ACADEMIC COUNCIL REPORT

ACTION REQUESTED:

Recommendation	☒
Decision	☒
Discussion/Direction	☐
Information	☐

DATE: 25 January 2021

FROM: Undergraduate Studies Committee

SUBJECT: New Program Proposal – Bachelor of Engineering and Bachelor of Engineering and Management in Energy Engineering (Honours)

COMMITTEE MANDATE:
In accordance with Section a) of the Undergraduate Studies Committee (USC) Terms of Reference, USC has the responsibility "to examine proposals for new undergraduate degree programs and major changes to existing programs and to recommend their approval, as appropriate, to the Academic Council".

And,

In accordance with Article 1.4 of By-Law Number 2 of the University of Ontario Institute of Technology "Academic Council will make recommendations to the Board on matters including: a. the establishment or termination of degree programs".

MOTION FOR CONSIDERATION:
That pursuant to the recommendation of the Undergraduate Studies Committee, Academic Council hereby approves the Bachelor of Engineering and Bachelor of Engineering and Management in Energy Engineering and recommends the program for approval by Board.

BACKGROUND/CONTEXT & RATIONALE:
In support of Ontario Tech University's Strategic Plan and its reputation as an emerging leader in career-ready education, with collaborative and pragmatic research, the Faculty of Energy Systems and Nuclear Science & Faculty of Engineering and Applied Science are proposing the Bachelor of Engineering and Bachelor of Engineering and Management in Energy Engineering. This program will meet the growing needs of the energy industry locally and graduates will be prepared to work across the energy sector and support the energy transition in Ontario, Canada, and globally. The program is designed to leverage Ontario Tech's strengths and leadership in energy, with minimal financial and resource requirements.

The program covers different aspects of the energy sector, including hydrogen energy, nuclear, renewables, energy storage, sustainable development, etc. It will eventually allow students to do a minor in sustainability. Similar to all other Engineering programs

at Ontario Tech, students will also have an opportunity to enroll in the energy engineering and management program and develop management skills to prepare them for leadership in the energy industry.

Energy engineering is multidisciplinary in nature and requires the integration of mechanical engineering, electrical engineering, nuclear engineering, renewable energy engineering, etc. Although the proposed program's name, Energy Engineering, reflects the broad field of energy, it will focus on some critical subject areas, such as renewable energies, hydrogen and fuel cells, energy storage, and smart grid, which will attract students with a wide range of interests. The program offers a variety of elective courses to give students the opportunity to learn specialized subjects, which may lead in future to new specializations in various areas, including sustainability engineering.

The program will be delivered with an emphasis on hands-on experience and experiential learning, similar to other engineering programs at Ontario Tech. It will also have courses delivered in hybrid mode, while the majority of the program's courses will be in conventional form. Furthermore, it is also planned to offer some online and hybrid elective courses to enrich the program.

The proposed Energy Engineering program differs considerably from the existing specializations in Mechanical Engineering and Nuclear Engineering in that a full suite of energy courses is provided through the new program. The establishment of a stand-alone Energy Engineering program has been identified as a strategic priority of Ontario Tech University. Ontario Tech has excellent core faculty members who are specialized in the area of energy. The program will also contribute significantly to provincial, national and global objectives of transitioning to low-carbon economies and striving for 'net-zero' emissions.

RESOURCES REQUIRED:

The initial two years of the program are expected to have students readily incorporated into existing (common) courses. New courses will be taught by existing faculty. As the program grows, e.g., more than 50 additional students, new faculty may be needed for additional classes of existing courses. This may require new hires; however, this is not anticipated for at least four to five years. Currently, there are sufficient faculty members to cover third- and fourth-year courses.

Existing student services could accommodate the increased number of students, especially for the first four years as additional student numbers are anticipated to stay below 50. Additional TA hours will likely be required in those common courses joined by Energy Engineering students. Similarly, there will be a marginal increase in laboratory requirements (e.g., consumables) for those courses with a laboratory component

CONSULTATION AND APPROVAL:

USC for Recommendation: December 2021
Engineering Faculty Council: 6 December 2021
FESNS Faculty Council: 16 December 2021
ARC Review: May 2021

NEXT STEPS:

- Pending the approval of Academic Council, this proposal must then proceed through the following steps:
    - Approval by the Board of Governors
    - Ontario Universities Council on Quality Assurance
    - Ontario Ministry of Colleges and Universities

SUPPORTING REFERENCE MATERIALS:

- New Program Proposal with Appendices
- Reports from External Review

New Undergraduate Program Proposal

Name of proposed program:	Energy Engineering/Energy Engineering & Management
Degree Designation/Credential:	BEng/BEng and Management
Faculty (where the program will be housed):	FEAS and FESNS
Collaborating Faculty (if applicable):	
Program Delivery Location:	North Oshawa
Collaborating Institution(s) (if applicable):	N/A
Proposed Program Start Date:	September 2022
Proposal Contact:	Dr. Hossam Kishawy (Dean, FEAS)
Submission Date:	December, 2021
Approved by Dean: **(signature and date)**	

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1 Introduction

a) Program Abstract

Please provide a brief overview of the proposed program, in 1000 characters or less (including spaces), including:

- *A clear statement of the purpose of the program*
- *Any program components, such as specializations, pathways, or other offerings in addition to the major*
- *Any distinctive elements, including alternative modes of delivery (including online)*

In support of Ontario Tech University's Strategic Plan and its reputation as an emerging leader in career-ready education, with collaborative and pragmatic research, this Energy Engineering program will meet the growing needs of the energy industry locally and globally. Graduates are expected to have strong technical skills, an appreciation for the value of multidisciplinary approaches, and robust communication skills. They will be prepared to work across the energy sector and support the energy transition in Ontario, Canada and globally. The program is designed to leverage Ontario Tech's strengths and leadership in energy, with minimal financial and resource requirements.

The program covers different aspects of the energy sector, including hydrogen energy, nuclear, renewables, energy storage, sustainable development, etc. It will eventually allow students to do a minor in sustainability. Similar to all other Engineering programs at Ontario Tech, students will also have an opportunity to enroll in the energy engineering and management program and develop management skills to prepare them for leadership in the energy industry. This program will be the same format as other 'and management' options where students take an additional year of business courses between Years 3 and 4 of their engineering program.

The proposed program is unique as it capitalizes on the University's leadership in hydrogen energy, energy storage, nuclear and other recognized expertise.

b) Background and Rationale

- *Identify what is being proposed and provide an academic rationale for the proposed program*
- *Explain the appropriateness of the program name and degree nomenclature; list any program specializations, pathways, etc.* ***(QAF 2.1.1c)***
- *Describe the mode of delivery (in-class, hybrid, online) and how it will support students in achieving the Degree Level Expectations and learning objectives of the program* ***(QAF 2.1.5)***
- *Describe the ways in which the program fits into the broader array of program offerings within the Faculty and the University*

Energy is the cornerstone of every civilization. The role of energy in our wellbeing and prosperity cannot be overemphasized. There is a growing demand for energy due to an increasing global population and overall affluence. Energy engineers need to develop, operate and service these systems to meet this growing demand. Energy engineering is multidisciplinary in nature and requires the integration of mechanical engineering, electrical engineering, nuclear engineering, renewable energy engineering, etc.

Although the proposed program's name, Energy Engineering, reflects the broad field of energy, it will focus on some critical subject areas, such as renewable energies, hydrogen and fuel cells, energy storage, smart grid, etc., which will attract students with a wide range of interests. The program offers a variety of elective courses to give students the opportunity to learn specialized subjects, which may lead in future to new specializations in various areas, including sustainability engineering.

The program will be delivered with an emphasis on hands-on experience and experiential learning, similar to other engineering programs at Ontario Tech. It will also have courses delivered in hybrid mode, while the majority of the program's courses will be in conventional form. Furthermore, it is also planned to offer some online and hybrid elective courses to enrich the program.

The proposed Energy Engineering program differs considerably from the existing specializations in Mechanical Engineering and Nuclear Engineering in that a full suite of energy courses is provided through the new program. The Energy option in Mechanical Engineering was intended to provide a limited specialization with a set of five additional courses. Regarding the Bachelor of Technology (BTech) in Sustainable Energy Systems program in Nuclear Engineering, it is general, but technology focussed with some comprehensive coverage on business, communication, regulatory and political aspects of energy supply, local and regional conditions and their impacts, etc. In fact, it was not intended to achieve CEAB accreditation nor to lead to professional engineering licensing of graduates. The proposed Energy Engineering program is fully energy engineering focused and builds upon the experience of the existing programs using the expertise of core faculty members in this field. In particular, the proposed program combines courses in electrical, mechanical, and nuclear engineering in addition to other renewable energy courses and specialized integration courses to offer a set of unique program outcomes. This further allows for better utilization of existing courses across the various programs, in addition to new core courses that allow graduating students to develop the needed skills for the energy engineering sector. There are several courses cross-listed with and slightly modified from existing courses to serve the program. Furthermore, it focuses on some critical subjects, such as renewable energies, hydrogen and fuel cells, energy storage, smart grid, etc., which will attract students with a wide range of interests. Graduates from the proposed program are expected to gain specialized skills needed to design entire energy systems, e.g. remote communities vs rapidly growing megacities, while also having the depth of knowledge to appreciate the complexities of transitioning traditional energy systems to low-carbon, resilient, safe and cost-effective alternatives.

The establishment of a stand-alone Energy Engineering program has been identified as a strategic priority of Ontario Tech University. Ontario Tech has excellent core faculty members who are specialized in the area of energy. The program will also contribute significantly to provincial, national and global objectives of transitioning to low-carbon economies and striving for 'net-zero' emissions.

c) Mission, Vision, Integrated Academic Plan, and Strategic Mandate Agreement (QAF 2.1.1a)

- *Describe how the program contributes to the University's Mission and Vision*
- *Explain how the program aligns with the goals and priorities outlined in the Faculty's(ies') and University's Integrated Academic Plans*
- *Identify how the program fits within one or more areas of strength or growth in Ontario Tech University's Strategic Mandate Agreement*

Ontario Tech's mission is to "Provide superior undergraduate and graduate programs that are technology-enriched and responsive to the needs of students and the evolving workplace." The new program will promote collaboration across disciplinary priorities in career-ready education and collaborative research that is consistent with our University's Strategic Plan and commitment to social, scientific, and economic innovations that create a better Canada and a better world.

As mentioned above, in the profession of engineering, there is a growing need for engineers that have the necessary skills to meet the challenges of solving interdisciplinary problems and have the needed interdisciplinary knowledge to innovate and contribute to a better society. It is imperative that Ontario Tech continues to evolve its programs to meet the needs of the modern workforce. A stand-alone Energy Engineering program will help Ontario Tech to continue to offer programs that students need, and employers want. This is further aligned with Ontario Tech's Strategic Mandate Agreement ("Skills & Job Outcomes") and "Tech with a conscience" priority area.

The proposed Energy Engineering program is unique as it capitalizes on the University's strong leadership in various key areas, including hydrogen energy, energy storage, nuclear and other recognized expertise. In addition, the proximity of the University to a diverse range of energy systems and applications and its existing strong partnerships with these energy related-institutions provide the program a unique opportunity to expose students in the proposed program to hands-on applications that do not exist anywhere else in Canada. The outcome-based assessment is essential in every course of the proposed program and covers the following: introducing what students should be able to do, measuring the student performance and using the data to improve the quality of the learning environment. In this regard, the CEAB graduate attributes are diligently considered and evaluated. There are specific advantages offered to students that are the result of strong ties with the City of Oshawa (such as the Teaching City program) and

Durham Region (on various subjects where students are involved in various projects related to energy efficiency and conservation, district energy systems, waste to energy options, etc.) as well as numerous projects coming from the local industries for capstone course design projects where students are allowed to have direct experience and cooperative work and enhance their experiential learning. These ensure the program's uniqueness.

d) Student Demand

- *Provide evidence of student demand, including number of prospective student inquiries; applications and registrations for similar programs; results from surveys/focus groups of existing students, graduates, or professionals in the field*
- *Include information about domestic vs. international student interest*

There is a clearly demonstrated demand amongst students for the proposed Energy Engineering program. Within the Faculty of Engineering and Applied Science's (FEAS) current mechanical engineering program has the energy option which attracts more than 35 students each year. Also, in the Faculty of Energy Systems and Nuclear Science (FESNS), nuclear engineering students are interested in alternative energy elective courses. Engineering students are increasingly more interested in energy related capstone projects. They further request to specialize particularly in renewable energy systems and applications. It therefore makes sense to build on these successes and the growing demand by employers for energy engineers. A stand-alone program will allow Ontario Tech to better market the program and grow enrolment.

Graduates of the proposed Energy Engineering program will possess a unique 'system-wide' understanding of energy applications in Canada. Graduates will also understand how provincial systems (electricity, space heating and cooling, transportation) may, or may not be, integrated and how they are all undergoing intensifying stresses in a changing climate and with much greater demands for lower-carbon energy. Graduates have a unique opportunity to learn about individual aspects of energy systems, e.g. nuclear with wind and solar, as well as how the components need to be integrated into an overall resilient and economic system. Several courses, particularly in the third and fourth years, are uniquely selected and incorporated into this program. These include specific courses in wind and hydro, solar, geothermal, smart grid, hydrogen and fuel cells, and emerging and detailed energy systems design.

The program is further envisioned to have large international student enrollments since Ontario Tech's leadership is clearly known globally through its experts, publications and activities, which will help capitalize on enrollment locally and internationally.

Enrolment Information

- *Please complete Table 1 and provide, in paragraph form, information regarding enrolment projections*
- *Please determine the academic year when the program enrollment will reach a steady-state and add an asterisk (*) in the corresponding box beside the number*

Table 1 presents the projected enrolment for the program. The numbers assume the following: 10% attrition (this is the current attrition rate in engineering programs) from Years 1 to 2; 5% attrition between Years 2 and 3, and also Years 3 and 4; enrollment for the 2nd and 3rd academic years increase by 33% and 66% of the first academic year, respectively. It is important to note that the numbers in 4th year may change as some students take co-op/internships and come back in the fifth year to finalize their engineering degree; on average, this represents about 30% of students (consistent with other engineering programs at Ontario Tech). The enrollment will reach steady-state in the 3rd academic year (2023-2024).

Table 1: Projected Enrollment by Academic and Program Year

	Academic Year					
	2022-2023	2023-2024	2024-2025	2025-2026	2026-2027	2027-2028
Level of Study						
1st year	30	40	50*	50	50	50
2nd year		27	36	45	45	45
3rd year			26	35	43	43
4th year				25	34	41
5th year						
Total Enrolment	30	67	112	155	172	179

e) Societal Need

- *Evidence of the need for graduates of the program and in which fields (within academic, public, and/or private sectors)*
- *Please indicate up to three occupations in which graduates from this proposed program may be employed using the Ontario Job Futures website*
- *For professional programs, a description of the program's congruence with current regulatory requirements*
- *Mention if any employers in the area support the need for this program and include a letter(s) of support as an additional appendix*

The role of energy in societal wellbeing and prosperity is clear. There is a growing demand for energy due to the increasing population, urbanization, and affluence. Energy engineers need to develop, operate and service these systems to meet this growing demand.

Currently, employers such as GE, Ontario Power Generation, General Motors, and Magna hire graduates from the existing programs – Mechanical Engineering with Energy specialization, smart grid specialization in Electrical Engineering, and Nuclear Engineering.

Graduates would be well-positioned to be employed in the following occupations from Ontario's Labour Market website (https://www.services.labour.gov.on.ca/labourmarket/search.xhtml?lang=en):

- Engineering managers (NOC 0211), after gaining experience
- Utilities managers (NOC 0912), after gaining experience
- Natural and applied science policy researchers, consultants, and program officers (NOC 4161)

The enhanced skill sets offered by the proposed Energy Engineering program will increase the overall demand for Ontario Tech engineering graduates.

As per all accredited engineering programs, the new Energy Engineering program is designed to meet the requirements of the Canadian Engineering Accreditation Board (CEAB).

f) Duplication

- *Describe how the program is distinct from other programs at Ontario Tech. Is it reasonable to anticipate this program might affect enrolment in other related programs? If so, how might this be addressed?*
- *Identify similar or complementary programs offered elsewhere in Ontario in Table 2. Please be brief but specific in the table. Avoid value-based statements*

Table 2: List of Similar Programs in Ontario

Institution Name	**Credential Level and Program Name**
Carleton University	Bachelor of Engineering in Sustainable and Renewable Energy Engineering
Link to Program Web Page: https://admissions.carleton.ca/programs/sustainable-and-renewable-energy-engineering/	
Brief Program Description: In their program, they aim to provide analytical and hands-on skills for designing, building, operating and enhancing sustainable energy systems that combine energy generation, distribution and utilization in an environmentally responsible and economically beneficial manner. Two streams are offered: Smart Technologies for Power Generation and Distribution and Efficient Energy Generation and Conversion.	
What differentiates the new program from this existing program: This program is specific to an aspect of energy, whereas the new program covers all aspects of energy.	
Hydrogen and fuel cell technologies	Renewable energy technologies
Energy storage technologies	Alternative fuels technologies
New nuclear energy technologies	

- *Provide additional overall comment on the justification for this duplicatiuon*

The Carleton University program is the only similar program in Ontario; however, the proposed program does not only focus on renewable energy but also provides students with the needed skills related to nuclear engineering, thermo-mechanical systems and electrical engineering "smart grid."

Ontario Tech currently offers BEng degrees in Electrical Engineering-smart grid specialization, Nuclear Engineering, and Mechanical Engineering – Energy specialization. While the Energy Engineering program may redirect a few students from these programs, the impact is expected to be marginal for the foreseeable future. The new program will have unique features of the current Electrical and Nuclear Engineering programs through its niche subjects and will be more specialized than the Mechanical Engineering – Energy option, where the students enjoy more mechanical engineering-based education.

2 Program Requirements

a) Admission Requirements

- *Outline the formal admission requirements; explain how these are appropriate for the program learning outcomes: How will they help to ensure students are successful? How do they align with the learning outcomes of the program? (QAF 2.1.2a)*
- *Explain any additional requirements for admission to the program such as special language, portfolio, etc. (and how the program recognizes prior work or learning experience, if applicable) (QAF 2.1.1b)*
- *If this is not a direct-entry from high-school program, please explain*

Current Ontario secondary school students must complete the Ontario Secondary School Diploma (OSSD) with six 4U or 4M credits, including English (ENG4U) with a minimum average of 60 percent, Advanced Functions (MHF4U), Calculus and Vectors (MCV4U), Chemistry (SCH4U) and Physics (SPH4U). In addition, a combined minimum 70 percent average in math and science courses is required, with no grade below 60 percent. For details about applicants with credentials from outside Ontario, one may see the admissions section of Future Students at https://ontariotechu.ca.

These admissions requirements are standard for Ontario Tech engineering programs.

b) Program Learning Outcomes and Assessment of Student Knowledge (QAF 2.1.1b, 2.1.6)

- ***Connect with the Academic Planning Officer in CIQE (ciqe@ontariotechu.ca) early in the program development to review learning outcomes***
- *In Table 3 below, please describe what the student will know or be able to do (knowledge, methodologies, and skills) by the end of the program and indicate how that knowledge or skill will be demonstrated*

- *An example has been provided in purple in the first row and can be removed.*

Degree Level Expectations are set by the Quality Council of Ontario and should not be modified. For the list of and more information on these expectations, including a detailed description, visit their website.

