lecture  Seminar  Lab  Tutorial  Other
   2.6 Term in which it will be offered:  T1  T2  T1 or T2  T1 and T2
   2.7 Prerequisite:
   If there is a prerequisite waiver, who is responsible for signing it?
   D – Instructor/Dept Approval
   H – Department Approval  (Associate Dean, Academic)
   I – Instructor Approval
   2.8 Catalogue description (150 words or less):

   This course is designed to introduce first year students to the building block of chemical engineering processes: the unit operation. The fundamentals of chemical plant design, process flow diagrams, and unit operations will be illustrated both by lecture and by laboratory experiments. The lecture component will focus on full-scale equipment used in industry and, in parallel, experiments using some of that same equipment will be undertaken at the bench-scale. A bench-scale batch chemical plant will be built along with a paper-design of a full-scale plant. The course will culminate in a field trip to an industrial plant.

   2.9 Do you allow this course to be repeated for credit?  No

3. Please list rationale for introducing this course:  This is part of the integrated curriculum in the redesigned first year program.
4. **Please list the learning objectives for this course:**

By the end of this course, students will be expected to:

1. explain the concept of the Unit Operation and how the Unit Operation can be used to develop a Process Flow Diagram of chemical processes,
2. develop a Process Flow Diagram,
3. categorize chemical process equipment,
4. perform basic calculations (short-cut equipment design) on the unit operations illustrated in the laboratory section of the course, and
5. display competence in measuring process variables and performing analysis of data taken at the bench-scale.

5. **Impact of this course**

Are the programs of other departments or Colleges affected by this course? No
If so, were these departments consulted? (Include correspondence)
Were any other departments asked to review or comment on the proposal? Yes, within the College and we worked with the Gwenna Moss Centre for Teaching and Learning.

6. **Other courses or program affected** (please list course titles as well as numbers)

6.1 Courses to be deleted? GE 101, GE 111, GE 121, GE 124, GE 125 (for Fall 2021)
6.2 Courses for which this course will be a prerequisite? Any changes to the course prerequisites in the programs will be submitted in future UCC.
6.3 Is this course to be required by your majors, or by majors in another program? Required for Engineering Students as part of the Common First Year.

7. **Course outline**

(Weekly outline of lectures or include a draft of the course information sheet.)

See attached syllabus.

8. **Enrolment**

8.1 Expected enrollment: up to 150
8.2 From which colleges? Engineering

9. **Student evaluation**

Give approximate weighting assigned to each indicator (assignments, laboratory work, mid-term test, final examination, essays or projects, etc.)

The methods of assessment and their respective weightings are given below:

Assignments (5): 10%
Laboratories (6): 30%
Midterm Exam: 10%
Final Exam: 50%
9.1 How should this course be graded?

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
<th>Code Options for Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>Completed Requirements</td>
<td>Completed Requirements, Fail, IP In Progress</td>
</tr>
<tr>
<td>N</td>
<td>Numeric/Percentage</td>
<td>Grade of 0% to 100%, IP in Progress</td>
</tr>
<tr>
<td>P</td>
<td>Pass/Fail</td>
<td>Pass, Fail, In Progress</td>
</tr>
<tr>
<td>S</td>
<td>Special</td>
<td>NA – Grade Not Applicable</td>
</tr>
</tbody>
</table>

If other, please specify:

9.2 Is the course exempt from the final examination? No

10. **Required text**

Include a bibliography for the course:


11. **Resources**

11.1 Proposed instructor: Engineering Faculty

11.2 How does the department plan to handle the additional teaching or administrative workload? Within College/department budget – these courses will be replacing others.

11.3 Are sufficient library or other research resources available for this course? Yes, Course notes and references to other online resources will constitute the required reference materials. The Library will also put useful reference materials and texts on reserve.

11.4 Are any additional resources required (library, audio-visual, technology, etc.)? NA

12. **Tuition**

12.1 Will this course attract tuition charges? If so, how much? (use tuition category) TC07

12.2 Does this course require non-standard fees, such as materials or excursion fees? If so, please include an approved “Application for New Fee or Fee Change Form”

http://www.usask.ca/sesd/info-for-instructors/program-course-preparation.php#course-fees

No

**Detailed Course Information**

1. **Schedule Types**

Please choose the Schedule Types that can be used for sections that fall under this course:

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CL</td>
<td>Clinical</td>
<td>PRB</td>
<td>Problem Session</td>
</tr>
<tr>
<td>COO</td>
<td>Coop Class</td>
<td>RDG</td>
<td>Reading Class</td>
</tr>
<tr>
<td>FLD</td>
<td>Field Trip</td>
<td>RES</td>
<td>Research</td>
</tr>
<tr>
<td>ICR</td>
<td>Internet Chat Relay</td>
<td>ROS</td>
<td>Roster (Dent Only)</td>
</tr>
<tr>
<td>Course Code</td>
<td>Course Title</td>
<td>Type</td>
<td></td>
</tr>
<tr>
<td>-------------</td>
<td>--------------------------------------------------</td>
<td>--------------</td>
<td></td>
</tr>
<tr>
<td>IHP</td>
<td>Internet Help</td>
<td>SEM Seminar</td>
<td></td>
</tr>
<tr>
<td>IN1</td>
<td>Internship - Education</td>
<td>SSI Supervised Self Instruction</td>
<td></td>
</tr>
<tr>
<td>IN2</td>
<td>Internship - CMPT &amp; EPIP</td>
<td>STU Studio</td>
<td></td>
</tr>
<tr>
<td>IN3</td>
<td>Internship - General</td>
<td>SUP Teacher Supervision</td>
<td></td>
</tr>
<tr>
<td>IND</td>
<td>Independent Studies</td>
<td>TEL Televised Class</td>
<td></td>
</tr>
<tr>
<td>LAB</td>
<td>Laboratory</td>
<td>TUT Tutorial</td>
<td></td>
</tr>
<tr>
<td>LC</td>
<td>Lecture/Clinical (Dent Only)</td>
<td>WEB Web Based Class</td>
<td></td>
</tr>
<tr>
<td>LEC</td>
<td>Lecture</td>
<td>XCH Exchange Program</td>
<td></td>
</tr>
<tr>
<td>LL</td>
<td>Lecture/Laboratory (Dent Only)</td>
<td>XGN Ghost Schedule Type Not Applicable</td>
<td></td>
</tr>
<tr>
<td>MM</td>
<td>Multimode</td>
<td>XHS High School Class</td>
<td></td>
</tr>
<tr>
<td>PCL</td>
<td>Pre-Clinical (Dent Only)</td>
<td>XNA Schedule Type Not Applicable</td>
<td></td>
</tr>
<tr>
<td>PRA</td>
<td>Practicum</td>
<td>XNC No Academic Credit</td>
<td></td>
</tr>
</tbody>
</table>

2. Course Attributes
Please highlight the attributes that should be attached to the course (they will apply to all sections):

2.1 NOAC No Academic Credit
0 Credit Unit courses that possess “deemed” CUs (Called Operational Credit Units). NOAC causes the system to roll 0 academic credit units to academic history.

2.2 For the College of Arts and Science only: To which program type does this course belong?
- FNAR Fine Arts
- HUM Humanities
- SCIE Science
- SOCS Social Science
- ARNP No Program Type (Arts and Science)

3. Registration Information (Note: multi-term courses cannot be automated as corequisites)

3.1 Permission Required: No
3.2 Restriction(s): course only open to students in a specific college, program/degree, major, year in program
   College of Engineering only
3.3 Prerequisite(s): course(s) that must be completed prior to the start of this course
3.4 Prerequisite(s) or Corequisite(s): course(s) that can be completed prior to or taken at the same time as this course
   MATH 134 – Engineering Mathematics II
   GE 163 – Process Engineering
3.5 Corequisite(s): course(s) that must be taken at the same time as this course
3.6 Notes: recommended courses, repeat restrictions/content overlap, other additional information

4. List Equivalent Course(s) here:
An equivalent course can be used in place of the course for which this form is being completed, specifically for the purposes of prerequisite and degree audit checking. Credit will be given for only one of the equivalent courses.

4.1 If this is a recently-repurposed course number, please list the courses that are no longer considered to be equivalent:
*Please note:* If the equivalent courses carry an UNEQUAL number of credit units, DegreeWorks will automatically enforce the following, unless otherwise stated:

- If a 3 credit unit course is considered to be equivalent to a 6 credit unit course, it will fulfill the 6 credit unit requirement and the student will not have to complete another 3 credit units toward the overall number of required credit units for the program.
- If a 6 credit unit course is considered to be equivalent to a 3 credit unit course, ALL 6 of the credit units may be used to fulfill the 3 credit unit requirement.

5. **List Mutually-Exclusive Course(s) here:**
Mutually exclusive courses have similar content such that students cannot receive credit for both.

5.1 If this is a recently-repurposed course number, please list the courses that are no longer considered to be mutually exclusive:

*Please note:* SiRIUS cannot enforce a situation where the exclusion goes only one way.

6. **Additional Notes:**
CHE 113.3
Unit Operations in Chemical Process Engineering
Winter 2022

Land Acknowledgement
At the University of Saskatchewan, we acknowledge we are on Treaty Six Territory and the Homeland of the Métis. We pay our respect to the First Nation and Métis ancestors of this place and reaffirm our relationship with one another.

Instructors and Teaching Assistants:
Name: TBD
Office: TBD
Phone: TBD
Email: TBD
Optional: Instructor Profile

Office Hours: TBD

Lectures:
Weeks: 32 – 34
Classes: Six 1.5 hr classes in Weeks 32 and 34, Four 1.5 hr classes in Week 33 (a total of 16 classes)

Laboratory:
Weeks: 32 – 34
Labs: Two 3 hr labs per week (a total of 6 labs)

Website:
Assignments, solutions, lab schedules, general course information, and announcements will be posted on the course website (PAWS/Blackboard). Students are responsible for keeping up-to-date with the information on the course website. [https://bbelearn.usask.ca/](https://bbelearn.usask.ca/)

End-of-Day Help Sessions
End-of-day help sessions will be offered by the College of Engineering for the Common First Year and will provide support for all courses.

Unit Operations in Chemical Process Engineering will have end-of-day help sessions 3 times a week in Weeks 32, 33 and 34.

Description:
This course is designed to introduce first year students to the building block of chemical engineering processes: the unit operation. The fundamentals of chemical plant design, process flow diagrams, and unit operations will be illustrated both by lecture and by laboratory experiments. The lecture component will focus on full-scale equipment used in industry and, in parallel, experiments using some of that same equipment will be undertaken at the bench-scale. A bench-scale batch chemical plant will be built along with a paper-design of a full-scale plant. The course will culminate in a field trip to an industrial plant.

Pre or co-requisites:
MATH 134 – Engineering Math II
GE 163 – Process Engineering
Course Reference Numbers (CRNs): TBD
Available from the Dynamic Schedule once courses are built
(https://pawnss.usask.ca/ban/bwckschd.p_disp_dyn_sched)

Course Learning Outcomes: By the end of this course, students will be expected to:
1. explain the concept of the Unit Operation and how the Unit Operation can be used to develop a Process Flow Diagram of chemical processes,
2. develop a Process Flow Diagram,
3. categorize chemical process equipment,
4. perform basic calculations (short-cut equipment design) on the unit operations illustrated in the laboratory section of the course, and
5. display competence in measuring process variables and performing analysis of data taken at the bench-scale.

Assessment: The methods of assessment and their respective weightings are given below:
Assignments (5): 10%
Laboratories (6): 30%
Midterm Exam: 10%
Final Exam: 50%

Attendance and Participation: Attendance and participation is encouraged/expected, and students will be responsible for what happens in classes e.g. quizzes. However, attendance will not be mandatory (or marked).

Criteria That Must Be Met to Pass: Students must obtain a passing grade (greater than or equal to 50%) in either the midterm exam or the final exam in order to receive a passing grade in this course. A student who does not pass either the midterm exam or the final exam will receive a grade of 49% or the overall mark, whichever is lower.

Attendance and submission of laboratory reports is mandatory. Failure to meet these requirements will result in a final grade of 49% or the overall mark, whichever is lower.

Final Grades: The final grades will be consistent with the “literal descriptors” specified in the university's grading system (at the link below, click on “for undergraduate students”).
https://students.usask.ca/academics/grading/grading-system.php

For information regarding appeals of final grades or other academic matters, please visit the Student Conduct and Appeals section of the University Secretary's website:
Academic Courses Policy: More information on the Academic Courses Policy on course delivery, examinations and assessment of student learning can be found at: http://policies.usask.ca/policies/academic-affairs/academic-courses.php

Learning Charter: The University of Saskatchewan Learning Charter is intended to define aspirations about the learning experience that the University aims to provide, and the roles to be played in realizing these aspirations by students, instructors and the institution. A copy of the Learning Charter can be found at: https://teaching.usask.ca/about/policies/learning-charter.php

Course Content/Schedule:

<table>
<thead>
<tr>
<th>Topic</th>
<th>Approximate Lecture Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. COURSE INTRODUCTION (TEXT CHAPTER 1)</td>
<td></td>
</tr>
<tr>
<td>1.1. Definition of Chemical Engineering</td>
<td></td>
</tr>
<tr>
<td>1.2. Definition of a chemical process</td>
<td></td>
</tr>
<tr>
<td>1.3. The context of chemical process design</td>
<td></td>
</tr>
<tr>
<td>1.4. Levels of process design</td>
<td>1</td>
</tr>
<tr>
<td>2. PROCESS FLOW DIAGRAMS (TEXT CHAPTER 3)</td>
<td></td>
</tr>
<tr>
<td>2.1. Elements of process flow diagrams</td>
<td></td>
</tr>
<tr>
<td>2.2. Creating process flow diagrams</td>
<td></td>
</tr>
<tr>
<td>2.3. Interpreting process flow diagrams</td>
<td>3</td>
</tr>
<tr>
<td>3. EXAMPLES OF CHEMICAL PROCESSES (TEXT CHAPTER 3)</td>
<td></td>
</tr>
<tr>
<td>3.1. 1 or 2 examples from: Steam generation, Potash mill, Water treatment, β-Galactosidase via Recombinant E. coli</td>
<td></td>
</tr>
<tr>
<td>4. UNIT OPERATIONS BY GENERIC EQUIPMENT TYPE (TEXT CHAPTER 4)</td>
<td></td>
</tr>
<tr>
<td>4.1. Auxiliary facilities</td>
<td></td>
</tr>
<tr>
<td>4.2. Conveyors</td>
<td></td>
</tr>
<tr>
<td>4.3. Crushers, mills and grinders</td>
<td></td>
</tr>
<tr>
<td>4.4. Drives and power recovery machines</td>
<td></td>
</tr>
<tr>
<td>4.5. Evaporators, vapourizers (explored in the labs)</td>
<td></td>
</tr>
<tr>
<td>4.6. Furnaces</td>
<td></td>
</tr>
<tr>
<td>4.7. Gas movers, compressors and exhausters</td>
<td></td>
</tr>
<tr>
<td>4.8. Heat exchangers (explored in the labs)</td>
<td></td>
</tr>
<tr>
<td>4.9. Mixers (explored in the labs)</td>
<td></td>
</tr>
<tr>
<td>4.10. Process Vessels</td>
<td></td>
</tr>
<tr>
<td>4.11. Pumps (explored in the labs)</td>
<td></td>
</tr>
<tr>
<td>4.12. Reactors (explored in the labs)</td>
<td></td>
</tr>
<tr>
<td>4.13. Separators (explored in the labs)</td>
<td></td>
</tr>
<tr>
<td>4.14. Size-enlargement equipment</td>
<td></td>
</tr>
<tr>
<td>4.15. Storage vessels</td>
<td>12</td>
</tr>
<tr>
<td>5. DEVELOPMENT OF A PROCESS FLOW DIAGRAM FOR A DISTILLERY (TEXT CHAPTER 3)</td>
<td>2</td>
</tr>
<tr>
<td>6. FIELD TRIP TO A DISTILLERY</td>
<td>3</td>
</tr>
</tbody>
</table>

Assignments: There will be 5 semi-weekly assignments focusing on the technical content of the course. Each assignment is worth 2% of the total course grade (for a total of 10% of the total grade).
Laboratory:

<table>
<thead>
<tr>
<th>Topic</th>
<th>Approximate Lab Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. MIXING AND BLENDING</td>
<td>3</td>
</tr>
<tr>
<td>2. REACTION AND FERMENTATION</td>
<td>3</td>
</tr>
<tr>
<td>3. FILTRATION AND FLUID MOVERS</td>
<td>3</td>
</tr>
<tr>
<td>4. DISTILLATION AND EVAPORATION &amp; CONDENSATION AND PHASE CHANGE</td>
<td>3</td>
</tr>
<tr>
<td>5. DILUTION AND GLASSWARE TECHNIQUES</td>
<td>3</td>
</tr>
<tr>
<td>6. LAB QUIZ</td>
<td>3</td>
</tr>
</tbody>
</table>

Completion of lab work and the associated deliverables for each lab (including the lab quiz) is worth 5% of the total course grade (for a total of 30% of the total grade).

Attendance and submission of laboratory reports is mandatory. Failure to meet these requirements will result in a final grade of less than 50% for the course.

Late Assignments:

Late assignments receive a mark of zero. In the case of sickness, bereavement or other excusable absences, students will not be penalized for late submissions although they may be required to complete a variation on the original assignment.

Examinations:

**Midterm Exam:**

Week 33, Day and Time TDB
1 Hour

**Final Exam:**

Week 34, Day and Time TDB
2 Hours

Examination Policies:

- Examinations may be scheduled outside of regular class time: students should therefore avoid making prior travel, employment, or other commitments at these times. If a student is unable to write an exam through no fault of their own for medical or other valid reasons, documentation must be provided and an opportunity to write the missed exam may be given. Students are encouraged to review all examination policies and procedures: [http://students.usask.ca/academics/exams.php](http://students.usask.ca/academics/exams.php)
- The student cannot earn a passing grade in the course without having earned a mark of 50% or higher in at least one of the midterm or final exams. A student who does not pass either the midterm or final exam will receive a grade of 49% or the overall mark, whichever is lower.
- All exams are closed book. Students may bring in one 8.5” x 11”, double-sided formula sheet.
- The use of electronic devices, including calculators, phones and watches, with document storage and/or communication capabilities is prohibited during exams.
- Alternate times to write midterm examinations will not be considered except in the case of illness or a conflict with other university related activities.
• Alternate times to write final examinations cannot be accommodated. If a student misses a final exam, application must be made to the Engineering Student Centre to write a deferred exam.
• Students planning on registering with the office for Access and Equity Services for Students (AES) must do so in accordance with AES procedures and deadlines.

**Required Activities Outside of Class Time**

The midterm exam and the final exam will be written outside of class time.

**Experiential Learning**

Students will be involved in experimental investigation and design in the laboratory periods.

**Important Dates:**

<table>
<thead>
<tr>
<th>TBD</th>
<th>First day of classes</th>
</tr>
</thead>
<tbody>
<tr>
<td>TBD</td>
<td>Last day for making changes in registration for first-term courses (100% tuition credit).</td>
</tr>
<tr>
<td>TBD</td>
<td>Fall/Winter Break</td>
</tr>
<tr>
<td>TBD</td>
<td>Midterm Exam</td>
</tr>
<tr>
<td>TBD</td>
<td>Last day to withdraw from T2 classes</td>
</tr>
<tr>
<td>TBD</td>
<td>Holidays (if any)</td>
</tr>
<tr>
<td>TBD</td>
<td>Last day of classes.</td>
</tr>
<tr>
<td>TBD</td>
<td>Final examination</td>
</tr>
</tbody>
</table>

**Required Resources**

**Readings/Textbooks**


Textbooks are available from the University of Saskatchewan Bookstore: [https://bookstore.usask.ca/students.php#MyTextbooks](https://bookstore.usask.ca/students.php#MyTextbooks)

**Other Required Materials**

None.

**Policies on Academic Dishonesty, Academic Appeals and Course Delivery:**

Students are expected to undertake all aspects of their academic work in an ethical manner. Students are expected to submit their own individual work for academic credit, properly cite the work of others, and to follow all rules for examinations. Academic misconduct, plagiarism, and cheating will not be tolerated. Students are responsible for understanding the university’s policies on academic integrity and academic misconduct. If any form of academic misconduct is discovered, appropriate disciplinary action will be taken.

For information regarding appeals of a final grade or other academic matters, please consult the University Council document on Student Appeals of Evaluation, Grading and Academic Standing (http://policies.usask.ca/policies/student-affairs-and-activities/student-appeals.php).

Additional policies and procedures related to student conduct and appeals are provided on the University Secretariat website (www.usask.ca/secretariat/student-conduct-appeals) and on the University website http://www.usask.ca/integrity/.

A summary of University of Saskatchewan policies relating to academic courses is provided in the document: Academic Courses Policy on Class Delivery, Examinations, and Assessment of Student Learning (http://policies.usask.ca/policies/academic-affairs/academic-courses.php).

Integrity Defined (from the Office of the University Secretary)

The University of Saskatchewan is committed to the highest standards of academic integrity and honesty. Students are expected to be familiar with these standards regarding academic honesty and to uphold the policies of the University in this respect. Students are particularly urged to familiarize themselves with the provisions of the Student Conduct & Appeals section of the University Secretary Website and avoid any behavior that could potentially result in suspicions of cheating, plagiarism, misrepresentation of facts and/or participation in an offence. Academic dishonesty is a serious offence and can result in suspension or expulsion from the University.


For more information on what academic integrity means for students see the Academic Integrity section of the University Library Website at: https://library.usask.ca/academic-integrity#AboutAcademicIntegrity

You are encouraged to complete the Academic Integrity Tutorial to understand the fundamental values of academic integrity and how to be a responsible scholar and member of the USask community - https://library.usask.ca/academic-integrity.php#AcademicIntegrityTutorial

Safety:
Safety is of paramount importance in the College of Engineering. Students are expected to work in a safe and responsible manner, to follow all safety instructions, and use any specified personal protective equipment. Students failing to behave in a safe manner will be asked to leave.
**Emergency Response Plan:**
Preparing for emergencies protects our lives and property. An emergency response plan (ERP) posting is located in each classroom and lab near the main door of the room. Students are advised to review and be familiar with the College ERP and be aware that when an alarm sounds for more than 10 seconds, the building must be evacuated. Muster point locations are posted at each entrance of the Engineering Building. For more details about the ERP, please visit the following website: [https://engineering.usask.ca/documents/facilities/ERP%20-%20ENG%20-%20v%2005%20-%2009_01_2017.pdf](https://engineering.usask.ca/documents/facilities/ERP%20-%20ENG%20-%20v%2005%20-%2009_01_2017.pdf)

**Recording Lectures:**
Lectures will be recorded, when possible, and made available to students in Blackboard so students can rewatch them as needed for study purposes.

**Copyright:**
Course materials are provided to students based on their registration in a class. Any materials created by course instructors is the intellectual property of the instructors. This includes exams, tests, PowerPoint/PDF slides and other course notes. Additionally, other copyright-protected materials created by textbook publishers and authors may be provided to students based on license terms and educational exceptions in the Canadian Copyright Act (see [http://laws-lois.justice.gc.ca/eng/acts/C-42/index.html](http://laws-lois.justice.gc.ca/eng/acts/C-42/index.html)).

Before copying or distributing others' copyright-protected materials, students need to ensure that their use of the materials is covered under the University’s Fair Dealing Copyright Guidelines available at [http://www.usask.ca/copyright/basics/copyright-policy/fair-dealing-guidelines/index.php](http://www.usask.ca/copyright/basics/copyright-policy/fair-dealing-guidelines/index.php). For example, posting others’ copyright-protected materials on the internet is not covered under the University’s Fair Dealing Copyright Guidelines; doing so requires permission from the copyright holder. For more information about copyright, please visit [http://www.usask.ca/copyright/students/rights/index.php](http://www.usask.ca/copyright/students/rights/index.php) or contact the University’s Copyright Coordinator at [copyright.coordinator@usask.ca](mailto:copyright.coordinator@usask.ca).

Students should be aware that a violation of the university's copyright policies could be an instance of non-academic misconduct. For example, the practice of uploading or posting copyright-protected materials to course-sharing websites, depositories, or “drop boxes”, without the permission of the copyright holder, could result in a charge of non-academic misconduct under the university’s “Standard of Student Conduct in Non-Academic Matters”, found at the following location: [https://secretariat.usask.ca/student-conduct-appeals/non-academic-misconduct.php](https://secretariat.usask.ca/student-conduct-appeals/non-academic-misconduct.php).

**Student Conduct:**
Ethical behaviour is an important part of engineering practice. Each professional engineering association has a Code of Ethics, which its members are expected to follow. Since students are in the process of becoming Professional Engineers, it is expected that students will conduct themselves in an ethical manner.

The APEGS (Association of Professional Engineers and Geoscientists of Saskatchewan) Code of Ethics states that engineers shall “conduct themselves with fairness, courtesy and good faith towards clients, colleagues, employees and others; give credit where it is due and accept, as well as give, honest and fair professional criticism” (Section 20(e), The Engineering and Geoscience Professions Regulatory Bylaws, 1997).

The first part of this statement discusses an engineer’s relationships with their colleagues. One of the ways in which engineering students can demonstrate courtesy to their colleagues is by
helping to maintain an atmosphere that is conducive to learning, and minimizing disruptions in class. This includes arriving on time for lectures, turning cell phones and other electronic devices off during lectures, not leaving or entering the class at inopportune times, and refraining from talking to others while the instructor is talking.

**Access and Equity Services (AES) for Students**

Students who have disabilities (learning, medical, physical, or mental health) are strongly encouraged to register with Access and Equity Services (AES) if they have not already done so. Students who suspect they may have disabilities should contact AES for advice and referrals at any time. Those students who are registered with AES with mental health disabilities and who anticipate that they may have responses to certain course materials or topics, should discuss course content with their instructors prior to course add / drop dates. In order to access AES programs and supports, students must follow AES policy and procedures. For more information or advice, visit [https://students.usask.ca/health/centres/access-equity-services.php](https://students.usask.ca/health/centres/access-equity-services.php), or contact AES at 306-966-7273 or aes@usask.ca.

Students registered with AES may request alternative arrangements for mid-term and final examinations. Students must arrange such accommodations through AES by the stated deadlines. Instructors shall provide the examinations for students who are being accommodated by the deadlines established by AES.

**Support Services for Engineering Students:**

- Engineering Student Centre (Rm. 2A05 Engineering Building)
  - Email: esc@usask.ca; Phone: 306-966-5274; [https://engineering.usask.ca/contact_info/esc-office.php](https://engineering.usask.ca/contact_info/esc-office.php)

End of day help sessions will be offered by the College of Engineering for the Common First Year and will provide support for all courses. Please see **End-of-day Help Sessions** for more details.

**Student Learning Services**

Student Learning Services (SLS) offers assistance to U of S undergrad and graduate students. For information on specific services, please see the SLS web site [https://library.usask.ca/studentlearning/](https://library.usask.ca/studentlearning/).

**Teaching, Learning and Student Experience**

The Teaching, Learning and Student Experience Unit (TLSE) focuses on providing developmental and support services and programs to students and the university community. For more information, see [https://students.usask.ca/](https://students.usask.ca/). Specific resources include:

- Student Wellness Centre (3rd & 4th Floors, Place Riel): [https://students.usask.ca/health/](https://students.usask.ca/health/)
- Financial Services: [https://students.usask.ca/money/](https://students.usask.ca/money/)
College of Engineering Attribute Mapping:

This information shows the relationship of the learning outcomes of this course to the graduate attributes intended upon students’ completion of the degree program. This information is used for accreditation purposes.

<table>
<thead>
<tr>
<th>Learning Outcome</th>
<th>A1</th>
<th>A2</th>
<th>A3</th>
<th>A4</th>
<th>A5</th>
<th>A6</th>
<th>A7</th>
<th>A8</th>
<th>A9</th>
<th>A10</th>
<th>A11</th>
<th>A12</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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</tbody>
</table>

†Attributes:
A1 A knowledge base for engineering
A2 Problem analysis
A3 Investigation
A4 Design
A5 Use of engineering tools
A6 Individual and team work
A7 Communication skills
A8 Professionalism
A9 Impact of engineering on society and the environment
A10 Ethics and equity
A11 Economics and project management
A12 Life-long learning

‡Instructional Level:
Introduced (I) – Students learn the working vocabulary of the area of content, along with some of the major underlying concepts.
Developed (D) – Students use their working vocabulary and major fundamental concepts to probe more deeply, to read the literature, and to deepen their exploration of the concepts. They may begin to practice, extend, or refine knowledge in familiar contexts.
Applied (A) – Students approach mastery in the area of content. They explore deeply into the discipline and experience the controversies, debate, and uncertainties that characterize the leading edges of any field. They practice, extend, or refine knowledge in unfamiliar contexts.

Accreditation Unit (AU) Mapping: (% of total class AU)

<table>
<thead>
<tr>
<th>Math</th>
<th>Natural Science</th>
<th>Complementary Studies</th>
<th>Engineering Science</th>
<th>Engineering Design</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100%</td>
</tr>
</tbody>
</table>

Accreditation Data Collection and Privacy:
Undergraduate programs in the College of Engineering are accredited by the Canadian Engineering Accreditation Board. Student performance data may be collected in this course to support accreditation and continuous program improvement processes. Anonymous samples of student work may also be collected for accreditation purposes. All data provided to the accreditation body or external entities is anonymized and reported in aggregate form to protect your information and identity. If you have any concerns about how your personal information is used or maintained, please contact the Associate Dean Academic, College of Engineering.
1. Approval by Department Head or Dean
   1.1 College or School with academic authority: College of Engineering
   1.2 Department with academic authority: Associate Dean, Academic Office
   1.3 Term from which the course is effective: 202105

2. Information required for the Catalogue
   2.1 Label & Number of course: ME 113
   2.2 Academic credit units: 3
   2.3 Course Long Title (maximum 100 characters): Engineering Analysis I
   Course Short Title (maximum 30 characters): Engineering Analysis I
   2.4 Total Hours: Lecture 24 Seminar Lab 18 Tutorial Other
   2.5 Weekly Hours: Lecture Seminar Lab Tutorial Other
   2.6 Term in which it will be offered: T1 T2 T1 or T2 T1 and T2
   2.7 Prerequisite:

   If there is a prerequisite waiver, who is responsible for signing it?
   D – Instructor/Dept Approval
   H – Department Approval (Associate Dean, Academic)
   I – Instructor Approval
   2.8 Catalogue description (150 words or less):

   This course introduces mathematical tools and techniques used to solve mechanical engineering
   problems. Topics include: intermediate linear algebra, numerical methods for linear systems of
   equations, solving nonlinear equations, and numerical integration and differentiation. Centre of
   gravity and centroids, moments of inertia, and vibrations are also introduced. Applications to
   engineering problems are stressed. The laboratory content consists of two components: numerical
   modelling and introductory training in parametric solid modelling software.
   2.9 Do you allow this course to be repeated for credit? No

3. Please list rationale for introducing this course: This is part of the integrated curriculum in the
   redesigned first year program.

4. Please list the learning objectives for this course:

   By the end of this course, students will be able to:
1. add, transpose, multiply, and invert matrices;
2. understand a range of techniques to solve linear systems of equations;
3. use computational tools to solve linear systems of equations;
4. use computational tools to solve a non-linear equation;
5. determine eigenvalues and eigenvectors for simple problems;
6. articulate various numerical methods and apply them to engineering problem solving; and
7. perform numerical differentiation on simple to intermediate functions;
8. perform numerical line integrals, area integrals, and volume integrals on simple to intermediate function;
9. calculate the centroid and moment of inertia for simple to intermediate shapes;
10. perform simple vibration analyses; and
11. demonstrate beginner-level skills in SOLIDWORKS.

5. **Impact of this course**
   Are the programs of other departments or Colleges affected by this course? No
   If so, were these departments consulted? (Include correspondence)
   Were any other departments asked to review or comment on the proposal? Yes, within the College and we worked with the Gwenna Moss Centre for Teaching and Learning.

6. **Other courses or program affected** (please list course titles as well as numbers)
   6.1 Courses to be deleted? GE 101, GE 111, GE 121, GE 124, GE 125 (for Fall 2021)
   6.2 Courses for which this course will be a prerequisite?
   Any changes to the course prerequisites in the programs will be submitted in future UCC.
   6.3 Is this course to be required by your majors, or by majors in another program? Required for Engineering Students as part of the Common First Year.

7. **Course outline**
   (Weekly outline of lectures or include a draft of the course information sheet.)
   See attached syllabus.

8. **Enrolment**
   8.1 Expected enrollment: up to 200
   8.2 From which colleges? Engineering

9. **Student evaluation**
   Give approximate weighting assigned to each indicator (assignments, laboratory work, mid-term test, final examination, essays or projects, etc.)

   The methods of assessment and their respective weightings are:
   Assignments 15%
   Lab reports (3) 15%
   SOLIDWORKS Certification 5%
   Final Exam 65%
   Total 100%

   9.1 How should this course be graded?
   C – Completed Requirements
   *(Grade options for instructor: Completed Requirements, Fail, IP In Progress)*
N – Numeric/Percentage

(Grade options for instructor: grade of 0% to 100%, IP in Progress)

P – Pass/Fail

(Grade options for instructor: Pass, Fail, In Progress)

S – Special

(Grade options for instructor: NA – Grade Not Applicable) If other, please specify:

9.2 Is the course exempt from the final examination?  No

10. Required text
Include a bibliography for the course:


11. Resources
11.1 Proposed instructor: Engineering Faculty
11.2 How does the department plan to handle the additional teaching or administrative workload? Within College/department budget.
11.3 Are sufficient library or other research resources available for this course? Yes.
11.4 Are any additional resources required (library, audio-visual, technology, etc.)? SolidProfessor SolidWorks subscription required (www.solidprofessor.com)

12. Tuition
12.1 Will this course attract tuition charges? If so, how much? (use tuition category) TC07
12.2 Does this course require non-standard fees, such as materials or excursion fees? If so, please include an approved “Application for New Fee or Fee Change Form” http://www.usask.ca/sesd/info-for-instructors/program-course-preparation.php#course-fees
No

Detailed Course Information

1. Schedule Types
Please choose the Schedule Types that can be used for sections that fall under this course:

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CL</td>
<td>Clinical</td>
<td>PRB</td>
<td>Problem Session</td>
</tr>
<tr>
<td>COO</td>
<td>Coop Class</td>
<td>RDG</td>
<td>Reading Class</td>
</tr>
<tr>
<td>FLD</td>
<td>Field Trip</td>
<td>RES</td>
<td>Research</td>
</tr>
<tr>
<td>ICR</td>
<td>Internet Chat Relay</td>
<td>ROS</td>
<td>Roster (Dent Only)</td>
</tr>
<tr>
<td>IHP</td>
<td>Internet Help</td>
<td>SEM</td>
<td>Seminar</td>
</tr>
<tr>
<td>IN1</td>
<td>Internship - Education</td>
<td>SSI</td>
<td>Supervised Self Instruction</td>
</tr>
<tr>
<td>IN2</td>
<td>Internship - CMPT &amp; EPIP</td>
<td>STU</td>
<td>Studio</td>
</tr>
<tr>
<td>IN3</td>
<td>Internship - General</td>
<td>SUP</td>
<td>Teacher Supervision</td>
</tr>
<tr>
<td>IND</td>
<td>Independent Studies</td>
<td>TEL</td>
<td>Televised Class</td>
</tr>
</tbody>
</table>

391
LAB Laboratory  TUT Tutorial
LC Lecture/Clinical (Dent Only)  WEB Web Based Class
LEC Lecture  XCH Exchange Program
LL Lecture/Laboratory (Dent Only)  XGN Ghost Schedule Type Not Applicable
MM Multimode  XHS High School Class
PCL Pre-Clinical (Dent Only)  XNA Schedule Type Not Applicable
PRA Practicum  XNC No Academic Credit

2. Course Attributes
Please highlight the attributes that should be attached to the course (they will apply to all sections):

2.1 NOAC No Academic Credit
0 Credit Unit courses that possess “deemed” CUs (Called Operational Credit Units). NOAC causes the system to roll 0 academic credit units to academic history.

2.2 For the College of Arts and Science only: To which program type does this course belong?
   FNAR Fine Arts
   HUM Humanities
   SCIE Science
   SOCS Social Science
   ARNP No Program Type (Arts and Science)

3. Registration Information (Note: multi-term courses cannot be automated as corequisites)
   3.1 Permission Required: No
   3.2 Restriction(s): course only open to students in a specific college, program/degree, major, year in program
   College of Engineering only
   3.3 Prerequisite(s): course(s) that must be completed prior to the start of this course: MATH 134- Engineering Math II (taken), GE 123- Engineering Mechanics II (taken)
   3.4 Prerequisite(s) or Corequisite(s): course(s) that can be completed prior to or taken at the same time as this course
   3.5 Corequisite(s): course(s) that must be taken at the same time as this course
   3.6 Notes: recommended courses, repeat restrictions/content overlap, other additional information

4. List Equivalent Course(s) here:
An equivalent course can be used in place of the course for which this form is being completed, specifically for the purposes of prerequisite and degree audit checking. Credit will be given for only one of the equivalent courses.

4.1 If this is a recently-repurposed course number, please list the courses that are no longer considered to be equivalent:

*Please note: If the equivalent courses carry an UNEQUAL number of credit units, DegreeWorks will automatically enforce the following, unless otherwise stated:

- If a 3 credit unit course is considered to be equivalent to a 6 credit unit course, it will fulfill the 6 credit unit requirement and the student will not have to complete another 3 credit units toward the overall number of required credit units for the program.
• If a 6 credit unit course is considered to be equivalent to a 3 credit unit course, ALL 6 of the credit units may be used to fulfill the 3 credit unit requirement.

5. List Mutually-Exclusive Course(s) here:
Mutually exclusive courses have similar content such that students cannot receive credit for both.

5.1 If this is a recently-repurposed course number, please list the courses that are no longer considered to be mutually exclusive:

*Please note:* SiRIUS cannot enforce a situation where the exclusion goes only one way.

6. Additional Notes:
Description: This course introduces mathematical tools and techniques used to solve mechanical engineering problems. Topics include: intermediate linear algebra, numerical methods for linear systems of equations, solving nonlinear equations, and numerical integration and differentiation. Centre of gravity and centroids, moments of inertia, and vibrations are also introduced. Applications to engineering problems are stressed. The laboratory content consists of two components: numerical modelling and introductory training in parametric solid modelling software.

Prerequisites: MATH 134.3 (taken) and GE 123.3 (taken) (Note: The GE 123 is the second mechanics class.)

Co-requisites: None

Instructor: TBA

Lectures: Date, Time, Location TBA

Tutorials: Date, Time, Location TBA

Laboratory: TBA

Office Hours: Assignments, solutions, lab schedules, general course information, and announcements will be posted on the course website/LMS. Students are responsible for keeping up-to-date with the information on the course website/LMS.

Website: Link provided here (TBA)

Course Reference Numbers (CRNs): TBA (lectures), TBA (laboratory)

2. SolidProfessor SolidWorks subscription required (www.solidprofessor.com)

Reading List: None

Assessment: The methods of assessment and their respective weightings are:

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>15%</td>
</tr>
<tr>
<td>Lab reports (3)</td>
<td>15%</td>
</tr>
<tr>
<td>SOLIDWORKS Certification</td>
<td>5%</td>
</tr>
<tr>
<td>Final Exam</td>
<td>65%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

Final Grades: The final grades will be consistent with the “literal descriptors” specified in the university’s grading system (at the link below, click on “Understanding Your Grades”).

http://students.usask.ca/academics/grades.php

For information regarding appeals of final grades or other academic matters, please visit the Student Conduct and Appeals section of the University Secretary’s website:
http://www.usask.ca/secretariat/student-conduct-appeals/

Students receiving a failing grade in this course will be eligible for a Supplemental Examination. The supplemental examination grade will replace the original final examination in the final grade calculation.

Student failing ME 113 after writing the supplemental examination, and who receive a Required to Discontinue faculty action, can apply to the College of Engineering to re-take ME 113 during their required to discontinue year.

Assignments: There will be approximately four assignments worth a total of 15%.

Tutorials: None

Laboratory: There will be six, 3-hour laboratory periods. (See Course Content for topics)
There are four deliverables associated with the labs, each worth 5% of the course grade.
1. Certified SOLIDWORKS Associate (CSWA) exam
   Exam passed – Score = 100%
   Exam attempted but not passed – Score = 50%
2. Linear/non-linear equation solving lab report
3. Numerical integration lab report
4. Numerical differentiation lab report

Quizzes: None.

Midterm Exam: None.

Final Exam: The final exam will be a three-hour, written, closed-book examination. See “Important Dates” below for the date and time of the final exam. For more information on university examination schedules, policies and regulations, please visit the following website:

http://students.usask.ca/academics/exams.php

Rules for Exams: Electronic devices (e.g., cell phones, computers, tablets, PDA’s, smart watches, and tape, CD and digital music players) are not permitted in exams. The use of electronic communication devices during the exams is prohibited, both inside and outside the examination rooms. Access to the internet during these times may be monitored.

Students should also be aware of University of Saskatchewan examination regulations: (http://policies.usask.ca/policies/academic-affairs/academic-courses.php#examinations).

Important Dates: TBA First day of classes
TBA Last day of classes
April TBA, 2022 from 7:00 pm to 10:00 pm Final Examination

Attendance and Participation: There are no explicit attendance requirements for the lectures. However, regular attendance is very strongly recommended.

It is mandatory that all four laboratory exercises be completed. If all four are not completed, the maximum course grade will be 48%.

Recording Lectures: Video and/or audio recording of lectures is not allowed. Students with disabilities may record lectures for their own use with the permission of the instructor.

Copyright: Course materials are provided to students based on their registration in a class, and anything created by their professors and instructors is the intellectual property of the professors and instructors. This includes exams, PowerPoint/PDF slides and other course notes. Additionally,
other copyright-protected materials created by textbook publishers and authors may be provided to students based on license terms and educational exceptions in the Canadian Copyright Act (see http://laws-lois.justice.gc.ca/eng/acts/C-42/index.html).

Before copying or distributing others’ copyright-protected materials, students need to ensure that their use of the materials is covered under the University’s Fair Dealing Copyright Guidelines available at http://www.usask.ca/copyright/basics/copyright-policy/fair-dealing-guidelines/index.php. For example, posting others’ copyright-protected materials on the internet is not covered under the University’s Fair Dealing Copyright Guidelines, and doing so requires permission from the copyright holder. For more information about copyright, please visit http://www.usask.ca/copyright/students/rights/index.php or contact the University’s Copyright Coordinator at copyright.coordinator@usask.ca.

Students should be aware that the violation of the university’s copyright policies could be an instance of non-academic misconduct. For example, the practice of uploading or posting copyright-protected materials to course-sharing websites, depositories, or “drop boxes”, without the permission of the copyright holder, could result in a charge of non-academic misconduct under the university’s “Standard of Student Conduct in Non-Academic Matters”, found at the following location:


### Course Content:

<table>
<thead>
<tr>
<th>Hours</th>
<th>Textbook Section</th>
<th>Lecture Topics</th>
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</thead>
<tbody>
<tr>
<td>6</td>
<td></td>
<td>Intermediate Linear Algebra and its Applications</td>
</tr>
<tr>
<td>9</td>
<td></td>
<td>Numerical Methods</td>
</tr>
<tr>
<td>3</td>
<td>9.1-9.4</td>
<td>Centre of Gravity and Centroid</td>
</tr>
<tr>
<td>2</td>
<td>10.1-10.8</td>
<td>Moments of Inertia</td>
</tr>
<tr>
<td>4</td>
<td>22.1-22.5</td>
<td>Vibrations</td>
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### Lecture Details

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<tbody>
<tr>
<td>1</td>
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<td>Matrix concepts &amp; operations; rank, determinant, and inverse of a matrix</td>
</tr>
<tr>
<td>2</td>
<td>1.5</td>
<td>Systems of linear algebraic equations</td>
</tr>
<tr>
<td>3</td>
<td>1.5</td>
<td>Eigenvalues and eigenvectors, method of least squares</td>
</tr>
<tr>
<td>4</td>
<td>1.5</td>
<td>Introduction to numerical methods</td>
</tr>
<tr>
<td>5</td>
<td>1.5</td>
<td>Numerical solution of linear systems</td>
</tr>
<tr>
<td>6</td>
<td>1.5</td>
<td>Solution of nonlinear equation by iteration</td>
</tr>
<tr>
<td>7</td>
<td>1.5</td>
<td>Interpolation</td>
</tr>
<tr>
<td>8</td>
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<td>Numerical integration</td>
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<td>9</td>
<td>1.5</td>
<td>Numerical differentiation</td>
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<td>1.5</td>
<td>Centre of gravity</td>
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<td>11</td>
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<td>Centroids</td>
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<tr>
<td>12</td>
<td>1.5</td>
<td>Moments of inertia</td>
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<td>13</td>
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<td>14</td>
<td>1.5</td>
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</table>
Student Conduct:

Ethical behaviour is an important part of engineering practice. Each professional engineering association has a Code of Ethics, which its members are expected to follow. Since students are in the process of becoming Professional Engineers, it is expected that students will conduct themselves in an ethical manner.

The APEGS (Association of Professional Engineers and Geoscientists of Saskatchewan) Code of Ethics states that engineers shall “conduct themselves with fairness, courtesy and good faith towards clients, colleagues, employees and others; give credit where it is due and accept, as well as give, honest and fair professional criticism” (Section 20(e), The Engineering and Geoscience Professions Regulatory Bylaws, 1997).

The first part of this statement discusses an engineer’s relationships with their colleagues. One of the ways in which engineering students can demonstrate courtesy to their colleagues is by helping to maintain an atmosphere that is conducive to learning, and minimizing disruptions in class. This includes arriving on time for lectures, turning cell phones and other electronic devices off during lectures, not leaving or entering the class at inopportune times, and refraining from talking to others while the instructor is talking. However, if you have questions at any time during lectures, please feel free to ask (chances are very good that someone else may have the same question as you do).

For more information, please visit the Student Conduct and Appeals section of the University Secretary’s website:

http://www.usask.ca/secretariat/student-conduct-appeals/

Academic Honesty:

The latter part of the above statement from the APEGS Code of Ethics discusses giving credit where it is due. At the University, this is addressed by university policies on academic integrity and academic misconduct. In this class, students are expected to submit their own individual work for academic credit, properly cite the work of others, and to follow the rules for examinations. Academic misconduct, plagiarism, and cheating will not be tolerated. Students are responsible for understanding the university’s policies on academic integrity and academic misconduct.

For more information on academic integrity and university policies on academic misconduct, please visit the following websites:

http://www.usask.ca/integrity/
http://www.usask.ca/secretariat/student-conduct-appeals/
Safety: The APEGS Code of Ethics also states that Professional Engineers shall “hold paramount the safety, health and welfare of the public and the protection of the environment and promote health and safety within the workplace” (Section 20(a), The Engineering and Geoscience Professions Regulatory Bylaws, 1997).

Safety is taken very seriously by the Department of Mechanical Engineering. Students are expected to work in a safe manner, follow all safety instructions, and use any personal protective equipment provided. Students failing to observe the safety rules in any laboratory will be asked to leave.

Preparing for emergencies protects our lives and property. An emergency response plan (ERP) posting is located in each classroom and lab near the main door of the room. Students are advised to review and be familiar with the College ERP and be aware that when an alarm sounds for more than 10 seconds, the building must be evacuated. Muster point locations are posted at each entrance of the Engineering Building. For more details about the ERP, please visit the following website:


Policies: Further information on class delivery, examinations, and assessment of student learning, can be found at the following website:

http://policies.usask.ca/policies/academic-affairs/academic-courses.php

Support Services: For Academic Advising, students can contact the department’s Undergraduate Program Chair or visit the Engineering Student Centre. A wide range of Academic Support programs are provided by Student Learning Services. Other university support services are available through Student Wellness Centre, Student Affairs and Outreach, and Access and Equity Services (AES).

For more information, please visit the following websites:

http://www.usask.ca/ulc/
https://students.usask.ca/health/centres/wellness-centre.php
https://students.usask.ca/health/centres/access-equity-services.php

Learning Outcomes: By the end of this course, students will be able to:

1. add, transpose, multiply, and invert matrices;
2. understand a range of techniques to solve linear systems of equations;
3. use computational tools to solve linear systems of equations;
4. use computational tools to solve a non-linear equation;
5. determine eigenvalues and eigenvectors for simple problems;
6. articulate various numerical methods and apply them to engineering problem solving; and
7. perform numerical differentiation on simple to intermediate functions;
8. perform numerical line integrals, area integrals, and volume integrals on simple to intermediate function;
9. calculate the centroid and moment of inertia for simple to intermediate shapes;
10. perform simple vibration analyses; and
11. demonstrate beginner-level skills in SOLIDWORKS.
Graduate Attribute Mapping:

<table>
<thead>
<tr>
<th>Learning Outcome</th>
<th>A1</th>
<th>A2</th>
<th>A3</th>
<th>A4</th>
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<th>A6</th>
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**Graduate Attributes:**
A1 A knowledge base for engineering
A2 Problem analysis
A3 Investigation
A4 Design
A5 Use of engineering tools
A6 Individual and team work
A7 Communication skills
A8 Professionalism
A9 Impact of engineering on society and the environment
A10 Ethics and equity
A11 Economics and project management
A12 Life-long learning

*Instructional Level:
Introduced (I) - Students learn the working vocabulary of the area of content, along with some of the major underlying concepts.
Developed (D) - Students use their working vocabulary and major fundamental concepts to probe more deeply, to read the literature, and to deepen their exploration of the concepts. They may begin to practice, extend, or refine knowledge in familiar contexts.
Applied (A) - Students approach mastery in the area of content. They explore deeply into the discipline and experience the controversies, debate, and uncertainties that characterize the leading edges of any field. They practice, extend, or refine knowledge in unfamiliar contexts.

