GE 152.1
Electrical Circuits I
Fall 2021

UNIVERSITY OF SASKATCHEWAN

Land Acknowledgement

As we engage in teaching and learning, we would like to acknowledge that the Saskatoon campus of the University of Saskatchewan is on ***Treaty Six Territory*** and the ***Homeland of the Métis***. We pay our respects to the First Nation and Métis ancestors of this place and reaffirm our relationship with one another. We would also like to recognize that some may be attending this course from other traditional Indigenous lands. We ask that you take a moment to make your own Land Acknowledgement to the peoples of those lands. In doing so, we are actively participating in reconciliation as we navigate our time in this course, learning and supporting each other.

COVID-19

Concerning the COVID-19 pandemic, important information, rules, and requirements for University of Saskatchewan students (which may get periodically changed and/or updated) can be found here: https://covid19.usask.ca/. It is the responsibility of students to keep up-to-date and abide by these rules and requirements. Right now, the impact of student choices and activities when not on campus cannot be separated from time spent on campus. In order to "protect the pack", the university is asking all students who are doing in-person work to be mindful and do whatever possible to lower the risk that you will contract COVID-19 and bring it onto campus. Students are expected to follow all guidance provided by the University's Pandemic Recovery/Response Team (PRT), College/Department, professors, lab instructors, TAs, and any other staff member involved in the in-person academic program activities e.g. Protective Services, Safety Resources. If there is a need for the class to temporarily stop meeting in-person for a period of time (for labs), you will be notified. If this occurs, you will be provided with detailed information on what you will need to do in place of the in-person labs e.g. read content posted in Canvas, and complete learning activities in Canvas). You would be notified of such situations via email and/or through Canvas.

Respectful Learning Environment

We will endeavor to facilitate equity, diversity, and inclusion within our learning spaces. If a student demonstrates behavior that is hateful, bullying, or harassing, that student may be excluded from the learning space or software platform.

Course 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 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 Instructor

Zoe Mao, B.Sc., zoe.mao@usask.ca

This is the person to contact for anything related to this course that is **not** about the subject matter content.

Office Hours By appointment i.e. email your instructor to arrange a time to meet.

Classes

Electrical Circuits

The lectures in this course, including your participation in them, will be recorded and made available only to students in the course for viewing via Canvas after each classroom session. This is done, in part, to ensure that students unable to join the in-person lectures (due to, for example, medical reasons) can view the session at a later time. This will also provide you the opportunity to review any material discussed in class.

Please remember that course recordings belong to your instructor and the University, and are protected by copyright. Do not share recordings without the explicit permission of the instructor.

For questions about recording and use of sessions in which you have participated, including any concerns related to your privacy, please contact your instructor. More information on class recordings can be found in the Academic Courses Policy

https://policies.usask.ca/policies/academic-affairs/academic-courses.php#5ClassRecordings.