Table 3: Program Learning Outcomes

Program Learning Outcomes By the end of the program, students graduating will be able to… (normally 6-8 outcomes per program with 12 being the maximum)	Degree Level Expectations (list all that apply; you must align with each expectation at least once)	Relevant courses (provide course code and course title)	Assessment of Learning Outcomes (e.g. test, rubric, self-assessment, etc.)
Apply knowledge of athematics, physics, chemistry, engineering science, and engineering design to identify, formulate, analyze, and solve problems	Depth and Breadth of Knowledge	Particularly core courses in Years 1 to 4, including: ENGR1025U-Engineering Design ENEE2160U-Energy and Environmental Impacts	-In-class quizzes, midterm, assignments, lab reports, group project and final exam for ENGR1025U, -In-class quizzes, midterm, course project and final exam for ENEE2160U.
Describe and apply the engineering design process to energy system design problems, learn and quantify the environmental impacts of energy, system implementation practices, performance assessment and evaluation, impact assessment methodologies, carbon capturing and reduction technologies, cleaner energy solutions, comparative evaluation of energy options	Knowledge of Methodologies	Core design courses and courses featuring a design project, including: ENGR1025U-Engineering Design ENEE3265U-Hydrogen and Fuel Cells ENGR4960U-Capstone Systems Design-I ENEE4161U-Solar Energy ENEE4163U-Wind and Hydro Energy ENEE4260U-Integrated Energy Systems ENGR4961U-Capstone Systems Design-II	-In-class quizzes, midterm, assignments, lab reports, group project and final exam for ENGR1025U, -Midterm, assignments, course project and final exam for ENEE3265U, -Progress reports, final report and presentation for ENGR4960U, -Midterm, assignments, course project and final exam for ENEE4161U, -Midterm, assignments, course project and final exam for ENEE4163U, -Midterm, assignments, course project and final exam for ENEE4260U,

			-Progress reports, final report, final poster, flyer, building prototype and presentation for ENGR4961U)
Use computer-aided engineering software tools to solve problems and to acquire and process data	Knowledge of Methodologies	Core courses that teach and utilize engineering software tools, including: ENEE3030U-Computer Aided Design MECE3260U-Intro. to Energy Systems ENGR4960U-Capstone Systems Design-I ENEE4161U-Solar Energy ENEE4163U-Wind and Hydro Energy ENGR4961U-Capstone Systems Design-II	-Assignments, case study and course project for ENGR1025U, -Course project for MECE3260U, -Progress reports and final report for ENGR4960U, -Course project for ENEE4161U, -Course project for ENEE4163U, -Progress reports and final report for ENGR4961U)
Demonstrate strong independent learning and analytical skills and be an effective member of multidisciplinary and multi-cultural teams, either as a team member or as a project manager	Application of Knowledge	ENGR4960U-Capstone Systems Design-I ENGR4961U-Capstone Systems Design-II	-Progress reports and final report for ENGR4960U, -Progress reports, final report and building prototype for ENGR4961U)
Communicate effectively in written, spoken, and visual form with both technical experts and with members of the general public on engineering matters	Communication Skills	ENGR4960U-Capstone Systems Design-I ENGR4961U-Capstone Systems Design-II	-Progress reports, final report and presentation for ENGR4960U, -Progress reports, final report, final poster, flyer, prototype demonstration & exhibition and presentation for ENGR4961U)
Recognize and describe the value of alternative outlooks that people from various social,	Awareness of Limits of Knowledge	SSCI1470U-Impact of Science and Technology on Society	-Assignments and reports for SSCI1470U, -Course project for ENEE2160U, -Course project for

ethnic and religious backgrounds, as well as professions, may bring to energy engineering, understand and apply various knowledge and methodologies for design, analysis and assessment purposes, social, environmental and economic impact assessments		ENEE2160U-Energy and Environmental Impacts ENEE4260U-Integrated Energy Systems	ENEE4260U.
Demonstrate an appreciation for the importance of new and emerging energy technologies, and the strategies and policies available for lifelong learning, learn and apply the social, environmental,ethical, economic and sustainability dimensions for better engineering practices.	Autonomy and Professional Capacity	ENGR4960U-Capstone Systems Design-I ENEE4260U-Integrated Energy Systems ENGR4961U-Capstone Systems Design-II	-Reports and Presentation for ENGR4960U, -Course project and presentation for ENEE4260U. -Reports, presentation and demonstrating the prototype for ENGR4961U)

- *Selecting a few examples from above, explain in detail how the program design and requirements support the attainment of the Program Learning Outcomes (QAF 2.1.1b)*
- *With assistance from the Academic Planning Officer in CIQE (ciqe@ontariotechu.ca), please provide further details on the Assessment of the Program Learning Outcomes, as outlined in the Quality Council's Quality Assurance Framework Section 2.1.6 - Assessment of Teaching and Learning:*
  - *QAF 2.1.6a: Appropriateness of the proposed methods for the assessment of student achievement of the intended program learning outcomes and Degree Level Expectations (How will students demonstrate they have learned and can do what we expect them to by the end of the program?).*
  - *QAF 2.1.6b: Completeness of plans for documenting and demonstrating the level of performance of students, consistent with the Degree Level Expectations (How will the effectiveness of the program be assessed?)*

The new Energy Engineering program is designed to meet the requirements set forth by the Canadian Engineering Accreditation Board (CEAB). The CEAB currently uses an outcome-based model for accreditation purposes. As part of this process, the CEAB has identified 12 Graduate Attributes (GAs) as follows:
1. Knowledge Base for Engineering
2. Problem Analysis
3. Investigation
4. Design

5. Use of Engineering Tools
6. Individual and Team Work
7. Communication Skills
8. Professionalism
9. Impact of Engineering on Society and the Environment
10. Ethics and Equity
11. Economics and Project Management
12. Life-Long Learning

In every course, the Course GAs are first identified, and the levels of their coverages are determined as appropriate [introduced (I), developed (D), applied (A), or NA], along with that a brief description of the content covered in support of each graduate attribute is also provided. The next step is to link Course Outcomes (Course GA Indicators) to Faculty GA Indicators and CEAB GAs. The following step is to provide the Performance Levels and Methods of Measurement under the Course Outcomes (Course GA Indicators). The next one becomes an evaluation of the Performance Level Grading Rubric for Course Outcomes (Course GA Indicators). These are illustrated through the graphs and evaluated accordingly. In the second part, the course contributions to graduate attributes and continual improvement – results are presented and evaluated accordingly for the subject matter courses. In this regard, the Performance Level Breakdowns for Course Outcomes (Course GA Indicators) and Improvement Assessment for the Year Assessed are tabulated for evaluation accordingly.

The following example given for MECE3260U-Introduction to Energy Systems, which is a key course in this program, to illustrate the above listed process and provide a clear description.

Table 1a. Course Graduate Attributes and Level of Coverage in Course

CEAB Graduate Attribute (GA)	Level of Coverage in Course "IDA"	Brief Description of Content Covered Broken Down by Graduate Attribute (to Explain Level of Coverage Claimed)
A Knowledge Base for Engineering (KB)	D	A knowledge base is developed on various conventional and renewable energy systems, their operation, technologies, issues, analyses, assessment, etc. For more details, see Table 1b, c.
Problem Analysis (PA)	D	Problem analysis for energy systems is developed through energy and exergy analyses and their use for system design , analysis, assessment and possible improvement. Fuel combustion analysis is also developed. Furthermore, environmental impact assessment is developed for study. For more details, see Table 1b, c.

Investigation (Inv.)	D	An open ended course project is given on design and analysis as requiring investigation. Also, quizzes were given to them to investigate engineering . For more details, see Table 1b, c.
Design (Des.)	D	This developed by introducing some specific coverage about the design of energy systems. Also, there is an open-ended course design-analysis project assigned. For more details, see Table 1b, c.
Use of Engineering Tools (Tools)	D	Students use thermodynamic analysis, performance assessment and impact assessment tools, as well as some software packages (e.g., EES, RETScreen, GREET). For more details, see Table 1b, c.
Individual and Team Work (Team)		Topics well cover and discuss the impacts of energy engineering on human health and human welfare as well as on the environment, along with case studies and examples. For more details, see Table 1b, c.

Table 1b. Course Outcomes (Course GA Indicators) and their Link to Faculty GA Indicators and CEAB GAs

Course Outcome (Course GA Indicator)	**Faculty GA Indicator Supported (Main Ones in Bold)**	**CEAB GA Supported Significantly (D and/or A Level of Coverage)**
Demonstrate a knowledge of the basic technical and operational aspects of energy systems and applications.	**KBb, KBc, PAa, PAb, Inva, Des, Impactsa, Impactsb, Impactsc**	KB, PA, Inv, Des, Impacts
Understand how thermodynamic principles govern the behavior of various energy systems and applications	**PAa, PAb, PAc, Inva, Invb, Desa, Desb, Toolsa, Toolsb**	PA, Inv, Des, Tools
Apply appropriate simplifying assumptions and the laws of thermodynamics to energy systems and processes.	**PAb, PAc,** Toolsb	PA
Demonstrate a knowledge of methods of analysis, design and performance improvement of energy systems.	**PAc, PAd, Invb, Invc, Desa, Desb, Desc, Desd, Toolsb, Toolsc**	PA, Inv, Des, Tools

Course Outcome (Course GA Indicator)	**Faculty GA Indicator Supported (Main Ones in Bold)**	**CEAB GA Supported Significantly (D and/or A Level of Coverage)**
Use thermodynamic tables, charts, equations and software to obtain thermodynamic data in terms of pressure, temperature, specific volume, internal energy, enthalpy, and entropy and determine their relationships for system analysis.	**PAa, Invb, Toolsb**	PA, Inv, Tools
Demonstrate the impacts of energy engineering on human health and human welfare as well as on the environment, along with case studies and examples	**Impactsa, Impactsb, Impactsc**	Impact

Table1c. Course Outcomes (Course GA Indicators) and Performance Levels and Methods of Measurement

Course Outcome (Course GA Indicator)	Performance Level Definition Used	Method of Measurement of Performance Level
Demonstrate a knowledge of the basic technical and operational aspects of energy systems and applications.	3: >80%; 2: 60-80%, 1: 50-60%, 0: <50%	Quizzes, Course project, Midterm exam, Final exam
Understand how thermodynamic principles govern the behavior of various energy systems and applications	3: >80%; 2: 60-80%, 1: 50-60%, 0: <50%	Quizzes, Course project, Midterm exam, Final exam
Apply appropriate simplifying assumptions and the laws of thermodynamics to energy systems and processes.	3: >80%; 2: 60-80%, 1: 50-60%, 0: <50%	Course project
Demonstrate a knowledge of methods of analysis, design and performance improvement of energy systems.	3: >80%; 2: 60-80%, 1: 50-60%, 0: <50%	Course project
Use thermodynamic tables, charts, equations and software to obtain thermodynamic data in terms of pressure, temperature, specific volume, internal energy, enthalpy, and entropy and determine their relationships for system analysis.	3: >80%; 2: 60-80%, 1: 50-60%, 0: <50%	Course project, Quizzes
Demonstrate the impacts of energy engineering on human health and human welfare as well as on the environment, along with case studies and examples	3: >80%; 2: 60-80%, 1: 50-60%, 0: <50%	Course project, Quizzes

Table 1d. Performance Level Grading Rubric for Course Outcomes (Course GA Indicators)

Course Outcome (Course GA Indicator)	Performance Level
Demonstrate a knowledge of the basic technical and operational aspects of energy systems and applications.	Based on midterm and final exams, quizzess, and course design project. 3: Excellent performance on exam questions (≥80%) 2: Good to very good performance on exam questions (60-80%) 1: Marginally acceptable performance on exam questions (50-60%) 0: Unacceptable performance on exam questions (<50%)
Understand how thermodynamic principles govern the behavior of various energy systems and applications	Based on midterm and final exams, quizzes, and course design project. 3: (≥80%), 2: (60-80%) 1: (50-60%) 0: (<50%)
Apply appropriate simplifying assumptions and the laws of thermodynamics to energy systems and processes.	Based on the course design project. 3: (≥80%), 2: (60-80%) 1: (50-60%) 0: (<50%)
Demonstrate a knowledge of methods of analysis, design and performance improvement of energy systems.	Based on the course design project. 3: (≥80%), 2: (60-80%) 1: (50-60%) 0: (<50%)
Use thermodynamic tables, charts, equations and software to obtain thermodynamic data in terms of pressure, temperature, specific volume, internal energy, enthalpy, and entropy and determine their relationships for system analysis.	Based on the quizzes and course design project. 3: (≥80%), 2: (60-80%) 1: (50-60%) 0: (<50%)
Demonstrate the impacts of energy engineering on human health and human welfare as well as on the environment, along with case studies and examples	Based on the quizzes and course design project.3: (≥80%), 2: (60-80%) 1: (50-60%) 0: (<50%)

Table 2. Performance Level Breakdown for Course Outcomes (Course GA Indicators) and Improvement Assessment for the Year Assessed

Course Outcome (Course GA Indicator)	Performance Level Breakdown (Student Numbers)*	Analysis, Conclusions and Recommendations
Demonstrate a knowledge of the basic technical and operational aspects of energy systems and applications.	3: 12 2: 17 1: 4 0: 1 Overall: 34	Analysis: performance adequately meets or exceeds expectations. Conclusions: Students mastered the material taught adequately and seemed suitably prepared on entry. Recommendations: No course changes are required based on the performance on GAs. However, the instructor will consider using specific questions to assess the GA (KBE) in future and not the total mark as in this case.
Understand how thermodynamic principles govern the behavior of various energy systems and applications	3: 16 2: 15 1: 3 0: 0 Overall: 34	Analysis: performance adequately meets or exceeds expectations. Conclusions: Students mastered the material taught adequately. Recommendations: No course changes are required based on the performance on GAs. However, the instructor will consider using specific questions to assess the GA (i.e., PA) in future instead of using the total grades.
Apply appropriate simplifying assumptions and the laws of thermodynamics to energy systems and processes.	3: 15 2: 15 1: 2 0: 2 Overall: 34	Analysis: performance adequately meets or exceeds expectations. Conclusions: Students mastered the material taught adequately. Recommendations: No course changes are required based on the performance on GAs. In future the instructor will design the project question such that the first part involves investigation of the various systems in the area in the design project. It is the marks for this part of the project that are used to assess this GA (i.e., Inv.) instead of the total grade for the project.

In addition to showing that there is sufficient lecture, lab, and tutorial hours in the areas of Mathematics, Basic Science, Engineering Science, Engineering Design, and Complementary Studies, all engineering programs in Canada must demonstrate how the 12 Graduate Attributes listed above are attained in their program. These attributes will partly or fully (depending on the course content) be implemented accordingly in every course. The students of this program will be well-trained and equipped with the knowledge and critical thinking, design, analysis, modeling, investigation, assessment, evaluation, improvement, innovative solution capabilities. They will further learn about environmental impact assessment, life cycle assessment, optimization and policy and strategy development and gaining such skills will differentiate our graduates.

Tables for the Accreditation Units (AU) breakdown and the CEAB Graduate Attributes can be found in Appendix A.

- *Please attach, as an Appendix, the Program Learning Outcome Alignment Map to Degree Level Expectations – See Appendix A - Accreditation tables*
- *If the program is to be accredited, include with the above information about the accreditation requirements and add the accreditation tables, if available, as an Appendix.*

c) Program Structure and Content

- *Describe the requirements and structure of the program. Is it full-time/part-time? Is this an online or partially online/hybrid program? What are the unique curriculum or program innovations or creative components in this program? (QAF 2.1.4b)*
- *Address how the program's structure will help students to meet the program learning outcomes and Degree Level Expectations (QAF 2.1.3a)*

The new Energy Engineering program will continue the strategy of other engineering programs at Ontario Tech of having a core engineering design course in each year of the program. Design, problem solving and experiential learning are fundamental engineering activities in each engineering sector, and thus these are core values in in any engineering program. The program will be administered by the Program Curriculum Committee (PCC), two members from FEAS and two members from FESNS, and the Engineering Curriculum Committee (ECC), which has a member from each engineering program. The readiness of the program for engineering accreditation and approvals of changes or modifications will be subjected to the same governance of engineering programs at Ontario Tech, which has the Engineering Faculty Council as the final approval body within the Faculty.

Since energy includes elements from mechanical, electrical, nuclear, and control systems, the Energy Engineering program features courses from all of these disciplines. The program maps for the BEng Energy Engineering and the BEng Energy Engineering and Management programs can be found in Appendix B.

The program is intended to be delivered primarily face-to-face for the existing courses with opportunities for blended delivery of some courses and their components. For example, experiential learning and hands-on experience are important features, and also there are opportunities for flipped classrooms and project-based delivery. The current first year course, "Introduction to Engineering" is under review to include Indigenous components and also to allow students to gain knowledge beyond the traditional classroom delivery through plant and community visits and course projects. There will also be community-based capstone projects allocated to indigenous communities. Instructors will be encouraged to emphasize laboratory activities and invite speakers from different industrial sectors to provide students with exposure to different engineering disciplines and careers.

Detailed mapping of the program structure against graduate attributes can be found in Appendix A.

- *Describe the ways in which the curriculum addresses the current state of the discipline (QAF 2.1.4a)*

Energy Engineering is tailored to address the current state of the discipline, covering critical energy challenges and bringing forward solutions. This includes required (and ongoing) transitions to electricity supply grids through the integration of renewable energy, energy storage, and smart grid applications. It also goes further to cover system(s) integration, hydrogen and fuel cell technologies, and polygeneration possibilities. Including courses such as Artificial Intelligence in Engineering, and Energy and Environmental Impacts ensures students learn about the biggest challenges/ opportunities and state-of-the-art. The program links energy dimensions to environmental impact, economy, society and sustainable development, along with the sustainable development goals of the United Nations.

- *Is there an experiential learning component (e.g. workplace learning, co-op, internship, field placements, service learning, mandatory professional practice) to the program? If yes, please describe this component in 2500 words or less. Include confirmed partners, duration of the experiential learning component(s), and projected number of placements (where applicable)*

The Engineering Co-Op and Internship Office is committed to supporting eligible students enrolled in all Engineering programs, as well as students in the Health Physics and Radiation Science program at Ontario Tech University. Their goal is to assist in all aspects of finding an appropriate Co-Op or Internship placement that provides valuable engineering work experience while completing an undergraduate degree program.

Our programs incorporate engineering co-op opportunities to gain invaluable working experience prior to graduation. These experiential learning opportunities range in duration from 4-16 months. Students in the co-op stream who successfully complete 3 work terms will graduate with the Co-operative Education designation on their degree parchment.

Other experiential learning opportunities, including field trips to local energy suppliers and participation in the City of Oshawa Teaching City initiative, will also be available.

- *Describe how the potential need to provide accessibility accommodations has been considered in the development of this program; please provide information beyond the services offered by Student Accessibility Services*

Disability-related and accommodation support is available for students with mental health, physical, mobility, sensory, medical, cognitive, or learning challenges. It is ensured that disability-related concerns are properly addressed during this program. Students with documented disabilities and who may require assistance to participate in this program are encouraged to speak with their Academic Advisor as soon as possible. Students who suspect they may have a disability that may affect their participation in this program are advised to go to the Centre for Students with Disabilities as soon as possible.

It is anticipated that the accommodations available to our current engineering students will also well-serve students in the Energy Engineering program.

d) Calendar Copy with Program Map(s)

- *Provide, as an Appendix using the template provided, a clear and full calendar copy. The template ensures consistency across all programs in the Academic Calendar*
  - *Note that pathway (Bridge/Advanced Entry) programs will require a separate, usually shorter, section in the Calendar; please be sure to include one entry for each program type. Pathway Calendar example*
  - *New Minors, Co-op programs, or other alternatives have additional Calendar entries. Should you be including these items, please contact CIQE for more information and templates*
- *Provide, as an Appendix, a full list of the all courses included in the program including course numbers, titles, and descriptions. Please indicate clearly whether they are new/existing. Include full course proposals for new courses, and the most recent course syllabi for existing courses. If you are making changes to existing courses, include instead a course change form. In an appendix noted below, you will note which faculty members are expected to teach in the program and who is responsible for developing any new courses.*

See Appendix B for the proposed calendar copy.

See Appendix C for a full list of courses in the program.