Accreditation Unit (AU) Mapping: (% of total class AU)

<table>
<thead>
<tr>
<th>Math</th>
<th>Natural Science</th>
<th>Complementary Studies</th>
<th>Engineering Science</th>
<th>Engineering Design</th>
</tr>
</thead>
<tbody>
<tr>
<td>75%</td>
<td></td>
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<td>25%</td>
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</table>

Accreditation Data Collection and Privacy:
Undergraduate majors in the College of Engineering are accredited by the Canadian Engineering Accreditation Board. Student performance data may be collected in this course to support accreditation and continuous program improvement processes. Anonymous samples of student work may also be collected for accreditation purposes. All data provided to the accreditation body or external entities are anonymized and reported in aggregate form to protect your information and identity. If you have any concerns about how your personal information is used or maintained, please contact the Associate Dean Academic, College of Engineering.
The Academic Programs Committee (B.Sc.) has approved the proposals for the following courses, at the college-level, on behalf of the College of Arts & Science:

BIOL 102.1 Nature of Engineering
CHEM 142.1 The Global Impact of Chemistry for Engineering
CHEM 146.3 General Chemistry for Engineering
CMPT 142.3 Introduction to Computer Science for Engineers
CMPT 146.3 Principles of Computer Science for Engineers
GEOL 102.1 Introduction to Geology for Engineering
MATH 133.4 Engineering Mathematics I
MATH 134.3 Engineering Mathematics II
PHYS 152.1 Introduction to Atoms and Nuclei for Engineering
PHYS 156.3 Electromagnetism and Waves for Engineering

The College of Arts & Science Faculty Council will be informed of the approval of these courses in the Items for Information document submitted by the committee, to the February 4, 2020 meeting.

Pending approval of the program revisions by the College of Engineering, the College of Arts & Science will collaborate with your college to submit a joint proposal to the Academic Programs Committee of Council, such that the new program and the constituent courses proceed through the university-level approval processes concurrently.
1. Approval by Department Head or Dean
   1.1 College or School with academic authority: College of Arts & Science
   1.2 Department with academic authority: Department of Biology
   1.3 Term from which the course is effective: 202105

2. Information required for the Catalogue
   2.1 Label & Number of course: BIOL 102
   2.2 Academic credit units: 1
   2.3 Course Long Title (maximum 100 characters): Nature for Engineering
       Course Short Title (maximum 30 characters): Nature for Engineering
   2.4 Total Hours: Lecture 9 Seminar Lab 6 Tutorial Other
   2.5 Weekly Hours: Lecture 3 Seminar Lab 3 Tutorial Other
   2.6 Term in which it will be offered: T1 T2 T1 or T2 T1 and T2
   2.7 Prerequisite:
       If there is a prerequisite waiver, who is responsible for signing it?
       D – Instructor/Dept Approval
       H – Department Approval
       I – Instructor Approval
   2.8 Catalogue description (150 words or less):
       Human activity is altering environments and biodiversity with profound effects on ecosystems. This course will explore foundational principles of ecology and the causes, consequences and solutions to questions about anthropogenic changes in biodiversity and ecosystems.
   2.9 Do you allow this course to be repeated for credit? No

3. Please list rationale for introducing this course:
   Currently a number of Arts & Science departments contribute to the Common First Year for the College of Engineering Bachelor of Science in Engineering (B.E.) program. The College of Engineering is in the process of redesigning this Common First Year to create the most effective first year engineering program in Canada. They are working hard to create something that will excite, engage and inspire their students, and to holistically prepare them for the challenges to come in later years. This project has been underway since 2016-2017 and has a planned launch of Fall 2021. Over this time there has been extensive consultation between the College of Engineering and specific
Departments in the College of Arts & Science. A suite of new Science courses are being proposed for use in this redesigned Common First Year which will replace or complement the use of existing courses.

The College of Engineering wishes to provide their first-year students with broad exposure to four of the Natural Science disciplines in the College of Arts and Science (Biology, Chemistry, Geological Sciences, and Physics). This is to be achieved through short (1 cu) courses in each of these disciplines. Each of the four courses will be delivered in the Fall term. The first-year cohort of engineering students will be divided into four groups and these groups will progress through the four disciplines in rotation. Each course will consist of nine hours of lectures and two, 3-hour labs components. By the end of the term, all first year engineering students will have progressed through all of the courses, having received 36 hours of lecture-based instruction and twenty-four hours of lab/practicum-based instruction.

The plan outlined above necessitates that each course is focused on a subset of disciplinary topics that can be delivered consistently at four distinct times over the term. To facilitate student learning, it was agreed that the four Science courses would seek some commonality in the topics delivered. To that end, it was agreed that the “environment” and “climate change” would be logical candidates. Thus, chemistry will have lab exercises investigating warming associated with different greenhouse gases, physics will discuss blackbody radiation within their course, geological science will deal with Earth system interactions and changes over time, and biology will focus on anthropogenic effects on biodiversity and ecosystems, including human-induced climate change. The four courses will have a common final examination in December with 45 minutes allotted to each course. Beyond that, courses will have a diversity of assignments, labs, quizzes, reports, or an exam at the end of their sections.

Each of these four 1 cu courses will have “GE 102 - Introduction to Engineering” listed as a Pre- or Co-Requisite. The Introduction to Engineering I course will focus on setting the students up to manage their time, reflect upon their study habits and work in groups – all things that will be important to each of the following courses. Perhaps more importantly, this is where the students will be learning to use TopHat, the LMS, other assessment software, and MS Office. Specifically for these Science courses it provides the lab safety training and acts as the vehicle for a reflective assessment that will incorporate what students learn in each of this 1 cu Science courses, effectively linking them together and solidifying the students’ learning.

The College of Engineering is also working toward a new competency-based assessment system that will be utilized in the new First Year Engineering courses in Fall 2021. The Arts & Science departments will continue to learn more about this system through 2020-2021 and 2021-2022 as it is implemented in Engineering, and will then determine how it can be used in the Science courses attached to the Engineering Common First Year. Revisions to the courses, to implement this assessment system, will be submitted to the appropriate College Academic Programs Committee for approval, prior to use in the courses.

Currently, the Department of Biology does not have experience teaching first-year engineering students en masse. This means that we cannot rely on previous knowledge about student performance in their first year to calibrate our course and ensure that it is delivered at an appropriate level. An analysis of the current first year engineering cohort revealed that approximately 2/3 of the students did not complete grade 12 biology (Biology 30). This is in contrast with our current introductory biology courses (BIOL 120 and 121) where we know that the overwhelming majority of
the students will have completed Biology 30 as a prerequisite. The engineering students will have grade 12 pre-calculus, physics and chemistry as these are the current entry requirements to the College of Engineering.

The proposed Department of Biology course was developed with these student characteristics in mind. Some adjustments in our approach to the course material may be needed as we gain experience with the course, but the topics and pedagogical methods chosen for the course should allow that to be accomplished within the proposed course structure. Case-based learning for the laboratories was selected as an alternative to our current laboratories as these can be geared to topics that engineers will likely engage with throughout their careers, and are easily adjusted if we need to recalibrate the course as we proceed. We can also leverage the technology-enhanced learning lab that was recently installed in room 122 of the Biology teaching wing. This facility allows us to offer meaningful active-learning exercises for the engineering students that focus on problem-solving and a team approach. It is also allows us to be parsimonious in the use of our precious teaching laboratories.

There is large variation possible in the cases that can be developed for the labs in the 1 cu course. This variation will be needed as the course will be offered in four sections delivered in series each year (about 150 students in each section). With 600 students in the course, plagiarism will quickly become an issue, especially for written submissions. Once the course is approved, we will have about 1.5 years to develop and refine the cases that will be used in the actual course. The proposed course syllabus sets out one way to teach the labs with a case-based approach. There are many ways to do this and some good online resources are available (two are linked below).

Finally, no textbook will be required for the course. It just did not seem reasonable to require students to purchase a text for a 1 cu course. The proposal lists an online open source text available through Rice University. The proposal for the case studies also makes use of the rich scientific literature in this area that is available through the USask library. A sample Reading List is included in the proposed syllabus. It never seems too early to have university-level students start using the scientific literature, although one does have to be careful in the expectations associated with the use of the literature. By using the literature, it is hoped that the first-year engineering students will see the USask Library as a valuable and tractable resource for their learning.

1Additional information about case-based learning for BIOL 102 can be found at http://sciencecases.lib.buffalo.edu/cs/about/ https://serc.carleton.edu/integrate/index.html

Attachments
Appendix I: Example of a case study to be provided in week one of the lab exercises. This case will center on the key ecological topic “Invasive Species”.


Appendix II: Example of a research article to be provided to the same group of students in week two of the lab exercises. This group of student would be guided (via written instructions or through interaction with the Teaching Assistants) to direct their case study highlight the ecological topic “Trophic Cascades”. This group of students would have dealt “Invasive Species” in the case from their first week.

4. **Please list the learning objectives for this course:**

By the end of the course, you are expected to:

1. **recall core principles and fundamental terminology associated with ecology, biodiversity and ecosystems**
2. **explain food-web structure and energy flow within an ecosystem, and their relevance to environmental engineering at local and global scales**
3. **articulate how engineers can better incorporate an understanding of biodiversity and ecosystems in their professional practice in order to minimize environmental impacts to species and human quality of life**
4. **apply scientific methods and evidence to understand biodiversity and ecosystems**
5. **work effectively within small groups to investigate multifaceted problems**
6. **demonstrate proficiency in disseminating your findings through writing and speech**

5. **Impact of this course**
   
   Are the programs of other departments or Colleges affected by this course? This course is for the College of Engineering First Year.
   
   If so, were these departments consulted? (Include correspondence) Yes
   
   Were any other departments asked to review or comment on the proposal? Biology, Chemistry, Physics and Geology reps met a number of times regarding these four – 1cu courses. The course also went through the Arts & Science College Challenge, which provides opportunity for responses by all departments in the College.

6. **Other courses or program affected** (please list course titles as well as numbers)
   
   6.1 Courses to be deleted? None
   
   6.2 Courses for which this course will be a prerequisite? None
   
   6.3 Is this course to be required by your majors, or by majors in another program?

   Required course in the first-year as part of revised Engineering program.
   
   No credit allowed in BIOL or ENVB major requirements. Does not meet prerequisite requirements for other BIOL courses. Can only be used to fulfill electives.
   
   Students with credit for all four of BIOL 102.1, CHEM 142.1, GEOL 102.1 and PHYS 152.1 will receive 3 credit units of elective credit in Arts & Science B.Sc. programs and 3 credit units of "science" or "elective" credit in B.A., B.F.A., or B.Mus. programs. Students who do not pass all 4 courses will receive no credit in Arts & Science programs.

7. **Course outline**
   
   (Weekly outline of lectures or include a draft of the course information sheet.)

   See attached syllabus.

8. **Enrolment**
   
   8.1 Expected enrollment: up to 600
   
   8.2 From which colleges? Engineering
9. **Student evaluation**
Give approximate weighting assigned to each indicator (assignments, laboratory work, mid-term test, final examination, essays or projects, etc.)

<table>
<thead>
<tr>
<th>Grade Component</th>
<th>%</th>
<th>Learning Outcomes To Be Assessed</th>
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</thead>
<tbody>
<tr>
<td>End of Section Exam</td>
<td>30</td>
<td>1, 2</td>
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<tr>
<td>Final Course Exam</td>
<td>30</td>
<td>1, 2, 3, 4</td>
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<tr>
<td>Group Lab Reports (two)</td>
<td>30</td>
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<td>Group Presentation &amp; Video</td>
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<td>3, 4, 5, 6</td>
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<td>Total</td>
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9.1 How should this course be graded?
C – Completed Requirements
(Grade options for instructor: Completed Requirements, Fail, IP In Progress)

N – Numeric/Percentage
(Grade options for instructor: grade of 0% to 100%, IP in Progress)

P – Pass/Fail
(Grade options for instructor: Pass, Fail, In Progress)

S – Special
(Grade options for instructor: NA – Grade Not Applicable)
If other, please specify:

9.2 Is the course exempt from the final examination? No – Final exam date may be schedule outside of the normal exam scheduling process.

10. **Required text**
Include a bibliography for the course.

There is no specific textbook to be purchased for this course. Students can use the following online textbook to support for their learning:


A Reading List of current scientific research articles relevant to the course is included in the syllabus (attached). You can access these articles through the USask Library.

11. **Resources**
11.1 Proposed instructor:
Biology Faculty (e.g. Chivers, Hudson, Lane, McLoughlin, Morrissey, Trick, Wiebe)

11.2 How does the department plan to handle the additional teaching or administrative workload? Within department.

11.3 Are sufficient library or other research resources available for this course? Yes

11.4 Are any additional resources required (library, audio-visual, technology, etc.)? Details have been worked out between College of Arts & Science and College of Engineering to fund laboratory costs for this course.
12. **Tuition**

12.1 Will this course attract tuition charges? If so, how much? (use tuition category) TC14

12.2 Does this course require non-standard fees, such as materials or excursion fees? If so, please include an approved “Application for New Fee or Fee Change Form”

http://www.usask.ca/sesd/info-for-instructors/program-course-preparation.php#course-fees

No

---

**Detailed Course Information**

1. **Schedule Types**

Please choose the Schedule Types that can be used for sections that fall under this course:

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CL</td>
<td>Clinical</td>
<td>PRB</td>
<td>Problem Session</td>
</tr>
<tr>
<td>COO</td>
<td>Coop Class</td>
<td>RDG</td>
<td>Reading Class</td>
</tr>
<tr>
<td>FLD</td>
<td>Field Trip</td>
<td>RES</td>
<td>Research</td>
</tr>
<tr>
<td>ICR</td>
<td>Internet Chat Relay</td>
<td>ROS</td>
<td>Roster (Dent Only)</td>
</tr>
<tr>
<td>IHP</td>
<td>Internet Help</td>
<td>SEM</td>
<td>Seminar</td>
</tr>
<tr>
<td>IN1</td>
<td>Internship - Education</td>
<td>SSI</td>
<td>Supervised Self Instruction</td>
</tr>
<tr>
<td>IN2</td>
<td>Internship - CMPT &amp; EPIP</td>
<td>STU</td>
<td>Studio</td>
</tr>
<tr>
<td>IN3</td>
<td>Internship - General</td>
<td>SUP</td>
<td>Teacher Supervision</td>
</tr>
<tr>
<td>IND</td>
<td>Independent Studies</td>
<td>TEL</td>
<td>Televised Class</td>
</tr>
<tr>
<td>LAB</td>
<td>Laboratory</td>
<td>TUT</td>
<td>Tutorial</td>
</tr>
<tr>
<td>LC</td>
<td>Lecture/Clinical (Dent Only)</td>
<td>WEB</td>
<td>Web Based Class</td>
</tr>
<tr>
<td>LEC</td>
<td>Lecture</td>
<td>XCH</td>
<td>Exchange Program</td>
</tr>
<tr>
<td>LL</td>
<td>Lecture/Laboratory (Dent Only)</td>
<td>XGN</td>
<td>Ghost Schedule Type Not Applicable</td>
</tr>
<tr>
<td>MM</td>
<td>Multimode</td>
<td>XHS</td>
<td>High School Class</td>
</tr>
<tr>
<td>PCL</td>
<td>Pre-Clinical (Dent Only)</td>
<td>XNA</td>
<td>Schedule Type Not Applicable</td>
</tr>
<tr>
<td>PRA</td>
<td>Practicum</td>
<td>XNC</td>
<td>No Academic Credit</td>
</tr>
</tbody>
</table>

2. **Course Attributes**

Please highlight the attributes that should be attached to the course (they will apply to all sections):

2.1 **NOAC No Academic Credit**

0 Credit Unit courses that possess “deemed” CUs (Called Operational Credit Units). NOAC causes the system to roll 0 academic credit units to academic history.

2.2 For the College of Arts and Science only: To which program type does this course belong?

- FNAR Fine Arts
- HUM Humanities
- **SCIE Science**
- SOCS Social Science
- ARNP No Program Type (Arts and Science)

3. **Registration Information (Note: multi-term courses cannot be automated as corequisites)**

3.1 Permission Required:
3.2 Restriction(s): course only open to students in a specific college, program/degree, major, year in program
Restricted to students in the College of Engineering.

3.3 Prerequisite(s): course(s) that must be completed prior to the start of this course

GE 102 – Introduction to Engineering I

3.4 Prerequisite(s) or Corequisite(s): course(s) that can be completed prior to or taken at the same time as this course

3.5 Corequisite(s): course(s) that must be taken at the same time as this course

3.6 Notes: recommended courses, repeat restrictions/content overlap, other additional information

4. List Equivalent Course(s) here: None
An equivalent course can be used in place of the course for which this form is being completed, specifically for the purposes of prerequisite and degree audit checking. Credit will be given for only one of the equivalent courses.

4.1 If this is a recently-repurposed course number, please list the courses that are no longer considered to be equivalent:

*Please note: If the equivalent courses carry an UNEQUAL number of credit units, DegreeWorks will automatically enforce the following, unless otherwise stated:

- If a 3 credit unit course is considered to be equivalent to a 6 credit unit course, it will fulfill the 6 credit unit requirement and the student will not have to complete another 3 credit units toward the overall number of required credit units for the program.
- If a 6 credit unit course is considered to be equivalent to a 3 credit unit course, ALL 6 of the credit units may be used to fulfill the 3 credit unit requirement.

5. List Mutually-Exclusive Course(s) here: None
Mutually exclusive courses have similar content such that students cannot receive credit for both.

5.1 If this is a recently-repurposed course number, please list the courses that are no longer considered to be mutually exclusive:

*Please note: SiRIUS cannot enforce a situation where the exclusion goes only one way.

6. Additional Notes:
COURSE SYLLABUS

COURSE TITLE: BIOL 102.1 NATURE FOR ENGINEERING

<table>
<thead>
<tr>
<th>COURSE CODE:</th>
<th>tbd</th>
<th>TERM:</th>
<th>Fall 2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>COURSE CREDITS:</td>
<td>1.0</td>
<td>DELIVERY:</td>
<td>Lecture &amp; Practicum (Lab)</td>
</tr>
<tr>
<td>COOURSE SECTION:</td>
<td>01</td>
<td>START DATE:</td>
<td>tbd</td>
</tr>
<tr>
<td>LECTURE LOCATION:</td>
<td>tbd</td>
<td>LAB LOCATION:</td>
<td>room 122 WPT Biology</td>
</tr>
<tr>
<td>LECTURE TIME:</td>
<td>tbd (maybe 1:30 to 2:50 pm T/Th)</td>
<td>LAB TIMES:</td>
<td>9:00 to 11:50 am (Tuesday, Wednesday, Thursday or Friday)</td>
</tr>
<tr>
<td>WEBSITE:</td>
<td>via PAWS/Blackboard</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Land Acknowledgement
At the University of Saskatchewan, we acknowledge we are on Treaty Six Territory and the Homeland of the Métis. We pay our respect to the First Nation and Métis ancestors of this place and reaffirm our relationship with one another.

Course Description
Human activity is altering environments and biodiversity with profound effects on ecosystems. This course will explore foundational principles of ecology and the causes, consequences and solutions to questions about anthropogenic changes in biodiversity and ecosystems.

Note: Restricted to students in the College of Engineering.

Learning Outcomes
By the end of the course, you are expected to
1. recall core principles and fundamental terminology associated with ecology, biodiversity and ecosystems
2. explain food-web structure and energy flow within an ecosystem, and their relevance to environmental engineering at local and global scales
3. articulate how engineers can better incorporate an understanding of biodiversity and ecosystems in their professional practice in order to minimize environmental impacts to species and human quality of life
4. apply scientific methods and evidence to understand biodiversity and ecosystems
5. work effectively within small groups to investigate multifaceted problems
6. demonstrate proficiency in disseminating your findings through writing and speech

Course Overview
The goal of this course is to provide an opportunity for first-year students in the College of Engineering to gain a basic understanding of the science of ecology, appreciate the impacts of
human activity on biodiversity and ecosystems at local, regional and global scales, and see the positive role the engineering profession can play in mitigating the negative effects of these activities. The course is scheduled for three weeks and consists of six lectures (75 minutes each) delivered on Tuesday and Thursday afternoons. In two of the weeks, there is an opportunity for students to apply their knowledge during 3-hour lab exercises. The labs involve interactive group work to study real world problems, and are taught in the Biology-Technology Enhanced Learning Lab (BTEL Lab). All instructors for the course are drawn from the Department of Biology and have a particular enthusiasm for the science of ecology. By the end of the course, we anticipate that students will be able to provide scientifically sound answers to the questions posed in the Lecture Topics listed below. Your course instructors will use their expertise, experience and enthusiasm to help you gain knowledge to answer these questions.

**Learning Charter**

The University of Saskatchewan Learning Charter is intended to define aspirations about the learning experience that the University aims to provide, and the roles to be played in realizing these aspirations by students, instructors and the institution. Information about the Learning Charter can be found at: [https://teaching.usask.ca/about/policies/learning-charter.php](https://teaching.usask.ca/about/policies/learning-charter.php)

**Course Schedule**

**Lectures:**

<table>
<thead>
<tr>
<th>Date</th>
<th>Lecture Topics to be Addressed</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Week One</strong></td>
<td>Ecology, evolution, biodiversity: definitions</td>
</tr>
<tr>
<td>Tuesday</td>
<td>Why is biodiversity fundamental to human existence?</td>
</tr>
<tr>
<td>Thursday</td>
<td>What is an ecosystem and how is it structured?</td>
</tr>
<tr>
<td></td>
<td>What is the pattern of energy flow through an ecosystem?</td>
</tr>
<tr>
<td></td>
<td>What are the abiotic components of terrestrial and aquatic ecosystems?</td>
</tr>
<tr>
<td></td>
<td>What is an ecological population, what is a community?</td>
</tr>
<tr>
<td></td>
<td>What is a food web and how are they constructed in different ecosystems?</td>
</tr>
<tr>
<td></td>
<td>What is biomagnification and how does it relate to food webs and energy flow through ecosystems?</td>
</tr>
<tr>
<td><strong>Week Two</strong></td>
<td>What are keystone species?</td>
</tr>
<tr>
<td>Tuesday</td>
<td>What is trophic cascade?</td>
</tr>
<tr>
<td></td>
<td>What are ecosystem engineers?</td>
</tr>
<tr>
<td></td>
<td>How are habitat loss, pollution, introduced species and overharvesting influencing ecosystems and biodiversity?</td>
</tr>
<tr>
<td></td>
<td>How do populations/communities respond after a disturbance?</td>
</tr>
<tr>
<td></td>
<td>What are the similarities and differences between natural (e.g. fire, flood) vs. anthropogenic disturbance regimes?</td>
</tr>
<tr>
<td></td>
<td>What environmental engineering solutions are there to mitigate impacts of anthropogenic disturbance?</td>
</tr>
<tr>
<td></td>
<td>What are some lessons learned from large-scale</td>
</tr>
</tbody>
</table>
engineering projects that have impacted human health and biodiversity?
Examples that can be used include dam construction and mitigation: schistosomiasis, loss of agricultural productivity in the Nile Delta from the Aswan High Dam; dams of the Columbia River and elimination of and re-establishment of salmon migration; current impacts of dams along the Saskatchewan River.

<table>
<thead>
<tr>
<th>Week Three</th>
<th>Tuesday</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Climate Change I.</strong></td>
<td>What is the science behind global change biology? How does global climate change interact with other types of anthropogenic disturbance? How is global climate change influencing terrestrial ecosystems? Aquatic ecosystems?</td>
</tr>
<tr>
<td><strong>Climate Change II.</strong></td>
<td>What are ecosystem services? What are some engineering solutions to reduce carbon emissions? At the local scale? At the global scale? What other roles will engineers play in societal adaptation to climate change? What is the impact of climate change from a Saskatchewan perspective? What does climate change look like from an Indigenous Peoples’ perspective?</td>
</tr>
</tbody>
</table>

**Laboratories:**
The practicum will utilize case-based scenarios and require students to work in small groups (maximum four students) to analyze ecosystem functioning, and to identify interventions that will prevent or alleviate problems associated with alterations in biodiversity and ecosystems. Written lab reports and a presentation are required (see Evaluation of Student Performance below). There are a myriad of topics available for these cases. This year, cases will illustrate several key ecological topics: primary production, ecosystem engineer, trophic cascade, biomagnification, invasive species, bioremediation, keystone species, refugia, ecosystem service and ocean acidification. As you progress through the cases, keep in mind that your performance during these lab activities is being assessed by the Teaching Assistants (see Participation & Performance in Laboratory Activities below).

**Week One.** Each group will be given a case-based scenario to analyze that illustrates one of the ecological topics listed above. Each case will be drawn from a published source(s) and is organized in a way to help you acquire and practice the basic terminology of biodiversity and ecosystems. A structured group report will be due at the end of the lab period. The report will be submitted via the course Blackboard. The hand-in folder will close at the end of the lab period. Reports cannot be submitted after that time.

Prior to the end of the week one lab period (after the group report has been completed or nearly completed), each group will be provided with an original published research article that investigates some aspect of biodiversity and ecology. Whatever time is remaining in the lab can
be used to do an initial read of this article and ask a Teaching Assistant for their advice about the article.

Group homework for the week will be to spend additional time understanding the research article. Your group can also start to prepare a draft of a short powerpoint presentation about the case study that was completed during the week one lab period. Structure this powerpoint so that other students can use it to learn about the specific case and the key ecological topic illustrated by the case.

**Week Two.** This lab period will focus on the original research article provided in week one. For this week, you will work as a group to extract the salient points from the article and understand how one of the key ecological topics listed above was studied in the research article. Each group will then prepare a case study document (generally modeled on the format used in week one). This case study document should be sufficiently rigorous so that other students in the course can use your group’s document to effectively learn about the key ecological topic. Teaching Assistants will select the ten best case studies from the four lab sections and post these on Blackboard for other students in the class to use as they study for the final exam. Groups that have their case study chosen as one of the ten best will receive 2 bonus marks (%) on their overall practicum scores (to a maximum of 25% overall for the practicum). The posted cases will also be used to form questions for the final exam (see Final Course Exam description below). Any remaining time in this lab period should be used to work on the powerpoint presentation from week one.

Group homework for the week will be to complete the presentation and prepare a video (five minutes maximum) of the powerpoint presentation from week one. The video is due during week three, specifically at noon on the day when your lab would normally be held. There are no other formal lab activities scheduled during week three. The presentation must also include an explanation of the role that engineers might play in mitigating the biodiversity and ecosystem effects illustrated by the research articles. The TAs will select the ten best videos from the four lab sections and post these to Blackboard for other students in the class to use as they study for the end of section and final exams. Groups that have their case study video chosen as one of the ten best will receive 2 bonus marks (%) on their overall practicum scores (to a maximum of 25% overall for the practicum).

**Instructors**

**Contact Information**
To be determined

**Office Hours**
To be determined

**Instructor Profiles & Other Information**
To be determined

**Required Resources**

**Textbooks**
There is no specific textbook to be purchased for this course. Students can use the following online textbook to support for their learning:

More advanced ecology textbooks are available for purchase through the University Bookstore, but students should not need these to complete the course. The University Library also has many textbooks and other resources available if you wish to pursue the topics of this course on your own. Please feel free to contact the course instructor for further advice on these resources if you wish.

**Course Website & Supplementary Resources**

Your instructors may make supplementary material available to you through the course blackboard. This material will not replace the lecture experience and you are encouraged to attend all lectures and take your own notes. A supplemental reading list and other material needed for the laboratory will be available as a download from the course Blackboard. Students are responsible for keeping up-to-date with announcements and information posted on blackboard. [https://bblearn.usask.ca/](https://bblearn.usask.ca/)

**Portable Electronic Device Required**

The laboratory portion of this course will require the use of a laptop computer or tablet. Each student is responsible for bringing a laptop or tablet to the lab exercises.

**Grading & Assessment Scheme**

<table>
<thead>
<tr>
<th>Grade Component</th>
<th>%</th>
<th>Learning Outcomes To Be Assessed</th>
</tr>
</thead>
<tbody>
<tr>
<td>End of Section Exam</td>
<td>30</td>
<td>1,2</td>
</tr>
<tr>
<td>Final Course Exam</td>
<td>30</td>
<td>1,2,3,4</td>
</tr>
<tr>
<td>Group Lab Reports (two)</td>
<td>30</td>
<td>4,5,6</td>
</tr>
<tr>
<td>Group Presentation &amp; Video</td>
<td>10</td>
<td>3,4,5,6</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

**Evaluation of Student Performance**

**End of Section Exam**

- **Value:** 30% of final course grade
- **Date:** To be scheduled soon after lectures are completed.
- **Length:** 45 minutes
- **Format:** Multiple choice questions
- **Description:** This will be a closed book exam on material delivered in the lectures. Students may use a calculator during the exam. No phones, laptops, tablets (or other devices with storage and communication capabilities), or other material are allowed in the exam room. Note that this exam is scheduled outside of the regular course meeting times.

**Final Course Exam**

- **Value:** 30% of final course grade
- **Date:** To be scheduled during the December final exam period.
- **Length:** 45 minutes
- **Format:** Multiple choice questions
- **Description:** This will be a closed book exam. It is comprehensive in that it will cover lecture material and incorporate aspects of the laboratories. Approximately ten of the questions on the final exam will require analysis of one or more case-based scenario. Students may use a calculator during the exam. No phones, laptops, tablets (or other devices with storage and communication capabilities), or other material are allowed in the exam room. Note that this exam is scheduled outside of the regular course meeting times.
Group Lab Reports

Value: 30% of final course grade (15% for each report)
Due Date: These are due at the end of each lab period.
Format: These are group reports to be completed before the end of each lab period.
Description: During first lab period, students will be directed through a case-based scenario and will provide written answers to specific questions as they analyze the case material in the form of a structured group report. In the second week, each group will analyze a research article and then prepare a case study document (generally modeled on the format they studied in week one). Additional information about the group reports will be provided on the course Blackboard. Teaching assistants for the labs will select the ten best case studies from week two and post these to blackboard for other students in the class to use as they study for the end of section and final exams. Groups that have their case study chosen as one of the ten best will receive 2% bonus marks on their overall practicum scores (to a maximum of 40% total for the laboratory component of the course). Students are required to know what constitutes plagiarism and the University’s Regulations on Academic Student Misconduct (see below). Hand-in folders will be available on the course blackboard for these reports. The folder will close immediately at the end of the lab period.

Group Presentation & Video

Value: 10% of final course grade
Date: This is due in week three of the course, at noon on the day when the lab section would normally be scheduled.
Format: Groups will prepare a 5-minute powerpoint presentation and record a video of their presentation.
Description: The topic for the presentation will be the case material from week two of the labs. The presentation must include an explanation of the role that the engineering profession might play in mitigating the general biodiversity and ecosystem effects illustrated by the case. Teaching Assistants will select the ten best videos from the four lab sections and post these to Blackboard for other students in the class to use as they study for the end of section and final exams. Groups that have their case study chosen as one of the ten best will receive 2% bonus marks on their overall practicum scores (to a maximum of 40% total for the laboratory component of the course). The video should be recorded at sufficient quality to enable effective viewing by other students. Students may use their own recording devices or classroom recording equipment; use of the latter must be arranged through the course instructors. It is expected that all group members will present some aspect of the group video.

Feedback to Students

The lab reports will be graded by teaching assistants who will also watch for plagiarism. Reports will be graded and returned on a schedule such that students will have feedback about their work before they need to submit their second report. Grades will be assigned based on the quality of the written report, including clarity and logic of the writing, grammar and spelling. Video presentations will be graded based on the quality of the presentation, including professionalism. A rubric for the video presentation will be provided through the course Blackboard. During the lab periods, students are encouraged to interact with their Teaching Assistants. However, working with other students in the group to find answers will be encouraged.


**Attendance & Participation Expectations**

Attendance at both laboratory periods is required. Absence from a lab period will result in an assignment of zero for any group activity missed in that lab period. Students who are ill on the day of the lab or who experience extenuating personal circumstances that require them to miss an lab must contact the course instructor (an email or phone call is adequate) prior to the lab and explain the reason why the lab is being missed. There are no exceptions to this policy; students who fail to proactively advise the instructor that they will miss the lab period will be subject to the penalty noted above. Depending on the situation, additional documentation may be requested from the student. Grades associated with the work that is missed will be transferred to other components of the course. The components to receive extra weighting in these situations will be chosen at the sole discretion of the instructor.

The anticipation is that the labs will be lively with conversations focused on the lab activities. Students who leave before the end of the lab period or those who spend extensive time during the lab period on activities unrelated to the lab will do less well in the course. It is expected that students will adequately prepare for the labs. This includes reading any preparatory material posted on blackboard by the instructors. Week two will require the analysis of a scientific research article. It is expected that students will arrive at this lab period with a basic understanding of the assigned article.

When a student is unable to attend both of the lab periods due to illness or personal circumstance, it is assumed that student will have also missed the lectures delivered in those weeks. This means that the student has been unable to attend a significant component of the course. The student will be referred to the Engineering Student Centre for advice on how to proceed with the rest of the course.

**Late Assignments**

Group lab reports are due at the end of each laboratory. These must be submitted via the course blackboard no later than the end of the lab period. Late reports will not be accepted. This means that groups must work efficiently during the lab period to complete the assignment each day. Group videos are due during the third week of the course. Videos that are submitted after the due date will have 25% deducted from their value for each day (or portion of a day, including weekends) beyond their due date. This translates into a deduction of 2% from the final course grade for each day that the video is late. Videos submitted on the fifth day (or later) after their due date will be assigned a grade of zero.

**End of Section Exam and Final Course Examination Scheduling**

The end of section exam will be scheduled after the last lecture. This may be during an evening or weekend, depending on the first year engineering program schedule. An alternate time to write the end of section exam will be considered for students who are ill or who have a conflict for legitimate personal reasons (e.g. employment schedule, child care duties) or with other university-related activities (e.g. practice with Huskie Athletics). Documentation supporting the scheduling conflict may be required. Deferments will not be allowed when the conflict arises from any type of social activity.

The final course examination may be scheduled at any time during the examination period (dates to be inserted here); students should therefore avoid making prior travel, employment, or other commitments for this period. If a student is unable to write an exam through no fault of her or his own for medical, compassionate or other valid reasons, documentation must be provided and an opportunity to write the missed exam may be given. Students are encouraged
to review all examination policies and procedures:  
http://students.usask.ca/academics/exams.php

Alternate times to write the final course examination cannot be accommodated by the instructor. If a student misses the final exam, application must be made to the Engineering Student Centre to write a deferred exam.

Students planning on registering with the office for Access and Equity Services for Students (AES) must do so in accordance with AES procedures and deadlines (see information regarding Student Supports below).

**Recording of the Course**

Students are not allowed to record any aspect of this course, except with the permission of the instructor or as provided for by arrangements with AES. Any recording made under AES provisions is to only be used for the personal learning of the student who made the recording.

**Copyright**

Course materials are provided to students based on their registration in a class. Any material created by course instructors is the intellectual property of the instructors. This includes exams, PowerPoint/PDF slides and other course notes. Additionally, other copyright-protected materials created by textbook publishers and authors may be provided to students based on license terms and educational exceptions in the Canadian Copyright Act (see http://laws-lois.justice.gc.ca/eng/acts/C-42/index.html).

Before copying or distributing others’ copyright-protected materials, students need to ensure that their use of the materials is covered under the University’s Fair Dealing Copyright Guidelines available at http://www.usask.ca/copyright/basics/copyright-policy/fair-dealing-guidelines/index.php. For example, posting others’ copyright-protected materials on the internet is not covered under the University’s Fair Dealing Copyright Guidelines; doing so requires permission from the copyright holder. For more information about copyright, please visit http://www.usask.ca/copyright/students/rights/index.php or contact the University’s Copyright Coordinator at copyright.coordinator@usask.ca.

Students should be aware that a violation of the university’s copyright policies could be an instance of non-academic misconduct. For example, the practice of uploading or posting copyright-protected materials to course-sharing websites, depositories, or “drop boxes”, without the permission of the copyright holder, could result in a charge of non-academic misconduct under the university’s “Standard of Student Conduct in Non-Academic Matters” (see Student Conduct section below).

**Student Feedback**

The Department of Biology or the course instructors may survey students regarding the course. This is generally done through an in-class assessment near the end of the course.

**University of Saskatchewan Grading System**

The University has established a grading system to be used in all of its courses. Information on literal descriptors for grading at the University of Saskatchewan (reproduced below) can be found at: http://students.usask.ca/academics/grading/grading-system.php
Exceptional (90-100) A superior performance with consistent evidence of
- a comprehensive, incisive grasp of the subject matter;
- an ability to make insightful critical evaluation of the material given;
- an exceptional capacity for original, creative and/or logical thinking;
- an excellent ability to organize, to analyze, to synthesize, to integrate ideas, and to express thoughts fluently.

Excellent (80-90) An excellent performance with strong evidence of
- a comprehensive grasp of the subject matter;
- an ability to make sound critical evaluation of the material given;
- a very good capacity for original, creative and/or logical thinking;
- an excellent ability to organize, to analyze, to synthesize, to integrate ideas, and to express thoughts fluently.

Good (70-79) A good performance with evidence of
- a substantial knowledge of the subject matter;
- a good understanding of the relevant issues and a good familiarity with the relevant literature and techniques;
- some capacity for original, creative and/or logical thinking;
- a good ability to organize, to analyze and to examine the subject material in a critical and constructive manner.

Satisfactory (60-69) A generally satisfactory and intellectually adequate performance with evidence of
- an acceptable basic grasp of the subject material;
- a fair understanding of the relevant issues;
- a general familiarity with the relevant literature and techniques;
- an ability to develop solutions to moderately difficult problems related to the subject material;
- a moderate ability to examine the material in a critical and analytical manner.

Minimal Pass (50-59) A barely acceptable performance with evidence of
- a familiarity with the subject material;
- some evidence that analytical skills have been developed;
- some understanding of relevant issues;
- some familiarity with the relevant literature and techniques;
- attempts to solve moderately difficult problems related to the subject material and to examine the material in a critical and analytical manner which are only partially successful.

Failure <50 An unacceptable performance

For information regarding appeals of final grades or other academic matters, please visit the Student Conduct and Appeals section of the University Secretary’s webpages: https://secretariat.usask.ca/student-conduct-appeals/appeals-in-academic-matters.php

Student Conduct

Integrity Defined
The University of Saskatchewan is committed to the highest standards of academic integrity and honesty. Students are expected to be familiar with these standards regarding academic honesty and to uphold the policies of the University in this respect. Students are particularly urged to familiarize themselves with the provisions of the Student Conduct & Appeals section of the University Secretary webpages (see below) and avoid any behavior that could potentially result in suspicions of cheating, plagiarism, misrepresentation of facts and/or participation in an offence. Academic dishonesty is a serious offence and can result in suspension or expulsion from the University.

More information on what academic integrity means for students is found in the Academic Integrity webpages hosted by the University of Saskatchewan Library: https://library.usask.ca/academic-integrity.php
Code of Ethics For Engineers
Ethical behaviour is an important part of engineering practice. Each professional engineering association has a Code of Ethics, which its members are expected to follow. Since students are in the process of becoming Professional Engineers, it is expected that students will conduct themselves in an ethical manner.

The APEGS (Association of Professional Engineers and Geoscientists of Saskatchewan) Code of Ethics states that engineers shall “conduct themselves with fairness, courtesy and good faith towards clients, colleagues, employees and others; give credit where it is due and accept, as well as give, honest and fair professional criticism” (Section 20(e), The Engineering and Geoscience Professions Regulatory Bylaws, 1997).

The first part of this statement discusses an engineer’s relationships with his or her colleagues. One of the ways in which engineering students can demonstrate courtesy to their colleagues is by helping to maintain an atmosphere that is conducive to learning, and minimizing disruptions in class. This includes arriving on time for lectures, turning cell phones and other electronic devices off during lectures, not leaving or entering the class at inopportune times, and refraining from talking to others while the instructor is talking.

Policies on Academic Dishonesty, Academic Appeals and Course Delivery
Students are expected to undertake all aspects of their academic work in an ethical manner. Students are expected to submit their own individual work for academic credit, properly cite the work of others, and to follow all rules for examinations. Academic misconduct, plagiarism, and cheating will not be tolerated. Students are responsible for understanding the university’s policies on academic integrity and academic misconduct. If any form of academic misconduct is discovered, appropriate disciplinary action will be taken.

Information about expectations and policies about student conduct at the University of Saskatchewan can be found at The Office of the University Secretary webpage. This webpage contains links to several important documents including the Student Discipline Policy, Student Academic Misconduct Regulations, Standard of Student Conduct in Non-Academic Matters, and Procedures for Student Appeals in Academic Matters (see weblinks below).

About Student Conduct:  

Appeals in Academic Matters:  

Academic Misconduct:  

Non-Academic Misconduct:  

A summary of University of Saskatchewan polices relating to academic courses is provided in the document: Academic Courses Policy on Class Delivery, Examinations, and Assessment of Student Learning  https://policies.usask.ca/policies/academic-affairs/academic-courses.php

Safety:
Safety is of paramount importance in the College. Students are expected to work in a safe and responsible manner, to follow all safety instructions, and use any specified personal protective equipment. Students failing to behave in a safe manner will be asked to leave.
Student Supports

Support Services for Engineering Students

- Engineering Student Centre (Rm. 2A05 Engineering Building)
  - Email: esc@usask.ca; Phone: 306-966-5274; https://engineering.usask.ca/contact_info/esc-office.php
- Student Wellness Centre (3rd & 4th Floors, Place Riel): https://students.usask.ca/health/
- Financial Services: https://students.usask.ca/money/

Student Learning Services

Student Learning Services (SLS) offers assistance to U of S undergrad and graduate students. For information on specific services, please see the SLS web site:
https://library.usask.ca/studentlearning/

Teaching, Learning and Student Experience

The Teaching, Learning and Student Experience Unit (TLSE) focuses on providing developmental and support services and programs to students and the university community. For more information, see https://teaching.usask.ca/about/people/vice-provost-teaching-learning-and-student-experience.php

Examinations through Access and Equity Services (AES)

Students who have disabilities (learning, medical, physical, or mental health) are strongly encouraged to register with AES if they have not already done so. Students who suspect they may have disabilities should contact AES for advice and referrals. In order to access AES programs and supports, students must follow AES policy and procedures. For more information, check www.students.usask.ca/aes, or contact AES at 306-966-7273 or aes@usask.ca. They are located in Rm. E1, Administrative Building.

Students registered with AES may request alternative arrangements for mid-term and final examinations.

Students must arrange such accommodations through AES by the stated deadlines. Instructors shall provide the examinations for students who are being accommodated by the deadlines established by AES.
Sample Reading List


Carvalho, L. M. V. Assessing precipitation trends in the Americas with historical data: A review. *Wiley Interdisciplinary Reviews-Climate Change*.


Dobson, A., Richardson, J. and Blossey, B. Effects of earthworms and white-tailed deer on roots, arbuscular mycorrhizae, and forest seedling performance. *Ecology*.


Attachments

**Appendix 1**: Example of a case study to be provided in week one of the lab exercises. This case will center on the key ecological topic “Invasive Species”.


**Appendix II**: Example of a research article to be provided to the same group of students in week two of the lab exercises. This group of students would be guided (via written instructions or through interaction with the Teaching Assistants) to direct their case study highlight the ecological topic “Trophic Cascades”. This group of students would have dealt “Invasive Species” in the case from their first week.

A Trip to the Beach: Untangling the Mystery of Algal Blooms in the Great Lakes

by

Susan E. Gass, Environmental Science, Dalhousie University, Halifax, NS, Canada
Laurie S. Eberhardt, Department of Biology, Valparaiso University, Valparaiso, IN

Part I – The Problem

Matt and Flora are college sophomores studying biology who had met in their freshman biology lab. Matt had invited Flora up to his summer cottage on Lake Michigan to spend a week with his family and was excited to show her the beautiful beach. He hadn't been to the cottage in a couple of years because he had been working in the city to save up money for college. After arriving on a hot August evening, they decided to go straight out to the beach and chatted as they walked along the path.

“I can't wait for you to see the beach. I've been walking and swimming here since before I can remember. It even inspired me to study biology,” Matt explained.

“It sounds really beautiful. Maybe we can take a dip in the lake to cool down after the long drive,” said Flora.

When they arrived, there was a bad smell in the air and there were piles of brown goop along the water's edge. This wasn't how Matt remembered the beach.

“What's that lined up along the shore? And that smell! Do you think there's been a sewage leak?” Flora asked.

“I'm not sure, but I don't think we should stick around to find out. Let's go back to the cottage and ask my parents if they know what's going on,” Matt replied.

When they got back to the cottage, Matt's parents told them that for the past two years large quantities of green algae had washed up on the beach. The rotting algae formed stinking clumps along the shore. Fewer tourists had been coming to visit the area since the beach was so unpleasant when this happened. Their neighbors were worried about the impact on the value of their lake property.

“I wonder what's going on?” Matt asked.

“I think we should find out,” Flora replied.

“My Aunt Janet works for the Department of Natural Resources. I'm going to send her an email and ask if she knows anything about this,” said Flora.

“Great idea. I'm so sorry, Flora, that wasn't the romantic walk I had in mind,” said Matt.

Questions

1. What could have caused a recent increase in the amount of algae washing up on the beach? Brainstorm a list of possibilities.

2. Choose three of your ideas from the above list and write a testable hypothesis for each one. Describe the data that you would need to test each hypothesis. (Remember that a testable hypothesis is a falsifiable statement that could explain an observation. For example, when Matt and Flora see the brown piles, they think it might be fecal material. Their testable hypothesis would be that if there had been a recent sewage leak, then it could have resulted in the foul smell and rotting piles. They immediately falsify this hypothesis when they find out from Matt's parents that the piles are made up of algae and that they have been forming for several years.)
Part II – Could It Be Phosphorus?

Flora received an email response from her Aunt Janet.

Hi Flo,

Great to hear from you. Yes, the algae in question are called *Cladophora glomerata*. This species of algae grows on rocks just out in the water along the shore and has had a long history here in the Great Lakes, but has recently become a problem (again) for many beaches across the basin. Back in the 1960s and ’70s, a large increase in phosphorus pollution in the Great Lakes caused the algal growth to proliferate. Phosphorus is a limiting nutrient for algae in freshwater ecosystems. In the 1970s, laws were put in place to reduce the phosphorus inputs and the problem all but disappeared.

I need to run—meeting in 5 mins. More later.

Love Aunt Janet

Since Matt and Flora had internet access at the cottage, they decided to investigate further.

“Maybe there’s another source of phosphorus pollution in our lake?” suggested Matt.

“Yeah, good idea. Let’s see if we can find any data on recent phosphorus levels,” said Flora.

Question

3. Examine the figure below and predict what the data would look like if phosphorus in Lake Michigan is the cause of the recent excessive growth (bloom) in algae.

![Figure 1. Total phosphorus entering Lake Michigan. (Redrawn with data from Madenjian et al., 2002.)](image)
Part III – More about Algae

“So if it's not phosphorus then what could it be?” asked Matt.

“We know that algal growth is limited by light so maybe something is going on there. Let’s look into this and see what we find,” said Flora.

Flora found out that the Great Lakes also have phytoplankton, single-celled algae that float around in water and can affect water clarity. She followed this lead and found some data on what was happening with phytoplankton in the lake (see Figure 2).

**Question**

4. Describe in words what has happened to phytoplankton in Lake Michigan.

Matt found a report describing 20 years of data on the water clarity of the lake. The data came from Secchi disk readings reported from a school ship program in Lake Michigan. A Secchi disk is a circle divided into alternating black and white quarters (Figure 3). As the disk is lowered into the lake water, the depth at which the distinction between the black and white quarters can no longer be made is recorded, indicating the clarity or absence of phytoplankton. In the first years of the school ship program in Grand Traverse Bay, the Secchi disk could be seen down to about 6–8 m.

![Figure 2. Springtime primary production in southern Lake Michigan has declined since the mid-1990s. Bars represent average amount of phytoplankton (measured in mg carbon/m²/day) in repeated samples with lines above bars showing variation in the data. From: http://www.glerl.noaa.gov/pubs/brochures/mussel_dipo.pdf. Original data from Fahnenstiel et al. (2010).](https://www.flickr.com/photos/usace_albuquerque/5999717664)

![Figure 3. Secchi disk being lowered into water to measure clarity. (https://www.flickr.com/photos/usace_albuquerque/5999717664)](https://www.flickr.com/photos/usace_albuquerque/5999717664)
Questions

5. Given Flora's finding, fill in the missing data on the axes of Figure 4 below to depict the data Matt found.

![Graph](image)

*Figure 4.* Secchi disk depths taken from Lower West Arm Grand Traverse Bay during a school science ship program "Inland Seas" in Sutton's Bay, Michigan.

6. What factors in the environment would make one kind of alga increase while another decreases?
Part IV – The Rest of the Story

As Matt and Flora were looking over the information that they had found and trying to make sense of it all, Flora received another email from Aunt Janet:

Hi Flo,

I wanted to follow up on your question. We’ve been working on some research connecting the *Cladophora* blooms with the invasion of zebra and quagga mussels in the lakes. I’ve attached some maps showing the invasions...