Matlab

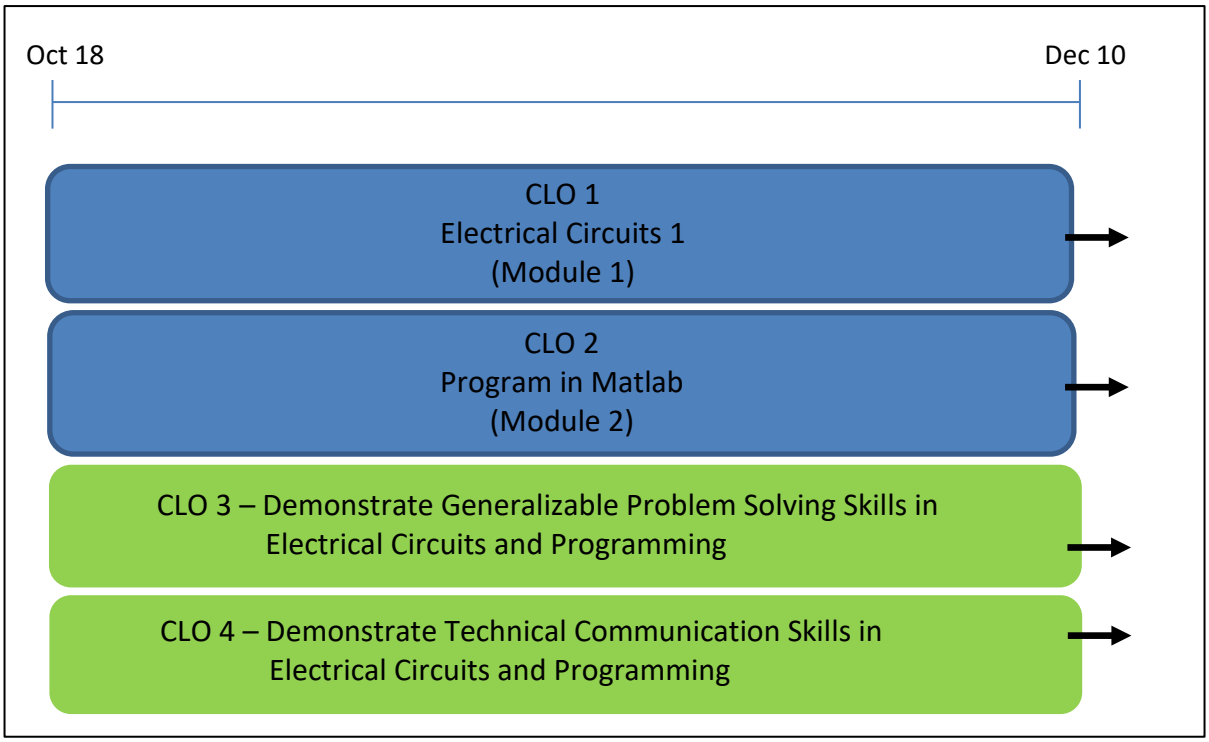
Matlab classes will be in-person. There will be a total of 6 Matlab classes in the course. They will occur once a week during the weeks of Oct 25, Nov 1, Nov 15, Nov 22, Nov 29, and Dec 6. Attendance is strongly advised as these classes will not be recorded.

Course Website

All course materials, including any lecture videos, worked examples, assignments, solutions, lab schedules, course notes/slides, general course information, and announcements, will be posted or linked on the course's Canvas Learning Management System (LMS) website. Students are responsible for keeping up-to-date with the information on these sites (which can be accessed through PAWS or www.canvas.usask.ca). **NB: there will be one Canvas site for the whole course.**

Course Learning Outcomes

This course consists of two core modules as well as material assessed in parallel. The modules and the parallel materials cover four (4) Course Learning Outcomes (CLOs), as shown in the schematic below. Competence in this course is assessed via each of these 4 Course Learning Outcomes. A further breakdown and mark weighting is explained below.



Each of the 4 Course Learning Outcomes (CLOs) displayed in the schematic above can be split into Root Learning Outcomes (RLOs). The lists below show the grading weights for each CLO and for corresponding RLOs.

CLO 1 – Analyze Resistive Direct-Current (DC) Electrical Circuits (45% of Final Course Grade)

CLO 1 will be assessed in a module (Module 1). By the end of this module, students will be expected to:	Weight (%)
1.1 identify and define fundamental electrical circuit concepts (Type A/unlimited tries)	Pass/Fail
1.2 draw and interpret resistive DC circuit diagrams (70% Type B/30% Type C);	10
1.3 apply Kirchhoff's Voltage Law, Kirchhoff's Current Law and Ohm's Law to Conduct Basic Resistive DC Circuit Analysis (80% Type B/20% Type C);	30
1.4 calculate Electrical Power Flow in Simple Resistive DC Circuits (100% Type B), and	20
1.5 apply node analysis, mesh analysis, the principle of superposition, Thevenin's theorem and Norton's theorem to Conduct Intermediate Resistive DC Circuit Analysis (60% Type B/40% Type C).	40

CLO 2 - Program in Matlab (35% of Final Course Grade)

CLO 2 will be assessed in a module (Module 2). By the end of this module, students will be expected to:	Weight (%)
2.1 recognize, define, and use terms relevant to programming in Matlab, navigate the Matlab interface, and use Matlab as a powerful calculator (Type A/unlimited tries)	Pass/Fail
2.2 plot 2D data (100% Type B);	10

2.3	implement display and file I/O (100% Type B);	15
2.4	create user-defined functions (100% Type B+); and	20
2.5	code basic programs in Matlab (100% Type B+).	55

CLO 3 - Demonstrate Generalizable Problem Solving Skills in Electrical Circuits and Matlab Programming (10% of Final Course Grade)