Program map for reference/course sequence illustrative purposes only)

Energy Engineering (Proposed)						
Year	**Course**	**Course**	**Course**	**Course**	**Course**	**Course**
1-1	COMM 1050U Technical Communications	ENGR 1015U Introduction to Engineering	MATH 1010U Calculus I	MATH 1850U Linear Algebra for Engineers	PHY 1010U Physics I	
1-2	CHEM 1800U Chemistry for Engineers (Credit restrictions: CHEM 1010U/CHEM 1020U/CHEM 1110U)	ENGR 1025U Engineering Design (ENGR 1015U)	ENGR 1200U Introduction to Programming for Engineers (Credit Restriction: INFR 1100U)	MATH 1020U Calculus II (MATH 1010U)	PHY 1020U Physics II (PHY 1010U)	SSCI 1470U Impact of Science and Technology on Society
2-1	MANE 2220U Structure and Properties of Materials (CHEM 1800U)	MATH 2860U Differential Equations for Engineers (MATH 1020U, Coreq: MATH 1850U)	ESNS 2140U Problem Solving, Modelling & Simulation (MATH 1020U, PHY 1010U or ENSY 2210U, ENGR 1200U or CSIC 1040U)	ENEE 2160U Energy and Environmental Impacts (PHY1020U)	NUCL2860U Fluid Mechanics (PHY 1010U, MATH 1020U)	Liberal Studies Elective
2-2	ELEE 2790U Electric Circuits (MATH 1020U, MATH 1850U, PHY 1020U)	ENGR 2100U Computational Engineering Applications (ENGR 1200U, MATH 1850U, MATH 2860U)	NUCL 1530U Radiation and Nuclear Technologies	STAT 2800U Statistics and Probability for Engineers (MATH 1020U)	NUCL2010U Thermodynamic Cycles (PHY 1010U, MATH 1020U)	
3-1	MECE 3260U Introduction to Energy Systems (NUCL2010, ENGR 1015U	NUCL 3930U Heat Transfer (NUCL2010)	ENEE 3030U Computer-Aided Design) (ENGR1025U, Coreq: ESNS 3380U)	MECE 3410U Electro-Mechanical Energy Conversion (ELEE 2790U, MECE 2320U or MECE 2640U or NUCL 2010U)	MECE 3350U Control Systems (ELEE 2790U or ELEE 2210U, MATH 2860U)	ESNS 3380U Strength of Materials (PHY1010, MANE2220)
3-2	ENGR 3360U Engineering Economics	MANE4160U Artificial Intelligence in Engineering (MECE3350U, MATH2070U or ENGR 2100U)	ELEE 3260U Power Systems (ELEE 3250U or MECE 3410U)	ENEE 3265U Hydrogen and Fuel Cells (MECE2320 or NUCL 2010U)	Liberal Studies Elective	
4-1	ELEE 4115U Fundamentals of Smart Grid (ELEE 3260U)	ENGR 4960U Capstone Systems Design for Energy Engineering I (Successful completion of all non-elective courses in year three)	MANE4380U Life Cycle Engineering (MECE 3030U)	ENEE 4161U Solar Energy MECE 3260U and (MECE 3930 or NUCL3930)	ENEE 4163U Wind and Hydro Energy MECE 3410U and MECE 3260U and (MECE 2860U or NUCL 2860U)	ENGR4760U Ethics, Law and Professionalism for Engineers
4-2	ENGR 4961U Capstone Systems Design for Energy Engineering II (ENGR 4960U)	ENEE4260U Integrated Energy Systems (MECE 3260U)	Energy Engineering Elective	Energy Engineering Elective	Energy Engineering Elective	

Program map for reference/course sequence illustrative purposes only)

Energy Engineering and Management (Proposed)						
Year	**Course**	**Course**	**Course**	**Course**	**Course**	**Course**
1-1	COMM 1050U Technical Communications	ENGR 1015U Introduction to Engineering	MATH 1010U Calculus I	MATH 1850U Linear Algebra for Engineers	PHY 1010U Physics I	
1-2	CHEM 1800U Chemistry for Engineers (Credit restrictions: CHEM 1010U/CHEM 1020U/CHEM 1110U)	ENGR 1025U Engineering Design (ENGR 1015U)	ENGR 1200U Introduction to Programming for Engineers (Credit Restriction: INFR 1100U)	MATH 1020U Calculus II (MATH 1010U)	PHY 1020U Physics II (PHY 1010U)	SSCI 1470U Impact of Science and Technology on Society
2-1	MANE 2220U Structure and Properties of Materials (CHEM 1800U)	MATH 2860U Differential Equations for Engineers (MATH 1020U, Coreq: MATH 1850U)	ESNS 2140U Problem Solving, Modelling & Simulation (MATH 1020U, PHY 1010U or ENSY 2210U, ENGR 1200U or CSIC 1040U)	ENEE 2160U Energy and Environmental Impacts (PHY1020U)	NUCL2860U Fluid Mechanics (PHY 1010U, MATH 1020U)	Liberal Studies Elective
2-2	ELEE 2790U Electric Circuits (MATH 1020U, MATH 1850U, PHY 1020U)	ENGR 2100U Computational Engineering Applications (ENGR 1200U, MATH 1850U, MATH 2860U)	NUCL 1530U Radiation and Nuclear Technologies	STAT 2800U Statistics and Probability for Engineers (MATH 1020U)	NUCL2010U Thermodynamic Cycles (PHY 1010U, MATH 1020U)	
3-1	MECE 3260U Introduction to Energy Systems (NUCL2010, ENGR 1015U	NUCL 3930U Heat Transfer (NUCL2010)	ENEE 3030U Computer-Aided Design) (ENGR1025U, Coreq: ESNS 3380U)	MECE 3410U Electro-Mechanical Energy Conversion (ELEE 2790U, MECE 2320U or MECE 2640U or NUCL 2010U)	MECE 3350U Control Systems (ELEE 2790U or ELEE 2210U, MATH 2860U)	ESNS 3380U Strength of Materials (PHY1010, MANE2220)
3-2	ENGR 3360U Engineering Economics	MANE4160U Artificial Intelligence in Engineering (MECE3350U, MATH2070U or ENGR 2100U)	ELEE 3260U Power Systems (ELEE 3250U or MECE 3410U)	ENEE 3265U Hydrogen and Fuel Cells (MECE2320 or NUCL 2010U)	Liberal Studies Elective	
4-1	BUSI 1130U Introduction to Financial Accounting	BUSI 2050U Managerial Economics	BUSI 2311U Organizational Behaviour	BUSI 3700U Strategic Management for Professionals	ENGR 3160U Engineering Operations and Project Management	
4-2	BUSI 2180U Introduction to managerial Accounting	Before Fall 2021: BUSI 2205U Principles of Marketing; After Fall 2021 BUSI 2200U Marketing Management	BUSI 2410U Managerial Finance	BUSI 2603U Introduction to Operations Management	Business Elective	
5-1	ELEE 4115U Fundamentals of Smart Grid (ELEE 3260U)	ENGR 4960U Capstone Systems Design I for Energy Engineering (Successful completion of all non-elective courses in year three)	MANE4380U Life Cycle Engineering (MECE 3030U)	ENEE 4161U Solar Energy MECE 3260U and (MECE 3930 or NUCL3930)	ENEE 4163U Wind and Hydro Energy MECE 3410U and MECE 3260U and (MECE 2860U or NUCL 2860U)	ENGR4760U Ethics, Law and Professionalism for Engineers
5-2	ENGR 4961U Capstone Systems Design II for Energy Engineering (ENGR 4960U)	ENEE4260U Integrated Energy Systems (MECE 3260U)	Energy Engineering Elective	Energy Engineering Elective	Energy Engineering Elective	

3 Consultation

- *Describe the expected impact of the new program on the nature and quality of other programs delivered by the home and collaborating Faculty(ies) and any expected impact on programs offered by other Faculties*
- *Outline the process of consultation with the Deans of Faculties that will be implicated or affected by the creation of the proposed program*
- *Provide letters of support for the program from Deans at Ontario Tech and/or from other institutions/partners*

Little impact is expected on faculties outside FEAS and FESNS (the initial additional 30 students anticipated could readily be accommodated in common first, and second year courses).

There may be an impact on enrollment in the current energy option of Mechanical Engineering, and possibly Nuclear Engineering (students may opt to enroll in the new program and get exposure to nuclear engineering through elective courses). However, overall enrollment in Electrical, Mechanical and Nuclear Engineering is expected to increase as students react to a greater emphasis on HVAC (post-Covid; mechanical engineering) and overall transition to low-carbon energy (increasing role of nuclear power).

Does this Program contain any Indigenous content? ☒ Yes ☐ No ☐ Unsure

For more information on how Indigenous content is defined at Ontario Tech University and how to consult with the Indigenous Education Advisory Circle (IEAC), please refer to the Protocol for Consultation with the Indigenous Education Advisory Circle.

Has the IEAC been contacted ☒ Yes ☐ No

If yes, when?

As stated earlier, currently, the first-year engineering course "ENGR 1015U: Introduction to Engineering" is under review with a goal to introduce Indigenous components as an introduction to Indigenous history in Canada, and the duty of engineers to consult with Indigenous groups will be added. This is meant to be a brief introduction to this complex topic with the goal of making engineering students aware of the major issues concerning Indigenous peoples and the duty of engineers to consult with them on projects that may affect them. The changes in this course will impact this program as well as other engineering programs at Ontario Tech. Initial discussions have started with IEAC, and we will ensure that we work with IEAC to determine the material content and the best way to deliver it.

There are other opportunities for incorporating Indigenous content into the curriculum; these will be discussed with the IEAC before implementation. These include: (1) The capstone course coordinator is inviting projects from Indigenous communities, which will

provide more opportunity for Indigenizing the curriculum and provide students with the needed exposure and skills.

This is being discussed with Saugeen Indigenous Community for possible collaboration. (2) It is planned to have field trips in various energy courses to allow students to experience and interact with the energy systems and applications as well as communities. In this regard, the field trip component of the course will also visit Indigenous Community-owned energy facilities, e.g., Henvey Inlet Wind facility (largest in Canada).

What was the advice you received from the IEAC, and how has it been included in your proposal?

Please see above, discussions are on-going.

Did the IEAC ask you to return the proposal to them for review? ☐ Yes ☒ No

If yes, have they completed their review? ☐ Yes ☐ No ☒ N/A

4 Resource Requirements (QAF 2.1.7, 2.1.9, 2.1.10)

a) General Resource Considerations

- *Note here if this new program may impact enrolment agreements with other institutions/external partners that exist with the Faculty/Provost's office*
- *Indicate if the new program will require changes to any existing agreements with other institutions, or will require the creation of a new agreement. Please consult with CIQE (ciqe@ontariotechu.ca) regarding any implications to existing or new agreements.*

There are no anticipated changes to enrollment agreements with other institutions or external partnerships. Students seeking internships and/or co-operative employment placements will be accommodated through existing sector partnerships (that would increase commensurate with student enrollment increases).

b) Faculty Members - Current and New Faculty Requirements

- *Complete as an Appendix, using the Faculty Information template provided, a chart detailing the list of faculty committed to the program and provide any additional details, in paragraph form, if necessary below*
- *Include here a brief statement to provide evidence of the participation of a sufficient number and quality of faculty who will actively participate in the delivery of the program*
- *Describe the role of any sessional faculty,*

- *Explain the provision of supervision of experiential learning opportunities*
- ***Describe the plan and commitment to provide additional faculty resources to support the program, if needed***
- *Indicate that faculty CVs are included in an Appendix, and please provide CVs for all faculty committed to the program*

A detailed Faculty Information table is included in Appendix D.

Ontario Tech is particularly well-served with a depth of qualified faculty with expertise in relevant energy fields. Our Electrical, Mechanical and Nuclear Engineering programs cover different aspects of energy engineering disciplines and there is a robust and growing research program in the area of renewable energy and hydrogen production and beyond

Experiential learning opportunities are also considerable at Ontario Tech. These include: Canada's largest smart grid (on campus); the Clean Energy Research Laboratory; two large-scale state-of-the-art geothermal systems (Ontario Tech and Durham College); an on-campus combined heat and power plant; easy access to an Energy From Waste facility (Clarington); energy storage and electric vehicle research (AVIN test-track at GM, Oshawa); and deep partnerships with local utilities and the City of Oshawa (Teaching City). These can all be accessed through existing faculty resources.

The initial two years of the program are expected to have students readily incorporated into existing (common) courses. New courses have faculty assigned already (and in place). As the program grows, e.g., more than 50 additional students, new faculty may be needed for additional classes of existing courses. This may require new hires; however, this is not anticipated for at least four to five years. Currently, there are sufficient faculty members to cover third and fourth year courses.

c) Additional academic and non-academic human resources

- *Give details regarding the nature and level of Sessional Instructor and TA support required by the program, the level of administrative and academic advising support, etc.*
- ***Please describe the plan and commitment to provide additional resources to support the program, if needed***

The addition of 30 students would be only a 1 to 3% increase in overall enrollment. Existing student services could accommodate this increase, especially for the first four years as additional student numbers are anticipated to stay below 50.

Additional TA hours will likely be required in those common courses joined by Energy Engineering students. Similarly, there will be a marginal increase in laboratory requirements (e.g., consumables) for those courses with a laboratory component.

d) Existing student supports

Ontario Tech University, as a relatively small campus community, has a centralized delivery model for student supports. All undergraduate students have access to an extensive support system that ensures a quality student experience. Each Faculty may provide additional, Faculty- or program-specific supports. In addition to the outlined services below, students may also take advantage of the Campus Childcare Centre, Campus Bookstores, Housing and Living Resources, as well as the Student Union. Further information can be found at: http://studentlife.ontariotechu.ca/

Faculty-Specific Support

Academic Advising

Please provide details on your Faculty Academic Advising Office and supports, and any Faculty-specific student support services (e.g. peer mentoring, 'coffee chats', study groups, etc.).

Academic Advising across the University is currently being reorganized, so faculty-specific impacts are expected to be less relevant. Regardless, the addition of 30 Energy Engineering students (initially) would be only a 1 to 3% increase in overall enrollment.

Student Life

Student Learning Centre

The Student Learning Centre fosters a high level of academic excellence in the Ontario Tech University community by working with all Ontario Tech University students, undergraduate and graduate, to achieve educational success. Foundational knowledge and prerequisite skills are essential to all university-level courses, and competency with these skills is vital for strong academic performance. Faculty specific academic resources are available online and include tip sheets and videos. The subject specialists offer in-person support services in mathematics, writing, study skills, ESL and physics. With the additional support of peer tutors and workshops, the Centre can further accommodate the needs of a specific course or program.

Student Accessibility Services

Student Accessibility Services (SAS) works collaboratively to ensure that students with disabilities have equal opportunities for academic success. SAS operates under the Ontario Human Rights Code (OHRC) and the Accessibility for Ontarians with Disabilities Act (AODA). Services are provided for students with documented disabilities. Accommodation supports include but are not limited to:

- Adaptive technology training

- Alternate format course material
- Learning skills support
- Testing support
- Transition support for incoming students

SAS also provides inclusive peer spaces, support groups, and skills workshops for students.

Careers and Internships
The Career Centre offers comprehensive career service assistance, co-op and internship support and resources, and a variety of valuable resources to help students along their career paths, including:

- Assistance with creating effective job-search documents
- Career Counselling
- Co-op and internship job search advising
- Interview preparation
- Job market information
- Job search strategies

A variety of events are hosted on campus during the academic year including employer information and networking sessions, job fairs, and interviews conducted by leading employers.

Student Engagement and Equity
Student Engagement and Equity supports students' successful transition into the university and provides opportunities for them to develop leadership and professional skills throughout their university career. Services provided through Student Engagement and Equity include:

- Orientation and events through first year
- Specialized programming for first-generation, graduate, Indigenous, international, mature, online, transfer, and diploma-to-degree pathways students
- Services and supports for international and exchange students
- Equity and inclusivity programming and support groups
- Assistance and advice for living off-campus
- Peer mentoring to help students through first year
- Opportunities to grow and develop leadership skills through the Ambassador and Peer Mentorship program

Student Mental Health Services
Student Mental Health Services helps students learn how to better manage the pressures of student life. Students can:

- Attend a drop-in session

- Participate in events and activities or support groups that promote positive health and well-being
- Access tools and resources online to learn about mental health and how to maintain good health and wellness
- Work with a mental health professional to address concerns
- Contact the Student Lifeline for immediate help and assistance
- Get answers to frequently asked questions about mental health

Student Mental Health Services offers short-term counselling and therapy services to students. Students in distress will also be provided with support and counselling as needed. There is no cost to students and services are confidential. For those who need long-term counselling support or specialized mental health services, Ontario Tech University will provide referrals to assist the student in accessing resources in the local community or in the student's home community.

Athletics and Recreation Facilities

Ontario Tech University offers a number of recreation facilities and fitness opportunities to meet all lifestyles and needs. On-campus facilities include the state-of-the-art FLEX Fitness Centre which overlooks Oshawa Creek, five gymnasiums, a 200-metre indoor track, two aerobic/dance studios, the Campus Ice Centre, Campus Fieldhouse, a soccer pitch, a fastball diamond, squash courts and an indoor golf training centre. Students are able to participate in varsity and intramural sports as well as group fitness classes and personal training sessions.

Campus Health Centre

The Campus Health Centre provides assistance in numerous confidential health-care options including:

- A medical clinic with daily access to physician and nursing staff
- Treatment of disease, illness, and injury
- Allergy injections, immunizations, and influenza injections
- Complementary Health Services featuring acupuncture, chiropractic, custom orthotics, massage therapy, nutritional counselling, and physical therapy
- An on-site laboratory (blood work, STI testing, throat swabs, etc.)
- Gynaecological health-care and prescriptions

Student Awards and Financial Aid

Student Awards and Financial Aid (SAFA) is dedicated to helping students understand the variety of options available to finance their education. Budgeting and financial planning are essential to their success and Student Awards and Financial Aid is on hand to help create the right financial plan. Financial assistance can be in the form of bursaries, employment (both on-campus and off), parental resources, scholarships, student lines of credit and the Ontario Student Assistance Program (OSAP).

Information Technology Resources

IT Services strives to provide quality services to students at Ontario Tech. To support these objectives, the following components are included:

Wireless network

Wireless internet connection is available in public areas and open-air locations around the Ontario Tech campus where students congregate (North Oshawa and Downtown locations).

Wired network

To ensure the success of the technology-enriched learning environment, a comprehensive data network has been installed on campus. This includes a network drops in lecture halls and designated areas as well as network drops for each residence suite.

Ontario Tech students benefit from networked classrooms and learning spaces. Each ergonomically-designed space has data network connection access and electrical connections to ensure battery regeneration. In addition, classrooms include electronic projection equipment and full multimedia support.

IT Service Desk

The IT Service Desk is equipped with certified technicians and experienced IT professionals offering technical support services on a drop-in, call-in or email basis.

GUWs

Ontario Tech undergraduate students are able to use general workstations available at the library and have access to Bring Your Own Device Technology-Enriched Learning Environment (BYOD TELE) model course-specific software.

Software Support

Software Support specialists are available to students on-site and online to assist in downloading/installing University software and support any other software related issues.

Printing services

Printing services are available to students in the following areas: labs, classrooms, study common areas, the Learning Commons and the Library. All Ontario Tech students receive print

credits every year, more Printpacks can be purchased through the Campus Bookstore if students require additional printing services.

Teaching & Learning Centre

The mission of the Teaching and Learning Centre (TLC) at Ontario Tech is to empower faculty to reach their potential as educators and to create a culture where effective teaching is valued. We champion the scholarship of teaching and implementation of pedagogy. We create valuable teaching and learning professional development experiences. We move Ontario Tech towards being a leader in teaching excellence, ultimately leading to greater student success.

The TLC provides faculty with a range of tools and facilities to assist them in providing a rich learning experience for students. Experts at the TLC provide support in various areas including curriculum development, multimedia design, learning technology and in the overall improvement of teaching practice.

In addition, the TLC funds teaching-related projects from the Teaching Innovation Fund (TIF) for proposals by faculty members aimed at developing new methods in teaching and learning. The TLC facilitates teaching awards at the University and supports faculty in their application for external awards and funding opportunities that focus on teaching and learning.

e) Physical resource requirements

- *Please attach a report, as an Appendix, from the Library regarding existing library holdings and support for student learning; please contact your Subject Librarian as you begin your proposal to request a 'Library statement for new program proposal'*
- *Address any space/infrastructure requirements including information technology, laboratory space, equipment, etc. If new space is required, please complete Table 4 (examples in purple); otherwise, please remove this Table from the document*
- *Ideally, please provide information on the change in the number of faculty, students, administrative staff, etc. as it relates to space, as well as information on changes in equipment and activities (additional space; the renovation of existing space; or will the current space allocation accommodate the new program)*
- ***Describe the plan and commitment to provide additional resources to support the program, if needed***

See Appendix E for the library report.

No new space requirements are anticipated. It is expected that Energy Engineering students will be able to be accommodated in existing laboratories for course-work. There will be a marginal increase in, e.g., laboratory consumables for those courses.

f) Business Plan

- *Provide a brief statement of the funding requirements, and insert the Program Summary tab from the New Degree Program UG Proposal Budget spreadsheet as an Appendix. Also, please submit a copy of the full Excel document to CIQE.*
- *Complete the highlighted sections of the New Program Funding and Tuition form and submit the form to CIQE as soon as possible*

See Appendix F for the Budget Spreadsheet.