![Zebra and Quagga Mussel Densities](http://sanctuaries.noaa.gov/science/condition/tbnms/pressures.html)

Figure 5. Zebra mussel and quagga mussel densities in Lake Michigan. Source: Figure 36 from *Thunder Bay National Marine Sanctuary 2013 Condition Report*, http://sanctuaries.noaa.gov/science/condition/tbnms/pressures.html.

It turns out that the mussels are so efficient at filter feeding they have removed enough phytoplankton from the lake system to significantly increase the water clarity of the lake, allowing more light in for the *Cladophora*. The mussels also may be recycling phosphorus in the water and shifting it from the water column down to the lake bed, thus directly feeding the *Cladophora*. There is still a lot more research to be done to fully understand this story but we’re making headway.

Flo, I hope this info helps answer your question. You and Matt should come out with me on my next field trip!

Love, Aunt Janet

**Question**

7. Examine the information about these two species of filter feeding mussels. Return to Question 6 and reconsider using this new information.
Additional Questions

8. Speculate about how water temperature changes could influence the success of *Cladophora*.

9. Do you think recent changes in atmospheric carbon could play a role in problems with algae? Why or why not?

10. What actions could we take in response to these problems with *Cladophora*?

11. What is the likely interaction between zebra and quagga mussels?

12. What characteristics make an invasive species successful?

13. What are the likely economic impacts of the mussel invasion?

14. Non-native Asian carp are very close to entering Lake Michigan from the Mississippi River watershed where they have caused huge changes to the ecosystem. These fish are voracious filter feeders. Speculate on what may happen to the ecosystem of Lake Michigan if these new fish invade.
Cascading impacts of large-carnivore extirpation in an African ecosystem

Justine L. Atkins1, Ryan A. Long2, Johan Pansu3,4, Joshua H. Daskin1, Arjun B. Potter5, Marc E. Stalmans5, Corina E. Tarnita1, Robert M. Pringle1

Populations of the world’s largest carnivores are declining and now occupy mere fractions of their historical ranges. Theory predicts that when apex predators disappear, large herbivores become less fearful, occupy new habitats, and modify their foraging habits by eating new food plants. Yet experimental support for this prediction has been difficult to obtain in large-mammal systems. After the extirpation of leopards and African wild dogs from Mozambique’s Gorongosa National Park, forest-dwelling antelopes (bushbuck [*Tragelaphus sylvaticus]*) expanded into treeless floodplains, where they consumed novel diets and suppressed a common food plant [waterwort (*Bergia mossambicensis*)]. By experimentally simulating predation risk, we demonstrate that this behavior was reversible. Thus, whereas anthropogenic predator extirpation disrupted a trophic cascade by enabling rapid differentiation of prey behavior, carnivore restoration may just as rapidly reestablish that cascade.

The worldwide decline in populations of large mammalian carnivores is a major environmental concern (1, 2), in part because apex predators can exert a defining influence on ecosystems via trophic cascades (3). A trophic cascade occurs when predators indirectly affect plants through either of two mechanisms: by consumptively reducing prey abundance (4) or by imposing “landscapes of fear” in which prey modify their behavior to reduce predation risk. In landscapes of fear, prey are expected to forego foraging opportunities in resource-rich habitats that are risky, thereby creating spaces where palatable food plants can thrive (5, 6). Accordingly, the extirpation of top carnivores should create “landscapes of fearlessness” where large herbivores seek out the nutritional benefits of previously risky habitats, suppressing food-plant abundance in the process (5); conversely, the reestablishment of real or perceived predation risk should reverse this behavior (7). Although behaviorally mediated trophic cascades have been documented frequently for relatively small consumer species (8–10), there are few unequivocal examples involving large mammalian carnivores and herbivores (11–13). This gap reflects the difficulty of experimentally manipulating predation risk and quantifying its downstream effects at scales relevant to large mammals. Correlative and comparative analyses generally cannot rule out potentially confounding factors, which has fueled debates (14–18) and prompted calls for stronger mechanistic inference in the study of megafaunal trophic cascades (19).

Ecosystems in which top predators have been experimentally decreased contain vast numbers of potential prey, and both predators (20) and herbivores (21–23) have demonstrated the ability to respond to perceived changes in predation risk. In Mozambique’s Gorongosa National Park, large-mammal populations were severely reduced during the Mozambican Civil War (1977 to 1992), with >90% declines across all monitored species (21–23). Large-herbivore populations have subsequently increased, but leopards (*Panthera pardus*), wild dogs (*Lycaon pictus*), and hyenas (*Crocuta crocuta*) were extirpated, while lions (*P. leo*) persisted at low abundance (23, 24) (table S1). In this carnivore-depleted system, we evaluated evidence for a behaviorally mediated trophic cascade by using field manipulations of predator presence and herbivory, GPS telemetry of individual movements, and intestinal herbarium. We quantified these initial observations by simulating predation risk, and prompted calls for stronger mechanistic inference in the study of megafaunal trophic cascades (19).

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predator species. Playbacks of leopard vocalizations, artificial lion scat, and generic carnivore urine (32) were used to mimic predator presence; white noise, locally collected herbivore dung, and saline solution were used as sham cues in procedural-control trials (12, 33). We restricted our analyses to data collected between 17:00 and 06:00, the period encompassing peak bushbuck activity (32). For each individual, we quantified two response variables in the 48 hours immediately before and after cue deployment. First, we measured the avoidance of predator and control cues by calculating the distance between each bushbuck GPS point and the sound-cue location. Second, we measured whether simulated risk caused floodplain individuals to increase their use of tree cover (i.e., shift back toward a more “typical” bushbuck habitat).

Bushbuck strongly avoided predator cues in both habitats but did not avoid sham cues in either habitat (Fig. 2A and table S2). Moreover, predator cues caused a significant increase in the use of tree cover by floodplain but not woodland bushbuck, whereas sham cues did not significantly alter tree-cover use in either habitat (Fig. 2B and table S2). We evaluated the statistical significance of these responses by using mixed-effects models with random intercepts for individuals (table S2). These results were robust to both GPS and habitat classification error (32) (figs. S4 and S5 and table S3). That floodplain bushbuck exhibited more cautious behavior in response to even a brief exposure to simulated risk suggests that some fear of predators has been retained and is primed in more risky open habitats (7, 12). Our design does not enable us to distinguish the roles of specific predator cues in generating these responses, but future studies could test sound and scent cues separately.

Theory often assumes a nutritional opportunity cost of risk avoidance (5). We therefore hypothesized that floodplain bushbuck would consume higher-quality diets and exhibit greater size and body condition. We analyzed bushbuck diet composition by using DNA metabarcoding of
Fig. 2. Responses of floodplain and woodland bushbuck to simulated-predator and procedural-control cues. Average changes in (A) the distance from cues (avoidance) and (B) the proportional use of tree cover for bushbuck in woodland (n = 5) and floodplain (n = 7) habitats at night. Each bar (colored by habitat affiliation) represents the average difference between the 48-hour pre-cue period and the 48-hour post-cue period across all collared individuals in each category; error bars show ±1 SE. Shading indicates experimental treatment, with darker bars for the predator cues and lighter bars for the sham cues (see x-axis labels). P values from generalized linear mixed models are shown above each bar, indicating whether each response differed significantly from zero (see full model results in table S2).

Fig. 3. Differences in composition and nutritional quality of bushbuck diets across habitats. (A) Nonmetric multidimensional scaling (NMDS) ordination, based on Bray-Curtis dissimilarities from DNA-metabarcoding data, showing that bushbuck diets clustered within each habitat and diverged between them. The distance between points (n = 7 floodplain fecal samples; n = 17 woodland fecal samples) reflects compositional dissimilarity. (B) The 10 most abundant food-plant taxa for bushbuck in the floodplain (orange bars) and woodland (blue bars). (C) Mean digested energy and (D) protein contents of bushbuck diets, revealing higher dietary quality in floodplain individuals (Wilcoxon rank sum tests; energy, W = 76, n = 18 individuals, P = 0.0001; protein, W = 77, n = 18 individuals, P < 0.0001). Error bars show ±1 SE.
The waterwort species consumed almost exclusively by bushbuck. Used our diet analysis to identify an indicator plant species in the diets of floodplain herbivores. Therefore, to isolate the effects of bushbuck, we used exclosures, but it would be impossible to parse the effects of bushbuck relative to those of other floodplain ungulates with overlapping diets. Thus, to isolate the effects of bushbuck, we used diet analysis to identify an indicator plant species consumed almost exclusively by bushbuck. The waterwort *B. mossambicensis* was the second most abundant taxon in the diets of floodplain bushbuck but was negligible (≤1% RRA) in the diets of all other floodplain herbivores (Fig. 4A). We constructed wire-mesh herbivore exclosures around *Bergia* plants in a randomized, paired caged-uncaged design (fig. S7) at two different floodplain sites (with 15 total pairs) (32). Before the experiment, and again after a minimum of 16 days, we measured and counted all leaves, flowers, and browsed stems. The percentage of browsed stems per plant increased in uncaged plants during the experiment but did not change in caged plants (Fig. 4B and table S7). Similarly, the mean number of leaves increased in caged plants but decreased in uncaged plants (Fig. 4C). The mean number of flowers, height, and canopy area at the conclusion of the experiment were all significantly greater in caged plants (Fig. 4 and table S7). Thus, the expansion of bushbuck into open habitats was accompanied by strong suppression of growth and reproduction in *Bergia*. Although other floodplain herbivores may have contributed somewhat to this effect, only bushbuck consumed substantial quantities of *Bergia* (Fig. 4A), suggesting that this plant would otherwise find refuge from large-mammal herbivory in the floodplain.

Altogether, our results provide evidence that the extirpation of large carnivores in the wake of the Mozambican Civil War has disrupted a behaviorally mediated trophic cascade. In the absence of apex predators such as leopards and wild dogs, a common ungulate prey species rapidly expanded into a high-risk, high-reward habitat, with concomitant shifts in diet composition and quality, body size and condition, and the performance of a key food plant. Despite the multidecadal absence of several apex predators in Gorongosa, we found that bushbuck retained a fear of these carnivores (7, 12): Experimental imposition of risk cues over just 48 hours shifted habitat use toward patterns that prevailed before carnivore loss (30). The next phase of trophic rewilding in Gorongosa involves carnivore reintroductions (23), beginning in 2018 with 14 wild dogs, which should eventually enable tests of our prediction that bushbuck will vacate the floodplain. Notably, the relaxation of risk after carnivore extirpation differentially affected individual behavior within a population, leading to bimodality in habitat use and perhaps some degree of reproductive separation, which could amplify preexisting individual variation (35). The influence of carnivores on behavioral variation within ungulate populations, and its potential evolutionary significance, remains largely unexplored.

Our study supports the general hypothesis that the loss of top carnivores can convert landscapes of fear into landscapes of fearlessness for large mammalian herbivores, with far-reaching consequences for prey and plant populations (6). It further shows that the effects of fear depend on the social, foraging, and antipredator behaviors of the species involved. Whereas recent work has shown that gregarious, flight-dependent grazers and mixed feeders use open, high-visibility habitats for risk avoidance (71, 13), our study of a solitary, cryptic-dependent browser reveals an opposing pattern. This distinction was appreciated by early naturalists [(36), pp. 32–33]:

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**Fig. 4. Large herbivores suppress *Bergia mossambicensis*, a common floodplain plant.** (A) Among all floodplain herbivore species in Gorongosa, only bushbuck consumed substantial quantities of *Bergia*. Shown are the mean changes in (B) the percentage of stems browsed and (C) the number of leaves per plant on caged versus uncaged *Bergia* plants over a minimum of 16 days (maximum of 18 days). Herbivores also reduced (D) the mean number of flowers per plant, (E) mean height, and (F) mean canopy area at the conclusion of the experiment. For (D) to (F), there was no significant difference in the initial values between caged and uncaged treatment groups. Model results of the effects of herbivore exclusion on each response variable are presented in table S7. Error bars show ±1 SE.
It is curious to note the different ideas of safety entertained respectively by the plain and the bush dweller. Let us say a Grant’s gazelle and a bushbuck are grazing near each other on the edge of a plain when something occurs to alarm them. The bushbuck lopes quickly back into the bush, sure that in this lies his only chance of safety. The Grant’s turns and gallops from the bush as if it were some deadly thing ...

Thus, although generalizations about trophic cascades involving particular species and food chains may be possible on the basis of characteristics such as herbivore size, behavior (37, 38), and predator hunting mode (39), we suggest that community-wide cascades may be dampened in diverse African large-mammal assemblages because of the orthogonal responses of different herbivore species to predation risk (40).

REFERENCES AND NOTES
Cascading impacts of large-carnivore extirpation in an African ecosystem

Justine L. Atkins, Ryan A. Long, Johan Pansu, Joshua H. Daskin, Arjun B. Potter, Marc E. Stalmans, Corina E. Tarnita and Robert M. Pringle

Science 364 (6436), 173-177.
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Ecosystems feel war’s effects

War ravages human lives and landscapes, but nonhuman victims are no less affected. The Mozambican Civil War resulted in the rapid decline of predators in Gorongosa National Park and led to a trophic cascade that shifted prey behaviors and plant communities. Atkins et al. monitored this shift and found that the absence of wild dogs and leopards resulted in a change in habitat use and plant consumption by bushbuck, which are forest-dwelling antelopes. Experiments further showed that changes in prey behavior were reversible when signs of predator activity were introduced, supporting the impact of the predator loss. These results confirm patterns seen elsewhere and go further in providing mechanistic detail about the importance of the "landscape of fear" perceived by prey animals.

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New Course Proposal & Creation Form

1. Approval by Department Head or Dean
   1.1 College or School with academic authority: College of Arts & Science
   1.2 Department with academic authority: Department of Chemistry
   1.3 Term from which the course is effective: 202105

2. Information required for the Catalogue
   2.1 Label & Number of course: CHEM 142
   2.2 Academic credit units: 1
   2.3 Course Long Title (maximum 100 characters): The Global Impact of Chemistry for Engineering
       Course Short Title (maximum 30 characters): Global Impact of Chem for Engr
   2.4 Total Hours: Lecture 9 Seminar Lab 6 Tutorial Other
   2.5 Weekly Hours: Lecture 3 Seminar Lab 3 Tutorial Other
   2.6 Term in which it will be offered: T1 T2 T1 or T2 T1 and T2
   2.7 Prerequisite: Chemistry 30 or CHEM 90 or CHEM 100; and Mathematics B30 or Foundations of Mathematics 30 or Pre-Calculus 30

   If there is a prerequisite waiver, who is responsible for signing it?
   D – Instructor/Dept Approval
   H – Department Approval
   I – Instructor Approval

   2.8 Catalogue description (150 words or less):
       The course is intended as a brief introduction to general chemistry topics with emphasis on the greenhouse effect utilizing both qualitative and quantitative aspects of chemistry to investigate this global issue. You will learn practical applications of chemistry through course material and laboratory experiments.

   2.9 Do you allow this course to be repeated for credit? No

3. Please list rationale for introducing this course:

   Currently a number of Arts & Science departments contribute to the Common First Year for the College of Engineering Bachelor of Science in Engineering (B.E.) program. The College of Engineering is in the process of redesigning this Common First Year to create the most effective first year engineering program in Canada. They are working hard to create something that will excite, engage and inspire their students, and to holistically prepare them for the challenges to come in later years.
This project has been underway since 2016-2017 and has a planned launch of Fall 2021. Over this time there has been extensive consultation between the College of Engineering and specific Departments in the College of Arts & Science. A suite of new Science courses are being proposed for use in this redesigned Common First Year which will replace or complement the use of existing courses.

The College of Engineering wishes to provide their first-year students with broad exposure to four of the Natural Science disciplines in the College of Arts and Science (Biology, Chemistry, Geological Sciences, and Physics). This is to be achieved through short (1 cu) courses in each of these disciplines. Each of the four courses will be delivered in the Fall term. The first-year cohort of engineering students will be divided into four groups and these groups will progress through the four disciplines in rotation. Each course will consist of nine hours of lectures and two, 3-hour labs components. By the end of the term, all first year engineering students will have progressed through all of the courses, having received 36 hours of lecture-based instruction and twenty-four hours of lab/practicum-based instruction.

The plan outlined above necessitates that each course is focused on a subset of disciplinary topics that can be delivered consistently at four distinct times over the term. To facilitate student learning, it was agreed that the four Science courses would seek some commonality in the topics delivered. To that end, it was agreed that the “environment” and “climate change” would be logical candidates. Thus, chemistry will have lab exercises investigating warming associated with different greenhouse gases, physics will discuss blackbody radiation within their course, geological science will deal with Earth system interactions and changes over time, and biology will focus on anthropogenic effects on biodiversity and ecosystems, including human-induced climate change. The four courses will have a common final examination in December with 45 minutes allotted to each course. Beyond that, courses will have a diversity of assignments, labs, quizzes, reports, or an exam at the end of their sections.

Each of these four 1 cu courses will have “GE 102 - Introduction to Engineering” I listed as a Pre- or Co-Requisite. The Introduction to Engineering I course will focus on setting the students up to manage their time, reflect upon their study habits and work in groups – all things that will be important to each of the following courses. Perhaps more importantly, this is where the students will be learning to use TopHat, the LMS, other assessment software, and MS Office. Specifically for these Science courses it provides the lab safety training and acts as the vehicle for a reflective assessment that will incorporate what students learn in each of this 1 cu Science courses, effectively linking them together and solidifying the students’ learning.

The College of Engineering is also working toward a new competency-based assessment system that will be utilized in the new First Year Engineering courses in Fall 2021. The Arts & Science departments will continue to learn more about this system through 2020-2021 and 2021-2022 as it is implemented in Engineering, and will then determine how it can be used in the Science courses attached to the Engineering Common First Year. Revisions to the courses, to implement this assessment system, will be submitted to the appropriate College Academic Programs Committee for approval, prior to use in the courses.

4. **Please list the learning objectives for this course:**

By the end of this course, students will be expected to:
1. Summarize the basic chemical concepts pertaining to the Greenhouse Effect (GHE) and differentiate between atmospheric gases in terms of GHE.
2. Carry out calculations and understand concepts related to electromagnetic radiation and blackbody radiation.
3. Determine quantum numbers for atomic orbitals, draw simple Lewis dot diagrams, and determine polarity and relative intermolecular forces of molecules based on structure.
4. Understand vibrational motion in molecules and apply knowledge to IR absorption spectra.
5. Design and test a simple pop bottle greenhouse and measure temperatures of various gases to evaluate their Global Warming Potential (GWP).

5. Impact of this course
   Are the programs of other departments or Colleges affected by this course? This course is for the College of Engineering First Year.
   If so, were these departments consulted? (Include correspondence) Yes
   Were any other departments asked to review or comment on the proposal? Biology, Chemistry, Physics and Geology reps met a number of times regarding these four – 1cu courses. The course also went through the Arts & Science College Challenge, which provides opportunity for responses by all departments in the College.

6. Other courses or program affected (please list course titles as well as numbers)
   6.1 Courses to be deleted? CHEM 114.3
   6.2 Courses for which this course will be a prerequisite? CHEM 146.3

6.3 Is this course to be required by your majors, or by majors in another program?

Required course in the first-year as part of revised Engineering program.
Students with credit for all four of BIOL 102.1, CHEM 142.1, GEOL 102.1 and PHYS 152.1 will receive 3 credit units of elective credit in Arts & Science B.A.&Sc. and B.Sc. programs and 3 credit units of "science" or "elective" credit in B.A., B.F.A., or B.Mus. programs. Students who do not pass all 4 courses will receive no credit in Arts & Science programs.

7. Course outline
   (Weekly outline of lectures or include a draft of the course information sheet.)

See attached syllabus.

8. Enrolment
   8.1 Expected enrollment: up to 600
   8.2 From which colleges? Engineering
9. Student evaluation
   Give approximate weighting assigned to each indicator (assignments, laboratory work, mid-term test, final examination, essays or projects, etc.)

   The methods of assessment and their respective weightings are given below:

   **Assessment:**
   
<table>
<thead>
<tr>
<th>Activity</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>10%</td>
</tr>
<tr>
<td>Laboratories</td>
<td>25%</td>
</tr>
<tr>
<td>Mid-Module Quiz</td>
<td>15%</td>
</tr>
<tr>
<td>Final Exam</td>
<td>50%</td>
</tr>
</tbody>
</table>

9.1 How should this course be graded?
   C – Completed Requirements
   *(Grade options for instructor: Completed Requirements, Fail, IP In Progress)*

   N – Numeric/Percentage
   *(Grade options for instructor: grade of 0% to 100%, IP in Progress)*

   P – Pass/Fail
   *(Grade options for instructor: Pass, Fail, In Progress)*

   S – Special
   *(Grade options for instructor: NA – Grade Not Applicable)* If other, please specify:

9.2 Is the course exempt from the final examination? No – Final exam date may be schedule outside of the normal exam scheduling process.

10. Required text
   Include a bibliography for the course.

   2. Access Kit for Smartwork5 on-line assignment system. This access kit is required for the homework assignments (sold in package with the text)

11. Resources
   11.1 Proposed instructor:
       Chemistry Faculty

   11.2 How does the department plan to handle the additional teaching or administrative workload? Within department – CHEM 142 and 146 replace CHEM 114.

   11.3 Are sufficient library or other research resources available for this course? Yes
11.4 Are any additional resources required (library, audio-visual, technology, etc.)? Details have been worked out between College of Arts & Science and College of Engineering to fund laboratory costs for this course. All requires the use of THORV 212 as lab space. Space Planning has allocated this space to the Department of Chemistry. It will be in structural vacancy until the redesigned First Year Engineering program launches in Fall 2021. Between now and then there are some minor renovations required. Funding for these is currently being determined.

12. **Tuition**

12.1 Will this course attract tuition charges? If so, how much? (use tuition category) TC14

12.2 Does this course require non-standard fees, such as materials or excursion fees? If so, please include an approved “Application for New Fee or Fee Change Form” http://www.usask.ca/sesd/info-for-instructors/program-course-preparation.php#course-fees

No

---

**Detailed Course Information**

1. **Schedule Types**

Please choose the Schedule Types that can be used for sections that fall under this course:

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CL</td>
<td>Clinical</td>
<td>PRB</td>
<td>Problem Session</td>
</tr>
<tr>
<td>COO</td>
<td>Coop Class</td>
<td>RDG</td>
<td>Reading Class</td>
</tr>
<tr>
<td>FLD</td>
<td>Field Trip</td>
<td>RES</td>
<td>Research</td>
</tr>
<tr>
<td>ICR</td>
<td>Internet Chat Relay</td>
<td>ROS</td>
<td>Roster (Dent Only)</td>
</tr>
<tr>
<td>IHP</td>
<td>Internet Help</td>
<td>SEM</td>
<td>Seminar</td>
</tr>
<tr>
<td>IN1</td>
<td>Internship - Education</td>
<td>SSI</td>
<td>Supervised Self Instruction</td>
</tr>
<tr>
<td>IN2</td>
<td>Internship - CMPT &amp; EPIP</td>
<td>STU</td>
<td>Studio</td>
</tr>
<tr>
<td>IN3</td>
<td>Internship - General</td>
<td>SUP</td>
<td>Teacher Supervision</td>
</tr>
<tr>
<td>IND</td>
<td>Independent Studies</td>
<td>TEL</td>
<td>Televised Class</td>
</tr>
<tr>
<td>LAB</td>
<td>Laboratory</td>
<td>TUT</td>
<td>Tutorial</td>
</tr>
<tr>
<td>LC</td>
<td>Lecture/Clinical (Dent Only)</td>
<td>WEB</td>
<td>Web Based Class</td>
</tr>
<tr>
<td>LEC</td>
<td>Lecture</td>
<td>XCH</td>
<td>Exchange Program</td>
</tr>
<tr>
<td>LL</td>
<td>Lecture/Laboratory (Dent Only)</td>
<td>XGN</td>
<td>Ghost Schedule Type Not Applicable</td>
</tr>
<tr>
<td>MM</td>
<td>Multimode</td>
<td>XHS</td>
<td>High School Class</td>
</tr>
<tr>
<td>PCL</td>
<td>Pre-Clinical (Dent Only)</td>
<td>XNA</td>
<td>Schedule Type Not Applicable</td>
</tr>
<tr>
<td>PRA</td>
<td>Practicum</td>
<td>XNC</td>
<td>No Academic Credit</td>
</tr>
</tbody>
</table>

2. **Course Attributes**

Please highlight the attributes that should be attached to the course (they will apply to all sections):

2.1 NOAC No Academic Credit

0 Credit Unit courses that possess “deemed” CUs (Called Operational Credit Units). NOAC causes the system to roll 0 academic credit units to academic history.

2.2 For the College of Arts and Science only: To which program type does this course belong?

FNAR Fine Arts
3. Registration Information (Note: multi-term courses cannot be automated as corequisites)

3.1 Permission Required:

3.2 Restriction(s): course only open to students in a specific college, program/degree, major, year in program

Restricted to students in the College of Engineering.

3.3 Prerequisite(s): course(s) that must be completed prior to the start of this course
Chemistry 30 or CHEM 90 or CHEM 100; and Mathematics B30 or Foundations of Mathematics 30 or Pre-Calculus 30.

3.4 Prerequisite(s) or Corequisite(s): course(s) that can be completed prior to or taken at the same time as this course
GE 102 – Introduction to Engineering I

3.5 Corequisite(s): course(s) that must be taken at the same time as this course

3.6 Notes: recommended courses, repeat restrictions/content overlap, other additional information

4. List Equivalent Course(s) here: None
An equivalent course can be used in place of the course for which this form is being completed, specifically for the purposes of prerequisite and degree audit checking. Credit will be given for only one of the equivalent courses.

4.1 If this is a recently-repurposed course number, please list the courses that are no longer considered to be equivalent:

*Please note: If the equivalent courses carry an UNEQUAL number of credit units, DegreeWorks will automatically enforce the following, unless otherwise stated:

- If a 3 credit unit course is considered to be equivalent to a 6 credit unit course, it will fulfill the 6 credit unit requirement and the student will not have to complete another 3 credit units toward the overall number of required credit units for the program.
- If a 6 credit unit course is considered to be equivalent to a 3 credit unit course, ALL 6 of the credit units may be used to fulfill the 3 credit unit requirement.

5. List Mutually-Exclusive Course(s) here: None
Mutually exclusive courses have similar content such that students cannot receive credit for both.

5.1 If this is a recently-repurposed course number, please list the courses that are no longer considered to be mutually exclusive:

*Please note: SiRIUS cannot enforce a situation where the exclusion goes only one way.
6. Additional Notes:
CHEM 142.1 (01)  
The Global Impact of Chemistry for Engineering  
Fall 2021

Land Acknowledgement  
At the University of Saskatchewan, we acknowledge we are on Treaty Six Territory and the Homeland of the Métis. We pay our respect to the First Nation and Métis ancestors of this place and reaffirm our relationship with one another.

Instructor[s]  
Name (include credentials; if applicable please include P.Eng. or EIT as well)  
Office:  
Phone:  
Optional: Instructor Profile  
A brief (1-2 paragraphs) summary of your teaching philosophy would also be appropriate and helpful to share in this section. This should be written in first as research does show that writing the profile in the first person helps to create more of a welcoming environment for students. (Richardson, R. and Woods, S. (2009). Course syllabus: A guide. Retrieved online from http://www.smu.ca/webfiles/SyllabusGuide_000.pdf)

Lectures:  
3 hours /week (TBA)

Laboratory:  
3 hr/week- 2 lab sessions total- Dates/Times TBA  
Lab Manager:  
Office:  
Phone:  
Email:  
Website:  
Assignments, solutions, lab schedules, general course information, and announcements will be posted on the course website (PAWS/Blackboard). Students are responsible for keeping up-to-date with the information on the course website.  
https://bblearn.usask.ca/

Description:  
The course is intended as a brief introduction to general chemistry topics with emphasis on the greenhouse effect utilizing both qualitative and quantitative aspects of chemistry to investigate this global issue. You will learn practical applications of chemistry through course material and laboratory experiments.

Prerequisites:  
(Chemistry 30 or CHEM 90 or CHEM 100) and (Mathematics B30 or Foundations of Mathematics 30 or Pre-Calculus 30)  
Note: This course is intended for students in the College of Engineering. Students with credit for CHEM 111, 112 or 114 may not take this course for credit.

Co-requisites:  
Introduction to Engineering I

Course Reference  
xxxxx (lectures), xxxxx (laboratory), xxxxx (tutorial)  
Available from the Dynamic Schedule once courses are built  
(https://pawnss.usask.ca/ban/bwckschd.p_disp_dyn_sched)
Course Learning Outcomes: By the end of this course, students will be expected to:

1. Summarize the basic chemical concepts pertaining to the Greenhouse Effect (GHE) and differentiate between atmospheric gases in terms of GHE.
2. Carry out calculations and understand concepts related to electromagnetic radiation and blackbody radiation.
3. Determine quantum numbers for atomic orbitals, draw simple Lewis dot diagrams, and determine polarity and relative intermolecular forces of molecules based on structure.
4. Understand vibrational motion in molecules and apply knowledge to IR absorption spectra.
5. Design and test a simple pop bottle greenhouse and measure temperatures of various gases to evaluate their Global Warming Potential (GWP).

Assessment: The methods of assessment and their respective weightings are given below:

<table>
<thead>
<tr>
<th>Component</th>
<th>Weighting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>10%</td>
</tr>
<tr>
<td>Laboratories</td>
<td>25%</td>
</tr>
<tr>
<td>Mid-Module Quiz</td>
<td>15%</td>
</tr>
<tr>
<td>Final Exam</td>
<td>50%</td>
</tr>
</tbody>
</table>

Attendance and Participation: It is expected that students will attend all lectures, and laboratory sessions. Students are responsible for all required readings, and topics presented in lectures and laboratories. See “Laboratory” for details regarding lab attendance.

Criteria That Must Be Met to Pass: In order to be assigned a passing final grade, you must fulfill the following conditions:

1. Obtain an overall mark greater than 50%, AND
2. Attend all laboratory sessions and complete all required lab work and obtain a 50% mark therein, AND
3. Achieve a satisfactory performance in the examinations.

Final Grades: The final grades will be consistent with the “literal descriptors” specified in the university's grading system (at link below, click “for undergraduate students”).

https://students.usask.ca/academics/grading/grading-system.php

For information regarding appeals of final grades or other academic matters, please visit https://secretariat.usask.ca/student-conduct-appeals/index.php

Academic Courses Policy: More information on the Academic Courses Policy on course delivery, examinations and assessment of student learning can be found at:

http://policies.usask.ca/policies/academic-affairs/academic-courses.php

Learning Charter: The University of Saskatchewan Learning Charter is intended to define aspirations about the learning experience that the University aims to provide, and the roles to be played in realizing these aspirations by students, instructors and the institution. A copy of the Learning Charter can be found at:

https://teaching.usask.ca/about/policies/learning-charter.php
Course Content/Schedule:

<table>
<thead>
<tr>
<th>WEEK</th>
<th>Topic</th>
<th>Approximate Lecture Hours</th>
<th>LAB</th>
</tr>
</thead>
</table>
| WEEK 1 | 1. **CO₂ AND THE GREENHOUSE EFFECT**  
   1.1. What chemical concepts pertain to the Greenhouse Effect (GHE)?  
   1.2. Case Study on CO₂ conversion  
   1.3. Fundamentals of light (wavelength, frequency, energy of light) | 1.5 | |
|      | 2. **THE ELECTRON IS NOT AS SIMPLE AS IT LOOKS –**  
   Sir L. Bragg  
   2.1. Blackbody radiation, and solar and terrestrial emission spectra  
   2.2. Basics of quantum mechanics, particle in a 1-D box, and the Hydrogen atom  
   2.3. Electronic transitions and atomic orbitals | 1.5 | |
|      | **ASSIGNMENT 1- DUE AT BEGINNING OF LECTURE 3** | | |
| WEEK 2 | 3. **KINDERGARTEN RULES OF BONDING AND SHAPES OF MOLECULES**  
   3.1. Mom! Chlorine won’t share equally!  
   3.2. Lewis Theory and VSEPR | 1.5 | |
|      | 4. **RELATING STRUCTURES AND PROPERTIES**  
   4.1. Polarity and Dipole moments  
   4.2. Intermolecular forces | 1.5 | |
|      | **MID-MODULE QUIZ- SCHEDULED DATE, 6PM-10PM** | | |
|      | **SMARTWORK5** | | |
| WEEK 3 | 5. **GOOD VIBRATIONS**  
   5.1. Vibrating molecules, simple harmonic oscillator, quantized vibrational levels  
   5.2. IR absorption spectra and selection rules | 1.5 | |
|      | **ASSIGNMENT 2- DUE AT BEGINNING OF LECTURE 6** | | |
|      | 6. **GREENHOUSE GAS SOUP**  
   6.1. Putting all the components together- a detailed analysis of the GHE | 1.5 | |
Homework Assignments
The course textbook is fully supported by the Smartwork5 website. We will use Smartwork5 to assign homework assignments (see Assessments above). The homework assignments will not only help you to test if you understand the material, but it will also teach you how to solve chemical problems since some of the problems are fully tutored. Assignments should be done by all students individually. We note that students attempting to cut corners – including cheating - on assignments have always suffered in examinations.

BEFORE you can register for SmartWork5, you need the right “Registration Code” (provided with a new print/electronic textbook) and the correct “Student Set ID” for your section of the course. “Student Set IDs” are specific to each section. The link: http://bit.ly/nortonregistration shows a complete video on how to register and join a Student Set. Also, please see the Smartwork5 FAQ document in the course website for frequently asked questions (and answers) about Smartwork5. More important details may be given during the first week of lectures. With your “Student Set ID” (see table below), your “Student ID” (see your student card), and your “Registration Code” you can then register on the website: https://digital.wwnorton.com/chem5

If you have used Smartwork5 before (i.e. in another course) your login and password should still be valid, but you will need to register for the correct section of CHEM 142 using the appropriate 6-digit “Student Set ID”.

<table>
<thead>
<tr>
<th>CHEM 142 Section</th>
<th>Lecturer</th>
<th>Students Set ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>Section 01- TR 9:30 am</td>
<td>TBA</td>
<td>111111</td>
</tr>
<tr>
<td>Section 03- TR 10:30 am</td>
<td>TBA</td>
<td>222222</td>
</tr>
</tbody>
</table>

There will be two graded assignments scheduled during the term. The due dates are listed above in the Course Schedule. Assignments are submitted on-line through the Smartwork5 system. The Introduction to Smartwork5 (non-graded) assignment will NOT be considered in your overall assignment mark.

All assignments are due by the start of class on the day indicated in the syllabus. There are NO extensions of due dates for the graded assignments. Students who have missed the deadline should continue to work on the assignment in order to practice those concepts but will not receive credit for the questions completed after the due date.
Laboratory:
The CHEM 142 labs will begin during the second week of the course. The location of your lab is available in your registration information on PAWS.

<table>
<thead>
<tr>
<th>Laboratory Experiment</th>
<th>Dates</th>
</tr>
</thead>
<tbody>
<tr>
<td>LABORATORY 1- Designing Pop Bottle Greenhouses To Investigate The Effect Of CO₂, Air And Ar On Temperature</td>
<td>Week 2</td>
</tr>
<tr>
<td>LABORATORY 2- Investigating IR Absorption of Different Gases using Pop Bottle Greenhouses</td>
<td>Week 3</td>
</tr>
</tbody>
</table>

What to Bring to the Lab
- CHEM 142 Laboratory Instructions (posted on Course website)
- Safety glasses (Available in the main Bookstore and Chemistry Stores (Thorv. G46)). Prescription glasses alone do not provide sufficient eye protection. Students who wear prescription glasses must also wear safety glasses.
- Loose-leaf paper, pen

Students are expected to follow all safety considerations in the laboratory, perform the experiments during the allotted time, and complete calculations and reports during the lab.

The Laboratory will make up 20% of the Overall Course mark and each lab will be weighted equally. **Grading of each lab will be based on**
- Preparation exercise or quiz (10%),
- Performance during the experiment including Safety and Cleanliness (30%)
- Calculations and Report (50%)
- Group Participation (10%)

Absences from the Assigned Lab Period
Students are expected to attend ALL laboratory sessions. However, if an absence is unavoidable, for example, a serious illness or the death of a family member, you may apply for permission to reschedule the lab on a different day. You will have 2 business days after the missed lab period to contact the Lab Manager, Dr. Alexandra Bartole-Scott (firstyear.chem@usask.ca); to fill out the “Permission to Reschedule Lab” Form and arrange the make-up lab. If permission is not granted or the student does not complete the lab, the experiment will be assigned a mark of “0” and will result in a failing grade in the course.

If, due to a valid prior commitment, you cannot attend your assigned lab period, you should see the lab manager at least TWO WEEKS before to arrange an alternate time and to obtain the “Permission to Reschedule Lab” form. Examples of valid reasons for rescheduling a lab include: medical appointments that cannot be rescheduled, commitments for Huskies athletes, and observances of religious holidays. Additional documentation may be required to verify the reason for your absence from your regular lab time. Note: Tests/exams in other courses are not valid reasons for missing your lab. It is your responsibility to arrange alternate test times outside of your regularly scheduled lab.

Attendance at laboratory sessions and submission of laboratory reports is **mandatory**. Late lab reports are not permitted. Failure to meet these requirements will result in a final grade of less than 50% for the course.
Examinations:

Mid-Module Quiz:

The mid-module quiz will take place on the following dates.

<table>
<thead>
<tr>
<th>Section</th>
<th>Date</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A</td>
<td>Day, Month XX, 20XX</td>
<td>Available between 6:00 pm -10:00 pm</td>
</tr>
<tr>
<td>1B</td>
<td>Day, Month XX, 20XX</td>
<td>Available between 6:00 pm -10:00 pm</td>
</tr>
<tr>
<td>1C</td>
<td>Day, Month XX, 20XX</td>
<td>Available between 6:00 pm -10:00 pm</td>
</tr>
<tr>
<td>1D</td>
<td>Day, Month XX, 20XX</td>
<td>Available between 6:00 pm -10:00 pm</td>
</tr>
</tbody>
</table>

The mid-module quiz will be available for 4 hrs on the Smartwork5 on-line system (to allow for scheduling conflicts), and each student will have a maximum of 2 hrs to complete all questions once they have started the quiz. Please mark this date and time on your calendar and plan now to ensure that your work and travel plans do not interfere with this schedule.

The quiz will be a combination of multiple choice, short answer/numerical answer problems. The quiz is cumulative and ‘open-book’. All students are expected to work individually in accordance of academic honesty regulations. See “Integrity Defined” below.

Final Exam:

The final exam will be scheduled at the end of the Natural Sciences Module during the December final examination period. Exams can be scheduled at any time in the December 6 - 23, 2021 period. Please do not schedule travel until after the official exam schedule is released (usually by early October). If a student is unable to write an exam through no fault of his or her own for medical or other valid reasons, documentation must be provided and an opportunity to write the missed exam may be given. Students are encouraged to review all examination policies and procedures:

http://students.usask.ca/academics/exams.php

The Final Examination will be common to all concurrent sections of CHEM 142. All final examinations are cumulative and ‘closed-book’. Data sheets and other help will be supplied at the examinations, if required. The final exam will be based on multiple-choice problems and students will have maximum of 3 hours to complete the total exam (comprised of the four Natural sciences: Biology, Chemistry, Geology, and Physics).

Examination Policies:

- The final exam is ‘closed-book’. A formula sheet may be provided with the exam.
- **Students will only be permitted to use a non-programmable calculator at examinations.** The use of electronic devices, including programmable calculators, phones and watches, with document storage and/or communication capabilities is prohibited during exams.
- Alternate times to write final examinations cannot be accommodated. If a student misses a final exam, application must be made to the Engineering Student Centre to write a deferred exam.
- Students planning on registering with the office for Access and Equity Services for Students (AES) must do so in accordance with AES procedures and deadlines.
Required Activities Outside of Class Time

The mid-module quiz will take place outside of class time on the dates provided in the schedule above. See “Mid-Module Quiz” for details.

Important Dates:

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wed., Sept. 4</td>
<td>First day of classes</td>
</tr>
<tr>
<td>Tues., Sept. 16</td>
<td>Last day for making changes in registration for T1 courses (100% tuition credit).</td>
</tr>
<tr>
<td>Oct.11</td>
<td>Thanksgiving holiday</td>
</tr>
<tr>
<td>Nov. 12 - 16</td>
<td>Fall Midterm Break</td>
</tr>
<tr>
<td>Thurs., Nov. 15</td>
<td>Last day to withdraw from T1 classes</td>
</tr>
</tbody>
</table>

Required Resources

Readings/Textbooks
2. Access Kit for Smartwork5 on-line assignment system. This access kit is required for the homework assignments (sold in package with the text)

Textbooks are available from the University of Saskatchewan Bookstore: https://bookstore.usask.ca/students.php#MyTextbooks

Other Required Materials
1. Safety Glasses for the laboratory. See “Laboratory” for details.
2. CHEM 142.1 - Laboratory Instructions (pdfs posted in Laboratory folder in COURSE TOOLS)

Electronic Resources
General and section specific CHEM 142 information can be found on PAWS (paws.usask.ca) under the COURSE TOOLS tab. This site will contain laboratory information, important updates, answers to most common questions about the course, and any section specific information. Updates and announcements will be posted on PAWS.

Calculator Policy
You should have a simple scientific calculator and know how to use it. Students may use a basic scientific calculator (e.g. Texas Instruments TI-30X series, Hewlett-Packard HP 10s or 30S) for all CHEM 142 exams. Graphing or programmable calculators, or calculators with communication capability, are not allowed. For example, HP 35s, Casio fx-50FH, TI-83Plus calculators are not allowed. Ask your instructor if you are unsure whether your calculator is acceptable.

Email
All University of Saskatchewan students are supplied with a university email account and are strongly encouraged to use the university account instead of Hotmail or Gmail (or other free email service) for any university-related correspondence. See http://www.usask.ca/its/guides/student_guide for more information about services available.
Policies on Academic Dishonesty, Academic Appeals and Course Delivery:

Students are expected to undertake all aspects of their academic work in an ethical manner. Students are expected to submit their own individual work for academic credit, properly cite the work of others, and to follow all rules for examinations. Academic misconduct, plagiarism, and cheating will not be tolerated. Students are responsible for understanding the university's policies on academic integrity and academic misconduct. If any form of academic misconduct is discovered, appropriate disciplinary action will be taken.


For information regarding appeals of a final grade or other academic matters, please consult the University Council document on Student Appeals of Evaluation, Grading and Academic Standing (http://policies.usask.ca/policies/student-affairs-and-activities/student-appeals.php).

A summary of University of Saskatchewan policies relating to academic courses is provided in the document: Academic Courses Policy on Class Delivery, Examinations, and Assessment of Student Learning (http://policies.usask.ca/policies/academic-affairs/academic-courses.php).

Integrity Defined (from the Office of the University Secretary)

The University of Saskatchewan is committed to the highest standards of academic integrity and honesty. Students are expected to be familiar with these standards regarding academic honesty and to uphold the policies of the University in this respect. Students are particularly urged to familiarize themselves with the provisions of the Student Conduct & Appeals section of the University Secretary Website and avoid any behavior that could potentially result in suspicions of cheating, plagiarism, misrepresentation of facts and/or participation in an offence. Academic dishonesty is a serious offence and can result in suspension or expulsion from the University.


For more information on what academic integrity means for students see the Academic Integrity section of the University Library Website at: https://library.usask.ca/academic-integrity#AboutAcademicIntegrity

You are encouraged to complete the Academic Integrity Tutorial to understand the fundamental values of academic integrity and how to be a responsible scholar and member of the USask community - https://library.usask.ca/academic-integrity.php#AcademicIntegrityTutorial
Safety:
Safety is of paramount importance in the College. Students are expected to work in a safe and responsible manner, to follow all safety instructions, and use any specified personal protective equipment. Students failing to behave in a safe manner will be asked to leave.

Recording Lectures:
Recording of the course will only be allowed in certain circumstances. Please see the instructor for information on how to receive approval.

Copyright:
Course materials are provided to students based on their registration in a class. Any materials created by course instructors is the intellectual property of the instructors. This includes exams, PowerPoint/PDF slides and other course notes. Additionally, other copyright-protected materials created by textbook publishers and authors may be provided to students based on license terms and educational exceptions in the Canadian Copyright Act (see http://laws-lois.justice.gc.ca/eng/acts/C-42/index.html).

Before copying or distributing others’ copyright-protected materials, students need to ensure that their use of the materials is covered under the University’s Fair Dealing Copyright Guidelines available at http://www.usask.ca/copyright/basics/copyright-policy/fair-dealing-guidelines/index.php. For example, posting others’ copyright-protected materials on the internet is not covered under the University’s Fair Dealing Copyright Guidelines; doing so requires permission from the copyright holder. For more information about copyright, please visit http://www.usask.ca/copyright/students/rights/index.php or contact the University’s Copyright Coordinator at copyright.coordinator@usask.ca.

Students should be aware that a violation of the university’s copyright policies could be an instance of non-academic misconduct. For example, the practice of uploading or posting copyright-protected materials to course-sharing websites, depositaries, or “drop boxes”, without the permission of the copyright holder, could result in a charge of non-academic misconduct under the university’s “Standard of Student Conduct in Non-Academic Matters”, found at the following location: https://secretariat.usask.ca/student-conduct-appeals/non-academic-misconduct.php.

Student Conduct:
Ethical behaviour is an important part of engineering practice. Each professional engineering association has a Code of Ethics, which its members are expected to follow. Since students are in the process of becoming Professional Engineers, it is expected that students will conduct themselves in an ethical manner.

The APEGS (Association of Professional Engineers and Geoscientists of Saskatchewan) Code of Ethics states that engineers shall “conduct themselves with fairness, courtesy and good faith towards clients, colleagues, employees and others; give credit where it is due and accept, as well as give, honest and fair professional criticism” (Section 20(e), The Engineering and Geoscience Professions Regulatory Bylaws, 1997).

The first part of this statement discusses an engineer’s relationships with his or her colleagues. One of the ways in which engineering students can demonstrate courtesy to their colleagues is by helping to maintain an atmosphere that is conducive to learning, and minimizing disruptions in class. This includes arriving on time for lectures, turning cell phones and other electronic devices off during lectures, not leaving or entering the class at inopportune times, and refraining from talking to others while the instructor is talking.
Access and Equity Services (AES) for Students

Students who have disabilities (learning, medical, physical, or mental health) are strongly encouraged to register with Access and Equity Services (AES) if they have not already done so. Students who suspect they may have disabilities should contact AES for advice and referrals at any time. Those students who are registered with AES with mental health disabilities and who anticipate that they may have responses to certain course materials or topics, should discuss course content with their instructors prior to course add / drop dates. In order to access AES programs and supports, students must follow AES policy and procedures. For more information or advice, visit https://students.usask.ca/health/centres/access-equity-services.php, or contact AES at 306-966-7273 or aes@usask.ca.

Students registered with AES may request alternative arrangements for mid-term and final examinations. Students must arrange such accommodations through AES by the stated deadlines. Instructors shall provide the examinations for students who are being accommodated by the deadlines established by AES.

Support Services for Engineering Students:
- Engineering Student Centre (Rm. 2A05 Engineering Building)
  - Email: esc@usask.ca; Phone: 306-966-5274; https://engineering.usask.ca/contact_info/esc-office.php
- Student Wellness Centre (3rd & 4th Floors, Place Riel): https://students.usask.ca/health/
- Financial Services: https://students.usask.ca/money/

End of day tutorial sessions will be offered by the College of Engineering for the Common First Year and will provide support for all courses. Please see X for more details.

Student Learning Services

Student Learning Services (SLS) offers assistance to U of S undergrad and graduate students. For information on specific services, please see the SLS web site https://library.usask.ca/studentlearning/.

Teaching, Learning and Student Experience

The Teaching, Learning and Student Experience Unit (TLSE) focuses on providing developmental and support services and programs to students and the university community. For more information, see https://students.usask.ca/. Specific resources include:
- Student Wellness Centre (3rd & 4th Floors, Place Riel): https://students.usask.ca/health/
- Financial Services: https://students.usask.ca/money/

Consulting and Tutors

You are encouraged to approach instructors and laboratory staff on an individual basis to discuss any aspect of the course. The Chemistry Learning Centre (Thorvaldson 162; located opposite the Chemistry main office) will be available to CHEM 142 students; times will be posted on PAWS and outside the Centre. Other tutor opportunities may be arranged by the Chemistry Student’s Society. The University of Saskatchewan Students’ Union (http://www.ussu.ca) and Chemistry Students Society
Please note that most CHEM 142 instructors will generally respond to emails within 24 hours, during working hours. Please first check the course outline (this document) and the CHEM 142 course website to ensure that the answer is not already posted.

**College of Engineering Attribute Mapping:**

This information shows the relationship of the learning outcomes of this course to the graduate attributes intended upon students’ completion of the degree program. This information is used for accreditation purposes.