CLO 3 will be assessed throughout the course. By the end of this course, students will be expected to:		Weight (%)
4.1	frame solutions to DC circuits problems with Given, Find, Assumptions, circuit diagrams, systems of equations developed from circuit diagrams, and Conclusions (Type A)	Pass/Fail
4.2	exhibit technical accuracy, precision and thoroughness in framing solutions to DC circuits problems with Given, Find, Assumptions, and Conclusions (100% Type B); and	50
4.3	develop algorithms for computer programming (100% Type B+).	50

CLO 4 - Demonstrate Technical Communication Skills in Electrical Circuits and Matlab Programming (10% of Final Course Grade)

CLO 4 will be assessed throughout the course. By the end of this course, students will be expected to:		Weight (%)
2.1	document code (headers, function interfaces, line by line commenting, and variable naming) (100% Type B+);	25
2.2	organize program structure and formatting (100% Type B+);	25
2.3	express proper notation when solving circuits problems (100% Type B); and	25
2.4	format the steps and the logical flow of solutions to circuits problems (100% Type B).	25

Assessment System

This course uses a competency-based assessment (CBA) system that produces final numeric (percentage) grades. It requires that students demonstrate a minimum level of competence in key knowledge and skills, as well as in basic integrative problem solving skills, in order to obtain a passing grade.

Question Types

In every part of the course, each question on each assessment will be clearly indicated as being one of the following four Question Types:

Type A: These are key knowledge and basic skills vital to success in the course. They are the building blocks required for success in performing the more integrative skills in the course.

Type B: These questions require that Type A knowledge and skills be applied in an integrative manner to solve basic problems that should be familiar to the student from lectures.

Type B+: These questions can be adequately answered at a level similar to Type B questions. However, to demonstrate higher levels of competence with these questions, skills and knowledge similar to those required of Type C questions will be required.

Type C: These questions require an ability to apply the knowledge and skills from lectures in an advanced integrative manner to solve challenging problems that may not be familiar to the student.

Requirements to Pass the Course

To pass the course, students must do all of the following:

a) complete all Type A quizzes and requirements,
b) achieve at least 70% in the weighted Type B materials of all 4 CLOs (separately), and
c) achieve at least 50% in the weighted Type B+ materials of the 3 CLOs (separately) with Type B+ materials.

Otherwise, the final course grade will be a maximum of 49%. There are no minimum passing requirements for Type C questions. Type B or B+ work submitted after a missed Type A deadline will be assigned a grade of zero. Once one is caught up on the Type A quizzes, grading will resume.

Course Grades

Course grades will be calculated from a weighted average of CLO grades according to the weights indicated in the Course Learning Outcomes above. The only exception to this will be if a student achieves a "raw" grade of 50% or higher, but fails to meet the requirements stated in Requirements to Pass the Course above. Then they will receive a final course grade of 49%.

Type A Quizzes

For Type A Root Learning Outcomes (1.1 in CLO1 and 2.1 in CLO2) there will be 5 short quizzes for each of these RLOs available online on the Mobius™ Learning Management System (LMS) and linked through Canvas. If a student does not pass a quiz on the first try, they are provided with tips and tutorial resources to assist them and they can also seek help from a TA or instructor. They can retry any Type A quiz at any time, any number of times. There is no penalty for incorrect answers, other than having to repeat the quiz. Completion (passing) of all the Type A quizzes is a condition for passing the course.

Type B, B+ and C Assessments

For the Electrical Circuits module and for the Matlab module, they will each have 4 assignments and a Module Test. For Electrical Circuits, the assignments and Module Test will assess Type B/C materials. For Matlab, the assignments and Module Test will assess Type B/B+ materials.

For every one of these assessments, the Type B, B+ and C questions will be clearly identified and each assessment will also clearly describe which Root Learning Outcomes are its focus. There are no minimum performance requirements on Type C assessments. However, students only get one chance at each Type C assessment. For Type B assessments, as previously noted, students must get at least 70% on a weighted average of the Type B materials in each of the 4 CLOs, and at least 50% on a weighted average of the Type B+ material in each of the 3 CLOs that have Type B+ materials. If they fail to do so, students may be given the opportunity to complete a Top Up Module Test to improve their Type B grades to at least 70% and/or their Type B+ grades to at least 50%, in each module. These Top Up Module Tests will typically take place about 2 weeks after the Module Test (see the *Course Assessment Schedule*, below).