5 Closing Statements Regarding Program Quality (QAF 2.1.10)

- *Please describe the appropriateness of the collective faculty expertise to contribute substantively to the proposed program; what areas of faculty strength and expertise, innovation, and scholarly record will contribute to the quality of the program and student experience*
- *Please explain how the program structure and faculty research will ensure the intellectual quality of the student experience*

Since the inception of Ontario Tech University, energy and particularly renewable and clean energy, has been a strategic priority. There is considerable expertise in energy engineering, across many sub-disciplines, including electrical power, smart grid, thermo-mechanical engineering, nuclear engineering, renewable energy and hydrogen production and utilization technologies. Our research areas cover fields as wide and diverse as nuclear reactor design, electrical power, smart grid, energy storage, renewable energy, HVAC systems, hydrogen-based systems, and economic and environmental assessments. The energy sector is intrinsic to modern society, facilitating activities and a quality of life that many take for granted and to which many others aspire. At the same time, the sector is also inextricably linked with issues of equity, environmental impact and human health. Indeed, to mitigate its negative implications, such as contribution to climate change, the energy sector is undergoing a transition from its conventional form to something more sustainable. Ontario Tech faculty members are well-recognized locally and internationally and on the forefront of this energy evolution, particularly in some niche areas, namely renewable energies, hydrogen and fuel cells, energy storage, smart grid, etc. They are well-suited to teaching the next generation of Engineers that will continue to lead the energy transition and steer it in as yet unforeseen directions.

APPENDICES

Please include at minimum the below. Additional Appendices may be added, as appropriate. Appendices should ultimately be listed, attached, and labelled (A, B, C, etc.) in the order in which they first are mentioned in the document.

A. Accreditation Tables
B. Calendar Copy with Program Maps
C. 1List of Program Courses, New Course Proposals, Required Course Changes
   2 Course Syllabi for Existing Courses
D. Faculty Information
E. Library Report
F. Budget Spreadsheet Summary
G. Letters of Support

Items to be separate documents sent to CIQE:

New Program Funding and Tuition (for internal use only)
Full Budget Spreadsheet (for internal use only)
Faculty CVs (to be provided to the External Reviewers)

Appendix A – Accreditation Tables

	Course Code	Course Name	MC	LEC	Lab/Tut	LEC-Aus	LAB-Aus	S=Lec+0.5	Math%	NS %	CS %	ES%	ED %	Math au	NS au	CS au	ES au	ED au	ES + ED a	Math+NS
Year 1	COMM 1050U	Tech Comunication	0	3	1	36	12	42	0	0	100	0	0	0	0	42	0	0	0	0
	ENGR 1015U	Introduction to Engineering	0	3	4	36	48	60	0	0	30	45	25	0	0	18	27	15	42	0
	MATH 1010U	Calculus I	0	3	1	36	12	42	100	0	0	0	0	42	0	0	0	0	0	42
	MATH 1850U	Linear Algebra	0	3	1.5	36	18	45	100	0	0	0	0	45	0	0	0	0	0	45
	PHY 1010U	Physics I	0	3	2.25	36	27	49.5	0	100	0	0	0	0	49.5	0	0	0	0	49.5
	CHEM 1800U	Chemistry for Engs	0	3	1.75	36	21	46.5	0	100	0	0	0	0	46.5	0	0	0	0	46.5
	SSCI 1470U	Impact of Science on Society	0	3	0	36	0	36	0	0	100	0	0	0	0	36	0	0	0	0
	ENGR 1200U	Intro to Programming	0	3	2	36	24	48	0	0	0	100	0	0	0	0	48	0	48	0
	MATH 1020U	Calculus II	0	3	1	36	12	42	100	0	0	0	0	42	0	0	0	0	0	42
	PHY 1020U	Physics II	0	3	2.25	36	27	49.5	0	100	0	0	0	0	49.5	0	0	0	0	49.5
	ENGR 1025U	Engineering Design	0	3	3	36	36	54	0	0	0	0	100	0	0	0	0	54	54	0
Year 2	MANE 2220U	Structure and Properties of Materials	0	3	1	36	12	42	0	75	0	25	0	0	31.5	0	10.5	0	10.5	31.5
	MATH 2860U	Differential Equations	0	3	1	36	12	42	100	0	0	0	0	42	0	0	0	0	0	42
	ESNS 2140U	Problem Solving, Modelling & Simulation	0	3	0.75	36	9	40.5	0	0	0	67	33	0	0	0	27.135	13.365	40.5	0
	ENEE 2160U	Energy and Environmental Impacts	0	3	1	36	12	42	0	50	0	50	0	0	21	0	21	0	21	21
	NUCL 2860U	Fluid Mechanics	0	3	2	36	24	48	0	0	0	100	0	0	0	0	48	0	48	0
	ELEE 2790U	Electric Circuits	0	3	2.5	36	30	51	0	0	0	100	0	0	0	0	51	0	51	0
	ENGR 2100U	Computational Engineering Applications	0	3	3	36	36	54	25	0	0	75	0	13.5	0	0	40.5	0	40.5	13.5
	NUCL 1530U	Radiation and Nuclear Technologies	0	3	1.5	36	18	45	0	40	30	30	0	0	18	13.5	13.5	0	13.5	18
	STAT 2800U	Stats for Engs	0	3	0	36	0	36	100	0	0	0	0	36	0	0	0	0	0	36
	NUCL 2010U	Thermodynamic Cycles	0	3	2.25	36	27	49.5	0	25	0	75	0	0	12.375	0	37.125	0	37.125	12.375
	LSE	Liberal Studies Elective	0	3	0	36	0	36	0	0	100	0	0	0	0	36	0	0	0	0
Year 3	MECE 3260U	Introduction to Energy System	0	3	0	36	0	36	0	0	0	75	25	0	0	0	27	9	36	0
	NUCL 3930U	Heat Transfer	0	3	2	36	24	48	0	25	0	75	0	0	12	0	36	0	36	12
	ENEE 3030U	Computer Aided Design	0	3	2	36	24	48	0	0	0	25	75	0	0	0	12	36	48	0
	MECE 3350U	Control Systems	0	3	2	36	24	48	0	0	0	75	25	0	0	0	36	12	48	0
	ENGR 3360U	Engineering Economics	0	3	0	36	0	36	0	0	100	0	0	0	0	36	0	0	0	0
	MANE 4160U	Artificial Intelligence in Eng	0	3	1	36	12	42	0	0	0	60	40	0	0	0	25.2	16.8	42	0
	MECE 3410U	Electromechanical Energy Conversion	0	3	2	36	24	48	0	0	0	70	30	0	0	0	33.6	14.4	48	0
	ELEE 3263U	Introduction to Power Systems	0	3	3	36	36	54	0	0	0	100	0	0	0	0	54	0	54	0
	ENEE 3265U	Hydrogen and Fuel Cells	0	3	1	36	12	42	0	0	0	75	25	0	0	0	31.5	10.5	42	
	ESNS 3380U	Strength of Materials	0	3	2	36	24	48	0	0	0	70	30	0	0	0	33.6	14.4	48	0
	LSE	Liberal Studies Elective	0	3	0	36	0	36	0	0	100	0	0	0	0	36	0	0	0	0
Year 4	ENGR 4960U	Capstone Systems Design for Energy Engineering I	0	3	2.5	36	30	51	0	0	25	0	75	0	0	12.75	0	38.25	38.25	0
	ELEE 4115U	Fundamentals of Smart Grid	0	3	0	36	0	36	0	0	0	100	0	0	0	0	36	0	36	0
	MANE 4380U	Life Cycle Engineering	0	3	0.5	36	6	39	0	0	50	25	25	0	0	19.5	9.75	9.75	19.5	0
	ENEE 4161U	Solar Energy	0	3	1	36	12	42	0	0	0	75	25	0	0	0	31.5	10.5	42	0
	ENGR 4961U	Capstone Systems Design for Energy Engineering II	0	3	2.5	36	30	51	0	0	25	0	75	0	0	12.75	0	38.25	38.25	0
	ENEE 4163U	Wind and Hydro Energy	0	3	1	36	12	42	0	0	0	75	25	0	0	0	31.5	10.5	42	0
	ENEE 4260U	Integrated Energy Systems	0	3	1	36	12	42	0	0	0	75	25	0	0	0	31.5	10.5	42	0
	ENGR 4760U	Ethics, Law, Prof for Engs	0	3	0	36	0	36	0	0	100	0	0	0	0	36	0	0	0	0
	ENG Elective							36												
	ENG Elective							36												
	ENG Elective							36												
ENG																				
	MATH	220.5										Current AU		220.5	240.375	298.5	752.91	313.215	1066.125	460.875
	NS MC	240.375										CEAB Min Required		195	195	225	225	225	900	420
	CS MC	298.5																		
	ES MC	752.91																		
	ED MC	313.215																		
	MC TOTALS	1825.5																		
	K FACTOR	14.7875																		
	Total AU Without ENG Electives	1825.5																		
	Total AU	1933.5																		

	Course Code	Course Name	KBE	PA	INV	DES	UET	ITW	COM	PRO	ISE	ETH	EPM	LLL
	COMM 1050U	Tech Comunication							D	I	I			I
	ENGR 1015U	Introduction to Engineering	I	I		IA	I	IDA	IDA	I	IDA	I	I	I
	MATH 1010U	Calculus I	D	D										
	MATH 1850U	Linear Algebra	D	D										
	PHY 1010U	Physics I	D	D										
Year 1	CHEM 1800U	Chemistry for Engs	D	I							I			I
	SSCI 1470U	Impact of Science on Society									A	I		D
	ENGR 1200U	Intro to Programming	ID	ID	ID	I	IA	I						I
	MATH 1020U	Calculus II	D	D										
	PHY 1020U	Physics II	D	D										
	ENGR 1025U	Engineering Design	ID	ID	ID	IDA	IDA	DA	DA		DA		ID	DA
	MANE 2220U	Structure and Properties of Materials	I	I			I							I
	MATH 2860U	Differential Equations	D	D										
	ESNS 2140U	Problem Solving, Modelling & Simulation	D	ID		D	ID	ID	ID			I		
	ENEE 2160U	Energy and Environmental Impacts	ID	ID							ID			
	NUCL 2860U	Fluid Mechanics	ID	ID	ID		I		D					
Year 2	ELEE 2790U	Electric Circuits	ID	ID	ID		IA		I					ID
	ENGR 2100U	Computational Engineering Applications	IDA	IDA	DA	0	I	A	A	0	0	0	0	I
	NUCL 1530U	Radiation and Nuclear Technologies	ID				I			ID	D	I	I	I
	STAT 2800U	Stats for Engs	DA	DA										
	NUCL 2010U	Thermodynamic Cycles	IDA	ID	ID		ID	ID	D		D			
	LSE	Liberal Studies Elective												
	MECE 3260U	Introduction to Energy System	D	D	D	D	D				D			
	NUCL 3930U	Heat Transfer	DA	DA	IDA		I	DA			D			
	ENEE 3030U	Computer Aided Design	DA	DA	DA	DA	DA	DA	DA				DA	DA
	MECE 3350U	Control Systems	IDA	A	A	D	IDA	A	A					
	ENGR 3360U	Engineering Economics	I	IDA	IDA		IDA	IDA	IDA				IDA	IDA
Year 3	MANE 4160U	Artificial Intelligence in Eng												
	MECE 3410U	Electromechanical Energy Conversion	D	D		D								
	ELEE 3263U	Introduction to Power Systems	ID	ID			I							
	ENEE 3265U	Hydrogen and Fuel Cells	DA	DA		DA								
	ESNS 3380U	Strength of Materials	D	D	ID	D			D					
	LSE	Liberal Studies Elective												
	ENGR 4960U	Capstone Systems Design for Energy Engineering I	A	DA	DA	DA	DA	DA	A	A	A	A	A	A
	ELEE 4115U	Fundamentals of Smart Grid	ID	ID										
	MANE 4380U	Life Cycle Engineering	DA	DA	A	A	A				DA		DA	
	ENEE 4161U	Solar Energy	A	A	D	A	A	A	A		A			
	ENGR 4961U	Capstone Systems Design for Energy Engineering II	A	A	A	A	A	A	A	A	A	A	A	A
Year 4	ENEE 4163U	Wind and Hydro Energy	A	A		A	A	A	A		A			
	ENEE 4260U	Integrated Energy Systems		DA	DA						DA			
	ENGR 4760U	Ethics, Law, Prof for Engs	0	IDA	IDA				DA	DA	IDA	IDA	DA	IDA
	ENG Elective													
	ENG Elective													
	ENG Elective													

Appendix B Calendar Copy

Energy Engineering

General information

Ontario Tech University is one of a handful of universities in Canada that offers a dedicated undergraduate program in Energy Engineering. Energy Engineering is an interdisciplinary program and perhaps one of the broadest engineering disciplines that covers different engineering fields. Thus, its graduates are in high demand by various industries and employers. A typical Energy Engineering program, would overlap with different aspects of engineering applications including electrical, mechanical and nuclear, to name a few.

The Energy Industry has demonstrated increased demand to included environmentally conscience energy sources that focus on the efficient use of energy systems, as well as energy security and reliability. In this program, students will learn different aspects of energy systems including hydrogen, electrical, nuclear, renewable and energy storage.

Admission requirements

Admission is competitive. The specific average or standing required for admission varies from year to year. Students are selected by taking into consideration a wide range of criteria including school marks, distribution of subjects taken, and performance in subjects relevant to the academic program. Possession of the minimum requirements does not guarantee acceptance. Preference will be given to applicants with the best qualifications.

Current Ontario secondary school students must complete the Ontario Secondary School Diploma (OSSD) with six 4U or 4M credits including English (ENG4U) with a minimum average of 60 per cent, Advanced Functions (MHF4U), Calculus and Vectors (MCV4U), Chemistry (SCH4U), and Physics (SPH4U). In addition, a combined minimum 70 per cent average in math and science courses is required, with no grade below 60 per cent. All other applicants should refer to admissions for the requirements for their specific category of admission.

Professional designation

All of our undergraduate engineering programs have been fully accredited by the Canadian Engineering Accreditation Board. This program is designed to meet the CEAB requirements. (Note: The new Energy Engineering Program will be reviewed for accreditation in 2025-2026, to coincide with the first graduation class, as per CEAB requirements). Each graduate is eligible to apply for licensing as a professional engineer (PEng) in any province or territory in Canada.

Program details and degree requirements

To be eligible for an honours Bachelor of Engineering degree in Energy Engineering, students must successfully complete 132 credit hours, including all courses outlined here. For elective options, see the following list.

All courses in Year 1, except SSCI 1470U, are prerequisites to all non-elective courses in Year 3.

All courses in Years 1 and 2, except SSCI 1470U, are prerequisites to all non-elective courses in Year 4.

Although reasonable efforts will be made to adhere to the order and timing of courses as indicated, course requirements and term offerings may change. For the most up-to-date list of course offerings, please visit the faculty website at engineering.ontariotechu.ca.

Year 1 (33 credit hours)

COMM 1050U – Technical Communications

ENGR 1015U – Introduction to Engineering

MATH 1010U – Calculus I

MATH 1850U – Linear Algebra for Engineers

PHY 1010U – Physics I

CHEM 1800U – Chemistry for Engineers

ENGR 1025U – Engineering Design

ENGR 1200U – Introduction to Programming for Engineers

MATH 1020U – Calculus II

PHY 1020U – Physics II

SSCI 1470U – Impact of Science and Technology on Society

Year 2 (33 credit hours)

MANE 2220U - Structure and Properties of Materials

MATH 2860U - Differential Equations

ESNS 2140U - Problem Solving, Modelling & Simulation

ENEE 2160U - Energy and Environmental Impacts

NUCL 2860U - Fluid Mechanics

ELEE 2790U - Electric Circuits

ENGR 2100U - Computational Engineering Applications

NUCL 1530U - Radiation and Nuclear Technologies

STAT 2800U - Statistics for Engineers

NUCL 2010U - Thermodynamic Cycles

Liberal Studies Elective*

Year 3 (33 credit hours)

MECE 3260U - Introduction to Energy System

NUCL 3930U - Heat Transfer

ENEE 3030U - Computer Aided Design

MECE 3350U - Control Systems

MECE 3410U - Electro-Mechanical Energy Conversion

ESNS 3380U - Strength of Materials

ENGR 3360U - Engineering Economics

MANE 4160U - Artificial Intelligence in Engineering

ELEE 3260U – Power Systems

ENEE 3265U - Hydrogen and Fuel Cells

Liberal Studies elective*

Year 4 (33 credit hours)

ELEE 4115U - Fundamentals of Smart Grid

ENGR 4960U - Capstone Systems Design for Energy Engineering I

MANE 4380U - Life Cycle Engineering

ENEE 4161U - Solar Energy

ENEE 4163U - Wind and Hydro Energy

ENGR 4760U - Ethics, Law, Professionalism for Engineers

ENGR 4961U - Capstone Systems Design for Energy Engineering II

ENEE 4260U - Integrated Energy Systems

Three Engineering electives*

***Electives**

Engineering electives

Courses selected for the engineering elective must be approved by the Faculty of Engineering and Applied Science. Engineering courses from other engineering programs may be allowed as engineering electives provided students have the prerequisites and the courses extend the students' knowledge through greater depth in an advanced area, or greater breadth in a complementary field. Not all of the listed engineering electives will necessarily be offered each year.

The following are approved courses as engineering electives:

- AUTE 3450U - Combustion and Engines
- ELEE 4125U - Smart Grid Networking and Security
- ENEE 4460U – Sustainable Community Energy Systems
- NUCL 4460U – Nuclear Power Systems
- NUCL 4640U – Nuclear Plant Operation
- NUCL 5560U – Future Role of Nuclear Energy (Special Topic)
- MANE 3120U - Thermo-mechanical Processing of Materials
- MANE 4280U – Robotics and Automation
- MECE 3230U Thermodynamic Applications
- MECE 4450U - Thermal Environmental Engineering

Liberal Studies electives

Complementary studies, including courses in humanities, social sciences, arts, management, engineering economics, ethics and communication, are included in engineering programs to complement the technical content of the curriculum and thereby provide graduates with a broader perspective of their role in society. Inclusion of complementary studies also satisfies several accreditation criteria of the Canadian Engineering Accreditation Board. Courses or parts of courses covering engineering economics, ethics, and the impact of technology on society, as well as courses that develop the student's capability to communicate orally, visually and in writing, are essential to the education of an engineer and therefore are included in all of our engineering programs.

Liberal studies electives are included in each engineering program to ensure adequate coverage of subject matter that deals with central issues, methodologies and thought processes of the humanities and social sciences. Such material is required in the education of an engineer. Liberal studies electives can include, but are not limited to, courses dealing with cultural analysis; historical analysis; literature and the arts; knowledge, cognition, and moral reasoning; and social and behavioural analysis.

Foreign language and business courses may not be used as liberal studies. Courses can be approved as liberal studies electives for students in engineering programs at the university by the dean of the Faculty of Engineering and Applied Science (or designate), in accordance with these principles.