<table>
<thead>
<tr>
<th>Instructional Level‡</th>
<th>Learning Outcome</th>
<th>Attribute†</th>
<th>A1</th>
<th>A2</th>
<th>A3</th>
<th>A4</th>
<th>A5</th>
<th>A6</th>
<th>A7</th>
<th>A8</th>
<th>A9</th>
<th>A10</th>
<th>A11</th>
<th>A12</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>A</td>
<td>1</td>
<td>I</td>
<td>I</td>
<td>I</td>
<td>I</td>
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<tr>
<td>2</td>
<td></td>
<td>I</td>
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<tr>
<td>3</td>
<td></td>
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<tr>
<td>4</td>
<td></td>
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<td>I</td>
</tr>
</tbody>
</table>

†Attributes:
A1 A knowledge base for engineering
A2 Problem analysis
A3 Investigation
A4 Design
A5 Use of engineering tools
A6 Individual and team work
A7 Communication skills
A8 Professionalism
A9 Impact of engineering on society and the environment
A10 Ethics and equity
A11 Economics and project management
A12 Life-long learning

‡Instructional Level:
Introduced (I) – Students learn the working vocabulary of the area of content, along with some of the major underlying concepts.
Developed (D) – Students use their working vocabulary and major fundamental concepts to probe more deeply, to read the literature, and to deepen their exploration of the concepts. They may begin to practice, extend, or refine knowledge in familiar contexts.
Applied (A) – Students approach mastery in the area of content. They explore deeply into the discipline and experience the controversies, debate, and uncertainties that characterize the leading edges of any field. They practice, extend, or refine knowledge in unfamiliar contexts.

**Accreditation Unit (AU) Mapping:** (% of total class AU)

<table>
<thead>
<tr>
<th>Math</th>
<th>Natural Science</th>
<th>Complementary Studies</th>
<th>Engineering Science</th>
<th>Engineering Design</th>
</tr>
</thead>
<tbody>
<tr>
<td>0%</td>
<td>100%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
</tbody>
</table>

**Accreditation Data Collection and Privacy:**
Undergraduate programs in the College of Engineering are accredited by the Canadian Engineering Accreditation Board. Student performance data may be collected in this course to support accreditation and continuous program improvement processes. Anonymous samples of student work may also be collected for accreditation purposes. All data provided to the accreditation body or external entities is anonymized and reported in aggregate form to protect your information and identity. If you have any concerns about how your personal information is used or maintained, please contact the Associate Dean Academic, College of Engineering.
1. Approval by Department Head or Dean
   1.1 College or School with academic authority: College of Arts & Science
   1.2 Department with academic authority: Department of Chemistry
   1.3 Term from which the course is effective: 202105

2. Information required for the Catalogue
   2.1 Label & Number of course: CHEM 146
   2.2 Academic credit units: 3
   2.3 Course Long Title (maximum 100 characters): General Chemistry for Engineering
       Course Short Title (maximum 30 characters): General Chemistry for Engr
   2.4 Total Hours: Lecture 34.5 Seminar Lab 27 Tutorial Other
   2.5 Weekly Hours: Lecture 4.5 Seminar Lab 3 Tutorial Other
   2.6 Term in which it will be offered: T1 T2 T1 or T2 T1 and T2
   2.7 Prerequisite: Chemistry 30 or CHEM 90 or CHEM 100) and (Mathematics B30 or
       Foundations of Mathematics 30 or Pre-Calculus 30) and CHEM 142.1

If there is a prerequisite waiver, who is responsible for signing it?
   D – Instructor/Dept Approval
   H – Department Approval
   I – Instructor Approval

   2.8 Catalogue description (150 words or less):
       The course is intended to provide Engineering students with a fundamental understanding
       of core Chemistry concepts including equilibria and chemical thermodynamics. These goals
       are achieved and exemplified using an overarching theme of the role of carbon dioxide in
       the global climate change crisis.

   2.9 Do you allow this course to be repeated for credit? No

3. Please list rationale for introducing this course:

   Currently a number of Arts & Science departments contribute to the Common First Year for the
   College of Engineering Bachelor of Science in Engineering (B.E.) program. The College of Engineering
   is in the process of redesigning this Common First Year to create the most effective first year
   engineering program in Canada. They are working hard to create something that will excite, engage
   and inspire their students, and to holistically prepare them for the challenges to come in later years.
   This project has been underway since 2016-2017 and has a planned launch of Fall 2021. Over this
time there has been extensive consultation between the College of Engineering and specific Departments in the College of Arts & Science. A suite of new Science courses are being proposed for use in this redesigned Common First Year which will replace existing courses currently used.

The College of Engineering is also working toward a new competency-based assessment system that will be utilized in the new First Year Engineering courses in Fall 2021. The Arts & Science departments will continue to learn more about this system through 2020-2021 and 2021-2022 as it is implemented in Engineering, and will then determine how it can be used in the Science courses attached to the Engineering Common First Year. Revisions to the courses, to implement this assessment system, will be submitted to the appropriate College Academic Programs Committee for approval, prior to use in the courses.

This new competency-based assessment system will use module tests in place of midterm and final exams. A few of the new courses proposed by Arts and Science departments have started to use the concept of Module Tests in their courses in these first versions. This will make it easier when they switch to the competency-based assessment system in future. Some common wording regarding module tests was created and has been used in the Arts and Science course proposals. This wording is similar to that of the Examinations Policies section of Arts and Science syllabus, but has been modified to accurately portray the concept of the module tests.

4. Please list the learning objectives for this course:

By the end of this course, students will be expected to:

1. Be able to assign quantum numbers to atomic orbitals and use their values to describe the size, energy and orientation of orbitals.
2. Write electron configurations and draw orbital diagrams of atoms.
4. Predict bond angles, the shapes of molecular and the dipole moment of molecules using VSEPR theory.
5. Use valence bond theory to explain orbital overlap, bond angles and molecular shapes.
6. Calculate changes in the volume, temperature, pressure and number of moles of a gas using the ideal gas law.
7. Perform quantitative calculations using chemical reactions that involve gases.
8. Determine the mole fraction and the partial pressure of a gas in a mixture.
10. Explain the first law of thermodynamics
11. Calculate the amount of heat transferred in physical or chemical processes.
12. Calculate enthalpies of reaction.
13. Relate the rates of change in the concentrations of reactants and products to each other and reaction rates.
14. Derive rate laws from initial reaction rate data.
15. Use integrated rate laws to identify zero-, first- and second-order reactions.
16. Calculate half-lives of reactions.
17. Calculate the activation energy of a reaction and the effect of temperature on rate constants.
18. Write equilibrium constant expressions and predict the direction of reversible chemical reactions.
19. Predict how a reaction at equilibrium will respond to changes in conditions.
20. Relate the strengths of acids and bases to their $K_a$ and $K_b$ values.
22. Calculate the pH of polyprotic acids.
23. Prepare a buffer with a desired pH.
24. Calculate and interpret the results of an acid-base titration.
25. Relate the solubility of an ionic compound to its solubility product.
26. Predict the signs of entropy changes for spontaneous and non-spontaneous chemical reactions and physics processes.
27. Calculate entropy and free energy changes in chemical reactions using standard molar entropies and free energies.
28. Predict the spontaneity of a chemical reaction as a function of temperature.
29. Use the van’t Hoff equation to calculate the values of the equilibrium constant at different temperatures.
30. Perform laboratory-based experiments and be proficient in practical chemistry skills.

5. **Impact of this course**
   Are the programs of other departments or Colleges affected by this course? This course is for the College of Engineering First Year.
   If so, were these departments consulted? (Include correspondence) Yes
   Were any other departments asked to review or comment on the proposal? The course went through the Arts & Science College Challenge, which provides opportunity for responses by all departments in the College.

6. **Other courses or program affected** (please list course titles as well as numbers)
   6.1 Courses to be deleted? None
   6.2 Courses for which this course will be a prerequisite? Course revisions will be submitted separately to the UCC.

6.3 Is this course to be required by your majors, or by majors in another program?
Required course in the first-year as part of revised Engineering program.

7. **Course outline**
   (Weekly outline of lectures or include a draft of the course information sheet.)

See attached syllabus.

8. **Enrolment**
   8.1 Expected enrollment: up to 600
   8.2 From which colleges? Engineering
9. **Student evaluation**
Give approximate weighting assigned to each indicator (assignments, laboratory work, mid-term test, final examination, essays or projects, etc.)

The methods of assessment and their respective weightings are given below:

**Assessment:**

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>In-class Quizzes</td>
<td>5%</td>
</tr>
<tr>
<td>On-line Assignments</td>
<td>10%</td>
</tr>
<tr>
<td>Laboratories</td>
<td>25%</td>
</tr>
<tr>
<td>Three Module Tests</td>
<td>3 × 20%</td>
</tr>
</tbody>
</table>

9.1 How should this course be graded?

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>Completed Requirements (Grade options for instructor: Completed Requirements, Fail, IP In Progress)</td>
</tr>
<tr>
<td>N</td>
<td>Numeric/Percentage (Grade options for instructor: grade of 0% to 100%, IP in Progress)</td>
</tr>
<tr>
<td>P</td>
<td>Pass/Fail (Grade options for instructor: Pass, Fail, In Progress)</td>
</tr>
<tr>
<td>S</td>
<td>Special (Grade options for instructor: NA – Grade Not Applicable) If other, please specify:</td>
</tr>
</tbody>
</table>

9.2 Is the course exempt from the final examination? Yes – No final exam is proposed.

As shared in the rationale section above this course will use module tests in place of midterm and final exams.

**Insert from Rationale:**
This new competency-based assessment system will use module tests in place of midterm and final exams. A few of the new courses proposed by Arts and Science departments have started to use the concept of Module Tests in their courses in these first versions. This will make it easier when they switch to the competency-based assessment system in future. Some common wording regarding module tests was created and has been used in the Arts and Science course proposals. This wording is similar to that of the Examinations Policies section of Arts and Science syllabus, but has been modified to accurately portray the concept of the module tests.

10. **Required text**
Include a bibliography for the course.

2. Access Kit for Smartwork5 on-line assignment system. This access kit is required for the homework assignments (sold in package with the text)
11. **Resources**

11.1 Proposed instructor:
Chemistry Faculty

11.2 How does the department plan to handle the additional teaching or administrative workload? Within department.

11.3 Are sufficient library or other research resources available for this course? Yes

11.4 Are any additional resources required (library, audio-visual, technology, etc.)? Details have been worked out between College of Arts & Science and College of Engineering to fund laboratory costs for this course. All requires the use of THORV 212 as lab space. Space Planning has allocated this space to the Department of Chemistry. It will be in structural vacancy until the redesigned First Year Engineering program launches in Fall 2021. Between now and then there are some minor renovations required. Funding for these is currently being determined.

12. **Tuition**

12.1 Will this course attract tuition charges? If so, how much? (use tuition category) TC14

12.2 Does this course require non-standard fees, such as materials or excursion fees? If so, please include an approved “Application for New Fee or Fee Change Form”

http://www.usask.ca/sesd/info-for-instructors/program-course-preparation.php#course-fees

No

---

**Detailed Course Information**

1. **Schedule Types**

Please choose the Schedule Types that can be used for sections that fall under this course:

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CL</td>
<td>Clinical</td>
<td>PRB</td>
<td>Problem Session</td>
</tr>
<tr>
<td>COO</td>
<td>Coop Class</td>
<td>RDG</td>
<td>Reading Class</td>
</tr>
<tr>
<td>FLD</td>
<td>Field Trip</td>
<td>RES</td>
<td>Research</td>
</tr>
<tr>
<td>ICR</td>
<td>Internet Chat Relay</td>
<td>ROS</td>
<td>Roster (Dent Only)</td>
</tr>
<tr>
<td>IHP</td>
<td>Internet Help</td>
<td>SEM</td>
<td>Seminar</td>
</tr>
<tr>
<td>IN1</td>
<td>Internship - Education</td>
<td>SSI</td>
<td>Supervised Self Instruction</td>
</tr>
<tr>
<td>IN2</td>
<td>Internship - CMPT &amp; EPIP</td>
<td>STU</td>
<td>Studio</td>
</tr>
<tr>
<td>IN3</td>
<td>Internship - General</td>
<td>SUP</td>
<td>Teacher Supervision</td>
</tr>
<tr>
<td>IND</td>
<td>Independent Studies</td>
<td>TEL</td>
<td>Televised Class</td>
</tr>
<tr>
<td>LAB</td>
<td>Laboratory</td>
<td>TUT</td>
<td>Tutorial</td>
</tr>
<tr>
<td>LC</td>
<td>Lecture/Clinical (Dent Only)</td>
<td>WEB</td>
<td>Web Based Class</td>
</tr>
<tr>
<td>LEC</td>
<td>Lecture</td>
<td>XCH</td>
<td>Exchange Program</td>
</tr>
<tr>
<td>LL</td>
<td>Lecture/Laboratory (Dent Only)</td>
<td>XGN</td>
<td>Ghost Schedule Type Not Applicable</td>
</tr>
<tr>
<td>MM</td>
<td>Multimode</td>
<td>XHS</td>
<td>High School Class</td>
</tr>
<tr>
<td>PCL</td>
<td>Pre-Clinical (Dent Only)</td>
<td>XNA</td>
<td>Schedule Type Not Applicable</td>
</tr>
<tr>
<td>PRA</td>
<td>Practicum</td>
<td>XNC</td>
<td>No Academic Credit</td>
</tr>
</tbody>
</table>
2. Course Attributes
Please highlight the attributes that should be attached to the course (they will apply to all sections):

2.1 NOAC No Academic Credit
0 Credit Unit courses that possess “deemed” CUs (Called Operational Credit Units). NOAC causes the system to roll 0 academic credit units to academic history.

2.2 For the College of Arts and Science only: To which program type does this course belong?

<table>
<thead>
<tr>
<th>Option</th>
<th>Program Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>FNAR</td>
<td>Fine Arts</td>
</tr>
<tr>
<td>HUM</td>
<td>Humanities</td>
</tr>
<tr>
<td>SCIE</td>
<td>Science</td>
</tr>
<tr>
<td>SOCS</td>
<td>Social Science</td>
</tr>
<tr>
<td>ARNP</td>
<td>No Program Type (Arts and Science)</td>
</tr>
</tbody>
</table>

3. Registration Information (Note: multi-term courses cannot be automated as corequisites)

3.1 Permission Required:

3.2 Restriction(s): course only open to students in a specific college, program/degree, major, year in program

Restricted to students in the College of Engineering.

3.3 Prerequisite(s): course(s) that must be completed prior to the start of this course
(Chemistry 30 or CHEM 90 or CHEM 100) and (Mathematics B30 or Foundations of Mathematics 30 or Pre-Calculus 30) and CHEM 142.1

3.4 Prerequisite(s) or Corequisite(s): course(s) that can be completed prior to or taken at the same time as this course

3.5 Corequisite(s): course(s) that must be taken at the same time as this course

3.6 Notes: recommended courses, repeat restrictions/content overlap, other additional information

4. List Equivalent Course(s) here: CHEM 115
An equivalent course can be used in place of the course for which this form is being completed, specifically for the purposes of prerequisite and degree audit checking. Credit will be given for only one of the equivalent courses.

4.1 If this is a recently-repurposed course number, please list the courses that are no longer considered to be equivalent:

*Please note: If the equivalent courses carry an UNEQUAL number of credit units, DegreeWorks will automatically enforce the following, unless otherwise stated:

- If a 3 credit unit course is considered to be equivalent to a 6 credit unit course, it will fulfill the 6 credit unit requirement and the student will not have to complete another 3 credit units toward the overall number of required credit units for the program.
- If a 6 credit unit course is considered to be equivalent to a 3 credit unit course, ALL 6 of the credit units may be used to fulfill the 3 credit unit requirement.

5. List Mutually-Exclusive Course(s) here: None
Mutually exclusive courses have similar content such that students cannot receive credit for both.

5.1 If this is a recently-repurposed course number, please list the courses that are no longer considered to be mutually exclusive:

*Please note: SiRIUS cannot enforce a situation where the exclusion goes only one way.

6. Additional Notes:
CHEM 146.3 (01)
General Chemistry for Engineering
Winter 2022

Land Acknowledgement
At the University of Saskatchewan, we acknowledge we are on Treaty Six Territory and the Homeland of the Métis. We pay our respect to the First Nation and Métis ancestors of this place and reaffirm our relationship with one another.

Instructor[s]
Name (include credentials; if applicable please include P.Eng. or EIT as well)
Office: Email:
Phone: Optional: Instructor Profile
A brief (1-2 paragraphs) summary of your teaching philosophy would also be appropriate and helpful to share in this section. This should be written in first as research does show that writing the profile in the first person helps to create more of a welcoming environment for students. (Richardson, R. and Woods, S. (2009). Course syllabus: A guide. Retrieved online from http://www.smu.ca/webfiles/SyllabusGuide_000.pdf)

Lectures: 4.5 hours /week (TBA)

Laboratory: 3 hr/week- 9 lab sessions total- Dates/Times TBA
Lab Manager: Email:
Office: Phone:

Website: Assignments, solutions, lab schedules, general course information, and announcements will be posted on the course website (PAWS/Blackboard). Students are responsible for keeping up-to-date with the information on the course website. https://bblearn.usask.ca/

Description: The course is intended to provide Engineering students with a fundamental understanding of core Chemistry concepts including equilibria and chemical thermodynamics. These goals are achieved and exemplified using an overarching theme of the role of carbon dioxide in the global climate change crisis.

Prerequisites: (Chemistry 30 or CHEM 90 or CHEM 100) and (Mathematics B30 or Foundations of Mathematics 30 or Pre-Calculus 30) and CHEM 142.1
Note: This course is intended for students in the College of Engineering. Students with credit for CHEM 111, 112, 114 or 115 may not take this course for credit.

Course Reference Numbers (CRNs):
xxxxx (lectures), xxxxx (laboratory), xxxxx (tutorial)
Available from the Dynamic Schedule once courses are built (https://pawnss.usask.ca/ban/bwckschd.p_disp Dyn_schd)
Course Learning Outcomes: By the end of this course, students will be expected to:

1. Be able to assign quantum numbers to atomic orbitals and use their values to describe the size, energy and orientation of orbitals.
2. Write electron configurations and draw orbital diagrams of atoms.
4. Predict bond angles, the shapes of molecular and the dipole moment of molecules using VSEPR theory.
5. Use valence bond theory to explain orbital overlap, bond angles and molecular shapes.
6. Calculate changes in the volume, temperature, pressure and number of moles of a gas using the ideal gas law.
7. Perform quantitative calculations using chemical reactions that involve gases.
8. Determine the mole fraction and the partial pressure of a gas in a mixture.
10. Explain the first law of thermodynamics
11. Calculate the amount of heat transferred in physical or chemical processes.
12. Calculate enthalpies of reaction.
13. Relate the rates of change in the concentrations of reactants and products to each other and reaction rates.
14. Derive rate laws from initial reaction rate data.
15. Use integrated rate laws to identify zero-, first- and second-order reactions.
16. Calculate half-lives of reactions.
17. Calculate the activation energy of a reaction and the effect of temperature on rate constants.
18. Write equilibrium constant expressions and predict the direction of reversible chemical reactions.
19. Predict how a reaction at equilibrium will respond to changes in conditions.
20. Relate the strengths of acids and bases to their $K_a$ and $K_b$ values.
21. Interconvert $[\text{H}_3\text{O}^+]$, $\text{pH}$, $\text{pOH}$ and $[\text{OH}^-]$.
22. Calculate the pH of polyprotic acids.
23. Prepare a buffer with a desired pH.
24. Calculate and interpret the results of an acid-base titration.
25. Relate the solubility of an ionic compound to its solubility product.
26. Predict the signs of entropy changes for spontaneous and non-spontaneous chemical reactions and physics processes.
27. Calculate entropy and free energy changes in chemical reactions using standard molar entropies and free energies.
28. Predict the spontaneity of a chemical reaction as a function of temperature.
29. Use the van’t Hoff equation to calculate the values of the equilibrium constant at different temperatures.
30. Perform laboratory-based experiments and be proficient in practical chemistry skills.

Assessment: The methods of assessment and their respective weightings are given below:

- In-class Quizzes: 5%
- On-line Assignments: 10%
- Laboratories: 25%
- Three Module Tests: $3 \times 20\%$
**Attendance and Participation:**
It is expected that students will attend all lectures, and laboratory sessions. Students are responsible for all required readings, and topics presented in lectures and laboratories. Attendance may be monitored in lectures through the use of in-class quizzes. See “Laboratory” for details regarding lab attendance.

**Criteria That Must Be Met to Pass:**
In order to be assigned a passing final grade, you must fulfill the following conditions:
1. Obtain an overall mark greater than 50%, AND
2. Attend all laboratory sessions and complete all required lab work and obtain a 50% mark therein, AND
3. Achieve a minimum of 40% on the final exam

**Final Grades:**
The final grades will be consistent with the “literal descriptors” specified in the university's grading system (at link below, click “for undergraduate students”).
[https://students.usask.ca/academics/grading/grading-system.php](https://students.usask.ca/academics/grading/grading-system.php)

For information regarding appeals of final grades or other academic matters, please visit [https://secretariat.usask.ca/student-conduct-appeals/index.php](https://secretariat.usask.ca/student-conduct-appeals/index.php)

**Academic Courses Policy:**
More information on the Academic Courses Policy on course delivery, examinations and assessment of student learning can be found at:
[http://policies.usask.ca/policies/academic-affairs/academic-courses.php](http://policies.usask.ca/policies/academic-affairs/academic-courses.php)

**Learning Charter:**
The University of Saskatchewan Learning Charter is intended to define aspirations about the learning experience that the University aims to provide, and the roles to be played in realizing these aspirations by students, instructors and the institution. A copy of the Learning Charter can be found at:
[https://teaching.usask.ca/about/policies/learning-charter.php](https://teaching.usask.ca/about/policies/learning-charter.php)
## Course Content/Schedule:

<table>
<thead>
<tr>
<th>WEEK</th>
<th>Topic</th>
<th>Approximate Lecture Hours</th>
<th>LAB</th>
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<tbody>
<tr>
<td>WEEK 1</td>
<td>1. Chemical Bonding</td>
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<td>1.1 Shapes and sizes of atomic orbitals</td>
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<td>1.2 Electronic configurations, periodic properties</td>
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<td>1.3 Extensions and limitations of Lewis theory</td>
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<td><strong>Chemical Bonding continued</strong></td>
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<td>1.4 VSEPR</td>
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<td>1.5 Introduction to Valence Bond theory</td>
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<td>1.7 Pi and Sigma bonds.</td>
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<td>2. Properties of Gases – How much is a ton of CO₂?</td>
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<td>2.1 Simple gas relationships</td>
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<td>2.2 The ideal-gas law</td>
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<td>2.3 Gas reaction stoichiometry</td>
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<td><strong>Properties of Gases continued</strong></td>
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<td>2.4 Dalton’s law of partial pressures</td>
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<td><strong>3. Thermochemistry - Why do we burn fossil fuels?</strong></td>
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<td>3.1 Heat versus work</td>
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<td>3.3 Energy changes in chemical reactions</td>
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<td>3.5 Heat capacities and calorimetry</td>
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<td>WEEK 4</td>
<td>Thermochemistry continued…</td>
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<td>3.6 Enthalpy changes in reactions</td>
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<td>3.7 Standard enthalpies of formation</td>
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<td><strong>4. Chemical Kinetics – At what rate can atmospheric CO₂ be depleted “naturally”?</strong></td>
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<td>4.1 Rates of chemical reactions</td>
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<td>WEEK 5</td>
<td>5. Chemical Equilibria – How do oceans moderate CO₂ levels ?</td>
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<td>5.1 Chemical activity</td>
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<td>5.2 Reaction quotients</td>
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<td>5.6 Le Châtelier’s principle</td>
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<td>ASSIGNMENT 4- DUE ONLINE</td>
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<td>WEEK 6</td>
<td>6. Acid-Base Equilibria – Why does increased atmospheric CO₂ lead to loss of coral reefs ?</td>
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<td>6.1 Arrhenius acids and bases</td>
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<td>6.2 Brønsted-Lowry and Lewis definitions;</td>
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<td>6.4 Acid dissociation constants</td>
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<td>6.5 Auto-ionization of water</td>
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<td>6.6 The pH scale.</td>
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<td>6.7 Weak acid/base dissociation strong and weak acid solutions</td>
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<td>6.8 Polyprotic acids</td>
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<td>6.9 The pH of a polyprotic acids.</td>
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<td>ASSIGNMENT 5- DUE ONLINE</td>
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<td>WEEK 7</td>
<td>7. Aqueous Equilibria – Can we trap CO₂ as insoluble carbonates?</td>
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<td>7.1 Buffers, buffer range and buffer capacity</td>
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<td>7.2 Calculate the pH of a buffered solution</td>
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<td>7.3 Titrations, indicators and equivalence points</td>
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<td>7.4 Analysis of titration curves</td>
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<td>7.6 Solubility of sparingly soluble salts</td>
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<td>7.7 The common ion effect</td>
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<td>8. Chemical Thermodynamics – Why don’t we just chemically convert CO₂ back into fuels?</td>
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<td>8.1 Spontaneous and non-spontaneous processes</td>
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<td>8.2 Entropy</td>
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<td>8.9 Spontaneity and Gibbs free energies</td>
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<td>8.10 Standard change in Gibbs free energy</td>
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<td>8.11 Free energy changes for non-standard states</td>
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<td>8.12 Gibbs free energy and the equilibrium constant</td>
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<td>8.1 Spontaneous and non-spontaneous processes</td>
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<td>WEEKS 9-11</td>
<td>LABS CONTINUE- SEE LAB EXPERIMENT SCHEDULE</td>
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Homework Assignments
The course textbook is fully supported by the Smartwork5 website. We will use Smartwork5 to assign homework assignments (see Assessments above). The homework assignments will not only help you to test if you understand the material, but it will also teach you how to solve chemical problems since some of the problems are fully tutored. Assignments should be done by all students individually. We note that students attempting to cut corners – including cheating - on assignments have always suffered in examinations.

BEFORE you can register for SmartWork5, you need the right “Registration Code” (provided with a new print/electronic textbook) and the correct “Student Set ID” for your section of the course. “Student Set IDs” are specific to each section. The link: http://bit.ly/nortonregistration shows a complete video on how to register and join a Student Set. Also, please see the Smartwork5 FAQ document in the course website for frequently asked questions (and answers) about Smartwork5. More important details may be given during the first week of lectures. With your “Student Set ID” (see table below), your “Student ID” (see your student card), and your “Registration Code” you can then register on the website: https://digital.wwnorton.com/chem5

If you have used Smartwork5 before (i.e. in another course) your login and password should still be valid, but you will need to register for the correct section of CHEM 146 using the appropriate 6-digit “Student Set ID”.

<table>
<thead>
<tr>
<th>CHEM 146 Section</th>
<th>Lecturer</th>
<th>Students Set ID</th>
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<tbody>
<tr>
<td>Section 01- TR 9:30 am</td>
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<td>Section 03- TR 10:30 am</td>
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There will be seven graded assignments scheduled during the term. The due dates are listed above in the Course Schedule. Assignments are submitted on-line through the Smartwork5 system.

All assignments are due by the start of class on the day indicated in the syllabus. There are NO extensions of due dates for the graded assignments. Students who have missed the deadline should continue to work on the assignment in order to practice those concepts but will not receive credit for the questions completed after the due date.
Laboratory:
The CHEM 146 labs will begin during the second week of the course. The location of your lab is available in your registration information on PAWS.

<table>
<thead>
<tr>
<th>Laboratory Experiment</th>
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<td>PRESSURE AND PROPERTIES OF GASES</td>
<td>Week 3</td>
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<td>DESIGN OF A CALORIMETER TO STUDY CHANGE IN ENTHALPY</td>
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<td>RATES OF CHEMICAL REACTIONS</td>
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<td>LE CHATELIER’S PRINCIPLE AND CHEMICAL EQUILIBRUM</td>
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<td>TITRIMETRIC ANALYSIS OF ACIDS AND BASES-</td>
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<td>CALCULATION OF $K_{sp}$ IN AQUEOUS SOLUTIONS</td>
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<td>pH TITRATION CURVES AND INDICATORS-</td>
<td>Week 10</td>
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<tr>
<td>GIBB’S FREE ENERGY AND NON-SPOUTANE PROCESSES</td>
<td>Week 11</td>
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**What to Bring to the Lab**

- CHEM 146 Laboratory Instructions (posted on Course website)
- Safety glasses (Available in the main Bookstore and Chemistry Stores (Thorv. G46)). Prescription glasses alone do not provide sufficient eye protection. Students who wear prescription glasses must also wear safety glasses.
- Loose-leaf paper, pen

Students are expected to follow all safety considerations in the laboratory, perform the experiments during the allotted time, and complete calculations and reports during the lab.

The Laboratory will make up 20% of the Overall Course mark and each lab will be weighted equally. *Grading of each lab will be based on*

- Preparation exercise or quiz (10%),
- Performance during the experiment including Safety and Cleanliness (30%)
- Calculations and Report (50%)
- Group Participation (10%)

**Absences from the Assigned Lab Period**

Students are expected to attend ALL laboratory sessions. However, if an absence is unavoidable, for example, a serious illness or the death of a family member, you may apply for permission to reschedule the lab on a different day. You will have 2 business days after the missed lab period to contact the Lab Manager, Dr. Alexandra Bartole-Scott (firstyear.chem@usask.ca); to fill out the “Permission to Reschedule Lab” Form and arrange the make-up lab. If permission is not granted or the student does not complete the lab, the experiment will be assigned a mark of “0” and will result in a failing grade in the course.
If, due to a valid prior commitment, you cannot attend your assigned lab period, you should see the lab manager at least TWO WEEKS before to arrange an alternate time and to obtain the “Permission to Reschedule Lab” form. Examples of valid reasons for rescheduling a lab include: medical appointments that cannot be rescheduled, commitments for Huskies athletes, and observances of religious holidays. Additional documentation may be required to verify the reason for your absence from your regular lab time. Note: Tests/exams in other courses are not valid reasons for missing your lab. It is your responsibility to arrange alternate test times outside of your regularly scheduled lab.

Attendance at laboratory sessions and submission of laboratory reports is mandatory. Late lab reports are not permitted. Failure to meet these requirements will result in a final grade of less than 50% for the course.

Examinations:

Module Tests:
Three module tests will be scheduled during the term. They will be scheduled outside of class time. If a student is unable to write a test through no fault of his or her own for medical or other valid reasons, documentation must be provided. If a student misses multiple test an opportunity to write a deferred test may be given (see below). Students are encouraged to review all examination policies and procedures:
http://students.usask.ca/academics/exams.php

The module tests will be common to all concurrent sections of CHEM 146. All module tests are ‘closed-book’. Data sheets and other help will be supplied at the examinations, if required. The tests will be based on multiple-choice and/or short problems and students will have a maximum of 1.5 hours to complete each test.

Examination Policies:

- **Students will only be permitted to use a non-programmable calculator.** The use of electronic devices, including programmable calculators, phones and watches, with document storage and/or communication capabilities is prohibited during exams.
- Alternate times to write module tests cannot be accommodated. If a student misses multiple module tests, application must be made to the Engineering Student Centre to write a deferred test.
- Students planning on registering with the office for Access and Equity Services for Students (AES) must do so in accordance with AES procedures and deadlines.
Required Activities Outside of Class Time

The module tests will take place outside of class time on the dates provided in the schedule above. See “Module Tests” for details.

Important Dates:

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mon., Jan. 6</td>
<td>Classes resume</td>
</tr>
<tr>
<td>Fri., Jan. 17</td>
<td>Last day for making changes in registration for T2 courses (100% tuition credit).</td>
</tr>
<tr>
<td>Feb. 17 - 22</td>
<td>Winter Midterm Break</td>
</tr>
<tr>
<td>Sun., Mar. 15</td>
<td>Last day to withdraw from T2 classes</td>
</tr>
</tbody>
</table>

Required Resources

Readings/Textbooks
2. Access Kit for Smartwork5 on-line assignment system. This access kit is required for the homework assignments (sold in package with the text)

Textbooks are available from the University of Saskatchewan Bookstore: https://bookstore.usask.ca/students.php#MyTextbooks

Other Required Materials
1. Safety Glasses for the laboratory. See “Laboratory” for details.
2. CHEM 146 - Laboratory Instructions (pdfs posted in Laboratory folder in COURSE TOOLS)

Electronic Resources
General and section specific CHEM 146 information can be found on PAWS (paws.usask.ca) under the COURSE TOOLS tab. This site will contain laboratory information, important updates, answers to most common questions about the course, and any section specific information. Updates and announcements will be posted on PAWS.

Calculator Policy
You should have a simple scientific calculator and know how to use it. Students may use a basic scientific calculator (e.g, Texas Instruments TI-30X series, Hewlett-Packard HP 10s or 30S) for all CHEM 146 exams. Graphing or programmable calculators, or calculators with communication capability, are not allowed. For example, HP 35s, Casio fx-50FH, TI-83Plus calculators are not allowed. Ask your instructor if you are unsure whether your calculator is acceptable.

Email
All University of Saskatchewan students are supplied with a university email account and are strongly encouraged to use the university account instead of Hotmail or Gmail (or other free email service) for any university-related correspondence. See http://www.usask.ca/its/guides/student_guide for more information about services available.
Policies on Academic Dishonesty, Academic Appeals and Course Delivery:

Students are expected to undertake all aspects of their academic work in an ethical manner. Students are expected to submit their own individual work for academic credit, properly cite the work of others, and to follow all rules for examinations. Academic misconduct, plagiarism, and cheating will not be tolerated. Students are responsible for understanding the university's policies on academic integrity and academic misconduct. If any form of academic misconduct is discovered, appropriate disciplinary action will be taken.


For information regarding appeals of a final grade or other academic matters, please consult the University Council document on Student Appeals of Evaluation, Grading and Academic Standing (http://policies.usask.ca/policies/student-affairs-and-activities/student-appeals.php).

A summary of University of Saskatchewan policies relating to academic courses is provided in the document: Academic Courses Policy on Class Delivery, Examinations, and Assessment of Student Learning (http://policies.usask.ca/policies/academic-affairs/academic-courses.php).

Integrity Defined (from the Office of the University Secretary)

The University of Saskatchewan is committed to the highest standards of academic integrity and honesty. Students are expected to be familiar with these standards regarding academic honesty and to uphold the policies of the University in this respect. Students are particularly urged to familiarize themselves with the provisions of the Student Conduct & Appeals section of the University Secretary Website and avoid any behavior that could potentially result in suspicions of cheating, plagiarism, misrepresentation of facts and/or participation in an offence. Academic dishonesty is a serious offence and can result in suspension or expulsion from the University.

All students should read and be familiar with the Regulations on Academic Student Misconduct (https://secretariat.usask.ca/student-conduct-appeals/academic-misconduct.php) as well as the Standard of Student Conduct in Non-Academic Matters and Procedures for Resolution of Complaints and Appeals (https://secretariat.usask.ca/student-conduct-appeals/academic-misconduct.php#IXXIAPPEALS)

For more information on what academic integrity means for students see the Academic Integrity section of the University Library Website at: https://library.usask.ca/academic-integrity#AboutAcademicIntegrity

You are encouraged to complete the Academic Integrity Tutorial to understand the fundamental values of academic integrity and how to be a responsible scholar and member of the USask community - https://library.usask.ca/academic-integrity.php#AcademicIntegrityTutorial
Safety:
Safety is of paramount importance in the College. Students are expected to work in a safe and responsible manner, to follow all safety instructions, and use any specified personal protective equipment. Students failing to behave in a safe manner will be asked to leave.

Recording Lectures:
Recording of the course will only be allowed in certain circumstances. Please see the instructor for information on how to receive approval.

Copyright:
Course materials are provided to students based on their registration in a class. Any materials created by course instructors is the intellectual property of the instructors. This includes exams, PowerPoint/PDF slides and other course notes. Additionally, other copyright-protected materials created by textbook publishers and authors may be provided to students based on license terms and educational exceptions in the Canadian Copyright Act (see http://laws-lois.justice.gc.ca/eng/acts/C-42/index.html).

Before copying or distributing others’ copyright-protected materials, students need to ensure that their use of the materials is covered under the University's Fair Dealing Copyright Guidelines available at http://www.usask.ca/copyright/basics/copyright-policy/fair-dealing-guidelines/index.php. For example, posting others’ copyright-protected materials on the internet is not covered under the University's Fair Dealing Copyright Guidelines; doing so requires permission from the copyright holder. For more information about copyright, please visit http://www.usask.ca/copyright/students/rights/index.php or contact the University’s Copyright Coordinator at copyright.coordinator@usask.ca.

Students should be aware that a violation of the university’s copyright policies could be an instance of non-academic misconduct. For example, the practice of uploading or posting copyright-protected materials to course-sharing websites, depositories, or “drop boxes”, without the permission of the copyright holder, could result in a charge of non-academic misconduct under the university’s “Standard of Student Conduct in Non-Academic Matters”, found at the following location: https://secretariat.usask.ca/student-conduct-appeals/non-academic-misconduct.php.

Student Conduct:
Ethical behaviour is an important part of engineering practice. Each professional engineering association has a Code of Ethics, which its members are expected to follow. Since students are in the process of becoming Professional Engineers, it is expected that students will conduct themselves in an ethical manner.

The APEGS (Association of Professional Engineers and Geoscientists of Saskatchewan) Code of Ethics states that engineers shall “conduct themselves with fairness, courtesy and good faith towards clients, colleagues, employees and others; give credit where it is due and accept, as well as give, honest and fair professional criticism” (Section 20(e), The Engineering and Geoscience Professions Regulatory Bylaws, 1997).

The first part of this statement discusses an engineer’s relationships with his or her colleagues. One of the ways in which engineering students can demonstrate courtesy to their colleagues is by helping to maintain an atmosphere that is conducive to learning, and minimizing disruptions in class. This includes arriving on time for lectures, turning cell phones and other electronic devices off during lectures, not leaving or entering the class at inopportune times, and refrain from talking to others while the instructor is talking.
**Access and Equity Services (AES) for Students**

Students who have disabilities (learning, medical, physical, or mental health) are strongly encouraged to register with Access and Equity Services (AES) if they have not already done so. Students who suspect they may have disabilities should contact AES for advice and referrals at any time. Those students who are registered with AES with mental health disabilities and who anticipate that they may have responses to certain course materials or topics, should discuss course content with their instructors prior to course add / drop dates. In order to access AES programs and supports, students must follow AES policy and procedures. For more information or advice, visit [https://students.usask.ca/health/centres/access-equity-services.php](https://students.usask.ca/health/centres/access-equity-services.php), or contact AES at 306-966-7273 or [aes@usask.ca](mailto:aes@usask.ca).

Students registered with AES may request alternative arrangements for mid-term and final examinations. Students must arrange such accommodations through AES by the stated deadlines. Instructors shall provide the examinations for students who are being accommodated by the deadlines established by AES.

**Support Services for Engineering Students:**

- **Engineering Student Centre** (Rm. 2A05 Engineering Building)
  - Email: [esc@usask.ca](mailto:esc@usask.ca); Phone: 306-966-5274;
  - [https://engineering.usask.ca/contact_info/esc-office.php](https://engineering.usask.ca/contact_info/esc-office.php)
- **Student Wellness Centre** (3rd & 4th Floors, Place Riel): [https://students.usask.ca/health/](https://students.usask.ca/health/)
- **Financial Services**: [https://students.usask.ca/money/](https://students.usask.ca/money/)

End of day tutorial sessions will be offered by the College of Engineering for the Common First Year and will provide support for all courses. Please see [X](#) for more details.

**Student Learning Services**

Student Learning Services (SLS) offers assistance to U of S undergrad and graduate students. For information on specific services, please see the SLS web site [https://library.usask.ca/studentlearning/](https://library.usask.ca/studentlearning/).

**Teaching, Learning and Student Experience**

The Teaching, Learning and Student Experience Unit (TLSE) focuses on providing developmental and support services and programs to students and the university community. For more information, see [https://students.usask.ca/](https://students.usask.ca/). Specific resources include:

- **Student Wellness Centre** (3rd & 4th Floors, Place Riel): [https://students.usask.ca/health/](https://students.usask.ca/health/)
- **Financial Services**: [https://students.usask.ca/money/](https://students.usask.ca/money/)

**Consulting and Tutors**

You are encouraged to approach instructors and laboratory staff on an individual basis to discuss any aspect of the course. The Chemistry Learning Centre (Thorvaldson 162; located opposite the Chemistry main office.) will be available to CHEM 146 students; times will be posted on PAWS and outside the Centre. Other tutor opportunities may be arranged by the Chemistry Student’s Society. The University of Saskatchewan Students’ Union (http://www.ussu.ca) and Chemistry Students Society
Please note that most CHEM 146 instructors will generally respond to emails within 24 hours, during working hours. Please first check the course outline (this document) and the CHEM 146 course website to ensure that the answer is not already posted.

**College of Engineering Attribute Mapping:**

This information shows the relationship of the learning outcomes of this course to the graduate attributes intended upon students’ completion of the degree program. This information is used for accreditation purposes.

<table>
<thead>
<tr>
<th>Learning Outcome</th>
<th>Attribute†</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A1</td>
</tr>
<tr>
<td>1</td>
<td>I</td>
</tr>
<tr>
<td>2</td>
<td>I</td>
</tr>
<tr>
<td>3</td>
<td>I</td>
</tr>
<tr>
<td>4</td>
<td>I</td>
</tr>
<tr>
<td>5</td>
<td>I</td>
</tr>
</tbody>
</table>

†Attributes:
- **A1** A knowledge base for engineering
- **A2** Problem analysis
- **A3** Investigation
- **A4** Design
- **A5** Use of engineering tools
- **A6** Individual and team work
- **A7** Communication skills
- **A8** Professionalism
- **A9** Impact of engineering on society and the environment
- **A10** Ethics and equity
- **A11** Economics and project management
- **A12** Life-long learning

‡Instructional Level:
- **Introduced (I)** – Students learn the working vocabulary of the area of content, along with some of the major underlying concepts.
- **Developed (D)** – Students use their working vocabulary and major fundamental concepts to probe more deeply, to read the literature, and to deepen their exploration of the concepts. They may begin to practice, extend, or refine knowledge in familiar contexts.
- **Applied (A)** – Students approach mastery in the area of content. They explore deeply into the discipline and experience the controversies, debate, and uncertainties that characterize the leading edges of any field. They practice, extend, or refine knowledge in unfamiliar contexts.

**Accreditation Unit (AU) Mapping:** (% of total class AU)

<table>
<thead>
<tr>
<th>Math</th>
<th>Natural Science</th>
<th>Complementary Studies</th>
<th>Engineering Science</th>
<th>Engineering Design</th>
</tr>
</thead>
<tbody>
<tr>
<td>0%</td>
<td>100%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
</tbody>
</table>

**Accreditation Data Collection and Privacy:**
Undergraduate programs in the College of Engineering are accredited by the Canadian Engineering Accreditation Board. Student performance data may be collected in this course to support accreditation and continuous program improvement processes. Anonymous samples of student work may also be collected for accreditation purposes. All data provided to the accreditation body or external entities is anonymized and reported in aggregate form to protect your information and identity. If you have any concerns about how your personal information is used or maintained, please contact the Associate Dean Academic, College of Engineering.
1. Approval by Department Head or Dean
   1.1 College or School with academic authority: College of Arts & Science
   1.2 Department with academic authority: Department of Computer Science
   1.3 Term from which the course is effective: 202105

2. Information required for the Catalogue
   2.1 Label & Number of course: CMPT 142
   2.2 Academic credit units: 3
   2.3 Course Long Title (maximum 100 characters): Introduction to Computer Science for Engineers
       Course Short Title (maximum 30 characters): Intro Comp Sci for Engr
   2.4 Total Hours: Lecture 25.5 Seminar Lab 18 Tutorial Other
   2.5 Weekly Hours: Lecture 4.25 Seminar Lab 3 Tutorial Other
   2.6 Term in which it will be offered: T1 T2 T1 or T2 T1 and T2
   2.7 Prerequisite: Mathematics B30 or Foundations of Mathematics 30 or Pre-Calculus 30

       If there is a prerequisite waiver, who is responsible for signing it?
       D – Instructor/Dept Approval
       H – Department Approval
       I – Instructor Approval

   2.8 Catalogue description (150 words or less):
       Introduces essential computer science and computer programming concepts and principles, with application to problems relevant to all Engineering disciplines. Presents the context in which computational problem solving is done, including historical and elementary technical aspects. Emphasizes fundamental programming constructs, including data and data types, variables and expressions, conditional branching, repetition, functions, recursion, as well as data structures such as strings, lists, and dictionaries. Presents searching and sorting algorithms as an introduction to concepts in computer science. Emphasis throughout on the practice of basic skills needed for writing robust software, including formal design processes and documentation, internal code documentation, testing, and debugging.

   2.9 Do you allow this course to be repeated for credit? No
3. **Please list rationale for introducing this course:**

Currently a number of Arts & Science departments contribute to the [Common First Year](#) for the College of Engineering Bachelor of Science in Engineering (B.E.) program. The College of Engineering is in the process of redesigning this Common First Year to create the most effective first year engineering program in Canada. They are working hard to create something that will excite, engage and inspire their students, and to holistically prepare them for the challenges to come in later years. This project has been underway since 2016-2017 and has a planned launch of Fall 2021. Over this time there has been extensive consultation between the College of Engineering and specific Departments in the College of Arts & Science. A suite of new Science courses are being proposed for use in this redesigned Common First Year which will replace existing courses currently used.

CMPT 142 is essentially a specialized version of CMPT 141, with minor additions and substitutions to the CMPT 141 syllabus. Some of the changes are due to the compressed time frame for the course. For all purposes involving pre-requisites, course exclusions, and transfer credits, CMPT 142 should be considered equivalent to CMPT 141. CMPT 142 will be taken by all first year engineering students.

This course will replace CMPT 113, CMPT 116, and CMPT141 which are taken by second year students in current Engineering programs. CMPT 113 and CMPT 116 will be offered for the last time in 2021-2022 to accommodate students in those programs.

The College of Engineering is also working toward a new competency-based assessment system that will be utilized in the new First Year Engineering courses in Fall 2021. The Arts & Science departments will continue to learn more about this system through 2020-2021 and 2021-2022 as it is implemented in Engineering, and will then determine how it can be used in the Science courses attached to the Engineering Common First Year. Revisions to the courses, to implement this assessment system, will be submitted to the appropriate College Academic Programs Committee for approval, prior to use in the courses.

This new competency-based assessment system will use module tests in place of midterm and final exams. A few of the new courses proposed by Arts and Science departments have started to use the concept of Module Tests in their courses in these first versions. This will make it easier when they switch to the competency-based assessment system in future. Some common wording regarding module tests was created and has been used in the Arts and Science course proposals. This wording is similar to that of the Examinations Policies section of Arts and Science syllabus, but has been modified to accurately portray the concept of the module tests.

4. **Please list the learning objectives for this course:**

By the end of this course, students will be expected to:

1. Describe, at an introductory level, the elements of modern computer architecture, the role of operating system software, and the difference between source code, compiled software applications, and interpreted software applications.
2. Apply elementary programming constructs, including data and data types, variables and expressions, conditional branching, repetition, functions, recursion, as well as data structures such as strings, lists, and dictionaries.
3. Design, implement, and test software applications in a wide variety of contexts relevant to the Engineering profession.
4. Explain, at an introductory level, concepts in Computer Science, such as algorithmic efficiency, specifically in the context of algorithms for searching and sorting.
5. **Impact of this course**  
Are the programs of other departments or Colleges affected by this course? This course is for the College of Engineering First Year.  
If so, were these departments consulted? (Include correspondence) Yes  
Were any other departments asked to review or comment on the proposal? The course went through the Arts & Science College Challenge, which provides opportunity for responses by all departments in the College.

6. **Other courses or program affected** (please list course titles as well as numbers)  
6.1 Courses to be deleted? CMPT 113, CMPT 116  
6.2 Courses for which this course will be a prerequisite? CMPT 145  
6.3 Is this course to be required by your majors, or by majors in another program?  
This course is designed for the College of Engineering First Year, and will replace CMPT 113, CMPT 116, and CMPT 141 in CoE programs. Students with credit for CMPT 142 will be allowed to use CMPT 142 in place of CMPT 141 for any Arts & Science degree, e.g., students completing a Computer Science 3-year B.Sc.

7. **Course outline**  
(Weekly outline of lectures or include a draft of the course information sheet.)  
See attached syllabus.

8. **Enrolment**  
8.1 Expected enrollment: up to 600  
8.2 From which colleges? Engineering

9. **Student evaluation**  
Give approximate weighting assigned to each indicator (assignments, laboratory work, mid-term test, final examination, essays or projects, etc.)

<table>
<thead>
<tr>
<th>Assessment:</th>
<th>The methods of assessment and their respective weightings are given below:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Lab Assignments: 24% (4 @ 6% each)</td>
</tr>
<tr>
<td></td>
<td>Lab Exercises: 12% (4 @ 3% each)</td>
</tr>
<tr>
<td></td>
<td>Homework Assignments: 24% (4 @ 6% each)</td>
</tr>
<tr>
<td></td>
<td>Module Test: 40%</td>
</tr>
</tbody>
</table>

9.1 How should this course be graded?  
C – Completed Requirements  
*(Grade options for instructor: Completed Requirements, Fail, IP In Progress)*  
N – Numeric/Percentage  
*(Grade options for instructor: grade of 0% to 100%, IP in Progress)*  
P – Pass/Fail
(Grade options for instructor: Pass, Fail, In Progress)
S – Special
(Grade options for instructor: NA – Grade Not Applicable) If other, please specify:

9.2 Is the course exempt from the final examination? Module test replaces final exam. This will be scheduled at the end of the class, outside of the traditional final exam period.

10. **Required text**
Include a bibliography for the course.

Course Readings (textbook) are provided free of charge and are available on the course website.

11. **Resources**
11.1 Proposed instructor:
M. Horsch, J. Long

11.2 How does the department plan to handle the additional teaching or administrative workload? Within department.

11.3 Are sufficient library or other research resources available for this course? Yes

11.4 Are any additional resources required (library, audio-visual, technology, etc.)? Details have been worked out between College of Arts & Science and College of Engineering.