Assignments: Students will upload assignments to Crowdmark for marking. The instructor will provide instructions on how to do that. Not all questions may be marked. Circuits questions must be completed as per the **GE 152 Circuits Solution Requirements and Style Guide Fall 2021** document that will be provided to all students on Canvas. Solutions will be posted after the due date. The TAs and instructors will try to mark assignments within a week. Late assignments will receive a grade of zero, unless prior permission is granted by the instructor.

If a student is unable to complete an assessment through no fault of their own for medical or other acceptable reasons, documentation must be provided and a Top Up opportunity for the missed assessment will be given. Please contact Dr. Sean Maw if this is your situation. Students planning on registering with the office of Access and Equity Services for Students (AES) must do so in

accordance with AES procedures and deadlines, in order to have extra time and/or accommodations to complete assignments.

Module Tests: There will be one scheduled Module Test per module i.e. one for Circuits and one for Matlab. These will nominally be 120 minute tests (plus 30 mins for electronic submission) usually involving 3-5 questions. Students will access Module Tests online at pre-appointed times. They will complete the Module Tests on their own i.e. without the assistance of any other person, and they will upload (submit) their work by the appointed completion time to Crowdmark. The Module Tests are open-book and students can use textbooks, notes, calculators, computers and even general online resources to complete their Module Tests, but they cannot communicate with anyone or any service (such as Chegg) during the Module Tests for the purposes of getting assistance in completing questions nor can they access solved solutions for specific Module Test questions. Students should avoid making travel, employment, or other commitments at the times of scheduled Module Tests or their Top Ups.

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 (including a Type C problem) will be given during the Top Up Module Test. However, there will be no make-ups for the Top Up Module Tests. Alternate times to write Module Tests will not be considered except in the case of exceptional reasons. Please contact Dr. Sean Maw if this is your situation. Students planning on registering with the office of Access and Equity Services for Students (AES) must do so in accordance with AES procedures and deadlines, in order to have extra time and/or accommodations to complete Module Tests and Top Ups.

Note that there will be no final exam for this course.

Type B, B+ and C Performance Tracking

After every assessment, a student's Type B, B+ and/or C grade will be recalculated for every Root Learning Outcome that was covered in the assessment. Basically, if you do better on later Type B/B+ assessments for a given Root Learning Outcome, the later/better assessment will replace earlier/lower assessments. If later assessment grades are equal to or lower than previous Type B/B+ assessments for a given Learning Outcome, the new Type B/B+ grade for a given Learning Outcome will typically be the average of the current grade and the previous grade.

Grading of Assignments/Tests

Every non-Type A deliverable in the course that gets marked, will be assessed using a competency based rubric. The rubrics will have 6 levels, each equivalent to a specific percentage grade as shown below:

Mastery	100
Developing Mastery	85
Competence	70
Developing Competence	50
Not Yet Competent	30
No Evidence of Competence	0

For each Root Learning Outcome (RLO) that gets assessed on a given deliverable, there will be a specific rubric with descriptors for each of these competency levels. You will be shown these rubrics when you receive your assignments/tests/labs. For example, when an RLO gets assessed on a specific assignment question, you will receive a designation of one of these 6 levels of competency. Remember, as a general rule, better results on RLOs later in the module/course will replace earlier lower results for that RLO for Type B/B+ material. Lower results on RLOs later in the module/course will instead be averaged with prior results for that RLO. If two levels are being

averaged, the average percentage will be the mathematical average e.g. average of "mastery" and "competence" would be 85%.

Course Assessment Schedule (May be subjected to changes)