Courses selected for the liberal studies electives must be approved by the Faculty of Engineering and Applied Science. Liberal studies electives are subject to change. An updated list of liberal studies electives will be maintained online at engineering.ontariotechu.ca

Appendix C1: List of Program Courses, New Course Proposals & Required Course Changes

Energy Engineering Program

	Course Code	Course Name	
Year 1	COMM 1050U	Tech Communication	Existing Course – course outline attached
	ENGR 1015U	Introduction to Engineering	Existing Course – course outline attached
	MATH 1010U	Calculus I	Existing Course – course outline attached
	MATH 1850U	Linear Algebra	Existing Course – course outline attached
	PHY 1010U	Physics I	Existing Course – course outline attached
	CHEM 1800U	Chemistry for Engineers	Existing Course – course outline attached
	ENGR 1025U	Engineering Design	Existing Course – course outline attached
	ENGR 1200U	Intro to Programming	Existing Course – course outline attached
	MATH 1020U	Calculus II	Existing Course – course outline attached
	PHY 1020U	Physics II	Existing Course – course outline attached
	SSCI 1470U	Impact of Science on Society	Existing Course – course outline attached
Year 2	MANE 2220U	Structure and Properties of Materials	Existing Course – course outline attached
	MATH 2860U	Differential Equations	Existing Course – course outline attached
	ESNS 2140U	Problem Solving, Modelling & Simulation	Existing Course – course outline attached
	ENEE 2160U	Energy and Environmental Impacts	NEW course template below
	NUCL 2860U	Fluid Mechanics	Existing Course – course outline attached
	ELEE 2790U	Electric Circuits	Existing Course – course outline attached
	ENGR 2100U	Computational Engineering Applications	Existing Course – course outline attached
	NUCL 1530U	Radiation and Nuclear Technologies	Existing Course – course outline attached
	STAT 2800U	Statistics for Engineers	Existing Course – course outline attached
	NUCL 2010U	Thermodynamic Cycles	Existing Course – course outline attached
	LSE	Liberal Studies Elective	
Year 3	MECE 3260U	Introduction to Energy System	Existing Course – course outline attached
	NUCL 3930U	Heat Transfer	Existing Course – course outline attached
	ENEE 3030U	Computer Aided Design	NEW course template below
	MECE 3350U	Control Systems	Existing Course – course outline attached
	ESNS 3380U	Strength of Materials	Existing Course – course outline attached
	ENGR 3360U	Engineering Economics	Existing Course – course outline attached
	MANE 4160U	Artificial Intelligence in Engineering	Existing Course – course outline attached Course change prerequisites
	MECE 3410U	Electro-Mechanical Energy Conversion	Existing Course – course outline attached Course change prerequisites
	ELEE 3260U	Power Systems	Course change prerequisites
	ENEE 3265U	Hydrogen and Fuel Cells	NEW course template
	LSE	Liberal Studies Elective	

Year 4	ELEE 4115U	Fundamentals of Smart Grid	Existing Course – course outline attached
	ENGR 4960U	Capstone System Design for Energy Engineering I	NEW course template below
	ENGR 4760U	Ethics, Law, Professionalism for Engineers	Existing Course – course outline attached
	MANE 4380U	Life Cycle Engineering	Existing Course – course outline attached
	ENEE 4161U	Solar Energy	NEW course template and course change cross-listed MECE 4151U
	ENEE 4163U	Wind and Hydro Energy	NEW course template and course change cross-listed MECE 4153
	ENGR 4961U	Capstone System Design for Energy Engineering II	NEW course template below
	ENEE 4260U	Integrated Energy Systems	NEW course template below
	ENG Elective	Energy Engineering Elective	
	ENG Elective	Energy Engineering Elective	
	ENG Elective	Energy Engineering Elective	

Engineering Elective

ENG Elective	AUTE 3450U - Combustion and Engines	
	ELEE 4125U - Smart Grid Networking and Security	
	ENEE 4460U – Sustainable Community Energy Systems	New Course template
	NUCL 4460U – Nuclear Power Systems	
	NUCL 4640U – Nuclear Plant Operation	
	NUCL 5560U – Future Role of Nuclear Energy (Special Topic)	
	MANE 3120U - Thermo-mechanical Processing of Materials	
	MANE 4280U – Robotics and Automation	
	MECE 3230U Thermodynamic Applications	Course Change prerequisites
	MECE 4450U - Thermal Environmental Engineering	

New Course Template and Course Change forms listed below:

NEW COURSE TEMPLATE

For changes to existing courses see Course Change Template

New courses must be entered into Curriculog prior to Faculty Council. Please use this template to provide the information to your Curriculog contact.

Faculty: FEAS & FESNS
This new course is associated with: ☐ Minor Program Adjustment ☐ Major Program Modification ☒ New Program ☐ None

Will this course appear anywhere other than the course description section of the Calendar?	☒ Yes ☐ No

If you answered yes to the above, please complete:

A new core course for an existing program, specialization or minor*: Minor Program Adjustment*

A new elective course for an existing program, specialization or minor, listed in the program map*: Course Placement*

A new course (core or elective) related to a Major Program Modification*: Major Program Modification*

A new course (core or elective) related to a New Program*: New Program proposal*

Programs impacted: [Please list all impacted programs including any applicable fields or specializations.]

Energy Engineering Program

Calendar start date: (When the course should first appear in the Academic Calendar 2020-2021)

2022-2023

Registration start date: (The first time the course will be open for registration e.g. Fall 2020)

Fall 2023

Additional supporting information (optional; please indicate if you are attaching any additional documentation)

Subject Code: ENEE	Course Number: 2160U
Full Course Title: Energy and Environmental Impacts	
Short-Form Course Title (max. 30 characters): Energy & Environmental Impact	

Course Description

Environmental impacts of energy systems, such as power generation, industrial processes and transportation. Air, soil and water pollution. Pollutants from power production and engines and their effects on the environment, generation mechanisms of chemical pollutants, photochemical pollutants and smog, fluid mechanics of jets, plumes, thermals and turbulent diffusion in the atmosphere. Design for environment methods, including pollution prevention techniques, life cycle assessment, pollution abatement devices and control methods, including exhaust gas treatment, absorption, filtration, scrubbers. Industrial ecology. Environmental legislations. Design of sustainable energy systems. Case Studies.

Credit Hours: 3		
Contact Hours – please indicate total number of hours for each component		
Lecture: 3		Lab:
Tutorial: 1		Other:
Cross-listings		
Prerequisites for Calendar	PHY 1020U	
Prerequisites for Banner	PHY 1020U	
Co-requisites		
Prerequisites with concurrency (pre or co-requisite)		
Credit restrictions		☐ Equivalency*
Recommended Prerequisites		
Course Restrictions		
Course Type	☒ Core ☐ Elective ☐ Core or Elective	
Is the course: ☒ Undergraduate ☐ Graduate ☐ Professional (e.g. some Education courses)		
Grading scheme	☒ N (normal alpha grade) ☐ P (pass/fail)	

***Equivalency:** If it is equivalent, students can retake either course. If it is not equivalent, students are not allowed to register in the restricted course.

Course instructional method:

CLS (In Class Delivery)	x	HYB (In Class and Online Delivery)	
IND (Individual Studies)		OFF (Off Site)	
WB1 (Virtual Meet Time – Synchronous)		WEB (Fully Online – Asynchronous)	
Not Applicable			

Teaching and assessment methods:

Midterm, Assignments, Quizzes, Course Project, Case Study Report, Final Exam

Learning outcomes: (for assistance developing course learning outcomes, please refer to the Teaching and Learning website, or contact them at teachingandlearning@ontariotechu.ca.)

Students who successfully complete the course should have reliably demonstrated the ability to: 1. Understand the environmental impacts of energy systems and their applications 2. Identify appropriate impact abatement technologies 3. Design and develop energy systems for better environment 4. Utilize appropriate impact analysis and assessment tools (including LCA softwares) 5. Understand environmental legislations, codes and regulations as well as policies

Does this course contain any experiential learning components? ☒ **Yes** ☐ **No**

If yes:

Case Study	X	Simulated Workplace Project	
Consulting project/workplace project		Applied Research	
Field Experiences			
Other Types of Experiences:			

We have consulted with all impacted areas: ☒ **Yes** ☐ **NA**

Process of consultation, if applicable:

It was consulted through joint program committee members and colleagues in the area.

Does this course contain any Indigenous content? ☐ **Yes** ☒ **No** ☐ **Unsure**

For more information on how Indigenous content is defined at Ontario Tech University and how to consult with the Indigenous Education Advisory Circle (IEAC), please refer to the Protocol for Consultation with the Indigenous Education Advisory Circle.

Has the IEAC been contacted? ☐ **Yes** ☒ **No**

If yes, when?

n/a

What was the advice you received from the IEAC, and how has it been included in your proposal?

Did the IEAC ask you to return the proposal to them for review? ☐ **Yes** ☒ **No**

If yes, have they completed their review? ☐ **Yes** ☐ **No** ☒ **N/A**

Financial Implications

None.

Pre-Faculty Council Approval Dates (e.g. Curriculum Committee, Program Committee):

NEW COURSE TEMPLATE

For changes to existing courses see Course Change Template

New courses must be entered into Curriculog prior to Faculty Council. Please use this template to provide the information to your Curriculog contact.

Faculty: FEAS & FESNS
This new course is associated with: ☐ Minor Program Adjustment ☐ Major Program Modification ☒ New Program ☐ None

Will this course appear anywhere other than the course description section of the Calendar?	☒ **Yes** ☐ **No**

If you answered yes to the above, please complete:

A new core course for an existing program, specialization or minor*: Minor Program Adjustment*

A new elective course for an existing program, specialization or minor, listed in the program map*: Course Placement*

A new course (core or elective) related to a Major Program Modification*: Major Program Modification*

A new course (core or elective) related to a New Program*: New Program proposal*

Programs impacted: [Please list all impacted programs including any applicable fields or specializations.]

Energy Engineering

Calendar start date: (When the course should first appear in the Academic Calendar 2020-2021)

2022-2023

Registration start date: (The first time the course will be open for registration e.g. Fall 2020)

Additional supporting information (optional; please indicate if you are attaching any additional documentation)

Subject Code: ENEE	Course Number: 3030U
Full Course Title: Computer-Aided Design	
Short-Form Course Title (max. 30 characters): Computer-Aided Design	

Course Description

Geometric/solid modelling, computer graphics and feature modelling. Introduction to design refinement with finite element analysis tools. State-of-the-art software packages will be introduced and case studies with applications in different engineering fields will be employed.

Credit Hours: 3		
Contact Hours – please indicate total number of hours for each component		
Lecture: 3		Lab: 2
Tutorial:		Other:
Cross-listings		
Prerequisites for Calendar	ENGR 1025U	
Prerequisites for Banner	ENGR 1025U	
Co-requisites	ESNS 3380U	
Prerequisites with concurrency (pre or co-requisite)		
Credit restrictions	☐ Equivalency*	
Recommended Prerequisites		
Course Restrictions		
Course Type	☒ Core ☐ Elective ☐ Core or Elective	
Is the course: ☒ Undergraduate ☐ Graduate ☐ Professional (e.g. some Education courses)		
Grading scheme	☒ N (normal alpha grade) ☐ P (pass/fail)	

***Equivalency:** If it is equivalent, students can retake either course. If it is not equivalent, students are not allowed to register in the restricted course.

Course instructional method:

CLS (In Class Delivery)	x	HYB (In Class and Online Delivery)	
IND (Individual Studies)		OFF (Off Site)	
WB1 (Virtual Meet Time – Synchronous)		WEB (Fully Online – Asynchronous)	
Not Applicable			

Teaching and assessment methods:

Individual Assignments Case Study Labs Project Midterm Final exam

Learning outcomes: (for assistance developing course learning outcomes, please refer to the Teaching and Learning website, or contact them at teachingandlearning@ontariotechu.ca.)

(i) understand basics of geometric/solid modelling, computer graphics and feature modelling; e. g., represent curves and surfaces using parametric equations; understand the roles of a CAD/CAM/CAE system in the context of the product cycle;

(ii) demonstrate the capability to analyze engineering problems with or without CAD/CAM/CAE tools;

(iii) demonstrate the capability to conduct investigation with given design specifications;

(iv) demonstrate proficiency with product design and development processes;

(v) demonstrate proficiency with the application of CAD/CAE tools;

(vi) demonstrate strong communication skills to discuss, explain, present and promote engineering projects;

(vii) demonstrate successful collaborations with peers and teammates;

(viii) demonstrate the capability to conduct simple project management and economic analysis, understand key issues in CAM and the data associativity benefits of CAD/CAM systems;

(ix) demonstrate the capability to conduct self-learning for a commercial CAD/CAM/CAE system and to be a life-long learner.

Does this course contain any experiential learning components? ☐ **Yes** ☒ **No**

If yes:

Case Study		Simulated Workplace Project	
Consulting project/workplace project		Applied Research	
Field Experiences			
Other Types of Experiences:			

We have consulted with all impacted areas: ☒ **Yes** ☐ **NA**

Process of consultation, if applicable:

It was consulted through joint program committee members and colleagues in the area.

Does this course contain any Indigenous content? ☐ **Yes** ☒ **No** ☐ **Unsure**

For more information on how Indigenous content is defined at Ontario Tech University and how to consult with the Indigenous Education Advisory Circle (IEAC), please refer to the Protocol for Consultation with the Indigenous Education Advisory Circle.

Has the IEAC been contacted? ☐ **Yes** ☒ **No**

If yes, when?

n/a

What was the advice you received from the IEAC, and how has it been included in your proposal?

Did the IEAC ask you to return the proposal to them for review? ☐ **Yes** ☒ **No**

If yes, have they completed their review? ☐ **Yes** ☐ **No** ☒ **N/A**

Financial Implications

None.

Pre-Faculty Council Approval Dates (e.g. Curriculum Committee, Program Committee):

COURSE CHANGE TEMPLATE

For new courses see New Course Template
Changes to courses must be entered into Curriculog prior to Faculty Council. Please use this template to provide the information to your Curriculog contact.

Faculty: FEAS	
Course Level	☒ **Undergraduate** ☐ **Graduate**

COURSE CHANGES (check all that apply)

☐	Contact hours	☐	Cross-listings
☐	Co-requisites	☐	Experiential Learning
☐	Course description	☐	Grade Mode (N – alpha grade, P – Pass/Fail)
☐	Course Instructional Method (CLS, HYB, WB1, WEB)	☐	Learning outcomes
☐	Course number or course Subject code	☒	Prerequisites
☐	Course title (include new short form title)	☐	Delete course from Academic Calendar
☐	Credit restrictions and/or Equivalencies	☐	Teaching and assessment methods
☐	Credit weighting	☐	Other (please specify):
☐	Deleting an Elective Shown in the Program Map		

IS THIS COURSE CHANGE ASSOCIATED WITH A PROGRAM PROPOSAL? ☐ **Yes** ☐ **No**

REASON FOR CHANGE AND WAYS IN WHICH IT MAINTAINS/ENHANCES COURSE/PROGRAM OBJECTIVES

To add MECE 3410U: Electro-Mechanical Energy Conversion as a prerequisite to ELEE 3260U: Power Systems so the new Energy Engineering students can take this course.

FINANCIAL IMPLICATIONS

None.

CALENDAR START DATE (When the course should first appear in the Academic Calendar 2020-2021)

2022-2023

REGISTRATION START DATE (The first time the course will be open for registration e.g. Fall 2020)

Winter 2025

ADDITIONAL SUPPORTING INFORMATION (optional; please indicate if you are attaching any additional documentation)

COURSE INFORMATION

Subject Code: ELEE	**Course Number: 3260U**
Full Course Title: Power Systems	
Short-Form Course Title (max. 30 characters):	

CHANGE TO CALENDAR DESCRIPTION (if required)

Current - ELEE 3260U – Power Systems	**Proposed -** ELEE 3260U – Power Systems
First, various means of electric power generation-through hydroelectric, thermoelectric, geothermal, wind, solar, and nuclear sources are highlighted, and the choice of a given source-dictated by economic and environmental factors, application requirements and cost drivers is discussed. Then the course focuses on electric power systems; mainly electric power generation transmission, distribution; planning and operating inter-connected power systems; operating strategies and economic dispatch; transmission power line parameters, transformer models, symmetrical components, power system modelling, power flow on transmission lines; power system fault analysis. Credit hours: 3 Lecture hours: 3 Laboratory hours: 3 (biweekly) Tutorial hours: 1.5 Prerequisite(s): ELEE 3250U Credit restriction(s): ELEE 4110U	First, various means of electric power generation-through hydroelectric, thermoelectric, geothermal, wind, solar, and nuclear sources are highlighted, and the choice of a given source-dictated by economic and environmental factors, application requirements and cost drivers is discussed. Then the course focuses on electric power systems; mainly electric power generation transmission, distribution; planning and operating inter-connected power systems; operating strategies and economic dispatch; transmission power line parameters, transformer models, symmetrical components, power system modelling, power flow on transmission lines; power system fault analysis. Credit hours: 3 Lecture hours: 3 Laboratory hours: 3 (biweekly) Tutorial hours: 1.5 Prerequisite(s): ELEE 3250U or MECE 3410U Credit restriction(s): ELEE 4110U

CHANGE TO CREDIT AND CONTACT HOURS [if applicable, indicate changes to total contact hours only; changes to frequency (e.g. 1x3 hours to 2X1.5 hours) not required]:

Credit Hours	
Lecture	Lab
Tutorial	Other

OTHER CHANGES (if applicable)

Cross-listings	
Prerequisites for Calendar	ELEE 3250U or MECE 3410U
Prerequisites for Banner	ELEE 3250U or MECE 3410U
Co-requisites	
Prerequisites with concurrency (pre or co-requisite)	
Credit restrictions	☐ **Equivalency***
Recommended Prerequisites	
Course Restrictions	

Course Type	☐ **Core** ☐ **Elective** ☐ **Core or Elective**
Grading scheme	☐ **N (normal alpha grade)** ☐ **P (pass/fail)**

***Equivalency:** If it is equivalent, students can retake either course. If it is not equivalent, students are not allowed to register in the restricted course.

CHANGES TO COURSE INSTRUCTIONAL METHOD (if applicable):

CLS (In Class Delivery)		HYB (In Class and Online Delivery)	
IND (Individual Studies)		OFF (Off Site)	
WB1 (Virtual Meet Time – Synchronous)		WEB (Fully Online – Asynchronous)	
Not Applicable			

CHANGES TO TEACHING AND ASSESSMENT METHODS (if applicable)

N/A

CHANGES TO LEARNING OUTCOMES (if applicable; for assistance developing course learning outcomes, please refer to the Teaching and Learning website, or contact them at teachingandlearning@ontariotechu.ca.)

DOES THIS COURSE CONTAIN ANY EXPERIENTIAL LEARNING COMPONENTS?
If yes:

Case Study		Simulated Workplace Project	
Consulting project/workplace project		Applied Research	
Field Experiences			
Other Types of Experiences:			

CONSULTATION (Curriculog contact to complete an Impact Report)

WE HAVE CONSULTED WITH ALL IMPACTED AREAS? ☐ **Yes** ☒ **NA**

DOES THIS COURSE CONTAIN ANY INDIGENOUS CONTENT? ☐ **Yes** ☒ **No** ☐ **Unsure**
For more information on how Indigenous content is defined at Ontario Tech University and how to consult with the Indigenous Education Advisory Circle (IEAC), please refer to the Protocol for Consultation with the Indigenous Education Advisory Circle.

HAS THE IEAC BEEN CONTACTED? ☐ **Yes** ☒ **No**
If yes, when?

WHAT WAS THE ADVICE YOU RECEIVED FROM THE IEAC, AND HOW HAS IT BEEN INCLUDED IN YOUR PROPOSAL?

N/A

DID THE IEAC ASK YOU TO RETURN THE PROPOSAL TO THEM FOR REVIEW? ☐ **Yes** ☒ **No**

IF YES, HAVE THEY COMPLETED THEIR REVIEW? ☐ **Yes** ☐ **No** ☒ **N/A**

Pre-Faculty Council Approval Dates (e.g. Curriculum Committee, Program Committee):

NEW COURSE TEMPLATE

For changes to existing courses see Course Change Template

New courses must be entered into Curriculog prior to Faculty Council. Please use this template to provide the information to your Curriculog contact.

Faculty: FEAS & FESNS	
This new course is associated with: ☐ Minor Program Adjustment ☐ Major Program Modification ☒ New Program ☐ None	
Will this course appear anywhere other than the course description section of the Calendar?	☒ **Yes** ☐ **No**

If you answered yes to the above, please complete:

A new core course for an existing program, specialization or minor*: Minor Program Adjustment*

A new elective course for an existing program, specialization or minor, listed in the program map*: Course Placement*

A new course (core or elective) related to a Major Program Modification*: Major Program Modification*

A new course (core or elective) related to a New Program*: New Program proposal*

Programs impacted: [Please list all impacted programs including any applicable fields or specializations.]

Energy Engineering

Calendar start date: (When the course should first appear in the Academic Calendar 2020-2021)

2022-2023

Registration start date: (The first time the course will be open for registration e.g. Fall 2020)

Fall 2022

Additional supporting information (optional; please indicate if you are attaching any additional documentation)

Subject Code: ENEE	**Course Number:** 3265U
Full Course Title: Hydrogen and Fuel Cells	
Short-Form Course Title (max. 30 characters)**:** Hydrogen & Fuel Cells	

Course Description

Hydrogen production, storage, distribution and utilization methods. Hydrogen energy systems and applications. Principles and current state of fuel cell technologies; fuel cell thermodynamics; transport processes; electrochemistry; reliability and efficiency; fuel cell systems and areas of applications; design of various fuel cell types, including Phosphoric Acid Fuel Cells, Alkaline Fuel Cells, Proton Exchange Membrane, Molten Carbonate Fuel Cells, Solid Oxide Fuel Cells, Direct Methanol Fuel Cells.