12. **Tuition**
12.1 Will this course attract tuition charges? If so, how much? (use tuition category) TC03
12.2 Does this course require non-standard fees, such as materials or excursion fees? If so, please include an approved “Application for New Fee or Fee Change Form”
http://www.usask.ca/sesd/info-for-instructors/program-course-preparation.php#course-fees No

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**Detailed Course Information**

1. **Schedule Types**
Please choose the Schedule Types that can be used for sections that fall under this course:

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CL</td>
<td>Clinical</td>
<td>PRB</td>
<td>Problem Session</td>
</tr>
<tr>
<td>COO</td>
<td>Coop Class</td>
<td>RDG</td>
<td>Reading Class</td>
</tr>
<tr>
<td>FLD</td>
<td>Field Trip</td>
<td>RES</td>
<td>Research</td>
</tr>
<tr>
<td>ICR</td>
<td>Internet Chat Relay</td>
<td>ROS</td>
<td>Roster (Dent Only)</td>
</tr>
<tr>
<td>IHP</td>
<td>Internet Help</td>
<td>SEM</td>
<td>Seminar</td>
</tr>
<tr>
<td>IN1</td>
<td>Internship - Education</td>
<td>SSI</td>
<td>Supervised Self Instruction</td>
</tr>
<tr>
<td>IN2</td>
<td>Internship - CMPT &amp; EPIP</td>
<td>STU</td>
<td>Studio</td>
</tr>
<tr>
<td>IN3</td>
<td>Internship - General</td>
<td>SUP</td>
<td>Teacher Supervision</td>
</tr>
<tr>
<td>IND</td>
<td>Independent Studies</td>
<td>TEL</td>
<td>Televised Class</td>
</tr>
<tr>
<td>LAB</td>
<td>Laboratory</td>
<td>TUT</td>
<td>Tutorial</td>
</tr>
</tbody>
</table>
2. Course Attributes
Please highlight the attributes that should be attached to the course (they will apply to all sections):

2.1 NOAC No Academic Credit
0 Credit Unit courses that possess “deemed” CUs (Called Operational Credit Units). NOAC causes the system to roll 0 academic credit units to academic history.

2.2 For the College of Arts and Science only: To which program type does this course belong?
   FNAR Fine Arts
   HUM Humanities
   SCIE Science
   SOCS Social Science
   ARNP No Program Type (Arts and Science)

3. Registration Information (Note: multi-term courses cannot be automated as corequisites)
   3.1 Permission Required:
   3.2 Restriction(s): course only open to students in a specific college, program/degree, major, year in program
   Restricted to students in the College of Engineering.

   3.3 Prerequisite(s): course(s) that must be completed prior to the start of this course
   Mathematics B30 or Foundations of Mathematics 30 or Pre-Calculus 30

   3.4 Prerequisite(s) or Corequisite(s): course(s) that can be completed prior to or taken at the same time as this course
   3.5 Corequisite(s): course(s) that must be taken at the same time as this course
   3.6 Notes: recommended courses, repeat restrictions/content overlap, other additional information

4. List Equivalent Course(s) here: CMPT 141
An equivalent course can be used in place of the course for which this form is being completed, specifically for the purposes of prerequisite and degree audit checking. Credit will be given for only one of the equivalent courses.

   4.1 If this is a recently-repurposed course number, please list the courses that are no longer considered to be equivalent:

*Please note: If the equivalent courses carry an UNEQUAL number of credit units, DegreeWorks will automatically enforce the following, unless otherwise stated:
• If a 3 credit unit course is considered to be equivalent to a 6 credit unit course, it will fulfill the 6 credit unit requirement and the student will not have to complete another 3 credit units toward the overall number of required credit units for the program.
• If a 6 credit unit course is considered to be equivalent to a 3 credit unit course, ALL 6 of the credit units may be used to fulfill the 3 credit unit requirement.

5. List Mutually-Exclusive Course(s) here: None
Mutually exclusive courses have similar content such that students cannot receive credit for both.

5.1 If this is a recently-repurposed course number, please list the courses that are no longer considered to be mutually exclusive:

*Please note: SiRIUS cannot enforce a situation where the exclusion goes only one way.

6. Additional Notes:
CMPT 142.3
Introduction to Computer Science for Engineers
Fall 2021

Land Acknowledgement
At the University of Saskatchewan, we acknowledge we are on Treaty Six Territory and the Homeland of the Métis. We pay our respect to the First Nation and Métis ancestors of this place and reaffirm our relationship with one another.

Instructors: Name (include credentials; if applicable please include P.Eng. or EIT as well)
Office
Email

Office Hours: Dates, Times

Lectures: See First Year Engineering Schedule

Laboratory: See First Year Engineering Schedule

Website: Assignments, solutions, lab schedules, general course information, and announcements will be posted on the course website. Students are responsible for keeping up-to-date with the information on the course website.

Description: Introduces essential computer science and computer programming concepts and principles, with application to problems relevant to all Engineering disciplines. Presents the context in which computational problem solving is done, including historical and elementary technical aspects. Emphasizes fundamental programming constructs, including data and data types, variables and expressions, conditional branching, repetition, functions, recursion, as well as data structures such as strings, lists, and dictionaries. Presents searching and sorting algorithms as an introduction to concepts in computer science. Emphasis throughout on the practice of basic skills needed for writing robust software, including formal design processes and documentation, internal code documentation, testing, and debugging.

Corequisites: 
Prerequisites: Mathematics B30 or Foundations of Mathematics 30 or Pre-Calculus 30

Note: Students with credit for CMPT 141 (or equivalent) cannot take this course for credit.

Course Learning Outcomes: By the end of this course, students will be expected to:

1. Describe, at an introductory level, the elements of modern computer architecture, the role of operating system software, and the difference between source code, compiled software applications, and interpreted software applications.
2. Apply elementary programming constructs, including data and data types, variables and expressions, conditional branching, repetition, functions, recursion, as well as data structures such as strings, lists, and dictionaries.
3. Design, implement, and test software applications in a wide variety of contexts relevant to the Engineering profession.
4. Explain, at an introductory level, concepts in Computer Science, such as algorithmic efficiency, specifically in the context of algorithms for searching and sorting.

**Assessment:**
The methods of assessment and their respective weightings are given below:

<table>
<thead>
<tr>
<th>Component</th>
<th>Weightage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lab Assignments</td>
<td>24% (4 @ 6% each)</td>
</tr>
<tr>
<td>Lab Exercises</td>
<td>12% (4 @ 3% each)</td>
</tr>
<tr>
<td>Homework Assignments</td>
<td>24% (4 @ 6% each)</td>
</tr>
<tr>
<td>Module Test</td>
<td>40%</td>
</tr>
</tbody>
</table>

**Attendance and Participation:**
Students are expected to attend every class, and participate actively. There will be short reading assignments for all lectures and students are expected to come to class having completed the readings. There is no penalty for missed lectures.

Attend all laboratory sessions. These are opportunities to practice the course material with the guidance of a teaching assistant. There is no penalty for missed lab sessions, provided that the lab exercises are completed by the due date.

**Criteria That Must Be Met to Pass:**
The student cannot earn a passing grade in the course without having earned a mark of 50% or higher in the module test. A student who does not pass the module test will receive a grade of 49% or the overall mark, whichever is lower.

**Final Grades:**
The final grades will be consistent with the “literal descriptors” specified in the university's grading system (at the link below, click on “for undergraduate students”).

[https://students.usask.ca/academics/grading/grading-system.php](https://students.usask.ca/academics/grading/grading-system.php)

For information regarding appeals of final grades or other academic matters, please visit the Student Conduct and Appeals section of the University Secretary's website:


**Academic Courses Policy:**
More information on the Academic Courses Policy on course delivery, examinations and assessment of student learning can be found at:

[http://policies.usask.ca/policies/academic-affairs/academic-courses.php](http://policies.usask.ca/policies/academic-affairs/academic-courses.php)

**Learning Charter:**
The University of Saskatchewan Learning Charter is intended to define aspirations about the learning experience that the University aims to provide, and the roles to be played in realizing these aspirations by students, instructors and the institution. A copy of the Learning Charter can be found at:


**Course Overview:**
This course will provide first year engineering students basic skills needed to apply computational problem solving during their formal training, and during their practice of any Engineering discipline. The majority of the course will focus on the fundamental building blocks of
computation, as expressed in Python, which is currently a popular and practical language for many computational tasks. In addition, the course will introduce students to software design and development practices that will help them manage programs that are more than a few lines of code. Python programming can be fun, and many scientists and software developers use Python productively in their work. However, the underlying computational concepts covered in the course are not specific to Python, and mastery of these concepts in one language is transferable to any other programming language or environment.

Course Content/Schedule:

<table>
<thead>
<tr>
<th>Topic</th>
<th>Lecture Hours</th>
</tr>
</thead>
</table>
| 1. **Topic 1: Computing In Context**  
  1.1. A Brief History of Computing  
  1.2. A Brief Overview of Computer Hardware and Software | 1 Lecture |
| 2. **Topic 2: Computing with Python**  
  2.1. Data and Data Types  
  2.2. Variables, Values, and Expressions  
  2.3. Console Input and Output  
  2.4. Strings, Tuples, and Lists  
  2.5. Conditionals  
  2.6. Functions and Modules  
  2.7. Repetition and Loops | 6 Lectures |
| 3. **Topic 3: The Practice of Computing**  
  3.1. Software design  
  3.2. Testing and debugging  
  3.3. Documenting your software  
  3.4. File Input and Output  
  3.5. Dictionaries  
  3.6. Repetition and Recursion | 6 Lectures |
| 4. **Topic 4: Searching and Sorting**  
  4.1. Linear and Binary Search  
  4.2. Merge Sort, Quick Sort | 2 Lectures |
| 5. **Topic 5:**  
  5.1. Module test Take-Up  
  5.2. Course Retrospective | 1 Lecture |

Lectures are 80 minutes long, and will be held up to three times per week. They will generally consist of a combination of short technical presentations, interactive demonstrations, and guided problem-solving exercises. Short readings will be assigned before each class to ensure that lecture time is used for active learning. Lectures will be an opportunity to apply the concepts covered in the course readings, discuss them, as well as to ask questions and receive guidance in their application.
**Short Lab** sessions (90 minutes) are held once weekly for the duration of the course. The primary purpose of the short lab sessions is to provide an opportunity to complete **weekly laboratory exercises**. Exercises consist of several short and elementary programming problems to build technical skills and provide a foundation for more advanced problem solving. Lab exercises will be graded for successful completion; they can be repeated, corrected, and resubmitted as often as needed until a correct answer is submitted. Some short lab periods are used for presentation of technical matters such as creating projects, using the debugger, and practicing other software development skills. Students should be able to complete the required work within the short lab session, but the deadline for submitting lab exercises will be two days after the session. Lab exercises will be completed on-line, and graded electronically.

**Long Lab** sessions (180 minutes) are held once weekly for the duration of the course. The primary purpose the long lab sessions is to provide an opportunity to complete **weekly laboratory assignments**. Laboratory assignments consist of larger problems, and will require practice of software development skills as taught throughout the course. Lab assignments will be graded for quality of the solution, and the degree to which good software development skills have been demonstrated. Most long lab sessions are also used for presentation of technical matters such as creating projects, using the debugger, and practicing other software development skills. Students should be able to complete the required work within the long lab session, but the deadline for submitting lab exercises will be two days after the session. Lab assignments will be submitted electronically to the course website, and graded by a teaching assistant.

**Homework assignments** will consist of one or two practical problems per week, to be completed in addition to the weekly lab exercises and weekly lab assignments. These are opportunities to put into practice the concepts covered in the course, with less structured guidance from instructors and teaching assistants. Homework assignments will be submitted electronically to the course website, and graded by a teaching assistant.

**Late Assignments:**
- The deadline for lab exercises is two days after the lab session for which they were assigned. Lab exercises can be completed after the deadline for partial credit (50%) of the value, until the module test.
- The deadline for lab assignments is two days after the lab session for which they were assigned. Late lab assignments will not be accepted.
- The deadline for weekly homework assignments is Friday, 6pm. Late homework assignments will not be accepted.

Exceptions for health or compassionate reasons can be discussed with your instructor. However, the course moves quickly, and there is no room for long extensions.

**Examinations:**

Module test:
The module test will be scheduled by the College of Engineering (it may be scheduled in the evening in the last week of the course). The test will be 2 hours long, and will consist of multiple choice questions, and short programming problems.

**Examination Policies:**
If a student is unable to write an exam or test through no fault of his or her own for medical or other valid reasons, documentation must be provided and an opportunity to write the missed exam or test may be given. Students are encouraged to review all examination policies and procedures: [http://students.usask.ca/academics/exams.php](http://students.usask.ca/academics/exams.php)
• The student cannot earn a passing grade in the course without having earned a mark of 50% or higher in the module test. A student who does not pass the module test will receive a grade of 49% or the overall mark, whichever is lower.
• Students planning on registering with the office for Access and Equity Services for Students (AES) must do so in accordance with AES procedures and deadlines.

Required Activities Outside of Class Time
The module test will be scheduled by the College of Engineering, according to the schedule for first year engineering modules. The module test may be scheduled during the evening of the last week of the course.

Readings/Textbooks
Course Readings (textbook) are provided free of charge and are available on the course website.

Policies on Academic Dishonesty, Academic Appeals and Course Delivery:
Students are expected to undertake all aspects of their academic work in an ethical manner. Students are expected to submit their own individual work for academic credit, properly cite the work of others, and to follow all rules for examinations. Academic misconduct, plagiarism, and cheating will not be tolerated. Students are responsible for understanding the university's policies on academic integrity and academic misconduct. If any form of academic misconduct is discovered, appropriate disciplinary action will be taken.


For information regarding appeals of a final grade or other academic matters, please consult the University Council document on Student Appeals of Evaluation, Grading and Academic Standing (http://policies.usask.ca/policies/student-affairs-and-activities/student-appeals.php).

Additional policies and procedures related to student conduct and appeals are provided on the University Secretariat website (www.usask.ca/secretariat/student-conduct-appeals) and on the University website http://www.usask.ca/integrity/.

A summary of University of Saskatchewan polices relating to academic courses is provided in the document: Academic Courses Policy on Class Delivery, Examinations, and Assessment of Student Learning (http://policies.usask.ca/policies/academic-affairs.academic-courses.php).

Integrity Defined (from the Office of the University Secretary)
The University of Saskatchewan is committed to the highest standards of academic integrity and honesty. Students are expected to be familiar with these standards regarding academic honesty and to uphold the policies of the University in this respect. Students are particularly urged to familiarize themselves with the provisions of the Student Conduct & Appeals section of the University Secretary Website and avoid any behavior that could potentially result in suspicions of cheating, plagiarism, misrepresentation of facts and/or participation in an offence. Academic dishonesty is a serious offence and can result in suspension or expulsion from the University.

For more information on what academic integrity means for students see the Academic Integrity section of the University Library Website at: [https://library.usask.ca/academic-integrity#AboutAcademicIntegrity](https://library.usask.ca/academic-integrity#AboutAcademicIntegrity).

You are encouraged to complete the Academic Integrity Tutorial to understand the fundamental values of academic integrity and how to be a responsible scholar and member of the USask community - [https://library.usask.ca/academic-integrity.php#AcademicIntegrityTutorial](https://library.usask.ca/academic-integrity.php#AcademicIntegrityTutorial).

**Safety:**
Safety is of paramount importance in the College. Students are expected to work in a safe and responsible manner, to follow all safety instructions, and use any specified personal protective equipment. Students failing to behave in a safe manner will be asked to leave.

**Recording Lectures:**
Lectures will be recorded, when possible, and made available to students on the course website so students can rewatch them as needed for study purposes.

**Copyright:**
Course materials are provided to students based on their registration in a class. Any materials created by course instructors is the intellectual property of the instructors. This includes exams, PowerPoint/PDF slides and other course notes. Additionally, other copyright-protected materials created by textbook publishers and authors may be provided to students based on license terms and educational exceptions in the Canadian Copyright Act (see [http://laws-lois.justice.gc.ca/eng/acts/C-42/index.html](http://laws-lois.justice.gc.ca/eng/acts/C-42/index.html)).

Before copying or distributing others’ copyright-protected materials, students need to ensure that their use of the materials is covered under the University’s Fair Dealing Copyright Guidelines available at [http://www.usask.ca/copyright/basics/copyright-policy/fair-dealing-guidelines/index.php](http://www.usask.ca/copyright/basics/copyright-policy/fair-dealing-guidelines/index.php). For example, posting others’ copyright-protected materials on the internet is not covered under the University's Fair Dealing Copyright Guidelines; doing so requires permission from the copyright holder. For more information about copyright, please visit [http://www.usask.ca/copyright/students/rights/index.php](http://www.usask.ca/copyright/students/rights/index.php) or contact the University’s Copyright Coordinator at [copyright.coordinator@usask.ca](mailto:copyright.coordinator@usask.ca).

Students should be aware that a violation of the university’s copyright policies could be an instance of non-academic misconduct. For example, the practice of uploading or posting copyright-protected materials to course-sharing websites, depositories, or “drop boxes”, without the permission of the copyright holder, could result in a charge of non-academic misconduct under the university’s "Standard of Student Conduct in Non-Academic Matters", found at the following location: [https://www.usask.ca/secretariat/student-conduct-appeals/StudentNon-AcademicMisconduct.pdf](https://www.usask.ca/secretariat/student-conduct-appeals/StudentNon-AcademicMisconduct.pdf).

**Student Conduct:**
Ethical behaviour is an important part of engineering practice. Each professional engineering association has a Code of Ethics, which its members are expected to follow. Since students are in the process of becoming Professional Engineers, it is expected that students will conduct themselves in an ethical manner.

The APEGs (Association of Professional Engineers and Geoscientists of Saskatchewan) Code of Ethics states that engineers shall “conduct themselves with fairness, courtesy and good faith towards clients, colleagues, employees and others; give credit where it is due and accept, as well as give, honest and fair professional criticism” (Section 20(e), The Engineering and Geoscience Professions Regulatory Bylaws, 1997).

The first part of this statement discusses an engineer’s relationships with his or her colleagues. One of the ways in which engineering students can demonstrate courtesy to their colleagues is by helping to maintain an atmosphere that is conducive to learning, and minimizing disruptions in class. This includes arriving on time for lectures, turning cell phones and other electronic devices off during lectures, not leaving or entering the class at inopportune times, and refraining from talking to others while the instructor is talking.

Access and Equity Services (AES) for Students
Students who have disabilities (learning, medical, physical, or mental health) are strongly encouraged to register with Access and Equity Services (AES) if they have not already done so. Students who suspect they may have disabilities should contact AES for advice and referrals at any time. Those students who are registered with AES with mental health disabilities and who anticipate that they may have responses to certain course materials or topics, should discuss course content with their instructors prior to course add / drop dates. In order to access AES programs and supports, students must follow AES policy and procedures. In order to access AES programs and supports, students must follow AES policy and procedures. For more information or advice, visit https://students.usask.ca/health/centres/access-equity-services.php, or contact AES at 306-966-7273 or aes@usask.ca.

Students registered with AES may request alternative arrangements for mid-term and final examinations. Students must arrange such accommodations through AES by the stated deadlines. Instructors shall provide the examinations for students who are being accommodated by the deadlines established by AES.

Support Services for Engineering Students:
- Engineering Student Centre  (Rm. 2A05 Engineering Building)
  - Email: esc@usask.ca; Phone: 306-966-5274;
  - https://engineering.usask.ca/contact_info/esc-office.php

End of day tutorial sessions will be offered by the College of Engineering for the Common First Year and will provide support for all courses. Please see X for more details.

Student Learning Services
Student Learning Services (SLS) offers assistance to U of S undergrad and graduate students. For information on specific services, please see the SLS web site https://library.usask.ca/studentlearning/.

Teaching, Learning and Student Experience
The Teaching, Learning and Student Experience Unit (TLSE) focuses on providing developmental and support services and programs to students and the university community. For more information, see https://students.usask.ca/. Specific resources include:

- Student Wellness Centre (3rd & 4th Floors, Place Riel): https://students.usask.ca/health/
- Financial Services: https://students.usask.ca/money/

College of Engineering Attribute Mapping:
This information shows the relationship of the learning outcomes of this course to the graduate attributes intended upon students’ completion of the degree program. This information is used for accreditation purposes.

### Instructional Level

<table>
<thead>
<tr>
<th>Learning Outcome</th>
<th>A1</th>
<th>A2</th>
<th>A3</th>
<th>A4</th>
<th>A5</th>
<th>A6</th>
<th>A7</th>
<th>A8</th>
<th>A9</th>
<th>A10</th>
<th>A11</th>
<th>A12</th>
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</table>

**Attributes:**

- **A1** A knowledge base for engineering
- **A2** Problem analysis
- **A3** Investigation
- **A4** Design
- **A5** Use of engineering tools
- **A6** Individual and team work
- **A7** Communication skills
- **A8** Professionalism
- **A9** Impact of engineering on society and the environment
- **A10** Ethics and equity
- **A11** Economics and project management
- **A12** Life-long learning

**Instructional Level:**

- **Introduced (I)** – Students learn the working vocabulary of the area of content, along with some of the major underlying concepts.
- **Developed (D)** – Students use their working vocabulary and major fundamental concepts to probe more deeply, to read the literature, and to deepen their exploration of the concepts. They may begin to practice, extend, or refine knowledge in familiar contexts.
- **Applied (A)** – Students approach mastery in the area of content. They explore deeply into the discipline and experience the controversies, debate, and uncertainties that characterize the leading edges of any field. They practice, extend, or refine knowledge in unfamiliar contexts.

### Accreditation Unit (AU) Mapping: (% of total class AU)

<table>
<thead>
<tr>
<th>Math</th>
<th>Natural Science</th>
<th>Complementary Studies</th>
<th>Engineering Science</th>
<th>Engineering Design</th>
</tr>
</thead>
<tbody>
<tr>
<td>XX%</td>
<td>XX%</td>
<td>XX%</td>
<td>XX%</td>
<td>XX%</td>
</tr>
</tbody>
</table>

### Accreditation Data Collection and Privacy:
Undergraduate programs in the College of Engineering are accredited by the Canadian Engineering Accreditation Board. Student performance data may be collected in this course to support accreditation and continuous program improvement processes. Anonymous samples of student work may also be collected for accreditation purposes. All data provided to the accreditation body or external entities is anonymized and reported in aggregate form to protect your information and identity. If you have any concerns about how your personal information is used or maintained, please contact the Associate Dean Academic, College of Engineering.
1. Approval by Department Head or Dean
   1.1 College or School with academic authority: College of Arts & Science
   1.2 Department with academic authority: Department of Computer Science
   1.3 Term from which the course is effective: 202105

2. Information required for the Catalogue
   2.1 Label & Number of course: CMPT 146
   2.2 Academic credit units: 3
   2.3 Course Long Title (maximum 100 characters): Principles of Computer Science for Engineers
   Course Short Title (maximum 30 characters): Princ Comp Sci for Engr
   2.4 Total Hours: Lecture  22.5  Seminar  Lab  22.5  Tutorial  Other
   2.5 Weekly Hours: Lecture  7.5  Seminar  Lab  7.5  Tutorial  Other
   2.6 Term in which it will be offered:  T1  T2  T1 or T2  T1 and T2
   2.7 Prerequisite: CMPT 141.3 or CMPT 142.3

If there is a prerequisite waiver, who is responsible for signing it?
D – Instructor/Dept Approval
H – Department Approval
I – Instructor Approval

2.8 Catalogue description (150 words or less):
Introduces computer science principles and strategies for writing correct, efficient, robust, maintainable software. Presents principles and implementations of linear data structures including stacks, queues, and linked-lists, as well as recursive data structures including binary trees, and binary search trees. Introduces algorithm analysis to determine time and space requirements, including best-case and worst-case behaviour. Presents abstract data types as implemented using object-oriented programming. Emphasizes principles of software design, development, and testing, and practical development strategies, including defensive programming, version control, and good coding style.

2.9 Do you allow this course to be repeated for credit? No
3. **Please list rationale for introducing this course:**

Currently a number of Arts & Science departments contribute to the Common First Year for the College of Engineering Bachelor of Science in Engineering (B.E.) program. The College of Engineering is in the process of redesigning this Common First Year to create the most effective first year engineering program in Canada. They are working hard to create something that will excite, engage and inspire their students, and to holistically prepare them for the challenges to come in later years. This project has been underway since 2016-2017 and has a planned launch of Fall 2021. Over this time there has been extensive consultation between the College of Engineering and specific Departments in the College of Arts & Science. A suite of new Science courses are being proposed for use in this redesigned Common First Year which will replace existing courses currently used.

CMPT 146 is essentially a specialized version of CMPT 145, with minor additions and substitutions to the CMPT 145 syllabus. Some of the changes are due to the compressed time frame for the course. For all purposes involving pre-requisites, course exclusions, and transfer credits, CMPT 146 should be considered equivalent to CMPT 145. Specifically, this new course will be taken by students who have chosen Engineering disciplines of Computer Engineering, Electrical Engineering, and Engineering Physics, and is designed to provide these students with the preparation they need to advance to 200-level CMPT courses, especially CMPT 214, and CMPT 270.

The College of Engineering is also working toward a new competency-based assessment system that will be utilized in the new First Year Engineering courses in Fall 2021. The Arts & Science departments will continue to learn more about this system through 2020-2021 and 2021-2022 as it is implemented in Engineering, and will then determine how it can be used in the Science courses attached to the Engineering Common First Year. Revisions to the courses, to implement this assessment system, will be submitted to the appropriate College Academic Programs Committee for approval, prior to use in the courses.

This new competency-based assessment system will use module tests in place of midterm and final exams. A few of the new courses proposed by Arts and Science departments have started to use the concept of Module Tests in their courses in these first versions. This will make it easier when they switch to the competency-based assessment system in future. Some common wording regarding module tests was created and has been used in the Arts and Science course proposals. This wording is similar to that of the Examinations Policies section of Arts and Science syllabus, but has been modified to accurately portray the concept of the module tests.

4. **Please list the learning objectives for this course:**

   By the end of this course, students will be expected to:
   1. Be proficient at writing correct, efficient, robust, maintainable software in Python.
   2. Analyze time and space complexity of algorithms, and to compare and evaluate algorithms and data.
   3. Apply skills in elementary software design, development, testing, and debugging.
   4. Explain the concept of abstract data types (ADTs) in terms of interface and encapsulation, and explain the value of ADTs in design and development of software.
   5. Describe the use and behavior of objects in Python, as examples of the ADT concept.
   6. Describe the principles of specific data types: stacks, queues, linked-lists, binary trees, binary search trees, and implement them as part of the solution to computational problems.
   7. Apply recursion to computational tasks involving data structures such as lists and trees.
   8. Describe and apply strategies such as divide and conquer, greedy algorithms, and backtracking to computational problems.
5. **Impact of this course**
   Are the programs of other departments or Colleges affected by this course? This course is for the College of Engineering First Year.
   If so, were these departments consulted? (Include correspondence)  Yes
   Were any other departments asked to review or comment on the proposal? The course went through the Arts & Science College Challenge, which provides opportunity for responses by all departments in the College.

6. **Other courses or program affected** (please list course titles as well as numbers)
   6.1 Courses to be deleted? None
   6.2 Courses for which this course will be a prerequisite? CMPT 214, CMPT260, CMPT 270

6.3 Is this course to be required by your majors, or by majors in another program?
   This course is designed for the College of Engineering First Year, and will replace CMPT 145 in the Computer Engineering (CME) program. Students with credit for CMPT 146 will be allowed to use CMPT 146 in place of CMPT 145 for any Arts & Science degree, e.g., students completing a Computer Science 3-year B.Sc.

7. **Course outline**
   (Weekly outline of lectures or include a draft of the course information sheet.)
   See attached syllabus.

8. **Enrolment**
   8.1 Expected enrollment: 120
   8.2 From which colleges? Engineering

9. **Student evaluation**
   Give approximate weighting assigned to each indicator (assignments, laboratory work, mid-term test, final examination, essays or projects, etc.)

    **Assessment:** The methods of assessment and their respective weightings are given below:
    - Homework Assignments: (5@5%) 25%
    - Quizzes: (2@5%) 10%
    - Lab Assignments: (13@2%) 26%
    - Module test: 39%

9.1 How should this course be graded?
   C – Completed Requirements
   (Grade options for instructor: Completed Requirements, Fail, IP In Progress)
   N – Numeric/Percentage
   (Grade options for instructor: grade of 0% to 100%, IP in Progress)
   P – Pass/Fail
   (Grade options for instructor: Pass, Fail, In Progress)
   S – Special
(Grade options for instructor: NA – Grade Not Applicable) If other, please specify:

9.2 Is the course exempt from the final examination? Module exam replaces traditional final exam.

10. **Required text**
Include a bibliography for the course.

Course Readings (textbook) are provided free of charge and are available on the course website.

11. **Resources**
11.1 Proposed instructor:
M. Horsch, J. Long

11.2 How does the department plan to handle the additional teaching or administrative workload? Within department.

11.3 Are sufficient library or other research resources available for this course? Yes

11.4 Are any additional resources required (library, audio-visual, technology, etc.)? Details have been worked out between College of Arts & Science and College of Engineering.

12. **Tuition**
12.1 Will this course attract tuition charges? If so, how much? (use tuition category) TC03

12.2 Does this course require non-standard fees, such as materials or excursion fees? If so, please include an approved “Application for New Fee or Fee Change Form” http://www.usask.ca/sesd/info-for-instructors/program-course-preparation.php#course-fees

No

**Detailed Course Information**

**1. Schedule Types**
Please choose the Schedule Types that can be used for sections that fall under this course:

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CL</td>
<td>Clinical</td>
<td>PRB</td>
<td>Problem Session</td>
</tr>
<tr>
<td>COO</td>
<td>Coop Class</td>
<td>RDG</td>
<td>Reading Class</td>
</tr>
<tr>
<td>FLD</td>
<td>Field Trip</td>
<td>RES</td>
<td>Research</td>
</tr>
<tr>
<td>ICR</td>
<td>Internet Chat Relay</td>
<td>ROS</td>
<td>Roster (Dent Only)</td>
</tr>
<tr>
<td>IHP</td>
<td>Internet Help</td>
<td>SEM</td>
<td>Seminar</td>
</tr>
<tr>
<td>IN1</td>
<td>Internship - Education</td>
<td>SSI</td>
<td>Supervised Self Instruction</td>
</tr>
<tr>
<td>IN2</td>
<td>Internship - CMPT &amp; EPIP</td>
<td>STU</td>
<td>Studio</td>
</tr>
<tr>
<td>IN3</td>
<td>Internship - General</td>
<td>SUP</td>
<td>Teacher Supervision</td>
</tr>
<tr>
<td>IND</td>
<td>Independent Studies</td>
<td>TEL</td>
<td>Televised Class</td>
</tr>
<tr>
<td>LAB</td>
<td>Laboratory</td>
<td>TUT</td>
<td>Tutorial</td>
</tr>
<tr>
<td>LC</td>
<td>Lecture/Clinical (Dent Only)</td>
<td>WEB</td>
<td>Web Based Class</td>
</tr>
<tr>
<td>LEC</td>
<td>Lecture</td>
<td>XCH</td>
<td>Exchange Program</td>
</tr>
</tbody>
</table>
2. Course Attributes

Please highlight the attributes that should be attached to the course (they will apply to all sections):

2.1 NOAC No Academic Credit

0 Credit Unit courses that possess “deemed” CUs (Called Operational Credit Units). NOAC causes the system to roll 0 academic credit units to academic history.

2.2 For the College of Arts and Science only: To which program type does this course belong?

- FNAR Fine Arts
- HUM Humanities
- SCIE Science
- SOCS Social Science
- ARNP No Program Type (Arts and Science)

3. Registration Information (Note: multi-term courses cannot be automated as corequisites)

3.1 Permission Required:

3.2 Restriction(s): course only open to students in a specific college, program/degree, major, year in program

Restricted to students in the College of Engineering.

3.3 Prerequisite(s): course(s) that must be completed prior to the start of this course

CMPT 141.3 or CMPT 142.3

3.4 Prerequisite(s) or Corequisite(s): course(s) that can be completed prior to or taken at the same time as this course

3.5 Corequisite(s): course(s) that must be taken at the same time as this course

3.6 Notes: recommended courses, repeat restrictions/content overlap, other additional information

4. List Equivalent Course(s) here: CMPT 145

An equivalent course can be used in place of the course for which this form is being completed, specifically for the purposes of prerequisite and degree audit checking. Credit will be given for only one of the equivalent courses.

4.1 If this is a recently-repurposed course number, please list the courses that are no longer considered to be equivalent:

*Please note: If the equivalent courses carry an UNEQUAL number of credit units, DegreeWorks will automatically enforce the following, unless otherwise stated:

- If a 3 credit unit course is considered to be equivalent to a 6 credit unit course, it will fulfill the 6 credit unit requirement and the student will not have to complete another 3 credit units toward the overall number of required credit units for the program.
• If a 6 credit unit course is considered to be equivalent to a 3 credit unit course, ALL 6 of the credit units may be used to fulfill the 3 credit unit requirement.

5. List Mutually-Exclusive Course(s) here: None
Mutually exclusive courses have similar content such that students cannot receive credit for both.

5.1 If this is a recently-repurposed course number, please list the courses that are no longer considered to be mutually exclusive:

*Please note: SiRIUS cannot enforce a situation where the exclusion goes only one way.

6. Additional Notes:
CMPT 146.3
Principles of Computer Science for Engineers
Winter 2022

Land Acknowledgement
At the University of Saskatchewan, we acknowledge we are on Treaty Six Territory and the Homeland of the Métis. We pay our respect to the First Nation and Métis ancestors of this place and reaffirm our relationship with one another.

Instructors: Name (include credentials; if applicable please include P.Eng. or EIT as well)
Office
Email

Office Hours: Dates, Times

Lectures: See First Year Engineering Schedule

Laboratory: See First Year Engineering Schedule

Website: Assignments, solutions, lab schedules, general course information, and announcements will be posted on the course website. Students are responsible for keeping up-to-date with the information on the course website.

Description: Introduces computer science principles and strategies for writing correct, efficient, robust, maintainable software. Presents principles and implementations of linear data structures including stacks, queues, and linked-lists, as well as recursive data structures including binary trees, and binary search trees. Introduces algorithm analysis to determine time and space requirements, including best-case and worst-case behaviour. Presents abstract data types as implemented using object-oriented programming. Emphasizes principles of software design, development, and testing, and practical development strategies, including defensive programming, version control, and good coding style.

Corequisites:
Prerequisites: CMPT 141.3 or CMPT 142.3

Note: Students with credit for CMPT 145 (or equivalent) cannot take this course for credit.

Course Learning Outcomes: By the end of this course, students will be expected to:
1. Be proficient at writing correct, efficient, robust, maintainable software in Python.
2. Analyze time and space complexity of algorithms, and to compare and evaluate algorithms and data.
3. Apply skills in elementary software design, development, testing, and debugging.
4. Explain the concept of abstract data types (ATDs) in terms of interface and encapsulation, and explain the value of ADTs in design and development of software.
5. Describe the use and behavior of objects in Python, as examples of the ADT concept.
6. Describe the principles of specific data types: stacks, queues, linked-lists, binary trees, binary search trees, and implement them as part of the solution to computational problems.
7. Apply recursion to computational tasks involving data structures such as lists and trees.
8. Describe and apply strategies such as divide and conquer, greedy algorithms, and backtracking to computational problems.

Assessment: The methods of assessment and their respective weightings are given below:

- Homework Assignments: (5@5%) 25%
- Quizzes: (2@5%) 10%
- Lab Assignments: (13@2%) 26%
- Module test: 39%

Attendance and Participation: Students are expected to attend every class, and participate actively. There will be short reading assignments for all lectures and students are expected to come to class having completed the readings. There is no penalty for missed lectures.

Attend all laboratory sessions. These are opportunities to practice the course material with the guidance of a teaching assistant. There is no penalty for missed lab sessions, provided that the lab exercises are completed by the due date.

Criteria That Must Be Met to Pass: Students must write the module test. A student who does not write the module test will receive a grade of at most 49 in the course.

Final Grades: The final grades will be consistent with the “literal descriptors” specified in the university’s grading system (at the link below, click on “for undergraduate students”).

https://students.usask.ca/academics/grading/grading-system.php

For information regarding appeals of final grades or other academic matters, please visit the Student Conduct and Appeals section of the University Secretary’s website:

http://www.usask.ca/secretariat/student-conduct-appeals/
Academic Courses Policy: More information on the Academic Courses Policy on course delivery, examinations and assessment of student learning can be found at: http://policies.usask.ca/policies/academic-affairs/academic-courses.php

Learning Charter: The University of Saskatchewan Learning Charter is intended to define aspirations about the learning experience that the University aims to provide, and the roles to be played in realizing these aspirations by students, instructors and the institution. A copy of the Learning Charter can be found at: http://www.usask.ca/university_secretary/LearningCharter.pdf

Course Overview:
The purpose of this course is to deepen and broaden student skills in computer science and software development, bringing the efficient organization of data into primary focus. The course will introduce students to a few new language concepts using Python, but primarily the course will focus on skills related to organization of data, organization of software, and introductory level strategies for developing and validating software. The underlying principles and practices are transferrable to any programming language or environment. Students who diligently acquire these skills and practice them will be prepared to engage in moderately large software development projects. This course is a bridge course for first-year engineering students seeking to enter Computer Engineering, Electrical Engineering, and Engineering Physics, and successful completion is pre-requisite for 200-level Computer Science courses.

Course Content/Schedule:
This course is highly condensed, and will move quickly. The class will meet daily for three hours over 14 days. The class will be split into two ninety minute periods, with a break of 15 minutes between. The first period will consist of lecture and discussion, with some interactive demonstrations. The second period will consist of practical laboratory-type work, applying the course material. Assignments will be due on Thursdays and Mondays in the evenings. A short quiz will be held at the end of the first and the second week. Students should anticipate 2-3 hours of homework per day, including course readings, and assignments.

<table>
<thead>
<tr>
<th>Topic</th>
<th>Approximate Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. WEEK 1</strong></td>
<td></td>
</tr>
<tr>
<td>1.1. Software Design Goals</td>
<td>Lecture: 7.5 hours</td>
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<tr>
<td>1.2. Objects and Classes</td>
<td>Lab: 7.5 hours</td>
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<tr>
<td>1.3. Testing and Debugging, Defensive Programming</td>
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<td>1.4. Programming Practices and Style</td>
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<td>1.5. Recursion</td>
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<tr>
<td><strong>2. WEEK 2</strong></td>
<td></td>
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<tr>
<td>2.1. Algorithm Analysis</td>
<td>Lecture: 7.5 hours</td>
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<tr>
<td>2.2. Software Development Processes; Abstract Data Types</td>
<td>Lab: 7.5 hours</td>
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<tr>
<td>2.3. Stacks and Queues</td>
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<td>2.4. Nodes, Node-chains</td>
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<td>2.5. Linked Lists</td>
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<tr>
<td>2.6. Quiz # 2</td>
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<tr>
<td><strong>3. WEEK 3</strong></td>
<td></td>
</tr>
<tr>
<td>3.1. Trees, Binary Tree Algorithms</td>
<td>Lecture: 7.5 hours</td>
</tr>
<tr>
<td>3.2. Binary Search Trees</td>
<td>Lab: 4.5 hours</td>
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<tr>
<td>3.3. Tables</td>
<td></td>
</tr>
</tbody>
</table>
3.4. Case Study: Huffman Trees
3.5. Algorithms

**Homework Assignments:**
Five homework assignments will be completed during the course. Assignments will consist of applications of the course material, including design, development, implementation, and analysis. Assignments will be due on Thursdays and Mondays in the evening. To provide sufficient experience with the material in the course, each assignment will require 4-6 hours of work. Homework assignments will be submitted electronically to the course website, and graded by a teaching assistant.

Even a simple assignment can turn into a time-consuming affair if you get stuck on something that blocks your progress. Please make use of the teaching resources (instructors’ office hours, TAs, labs, lectures, discussion forums, etc.) available to you.

**Lab Assignments:**
Lab work must be completed daily, and grading will be based on sufficient completion; normally, students should reasonably expect to complete the lab work successfully every day in the time allocated for the lab. Lab assignments will be submitted electronically to the course website, and graded by a teaching assistant.

**Quizzes**
A quiz will be scheduled at the end of each of the first two weeks of the course, during the lab period. Quizzes will consist of multiple choice or short answer questions, and will assess basic skills and concepts. Quizzes will not require significant programming effort.

**Late Assignments:**
- The deadline for lab assignments the evening on the day they were assigned. Late lab assignments will not be accepted.
- The deadline for homework assignments is Monday or Thursday, 10pm. Late homework assignments will not be accepted.

Exceptions for health or compassionate reasons can be discussed with your instructor. However, the course moves very quickly, and there is no room for long extensions.

**Examinations:**

**Midterm Exam:**
There will be no midterm exam. Two quizzes will be scheduled during the lecture period at the end of weeks 1 and 2.

**Module test:**
The module test will be scheduled by the College of Engineering (it may be scheduled in the evening in the last week of the course). The exam will be 2 hours long, and will consist of multiple choice questions, short programming problems, design problems, and algorithm analysis problems.

**Examination Policies:**
If a student is unable to write an exam through no fault of his or her own for medical or other valid reasons, documentation must be provided and an opportunity to write the missed exam may be given. Students are encouraged to review all examination policies and procedures:

http://students.usask.ca/academics/exams.php
- The student cannot earn a passing grade in the course without having earned a mark of 50% or higher in the module test. A student who does not pass the module test will receive a grade of 49% or the overall mark, whichever is lower. (For Arts & Science see section above about criteria to pass)
- Students planning on registering with the office for Access and Equity Services for Students (AES) must do so in accordance with AES procedures and deadlines.

**Required Activities Outside of Class Time**
The module test will be scheduled by the College of Engineering, according to the schedule for first year engineering modules. The module test may be scheduled during the evening of the last week of the course.

**Readings/Textbooks**
Course Readings (textbook) are provided free of charge and are available on the course website.

**Policies on Academic Dishonesty, Academic Appeals and Course Delivery:**
Students are expected to undertake all aspects of their academic work in an ethical manner. Students are expected to submit their own individual work for academic credit, properly cite the work of others, and to follow all rules for examinations. Academic misconduct, plagiarism, and cheating will not be tolerated. Students are responsible for understanding the university's policies on academic integrity and academic misconduct. If any form of academic misconduct is discovered, appropriate disciplinary action will be taken.


Additional policies and procedures related to student conduct and appeals are provided on the University Secretariat website ([www.usask.ca/secretariat/student-conduct-appeals](http://www.usask.ca/secretariat/student-conduct-appeals)) and on the University website [http://www.usask.ca/integrity/](http://www.usask.ca/integrity/).

A summary of University of Saskatchewan policies relating to academic courses is provided in the document: *Academic Courses Policy on Class Delivery, Examinations, and Assessment of Student Learning* ([http://policies.usask.ca/policies/academic-affairs/academic-courses.php](http://policies.usask.ca/policies/academic-affairs/academic-courses.php)).

**Integrity Defined (from the Office of the University Secretary)**
The University of Saskatchewan is committed to the highest standards of academic integrity and honesty. Students are expected to be familiar with these standards regarding academic honesty and to uphold the policies of the University in this respect. Students are particularly urged to familiarize themselves with the provisions of the Student Conduct & Appeals section of the
University Secretary Website and avoid any behavior that could potentially result in suspicions of cheating, plagiarism, misrepresentation of facts and/or participation in an offence. Academic dishonesty is a serious offence and can result in suspension or expulsion from the University.


For more information on what academic integrity means for students see the Academic Integrity section of the University Library Website at: https://library.usask.ca/academic-integrity#AboutAcademicIntegrity

You are encouraged to complete the Academic Integrity Tutorial to understand the fundamental values of academic integrity and how to be a responsible scholar and member of the USask community - https://library.usask.ca/academic-integrity.php#AcademicIntegrityTutorial

**Safety:**
Safety is of paramount importance in the College. Students are expected to work in a safe and responsible manner, to follow all safety instructions, and use any specified personal protective equipment. Students failing to behave in a safe manner will be asked to leave.

**Recording Lectures:**
Lectures will be recorded, when possible, and made available to students on the course website so students can rewatch them as needed for study purposes.

**Copyright:**
Course materials are provided to students based on their registration in a class. Any materials created by course instructors is the intellectual property of the instructors. This includes exams, PowerPoint/PDF slides and other course notes. Additionally, other copyright-protected materials created by textbook publishers and authors may be provided to students based on license terms and educational exceptions in the Canadian Copyright Act (see http://laws-lois.justice.gc.ca/eng/acts/C-42/index.html). Before copying or distributing others' copyright-protected materials, students need to ensure that their use of the materials is covered under the University's Fair Dealing Copyright Guidelines available at http://www.usask.ca/copyright/basics/copyright-policy/fair-dealing-guidelines/index.php. For example, posting others' copyright-protected materials on the internet is not covered under the University's Fair Dealing Copyright Guidelines; doing so requires permission from the copyright holder. For more information about copyright, please visit http://www.usask.ca/copyright/students/rights/index.php or contact the University's Copyright Coordinator at copyright.coordinator@usask.ca.

Students should be aware that a violation of the university’s copyright policies could be an instance of non-academic misconduct. For example, the practice of uploading or posting copyright-protected materials to course-sharing websites, depositories, or “drop boxes”, without the permission of the copyright holder, could result in a charge of non-academic misconduct under the university’s "Standard of Student Conduct in Non-Academic Matters", found at the following location: https://www.usask.ca/secretariat/student-conduct-appeals/StudentNon-
Student Conduct:
Ethical behaviour is an important part of engineering practice. Each professional engineering association has a Code of Ethics, which its members are expected to follow. Since students are in the process of becoming Professional Engineers, it is expected that students will conduct themselves in an ethical manner.

The APEGs (Association of Professional Engineers and Geoscientists of Saskatchewan) Code of Ethics states that engineers shall "conduct themselves with fairness, courtesy and good faith towards clients, colleagues, employees and others; give credit where it is due and accept, as well as give, honest and fair professional criticism" (Section 20(e), The Engineering and Geoscience Professions Regulatory Bylaws, 1997).

The first part of this statement discusses an engineer's relationships with his or her colleagues. One of the ways in which engineering students can demonstrate courtesy to their colleagues is by helping to maintain an atmosphere that is conducive to learning, and minimizing disruptions in class. This includes arriving on time for lectures, turning cell phones and other electronic devices off during lectures, not leaving or entering the class at inopportune times, and refraining from talking to others while the instructor is talking.

Access and Equity Services (AES) for Students
Students who have disabilities (learning, medical, physical, or mental health) are strongly encouraged to register with Access and Equity Services (AES) if they have not already done so. Students who suspect they may have disabilities should contact AES for advice and referrals at any time. Those students who are registered with AES with mental health disabilities and who anticipate that they may have responses to certain course materials or topics, should discuss course content with their instructors prior to course add / drop dates. In order to access AES programs and supports, students must follow AES policy and procedures. For more information or advice, visit https://students.usask.ca/health/centres/access-equity-services.php, or contact AES at 306-966-7273 or aes@usask.ca.

Students registered with AES may request alternative arrangements for mid-term and final examinations. Students must arrange such accommodations through AES by the stated deadlines. Instructors shall provide the examinations for students who are being accommodated by the deadlines established by AES.

Support Services for Engineering Students:
- Engineering Student Centre (Rm. 2A05 Engineering Building)
  - Email: esc@usask.ca; Phone: 306-966-5274;
  - https://engineering.usask.ca/contact_info/esc-office.php

End of day tutorial sessions will be offered by the College of Engineering for the Common First Year and will provide support for all courses. Please see X for more details.

Student Learning Services
Student Learning Services (SLS) offers assistance to U of S undergrad and graduate students. For information on specific services, please see the SLS web site https://library.usask.ca/studentlearning/.
Teaching, Learning and Student Experience
The Teaching, Learning and Student Experience Unit (TLSE) focuses on providing developmental and support services and programs to students and the university community. For more information, see https://students.usask.ca/. Specific resources include:
- Student Wellness Centre (3rd & 4th Floors, Place Riel): https://students.usask.ca/health/
- Financial Services: https://students.usask.ca/money/

College of Engineering Attribute Mapping:
This information shows the relationship of the learning outcomes of this course to the graduate attributes intended upon students' completion of the degree program. This information is used for accreditation purposes.

<table>
<thead>
<tr>
<th>Instructional Level*</th>
<th>Attribute†</th>
</tr>
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<tbody>
<tr>
<td>Learning Outcome</td>
<td>A1</td>
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<td>1</td>
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</tbody>
</table>

*Attributes:  
A1 A knowledge base for engineering  
A2 Problem analysis  
A3 Investigation  
A4 Design  
A5 Use of engineering tools  
A6 Individual and team work  
A7 Communication skills  
A8 Professionalism  
A9 Impact of engineering on society and the environment  
A10 Ethics and equity  
A11 Economics and project management  
A12 Life-long learning  

†Instructional Level:  
Introduced (I) – Students learn the working vocabulary of the area of content, along with some of the major underlying concepts.  
Developed (D) – Students use their working vocabulary and major fundamental concepts to probe more deeply, to read the literature, and to deepen their exploration of the concepts. They may begin to practice, extend, or refine knowledge in familiar contexts.  
Applied (A) – Students approach mastery in the area of content. They explore deeply into the discipline and experience the controversies, debate, and uncertainties that characterize the leading edges of any field. They practice, extend, or refine knowledge in unfamiliar contexts.