Electrical Circuits

Assessment	Release Date	Due Date	RLOs Covered
Type A Unit 1 Quiz	Tuesday, Oct 19	Wednesday, Oct 27	1.1
Type A Unit 2 Quiz	Wednesday, Oct 27	Wednesday, Nov 3	1.1
Type A Unit 3 Quiz	Wednesday, Nov 3	Wednesday, Nov 17	1.1
Type A Unit 4 Quiz	Wednesday, Nov 17	Wednesday, Nov 24	1.1
Type A Unit 5 Quiz	Wednesday, Nov 24	Wednesday, Dec 1	1.1
Assignment 1	Wednesday, Oct 27	Wednesday, Nov 3	1.3
Assignment 2	Wednesday, Nov 3	Wednesday, Nov 17	1.2, 1.3, 3.1, 4.4, 1.3 C
Assignment 3	Wednesday, Nov 17	Wednesday, Nov 24	1.3, 1.4, 1.5, 3.1, 3.2, 1.5 C
Assignment 4	Wednesday, Nov 24	Wednesday, Dec 1	1.4, 1.5, 1.5 C
Module Test	Mon Dec 6 at 6 pm		1.3, 1.4, 1.5, 3.1, 3.2, 4.3, 4.4, 1.2 C, 1.5 C
Top Up Module Test	Tues Dec 21 at 10 am		1.2, 1.3, 1.4, 1.5, 3.1, 3.2, 4.3, 4.4

Matlab

Assessment	Release Date	Due Date	RLOs Covered
Type A Unit 1 Quiz	Wednesday, Oct 27	Wednesday, Nov 3	2.1
Type A Unit 2 Quiz	Wednesday, Nov 3	Monday, Nov 15	2.1
Type A Unit 3 Quiz	Wednesday, Nov 17	Wednesday, Nov 24	2.1
Type A Unit 4 Quiz	Wednesday, Nov 24	Wednesday, Dec 1	2.1
Type A Unit 5 Quiz	Wednesday, Dec 1	Wednesday, Dec 8	2.1
Assignment 1	In lab, week of Nov 1	In lab, week of Nov 15	2.5
Assignment 2	In lab, week of Nov 15	In lab, week of Nov 22	2.3, 2.5, 4.2
Assignment 3	In lab, week of Nov 22	In lab, week of Nov 29	2.3, 2.4, 3.3, 4.1
Assignment 4	In lab, week of Nov 29	In lab, week of Dec 6	2.2, 2.5, 3.3, 4.2
Module Test	Sat Dec 11 at 10 am		2.2, 2.3, 2.4, 2.5, 3.3, 4.1
Top Up Module Test	Tues Dec 21 at 2 pm		Same as MT

Student Grades

On an ongoing basis throughout the course, students can monitor their progress on course assessments in three complementary respects:

By Root Learning Outcome:	A generic spreadsheet will be provided through which current grades for each learning outcome can be calculated.
Type A Unit Quiz Checklist:	A checklist on Mobius and/or Canvas will indicate which Type A Unit Quizzes have been completed.

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:

https://secretariat.usask.ca/student-conduct-appeals/index.php

Attendance/Participation

Students are strongly encouraged to attend all of their classes. However, attendance at classes is not mandatory, nor is it graded.

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

Important Dates

Monday October 19	First day of Circuits classes
Week of October 25	First week of Matlab classes
Week of Nov 8	No classes – Remembrance Day Break Week

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:

Electrical Circuits Topic	Approximate Class Hours
Class 1 – Properties of Circuits	1.5
Class 2 – Circuit Topology and Diagrams	1.5
Class 3 – Circuit Laws (Kirchhoff's Voltage Law, Kirchhoff's Current Law, Ohm's Law)	1.5
Class 4 – Voltage and Current Dividers, Combining Sources	1.5
Class 5 – Equivalent Resistances	1.5
Class 6 – Basic Circuit Analysis	1.5
Class 7 – Power and Energy	1.5
Class 8 – Node and Mesh Analysis	1.5
Class 9 – Superposition Theorem	1.5
Class 10 – Thevenin and Norton Equivalent Circuits	1.5
Class 11 – Maximum Power Transfer and Review	1.5

Matlab Topic	Approximate Class Hours
Class 1 – Introduction to Matlab and Creating Arrays	1.5
Class 2 – Array Operations and Programming in Matlab	1.5
Class 3 – Script Files, Data Management and Documentation	1.5
Class 4 – User Defined Functions and Algorithms	1.5
Class 5 – 2D Plotting and More Algorithms	1.5
Class 6 – Software Engineering, SimuLink, and Matlab Wrap-up	1.5

Required Resources

The required Electrical Circuits resources for the current offering of this course include:

- a laptop computer meeting RE-ENGINEERED First Year specs*, as well as access to the CircuitJS online simulation platform (free): https://www.falstad.com/circuit/circuitjs.html

The required Matlab resources for the current offering of this course include:

- a laptop computer meeting RE-ENGINEERED First Year specs*, as well as Matlab 2021b (download for $99US at https://www.mathworks.com/store/link/products/student/SV?s_tid=ac_buy_sv_but1)
- have Matlab 2021b installed on your laptop **before** your first Matlab class

Recommended Resources

The recommended Matlab resources for the current offering of this course include:

- MATLAB: An Introduction with Applications, 6th Ed., Amos Gilat, 2016

***Financial Support**

If the purchase of a suitable laptop for FY engineering is beyond the means of any student, a limited number of suitable laptops are available for loan for those who can demonstrate financial need. If you are in this position, please contact First Year Engineering Lab Coordinator Whitney Curtis at whitney.curtis@usask.ca. Any student who faces challenges securing their food or housing and believes this may affect their performance in the course is urged to contact Student Central (https://students.usask.ca/student-central.php).

Course Evaluations and Student Feedback

All students will have the opportunity at the end of the course to provide feedback about the course, through the SLEQ student evaluation system. Your instructor may ask for additional course feedback at other points during the course, through the Canvas survey system.

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

Although the face of teaching and learning has changed due to COVID-19, the rules and principles governing academic integrity remain the same. If you ever have questions about what may or may not be permitted, ask your instructor. Students have found it especially important to clarify rules related to tests administered remotely and to follow these carefully and completely.

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.

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 (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 needs permission from copyright holders.

For more information about copyright, visit https://library.usask.ca/copyright/index.php where information for students is available at https://library.usask.ca/copyright/students/rights.php, or

contact the University's Copyright Coordinator at mailto:copyright.coordinator@usask.ca or 306-966-8817.

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.

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 module tests for students who are being accommodated by the deadlines established by AES.

For information on AES services and remote learning please visit
https://updates.usask.ca/info/current/accessibility.php#AccessandEquityServices

Aboriginal Students' Centre

The Aboriginal Students' Centre (ASC) is dedicated to supporting Aboriginal student academic and personal success. The centre offers personal, social, cultural and some academic supports to Métis, First Nations, and Inuit students. The centre is also dedicated to intercultural education, brining Aboriginal and non-Aboriginal students together to learn from, with and about one another in a respectful, inclusive and safe environment. Students are encouraged to visit the ASC's Facebook page (https://www.facebook.com/aboriginalstudentscentre/) to learn more.

Support Services for Engineering Students

- Engineering Student Centre (Rm. 2A05 Engineering Building)
    - Email: esc@usask.ca; https://engineering.usask.ca/contact_info/esc-office.php

Student Learning Services

The University Library offers a range of learning and academic support to assist USask undergrad and graduate students. For information on specific services, please see the Learning page on the Library web site https://library.usask.ca/support/learning.php

- Remote learning support information https://students.usask.ca/remote-learning/index.php
- Class and study tips https://students.usask.ca/remote-learning/class-and-study-tips.php
- Remote learning tutorial https://libguides.usask.ca/remote_learning
- Study skills materials for online learning https://libguides.usask.ca/studyskills
- Respectful online learning interaction https://teaching.usask.ca/remote-teaching/netiquette.php

Teaching, Learning and Student Experience

Teaching, Learning and Student Experience (TLSE) provides developmental and support services and programs to students and the university community. For more information, see the students' website http://students.usask.ca. Any student who faces challenges securing their food or housing and believes this may affect their performance in the course is urged to contact Student Central (https://students.usask.ca/student-central.php).

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The International Student and Study Abroad Centre (ISSAC) supports student success and facilitates international education experiences at USask and abroad. ISSAC is here to assist all international undergraduate, graduate, exchange and English as a Second Language students in their transition to the University of Saskatchewan and to life in Canada. ISSAC offers advising and support on matters that affect international students and their families and on matters related to studying abroad as University of Saskatchewan students. Please visit students.usask.ca or updates.usask.ca for more information.

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.

Instructional Level‡

Course Learning Outcome	Attribute†											
	A1	**A2**	**A3**	**A4**	**A5**	**A6**	**A7**	**A8**	**A9**	**A10**	**A11**	**A12**
1	I,D	I,D		I	I,D							
2	I,D	I,D		I	I,D							I
3	I,D	I,D		I	I							
4	I,D	I,D		I			I,D					

†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)

Math	Natural Science	Complementary Studies	Engineering Science	Engineering Design
			100%	

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.