Credit Hours: 3		
Contact Hours – please indicate total number of hours for each component		
Lecture: 3		**Lab: 2 (bi-weekly)**
Tutorial:		**Other:**
Cross-listings		
Prerequisites for Calendar	**MECE2320 or NUCL2010U**	
Prerequisites for Banner	**MECE2320 or NUCL2010U**	
Co-requisites		
Prerequisites with concurrency (pre or co-requisite)		
Credit restrictions	☐ **Equivalency***	
Recommended Prerequisites		
Course Restrictions		
Course Type	☒ **Core** ☐ **Elective** ☐ **Core or Elective**	
Is the course: ☐ Undergraduate ☐ Graduate ☐ Professional (e.g. some Education courses)		
Grading scheme	☒ **N (normal alpha grade)** ☐ **P (pass/fail)**	

***Equivalency:** If it is equivalent, students can retake either course. If it is not equivalent, students are not allowed to register in the restricted course.

Course instructional method:

CLS (In Class Delivery)	X	HYB (In Class and Online Delivery)	
IND (Individual Studies)		OFF (Off Site)	
WB1 (Virtual Meet Time – Synchronous)		WEB (Fully Online – Asynchronous)	
Not Applicable			

Teaching and assessment methods:

Midterm, Assignments, Quizzes, Course Project, Lab Reports, Final Exam

Learning outcomes: (for assistance developing course learning outcomes, please refer to the Teaching and Learning website, or contact them at teachingandlearning@ontariotechu.ca.)

Students who successfully complete the course should have reliably demonstrated the ability to: 1. Understand how hydrogen is produced, stored, distributed and used in energy systems 2. Understand how fuel cells operate and their potential utilization in various applications 3. Design hydrogen energy systems and fuel cells 4. Utilize appropriate tools and softwares, such as EES, for design and analysis

Does this course contain any experiential learning components? ☐ **Yes** ☒ **No**

If yes:

Case Study		Simulated Workplace Project	
Consulting project/workplace project		Applied Research	
Field Experiences			
Other Types of Experiences:			

We have consulted with all impacted areas: ☒ **Yes** ☐ **NA**

Process of consultation, if applicable:

It was consulted through joint program committee members and colleagues in the area.

Does this course contain any Indigenous content? ☐ **Yes** ☒ **No** ☐ **Unsure**

For more information on how Indigenous content is defined at Ontario Tech University and how to consult with the Indigenous Education Advisory Circle (IEAC), please refer to the Protocol for Consultation with the Indigenous Education Advisory Circle.

Has the IEAC been contacted? ☐ **Yes** ☒ **No**

If yes, when?

n/a

What was the advice you received from the IEAC, and how has it been included in your proposal?

Did the IEAC ask you to return the proposal to them for review? ☐ **Yes** ☒ **No**

If yes, have they completed their review? ☐ **Yes** ☐ **No** ☐ **N/A**

Financial Implications

None.

Pre-Faculty Council Approval Dates (e.g. Curriculum Committee, Program Committee):

NEW COURSE TEMPLATE

For changes to existing courses see Course Change Template

New courses must be entered into Curriculog prior to Faculty Council. Please use this template to provide the information to your Curriculog contact.

Faculty: FEAS & FESNS	
This new course is associated with: ☐ Minor Program Adjustment ☐ Major Program Modification ☒ New Program ☐ None	
Will this course appear anywhere other than the course description section of the Calendar?	☒ **Yes** ☐ **No**

If you answered yes to the above, please complete:

A new core course for an existing program, specialization or minor*: Minor Program Adjustment*

A new elective course for an existing program, specialization or minor, listed in the program map*: Course Placement*

A new course (core or elective) related to a Major Program Modification*: Major Program Modification*

A new course (core or elective) related to a New Program*: New Program proposal*

Programs impacted: [Please list all impacted programs including any applicable fields or specializations.]

Energy Engineering Program

Calendar start date: (When the course should first appear in the Academic Calendar 2020-2021)

2022-2023

Registration start date: (The first time the course will be open for registration e.g. Fall 2020)

Fall 2022

Additional supporting information (optional; please indicate if you are attaching any additional documentation)

n/a

Subject Code: ENGR	**Course Number:** 4960U
Full Course Title: Capstone System Design for Energy Engineering I	
Short-Form Course Title (max. 30 characters)**:** Capstone Sys Design I	

Course Description

This course constitutes the first part of a two-term capstone systems design engineering Endeavor. These two capstone systems design courses (ENGR 4960U and ENGR 4961U) represent a critical mandatory component for fulfilling the requirements for accrediting engineering degree programs set by the Canadian Engineering Accreditation Board (CEAB). They provide a culminating major teamwork capstone design engineering experience that integrates various aspects of students' knowledge and skills acquired in the classroom as well as on co-op or internship work terms. These courses challenge senior-level students to engage in applying their engineering knowledge to produce useful engineering artifacts.
This design-built project-based course normally includes studying open-ended engineering design topics of interest to the students. A wide range of engineering design-related product, process, technology, service or system development topics may be covered in this course. The course covers design considerations for systems that predominantly incorporate many aspects of engineering. These may consist of real-world design projects proposed and sponsored by industrial partners, or design projects on topics proposed by faculty advisors, or topics proposed by a group of enrolled students. In this context, in this course the engineering design process will be reviewed along with its application to the design of the said systems. Students will work in small groups of students on a capstone design engineering project of major breadth that will require them to integrate the knowledge that they have gained throughout their program of study and apply it to the design and development of a complete device or system.

Credit Hours: 3	
Contact Hours – please indicate total number of hours for each component	
Lecture: 3.0	**Lab: 1.5**
Tutorial: 1.0	**Other:**
Cross-listings	
Prerequisites for Calendar	For Energy Engineering students, this course requires successful completion of all program option-respective non-elective courses in third year as a prerequisite (i.e., ELEE 3263U, ENEE 3265U, ENGR 3360U, ESNS 3380U, MANE 4160U, MECE 3030U, MECE 3260U, MECE 3350U, MECE 3410U, NUCL 3930U)
Prerequisites for Banner	For Energy Engineering students, this course requires successful completion of all program option-respective non-elective courses in third year as a prerequisite (i.e., ELEE 3263U, ENEE 3265U, ENGR 3360U, ESNS 3380U, MANE 4160U, MECE 3030U, MECE 3260U, MECE 3350U, MECE 3410U, NUCL 3930U)
Co-requisites	
Prerequisites with concurrency (pre or co-requisite)	
Credit restrictions	☐ **Equivalency***
Recommended Prerequisites	
Course Restrictions	
Course Type	☒ **Core** ☐ **Elective** ☐ **Core or Elective**
Is the course: ☒ Undergraduate ☐ Graduate ☐ Professional (e.g. some Education courses)	
Grading scheme	☒ **N (normal alpha grade)** ☐ **P (pass/fail)**

***Equivalency:** If it is equivalent, students can retake either course. If it is not equivalent, students are not allowed to register in the restricted course.

Course instructional method:

CLS (In Class Delivery)	X	HYB (In Class and Online Delivery)	
IND (Individual Studies)		OFF (Off Site)	
WB1 (Virtual Meet Time – Synchronous)		WEB (Fully Online – Asynchronous)	
Not Applicable			

Teaching and assessment methods:

Reports, presentations, prototype demonstrations

Learning outcomes: (for assistance developing course learning outcomes, please refer to the Teaching and Learning website, or contact them at teachingandlearning@ontariotechu.ca.)

This capstone design course is intended for the enrolled students to master the product development process and complete a significant open-ended design engineering project in the field of their specialization. By the end of this course students will have completed the following parts of the design process for their particular projects: Customer Requirements; Background Search; Design Plan and Project Management; Brainstorming; Preliminary Concept Generation; Sketching Ideas; Engineering Specifications (Benchmarking); Detailed Concept Generation; Functional Decomposition; Concept Development and Screening/Selection; Group Preliminary Proof of Concept Prototype Demonstrations and Oral Presentations; and Final Engineering Term Report. The primary specific learning and training outcomes are:

- Identify, formulate, and solve engineering problems;
- Design a component, process, technology, service, or system to meet desired design needs;
- Use appropriately engineering practice techniques, skills, and modern engineering tools;
- Apply knowledge of mathematics, science, and engineering;
- Design and conduct experiments and analyze and interpret experimental data;
- Function on multi-disciplinary teams; and
- Communicate effectively their work.

Does this course contain any experiential learning components? ☐ **Yes** ☒ **No**

If yes:

Case Study		Simulated Workplace Project	
Consulting project/workplace project		Applied Research	
Field Experiences			
Other Types of Experiences:			

We have consulted with all impacted areas: ☐ **Yes** ☒ **NA**

Process of consultation, if applicable:

It was consulted through joint program committee members and colleagues in the area.

Does this course contain any Indigenous content? ☐ **Yes** ☒ **No** ☐ **Unsure**

For more information on how Indigenous content is defined at Ontario Tech University and how to consult with the Indigenous Education Advisory Circle (IEAC), please refer to the Protocol for Consultation with the Indigenous Education Advisory Circle.

Has the IEAC been contacted? ☐ **Yes** ☒ **No**

If yes, when?

n/a

What was the advice you received from the IEAC, and how has it been included in your proposal?

Did the IEAC ask you to return the proposal to them for review? ☐ **Yes** ☒ **No**

If yes, have they completed their review? ☐ **Yes** ☐ **No** ☒ **N/A**

Financial Implications

$100 per student

NEW COURSE TEMPLATE

For changes to existing courses see Course Change Template

New courses must be entered into Curriculog prior to Faculty Council. Please use this template to provide the information to your Curriculog contact.

Faculty: FEAS & FESNS	
This new course is associated with: ☐ Minor Program Adjustment ☐ Major Program Modification ☒ New Program ☐ None	
Will this course appear anywhere other than the course description section of the Calendar?	☒ **Yes** ☐ **No**

If you answered yes to the above, please complete:

A new core course for an existing program, specialization or minor*: Minor Program Adjustment*

A new elective course for an existing program, specialization or minor, listed in the program map*: Course Placement*

A new course (core or elective) related to a Major Program Modification*: Major Program Modification*

A new course (core or elective) related to a New Program*: New Program proposal*

Programs impacted: [Please list all impacted programs including any applicable fields or specializations.]

Energy Engineering Program

Calendar start date: (When the course should first appear in the Academic Calendar 2020-2021)

2022-2023

Registration start date: (The first time the course will be open for registration e.g. Fall 2020)

2022-2023

Additional supporting information (optional; please indicate if you are attaching any additional documentation)

Subject Code: ENEE	**Course Number:** 4161U
Full Course Title: Solar Energy	
Short-Form Course Title (max. 30 characters)**:** Solar Energy	

Course Description

Solar radiation measurements and predictions. Radiative heat transfer aspects. Classification of solar energy options. Solar thermal applications, including heating, cooling, air conditioning, electricity and fresh water production. Solar collectors and absorbing materials and their spectral characteristics. Concentrated solar panels. Solar electrical applications. Basics, materials and operational details on photovoltaics/solar cells. Solar energy conversion systems for various applications. Energy storage systems, including latent (phase change materials, molten salts) and sensible (hot water, compressed air, rock bed, etc.) options. Integrated solar energy systems for more useful outputs. Solar fuels. Thermodynamic analysis and performance assessments through energy and exergy approaches.

Credit Hours: 3		
Contact Hours – please indicate total number of hours for each component		
Lecture: 3		**Lab: 2 (biweekly)**
Tutorial:		**Other:**
Cross-listings	MECE 4151U – Solar Energy	
Prerequisites for Calendar	MECE 3260U and (MECE 3930 or NUCL3930)	
Prerequisites for Banner	MECE 3260U and (MECE 3930 or NUCL3930)	
Co-requisites		
Prerequisites with concurrency (pre or co-requisite)		
Credit restrictions	☐ **Equivalency***	
Recommended Prerequisites		
Course Restrictions		
Course Type	☒ **Core** ☐ **Elective** ☐ **Core or Elective**	
Is the course: ☒ Undergraduate ☐ Graduate ☐ Professional (e.g. some Education courses)		
Grading scheme	☒ **N (normal alpha grade)** ☐ **P (pass/fail)**	

***Equivalency:** If it is equivalent, students can retake either course. If it is not equivalent, students are not allowed to register in the restricted course.

Course instructional method:

CLS (In Class Delivery)	X	HYB (In Class and Online Delivery)	
IND (Individual Studies)		OFF (Off Site)	
WB1 (Virtual Meet Time – Synchronous)		WEB (Fully Online – Asynchronous)	
Not Applicable			

Teaching and assessment methods:

Assignments, Lab Reports, Design Project, Midterm, Final Exam:

Learning outcomes: (for assistance developing course learning outcomes, please refer to the Teaching and Learning website, or contact them at teachingandlearning@ontariotechu.ca.)

- Demonstrate a fundamental understanding of solar radiation and its measurements and predictions.
- Demonstrate ability to make radiative heat transfer calculations for various applications.
- Demonstrate a clear understanding of solar thermal and solar thermal and electrical applications.

- Demonstrate a basic understanding solar collectors, concentrated panels and absorbing materials and their spectral characteristics.
- Demonstrate ability to use energy storage options to offset the mismatch between demand and supply.
- Demonstrate ability to understand and use solar energy for solar fuels (hydrogen, methanol and ethanol) production.
- Demonstrate ability to use both first and second laws of thermodynamics (through energy and exergy approaches) for system analysis, assessment and performance evaluation.

Does this course contain any experiential learning components? ☐ **Yes** ☒ **No**

If yes:

Case Study		Simulated Workplace Project	
Consulting project/workplace project		Applied Research	
Field Experiences			
Other Types of Experiences:			

We have consulted with all impacted areas: ☒ **Yes** ☐ **NA**

Process of consultation, if applicable:

It was consulted through joint program committee members and colleagues in the area.

Does this course contain any Indigenous content? ☐ **Yes** ☒ **No** ☐ **Unsure**

For more information on how Indigenous content is defined at Ontario Tech University and how to consult with the Indigenous Education Advisory Circle (IEAC), please refer to the Protocol for Consultation with the Indigenous Education Advisory Circle.

Has the IEAC been contacted? ☐ **Yes** ☒ **No**

If yes, when?

n/a

What was the advice you received from the IEAC, and how has it been included in your proposal?

Did the IEAC ask you to return the proposal to them for review? ☐ **Yes** ☒ **No**

If yes, have they completed their review? ☐ **Yes** ☐ **No** ☒ **N/A**

Financial Implications

None.

NEW COURSE TEMPLATE

For changes to existing courses see Course Change Template

New courses must be entered into Curriculog prior to Faculty Council. Please use this template to provide the information to your Curriculog contact.

Faculty: FEAS & FESNS	
This new course is associated with: ☐ Minor Program Adjustment ☐ Major Program Modification ☒ New Program ☐ None	
Will this course appear anywhere other than the course description section of the Calendar?	☒ **Yes** ☐ **No**

If you answered yes to the above, please complete:

A new core course for an existing program, specialization or minor*: Minor Program Adjustment*

A new elective course for an existing program, specialization or minor, listed in the program map*: Course Placement*

A new course (core or elective) related to a Major Program Modification*: Major Program Modification*

A new course (core or elective) related to a New Program*: New Program proposal*

Programs impacted: [Please list all impacted programs including any applicable fields or specializations.]

Energy Engineering Program

Calendar start date: (When the course should first appear in the Academic Calendar 2020-2021)

2022-2023

Registration start date: (The first time the course will be open for registration e.g. Fall 2020)

Fall 2022

Additional supporting information (optional; please indicate if you are attaching any additional documentation)

Subject Code: ENEE	**Course Number:** 4163U
Full Course Title: Wind and Hydro Energy	
Short-Form Course Title (max. 30 characters)**:** Wind and Hydro Energy	

Course Description

Turbomachinery fundamentals and analysis, including: angular momentum, pumps, fans, blowers, hydraulic turbines, propellers, and wind turbines. Wind characteristics, location, and wind farm design considerations. Aerodynamics of wind turbines and blade shape. Analysis of horizontal and vertical axis wind turbines. Wind turbine materials, components, and design. Design of dams and reservoirs, and use of rivers and tidal flows. Storage systems including pumped storage. Electrical aspects of wind and hydro energy generation systems. Integration, applications, and environmental impact of wind and hydro energy systems. Implementation of course principles in a design and construction project.

Credit Hours: 3		
Contact Hours – please indicate total number of hours for each component		
Lecture: 3		**Lab:**
Tutorial: 1		**Other:**
Cross-listings	MECE 4153U – Wind and Hydro Energy	
Prerequisites for Calendar	MECE 3410U and MECE 3260U and (MECE 2860U or NUCL 2860U)	
Prerequisites for Banner	MECE 3410U and MECE 3260U and (MECE 2860U or NUCL 2860U)	
Co-requisites		
Prerequisites with concurrency (pre or co-requisite)		
Credit restrictions	☐ **Equivalency***	
Recommended Prerequisites		
Course Restrictions		
Course Type	☒ **Core** ☐ **Elective** ☐ **Core or Elective**	
Is the course: ☒ Undergraduate ☐ Graduate ☐ Professional (e.g. some Education courses)		
Grading scheme	☒ **N (normal alpha grade)** ☐ **P (pass/fail)**	

***Equivalency:** If it is equivalent, students can retake either course. If it is not equivalent, students are not allowed to register in the restricted course.

Course instructional method:

CLS (In Class Delivery)	X	HYB (In Class and Online Delivery)	
IND (Individual Studies)		OFF (Off Site)	
WB1 (Virtual Meet Time – Synchronous)		WEB (Fully Online – Asynchronous)	
Not Applicable			

Teaching and assessment methods:

Quizzes, Assignments, Midterm Test, Course project, Final Exam

Learning outcomes: (for assistance developing course learning outcomes, please refer to the Teaching and Learning website, or contact them at teachingandlearning@ontariotechu.ca.)

By the end of this course, the student should be able to: • Demonstrate a knowledge of the basic technical and operational aspects of wind and hydro energy systems and applications. • Understand how fluid mechanics principles govern the behavior of wind and hydro energy systems

- Demonstrate knowledge of methods of analysis, design, and performance improvement of wind and hydro energy systems.
- Use tables, charts, equations, and software to obtain wind and hydro data for analysis and prediction of wind and hydro energy applications.

Does this course contain any experiential learning components? ☐ **Yes** ☒ **No**

If yes:

Case Study		Simulated Workplace Project	
Consulting project/workplace project		Applied Research	
Field Experiences			
Other Types of Experiences:			

We have consulted with all impacted areas: ☐ **Yes** ☐ **NA**

Process of consultation, if applicable:

It was consulted through joint program committee members and colleagues in the area.

Does this course contain any Indigenous content? ☐ **Yes** ☒ **No** ☐ **Unsure**

For more information on how Indigenous content is defined at Ontario Tech University and how to consult with the Indigenous Education Advisory Circle (IEAC), please refer to the Protocol for Consultation with the Indigenous Education Advisory Circle.

Has the IEAC been contacted? ☐ **Yes** ☒ **No**

If yes, when?

n/a

What was the advice you received from the IEAC, and how has it been included in your proposal?

Did the IEAC ask you to return the proposal to them for review? ☐ **Yes** ☒ **No**

If yes, have they completed their review? ☐ **Yes** ☐ **No** ☒ **N/A**

Financial Implications

None.

Pre-Faculty Council Approval Dates (e.g. Curriculum Committee, Program Committee):

NEW COURSE TEMPLATE

For changes to existing courses see Course Change Template

New courses must be entered into Curriculog prior to Faculty Council. Please use this template to provide the information to your Curriculog contact.

Faculty: FEAS & FESNS	
This new course is associated with: ☐ Minor Program Adjustment ☐ Major Program Modification ☒ New Program ☐ None	
Will this course appear anywhere other than the course description section of the Calendar?	☐ **Yes** ☐ **No**

If you answered yes to the above, please complete:

A new core course for an existing program, specialization or minor*: Minor Program Adjustment*

A new elective course for an existing program, specialization or minor, listed in the program map*: Course Placement*

A new course (core or elective) related to a Major Program Modification*: Major Program Modification*

A new course (core or elective) related to a New Program*: New Program proposal*

Programs impacted: [Please list all impacted programs including any applicable fields or specializations.]