Accreditation Unit (AU) Mapping: (% of total class AU)

<table>
<thead>
<tr>
<th>Math</th>
<th>Natural Science</th>
<th>Complementary Studies</th>
<th>Engineering Science</th>
<th>Engineering Design</th>
</tr>
</thead>
<tbody>
<tr>
<td>XX%</td>
<td>XX%</td>
<td>XX%</td>
<td>XX%</td>
<td>XX%</td>
</tr>
</tbody>
</table>

Accreditation Data Collection and Privacy:
Undergraduate programs in the College of Engineering are accredited by the Canadian Engineering Accreditation Board. Student performance data may be collected in this course to support accreditation and continuous program improvement processes. Anonymous samples of student work may also be collected for accreditation purposes. All data provided to the accreditation body or external entities is anonymized and reported in aggregate form to protect
your information and identity. If you have any concerns about how your personal information is used or maintained, please contact the Associate Dean Academic, College of Engineering.
1. Approval by Department Head or Dean
   1.1 College or School with academic authority: College of Arts & Science
   1.2 Department with academic authority: Department of Geological Sciences
   1.3 Term from which the course is effective: 202105

2. Information required for the Catalogue
   2.1 Label & Number of course: GEOL 102
   2.2 Academic credit units: 1
   2.3 Course Long Title (maximum 100 characters): Introduction to Geology for Engineering
       Course Short Title (maximum 30 characters): Intro Geology for Engineering
   2.4 Total Hours: Lecture 9 Seminar Lab 6 Tutorial Other
   2.5 Weekly Hours: Lecture 3 Seminar Lab 3 Tutorial Other
   2.6 Term in which it will be offered: T1 T2 T1 or T2 T1 and T2
   2.7 Prerequisite:
       If there is a prerequisite waiver, who is responsible for signing it?
       D – Instructor/Dept Approval
       H – Department Approval
       I – Instructor Approval
   2.8 Catalogue description (150 words or less):
       Introductory exploration of the Earth system for engineering students. The aim of the course is to provide students with an appreciation of global and local-scale geological processes and the influence of these processes on the Earth system through geologic time. Key topics will include plate tectonics, geologic time, the rock cycle, weathering and erosion, geologic hazards, mineral resources, and Earth science careers. Students will learn practical applications of rock and mineral identification through laboratory activities.
   2.9 Do you allow this course to be repeated for credit? No

3. Please list rationale for introducing this course:

Currently a number of Arts & Science departments contribute to the Common First Year for the College of Engineering Bachelor of Science in Engineering (B.E.) program. The College of Engineering is in the process of redesigning this Common First Year to create the most effective first year engineering program in Canada. They are working hard to create something that will excite, engage and inspire their students, and to holistically prepare them for the challenges to come in later years.
This project has been underway since 2016-2017 and has a planned launch of Fall 2021. Over this time there has been extensive consultation between the College of Engineering and specific Departments in the College of Arts & Science. A suite of new Science courses are being proposed for use in this redesigned Common First Year which will replace or complement the use of existing courses.

The College of Engineering wishes to provide their first-year students with broad exposure to four of the Natural Science disciplines in the College of Arts and Science (Biology, Chemistry, Geological Sciences, and Physics). This is to be achieved through short (1 cu) courses in each of these disciplines. Each of the four courses will be delivered in the Fall term. The first-year cohort of engineering students will be divided into four groups and these groups will progress through the four disciplines in rotation. Each course will consist of nine hours of lectures and two, 3-hour labs components. By the end of the term, all first year engineering students will have progressed through all of the courses, having received 36 hours of lecture-based instruction and twenty-four hours of lab/practicum-based instruction.

The plan outlined above necessitates that each course is focused on a subset of disciplinary topics that can be delivered consistently at four distinct times over the term. To facilitate student learning, it was agreed that the four Science courses would seek some commonality in the topics delivered. To that end, it was agreed that the “environment” and “climate change” would be logical candidates. Thus, chemistry will have lab exercises investigating warming associated with different greenhouse gases, physics will discuss blackbody radiation within their course, geological science will deal with Earth system interactions and changes over time, and biology will focus on anthropogenic effects on biodiversity and ecosystems, including human-induced climate change. The four courses will have a common final examination in December with 45 minutes allotted to each course. Beyond that, courses will have a diversity of assignments, labs, quizzes, reports, or an exam at the end of their sections.

Each of these four 1 cu courses will have “GE 102 - Introduction to Engineering I” listed as a Pre- or Co-Requisite. The Introduction to Engineering I course will focus on setting the students up to manage their time, reflect upon their study habits and work in groups – all things that will be important to each of the following courses. Perhaps more importantly, this is where the students will be learning to use TopHat, the LMS, other assessment software, and MS Office. Specifically for these Science courses it provides the lab safety training and acts as the vehicle for a reflective assessment that will incorporate what students learn in each of this 1 cu Science courses, effectively linking them together and solidifying the students’ learning.

The College of Engineering is also working toward a new competency-based assessment system that will be utilized in the new First Year Engineering courses in Fall 2021. The Arts & Science departments will continue to learn more about this system through 2020-2021 and 2021-2022 as it is implemented in Engineering, and will then determine how it can be used in the Science courses attached to the Engineering Common First Year. Revisions to the courses, to implement this assessment system, will be submitted to the appropriate College Academic Programs Committee for approval, prior to use in the courses.

4. Please list the learning objectives for this course:

By the end of this course, students will be expected to:
1. Identify the relationships between plate tectonics and the rock cycle and recognize links between geologic hazards and processes.
2. Demonstrate hands-on skills with basic rock and mineral identification.
3. Describe how the properties of rocks and minerals can be important to engineering applications.
4. Recognize and interpret key vocabulary used to describe geological concepts.
5. Articulate examples of the roles of professional geologists and provide examples of how geologists provide information that engineers can use to solve problems.

5. **Impact of this course**
   Are the programs of other departments or Colleges affected by this course? This course is for the College of Engineering First Year.
   If so, were these departments consulted? (Include correspondence) Yes
   Were any other departments asked to review or comment on the proposal? Biology, Chemistry, Physics and Geology reps met a number of times regarding these four – 1cu courses. The course also went through the Arts & Science College Challenge, which provides opportunity for responses by all departments in the College.

6. **Other courses or program affected** (please list course titles as well as numbers)
   6.1 Courses to be deleted? None
   6.2 Courses for which this course will be a prerequisite? None

6.3 Is this course to be required by your majors, or by majors in another program?

Required course in the first-year as part of revised Engineering program.
Students with credit for all four of BIOL 102.1, CHEM 142.1, GEOL 102.1 and PHYS 152.1 will receive 3 credit units of elective credit in Arts & Science B.Sc. programs and 3 credit units of "science" or "elective" credit in B.A., B.F.A., or B.Mus. programs. Students who do not pass all 4 courses will receive no credit in Arts & Science programs.

7. **Course outline**
   (Weekly outline of lectures or include a draft of the course information sheet.)
See attached syllabus.

8. **Enrolment**
   8.1 Expected enrollment: up to 600
   8.2 From which colleges? Engineering
9. **Student evaluation**

Give approximate weighting assigned to each indicator (assignments, laboratory work, mid-term test, final examination, essays or projects, etc.)

Assessment:

The methods of assessment and their respective weightings are given below:

- Laboratories and assignments: 50%
- Final Exam: 50%

9.1 How should this course be graded?

- C – Completed Requirements
  
  *(Grade options for instructor: Completed Requirements, Fail, IP In Progress)*

- N – Numeric/Percentage
  
  *(Grade options for instructor: grade of 0% to 100%, IP in Progress)*

- P – Pass/Fail
  
  *(Grade options for instructor: Pass, Fail, In Progress)*

- S – Special
  
  *(Grade options for instructor: NA – Grade Not Applicable)*

If other, please specify:

9.2 Is the course exempt from the final examination? No – Final exam date may be schedule outside of the normal exam scheduling process.

10. **Required text**

Include a bibliography for the course.


11. **Resources**

11.1 Proposed instructor:

Geology Faculty

11.2 How does the department plan to handle the additional teaching or administrative workload? Within department.

11.3 Are sufficient library or other research resources available for this course? Yes

11.4 Are any additional resources required (library, audio-visual, technology, etc.)? Details have been worked out between College of Arts & Science and College of Engineering.

12. **Tuition**

12.1 Will this course attract tuition charges? If so, how much? (use tuition category) TC14
12.2 Does this course require non-standard fees, such as materials or excursion fees? If so, please include an approved “Application for New Fee or Fee Change Form” http://www.usask.ca/sesd/info-for-instructors/program-course-preparation.php#course-fees No

Detailed Course Information

1. Schedule Types
Please choose the Schedule Types that can be used for sections that fall under this course:

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CL</td>
<td>Clinical</td>
<td>PRB</td>
<td>Problem Session</td>
</tr>
<tr>
<td>COO</td>
<td>Coop Class</td>
<td>RDG</td>
<td>Reading Class</td>
</tr>
<tr>
<td>FL</td>
<td>Field Trip</td>
<td>RES</td>
<td>Research</td>
</tr>
<tr>
<td>ICR</td>
<td>Internet Chat Relay</td>
<td>ROS</td>
<td>Roster (Dent Only)</td>
</tr>
<tr>
<td>IHP</td>
<td>Internet Help</td>
<td>SEM</td>
<td>Seminar</td>
</tr>
<tr>
<td>IN1</td>
<td>Internship - Education</td>
<td>SSI</td>
<td>Supervised Self Instruction</td>
</tr>
<tr>
<td>IN2</td>
<td>Internship - CMPT &amp; EPIP</td>
<td>STU</td>
<td>Studio</td>
</tr>
<tr>
<td>IN3</td>
<td>Internship - General</td>
<td>SUP</td>
<td>Teacher Supervision</td>
</tr>
<tr>
<td>IN</td>
<td>Independent Studies</td>
<td>TEL</td>
<td>Televised Class</td>
</tr>
<tr>
<td>LAB</td>
<td>Laboratory</td>
<td>TUT</td>
<td>Tutorial</td>
</tr>
<tr>
<td>LC</td>
<td>Lecture/Clinical (Dent Only)</td>
<td>WEB</td>
<td>Web Based Class</td>
</tr>
<tr>
<td>LEC</td>
<td>Lecture</td>
<td>XCH</td>
<td>Exchange Program</td>
</tr>
<tr>
<td>LL</td>
<td>Lecture/Laboratory (Dent Only)</td>
<td>XGN</td>
<td>Ghost Schedule Type Not Applicable</td>
</tr>
<tr>
<td>MM</td>
<td>Multimode</td>
<td>XHS</td>
<td>High School Class</td>
</tr>
<tr>
<td>PCL</td>
<td>Pre-Clinical (Dent Only)</td>
<td>XNA</td>
<td>Schedule Type Not Applicable</td>
</tr>
<tr>
<td>PRA</td>
<td>Practicum</td>
<td>XNC</td>
<td>No Academic Credit</td>
</tr>
</tbody>
</table>

2. Course Attributes
Please highlight the attributes that should be attached to the course (they will apply to all sections):

2.1 NOAC No Academic Credit
0 Credit Unit courses that possess “deemed” CUs (Called Operational Credit Units). NOAC causes the system to roll 0 academic credit units to academic history.

2.2 For the College of Arts and Science only: To which program type does this course belong?
FNAR Fine Arts
HUM Humanities
SCIE Science
SOCSC Social Science
ARNP No Program Type (Arts and Science)

3. Registration Information (Note: multi-term courses cannot be automated as corequisites)
3.1 Permission Required:
3.2 Restriction(s): course only open to students in a specific college, program/degree, major, year in program
Restricted to students in the College of Engineering.
3.3 Prerequisite(s): course(s) that must be completed prior to the start of this course
3.4 Prerequisite(s) or Corequisite(s): course(s) that can be completed prior to or taken at the same time as this course
GE 102 – Introduction to Engineering I
3.5 Corequisite(s): course(s) that must be taken at the same time as this course
3.6 Notes: recommended courses, repeat restrictions/content overlap, other additional information

4. List Equivalent Course(s) here: None
An equivalent course can be used in place of the course for which this form is being completed, specifically for the purposes of prerequisite and degree audit checking. Credit will be given for only one of the equivalent courses.

4.1 If this is a recently-repurposed course number, please list the courses that are no longer considered to be equivalent:

*Please note: If the equivalent courses carry an UNEQUAL number of credit units, DegreeWorks will automatically enforce the following, unless otherwise stated:

- If a 3 credit unit course is considered to be equivalent to a 6 credit unit course, it will fulfill the 6 credit unit requirement and the student will not have to complete another 3 credit units toward the overall number of required credit units for the program.
- If a 6 credit unit course is considered to be equivalent to a 3 credit unit course, ALL 6 of the credit units may be used to fulfill the 3 credit unit requirement.

5. List Mutually-Exclusive Course(s) here: None
Mutually exclusive courses have similar content such that students cannot receive credit for both.

5.1 If this is a recently-repurposed course number, please list the courses that are no longer considered to be mutually exclusive:

*Please note: SiRIUS cannot enforce a situation where the exclusion goes only one way.

6. Additional Notes:
GEOL 102.1 (01)
Introduction to geology for engineering
Fall 2021

Land Acknowledgement
At the University of Saskatchewan, we acknowledge we are on Treaty Six Territory and the Homeland of the Métis. We pay our respect to the First Nation and Métis ancestors of this place and reaffirm our relationship with one another.

Instructor[s]:
Name (include credentials; if applicable please include P.Eng. or EIT as well)
Office
Phone
Email

A brief (1-2 paragraphs) summary of your teaching philosophy would also be appropriate and helpful to share in this section. This should be written in first as research does show that writing the profile in the first person helps to create more of a welcoming environment for students. (Richardson, R. and Woods, S. (2009). Course syllabus: A guide. Retrieved online from http://www.smu.ca/webfiles/SyllabusGuide_000.pdf)

Office Hours: Dates, Times
Lectures: 3 hr/week (TBD)
Laboratory: 3 hr/week – 2 lab sessions total, Times, Location
Lab Manager: Email:
Office: Phone:
Website: Assignments, solutions, lab schedules, general course information, and announcements will be posted on the course website (PAWS/Blackboard). Students are responsible for keeping up-to-date with the information on the course website.
https://bblearn.usask.ca/

Description:
Introductory exploration of the Earth system for engineering students. The aim of the course is to provide students with an appreciation of global and local-scale geological processes and the influence of these processes on the Earth system through geologic time. Key topics will include plate tectonics, geologic time, the rock cycle, weathering and erosion, geologic hazards, mineral resources, and Earth science careers. Students will learn practical applications of rock and mineral identification through laboratory activities.

Prerequisites:
No prerequisites.
Note: This course is intended for students in the College of Engineering.

Pre- or Co-requisites:
GE 102 Introduction to Engineering I
Attendance and Participation:

It is expected that students will attend all lectures, and laboratory sessions. Students are responsible for all required readings, and topics presented in lectures and laboratories. See “Laboratory” for details regarding lab attendance.

Criteria That Must Be Met to Pass:

In order to be assigned a passing final grade, you must fulfill the following conditions:

1. Obtain an overall mark greater than 50%, AND
2. Attend all laboratory sessions and complete all required lab work and obtain a 50% mark therein, AND
3. Complete the assignments and examination.

Final Grades:

The final grades will be consistent with the “literal descriptors” specified in the university's grading system (at the link below, click on “for undergraduate students”).

https://students.usask.ca/academics/grading/grading-system.php

For information regarding appeals of final grades or other academic matters, please visit the Student Conduct and Appeals section of the University Secretary's website:

Academic Courses Policy: More information on the Academic Courses Policy on course delivery, examinations and assessment of student learning can be found at: http://policies.usask.ca/policies/academic-affairs/academic-courses.php

Learning Charter: The University of Saskatchewan Learning Charter is intended to define aspirations about the learning experience that the University aims to provide, and the roles to be played in realizing these aspirations by students, instructors and the institution. A copy of the Learning Charter can be found at: https://teaching.usask.ca/about/policies/learning-charter.php

Course Overview:
This course will provide engineering students with a high-level overview of concepts in physical geology. The instructor will give special consideration to aspects of the Earth system where engineers and geoscientists work together to solve problems and mitigate risks relating to Earth processes and Earth materials. These topics include earthquake hazards, mass wasting, surface and groundwater contaminants, and mine waste management. The two 3-hour hands-on labs in rock and mineral identification will provide students with an opportunity to develop a practical understanding of how chemical and physical properties of rocks and minerals can influence their utility and behavior in engineered environments. Three worksheet assignments will help students prepare for labs and reflect on the course content. Throughout the course, the instructor will share numerous examples of geoscience careers and engineering careers that require a strong background in geoscience.

Course Content/Schedule:

<table>
<thead>
<tr>
<th>WEEK</th>
<th>Topic</th>
<th>Approximate Lecture Hours</th>
<th>LAB</th>
</tr>
</thead>
<tbody>
<tr>
<td>WEEK 1</td>
<td><strong>GEOLOGIC TIME</strong>&lt;br&gt;1.1. Measuring geologic time&lt;br&gt;1.2. Uniformitarianism</td>
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<td></td>
<td><strong>THE EARTH SYSTEM</strong>&lt;br&gt;2.1. Interactions between the biosphere, atmosphere, hydrosphere, cryosphere, and lithosphere&lt;br&gt;2.2. Earth's interior, rocks and minerals, mountains and other landforms&lt;br&gt;2.3. Earth science careers profile, e.g., climate scientist/oceanographer</td>
<td>1.5</td>
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<td></td>
<td><strong>PLATE TECTONICS</strong>&lt;br&gt;3.1. Types of plate boundaries&lt;br&gt;3.2. Features of plate boundaries: earthquakes, mountains, volcanoes&lt;br&gt;3.3. Earth science careers profile, e.g., igneous petrologist</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td><strong>ASSIGNMENT 1 - DUE AT BEGINNING OF LECTURE 2</strong></td>
<td>1.5</td>
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<tr>
<td></td>
<td><strong>THE ROCK CYCLE</strong></td>
<td></td>
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</tr>
</tbody>
</table>
4.1. Types of rocks: igneous, sedimentary, metamorphic
4.2. Weathering, sedimentation, and sedimentary rock formation
4.3. Plate tectonic environments and igneous and metamorphic rock formation
4.4. Earth science careers profile, e.g., sedimentary geologist

5. MINERALS
5.1. The atomic-scale basis of mineral properties
5.2. Common rock forming minerals and their properties
5.3. Mineral weathering and chemistry
5.4. Earth science careers profile, e.g., mineralogist

ASSIGNMENT 2 - DUE AT BEGINNING OF LAB 1

6. MOUNTAIN BUILDING
6.1. Types of mountain building
6.2. Relationship of different kinds of mountains to plate tectonic boundaries
6.3. Earth science careers profile, e.g., structural geologist

7. VOLCANOES
7.1. Common types of volcanoes and characteristics
7.2. Volcanic hazards
7.3. Earth science careers profile, e.g., volcanologist

8. EARTHQUAKES
8.1. Relationship to plate tectonic boundaries
8.2. Anthropogenic earthquakes
8.3. Earthquake hazards

9. MASS WASTING
9.1. Types of mass wasting
9.2. Mass wasting hazards and management
9.3. Earth science careers profile, e.g., groundwater hydrogeologist

10. SURFACE WATER
10.1. Reservoirs
10.2. Surface water patterns and behavior
10.3. Relationship to weathering and erosion
10.4. Earth science careers profile, e.g., hydrologist

11. GROUNDWATER
11.1. Groundwater resources: sources, sinks, threats
11.2. Groundwater contaminants: natural vs anthropogenic
11.3. Earth science careers profile, e.g., geomicrobiologist
Assignments and Labs:

The Laboratory and Assignments will make up 50% of the Overall Course mark: 20% for the three assignments (including the pre-lab worksheet assignments) and 30% for the labs (including the lab activity worksheets).

There will be three 2-page worksheet assignments in this course. Assignment 1 (10%) must be handed in by the start of the second lecture, and assignments 2 and 3 (pre-lab preparatory assignments, 5% each) are due at the start of lab 1 and lab 2, respectively. Assignments should be handed in using the homework management system (TBD).

Assignments should be done by all students individually. We note that students attempting to cut corners – including cheating - on assignments have always suffered in examinations.

All assignments are due by the start of class or lab (as specified in the syllabus) on the day indicated in the syllabus. There are NO extensions of due dates for the graded assignments. Students who have missed the deadline(s) should continue to work on the assignment(s) to practice those concepts but will not receive credit for the questions completed after the due date.

The GEOL 102 labs will begin during the second week of the course. The location of your lab is available in your registration information on PAWS.

<table>
<thead>
<tr>
<th>Laboratory Experiment</th>
<th>Dates</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LABORATORY 1-</strong> Mineral and rock physical properties – assessing utility of Earth materials for engineering applications</td>
<td>Week 2</td>
</tr>
<tr>
<td><strong>LABORATORY 2-</strong> Mineral and rock chemical properties – considering chemical weathering behavior of Earth materials and implications for waste management</td>
<td>Week 3</td>
</tr>
</tbody>
</table>

What to Bring to the Lab

- GEOL 102 Laboratory Manual (posted on course website and available for purchase at the bookstore)
• Loose-leaf paper, pen, pencil, eraser, pencil sharpener

Students are expected to follow all safety considerations in the laboratory, perform the exercises during the allotted time, and complete the lab activity worksheets during the labs.

Each lab will be weighted equally.

**Grading of each lab will be based on**
- Performance during the lab activities (30%)
- Lab activity worksheet (50%)
- Group Participation (20%)

**Absences from the Assigned Lab Period**
Students are expected to attend ALL laboratory sessions. However, if an absence is unavoidable, for example, a serious illness or the death of a family member, you may apply for permission to reschedule the lab on a different day. You will have 2 business days after the missed lab period to contact the Lab Coordinator, xxxxxx, xxxxx.xxxxx@usask.ca; to fill out the “Permission to Reschedule Lab” Form and arrange the make-up lab. If permission is not granted or the student does not complete the lab, the experiment will be assigned a mark of "0" and will result in a failing grade in the course.

If, due to a valid prior commitment, you cannot attend your assigned lab period, you should see the lab coordinator at least TWO WEEKS before to arrange an alternate time and to obtain the “Permission to Reschedule Lab” form. Examples of valid reasons for rescheduling a lab include: medical appointments that cannot be rescheduled, commitments for Huskies athletes, and observances of religious holidays. Additional documentation may be required to verify the reason for your absence from your regular lab time. Note: Tests/exams in other courses are not valid reasons for missing your lab. It is your responsibility to arrange alternate test times outside of your regularly-scheduled lab.

Attendance and submission of laboratory activity worksheets is **mandatory**. Failure meet these requirements will result in a final grade of less than 50% for the course.

**Examinations:**

**Final Exam:**
The final exam will be scheduled at the end of the Natural Sciences Module during the December final examination period. Exams can be scheduled at any time in the December 6 - 23, 2021 period. Please do not schedule travel until after the official exam schedule is released (usually by early October). If a student is unable to write an exam through no fault of his or her own for medical or other valid reasons, documentation must be provided and an opportunity to write the missed exam **may** be given. Students are encouraged to review all examination policies and procedures: [http://students.usask.ca/academics/exams.php](http://students.usask.ca/academics/exams.php)

The Final Examination will be common to all concurrent sections of GEOL 102. All final examinations are cumulative and ‘closed-book’. Data sheets and other help will be supplied at the examinations, if required. The final exam will be based on multiple-choice problems
and students will have maximum of 3 hours to complete the total exam (comprised of the four natural sciences: Biology, Chemistry, Geology, and Physics).

**Examination Policies:**
- The exam for GEOL 102 is closed book.
- The use of electronic devices, including calculators, phones and watches, with document storage and/or communication capabilities is prohibited during exams.
- Alternate times to write final examinations cannot be accommodated. If a student misses a final exam, application must be made to the Engineering Student Centre to write a deferred exam.
- Students planning on registering with the office for Access and Equity Services for Students (AES) must do so in accordance with AES procedures and deadlines.

**Important Dates:**

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wed., Jan. 3</td>
<td>First day of classes</td>
</tr>
<tr>
<td>Tues., Jan. 16</td>
<td>Last day for making changes in registration for T2 classes</td>
</tr>
<tr>
<td></td>
<td>(100% tuition credit).</td>
</tr>
<tr>
<td>Feb. 19 - 23</td>
<td>Fall/Winter Break</td>
</tr>
<tr>
<td>Thurs., March 1</td>
<td>Midterm Exam</td>
</tr>
<tr>
<td>Thurs., Mar. 15</td>
<td>Last day to withdraw from T2 classes</td>
</tr>
<tr>
<td>Fri., March 30</td>
<td>Holidays (if any)</td>
</tr>
<tr>
<td>Fri., Apr. 6</td>
<td>Last day of classes</td>
</tr>
<tr>
<td>April 7 - 23</td>
<td>Final examination period</td>
</tr>
</tbody>
</table>

**Required Resources**

**Readings/Textbooks**

Textbooks are available from the University of Saskatchewan Bookstore: [https://bookstore.usask.ca/students.php#MyTextbooks](https://bookstore.usask.ca/students.php#MyTextbooks)

**Other Required Materials**
Lab manual (available from bookstore or download from BBlearn).

**Electronic Resources**
General and section specific GEOL 102 information can be found on PAWS (paws.usask.ca) under the COURSE TOOLS tab. This site will contain laboratory information, important updates, answers to most common questions about the course, and any section specific information. Updates and announcements will be posted on PAWS.
on academic integrity and academic misconduct. If any form of academic misconduct is discovered, appropriate disciplinary action will be taken.


For information regarding appeals of a final grade or other academic matters, please consult the University Council document on Student Appeals of Evaluation, Grading and Academic Standing (http://policies.usask.ca/policies/student-affairs-and-activities/student-appeals.php). Additional policies and procedures related to student conduct and appeals are provided on the University Secretariat website (www.usask.ca/secretariat/student-conduct-appeals) and on the University website http://www.usask.ca/integrity/.

A summary of University of Saskatchewan polices relating to academic courses is provided in the document: Academic Courses Policy on Class Delivery, Examinations, and Assessment of Student Learning (http://policies.usask.ca/policies/academic-affairs/academic-courses.php).

Integrity Defined (from the Office of the University Secretary)

The University of Saskatchewan is committed to the highest standards of academic integrity and honesty. Students are expected to be familiar with these standards regarding academic honesty and to uphold the policies of the University in this respect. Students are particularly urged to familiarize themselves with the provisions of the Student Conduct & Appeals section of the University Secretary Website and avoid any behavior that could potentially result in suspicions of cheating, plagiarism, misrepresentation of facts and/or participation in an offence. Academic dishonesty is a serious offence and can result in suspension or expulsion from the University.


For more information on what academic integrity means for students see the Academic Integrity section of the University Library Website at: https://library.usask.ca/academic-integrity#AboutAcademicIntegrity

You are encouraged to complete the Academic Integrity Tutorial to understand the fundamental values of academic integrity and how to be a responsible scholar and member of the USask community - https://library.usask.ca/academic-integrity.php#AcademicIntegrityTutorial

Safety:

Safety is of paramount importance in the College. Students are expected to work in a safe and responsible manner, to follow all safety instructions, and use any specified personal protective equipment. Students failing to behave in a safe manner will be asked to leave.
Recording Lectures:
Lectures will be recorded, when possible, and made available to students in Blackboard so students can rewatch them as needed for study purposes.

Copyright:
Course materials are provided to students based on their registration in a class. Any materials created by course instructors is the intellectual property of the instructors. This includes exams, PowerPoint/PDF slides and other course notes. Additionally, other copyright-protected materials created by textbook publishers and authors may be provided to students based on license terms and educational exceptions in the Canadian Copyright Act (see http://laws-lois.justice.gc.ca/eng/acts/C-42/index.html).

Before copying or distributing others' copyright-protected materials, students need to ensure that their use of the materials is covered under the University's Fair Dealing Copyright Guidelines available at http://www.usask.ca/copyright/basics/copyright-policy/fair-dealing-guidelines/index.php. For example, posting others' copyright-protected materials on the internet is not covered under the University's Fair Dealing Copyright Guidelines; doing so requires permission from the copyright holder. For more information about copyright, please visit http://www.usask.ca/copyright/students/rights/index.php or contact the University's Copyright Coordinator at copyright.coordinator@usask.ca.

Students should be aware that a violation of the university's copyright policies could be an instance of non-academic misconduct. For example, the practice of uploading or posting copyright-protected materials to course-sharing websites, depositories, or “drop boxes”, without the permission of the copyright holder, could result in a charge of non-academic misconduct under the university’s “Standard of Student Conduct in Non-Academic Matters”, found at the following location: https://www.usask.ca/secretariat/student-conduct-appeals/StudentNon-AcademicMisconduct.pdf.

Student Conduct:
Ethical behaviour is an important part of engineering practice. Each professional engineering association has a Code of Ethics, which its members are expected to follow. Since students are in the process of becoming Professional Engineers, it is expected that students will conduct themselves in an ethical manner.

The APEGs (Association of Professional Engineers and Geoscientists of Saskatchewan) Code of Ethics states that engineers shall “conduct themselves with fairness, courtesy and good faith towards clients, colleagues, employees and others; give credit where it is due and accept, as well as give, honest and fair professional criticism” (Section 20(e), The Engineering and Geoscience Professions Regulatory Bylaws, 1997).

The first part of this statement discusses an engineer’s relationships with his or her colleagues. One of the ways in which engineering students can demonstrate courtesy to their colleagues is by helping to maintain an atmosphere that is conducive to learning, and minimizing disruptions in class. This includes arriving on time for lectures, turning cell phones and other electronic devices off during lectures, not leaving or entering the class at inopportune times, and refraining from talking to others while the instructor is talking.

Access and Equity Services (AES) for Students
Students who have disabilities (learning, medical, physical, or mental health) are strongly encouraged to register with Access and Equity Services (AES) if they have not already done so. Students who suspect they may have disabilities should contact AES for advice and referrals at any time. Those students who are registered with AES with mental health disabilities and who anticipate that they may have responses to certain course materials or topics, should discuss course content with their instructors prior to course add / drop dates. In order to access AES programs and supports, students must follow AES policy and procedures. For more information or advice, visit https://students.usask.ca/health/centres/access-equity-services.php, or contact AES at 306-966-7273 or aes@usask.ca.

Students registered with AES may request alternative arrangements for mid-term and final examinations. Students must arrange such accommodations through AES by the stated deadlines. Instructors shall provide the examinations for students who are being accommodated by the deadlines established by AES.

Support Services for Engineering Students:
- Engineering Student Centre (Rm. 2A05 Engineering Building)
  - Email: esc@usask.ca; Phone: 306-966-5274; https://engineering.usask.ca/contact_info/esc-office.php

End of day tutorial sessions will be offered by the College of Engineering for the Common First Year and will provide support for all courses. Please see X for more details.

Student Learning Services

Student Learning Services (SLS) offers assistance to U of S undergrad and graduate students. For information on specific services, please see the SLS web site https://library.usask.ca/studentlearning/.

Teaching, Learning and Student Experience

The Teaching, Learning and Student Experience Unit (TLSE) focuses on providing developmental and support services and programs to students and the university community. For more information, see https://students.usask.ca/. Specific resources include:
- Student Wellness Centre (3rd & 4th Floors, Place Riel): https://students.usask.ca/health/
- Financial Services: https://students.usask.ca/money/

College of Engineering Attribute Mapping:

This information shows the relationship of the learning outcomes of this course to the graduate attributes intended upon students’ completion of the degree program. This information is used for accreditation purposes.

<table>
<thead>
<tr>
<th>Learning Outcome</th>
<th>A1</th>
<th>A2</th>
<th>A3</th>
<th>A4</th>
<th>A5</th>
<th>A6</th>
<th>A7</th>
<th>A8</th>
<th>A9</th>
<th>A10</th>
<th>A11</th>
<th>A12</th>
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<tr>
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*Industrial Level*
Attributes:
A1  A knowledge base for engineering
A2  Problem analysis
A3  Investigation
A4  Design
A5  Use of engineering tools
A6  Individual and team work
A7  Communication skills
A8  Professionalism
A9  Impact of engineering on society and the environment
A10 Ethics and equity
A11 Economics and project management
A12 Life-long learning

Instructional Level:
Introduced (I) – Students learn the working vocabulary of the area of content, along with some of the major underlying concepts.
Developed (D) – Students use their working vocabulary and major fundamental concepts to probe more deeply, to read the literature, and to deepen their exploration of the concepts. They may begin to practice, extend, or refine knowledge in familiar contexts.
Applied (A) – Students approach mastery in the area of content. They explore deeply into the discipline and experience the controversies, debate, and uncertainties that characterize the leading edges of any field. They practice, extend, or refine knowledge in unfamiliar contexts.

Accreditation Unit (AU) Mapping: (% of total class AU)

<table>
<thead>
<tr>
<th>Math</th>
<th>Natural Science</th>
<th>Complementary Studies</th>
<th>Engineering Science</th>
<th>Engineering Design</th>
</tr>
</thead>
<tbody>
<tr>
<td>0%</td>
<td>100%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
</tbody>
</table>

Accreditation Data Collection and Privacy:
Undergraduate programs in the College of Engineering are accredited by the Canadian Engineering Accreditation Board. Student performance data may be collected in this course to support accreditation and continuous program improvement processes. Anonymous samples of student work may also be collected for accreditation purposes. All data provided to the accreditation body or external entities is anonymized and reported in aggregate form to protect your information and identity. If you have any concerns about how your personal information is used or maintained, please contact the Associate Dean Academic, College of Engineering.
1. Approval by Department Head or Dean
   1.1 College or School with academic authority: College of Arts & Science
   1.2 Department with academic authority: Department of Mathematics and Statistics
   1.3 Term from which the course is effective: 202105

2. Information required for the Catalogue
   2.1 Label & Number of course: MATH 133
   2.2 Academic credit units: 4
   2.3 Course Long Title (maximum 100 characters): Engineering Mathematics I
       Course Short Title (maximum 30 characters): Engineering Mathematics I
   2.4 Total Hours: Lecture 49.5 Seminar Lab 15 Tutorial Other
   2.5 Weekly Hours: Lecture 4.5 Seminar Lab 1.5 Tutorial Other
   2.6 Term in which it will be offered: T1 T2 T1 or T2 T1 and T2
   2.7 Prerequisite: Mathematics B30 and C30, or Pre-Calculus 30, or MATH 102

   If there is a prerequisite waiver, who is responsible for signing it?
   D – Instructor/Dept Approval
   H – Department Approval
   I – Instructor Approval

   2.8 Catalogue description (150 words or less):
       An introduction to foundational concepts and tools in calculus, linear algebra, and statistics
       that are essential to engineering. Topics include basic integration techniques, limits and
       continuity, derivatives and their applications, matrix operations and linear transformations,
       linear regression, and graphing data on various scales.

   2.9 Do you allow this course to be repeated for credit? No

3. Please list rationale for introducing this course:

   Currently a number of Arts & Science departments contribute to the Common First Year for the
   College of Engineering Bachelor of Science in Engineering (B.E.) program. The College of Engineering
   is in the process of redesigning this Common First Year to create the most effective first year
   engineering program in Canada. They are working hard to create something that will excite, engage
   and inspire their students, and to holistically prepare them for the challenges to come in later years.
   This project has been underway since 2016-2017 and has a planned launch of Fall 2021. Over this
   time there has been extensive consultation between the College of Engineering and specific
Departments in the College of Arts & Science. A suite of new Science courses are being proposed for use in this redesigned Common First Year which will replace existing courses currently used.

The College of Engineering is also working toward a new competency-based assessment system that will be utilized in the new First Year Engineering courses in Fall 2021. The Arts & Science departments will continue to learn more about this system through 2020-2021 and 2021-2022 as it is implemented in Engineering, and will then determine how it can be used in the Science courses attached to the Engineering Common First Year. Revisions to the courses, to implement this assessment system, will be submitted to the appropriate College Academic Programs Committee for approval, prior to use in the courses.

This new competency-based assessment system will use module tests in place of midterm and final exams. A few of the new courses proposed by Arts and Science departments have started to use the concept of Module Tests in their courses in these first versions. This will make it easier when they switch to the competency-based assessment system in future. Some common wording regarding module tests was created and has been used in the Arts and Science course proposals. This wording is similar to that of the Examinations Policies section of Arts and Science syllabus, but has been modified to accurately portray the concept of the module tests.

4. Please list the learning objectives for this course:

By the end of this course, students will be expected to:

1. Perform integration of simple functions such as polynomials;
2. Compute limits, assess continuity, and find asymptotes of a given function;
3. Define, interpret, and evaluate derivatives of common functions;
4. Carry out basic matrix operations and solve simple linear systems;
5. Graph points and curves on non-linear axes, such as semi-log and log-log scales;
6. Utilize derivatives in various applications, such as finding extrema, solving problems involving related rates, and evaluating limits of indeterminate forms using L'Hospital's rule.
7. Compute and interpret basic summary statistics, and find the line of best fit of a given set of discrete data.

5. Impact of this course

Are the programs of other departments or Colleges affected by this course? This course is for the College of Engineering First Year.

If so, were these departments consulted? (Include correspondence) Yes

Were any other departments asked to review or comment on the proposal? The course went through the Arts & Science College Challenge, which provides opportunity for responses by all departments in the College.

6. Other courses or program affected (please list course titles as well as numbers)

6.1 Courses to be deleted? MATH 123 and MATH 124

6.2 Courses for which this course will be a prerequisite? MATH 133 and 134 will replace MATH 123 and 124 as a pathway into 200-level calculus courses.
6.3 Is this course to be required by your majors, or by majors in another program?

Required course in the first-year as part of revised Engineering program. Students with credit for MATH 133 will be considered to have completed a program requirement for MATH 110, MATH 121, or MATH 125.

Also please note that students with credit for MATH 133 may not subsequently receive credit for MATH 101, MATH 102, MATH 104, MATH 110, MATH 121, MATH 125, MATH 150 and MATH 176.

7. Course outline
   (Weekly outline of lectures or include a draft of the course information sheet.)

See attached syllabus.

8. Enrolment
   8.1 Expected enrollment: up to 600
   8.2 From which colleges? Engineering

9. Student evaluation
   Give approximate weighting assigned to each indicator (assignments, laboratory work, mid-term test, final examination, essays or projects, etc.)

Assessment:

A numerical course grade out of 100 is calculated using the following weightings of the respective assessments:

- Assignments: 10%
- Laboratories: 15%
- Module Test #1: 25%
- Module Test #2: 25%
- Module Test #3: 25%

9.1 How should this course be graded?

<table>
<thead>
<tr>
<th>Grade</th>
<th>Grade options for instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>C – Completed</td>
<td>Completed Requirements, Fail, IP In Progress</td>
</tr>
<tr>
<td>N – Numeric/Percentage</td>
<td>grade of 0% to 100%, IP in Progress</td>
</tr>
<tr>
<td>P – Pass/Fail</td>
<td>Pass, Fail, In Progress</td>
</tr>
<tr>
<td>S – Special</td>
<td></td>
</tr>
</tbody>
</table>
9.2 Is the course exempt from the final examination? Yes – No final exam is proposed. As shared in the rationale section above this course will use module tests in place of midterm and final exams.

Insert from Rationale:
This new competency-based assessment system will use module tests in place of midterm and final exams. A few of the new courses proposed by Arts and Science departments have started to use the concept of Module Tests in their courses in these first versions. This will make it easier when they switch to the competency-based assessment system in future. Some common wording regarding module tests was created and has been used in the Arts and Science course proposals. This wording is similar to that of the Examinations Policies section of Arts and Science syllabus, but has been modified to accurately portray the concept of the module tests.

10. Required text
Include a bibliography for the course.

The course will utilize a number of open-access textbooks that are freely available online:


Additional supplementary notes may also be provided by the course instructor.

11. Resources
11.1 Proposed instructor:
Mathematics Faculty

11.2 How does the department plan to handle the additional teaching or administrative workload? Within department.

11.3 Are sufficient library or other research resources available for this course? Yes

11.4 Are any additional resources required (library, audio-visual, technology, etc.)? No

12. Tuition
12.1 Will this course attract tuition charges? If so, how much? (use tuition category) TC08
12.2 Does this course require non-standard fees, such as materials or excursion fees? If so, please include an approved “Application for New Fee or Fee Change Form” http://www.usask.ca/sesd/info-for-instructors/program-course-preparation.php#course-fees No

Detailed Course Information
1. Schedule Types
Please choose the Schedule Types that can be used for sections that fall under this course:

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CL</td>
<td>Clinical</td>
<td>PRB</td>
<td>Problem Session</td>
</tr>
<tr>
<td>COO</td>
<td>Coop Class</td>
<td>RDG</td>
<td>Reading Class</td>
</tr>
<tr>
<td>FLD</td>
<td>Field Trip</td>
<td>RES</td>
<td>Research</td>
</tr>
<tr>
<td>ICR</td>
<td>Internet Chat Relay</td>
<td>ROS</td>
<td>Roster (Dent Only)</td>
</tr>
<tr>
<td>IHP</td>
<td>Internet Help</td>
<td>SEM</td>
<td>Seminar</td>
</tr>
<tr>
<td>IN1</td>
<td>Internship - Education</td>
<td>SSI</td>
<td>Supervised Self Instruction</td>
</tr>
<tr>
<td>IN2</td>
<td>Internship - CMPT &amp; EPIP</td>
<td>STU</td>
<td>Studio</td>
</tr>
<tr>
<td>IN3</td>
<td>Internship - General</td>
<td>SUP</td>
<td>Teacher Supervision</td>
</tr>
<tr>
<td>IND</td>
<td>Independent Studies</td>
<td>TEL</td>
<td>Televised Class</td>
</tr>
<tr>
<td>LAB</td>
<td>Laboratory</td>
<td>TUT</td>
<td>Tutorial</td>
</tr>
<tr>
<td>LC</td>
<td>Lecture/Clinical (Dent Only)</td>
<td>WEB</td>
<td>Web Based Class</td>
</tr>
<tr>
<td>LEC</td>
<td>Lecture</td>
<td>XCH</td>
<td>Exchange Program</td>
</tr>
<tr>
<td>LL</td>
<td>Lecture/Laboratory (Dent Only)</td>
<td>XGN</td>
<td>Ghost Schedule Type Not Applicable</td>
</tr>
<tr>
<td>MM</td>
<td>Multimode</td>
<td>XHS</td>
<td>High School Class</td>
</tr>
<tr>
<td>PCL</td>
<td>Pre-Clinical (Dent Only)</td>
<td>XNA</td>
<td>Schedule Type Not Applicable</td>
</tr>
<tr>
<td>PRA</td>
<td>Practicum</td>
<td>XNC</td>
<td>No Academic Credit</td>
</tr>
</tbody>
</table>

2. Course Attributes
Please highlight the attributes that should be attached to the course (they will apply to all sections):

2.1 NOAC No Academic Credit
0 Credit Unit courses that possess “deemed” CUs (Called Operational Credit Units). NOAC causes the system to roll 0 academic credit units to academic history.

2.2 For the College of Arts and Science only: To which program type does this course belong?
   - FNAR Fine Arts
   - HUM Humanities
   - SCIE Science
   - SOCS Social Science
   - ARNP No Program Type (Arts and Science)

Does this course satisfy one of the official college requirements:
   - ELWR – English Language Writing Requirement
   - ILRQ – Indigenous Learning Requirement
   - QRRQ – Quantitative Reasoning Requirement

3. Registration Information (Note: multi-term courses cannot be automated as corequisites)
3.1 Permission Required:
3.2 Restriction(s): course only open to students in a specific college, program/degree, major, year in program
   Restricted to students in the College of Engineering.

3.3 Prerequisite(s): course(s) that must be completed prior to the start of this course
   Mathematics B30 and C30, or Pre-Calculus 30, or MATH 102
3.4 Prerequisite(s) or Corequisite(s): course(s) that can be completed prior to or taken at the same time as this course
3.5 Corequisite(s): course(s) that must be taken at the same time as this course
3.6 Notes: recommended courses, repeat restrictions/content overlap, other additional information

4. List Equivalent Course(s) here: None
An equivalent course can be used in place of the course for which this form is being completed, specifically for the purposes of prerequisite and degree audit checking. Credit will be given for only one of the equivalent courses.

4.1 If this is a recently-repurposed course number, please list the courses that are no longer considered to be equivalent:

*Please note: If the equivalent courses carry an UNEQUAL number of credit units, DegreeWorks will automatically enforce the following, unless otherwise stated:

- If a 3 credit unit course is considered to be equivalent to a 6 credit unit course, it will fulfill the 6 credit unit requirement and the student will not have to complete another 3 credit units toward the overall number of required credit units for the program.
- If a 6 credit unit course is considered to be equivalent to a 3 credit unit course, ALL 6 of the credit units may be used to fulfill the 3 credit unit requirement.

5. List Mutually-Exclusive Course(s) here: None
Mutually exclusive courses have similar content such that students cannot receive credit for both.

5.1 If this is a recently-repurposed course number, please list the courses that are no longer considered to be mutually exclusive:

*Please note: SiRIUS cannot enforce a situation where the exclusion goes only one way.

6. Additional Notes:
MATH 133.4  
Engineering Mathematics I  
Fall, 2021

Land Acknowledgement  
At the University of Saskatchewan, we acknowledge we are on Treaty Six Territory and the Homeland of the Métis. We pay our respect to the First Nation and Métis ancestors of this place and reaffirm our relationship with one another.

Instructor:  
Name: TBD  
Office: TBD  
Phone: TBD  
Email: TBD

Office Hours:  
TBD

Lectures:  
See Course Schedule

Laboratory:  
See Course Schedule

Website:  
Assignments, solutions, lab schedules, general course information, and announcements will be posted on the course website. Students are responsible for keeping up-to-date with the information on the course website.

Description:  
An introduction to foundational concepts and tools in calculus, linear algebra, and statistics that are essential to engineering. Topics include basic integration techniques, limits and continuity, derivatives and their applications, matrix operations and linear transformations, linear regression, and graphing data on various scales.

Prerequisites:  
Mathematics B30 and C30, or Pre-Calculus 30, or MATH 102.

Co-requisites:  
N/A

Course Reference Numbers (CRNs):  
Available from the Dynamic Schedule once courses are built (https://pawss.usask.ca/ban/bwckschd.p_disp_dyn_sched)

Course Learning Outcomes:  
By the end of this course, students will be expected to:
1. Perform integration of simple functions such as polynomials;
2. Compute limits, assess continuity, and find asymptotes of a given function;
3. Define, interpret, and evaluate derivatives of common functions;
4. Carry out basic matrix operations and solve simple linear systems;
5. Graph points and curves on non-linear axes, such as semi-log and log-log scales;
6. Utilize derivatives in various applications, such as finding extrema, solving problems involving related rates, and evaluating limits of indeterminate forms using L’Hospital’s rule.
7. Compute and interpret basic summary statistics, and find the line of best fit.
of a given set of discrete data.

Assessment: A numerical course grade out of 100 is calculated using the following weightings of the respective assessments:

- Assignments: 10%
- Laboratories: 15%
- Module Test #1: 25%
- Module Test #2: 25%
- Module Test #3: 25%

Attendance and Participation: While attendance will not be taken, we expect attendance for all lectures and labs, and students will be responsible for the material presented therein.

Criteria That Must Be Met to Pass: N/A

Final Grades: The final grades will be consistent with the “literal descriptors” specified in the university's grading system (at the link below, click on “for undergraduate students”).

https://students.usask.ca/academics/grading/grading-system.php

For information regarding appeals of final grades or other academic matters, please visit the Student Conduct and Appeals section of the University Secretary's website:


Academic Courses Policy: More information on the Academic Courses Policy on course delivery, examinations and assessment of student learning can be found at:

http://policies.usask.ca/policies/academic-affairs/academic-courses.php

Learning Charter: The University of Saskatchewan Learning Charter is intended to define aspirations about the learning experience that the University aims to provide, and the roles to be played in realizing these aspirations by students, instructors and the institution. A copy of the Learning Charter can be found at:

https://teaching.usask.ca/about/policies/learning-charter.php

Course Overview:

This course introduces students to a broad spectrum of both classical and modern mathematical concepts that are essential to many engineering disciplines. The scope and the sequencing of the topics have been optimized to align with the other courses taken by first year engineering students, so that they will see timely applications of the mathematical tools they acquire in this course.

Course Content/Schedule:

The following table provides an overview of the scheduling of the topics and activities in this course. A note on the distribution of the lecture hours:
– Engineering Mathematics I starts on Monday of Week 3, and ends on Wednesday Week 14.
– There are three (80-minute) lectures every week (one each on Mondays, Wednesdays and Fridays), except during Week 6 (no Monday lecture due to Thanksgiving) and Week 11 (no lectures due to the Fall break).
– There is an extra lecture on the Tuesday of Week 15 that is intended to be a feedback session (e.g. to take up the last module test).

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
<th>Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>No Lectures</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>No Lectures</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Module 1: Basic Differentiation and Integration</td>
<td>Lab 1</td>
</tr>
<tr>
<td></td>
<td>– interpret a definite integral as the net area under a curve, as well as a continuous accumulation of values over an interval</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-- evaluate derivatives and integrals of polynomials</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Module 2: Limits and Continuity</td>
<td>Lab 2, Assignment 1 due</td>
</tr>
<tr>
<td></td>
<td>-- determine whether a limit exists, and compute it if it does</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-- determine intervals on which functions are continuous</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-- identify removable and non-removable discontinuities</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>-- find asymptotes of functions using limits</td>
<td>Lab 3</td>
</tr>
<tr>
<td></td>
<td>Module 3: Computing Derivatives</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-- define the derivative as a limit</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-- interpret the derivative in terms of slopes of tangent lines and instantaneous rates of change</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>-- evaluate derivatives of common functions (e.g. trigonometric, exponential, logarithmic) using various differentiation techniques (e.g. product, quotient, and chain rule; implicit differentiation)</td>
<td>Lab 4, Assignment 2 due</td>
</tr>
<tr>
<td>7</td>
<td>Module 4: Matrices and Linear Systems</td>
<td>Lab 5, Module Test #1</td>
</tr>
<tr>
<td></td>
<td>-- model a variety of types of problems as linear systems of equations</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-- solve linear systems by hand (Gaussian/Gauss-Jordan elimination) and computationally (via Matlab)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-- carry out basic matrix operations (addition, multiplication)</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>-- perform linear transformations (translation, stretch, rotation/reflection)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-- calculate the inverse of a matrix</td>
<td></td>
</tr>
<tr>
<td></td>
<td>– find the determinant of a matrix</td>
<td>Lab 6</td>
</tr>
<tr>
<td>9</td>
<td>-- find the eigenvalues and eigenvectors of a matrix</td>
<td>Lab 7, Assignment 3 due</td>
</tr>
<tr>
<td></td>
<td>Module 5: Graphing Data</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-- graph functions (points and curves) on non-linear axes (semi-log and log-log scales)</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Module 6: Applications of Derivatives</td>
<td>Lab 8, Module Test #2</td>
</tr>
<tr>
<td></td>
<td>-- use first and second derivative tests to find and classify extrema, and determine concavity and inflection points of functions</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-- solve optimization problems of one variable, as well as related rates problems</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-- calculate the linearizations of simple functions</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Fall break</td>
<td></td>
</tr>
</tbody>
</table>
Assignments:

There will be 5 assignments throughout the term, due on the weeks indicated in the Course Schedule above. For each assignment, students will provide detailed solutions to a variety of problems based on the course material. The purpose of these assignments is to provide students feedback on their progress in mastering the relevant material, and to ensure that students are keeping up with the course. The assignments are weighted equally, and as a whole constitute 10% of the final grade.

Laboratory:

During each of the 10 lab sessions, students will be led by the lab instructor to solve problems that are related to the materials that were recently covered in the lectures. Students will complete and submit a short lab assignment during the lab session. The lab assignments are weighted equally, and are worth a total of 15% of the final grade.

Submitting Assignments:

Students are expected to submit their assignments electronically online.

Late Assignments and Missed Labs:

Late assignments will not be accepted, and will receive a grade of zero. There will also be no make-up lab assignments for students who miss labs. Exemptions may be granted only in exceptional circumstances (e.g. documented illness or emergency), in which case the weight of the missed work will be shifted to the Module Test most representative of the corresponding material, as determined by the course instructor.

Module Tests:

This course is comprised of 7 modules. Students' mastery of the subject material of these modules will be assessed in 3 Module Tests. Each Module Test is 2 hours long and takes place in an evening, outside of class time. The scope and schedule for the Module Tests are as follows:

- Module Test #1 (Week 7) covers Modules 1, 2, and 3;
- Module Test #2 (Week 10) covers Modules 4 and 5;
- Module Test #3 (Week 14) covers Modules 6 and 7.
Students should avoid making prior travel, employment, or other commitments at these times. Alternate times to write the module tests will not be considered except in the case of acceptable reasons, such as illness, bereavement, etc, or a conflict with other university related activities.

If a student is unable to write a module test through no fault of his or her own for medical or other acceptable reasons, the request and documentation must be provided within 3 days of the module test date and an opportunity to write the missed module test may be given at the discretion of the course instructor. Students are encouraged to review all examination policies and procedures, available at: http://students.usask.ca/academics/exams.php

Students will be allowed to bring and use a non-programmable, non-graphing scientific calculator on the module tests. The use of any other aids, such as devices with document storage and/or communication capabilities, is prohibited during all module tests for this course.

**Required Activities Outside of Class Time**

The three module tests will take place outside of class time, during the evening of weekdays.

**Required Resources**

**Readings/Textbooks**

The course will utilize a number of open-access textbooks that are freely available online:


Additional supplementary notes may also be provided by the course instructor.

**Other Required Materials**

Students may use a simple scientific calculator (non-programmable, non-graphing, with no storage capacity) during the module tests. Some eligible calculator models are TI 30Xa, TI 30XII, Casio fx260, Casio fx300MS, Sharp EL531X, and HP 10s.

**Policies on Academic Dishonesty, Academic Appeals and Course Delivery:**

Students are expected to undertake all aspects of their academic work in an ethical manner. Students are expected to submit their own individual work for academic credit, properly cite the work of others, and to follow all rules for examinations. Academic misconduct, plagiarism, and cheating will not be tolerated. Students are responsible for understanding the university's policies on academic integrity and academic misconduct. If any form of academic misconduct is discovered, appropriate disciplinary action will be taken.

For more information on what constitutes academic misconduct, please consult the University Council Regulations on Student Academic Misconduct (https://secretariat.usask.ca/student-conduct-appeals/academic-misconduct.php) as well as the

For information regarding appeals of a final grade or other academic matters, please consult the University Council document on Student Appeals of Evaluation, Grading and Academic Standing (http://policies.usask.ca/policies/student-affairs-and-activities/student-appeals.php).

Additional policies and procedures related to student conduct and appeals are provided on the University Secretariat website (www.usask.ca/secretariat/student-conduct-appeals) and on the University website http://www.usask.ca/integrity/.

A summary of University of Saskatchewan policies relating to academic courses is provided in the document: Academic Courses Policy on Class Delivery, Examinations, and Assessment of Student Learning (http://policies.usask.ca/policies/academic-affairs/academic-courses.php).

**Integrity Defined (from the Office of the University Secretary)**

The University of Saskatchewan is committed to the highest standards of academic integrity and honesty. Students are expected to be familiar with these standards regarding academic honesty and to uphold the policies of the University in this respect. Students are particularly urged to familiarize themselves with the provisions of the Student Conduct & Appeals section of the University Secretary Website and avoid any behavior that could potentially result in suspicions of cheating, plagiarism, misrepresentation of facts and/or participation in an offence. Academic dishonesty is a serious offence and can result in suspension or expulsion from the University.

All students should read and be familiar with the Regulations on Academic Student Misconduct (https://secretariat.usask.ca/student-conduct-appeals/academic-misconduct.php) as well as the Standard of Student Conduct in Non-Academic Matters and Procedures for Resolution of Complaints and Appeals (https://secretariat.usask.ca/student-conduct-appeals/academic-misconduct.php#IXXIIAPPEALS)

For more information on what academic integrity means for students see the Academic Integrity section of the University Library Website at: https://library.usask.ca/academic-integrity#AboutAcademicIntegrity

You are encouraged to complete the Academic Integrity Tutorial to understand the fundamental values of academic integrity and how to be a responsible scholar and member of the USask community - https://library.usask.ca/academic-integrity.php#AcademicIntegrityTutorial

**Safety:**

Safety is of paramount importance in the College. Students are expected to work in a safe and responsible manner, to follow all safety instructions, and use any specified personal protective equipment. Students failing to behave in a safe manner will be asked to leave.

**Recording Lectures:**

Lectures will be recorded, when possible, and made available to students in Blackboard so students can rewatch them as needed for study purposes.
Copyright:

Course materials are provided to students based on their registration in a class. Any materials created by course instructors is the intellectual property of the instructors. This includes tests, PowerPoint/PDF slides and other course notes. Additionally, other copyright-protected materials created by textbook publishers and authors may be provided to students based on license terms and educational exceptions in the Canadian Copyright Act (see http://laws-lois.justice.gc.ca/eng/acts/C-42/index.html).

Before copying or distributing others’ copyright-protected materials, students need to ensure that their use of the materials is covered under the University's Fair Dealing Copyright Guidelines available at http://www.usask.ca/copyright/basics/copyright-policy/fair-dealing-guidelines/index.php. For example, posting others’ copyright-protected materials on the internet is not covered under the University’s Fair Dealing Copyright Guidelines; doing so requires permission from the copyright holder. For more information about copyright, please visit http://www.usask.ca/copyright/students/rights/index.php or contact the University’s Copyright Coordinator at copyright.coordinator@usask.ca.

Students should be aware that a violation of the university’s copyright policies could be an instance of non-academic misconduct. For example, the practice of uploading or posting copyright-protected materials to course-sharing websites, depositories, or “drop boxes”, without the permission of the copyright holder, could result in a charge of non-academic misconduct under the university’s “Standard of Student Conduct in Non-Academic Matters”, found at the following location: https://www.usask.ca/secretariat/student-conduct-appeals/StudentNon-AcademicMisconduct.pdf.

Student Conduct:

Ethical behaviour is an important part of engineering practice. Each professional engineering association has a Code of Ethics, which its members are expected to follow. Since students are in the process of becoming Professional Engineers, it is expected that students will conduct themselves in an ethical manner.

The APEGS (Association of Professional Engineers and Geoscientists of Saskatchewan) Code of Ethics states that engineers shall ”conduct themselves with fairness, courtesy and good faith towards clients, colleagues, employees and others; give credit where it is due and accept, as well as give, honest and fair professional criticism” (Section 20(e), The Engineering and Geoscience Professions Regulatory Bylaws, 1997).

The first part of this statement discusses an engineer’s relationships with his or her colleagues. One of the ways in which engineering students can demonstrate courtesy to their colleagues is by helping to maintain an atmosphere that is conducive to learning, and minimizing disruptions in class. This includes arriving on time for lectures, turning cell phones and other electronic devices off during lectures, not leaving or entering the class at inopportune times, and refraining from talking to others while the instructor is talking.

Access and Equity Services (AES) for Students

Students who have disabilities (learning, medical, physical, or mental health) are strongly encouraged to register with Access and Equity Services (AES) if they have not already done so. Students who suspect they may have disabilities should contact AES for advice and referrals at any time. Those students who are registered with AES with mental health disabilities and who anticipate that they may have responses to
certain course materials or topics, should discuss course content with their instructors prior to course add / drop dates. In order to access AES programs and supports, students must follow AES policy and procedures. For more information or advice, visit https://students.usask.ca/health/centres/access-equity-services.php, or contact AES at 306-966-7273 or aes@usask.ca.

Students registered with AES may request alternative arrangements for module tests. Students must arrange such accommodations through AES by the stated deadlines. Instructors shall provide the examinations for students who are being accommodated by the deadlines established by AES.

**Support Services for Engineering Students:**

- Engineering Student Centre (Rm. 2A05 Engineering Building)
  - Email: esc@usask.ca; Phone: 306-966-5274;
  - https://engineering.usask.ca/contact_info/esc-office.php

End of day tutorial sessions will be offered by the College of Engineering for the Common First Year and will provide support for all courses. Please see X for more details.

**Student Learning Services**

Student Learning Services (SLS) offers assistance to U of S undergrad and graduate students. For information on specific services, please see the SLS web site https://library.usask.ca/studentlearning/.

**Teaching, Learning and Student Experience**

The Teaching, Learning and Student Experience Unit (TLSE) focuses on providing developmental and support services and programs to students and the university community. For more information, see https://students.usask.ca/. Specific resources include:

- Student Wellness Centre (3rd & 4th Floors, Place Riel): https://students.usask.ca/health/
- Financial Services: https://students.usask.ca/money/

**College of Engineering Attribute Mapping:**

This information shows the relationship of the learning outcomes of this course to the graduate attributes intended upon students’ completion of the degree program. This information is used for accreditation purposes.

<table>
<thead>
<tr>
<th>Learning Outcome</th>
<th>A1</th>
<th>A2</th>
<th>A3</th>
<th>A4</th>
<th>A5</th>
<th>A6</th>
<th>A7</th>
<th>A8</th>
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<tr>
<td>7</td>
<td>I</td>
<td>I</td>
<td>I</td>
<td>D</td>
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</tr>
</tbody>
</table>

†Attributes:
- A1 A knowledge base for engineering
- A2 Problem analysis
- A3 Investigation
- A4 Design

‡Instructional Level:
- Introduced (I) – Students learn the working vocabulary of the area of content, along with some of the major underlying concepts.
- Developed (D) – Students use their working vocabulary and
Use of engineering tools
Individual and team work
Communication skills
Professionalism
Impact of engineering on society and the environment
Ethics and equity
Economics and project management
Life-long learning

major fundamental concepts to probe more deeply, to read the literature, and to deepen their exploration of the concepts. They may begin to practice, extend, or refine knowledge in familiar contexts.

Applied (A) – Students approach mastery in the area of content. They explore deeply into the discipline and experience the controversies, debate, and uncertainties that characterize the leading edges of any field. They practice, extend, or refine knowledge in unfamiliar contexts.

Accreditation Unit (AU) Mapping: (% of total class AU)

<table>
<thead>
<tr>
<th>Math</th>
<th>Natural Science</th>
<th>Complementary Studies</th>
<th>Engineering Science</th>
<th>Engineering Design</th>
</tr>
</thead>
<tbody>
<tr>
<td>100%</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>

Accreditation Data Collection and Privacy:

Undergraduate programs in the College of Engineering are accredited by the Canadian Engineering Accreditation Board. Student performance data may be collected in this course to support accreditation and continuous program improvement processes. Anonymous samples of student work may also be collected for accreditation purposes. All data provided to the accreditation body or external entities is anonymized and reported in aggregate form to protect your information and identity. If you have any concerns about how your personal information is used or maintained, please contact the Associate Dean Academic, College of Engineering.
1. **Approval by Department Head or Dean**
   1.1 College or School with academic authority: College of Arts & Science
   1.2 Department with academic authority: Department of Mathematics and Statistics
   1.3 Term from which the course is effective: 202105

2. **Information required for the Catalogue**
   2.1 Label & Number of course: MATH 134
   2.2 Academic credit units: 3
   2.3 Course Long Title (maximum 100 characters): Engineering Mathematics II
      Course Short Title (maximum 30 characters): Engineering Mathematics II
   2.4 Total Hours: Lecture 33 Seminar Lab 13.5 Tutorial Other
   2.5 Weekly Hours: Lecture 3 Seminar Lab 1.5 Tutorial Other
   2.6 Term in which it will be offered: T1 T2 T1 or T2 T1 and T2
   2.7 Prerequisite: MATH 133, or [(MATH 110 or 123 or 176) and (MATH 164 or 264 or 266)]

If there is a prerequisite waiver, who is responsible for signing it?

- D – Instructor/Dept Approval
- H – Department Approval
- I – Instructor Approval

2.8 Catalogue description (150 words or less):
   This course is a continuation of Engineering Mathematics I. Topics include integration techniques and applications, dot products and cross products for vectors, polar coordinates, and complex numbers.

2.9 Do you allow this course to be repeated for credit? No

3. **Please list rationale for introducing this course:**

Currently a number of Arts & Science departments contribute to the Common First Year for the College of Engineering Bachelor of Science in Engineering (B.E.) program. The College of Engineering is in the process of redesigning this Common First Year to create the most effective first year engineering program in Canada. They are working hard to create something that will excite, engage and inspire their students, and to holistically prepare them for the challenges to come in later years. This project has been underway since 2016-2017 and has a planned launch of Fall 2021. Over this time there has been extensive consultation between the College of Engineering and specific
Departments in the College of Arts & Science. A suite of new Science courses are being proposed for use in this redesigned Common First Year which will replace existing courses currently used.

The College of Engineering is also working toward a new competency-based assessment system that will be utilized in the new First Year Engineering courses in Fall 2021. The Arts & Science departments will continue to learn more about this system through 2020-2021 and 2021-2022 as it is implemented in Engineering, and will then determine how it can be used in the Science courses attached to the Engineering Common First Year. Revisions to the courses, to implement this assessment system, will be submitted to the appropriate College Academic Programs Committee for approval, prior to use in the courses.

This new competency-based assessment system will use module tests in place of midterm and final exams. A few of the new courses proposed by Arts and Science departments have started to use the concept of Module Tests in their courses in these first versions. This will make it easier when they switch to the competency-based assessment system in future. Some common wording regarding module tests was created and has been used in the Arts and Science course proposals. This wording is similar to that of the Examinations Policies section of Arts and Science syllabus, but has been modified to accurately portray the concept of the module tests.

4. Please list the learning objectives for this course:

By the end of this course, students will be expected to:
1. Compute dot products, cross products, and projections for vectors;
2. Integrate a variety of common functions using techniques such as substitutions, parts, partial fractions, and numerical approximations;
3. Perform computations involving complex numbers in standard and polar forms;
4. Utilize integration in various applications, such as computing volume and surface area of solids of revolution, and evaluating improper integrals.

5. Impact of this course
Are the programs of other departments or Colleges affected by this course? This course is for the College of Engineering First Year.
If so, were these departments consulted? (Include correspondence) Yes
Were any other departments asked to review or comment on the proposal? No

6. Other courses or program affected (please list course titles as well as numbers)
6.1 Courses to be deleted? MATH 123 and MATH 124
6.2 Courses for which this course will be a prerequisite? MATH 133 and 134 will replace MATH 123 and 124 as a pathway into 200-level calculus courses.

6.3 Is this course to be required by your majors, or by majors in another program?
Required course in the first-year as part of revised Engineering program.
Students with credit for MATH 134 will be considered to have completed a program requirement for MATH 116.
Students with credit for MATH 134 may not subsequently receive credit for MATH 101, MATH 102, MATH 104, MATH 110, MATH 116, MATH 121, MATH 125, MATH 150, MATH 176 and MATH 177.
7. **Course outline**  
(Weekly outline of lectures or include a draft of the course information sheet.)

See attached syllabus.

8. **Enrolment**  
8.1 Expected enrollment: up to 600  
8.2 From which colleges? Engineering

9. **Student evaluation**  
Give approximate weighting assigned to each indicator (assignments, laboratory work, mid-term test, final examination, essays or projects, etc.)

**Assessment:**  
A numerical course grade out of 100 is calculated using the following weightings of the respective assessments:

- Assignments: 12%
- Laboratories: 18%
- Module Test #1: 35%
- Module Test #2: 35%

9.1 How should this course be graded?  
C – Completed Requirements  
*(Grade options for instructor: Completed Requirements, Fail, IP In Progress)*  
N – Numeric/Percentage  
*(Grade options for instructor: grade of 0% to 100%, IP in Progress)*  
P – Pass/Fail  
*(Grade options for instructor: Pass, Fail, In Progress)*  
S – Special  
*(Grade options for instructor: NA – Grade Not Applicable)* If other, please specify:

9.2 Is the course exempt from the final examination? Yes – No final exam is proposed.  
As shared in the rationale section above this course will use module tests in place of midterm and final exams.

Insert from Rationale:  
This new competency-based assessment system will use module tests in place of midterm and final exams. A few of the new courses proposed by Arts and Science departments have started to use the concept of Module Tests in their courses in these first versions. This will make it easier when they switch to the competency-based assessment system in future. Some common wording regarding
module tests was created and has been used in the Arts and Science course proposals. This wording is similar to that of the Examinations Policies section of Arts and Science syllabus, but has been modified to accurately portray the concept of the module tests.

10. **Required text**
   Include a bibliography for the course.

The course will utilize a number of open-access textbooks that are freely available online:


Additional supplementary notes may also be provided by the course instructor.

11. **Resources**
   11.1 Proposed instructor:
   Mathematics Faculty

   11.2 How does the department plan to handle the additional teaching or administrative workload? Within department.

   11.3 Are sufficient library or other research resources available for this course? Yes

   11.4 Are any additional resources required (library, audio-visual, technology, etc.)? No

12. **Tuition**
   12.1 Will this course attract tuition charges? If so, how much? (use tuition category) TC08
   12.2 Does this course require non-standard fees, such as materials or excursion fees? If so, please include an approved “Application for New Fee or Fee Change Form” [http://www.usask.ca/sezd/info-for-instructors/program-course-preparation.php#course-fees](http://www.usask.ca/sezd/info-for-instructors/program-course-preparation.php#course-fees) No

---

**Detailed Course Information**

1. **Schedule Types**
   Please choose the Schedule Types that can be used for sections that fall under this course:

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CL</td>
<td>Clinical</td>
<td>PRB</td>
<td>Problem Session</td>
</tr>
<tr>
<td>COO</td>
<td>Coop Class</td>
<td>RDG</td>
<td>Reading Class</td>
</tr>
<tr>
<td>FLD</td>
<td>Field Trip</td>
<td>RES</td>
<td>Research</td>
</tr>
<tr>
<td>ICR</td>
<td>Internet Chat Relay</td>
<td>ROS</td>
<td>Roster (Dent Only)</td>
</tr>
<tr>
<td>IHP</td>
<td>Internet Help</td>
<td>SEM</td>
<td>Seminar</td>
</tr>
<tr>
<td>IN1</td>
<td>Internship - Education</td>
<td>SSI</td>
<td>Supervised Self Instruction</td>
</tr>
</tbody>
</table>
2. Course Attributes
Please highlight the attributes that should be attached to the course (they will apply to all sections):

- **2.1 NOAC No Academic Credit**
  0 Credit Unit courses that possess “deemed” CUs (Called Operational Credit Units). NOAC causes the system to roll 0 academic credit units to academic history.

- **2.2 For the College of Arts and Science only: To which program type does this course belong?**
  - FNAR Fine Arts
  - HUM Humanities
  - SCIE Science
  - SOCS Social Science
  - ARNP No Program Type (Arts and Science)

3. Registration Information (Note: multi-term courses cannot be automated as corequisites)

- **3.1 Permission Required:**
- **3.2 Restriction(s): course only open to students in a specific college, program/degree, major, year in program**
  Restricted to students in the College of Engineering.

- **3.3 Prerequisite(s): course(s) that must be completed prior to the start of this course**
  MATH 133, or [(MATH 110 or 123 or 176) and (MATH 164 or 264 or 266)]

- **3.4 Prerequisite(s) or Corequisite(s): course(s) that can be completed prior to or taken at the same time as this course**

- **3.5 Corequisite(s): course(s) that must be taken at the same time as this course**

- **3.6 Notes: recommended courses, repeat restrictions/content overlap, other additional information**

4. List Equivalent Course(s) here: None
An equivalent course can be used in place of the course for which this form is being completed, specifically for the purposes of prerequisite and degree audit checking. Credit will be given for only one of the equivalent courses.

- **4.1 If this is a recently-repurposed course number, please list the courses that are no longer considered to be equivalent:**
*Please note*: If the equivalent courses carry an UNEQUAL number of credit units, DegreeWorks will automatically enforce the following, unless otherwise stated:

- If a 3 credit unit course is considered to be equivalent to a 6 credit unit course, it will fulfill the 6 credit unit requirement and the student will not have to complete another 3 credit units toward the overall number of required credit units for the program.
- If a 6 credit unit course is considered to be equivalent to a 3 credit unit course, ALL 6 of the credit units may be used to fulfill the 3 credit unit requirement.

5. List Mutually-Exclusive Course(s) here: None
Mutually exclusive courses have similar content such that students cannot receive credit for both.

5.1 If this is a recently-repurposed course number, please list the courses that are no longer considered to be mutually exclusive:

*Please note*: SiRIUS cannot enforce a situation where the exclusion goes only one way.

6. Additional Notes:
Land Acknowledgement
At the University of Saskatchewan, we acknowledge we are on Treaty Six Territory and the Homeland of the Métis. We pay our respect to the First Nation and Métis ancestors of this place and reaffirm our relationship with one another.

Instructor: Name: TBD
Office: TBD
Phone: TBD
Email: TBD

Office Hours: TBD

Lectures: See Course Schedule

Laboratory: See Course Schedule

Website: Assignments, solutions, lab schedules, general course information, and announcements will be posted on the course website. Students are responsible for keeping up-to-date with the information on the course website.

Description: This course is a continuation of Engineering Mathematics I. Topics include integration techniques and applications, dot products and cross products for vectors, polar coordinates, and complex numbers.

Prerequisites: MATH 133, or [(MATH 110 or 123 or 176) and (MATH 164 or 264 or 266)].

NOTE: This course is only for students in the College of Engineering.

Co-requisites: N/A

Course Reference Numbers (CRNs): Available from the Dynamic Schedule once courses are built (https://pawnss.usask.ca/ban/bwckschd.p_disp_dyn_sched)

Course Learning Outcomes: By the end of this course, students will be expected to:
1. Compute dot products, cross products, and projections for vectors;
2. Integrate a variety of common functions using techniques such as substitutions, parts, partial fractions, and numerical approximations;
3. Perform computations involving complex numbers in standard and polar forms;
4. Utilize integration in various applications, such as computing volume and surface area of solids of revolution, and evaluating improper integrals.

Assessment: A numerical course grade out of 100 is calculated using the following weightings of respective assessments:
Assignments: 12%
Laboratories: 18%
Module Test #1: 35%
Module Test #2: 35%

Attendance and Participation: While attendance will not be taken, we expect attendance for all lectures and labs, and students will be responsible for the material presented therein.

Criteria That Must Be Met to Pass: N/A

Final Grades: The final grades will be consistent with the "literal descriptors" specified in the university's grading system (at the link below, click on “for undergraduate students”).
https://students.usask.ca/academics/grading/grading-system.php

For information regarding appeals of final grades or other academic matters, please visit the Student Conduct and Appeals section of the University Secretary's website:

Academic Courses Policy: More information on the Academic Courses Policy on course delivery, examinations and assessment of student learning can be found at:
http://policies.usask.ca/policies/academic-affairs/academic-courses.php

Learning Charter: The University of Saskatchewan Learning Charter is intended to define aspirations about the learning experience that the University aims to provide, and the roles to be played in realizing these aspirations by students, instructors and the institution. A copy of the Learning Charter can be found at:
https://teaching.usask.ca/about/policies/learning-charter.php

Course Overview:

This course builds on Engineering Mathematics I. The scope and the sequencing of the topics have been optimized to align with the other courses taken by first year engineering students, so that they will see timely applications of the mathematical tools they acquire in this course.

Course Content/Schedule:

The following table provides an overview of the scheduling of the topics and activities in this course. A note on the distribution of the lecture hours:

- Engineering Mathematics II starts on Tuesday of Week 2 the Winter term (Week 19 if we start counting from the beginning of the Fall term), and ends on Tuesday Week 13.
- There are two (80-minute) lectures every week (one each on Tuesdays and Thursdays), except during Week 8 (no lectures due to the Winter break).
- There is an extra lecture on the Tuesday of Week 14 that is intended to be a feedback session (e.g. to take up the last module test).
<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
<th>Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>No Lectures</td>
<td></td>
</tr>
</tbody>
</table>
| 2 | **Module 1: Vector Operations**  
-- compute dot products, cross products, and projections for vectors | |
| 3 | **Module 2: Integration Techniques**  
-- define a definite integral as a limit using sigma notation for sums | Lab 1 |
| 4 | -- evaluate definite and indefinite integrals using substitutions, parts and partial fraction techniques | Lab 2  
Assignment 1 due |
| 5 | -- use numerical integration to obtain approximations for integrals as well as error bounds of these approximations | Lab 3 |
| 6 | -- determine when an integral is difficult to solve analytically | Lab 4  
Assignment 2 due |
| 7 | **Module 3: Polar Coordinates and Complex Numbers**  
-- convert points and equations between Cartesian and polar coordinates  
-- compute slopes and arc lengths for parametric and polar curves | Lab 5  
Module Test #1 |
| 8 | Winter break | |
| 9 | -- perform basic computations involving complex numbers in standard and polar forms | Lab 6  
Assignment 3 due |
| 10 | **Module 4: Applications of Integrals**  
-- compute area between curves  
-- compute arc lengths of curves | Lab 7 |
| 11 | -- compute volume and surface area of solids of revolution | Lab 8 |
| 12 | -- define improper integrals as limits | Lab 9  
Assignment 4 due |
| 13 | -- compute improper integrals and determine their convergence | Module Test #2 |
| 14 | Feedback Session | |

**Assignments:**

There will be 4 assignments throughout the term, due on the weeks indicated in the Course Schedule above. For each assignment, students will provide detailed solutions to a variety of problems based on the course material. The purpose of these assignments is to provide students feedback on their progress in mastering the relevant material, and to ensure that students are keeping up with the course. The assignments are weighted equally, and as a whole constitute 12% of the final grade.
Laboratory:

During each of the 9 lab sessions, students will be led by the lab instructor to solve problems that are related to the materials that were recently covered in the lectures. Students will complete and submit a short lab assignment during the lab session. The lab assignments are weighted equally, and are worth a total of 18% of the final grade.

Submitting Assignments:

Students are expected to submit their assignments electronically online.

Late Assignments and Missed Labs:

Late assignments will not be accepted, and will receive a grade of zero. There will also be no make-up lab assignments for students who miss labs. Exemptions may be granted only in exceptional circumstances (e.g. documented illness or emergency), in which case the weight of the missed work will be shifted to the Module Test most representative of the corresponding material, as determined by the course instructor.

Module Tests:

This course is comprised of 4 modules. Students’ mastery of the subject material of these modules will be assessed in 2 Module Tests. Each Module Test is 2 hours long and takes place in an evening, outside of class time. The scope and schedule for the Module Tests are as follows:

- Module Test #1 (Week 7) covers Modules 1 and 2;
- Module Test #2 (Week 13) covers Modules 3 and 4.

Students should avoid making prior travel, employment, or other commitments at these times. Alternate times to write the module tests will not be considered except in the case of acceptable reasons, such as illness, bereavement, etc, or a conflict with other university related activities.

If a student is unable to write a module test through no fault of his or her own for medical or other acceptable reasons, the request and documentation must be provided within 3 days of the module test date and an opportunity to write the missed module test may be given at the discretion of the course instructor. Students are encouraged to review all examination policies and procedures, available at: http://students.usask.ca/academics/exams.php

Students will be allowed to bring and use a non-programmable, non-graphing scientific calculator on the module tests. The use of any other aids, such as devices with document storage and/or communication capabilities, is prohibited during all module tests for this course.

Required Activities Outside of Class Time

The two module tests will take place outside of class time, during the evening of weekdays.

Required Resources

Readings/Textbooks

The course will utilize a number of open-access textbooks that are freely available online:


Additional supplementary notes may also be provided by the course instructor.

**Other Required Materials**

Students may use a simple scientific calculator (non-programmable, non-graphing, with no storage capacity) during the module tests. Some eligible calculator models are TI 30Xa, TI 30XII, Casio fx260, Casio fx300MS, Sharp EL531X, and HP 10s.

**Policies on Academic Dishonesty, Academic Appeals and Course Delivery:**

Students are expected to undertake all aspects of their academic work in an ethical manner. Students are expected to submit their own individual work for academic credit, properly cite the work of others, and to follow all rules for examinations. Academic misconduct, plagiarism, and cheating will not be tolerated. Students are responsible for understanding the university’s policies on academic integrity and academic misconduct. If any form of academic misconduct is discovered, appropriate disciplinary action will be taken.


Additional policies and procedures related to student conduct and appeals are provided on the University Secretariat website ([www.usask.ca/secretariat/student-conduct-appeals](http://www.usask.ca/secretariat/student-conduct-appeals)) and on the University website [http://www.usask.ca/integrity/](http://www.usask.ca/integrity/).

A summary of University of Saskatchewan polices relating to academic courses is provided in the document: *Academic Courses Policy on Class Delivery, Examinations, and Assessment of Student Learning* ([http://policies.usask.ca/policies/academic-affairs/academic-courses.php](http://policies.usask.ca/policies/academic-affairs/academic-courses.php)).

**Integrity Defined (from the Office of the University Secretary)**

The University of Saskatchewan is committed to the highest standards of academic integrity and honesty. Students are expected to be familiar with these standards regarding academic honesty and to uphold the policies of the University in this respect. Students are particularly urged to familiarize themselves with the provisions of the Student Conduct & Appeals section of the University Secretary Website and avoid any behavior that could potentially result in suspicions of cheating, plagiarism, misrepresentation of facts and/or participation in an offence. Academic dishonesty is a serious offence and can result in suspension or expulsion from the University.
All students should read and be familiar with the Regulations on Academic Student Misconduct (https://secretariat.usask.ca/student-conduct-appeals/academic-misconduct.php) as well as the Standard of Student Conduct in Non-Academic Matters and Procedures for Resolution of Complaints and Appeals (https://secretariat.usask.ca/student-conduct-appeals/academic-misconduct.php#IXXIIAPPEALS)

For more information on what academic integrity means for students see the Academic Integrity section of the University Library Website at: https://library.usask.ca/academic-integrity#AboutAcademicIntegrity

You are encouraged to complete the Academic Integrity Tutorial to understand the fundamental values of academic integrity and how to be a responsible scholar and member of the USask community - https://library.usask.ca/academic-integrity.php#AcademicIntegrityTutorial

Safety:

Safety is of paramount importance in the College. Students are expected to work in a safe and responsible manner, to follow all safety instructions, and use any specified personal protective equipment. Students failing to behave in a safe manner will be asked to leave.

Recording Lectures:

Lectures will be recorded, when possible, and made available to students in Blackboard so students can rewatch them as needed for study purposes.

Copyright:

Course materials are provided to students based on their registration in a class. Any materials created by course instructors is the intellectual property of the instructors. This includes tests, PowerPoint/PDF slides and other course notes. Additionally, other copyright-protected materials created by textbook publishers and authors may be provided to students based on license terms and educational exceptions in the Canadian Copyright Act (see http://laws-lois.justice.gc.ca/eng/acts/C-42/index.html).

Before copying or distributing others’ copyright-protected materials, students need to ensure that their use of the materials is covered under the University’s Fair Dealing Copyright Guidelines available at http://www.usask.ca/copyright/basics/copyright-policy/fair-dealing-guidelines/index.php. For example, posting others’ copyright-protected materials on the internet is not covered under the University’s Fair Dealing Copyright Guidelines; doing so requires permission from the copyright holder.
For more information about copyright, please visit http://www.usask.ca/copyright/students/rights/index.php or contact the University’s Copyright Coordinator at copyright.coordinator@usask.ca.

Students should be aware that a violation of the university’s copyright policies could be an instance of non-academic misconduct. For example, the practice of uploading or posting copyright-protected materials to course-sharing websites, depositories, or “drop boxes”, without the permission of the copyright holder, could result in a charge of non-academic misconduct under the university’s “Standard of Student Conduct in Non-Academic Matters”, found at the following location: https://www.usask.ca/secretariat/student-conduct-appeals/StudentNon-AcademicMisconduct.pdf.
**Student Conduct:**

Ethical behaviour is an important part of engineering practice. Each professional engineering association has a Code of Ethics, which its members are expected to follow. Since students are in the process of becoming Professional Engineers, it is expected that students will conduct themselves in an ethical manner.

The APEGs (Association of Professional Engineers and Geoscientists of Saskatchewan) Code of Ethics states that engineers shall "conduct themselves with fairness, courtesy and good faith towards clients, colleagues, employees and others; give credit where it is due and accept, as well as give, honest and fair professional criticism" (Section 20(e), The Engineering and Geoscience Professions Regulatory Bylaws, 1997).

The first part of this statement discusses an engineer's relationships with his or her colleagues. One of the ways in which engineering students can demonstrate courtesy to their colleagues is by helping to maintain an atmosphere that is conducive to learning, and minimizing disruptions in class. This includes arriving on time for lectures, turning cell phones and other electronic devices off during lectures, not leaving or entering the class at inopportune times, and refraining from talking to others while the instructor is talking.

**Access and Equity Services (AES) for Students**

Students who have disabilities (learning, medical, physical, or mental health) are strongly encouraged to register with Access and Equity Services (AES) if they have not already done so. Students who suspect they may have disabilities should contact AES for advice and referrals at any time. Those students who are registered with AES with mental health disabilities and who anticipate that they may have responses to certain course materials or topics, should discuss course content with their instructors prior to course add / drop dates. In order to access AES programs and supports, students must follow AES policy and procedures. For more information or advice, visit [https://students.usask.ca/health/centres/access-equity-services.php](https://students.usask.ca/health/centres/access-equity-services.php), or contact AES at 306-966-7273 or aes@usask.ca.

Students registered with AES may request alternative arrangements for module tests. Students must arrange such accommodations through AES by the stated deadlines. Instructors shall provide the examinations for students who are being accommodated by the deadlines established by AES.

**Support Services for Engineering Students:**

- Engineering Student Centre (Rm. 2A05 Engineering Building)
  - Email: esc@usask.ca; Phone: 306-966-5274; [https://engineering.usask.ca/contact_info/esc-office.php](https://engineering.usask.ca/contact_info/esc-office.php)

End of day tutorial sessions will be offered by the College of Engineering for the Common First Year and will provide support for all courses. Please see X for more details.

**Student Learning Services**

Student Learning Services (SLS) offers assistance to U of S undergrad and graduate students. For information on specific services, please see the SLS web site [https://library.usask.ca/studentlearning/](https://library.usask.ca/studentlearning/).

**Teaching, Learning and Student Experience**
The Teaching, Learning and Student Experience Unit (TLSE) focuses on providing developmental and support services and programs to students and the university community. For more information, see https://students.usask.ca/. Specific resources include:

- Student Wellness Centre (3rd & 4th Floors, Place Riel): https://students.usask.ca/health/
- Financial Services: https://students.usask.ca/money/

College of Engineering Attribute Mapping:

This information shows the relationship of the learning outcomes of this course to the graduate attributes intended upon students’ completion of the degree program. This information is used for accreditation purposes.

<table>
<thead>
<tr>
<th>Learning Outcome</th>
<th>A1</th>
<th>A2</th>
<th>A3</th>
<th>A4</th>
<th>A5</th>
<th>A6</th>
<th>A7</th>
<th>A8</th>
<th>A9</th>
<th>A10</th>
<th>A11</th>
<th>A12</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I</td>
<td>I</td>
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<td>2</td>
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<tr>
<td>3</td>
<td>I</td>
<td>I</td>
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<td>D</td>
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<tr>
<td>4</td>
<td>D</td>
<td>D</td>
<td>D</td>
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<td></td>
<td>D</td>
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</tr>
</tbody>
</table>

†Attributes:
A1 A knowledge base for engineering
A2 Problem analysis
A3 Investigation
A4 Design
A5 Use of engineering tools
A6 Individual and team work
A7 Communication skills
A8 Professionalism
A9 Impact of engineering on society and the environment
A10 Ethics and equity
A11 Economics and project management
A12 Life-long learning

‡Instructional Level:
Introduced (I) – Students learn the working vocabulary of the area of content, along with some of the major underlying concepts.
Developed (D) – Students use their working vocabulary and major fundamental concepts to probe more deeply, to read the literature, and to deepen their exploration of the concepts. They may begin to practice, extend, or refine knowledge in familiar contexts.
Applied (A) – Students approach mastery in the area of content. They explore deeply into the discipline and experience the controversies, debate, and uncertainties that characterize the leading edges of any field. They practice, extend, or refine knowledge in unfamiliar contexts.

Accreditation Unit (AU) Mapping: (% of total class AU)

<table>
<thead>
<tr>
<th>Math</th>
<th>Natural Science</th>
<th>Complementary Studies</th>
<th>Engineering Science</th>
<th>Engineering Design</th>
</tr>
</thead>
<tbody>
<tr>
<td>100%</td>
<td>--</td>
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</tr>
</tbody>
</table>

Accreditation Data Collection and Privacy:

Undergraduate programs in the College of Engineering are accredited by the Canadian Engineering Accreditation Board. Student performance data may be collected in this course to support accreditation and continuous program improvement processes. Anonymous samples of student work may also be collected for accreditation purposes. All data provided to the accreditation body or external entities is anonymized and reported in aggregate form to protect your information and identity. If you have any concerns about how your personal information is used or maintained, please contact the Associate Dean Academic, College of Engineering.
1. **Approval by Department Head or Dean**
   1.1 College or School with academic authority: College of Arts & Science
   1.2 Department with academic authority: Department of Physics and Engineering Physics
   1.3 Term from which the course is effective: 202105

2. **Information required for the Catalogue**
   2.1 Label & Number of course: PHYS 152
   2.2 Academic credit units: 1

   2.3 Course Long Title (maximum 100 characters): Introduction to Atoms and Nuclei for Engineering
   
   Course Short Title (maximum 30 characters): Intro Atoms and Nuclei

   2.4 Total Hours: Lecture 9 Seminar Lab 6 Tutorial Other

   2.5 Weekly Hours: Lecture 3 Seminar Lab 3 Tutorial Other

   2.6 Term in which it will be offered: T1 T2 T1 or T2 T1 and T2

   2.7 Prerequisite: Physics 30 or PHYS 90; and (Mathematics B30 and C30; or Foundations of Mathematics 30; or Pre-Calculus 30).

   If there is a prerequisite waiver, who is responsible for signing it?
   D – Instructor/Dept Approval
   H – Department Approval
   I – Instructor Approval

   2.8 Catalogue description (150 words or less):

   Provides a brief introduction to quantum physics, atomic physics and nuclear physics for students of engineering. Topics include evidence for wave-particle duality of photons and electrons, blackbody radiation, photoelectric effect, Compton effect, line spectra, atomic models, nuclear models, radioactivity, nuclear fission and fusion.

   2.9 Do you allow this course to be repeated for credit? No

3. **Please list rationale for introducing this course:**

   Currently a number of Arts & Science departments contribute to the Common First Year for the College of Engineering Bachelor of Science in Engineering (B.E.) program. The College of Engineering is in the process of redesigning this Common First Year to create the most effective first year engineering program in Canada. They are working hard to create something that will excite, engage and inspire their students, and to holistically prepare them for the challenges to come in later years.
This project has been underway since 2016-2017 and has a planned launch of Fall 2021. Over this time there has been extensive consultation between the College of Engineering and specific Departments in the College of Arts & Science. A suite of new Science courses are being proposed for use in this redesigned Common First Year which will replace or complement the use of existing courses.

The College of Engineering wishes to provide their first-year students with broad exposure to four of the Natural Science disciplines in the College of Arts and Science (Biology, Chemistry, Geological Sciences, and Physics). This is to be achieved through short (1 cu) courses in each of these disciplines. Each of the four courses will be delivered in the Fall term. The first-year cohort of engineering students will be divided into four groups and these groups will progress through the four disciplines in rotation. Each course will consist of nine hours of lectures and two, 3-hour labs components. By the end of the term, all first year engineering students will have progressed through all of the courses, having received 36 hours of lecture-based instruction and twenty-four hours of lab/practicum-based instruction.

The plan outlined above necessitates that each course is focused on a subset of disciplinary topics that can be delivered consistently at four distinct times over the term. To facilitate student learning, it was agreed that the four Science courses would seek some commonality in the topics delivered. To that end, it was agreed that the “environment” and “climate change” would be logical candidates. Thus, chemistry will have lab exercises investigating warming associated with different greenhouse gases, physics will discuss blackbody radiation within their course, geological science will deal with Earth system interactions and changes over time, and biology will focus on anthropogenic effects on biodiversity and ecosystems, including human-induced climate change. The four courses will have a common final examination in December with 45 minutes allotted to each course. Beyond that, courses will have a diversity of assignments, labs, quizzes, reports, or an exam at the end of their sections.

Each of these four 1 cu courses will have “GE 102 - Introduction to Engineering” I listed as a Pre- or Co-Requisite. The Introduction to Engineering I course will focus on setting the students up to manage their time, reflect upon their study habits and work in groups – all things that will be important to each of the following courses. Perhaps more importantly, this is where the students will be learning to use TopHat, the LMS, other assessment software, and MS Office. Specifically for these Science courses it provides the lab safety training and acts as the vehicle for a reflective assessment that will incorporate what students learn in each of this 1 cu Science courses, effectively linking them together and solidifying the students’ learning.

The College of Engineering is also working toward a new competency-based assessment system that will be utilized in the new First Year Engineering courses in Fall 2021. The Arts & Science departments will continue to learn more about this system through 2020-2021 and 2021-2022 as it is implemented in Engineering, and will then determine how it can be used in the Science courses attached to the Engineering Common First Year. Revisions to the courses, to implement this assessment system, will be submitted to the appropriate College Academic Programs Committee for approval, prior to use in the courses.
4. Please list the learning objectives for this course:

By the end of this course, students will be expected to:

1. Recognize the importance of quantitative laws of nature as a basis for science and technology.
2. Solve quantitative problems in physics, including independent recognition of which equation or set of equations applies to a problem.
3. Describe the observational evidence that led to the inception of quantum mechanics.
4. Solve basic problems in quantum, atomic and nuclear physics.
5. Recognize applications of quantum, atomic and nuclear physics in science and engineering.

5. Impact of this course

Are the programs of other departments or Colleges affected by this course? This course is for the College of Engineering First Year.

If so, were these departments consulted? (Include correspondence) Yes
Were any other departments asked to review or comment on the proposal? Biology, Chemistry, Physics and Geology reps met a number of times regarding these four – 1cu courses. The course also went through the Arts & Science College Challenge, which provides opportunity for responses by all departments in the College.

6. Other courses or program affected (please list course titles as well as numbers)

6.1 Courses to be deleted? None
6.2 Courses for which this course will be a prerequisite? None

6.3 Is this course to be required by your majors, or by majors in another program?

Required course in the first-year as part of revised Engineering program.

Students with credit for all four of BIOL 102.1, CHEM 142.1, GEOL 102.1 and PHYS 152.1 will receive 3 credit units of elective credit in Arts & Science B.Sc. programs and 3 credit units of "science" or "elective" credit in B.A., B.F.A., or B.Mus. programs. Students who do not pass all 4 courses will receive no credit in Arts & Science programs.

7. Course outline

(Weekly outline of lectures or include a draft of the course information sheet.)

See attached syllabus.

8. Enrolment

8.1 Expected enrollment: up to 600
8.2 From which colleges? Engineering
9. **Student evaluation**
Give approximate weighting assigned to each indicator (assignments, laboratory work, mid-term test, final examination, essays or projects, etc.)

Assessment:

The methods of assessment and their respective weightings are given below:

- Assignments: 25%
- Laboratories: 25%
- Final Exam: 50%

9.1 How should this course be graded?
- C – Completed Requirements
  (Grade options for instructor: Completed Requirements, Fail, IP In Progress)
- N – Numeric/Percentage
  (Grade options for instructor: grade of 0% to 100%, IP in Progress)
- P – Pass/Fail
  (Grade options for instructor: Pass, Fail, In Progress)
- S – Special
  (Grade options for instructor: NA – Grade Not Applicable)
  If other, please specify:

9.2 Is the course exempt from the final examination? No – Final exam date may be schedule outside of the normal exam scheduling process.

10. **Required text**
Include a bibliography for the course.

This resource is used both for PHYS 152.1 in term 1 and PHYS 156.3 in term 2
You need the electronic resource including the textbook and WebAssign for 10 months:
Raymond A. Serway/John W. Jewett
Physics for Scientists and Engineers with Modern Physics, 10th edition
WebAssign for Physics for Scientists and Engineers 10 Months
ISBN: 9781337699297

11. **Resources**
11.1 Proposed instructor:
Rainer Dick, Tom Steele, Rob Pywell

11.2 How does the department plan to handle the additional teaching or administrative workload? Within department.

11.3 Are sufficient library or other research resources available for this course? Yes
11.4 Are any additional resources required (library, audio-visual, technology, etc.)? None

12. **Tuition**
   12.1 Will this course attract tuition charges? If so, how much? (use tuition category) TC14
   12.2 Does this course require non-standard fees, such as materials or excursion fees? If so, please include an approved “Application for New Fee or Fee Change Form”
   http://www.usask.ca/sesd/info-for-instructors/program-course-preparation.php#course-fees
   No

---

**Detailed Course Information**

1. **Schedule Types**
   Please choose the Schedule Types that can be used for sections that fall under this course:

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CL</td>
<td>Clinical</td>
<td>PRB</td>
<td>Problem Session</td>
</tr>
<tr>
<td>COO</td>
<td>Coop Class</td>
<td>RDG</td>
<td>Reading Class</td>
</tr>
<tr>
<td>FLD</td>
<td>Field Trip</td>
<td>RES</td>
<td>Research</td>
</tr>
<tr>
<td>ICR</td>
<td>Internet Chat Relay</td>
<td>ROS</td>
<td>Roster (Dent Only)</td>
</tr>
<tr>
<td>IHP</td>
<td>Internet Help</td>
<td>SEM</td>
<td>Seminar</td>
</tr>
<tr>
<td>IN1</td>
<td>Internship - Education</td>
<td>SSI</td>
<td>Supervised Self Instruction</td>
</tr>
<tr>
<td>IN2</td>
<td>Internship - CMPT &amp; EPIP</td>
<td>STU</td>
<td>Studio</td>
</tr>
<tr>
<td>IN3</td>
<td>Internship - General</td>
<td>SUP</td>
<td>Teacher Supervision</td>
</tr>
<tr>
<td>IND</td>
<td>Independent Studies</td>
<td>TEL</td>
<td>Televised Class</td>
</tr>
<tr>
<td>LAB</td>
<td>Laboratory</td>
<td>TUT</td>
<td>Tutorial</td>
</tr>
<tr>
<td>LC</td>
<td>Lecture/Clinical (Dent Only)</td>
<td>WEB</td>
<td>Web Based Class</td>
</tr>
<tr>
<td>LEC</td>
<td>Lecture</td>
<td>XCH</td>
<td>Exchange Program</td>
</tr>
<tr>
<td>LL</td>
<td>Lecture/Laboratory (Dent Only)</td>
<td>XGN</td>
<td>Ghost Schedule Type Not Applicable</td>
</tr>
<tr>
<td>MM</td>
<td>Multimode</td>
<td>XHS</td>
<td>High School Class</td>
</tr>
<tr>
<td>PCL</td>
<td>Pre-Clinical (Dent Only)</td>
<td>XNA</td>
<td>Schedule Type Not Applicable</td>
</tr>
<tr>
<td>PRA</td>
<td>Practicum</td>
<td>XNC</td>
<td>No Academic Credit</td>
</tr>
</tbody>
</table>

2. **Course Attributes**
   Please highlight the attributes that should be attached to the course (they will apply to all sections):

   2.1 NOAC No Academic Credit
   0 Credit Unit courses that possess “deemed” CUs (Called Operational Credit Units). NOAC causes the system to roll 0 academic credit units to academic history.