Energy Engineering Program

Calendar start date: (When the course should first appear in the Academic Calendar 2020-2021)

2022-2023

Registration start date: (The first time the course will be open for registration e.g. Fall 2020)

Fall 2022

Additional supporting information (optional; please indicate if you are attaching any additional documentation)

Subject Code: ENEE	**Course Number:** 4260U
Full Course Title: Integrated Energy Systems	
Short-Form Course Title (max. 30 characters)**:** Integrated Energy Systems	

Course Description

This course provides students with basic, conceptual and applied engineering design methods and practices of energy system integration and multigeneration. These are applied to various fossil fuels-, nuclear- and renewable-based conventional and new systems for productions of multi commodities, such as power, hot water heating, cooling, hydrogen, fresh water, etc. Energy storage options are studied and integrated with energy generation systems. Various case studies of integrated energy systems are developed for sustainability community applications. Assessment studies for performance, environmental impact and sustainability are undertaken for comparative assessment. Scaling-up issues are also discussed. Sectoral implementation and planning studies for such systems are evaluated. Potential improvements and optimizations are studied through various methodologies, design and simulations tools.

Credit Hours:		
Contact Hours – please indicate total number of hours for each component		
Lecture: 3		**Lab:**
Tutorial: 1		**Other:**
Cross-listings		
Prerequisites for Calendar	MECE 3260U	
Prerequisites for Banner	MECE 3260U	
Co-requisites		
Prerequisites with concurrency (pre or co-requisite)		
Credit restrictions		☐ **Equivalency***
Recommended Prerequisites		
Course Restrictions		
Course Type	☒ **Core** ☐ **Elective** ☐ **Core or Elective**	
Is the course: ☒ Undergraduate ☐ Graduate ☐ Professional (e.g. some Education courses)		
Grading scheme	☐ **N (normal alpha grade)** ☐ **P (pass/fail)**	

***Equivalency:** If it is equivalent, students can retake either course. If it is not equivalent, students are not allowed to register in the restricted course.

Course instructional method:

CLS (In Class Delivery)	X	HYB (In Class and Online Delivery)	
IND (Individual Studies)		OFF (Off Site)	
WB1 (Virtual Meet Time – Synchronous)		WEB (Fully Online – Asynchronous)	
Not Applicable			

Teaching and assessment methods:

Midterm, Assignments, Quizzes, Course Project, Final Exam

Learning outcomes: (for assistance developing course learning outcomes, please refer to the Teaching and Learning website, or contact them at teachingandlearning@ontariotechu.ca.)

By the end of the course students will learn the following:

- Understand working principles, various advances in fossil, hydro, nuclear, alternative energy systems and applications, including the effect of operating conditions on performance.
- Understand engineering design methods and practices of integrated energy systems for multigeneration.

- Understand how improved system integration increases performance, resilience and reliability.
- Design aspects related to fossil, nuclear and alternative energy technologies to support community level implementations.

Does this course contain any experiential learning components? ☐ **Yes** ☒ **No**

If yes:

Case Study		Simulated Workplace Project	
Consulting project/workplace project		Applied Research	
Field Experiences			
Other Types of Experiences:			

We have consulted with all impacted areas: ☒ **Yes** ☐ **NA**

Process of consultation, if applicable:

It was consulted through joint program committee members and colleagues in the area.

Does this course contain any Indigenous content? ☐ **Yes** ☒ **No** ☐ **Unsure**

For more information on how Indigenous content is defined at Ontario Tech University and how to consult with the Indigenous Education Advisory Circle (IEAC), please refer to the Protocol for Consultation with the Indigenous Education Advisory Circle.

Has the IEAC been contacted? ☐ **Yes** ☒ **No**

If yes, when?

What was the advice you received from the IEAC, and how has it been included in your proposal?

Did the IEAC ask you to return the proposal to them for review? ☐ **Yes** ☒ **No**

If yes, have they completed their review? ☐ **Yes** ☐ **No** ☒ **N/A**

Financial Implications

None.

Pre-Faculty Council Approval Dates (e.g. Curriculum Committee, Program Committee):

NEW COURSE TEMPLATE

For changes to existing courses see Course Change Template

New courses must be entered into Curriculog prior to Faculty Council. Please use this template to provide the information to your Curriculog contact.

Faculty: FEAS & FESNS	
This new course is associated with: ☐ Minor Program Adjustment ☐ Major Program Modification ☒ New Program ☐ None	
Will this course appear anywhere other than the course description section of the Calendar?	☐ **Yes** ☐ **No**

If you answered yes to the above, please complete:

A new core course for an existing program, specialization or minor*: Minor Program Adjustment*

A new elective course for an existing program, specialization or minor, listed in the program map*: Course Placement*

A new course (core or elective) related to a Major Program Modification*: Major Program Modification*

A new course (core or elective) related to a New Program*: New Program proposal*

Programs impacted: [Please list all impacted programs including any applicable fields or specializations.]

Energy Engineering

Calendar start date: (When the course should first appear in the Academic Calendar 2020-2021)

2022-2023

Registration start date: (The first time the course will be open for registration e.g. Fall 2020)

Fall 2022

Additional supporting information (optional; please indicate if you are attaching any additional documentation)

n/a

Subject Code: ENGR	**Course Number:** 4961U
Full Course Title: Capstone Systems Design for Energy Engineering II	
Short-Form Course Title (max. 30 characters)**:** Capstone Sys. Design II	

Course Description

This course constitutes the first part of a two-term capstone systems design engineering Endeavor. These two capstone systems design courses (ENGR 4960U and ENGR 4961U) represent a critical mandatory component for fulfilling the requirements for accrediting engineering degree programs set by the Canadian Engineering Accreditation Board (CEAB). They provide a culminating major teamwork capstone design engineering experience that integrates various aspects of students' knowledge and skills acquired in the classroom as well as on co-op or internship work terms. These courses challenge senior-level students to engage in applying their engineering knowledge to produce useful engineering artifacts.
This design-built project-based course normally includes studying open-ended engineering design topics of interest to the students. A wide range of engineering design-related product, process, technology, service or system development topics may be covered in this course. The course covers design considerations for systems that predominantly incorporate many aspects of engineering. These may consist of real-world design projects proposed and sponsored by industrial partners, or design projects on topics proposed by faculty advisors, or topics proposed by a group of enrolled students. In this context, in this course the engineering design process will be reviewed along with its application to the design of the said systems. Students will work in small groups of students on a capstone design engineering project of major breadth that will require them to integrate the knowledge that they have gained throughout their program of study and apply it to the design and development of a complete device or system.

Credit Hours: 3.0		
Contact Hours – please indicate total number of hours for each component		
Lecture: 3.0	**Lab: 1.5**	
Tutorial: 1.0	**Other:**	
Cross-listings		
Prerequisites for Calendar	**ENGR 4960U**	
Prerequisites for Banner	**ENGR 4960U**	
Co-requisites		
Prerequisites with concurrency (pre or co-requisite)		
Credit restrictions	☐ **Equivalency***	
Recommended Prerequisites		
Course Restrictions		
Course Type	☒ **Core** ☐ **Elective** ☐ **Core or Elective**	
Is the course: ☒ Undergraduate ☐ Graduate ☐ Professional (e.g. some Education courses)		
Grading scheme	☒ **N (normal alpha grade)** ☐ **P (pass/fail)**	

***Equivalency:** If it is equivalent, students can retake either course. If it is not equivalent, students are not allowed to register in the restricted course.

Course instructional method:

CLS (In Class Delivery)	X	HYB (In Class and Online Delivery)	
IND (Individual Studies)		OFF (Off Site)	
WB1 (Virtual Meet Time – Synchronous)		WEB (Fully Online – Asynchronous)	
Not Applicable			

Teaching and assessment methods:

Reports, presentations, prototype demonstrations

Learning outcomes: (for assistance developing course learning outcomes, please refer to the Teaching and Learning website, or contact them at teachingandlearning@ontariotechu.ca.)

This capstone design course is intended for the enrolled students to master the product development process and complete a significant open-ended design engineering project in the field of their specialization. By the end of this course students will have completed the following parts of the design process for their particular projects: Customer Requirements; Background Search; Design Plan and Project Management; Brainstorming; Preliminary Concept Generation; Sketching Ideas; Engineering Specifications (Benchmarking); Detailed Concept Generation; Functional Decomposition; Concept Development and Screening/Selection; Group Preliminary Proof of Concept Prototype Demonstrations and Oral Presentations; and Final Engineering Term Report. The primary specific learning and training outcomes are:

- Identify, formulate, and solve engineering problems;
- Design a component, process, technology, service, or system to meet desired design needs;
- Use appropriately engineering practice techniques, skills, and modern engineering tools;
- Apply knowledge of mathematics, science, and engineering;
- Design and conduct experiments and analyze and interpret experimental data;
- Function on multi-disciplinary teams; and
- Communicate effectively their work.

Does this course contain any experiential learning components? ☐ **Yes** ☒ **No**

If yes:

Case Study		Simulated Workplace Project	
Consulting project/workplace project		Applied Research	
Field Experiences			
Other Types of Experiences:			

We have consulted with all impacted areas: ☐ **Yes** ☒ **NA**

Process of consultation, if applicable:

It was consulted through joint program committee members and colleagues in the area.

Does this course contain any Indigenous content? ☐ **Yes** ☒ **No** ☐ **Unsure**

For more information on how Indigenous content is defined at Ontario Tech University and how to consult with the Indigenous Education Advisory Circle (IEAC), please refer to the Protocol for Consultation with the Indigenous Education Advisory Circle.

Has the IEAC been contacted? ☐ **Yes** ☒ **No**

If yes, when?

What was the advice you received from the IEAC, and how has it been included in your proposal?

Did the IEAC ask you to return the proposal to them for review? ☐ **Yes** ☒ **No**

If yes, have they completed their review? ☐ **Yes** ☐ **No** ☒ **N/A**

Financial Implications

$100 per student

Pre-Faculty Council Approval Dates (e.g. Curriculum Committee, Program Committee):

NEW COURSE TEMPLATE

For changes to existing courses see Course Change Template

New courses must be entered into Curriculog prior to Faculty Council. Please use this template to provide the information to your Curriculog contact.

Faculty: FEAS & FESNS	
This new course is associated with: ☐ Minor Program Adjustment ☐ Major Program Modification ☒ New Program ☐ None	
Will this course appear anywhere other than the course description section of the Calendar?	☒ **Yes** ☐ **No**

If you answered yes to the above, please complete:

A new core course for an existing program, specialization or minor*: Minor Program Adjustment*

A new elective course for an existing program, specialization or minor, listed in the program map*: Course Placement*

A new course (core or elective) related to a Major Program Modification*: Major Program Modification*

A new course (core or elective) related to a New Program*: New Program proposal*

Programs impacted: [Please list all impacted programs including any applicable fields or specializations.]

Energy Engineering

Calendar start date: (When the course should first appear in the Academic Calendar 2020-2021)

2022-2023

Registration start date: (The first time the course will be open for registration e.g. Fall 2020)

2024

Additional supporting information (optional; please indicate if you are attaching any additional documentation)

Subject Code: ENEE	**Course Number:** 4460U
Full Course Title: Sustainable Community Energy Systems	
Short-Form Course Title (max. 30 characters)**:** Sustain. Community Energy Sys.	

Course Description

This course provides students with advanced design analysis for energy applications in communities. Three scales of analysis are studied: buildings, the neighborhood, and city. Students will learn how communities can be designed to use less energy and materials in construction. Aspects include passive solar and building position, embodied emissions, geothermal and heat pump heating and cooling. At the neighborhood level, district energy, geothermal fields, transportation systems, 'behind the meter' renewables will be included in community design. At the city level, integrated energy systems, and how to prioritize infrastructure for sustainability will be assessed in a typical Canadian city and an international example. Community aspects will include waste management and waste-to-energy facilities. Students will develop an appreciation for how for how the energy 'pieces fit together' and how optimizing energy applications, including storage, leads to greater overall sustainability. Students will apply sustainable engineering methods to infrastructure and communities.

Credit Hours:	
Contact Hours – please indicate total number of hours for each component	
Lecture: 3	**Lab:**
Tutorial: 1	**Other:**
Cross-listings	
Prerequisites for Calendar	MECE 3260U
Prerequisites for Banner	MECE 3260U
Co-requisites	
Prerequisites with concurrency (pre or co-requisite)	
Credit restrictions	☐ **Equivalency***
Recommended Prerequisites	
Course Restrictions	
Course Type	☐ **Core** ☒ **Elective** ☐ **Core or Elective**
Is the course: ☒ Undergraduate ☐ Graduate ☐ Professional (e.g. some Education courses)	
Grading scheme	☒ **N (normal alpha grade)** ☐ **P (pass/fail)**

***Equivalency:** If it is equivalent, students can retake either course. If it is not equivalent, students are not allowed to register in the restricted course.

Course instructional method:

CLS (In Class Delivery)	x	HYB (In Class and Online Delivery)	
IND (Individual Studies)		OFF (Off Site)	
WB1 (Virtual Meet Time – Synchronous)		WEB (Fully Online – Asynchronous)	
Not Applicable			

Teaching and assessment methods:

Midterm, Assignments, Quizzes, Course Project, Final Exam

Learning outcomes: (for assistance developing course learning outcomes, please refer to the Teaching and Learning website, or contact them at teachingandlearning@ontariotechu.ca.)

By the end of the course students will learn the following:

- Understand building design and its impact on energy use.
- Understand engineering design methods and practices of integrated energy systems and how the interact within a neighborhood energy system.
- Understand how system integration improves energy efficiency, reduces carbon and particulate emissions, and increases well-being at a city-level.
- Design aspects related to energy and sustainability at the building, community and city scale.
- Energy applications in solid waste management such as anaerobic digestion and waste-to-energy

Does this course contain any experiential learning components? ☒ **Yes** ☐ **No**

If yes:

Case Study	x	Simulated Workplace Project	
Consulting project/workplace project		Applied Research	
Field Experiences			
Other Types of Experiences:			

We have consulted with all impacted areas: ☒ **Yes** ☐ **NA**

Process of consultation, if applicable:

The municipalities of Oshawa, Clarington and Pickering were consulted and will provide specific neighborhood development plans for further analysis by students.

Does this course contain any Indigenous content? ☒ **Yes** ☐ **No** ☐ **Unsure**

For more information on how Indigenous content is defined at Ontario Tech University and how to consult with the Indigenous Education Advisory Circle (IEAC), please refer to the Protocol for Consultation with the Indigenous Education Advisory Circle.

Has the IEAC been contacted? ☐ **Yes** ☒ **No**

If yes, when?

IEAC will be consulted as the course is further developed (first offering not until 2024). Discussions will focus on Indigenous design perspectives in buildings and communities. Case studies will include specific buildings, communities and Indigenous ownership (and design) of energy infrastructure.

What was the advice you received from the IEAC, and how has it been included in your proposal?

Did the IEAC ask you to return the proposal to them for review? ☐ **Yes** ☐ **No**

If yes, have they completed their review? ☐ **Yes** ☐ **No** ☐ **N/A**

Financial Implications

The subject matter course consists of lectures and tutorials which may be delivered in hybrid mode and will not require any experimental equipment and facilities.

Pre-Faculty Council Approval Dates (e.g. Curriculum Committee, Program Committee):

COURSE CHANGE TEMPLATE

For new courses see New Course Template
Changes to courses must be entered into Curriculog prior to Faculty Council. Please use this template to provide the information to your Curriculog contact.

Faculty: FEAS		
Course Level	☒ **Undergraduate**	☐ **Graduate**

COURSE CHANGES (check all that apply)

☐	Contact hours	☐	Cross-listings
☐	Co-requisites	☐	Experiential Learning
☐	Course description	☐	Grade Mode (N – alpha grade, P – Pass/Fail)
☐	Course Instructional Method (CLS, HYB, WB1, WEB)	☐	Learning outcomes
☐	Course number or course Subject code	☒	Prerequisites
☐	Course title (include new short form title)	☐	Delete course from Academic Calendar
☐	Credit restrictions and/or Equivalencies	☐	Teaching and assessment methods
☐	Credit weighting	☐	Other (please specify):
☐	Deleting an Elective Shown in the Program Map		

IS THIS COURSE CHANGE ASSOCIATED WITH A PROGRAM PROPOSAL? ☒ **Yes** ☐ **No**

REASON FOR CHANGE AND WAYS IN WHICH IT MAINTAINS/ENHANCES COURSE/PROGRAM OBJECTIVES

Prerequisite change to add NUCL 2010U for Energy Engineering Students to take this course

FINANCIAL IMPLICATIONS

None

CALENDAR START DATE (When the course should first appear in the Academic Calendar 2020-2021)

2022-2023

REGISTRATION START DATE (The first time the course will be open for registration e.g. Fall 2020)

ADDITIONAL SUPPORTING INFORMATION (optional; please indicate if you are attaching any additional documentation)

COURSE INFORMATION

Subject Code: MECE	**Course Number:** 3410U
Full Course Title: Electro-Mechanical Energy Conversion	
Short-Form Course Title (max. 30 characters):	

CHANGE TO CALENDAR DESCRIPTION (if required)

Current: MECE 3410U – Electro-Mechanical Energy Conversion	**Proposed:** MECE 3410U – Electro-Mechanical Energy Conversion
This course provides an understanding of the principles of electromechanical energy conversion and introduces some common devices employed in the process. Specific topics covered include the principles of electromechanical energy conversion; ferromagnetic materials and their properties; basic operating concepts and steady state models for transformers, dc machines, and ac machines; electromechanical test and measurement procedures; characteristics and behaviour of machines. **Credit hours:** 3 **Lecture hours:** 3 **Laboratory hours:** 2 (biweekly) **Tutorial hours:** 1 **Prerequisite(s):** ELEE 2790U and MECE 2320U or MECE 2640U	This course provides an understanding of the principles of electromechanical energy conversion and introduces some common devices employed in the process. Specific topics covered include the principles of electromechanical energy conversion; ferromagnetic materials and their properties; basic operating concepts and steady state models for transformers, dc machines, and ac machines; electromechanical test and measurement procedures; characteristics and behaviour of machines. Credit hours: 3 Lecture hours: 3 Laboratory hours: 2 (biweekly) Tutorial hours: 1 Prerequisite(s): ELEE 2790U and MECE 2320U or MECE 2640U or NUCL 2010U

CHANGE TO CREDIT AND CONTACT HOURS [if applicable, indicate changes to total contact hours only; changes to frequency (e.g. 1x3 hours to 2X1.5 hours) not required]:

Credit Hours	
Lecture	Lab
Tutorial	Other

OTHER CHANGES (if applicable)

Cross-listings	
Prerequisites for Calendar	ELEE 2790U and MECE 2320U or MECE 2640U or NUCL 2010U
Prerequisites for Banner	ELEE 2790U and MECE 2320U or MECE 2640U or NUCL 2010U
Co-requisites	
Prerequisites with concurrency (pre or co-requisite)	
Credit restrictions	☐ **Equivalency***
Recommended Prerequisites	
Course Restrictions	
Course Type	☐ **Core** ☐ **Elective** ☐ **Core or Elective**
Grading scheme	☐ **N (normal alpha grade)** ☐ **P (pass/fail)**

***Equivalency:** If it is equivalent, students can retake either course. If it is not equivalent, students are not allowed to register in the restricted course.

CHANGES TO COURSE INSTRUCTIONAL METHOD (if applicable):

CLS (In Class Delivery)		HYB (In Class and Online Delivery)	
IND (Individual Studies)		OFF (Off Site)	
WB1 (Virtual Meet Time – Synchronous)		WEB (Fully Online – Asynchronous)	
Not Applicable			

CHANGES TO TEACHING AND ASSESSMENT METHODS (if applicable)

CHANGES TO LEARNING OUTCOMES (if applicable; for assistance developing course learning outcomes, please refer to the Teaching and Learning website, or contact them at teachingandlearning@ontariotechu.ca.)

DOES THIS COURSE CONTAIN ANY EXPERIENTIAL LEARNING COMPONENTS?
If yes:

Case Study		Simulated Workplace Project	
Consulting project/workplace project		Applied Research	
Field Experiences			
Other Types of Experiences:			

CONSULTATION (Curriculog contact to complete an Impact Report)

WE HAVE CONSULTED WITH ALL IMPACTED AREAS? ☐ **Yes** ☐ **NA**

DOES THIS COURSE CONTAIN ANY INDIGENOUS CONTENT? ☐ **Yes** ☐ **No** ☐ **Unsure**
For more information on how Indigenous content is defined at Ontario Tech University and how to consult with the Indigenous Education Advisory Circle (IEAC), please refer to the Protocol for Consultation with the Indigenous Education Advisory Circle.

HAS THE IEAC BEEN CONTACTED? ☐ **Yes** ☐ **No**
If yes, when?

WHAT WAS THE ADVICE YOU RECEIVED FROM THE IEAC, AND HOW HAS IT BEEN INCLUDED IN YOUR PROPOSAL?