   2.2 For the College of Arts and Science only: To which program type does this course belong?
   - FNAR Fine Arts
   - HUM Humanities
   - SCIE Science
   - SOCS Social Science
   - ARNP No Program Type (Arts and Science)

3. **Registration Information (Note: multi-term courses cannot be automated as corequisites)**
3.1 Permission Required:

3.2 Restriction(s): course only open to students in a specific college, program/degree, major, year in program

Restricted to students in the College of Engineering.

3.3 Prerequisite(s): course(s) that must be completed prior to the start of this course

Physics 30 or PHYS 90; and (Mathematics B30 and C30; or Foundations of Mathematics 30; or Pre-Calculus 30).

3.4 Prerequisite(s) or Corequisite(s): course(s) that can be completed prior to or taken at the same time as this course

GE 102 – Introduction to Engineering I

3.5 Corequisite(s): course(s) that must be taken at the same time as this course

3.6 Notes: recommended courses, repeat restrictions/content overlap, other additional information

4. List Equivalent Course(s) here: None

An equivalent course can be used in place of the course for which this form is being completed, specifically for the purposes of prerequisite and degree audit checking. Credit will be given for only one of the equivalent courses.

4.1 If this is a recently-repurposed course number, please list the courses that are no longer considered to be equivalent:

*Please note: If the equivalent courses carry an UNEQUAL number of credit units, DegreeWorks will automatically enforce the following, unless otherwise stated:

- If a 3 credit unit course is considered to be equivalent to a 6 credit unit course, it will fulfill the 6 credit unit requirement and the student will not have to complete another 3 credit units toward the overall number of required credit units for the program.
- If a 6 credit unit course is considered to be equivalent to a 3 credit unit course, ALL 6 of the credit units may be used to fulfill the 3 credit unit requirement.

5. List Mutually-Exclusive Course(s) here: None

Mutually exclusive courses have similar content such that students cannot receive credit for both.

5.1 If this is a recently-repurposed course number, please list the courses that are no longer considered to be mutually exclusive:

*Please note: SiRIUS cannot enforce a situation where the exclusion goes only one way.

6. Additional Notes:
PHYS 152.1  
**Introduction to Atoms and Nuclei for Engineering**  
Fall 2021

**Land Acknowledgement**  
At the University of Saskatchewan, we acknowledge we are on Treaty Six Territory and the Homeland of the Métis. We pay our respect to the First Nation and Métis ancestors of this place and reaffirm our relationship with one another.

**Instructor:** Name (include credentials): TBA  
Office: TBA  
Email: TBA  
Phone: TBA

**Office Hours:** 3 hours/week – TBA

**Lectures:** 3 hours/week – TBA

**Laboratory:** Two 3-hour lab sections in weeks 2 and 3 of the course – Dates/Times TBA  
Lab Instructor: Email:  
Office: Phone:

**Website:** Assignments, solutions, lab schedules, general course information, and announcements will be posted on the course website (PAWS/Blackboard). Students are responsible for keeping up-to-date with the information on the course website. Students are expected to use at least one notification option for new material on the course website (email or text).  
https://bblearn.usask.ca/

**Description:** Provides a brief introduction to quantum physics, atomic physics and nuclear physics for students of engineering. Topics include evidence for wave-particle duality of photons and electrons, blackbody radiation, photoelectric effect, Compton effect, line spectra, atomic models, nuclear models, radioactivity, nuclear fission and fusion.

**Prerequisites:** Physics 30 or PHYS 90; and (Mathematics B30 and C30; or Foundations of Mathematics 30; or Pre-Calculus 30).

**Note:** This course is only open for students in the College of Engineering.

**Pre- or co-requisites:** GE 102: Introduction to Engineering I

**Course Reference Numbers (CRNs):** 3 (lectures), 2 (laboratory)  
Available from the Dynamic Schedule once courses are built  
(https://pawnss.usask.ca/ban/bwckschd.p_disp_dyn_sched)
**Course Learning Outcomes:**

By the end of this course, students will be expected to:

1. Recognize the importance of quantitative laws of nature as a basis for science and technology.
2. Solve quantitative problems in physics, including independent recognition of which equation or set of equations applies to a problem.
3. Describe the observational evidence that led to the inception of quantum mechanics.
4. Solve basic problems in quantum, atomic and nuclear physics.
5. Recognize applications of quantum, atomic and nuclear physics in science and engineering.

**Assessment:**

The methods of assessment and their respective weightings are given below:

- Assignments: 25%
- Laboratories: 25%
- Final Exam: 50%

**Attendance and Participation:**

Students are expected to attend all lectures, and all laboratory sessions in their lab section.

**Criteria That Must Be Met to Pass:**

Students must have attended the labs and submitted the lab reports to achieve a passing grade in this class. If the lab reports have not been submitted by the end of the class, a final grade of less than 50% will be submitted.

**Final Grades:**

The final grades will be consistent with the “literal descriptors” specified in the university's grading system (at the link below, click on “for undergraduate students”).

https://students.usask.ca/academics/grading/grading-system.php

For information regarding appeals of final grades or other academic matters, please visit the Student Conduct and Appeals section of the University Secretary's website:


**Academic Courses Policy:**

More information on the Academic Courses Policy on course delivery, examinations and assessment of student learning can be found at:

http://policies.usask.ca/policies/academic-affairs/academic-courses.php

**Learning Charter:**

The University of Saskatchewan Learning Charter is intended to define aspirations about the learning experience that the University aims to provide, and the roles to be played in realizing these aspirations by students, instructors and the institution. A copy of the Learning Charter can be found at:

https://teaching.usask.ca/about/policies/learning-charter.php
# Course Content/Schedule:

<table>
<thead>
<tr>
<th>Topics</th>
<th>Lecture</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. INTRODUCTION TO THE COURSE</strong></td>
<td>1</td>
</tr>
<tr>
<td>1.1. Overview of the course</td>
<td></td>
</tr>
<tr>
<td>1.2. The nature of physics and relation to other sciences</td>
<td></td>
</tr>
<tr>
<td>1.3. Relation of the course to the other 1cu science courses</td>
<td></td>
</tr>
<tr>
<td>1.4. Basic description of oscillations and waves</td>
<td></td>
</tr>
<tr>
<td><strong>2. INTRODUCTION TO QUANTUM PHYSICS: EVIDENCE FOR WAVE-PARTICLE DUALITY FOR PHOTONS</strong></td>
<td>2</td>
</tr>
<tr>
<td>2.1. Interpretation of spectra</td>
<td></td>
</tr>
<tr>
<td>2.2. Blackbody radiation, Wien's law and Planck's law</td>
<td></td>
</tr>
<tr>
<td>2.3. Photoelectric effect</td>
<td></td>
</tr>
<tr>
<td>2.4. Compton effect</td>
<td></td>
</tr>
<tr>
<td>2.5. Planck's and Compton's relations of wave-particle duality: $E = hf, p = h/\lambda$</td>
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<tr>
<td><strong>3. INTRODUCTION TO ATOMIC PHYSICS AND WAVE-PARTICLE DUALITY FOR ELECTRONS I</strong></td>
<td>3</td>
</tr>
<tr>
<td>3.1. Qualitative discussion of the Rutherford experiment</td>
<td></td>
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<tr>
<td>3.2. Line spectra</td>
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<tr>
<td>3.3. Bohr Model</td>
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<tr>
<td>3.4. de Broglie's observation</td>
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<tr>
<td>3.5. Electron diffraction, Davisson-Germer experiment</td>
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<tr>
<td><strong>4. INTRODUCTION TO ATOMIC PHYSICS AND WAVE-PARTICLE DUALITY FOR ELECTRONS II</strong></td>
<td>4</td>
</tr>
<tr>
<td>4.1. Applications of electron diffraction in electron microscopy and LEED</td>
<td></td>
</tr>
<tr>
<td>4.2. Double slit experiments</td>
<td></td>
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<tr>
<td>4.3. Qualitative discussion of the wave function and the Schrödinger equation</td>
<td></td>
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<tr>
<td>4.4. Heisenberg uncertainty relation</td>
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<tr>
<td><strong>5. INTRODUCTION TO NUCLEAR PHYSICS</strong></td>
<td>5</td>
</tr>
<tr>
<td>5.1. Properties of atomic nuclei, size, composition</td>
<td></td>
</tr>
<tr>
<td>5.2. Nuclear binding energies</td>
<td></td>
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<tr>
<td>5.3. Nuclear models</td>
<td></td>
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<td>5.4. Radioactivity and decay laws</td>
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<tr>
<td>5.5. Radioactive dating</td>
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<tr>
<td><strong>6. INTRODUCTION TO NUCLEAR REACTIONS</strong></td>
<td>6</td>
</tr>
<tr>
<td>6.1. Notation for nuclear reactions</td>
<td></td>
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<tr>
<td>6.2. Q values</td>
<td></td>
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<tr>
<td>6.3. Nuclear fission</td>
<td></td>
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<tr>
<td>6.4. Nuclear fusion</td>
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<tr>
<td>6.5. Advantages and difficulties of nuclear energy sources</td>
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</tbody>
</table>

**Assignments:**
There will be three online assignments posted in the first week of the course. The first online assignment will cover topics from the first two lectures, the second online assignment will cover topics from lectures 3 and 4, and the third online assignment will cover topics from lectures 5 and 6. Final submissions for online assignments are due on the Monday (4 pm) following the second, fourth and sixth lecture, respectively. E.g. after the second lecture on Thursday, you have until the
following Monday 4 pm to submit the first online assignment. Late assignment submissions will not be accepted.

**Laboratory:**
Students need to attend and complete two 3-hour lab periods, one each in the second and third week of the course. See the laboratory manual for details. Students are expected to have studied the descriptions and manuals for the hands on labs before the lab period.

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**Examinations:**
- The Final Examination will be common to all concurrent sections of PHYS 152.1. All final examinations are cumulative and 'closed-book'. A Physics formula sheet will be provided. The final exam will be based on multiple-choice problems and students will have maximum of 3 hours to complete the total exam (comprised of the four Natural Sciences: Biology, Chemistry, Geology, and Physics).
- The final exam will be scheduled at the end of the Natural Sciences Modules through the Engineering Student Centre. Exams can be scheduled at any time between the end of the Natural Sciences Modules and December 23. Please do not schedule travel until after the official exam schedule is released. If a student is unable to write an exam through no fault of his or her own for medical or other valid reasons, documentation must be provided and an opportunity to write the missed exam may be given. Students are encouraged to review all examination policies and procedures:
- Exams are closed book. A formula sheet will be provided with the exam.
- The use of electronic devices, including calculators, phones and watches, with document storage and/or communication capabilities is prohibited during exams.
- Alternate times to write final examinations cannot be accommodated. If a student misses a final exam, application must be made to the Engineering Student Centre to write a deferred exam.
- Students planning on registering with the office for Access and Equity Services for Students (AES) must do so in accordance with AES procedures and deadlines.

**Required Activities Outside of Class Time**
The common final examination for the four 1cu Natural Science courses will be scheduled at the end of the four courses through the Engineering Student Centre.

**Required Resources**
*(This is just one option. It must be coordinated between the PHYS 152.1 (T1) and the PHYS 156.3 instructors):*
You need the electronic resource including the textbook and WebAssign for 10 months:

Raymond A. Serway/John W. Jewett
Physics for Scientists and Engineers with Modern Physics, 10th edition

WebAssign for Physics for Scientists and Engineers 10 Months
ISBN: 9781337699297

Textbooks and access codes for electronic resources are available from the University of Saskatchewan Bookstore: [https://bookstore.usask.ca/students.php#MyTextbooks](https://bookstore.usask.ca/students.php#MyTextbooks)
Policies on Academic Dishonesty, Academic Appeals and Course Delivery:

Students are expected to undertake all aspects of their academic work in an ethical manner. Students are expected to submit their own individual work for academic credit, properly cite the work of others, and to follow all rules for examinations. Academic misconduct, plagiarism, and cheating will not be tolerated. Students are responsible for understanding the university's policies on academic integrity and academic misconduct. If any form of academic misconduct is discovered, appropriate disciplinary action will be taken.


For information regarding appeals of a final grade or other academic matters, please consult the University Council document on Student Appeals of Evaluation, Grading and Academic Standing (http://policies.usask.ca/policies/student-affairs-and-activities/student-appeals.php).

Additional policies and procedures related to student conduct and appeals are provided on the University Secretariat website (www.usask.ca/secretariat/student-conduct-appeals) and on the University website http://www.usask.ca/integrity/.

A summary of University of Saskatchewan polices relating to academic courses is provided in the document: Academic Courses Policy on Class Delivery, Examinations, and Assessment of Student Learning (http://policies.usask.ca/policies/academic-affairs/academic-courses.php).

Integrity Defined (from the Office of the University Secretary)

The University of Saskatchewan is committed to the highest standards of academic integrity and honesty. Students are expected to be familiar with these standards regarding academic honesty and to uphold the policies of the University in this respect. Students are particularly urged to familiarize themselves with the provisions of the Student Conduct & Appeals section of the University Secretary Website and avoid any behavior that could potentially result in suspicions of cheating, plagiarism, misrepresentation of facts and/or participation in an offence. Academic dishonesty is a serious offence and can result in suspension or expulsion from the University.


For more information on what academic integrity means for students see the Academic Integrity section of the University Library Website at: https://library.usask.ca/academic-integrity/#AboutAcademicIntegrity.
You are encouraged to complete the Academic Integrity Tutorial to understand the fundamental values of academic integrity and how to be a responsible scholar and member of the USask community - [https://library.usask.ca/academic-integrity.php#AcademicIntegrityTutorial](https://library.usask.ca/academic-integrity.php#AcademicIntegrityTutorial)

**Safety:**
Safety is of paramount importance in the College. Students are expected to work in a safe and responsible manner, to follow all safety instructions, and use any specified personal protective equipment. Students failing to behave in a safe manner will be asked to leave.

**Recording Lectures:**
Lecture may be recorded, when possible, and made available on Blackboard. Lecture recordings are property of the instructor and must not be made available outside of the course website.

**Copyright:**
Course materials are provided to students based on their registration in a class. Any materials created by course instructors is the intellectual property of the instructors. This includes exams, PowerPoint/PDF slides and other course notes. Additionally, other copyright-protected materials created by textbook publishers and authors may be provided to students based on license terms and educational exceptions in the Canadian Copyright Act (see [http://laws-lois.justice.gc.ca/eng/acts/C-42/index.html](http://laws-lois.justice.gc.ca/eng/acts/C-42/index.html)).

Before copying or distributing others’ copyright-protected materials, students need to ensure that their use of the materials is covered under the University's Fair Dealing Copyright Guidelines available at [http://www.usask.ca/copyright/basics/copyright-policy/fair-dealing-guidelines/index.php](http://www.usask.ca/copyright/basics/copyright-policy/fair-dealing-guidelines/index.php). For example, posting others’ copyright-protected materials on the internet is not covered under the University’s Fair Dealing Copyright Guidelines; doing so requires permission from the copyright holder. For more information about copyright, please visit [http://www.usask.ca/copyright/students/rights/index.php](http://www.usask.ca/copyright/students/rights/index.php) or contact the University’s Copyright Coordinator at copyright.coordinator@usask.ca.

Students should be aware that a violation of the university’s copyright policies could be an instance of non-academic misconduct. For example, the practice of uploading or posting copyright-protected materials to course-sharing websites, depositories, or “drop boxes”, without the permission of the copyright holder, could result in a charge of non-academic misconduct under the university’s “Standard of Student Conduct in Non-Academic Matters”, found at the following location: [https://secretariat.usask.ca/student-conduct-appeals/non-academic-misconduct.php](https://secretariat.usask.ca/student-conduct-appeals/non-academic-misconduct.php).

**Student Conduct:**
Ethical behaviour is an important part of engineering practice. Each professional engineering association has a Code of Ethics, which its members are expected to follow. Since students are in the process of becoming Professional Engineers, it is expected that students will conduct themselves in an ethical manner.

The APEGS (Association of Professional Engineers and Geoscientists of Saskatchewan) Code of Ethics states that engineers shall “conduct themselves with fairness, courtesy and good faith towards clients, colleagues, employees and others; give credit where it is due and accept, as well as give, honest and fair professional criticism” (Section 20(e), The Engineering and Geoscience Professions Regulatory Bylaws, 1997).
The first part of this statement discusses an engineer’s relationships with his or her colleagues. One of the ways in which engineering students can demonstrate courtesy to their colleagues is by helping to maintain an atmosphere that is conducive to learning, and minimizing disruptions in class. This includes arriving on time for lectures, turning cell phones and other electronic devices off during lectures, not leaving or entering the class at inopportun...talking to others while the instructor is talking.

Access and Equity Services (AES) for Students

Students who have disabilities (learning, medical, physical, or mental health) are strongly encouraged to register with Access and Equity Services (AES) if they have not already done so. Students who suspect they may have disabilities should contact AES for advice and referrals at any time. Those students who are registered with AES with mental health disabilities and who anticipate that they may have responses to certain course materials or topics, should discuss course content with their instructors prior to course add / drop dates. In order to access AES programs and supports, students must follow AES policy and procedures. In order to access AES programs and supports, students must follow AES policy and procedures. For more information or advice, visit https://students.usask.ca/health/centres/access-equity-services.php, or contact AES at 306-966-7273 or aes@usask.ca.

Students registered with AES may request alternative arrangements for mid-term and final examinations. Students must arrange such accommodations through AES by the stated deadlines. Instructors shall provide the examinations for students who are being accommodated by the deadlines established by AES.

Support Services for Engineering Students:

- Engineering Student Centre (Rm. 2A05 Engineering Building)
  - Email: esc@usask.ca; Phone: 306-966-5274; https://engineering.usask.ca/contact_info/esc-office.php

End of day tutorial sessions will be offered by the College of Engineering for the Common First Year and will provide support for all courses.

Student Learning Services

Student Learning Services (SLS) offers assistance to U of S undergrad and graduate students. For information on specific services, please see the SLS web site https://library.usask.ca/studentlearning/.

Teaching, Learning and Student Experience

The Teaching, Learning and Student Experience Unit (TLSE) focuses on providing developmental and support services and programs to students and the university community. For more information, see https://students.usask.ca/. Specific resources include:

- Student Wellness Centre (3rd & 4th Floors, Place Riel): https://students.usask.ca/health/
- Financial Services: https://students.usask.ca/money/
College of Engineering Attribute Mapping:

This information shows the relationship of the learning outcomes of this course to the graduate attributes intended upon students' completion of the degree program. This information is used for accreditation purposes.

<table>
<thead>
<tr>
<th>Instructional Level‡</th>
<th>Attribute†</th>
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<tbody>
<tr>
<td></td>
<td>A1</td>
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<tr>
<td>1</td>
<td>I</td>
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<tr>
<td>2</td>
<td>I</td>
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<tr>
<td>3</td>
<td>I</td>
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<tr>
<td>4</td>
<td>I</td>
</tr>
<tr>
<td>5</td>
<td>I</td>
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</tbody>
</table>

†Attributes:
A1 A knowledge base for engineering
A2 Problem analysis
A3 Investigation
A4 Design
A5 Use of engineering tools
A6 Individual and team work
A7 Communication skills
A8 Professionalism
A9 Impact of engineering on society and the environment
A10 Ethics and equity
A11 Economics and project management
A12 Life-long learning

‡Instructional Level:
Introduced (I) – Students learn the working vocabulary of the area of content, along with some of the major underlying concepts.
Developed (D) – Students use their working vocabulary and major fundamental concepts to probe more deeply, to read the literature, and to deepen their exploration of the concepts. They may begin to practice, extend, or refine knowledge in familiar contexts.
Applied (A) – Students approach mastery in the area of content. They explore deeply into the discipline and experience the controversies, debate, and uncertainties that characterize the leading edges of any field. They practice, extend, or refine knowledge in unfamiliar contexts.

Accreditation Unit (AU) Mapping: (% of total class AU)

<table>
<thead>
<tr>
<th>Math</th>
<th>Natural Science</th>
<th>Complementary Studies</th>
<th>Engineering Science</th>
<th>Engineering Design</th>
</tr>
</thead>
<tbody>
<tr>
<td>0%</td>
<td>100%</td>
<td>0%</td>
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<td>0%</td>
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Accreditation Data Collection and Privacy:
Undergraduate programs in the College of Engineering are accredited by the Canadian Engineering Accreditation Board. Student performance data may be collected in this course to support accreditation and continuous program improvement processes. Anonymous samples of student work may also be collected for accreditation purposes. All data provided to the accreditation body or external entities is anonymized and reported in aggregate form to protect your information and identity. If you have any concerns about how your personal information is used or maintained, please contact the Associate Dean Academic, College of Engineering.
New Course Proposal & Creation Form

1. Approval by Department Head or Dean
   1.1 College or School with academic authority: College of Arts & Science
   1.2 Department with academic authority: Department of Physics and Engineering Physics
   1.3 Term from which the course is effective: 202105

2. Information required for the Catalogue
   2.1 Label & Number of course: PHYS 156
   2.2 Academic credit units: 3
   2.3 Course Long Title (maximum 100 characters): Electromagnetism and Waves for Engineering
   Course Short Title (maximum 30 characters): Electromagnetism and Waves
   2.4 Total Hours: Lecture 34.5 Seminar Lab 12 Tutorial Other
   2.5 Weekly Hours: Lecture 4.5 Seminar Lab 3 Tutorial Other
   2.6 Term in which it will be offered: T1 T2 T1 or T2 T1 and T2
   2.7 Prerequisite: PHYS 152; GE 102: Introduction to Engineering I; and MATH 133: Engineering Mathematics I

   If there is a prerequisite waiver, who is responsible for signing it? 
   D – Instructor/Dept Approval
   H – Department Approval
   I – Instructor Approval

   2.8 Catalogue description (150 words or less):
   Provides an introduction to electromagnetism, oscillations and waves. Topics include electric fields and potentials, electric conductivities, magnetic fields, Lorentz force, inductance, superposition and interference of waves, electromagnetic waves.

   2.9 Do you allow this course to be repeated for credit? No

3. Please list rationale for introducing this course:

   Currently a number of Arts & Science departments contribute to the Common First Year for the College of Engineering Bachelor of Science in Engineering (B.E.) program. The College of Engineering is in the process of redesigning this Common First Year to create the most effective first year engineering program in Canada. They are working hard to create something that will excite, engage and inspire their students, and to holistically prepare them for the challenges to come in later years. This project has been underway since 2016-2017 and has a planned launch of Fall 2021. Over this time there has been extensive consultation between the College of Engineering and specific
Departments in the College of Arts & Science. A suite of new Science courses are being proposed for use in this redesigned Common First Year which will replace existing courses currently used.

PHYS 156.3 will replace our current course PHYS 155.3 in the new first year program for Engineering. PHYS 156 will provide the necessary introduction to electricity, magnetism, and oscillations and waves for all first-year Engineering students. This is necessary basic physics knowledge that all engineering students need to succeed in their programs.

The College of Engineering is also working toward a new competency-based assessment system that will be utilized in the new First Year Engineering courses in Fall 2021. The Arts & Science departments will continue to learn more about this system through 2020-2021 and 2021-2022 as it is implemented in Engineering, and will then determine how it can be used in the Science courses attached to the Engineering Common First Year. Revisions to the courses, to implement this assessment system, will be submitted to the appropriate College Academic Programs Committee for approval, prior to use in the courses.

This new competency-based assessment system will use module tests in place of midterm and final exams. A few of the new courses proposed by Arts and Science departments have started to use the concept of Module Tests in their courses in these first versions. This will make it easier when they switch to the competency-based assessment system in future. Some common wording regarding module tests was created and has been used in the Arts and Science course proposals. This wording is similar to that of the Examinations Policies section of Arts and Science syllabus, but has been modified to accurately portray the concept of the module tests.

4. **Please list the learning objectives for this course:**

By the end of this course, students will be expected to:
1. Recognize the importance of quantitative laws of nature as a basis for science and technology.
2. Solve quantitative problems in physics, including independent recognition of which equation or set of equations applies to a problem.
3. Use the laws of Coulomb, Ampère and Faraday to calculate electromagnetic fields for highly symmetric source configurations.
4. Define capacitance, conductivity, and inductance and calculate them in model systems.
5. Describe the scientific principles underlying the function of electric generators and electric motors.
6. Analyze the transient behavior of charge or current in simple RC and RL circuits, respectively.
7. Relate the concepts of oscillation period, frequency, wavelength, wave number and wave speed to one another.
8. Apply quantitative descriptions of wave motion to problems involving waves, including superposition and interference of waves.
9. Describe the basic properties of electromagnetic waves and quantitative features of the different parts of the electromagnetic spectrum.

5. **Impact of this course**

Are the programs of other departments or Colleges affected by this course? This course is for the College of Engineering First Year.

If so, were these departments consulted? (Include correspondence) Yes
Were any other departments asked to review or comment on the proposal? The course went through the Arts & Science College Challenge, which provides opportunity for responses by all departments in the College.

6. **Other courses or program affected** (please list course titles as well as numbers)
   6.1 Courses to be deleted? PHYS 155 (only if both PHYS 156 and the new first year program in engineering are approved)
   6.2 Courses for which this course will be a prerequisite? EP 202: Replace "PHYS 155 or PHYS 115" with "PHYS 155 or PHYS 156 or PHYS 115" in the list of prerequisites.

6.3 Is this course to be required by your majors, or by majors in another program?

Required course in the first-year as part of revised Engineering program.

7. **Course outline**
   (Weekly outline of lectures or include a draft of the course information sheet.)

See attached syllabus.

8. **Enrolment**
   8.1 Expected enrollment: up to 600
   8.2 From which colleges? Engineering

9. **Student evaluation**
   Give approximate weighting assigned to each indicator (assignments, laboratory work, mid-term test, final examination, essays or projects, etc.)

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**Assessment:** The methods of assessment and their respective weightings are given below:

- **Assignments:** 20%
- **Laboratories:** 20%
- **Module 1 Test:** 20%
- **Module 2 Test:** 20%
- **Module 3 Test:** 20%

9.1 How should this course be graded?

- C – Completed Requirements
  
  *(Grade options for instructor: Completed Requirements, Fail, IP In Progress)*

- N – Numeric/Percentage
  
  *(Grade options for instructor: grade of 0% to 100%, IP in Progress)*

- P – Pass/Fail
9.2 Is the course exempt from the final examination? Yes – No final exam is proposed. We would like to use module exams instead of a final exam. These exams will test the three different modules of the course (electricity, magnetism, oscillations and waves). We anticipate that module exams may serve the students better in courses which (like this one) naturally comprise different modules of knowledge, because students can focus on their recent learning instead of cramming the material from more than 30 lecture hours before a final exam.

10. **Required text**
   Include a bibliography for the course.

   This resource is used both for PHYS 152.1 in term 1 and PHYS 156.3 in term 2
   You need the electronic resource including the textbook and WebAssign for 10 months:
   Raymond A. Serway/John W. Jewett
   Physics for Scientists and Engineers with Modern Physics, 10th edition
   WebAssign for Physics for Scientists and Engineers 10 Months
   ISBN: 9781337699297

11. **Resources**
   11.1 Proposed instructor:
   Lenaic Couedel, Chijin Xiao, Sasha Kouostov, Michael Bradley, Rainer Dick, Andrei Smolyakov

   11.2 How does the department plan to handle the additional teaching or administrative workload? Within department.

   11.3 Are sufficient library or other research resources available for this course? Yes

   11.4 Are any additional resources required (library, audio-visual, technology, etc.)? None

12. **Tuition**
   12.1 Will this course attract tuition charges? If so, how much? (use tuition category) TC14
   12.2 Does this course require non-standard fees, such as materials or excursion fees? If so, please include an approved “Application for New Fee or Fee Change Form”
   http://www.usask.ca/sesd/info-for-instructors/program-course-preparation.php#course-fees
   No

**Detailed Course Information**

1. **Schedule Types**
   Please choose the Schedule Types that can be used for sections that fall under this course:

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
</table>

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2. Course Attributes
Please highlight the attributes that should be attached to the course (they will apply to all sections):

2.1 NOAC No Academic Credit
0 Credit Unit courses that possess “deemed” CUs (Called Operational Credit Units). NOAC causes the system to roll 0 academic credit units to academic history.

2.2 For the College of Arts and Science only: To which program type does this course belong?
FNAR Fine Arts
HUM Humanities
SCIE Science
SOCS Social Science
ARNP No Program Type (Arts and Science)

3. Registration Information (Note: multi-term courses cannot be automated as corequisites)
3.1 Permission Required:
3.2 Restriction(s): course only open to students in a specific college, program/degree, major, year in program
Restricted to students in the College of Engineering.

3.3 Prerequisite(s): course(s) that must be completed prior to the start of this course
PHYS 152, GE 102: Introduction to Engineering I, MATH 133: Engineering Mathematics I

3.4 Prerequisite(s) or Corequisite(s): course(s) that can be completed prior to or taken at the same time as this course

3.5 Corequisite(s): course(s) that must be taken at the same time as this course

3.6 Notes: recommended courses, repeat restrictions/content overlap, other additional information

4. List Equivalent Course(s) here:  PHYS 155
An equivalent course can be used in place of the course for which this form is being completed, specifically for the purposes of prerequisite and degree audit checking. Credit will be given for only one of the equivalent courses.

4.1 If this is a recently-repurposed course number, please list the courses that are no longer considered to be equivalent:

*Please note: If the equivalent courses carry an UNEQUAL number of credit units, DegreeWorks will automatically enforce the following, unless otherwise stated:

- If a 3 credit unit course is considered to be equivalent to a 6 credit unit course, it will fulfill the 6 credit unit requirement and the student will not have to complete another 3 credit units toward the overall number of required credit units for the program.
- If a 6 credit unit course is considered to be equivalent to a 3 credit unit course, ALL 6 of the credit units may be used to fulfill the 3 credit unit requirement.

5. List Mutually-Exclusive Course(s) here: PHYS 115
Mutually exclusive courses have similar content such that students cannot receive credit for both.

5.1 If this is a recently-repurposed course number, please list the courses that are no longer considered to be mutually exclusive:

*Please note: SiRIUS cannot enforce a situation where the exclusion goes only one way.

6. Additional Notes:
Land Acknowledgement
At the University of Saskatchewan, we acknowledge we are on Treaty Six Territory and the Homeland of the Métis. We pay our respect to the First Nation and Métis ancestors of this place and reaffirm our relationship with one another.

Instructor: Name (include credentials)
Office
Email
Phone

Optional: Instructor Profile

Office Hours: 3 hours/week – TBA

Lectures: 4.5 hours/week in 8 weeks - TBA

Laboratory: Four 3-hour lab sections in alternate weeks – Dates/Times TBA
Lab Instructor: Email:
Office: Phone:

Website: Assignments, solutions, lab schedules, general course information, and announcements will be posted on the course website (PAWS/Blackboard). Students are responsible for keeping up-to-date with the information on the course website. Students are expected to use at least one notification option for new material on the course website (email or text).
https://bblearn.usask.ca/

Description: Provides an introduction to electromagnetism, oscillations and waves. Topics include electric fields and potentials, electric conductivities, magnetic fields, Lorentz force, inductance, superposition and interference of waves, electromagnetic waves.

Prerequisites: Physics 152.1, GE 102: Introduction to Engineering I, MATH 133: Engineering Mathematics I
Note: This course is only open for students in the College of Engineering.

Course Reference Numbers (CRNs): 4.5 (lectures), 1.5 (laboratory)
Available from the Dynamic Schedule once courses are built (https://pawnss.usask.ca/ban/bwckschd.p_disp_dyn_sched)
Course Learning Outcomes: By the end of this course, students will be expected to:

1. Recognize the importance of quantitative laws of nature as a basis for science and technology.
2. Solve quantitative problems in physics, including independent recognition of which equation or set of equations applies to a problem.
3. Use the laws of Coulomb, Ampère and Faraday to calculate electromagnetic fields for highly symmetric source configurations.
4. Define capacitance, conductivity, and inductance and calculate them in model systems.
5. Describe the scientific principles underlying the function of electric generators and electric motors.
6. Analyze the transient behavior of charge or current in simple RC and RL circuits, respectively.
7. Relate the concepts of oscillation period, frequency, wavelength, wave number and wave speed to one another.
8. Apply quantitative descriptions of wave motion to problems involving waves, including superposition and interference of waves.
9. Describe the basic properties of electromagnetic waves and quantitative features of the different parts of the electromagnetic spectrum.

Assessment: The methods of assessment and their respective weightings are given below:

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Weighting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>20%</td>
</tr>
<tr>
<td>Laboratories</td>
<td>20%</td>
</tr>
<tr>
<td>Module 1 Test</td>
<td>20%</td>
</tr>
<tr>
<td>Module 2 Test</td>
<td>20%</td>
</tr>
<tr>
<td>Module 3 Test</td>
<td>20%</td>
</tr>
</tbody>
</table>

Attendance and Participation: Students are expected to attend all lectures, and all laboratory sessions in their lab section.

Criteria That Must Be Met to Pass: Students must have attended the labs and submitted the lab reports to achieve a passing grade in this class. If the lab reports have not been submitted by the end of the class, a final grade of less than 50% will be submitted.

Final Grades: The final grades will be consistent with the “literal descriptors” specified in the university's grading system (at the link below, click on “for undergraduate students”).

https://students.usask.ca/academics/grading/grading-system.php

For information regarding appeals of final grades or other academic matters, please visit the Student Conduct and Appeals section of the University Secretary's website:


Academic Courses Policy: More information on the Academic Courses Policy on course delivery, examinations and assessment of student learning can be found at:

http://policies.usask.ca/policies/academic-affairs/academic-courses.php

Learning Charter: The University of Saskatchewan Learning Charter is intended to define aspirations about the learning experience that the University aims to provide,
and the roles to be played in realizing these aspirations by students, instructors and the institution. A copy of the Learning Charter can be found at: 
https://teaching.usask.ca/about/policies/learning-charter.php

Course Content/Schedule:

The course comprises three thematic modules:
1. Electricity (8 lectures)
2. Magnetism (8 lectures)
3. Oscillations and Waves (7 lectures)
Module tests will be scheduled outside of class time as 1.5 hour tests after the conclusion of each module.

<table>
<thead>
<tr>
<th>Topics</th>
<th>Approximate Lecture Hours</th>
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<tbody>
<tr>
<td><strong>1. ELECTRIC CHARGES AND FIELDS I</strong></td>
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<tr>
<td>1.1. Overview of the course</td>
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<td>1.2. Properties of electric charges</td>
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<td>1.3. Charges by induction</td>
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<td>1.4. Coulomb’s law</td>
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<td>1.5. Electric field lines</td>
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<td>1.6. Motion of charges in uniform electric fields</td>
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<td><strong>2. ELECTRIC CHARGES AND FIELDS II</strong></td>
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<td>2.1. Electric field of continuous charge distributions</td>
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<td>2.2. Electric flux and relation to charge</td>
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<td>2.3. Electric fields of symmetric charge distributions</td>
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<td><strong>3. ELECTRIC POTENTIALS I</strong></td>
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<tr>
<td>3.1. Definition of electric potential</td>
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<td>3.2. Potential difference in a uniform electric field</td>
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<td>3.3. Electric potential and potential energy for point charges</td>
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<td><strong>4. ELECTRIC POTENTIALS II</strong></td>
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<td>4.2. Electric potential of continuous charge distributions</td>
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<td>4.3. Conductors in electrostatic equilibrium</td>
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<td><strong>5. CAPACITANCE AND DIELECTRICS</strong></td>
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<td>5.1. Definition of capacitance</td>
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<td>5.2. Combinations of capacitors</td>
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<td>5.3. Energy stored in capacitors</td>
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<td>5.4. Capacitors with dielectrics</td>
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<td>5.5. Electric dipoles</td>
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<td>5.6. Atomic description of dielectrics</td>
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<td><strong>6. CURRENT AND CONDUCTIVITY</strong></td>
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<td>6.1. Definitions of current (review) and current density</td>
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<td>6.2. Review of Ohm’s law</td>
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<td>6.3. Temperature behavior of resistance</td>
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<td>6.4. Power</td>
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<td>6.5. RC transients: Charging and discharging of capacitors</td>
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<td><strong>7. MODULE 1 TEST: 1.5 HOURS OUT OF CLASS TIME</strong></td>
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<td>8.</td>
<td><strong>Particles in Magnetic Fields I</strong></td>
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<td>8.1. Units for magnetic fields</td>
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<td>8.2. Lorentz force and right hand rule</td>
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<td>8.3. Motion of charged particles in a uniform magnetic field</td>
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<td>8.4. Cyclotron frequency</td>
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<td><strong>Particles in Magnetic Fields II</strong></td>
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<td>9.1. Mass spectrometers</td>
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<td>9.2. Magnetic forces on current-carrying conductors</td>
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<td>9.3. Torque on current loops</td>
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<td>9.4. Hall effect</td>
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<td><strong>Sources of Magnetic Fields I</strong></td>
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<td>10.1. Biot-Savart law</td>
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<td><strong>Sources of Magnetic Fields II</strong></td>
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<td>11.1. Magnetic fields of solenoids</td>
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<td>11.2. Absence of magnetic monopoles</td>
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<td>11.3. Magnetic materials</td>
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<td>11.4. Sources of magnetism in materials</td>
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<td>12.</td>
<td><strong>Faraday's Law of Induction</strong></td>
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<td>12.1. Induction for loops</td>
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<td>12.3. Lenz's law</td>
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<td>13.</td>
<td><strong>Electric Generators and Motors</strong></td>
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<td>13.1. Generators</td>
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<td>13.2. Electric motors</td>
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<td>13.3. Eddy currents</td>
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<td><strong>Inductance</strong></td>
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<td>14.1. Self-induction and definition of inductance</td>
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<td>14.2. Units for inductance</td>
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<td>14.3. RL transients: Switching of currents in circuits with inductance</td>
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<td>14.4. Energy in magnetic fields</td>
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<td>15.</td>
<td><strong>Module 2 Test: 1.5 Hours Out of Class Time</strong></td>
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<td>16.</td>
<td><strong>Oscillations I</strong></td>
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<td>16.1. Springs and Hooke's law</td>
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<td>16.2. Particle in harmonic motion</td>
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<td>16.3. Energy in harmonic motion</td>
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<td>16.4. Simple pendulum</td>
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<td>17.</td>
<td><strong>Oscillations II</strong></td>
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<td>17.1. Oscillations in damped systems</td>
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<td>17.2. Forced oscillations</td>
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<td>17.3. Resonance</td>
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<td>18.</td>
<td><strong>Waves</strong></td>
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<td>18.1. Waves as propagating disturbances</td>
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<td>18.2. Harmonic waves</td>
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<td>18.3. Wave speed and its relation to frequency and wavelength</td>
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<td>18.4. Energy transfer on a string</td>
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<td>19.</td>
<td><strong>Sound Waves</strong></td>
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<td>19.1. Sound waves in liquid and solid media</td>
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<td>19.2. Speeds of sound waves</td>
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Assignments:
There will be 6 homework assignments to practice problem solving related to the lecture material. The assignments are due one week after posting on the course website. Late submissions will not be accepted.

Laboratory:
Students need to attend and complete four 3-hour lab periods. See the laboratory manual for details. Students are expected to have studied the descriptions and manuals for the hands on labs before the lab period.

Module Tests:
- This course comprises 3 modules. Each module will end with a module test conducted outside of class time as a required activity outside class time. The module test will only assess the content of the particular module specified for that test. The schedule for the Module Tests is: (Note: Dates and Times TBA)
  - Module on Electricity - Test #1: Month, Day, Year, start time-end time
  - Module on Magnetism - Test #2: Month, Day, Year, start time-end time
  - Module on Oscillations and Waves - Test #3: Month, Day, Year, start time-end time
- Students should avoid making prior travel, employment, or other commitments at these times. If a student is unable to write a module test through no fault of his or her own for medical or other acceptable reasons, the request and documentation must be provided within 3 days of the module test date and an opportunity to write the missed exam may be given. Students are encouraged to review all examination policies and procedures: [http://students.usask.ca/academics/exams.php](http://students.usask.ca/academics/exams.php)
- Alternate times to write Module Tests will not be considered except in the case of acceptable reasons, such as illness, bereavement, etc., or a conflict with other university related activities.
- The use of electronic devices, including calculators, phones and watches, with document storage and/or communication capabilities is prohibited during exams for this course.
- Students planning on registering with the office for Access and Equity Services for Students (AES) must do so in accordance with AES procedures and deadlines.
- Module tests are closed book. A formula sheet will be provided with the tests.

### Required Activities Outside of Class Time

After each of the three modules (electricity, magnetism, oscillations and waves) a Module Test will be scheduled as a 1.5-hour test.

### Required Resources

(This is just one option. It must be coordinated between the PHYS 152.1 and the PHYS 156.3 instructors):

You need the electronic resource including the textbook and WebAssign for 10 months:

Raymond A. Serway/John W. Jewett
Physics for Scientists and Engineers *with Modern Physics*, 10th edition

WebAssign for Physics for Scientists and Engineers 10 Months
ISBN: 9781337699297

Textbooks and access codes for electronic resources are available from the University of Saskatchewan Bookstore: [https://bookstore.usask.ca/students.php#MyTextbooks](https://bookstore.usask.ca/students.php#MyTextbooks)

### Policies on Academic Dishonesty, Academic Appeals and Course Delivery:

Students are expected to undertake all aspects of their academic work in an ethical manner. Students are expected to submit their own individual work for academic credit, properly cite the work of others, and to follow all rules for examinations. Academic misconduct, plagiarism, and cheating will not be tolerated. Students are responsible for understanding the university’s policies on academic integrity and academic misconduct. If any form of academic misconduct is discovered, appropriate disciplinary action will be taken.


Additional policies and procedures related to student conduct and appeals are provided on the University Secretariat website ([www.usask.ca/secretariat/student-conduct-appeals](http://www.usask.ca/secretariat/student-conduct-appeals)) and on the University website [http://www.usask.ca/integrity/](http://www.usask.ca/integrity/).

A summary of University of Saskatchewan polices relating to academic courses is provided in the document: *Academic Courses Policy on Class Delivery, Examinations, and Assessment of Student
Learning
(http://policies.usask.ca/policies/academic-affairs/academic-courses.php).

Integrity Defined (from the Office of the University Secretary)

The University of Saskatchewan is committed to the highest standards of academic integrity and honesty. Students are expected to be familiar with these standards regarding academic honesty and to uphold the policies of the University in this respect. Students are particularly urged to familiarize themselves with the provisions of the Student Conduct & Appeals section of the University Secretary Website and avoid any behavior that could potentially result in suspicions of cheating, plagiarism, misrepresentation of facts and/or participation in an offence. Academic dishonesty is a serious offence and can result in suspension or expulsion from the University.


For more information on what academic integrity means for students see the Academic Integrity section of the University Library Website at: https://library.usask.ca/academic-integrity#AboutAcademicIntegrity

You are encouraged to complete the Academic Integrity Tutorial to understand the fundamental values of academic integrity and how to be a responsible scholar and member of the USask community - https://library.usask.ca/academic-integrity.php#AcademicIntegrityTutorial

Safety:
Safety is of paramount importance in the College. Students are expected to work in a safe and responsible manner, to follow all safety instructions, and use any specified personal protective equipment. Students failing to behave in a safe manner will be asked to leave.

Recording Lectures:
Lecture may be recorded, when possible, and made available on Blackboard. Lecture recordings are property of the instructor and must not be made available outside of the course website.

Copyright:
Course materials are provided to students based on their registration in a class. Any materials created by course instructors is the intellectual property of the instructors. This includes exams, PowerPoint/PDF slides and other course notes. Additionally, other copyright-protected materials created by textbook publishers and authors may be provided to students based on license terms and educational exceptions in the Canadian Copyright Act (see http://laws-lois.justice.gc.ca/eng/acts/C-42/index.html).

Before copying or distributing others’ copyright-protected materials, students need to ensure that their use of the materials is covered under the University’s Fair Dealing Copyright Guidelines available at http://www.usask.ca/copyright/basics/copyright-policy/fair-dealing-guidelines/index.php. For example, posting others’ copyright-protected materials on the internet is not covered under the University’s Fair Dealing Copyright Guidelines; doing so requires permission from the copyright holder. For more information about copyright, please visit
Students should be aware that a violation of the university’s copyright policies could be an instance of non-academic misconduct. For example, the practice of uploading or posting copyright-protected materials to course-sharing websites, depositories, or “drop boxes”, without the permission of the copyright holder, could result in a charge of non-academic misconduct under the university’s “Standard of Student Conduct in Non-Academic Matters”, found at the following location: https://secretariat.usask.ca/student-conduct-appeals/non-academic-misconduct.php.

Student Conduct:
Ethical behaviour is an important part of engineering practice. Each professional engineering association has a Code of Ethics, which its members are expected to follow. Since students are in the process of becoming Professional Engineers, it is expected that students will conduct themselves in an ethical manner.

The APEGS (Association of Professional Engineers and Geoscientists of Saskatchewan) Code of Ethics states that engineers shall “conduct themselves with fairness, courtesy and good faith towards clients, colleagues, employees and others; give credit where it is due and accept, as well as give, honest and fair professional criticism” (Section 20(e), The Engineering and Geoscience Professions Regulatory Bylaws, 1997).

The first part of this statement discusses an engineer’s relationships with his or her colleagues. One of the ways in which engineering students can demonstrate courtesy to their colleagues is by helping to maintain an atmosphere that is conducive to learning, and minimizing disruptions in class. This includes arriving on time for lectures, turning cell phones and other electronic devices off during lectures, not leaving or entering the class at inopportune times, and refraining from talking to others while the instructor is talking.

Access and Equity Services (AES) for Students

Students who have disabilities (learning, medical, physical, or mental health) are strongly encouraged to register with Access and Equity Services (AES) if they have not already done so. Students who suspect they may have disabilities should contact AES for advice and referrals at any time. Those students who are registered with AES with mental health disabilities and who anticipate that they may have responses to certain course materials or topics, should discuss course content with their instructors prior to course add / drop dates. In order to access AES programs and supports, students must follow AES policy and procedures. For more information or advice, visit https://students.usask.ca/health/centres/access-equity-services.php, or contact AES at 306-966-7273 or aes@usask.ca.

Students registered with AES may request alternative arrangements for mid-term and final examinations. Students must arrange such accommodations through AES by the stated deadlines. Instructors shall provide the examinations for students who are being accommodated by the deadlines established by AES.

Support Services for Engineering Students:
- Engineering Student Centre (Rm. 2A05 Engineering Building)
Email: esc@usask.ca; Phone: 306-966-5274; https://engineering.usask.ca/contact_info/esc-office.php

End of day tutorial sessions will be offered by the College of Engineering for the Common First Year and will provide support for all courses. Please see X for more details.

**Student Learning Services**

Student Learning Services (SLS) offers assistance to U of S undergrad and graduate students. For information on specific services, please see the SLS web site https://library.usask.ca/studentlearning/.

**Teaching, Learning and Student Experience**

The Teaching, Learning and Student Experience Unit (TLSE) focuses on providing developmental and support services and programs to students and the university community. For more information, see https://students.usask.ca/.

**College of Engineering Attribute Mapping:**

This information shows the relationship of the learning outcomes of this course to the graduate attributes intended upon students’ completion of the degree program. This information is used for accreditation purposes.

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<th>Learning Outcome</th>
<th>A1</th>
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*Attributes:
- **A1**: A knowledge base for engineering
- **A2**: Problem analysis
- **A3**: Investigation
- **A4**: Design
- **A5**: Use of engineering tools
- **A6**: Individual and team work
- **A7**: Communication skills
- **A8**: Professionalism
- **A9**: Impact of engineering on society and the environment
- **A10**: Ethics and equity
- **A11**: Economics and project management
- **A12**: Life-long learning

*Instructional Level:
- **Introduced (I)** – Students learn the working vocabulary of the area of content, along with some of the major underlying concepts.
- **Developed (D)** – Students use their working vocabulary and major fundamental concepts to probe more deeply, to read the literature, and to deepen their exploration of the concepts. They may begin to practice, extend, or refine knowledge in familiar contexts.
- **Applied (A)** – Students approach mastery in the area of content. They explore deeply into the discipline and experience the controversies, debate, and uncertainties that characterize the leading edges of any field. They practice, extend, or refine knowledge in unfamiliar contexts.
Accreditation Unit (AU) Mapping: (% of total class AU)

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<tr>
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<th>Complementary Studies</th>
<th>Engineering Science</th>
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Accreditation Data Collection and Privacy:
Undergraduate programs in the College of Engineering are accredited by the Canadian Engineering Accreditation Board. Student performance data may be collected in this course to support accreditation and continuous program improvement processes. Anonymous samples of student work may also be collected for accreditation purposes. All data provided to the accreditation body or external entities is anonymized and reported in aggregate form to protect your information and identity. If you have any concerns about how your personal information is used or maintained, please contact the Associate Dean Academic, College of Engineering.