DID THE IEAC ASK YOU TO RETURN THE PROPOSAL TO THEM FOR REVIEW? ☐ **Yes** ☐ **No**

IF YES, HAVE THEY COMPLETED THEIR REVIEW? ☐ **Yes** ☐ **No** ☐ **N/A**

Pre-Faculty Council Approval Dates (e.g. Curriculum Committee, Program Committee):

COURSE CHANGE TEMPLATE

For new courses see New Course Template
Changes to courses must be entered into Curriculog prior to Faculty Council. Please use this template to provide the information to your Curriculog contact.

Faculty: FEAS		
Course Level	☒ **Undergraduate**	☐ **Graduate**

COURSE CHANGES (check all that apply)

☐	Contact hours	☐	Cross-listings
☐	Co-requisites	☐	Experiential Learning
☐	Course description	☐	Grade Mode (N – alpha grade, P – Pass/Fail)
☐	Course Instructional Method (CLS, HYB, WB1, WEB)	☐	Learning outcomes
☐	Course number or course Subject code	☒	Prerequisites
☐	Course title (include new short form title)	☐	Delete course from Academic Calendar
☐	Credit restrictions and/or Equivalencies	☐	Teaching and assessment methods
☐	Credit weighting	☐	Other (please specify):
☐	Deleting an Elective Shown in the Program Map		

IS THIS COURSE CHANGE ASSOCIATED WITH A PROGRAM PROPOSAL? ☒ **Yes** ☐ **No**

REASON FOR CHANGE AND WAYS IN WHICH IT MAINTAINS/ENHANCES COURSE/PROGRAM OBJECTIVES

Prerequisite change to add NUCL 2010U which is equivalent to MECE 2320

FINANCIAL IMPLICATIONS

None

CALENDAR START DATE (When the course should first appear in the Academic Calendar 2020-2021)

2022-2023

REGISTRATION START DATE (The first time the course will be open for registration e.g. Fall 2020)

ADDITIONAL SUPPORTING INFORMATION (optional; please indicate if you are attaching any additional documentation)

COURSE INFORMATION

Subject Code: MECE	**Course Number:** 3230U
Full Course Title: Thermodynamic Applications	
Short-Form Course Title (max. 30 characters): Thermodynamic Applications	

CHANGE TO CALENDAR DESCRIPTION (if required)

Current: MECE 3230U – Thermodynamic Applications	**Proposed:** MECE 3230U – Thermodynamic Applications
Thermodynamic cycles are covered, including: the Carnot cycle, gas power cycles, vapour power cycles, combined power cycles, and refrigeration cycles. Analysis of complex cycles that include reheating, intercooling, regeneration, jet-propulsion, and cogeneration. Design considerations related to the application of the thermodynamic cycles including: heat engines, refrigeration systems, and power plants. Fundamentals of combustion including an overview of fuels, ignition, chemical reactions, and flame temperature. First and second law analysis of combustion reactions. Applications of combustion including engines and furnaces. An introduction to fuel cells, electrolyzers, batteries, and capacitors. **Credit hours:** 3 **Lecture hours:** 3 **Laboratory hours:** 2 (biweekly) **Tutorial hours:** 1 **Prerequisite(s):** MECE 2320U or MECE 2640U	Thermodynamic cycles are covered, including: the Carnot cycle, gas power cycles, vapour power cycles, combined power cycles, and refrigeration cycles. Analysis of complex cycles that include reheating, intercooling, regeneration, jet-propulsion, and cogeneration. Design considerations related to the application of the thermodynamic cycles including: heat engines, refrigeration systems, and power plants. Fundamentals of combustion including an overview of fuels, ignition, chemical reactions, and flame temperature. First and second law analysis of combustion reactions. Applications of combustion including engines and furnaces. An introduction to fuel cells, electrolyzers, batteries, and capacitors. Credit hours: 3 Lecture hours: 3 Laboratory hours: 2 (biweekly) Tutorial hours: 1 Prerequisite(s): MECE 2320U or MECE 2640U or NUCL 2010U

CHANGE TO CREDIT AND CONTACT HOURS [if applicable, indicate changes to total contact hours only; changes to frequency (e.g. 1x3 hours to 2X1.5 hours) not required]:

Credit Hours	
Lecture	Lab
Tutorial	Other

OTHER CHANGES (if applicable)

Cross-listings	
Prerequisites for Calendar	MECE 2320U or MECE 2640U or NUCL 2010U
Prerequisites for Banner	MECE 2320U or MECE 2640U or NUCL 2010U
Co-requisites	
Prerequisites with concurrency (pre or co-requisite)	
Credit restrictions	☐ **Equivalency***
Recommended Prerequisites	

Course Restrictions	
Course Type	☐ **Core** ☐ **Elective** ☐ **Core or Elective**
Grading scheme	☐ **N (normal alpha grade)** ☐ **P (pass/fail)**

***Equivalency:** If it is equivalent, students can retake either course. If it is not equivalent, students are not allowed to register in the restricted course.

CHANGES TO COURSE INSTRUCTIONAL METHOD (if applicable):

CLS (In Class Delivery)		HYB (In Class and Online Delivery)	
IND (Individual Studies)		OFF (Off Site)	
WB1 (Virtual Meet Time – Synchronous)		WEB (Fully Online – Asynchronous)	
Not Applicable			

CHANGES TO TEACHING AND ASSESSMENT METHODS (if applicable)

CHANGES TO LEARNING OUTCOMES (if applicable; for assistance developing course learning outcomes, please refer to the Teaching and Learning website, or contact them at teachingandlearning@ontariotechu.ca.)

DOES THIS COURSE CONTAIN ANY EXPERIENTIAL LEARNING COMPONENTS?

If yes:

Case Study		Simulated Workplace Project	
Consulting project/workplace project		Applied Research	
Field Experiences			
Other Types of Experiences:			

CONSULTATION (Curriculog contact to complete an Impact Report)

WE HAVE CONSULTED WITH ALL IMPACTED AREAS? ☐ **Yes** ☐ **NA**

DOES THIS COURSE CONTAIN ANY INDIGENOUS CONTENT? ☐ **Yes** ☐ **No** ☐ **Unsure**

For more information on how Indigenous content is defined at Ontario Tech University and how toconsult with the Indigenous Education Advisory Circle (IEAC), please refer to the Protocol for Consultation with the Indigenous Education Advisory Circle.

HAS THE IEAC BEEN CONTACTED? ☐ **Yes** ☐ **No**

If yes, when?

WHAT WAS THE ADVICE YOU RECEIVED FROM THE IEAC, AND HOW HAS IT BEEN INCLUDED IN YOUR PROPOSAL?

DID THE IEAC ASK YOU TO RETURN THE PROPOSAL TO THEM FOR REVIEW? ☐ **Yes** ☐ **No**

IF YES, HAVE THEY COMPLETED THEIR REVIEW? ☐ **Yes** ☐ **No** ☐ **N/A**

Pre-Faculty Council Approval Dates (e.g. Curriculum Committee, Program Committee):

COURSE CHANGE TEMPLATE

For new courses see New Course Template
Changes to courses must be entered into Curriculog prior to Faculty Council. Please use this template to provide the information to your Curriculog contact.

Faculty: FEAS	
Course Level	☒ **Undergraduate** ☐ **Graduate**

COURSE CHANGES (check all that apply)

☐	Contact hours	☐	Cross-listings
☐	Co-requisites	☐	Experiential Learning
☐	Course description	☐	Grade Mode (N – alpha grade, P – Pass/Fail)
☐	Course Instructional Method (CLS, HYB, WB1, WEB)	☐	Learning outcomes
☐	Course number or course Subject code	☒	Prerequisites
☐	Course title (include new short form title)	☐	Delete course from Academic Calendar
☐	Credit restrictions and/or Equivalencies	☐	Teaching and assessment methods
☐	Credit weighting	☐	Other (please specify):
☐	Deleting an Elective Shown in the Program Map		

IS THIS COURSE CHANGE ASSOCIATED WITH A PROGRAM PROPOSAL? ☒ **Yes** ☐ **No**

REASON FOR CHANGE AND WAYS IN WHICH IT MAINTAINS/ENHANCES COURSE/PROGRAM OBJECTIVES

FINANCIAL IMPLICATIONS

None

CALENDAR START DATE (When the course should first appear in the Academic Calendar 2020-2021)

2022-2023

REGISTRATION START DATE (The first time the course will be open for registration e.g. Fall 2020)

ADDITIONAL SUPPORTING INFORMATION (optional; please indicate if you are attaching any additional documentation)

COURSE INFORMATION

Subject Code: MANE	**Course Number:** 4160U
Full Course Title: Artificial Intelligence in Engineering	
Short-Form Course Title (max. 30 characters):	

CHANGE TO CALENDAR DESCRIPTION (if required)

Current: MANE 4160U – Artificial Intelligence in Engineering	**Proposed:** MANE 4160U – Artificial Intelligence in Engineering
Introduction to artificial intelligence; knowledge-based systems, state space representation, search strategies, knowledge representation, reasoning with uncertainty; fuzzy sets, membership functions and operations, fuzzy relations, fuzzy reasoning; neural networks, basic neuron modelling, multi-layer perceptron, self-organization networks and adaptive theory; genetic algorithms for optimization and search; applications of artificial intelligence in engineering, design and manufacturing. Credit hours: 3 Lecture hours: 3 Tutorial hours: 1 Prerequisite(s): MECE 3350U and MATH 2070U	Introduction to artificial intelligence; knowledge-based systems, state space representation, search strategies, knowledge representation, reasoning with uncertainty; fuzzy sets, membership functions and operations, fuzzy relations, fuzzy reasoning; neural networks, basic neuron modelling, multi-layer perceptron, self-organization networks and adaptive theory; genetic algorithms for optimization and search; applications of artificial intelligence in engineering, design and manufacturing. Credit hours: 3 Lecture hours: 3 Tutorial hours: 1 Prerequisite(s): MECE 3350U and (MATH 2070U or ENGR 2100U)

CHANGE TO CREDIT AND CONTACT HOURS [if applicable, indicate changes to total contact hours only; changes to frequency (e.g. 1x3 hours to 2X1.5 hours) not required]:

Credit Hours	
Lecture	Lab
Tutorial	Other

OTHER CHANGES (if applicable)

Cross-listings	
Prerequisites for Calendar	MECE 3350U and (MATH 2070U or ENGR 2100U)
Prerequisites for Banner	MECE 3350U and (MATH 2070U or ENGR 2100U)
Co-requisites	
Prerequisites with concurrency (pre or co-requisite)	
Credit restrictions	☐ **Equivalency***
Recommended Prerequisites	
Course Restrictions	
Course Type	☐ **Core** ☐ **Elective** ☐ **Core or Elective**
Grading scheme	☐ **N (normal alpha grade)** ☐ **P (pass/fail)**

***Equivalency:** If it is equivalent, students can retake either course. If it is not equivalent, students are not allowed to register in the restricted course.

CHANGES TO COURSE INSTRUCTIONAL METHOD (if applicable):

CLS (In Class Delivery)		HYB (In Class and Online Delivery)	
IND (Individual Studies)		OFF (Off Site)	
WB1 (Virtual Meet Time – Synchronous)		WEB (Fully Online – Asynchronous)	
Not Applicable			

CHANGES TO TEACHING AND ASSESSMENT METHODS (if applicable)

CHANGES TO LEARNING OUTCOMES (if applicable; for assistance developing course learning outcomes, please refer to the Teaching and Learning website, or contact them at teachingandlearning@ontariotechu.ca.)

DOES THIS COURSE CONTAIN ANY EXPERIENTIAL LEARNING COMPONENTS?
If yes:

Case Study		Simulated Workplace Project	
Consulting project/workplace project		Applied Research	
Field Experiences			
Other Types of Experiences:			

CONSULTATION (Curriculog contact to complete an Impact Report)

WE HAVE CONSULTED WITH ALL IMPACTED AREAS? ☐ **Yes** ☐ **NA**

DOES THIS COURSE CONTAIN ANY INDIGENOUS CONTENT? ☐ **Yes** ☐ **No** ☐ **Unsure**
For more information on how Indigenous content is defined at Ontario Tech University and how to consult with the Indigenous Education Advisory Circle (IEAC), please refer to the Protocol for Consultation with the Indigenous Education Advisory Circle.

HAS THE IEAC BEEN CONTACTED? ☐ **Yes** ☐ **No**
If yes, when?

WHAT WAS THE ADVICE YOU RECEIVED FROM THE IEAC, AND HOW HAS IT BEEN INCLUDED IN YOUR PROPOSAL?

DID THE IEAC ASK YOU TO RETURN THE PROPOSAL TO THEM FOR REVIEW? ☐ **Yes** ☐ **No**

IF YES, HAVE THEY COMPLETED THEIR REVIEW? ☐ **Yes** ☐ **No** ☐ **N/A**

Pre-Faculty Council Approval Dates (e.g. Curriculum Committee, Program Committee):

COURSE CHANGE TEMPLATE

For new courses see New Course Template
Changes to courses must be entered into Curriculog prior to Faculty Council. Please use this template to provide the information to your Curriculog contact.

Faculty: FEAS	
Course Level	☒ **Undergraduate** ☐ **Graduate**

COURSE CHANGES (check all that apply)

☐	Contact hours	☒	Cross-listings
☐	Co-requisites	☐	Experiential Learning
☐	Course description	☐	Grade Mode (N – alpha grade, P – Pass/Fail)
☐	Course Instructional Method (CLS, HYB, WB1, WEB)	☐	Learning outcomes
☐	Course number or course Subject code	☐	Prerequisites
☐	Course title (include new short form title)	☐	Delete course from Academic Calendar
☐	Credit restrictions and/or Equivalencies	☐	Teaching and assessment methods
☐	Credit weighting	☐	Other (please specify):
☐	Deleting an Elective Shown in the Program Map		

IS THIS COURSE CHANGE ASSOCIATED WITH A PROGRAM PROPOSAL? ☐ **Yes** ☐ **No**

REASON FOR CHANGE AND WAYS IN WHICH IT MAINTAINS/ENHANCES COURSE/PROGRAM OBJECTIVES

Cross-listing added for new course ENEE 4161U: Solar Energy

FINANCIAL IMPLICATIONS

None

CALENDAR START DATE (When the course should first appear in the Academic Calendar 2020-2021)

2022-2023

REGISTRATION START DATE (The first time the course will be open for registration e.g. Fall 2020)

ADDITIONAL SUPPORTING INFORMATION (optional; please indicate if you are attaching any additional documentation)

COURSE INFORMATION

Subject Code: MECE	**Course Number:** 4151U
Full Course Title: Solar Energy	
Short-Form Course Title (max. 30 characters): Solar Energy	

CHANGE TO CALENDAR DESCRIPTION (if required)

Current: MECE 4151U – Solar Energy	**Proposed:** MECE 4151U – Solar Energy
Solar radiation measurements and predictions. Radiative heat transfer aspects. Classification of solar energy options. Solar thermal applications, including heating, cooling, air conditioning, electricity and fresh water production. Solar collectors and absorbing materials and their spectral characteristics. Concentrated solar panels. Solar electrical applications. Basics, materials and operational details on photovoltaics/solar cells. Solar energy conversion systems for various applications. Energy storage systems, including latent (phase change materials, molten salts) and sensible (hot water, compressed air, rock bed, etc.) options. Integrated solar energy systems for more useful outputs. Solar fuels. Thermodynamic analysis and performance assessments through energy and exergy approaches. Credit hours: 3 Lecture hours: 3 Laboratory hours: 2 (biweekly) Prerequisite(s): MECE 3930U and MECE 3260U	Solar radiation measurements and predictions. Radiative heat transfer aspects. Classification of solar energy options. Solar thermal applications, including heating, cooling, air conditioning, electricity and fresh water production. Solar collectors and absorbing materials and their spectral characteristics. Concentrated solar panels. Solar electrical applications. Basics, materials and operational details on photovoltaics/solar cells. Solar energy conversion systems for various applications. Energy storage systems, including latent (phase change materials, molten salts) and sensible (hot water, compressed air, rock bed, etc.) options. Integrated solar energy systems for more useful outputs. Solar fuels. Thermodynamic analysis and performance assessments through energy and exergy approaches. Credit hours: 3 Lecture hours: 3 Laboratory hours: 2 (biweekly) Crosslisting(s) ENEE 4161U Prerequisite(s): MECE 3930U and MECE 3260U

CHANGE TO CREDIT AND CONTACT HOURS [if applicable, indicate changes to total contact hours only; changes to frequency (e.g. 1x3 hours to 2X1.5 hours) not required]:

Credit Hours	
Lecture	Lab
Tutorial	Other

OTHER CHANGES (if applicable)

Cross-listings	ENEE 4161U
Prerequisites for Calendar	
Prerequisites for Banner	
Co-requisites	
Prerequisites with concurrency (pre or co-requisite)	
Credit restrictions	☐ **Equivalency***
Recommended Prerequisites	

Course Restrictions	
Course Type	☐ **Core** ☐ **Elective** ☐ **Core or Elective**
Grading scheme	☐ **N (normal alpha grade)** ☐ **P (pass/fail)**

***Equivalency:** If it is equivalent, students can retake either course. If it is not equivalent, students are not allowed to register in the restricted course.

CHANGES TO COURSE INSTRUCTIONAL METHOD (if applicable):

CLS (In Class Delivery)		HYB (In Class and Online Delivery)	
IND (Individual Studies)		OFF (Off Site)	
WB1 (Virtual Meet Time – Synchronous)		WEB (Fully Online – Asynchronous)	
Not Applicable			

CHANGES TO TEACHING AND ASSESSMENT METHODS (if applicable)

CHANGES TO LEARNING OUTCOMES (if applicable; for assistance developing course learning outcomes, please refer to the Teaching and Learning website, or contact them at teachingandlearning@ontariotechu.ca.)

DOES THIS COURSE CONTAIN ANY EXPERIENTIAL LEARNING COMPONENTS?
If yes:

Case Study		Simulated Workplace Project	
Consulting project/workplace project		Applied Research	
Field Experiences			
Other Types of Experiences:			

CONSULTATION (Curriculog contact to complete an Impact Report)

WE HAVE CONSULTED WITH ALL IMPACTED AREAS? ☐ **Yes** ☐ **NA**

DOES THIS COURSE CONTAIN ANY INDIGENOUS CONTENT? ☐ **Yes** ☐ **No** ☐ **Unsure**
For more information on how Indigenous content is defined at Ontario Tech University and how to consult with the Indigenous Education Advisory Circle (IEAC), please refer to the Protocol for Consultation with the Indigenous Education Advisory Circle.

HAS THE IEAC BEEN CONTACTED? ☐ **Yes** ☐ **No**
If yes, when?

WHAT WAS THE ADVICE YOU RECEIVED FROM THE IEAC, AND HOW HAS IT BEEN INCLUDED IN YOUR PROPOSAL?

DID THE IEAC ASK YOU TO RETURN THE PROPOSAL TO THEM FOR REVIEW? ☐ **Yes** ☐ **No**

IF YES, HAVE THEY COMPLETED THEIR REVIEW? ☐ **Yes** ☐ **No** ☐ **N/A**

Pre-Faculty Council Approval Dates (e.g. Curriculum Committee, Program Committee):

COURSE CHANGE TEMPLATE

For new courses see New Course Template
Changes to courses must be entered into Curriculog prior to Faculty Council. Please use this template to provide the information to your Curriculog contact.

Faculty: FEAS	
Course Level	☒ **Undergraduate** ☐ **Graduate**

COURSE CHANGES (check all that apply)

☐	Contact hours	☒	Cross-listings
☐	Co-requisites	☐	Experiential Learning
☐	Course description	☐	Grade Mode (N – alpha grade, P – Pass/Fail)
☐	Course Instructional Method (CLS, HYB, WB1, WEB)	☐	Learning outcomes
☐	Course number or course Subject code	☐	Prerequisites
☐	Course title (include new short form title)	☐	Delete course from Academic Calendar
☐	Credit restrictions and/or Equivalencies	☐	Teaching and assessment methods
☐	Credit weighting	☐	Other (please specify):
☐	Deleting an Elective Shown in the Program Map		

IS THIS COURSE CHANGE ASSOCIATED WITH A PROGRAM PROPOSAL? ☐ **Yes** ☐ **No**

REASON FOR CHANGE AND WAYS IN WHICH IT MAINTAINS/ENHANCES COURSE/PROGRAM OBJECTIVES

Cross-listing added for new course ENEE 4163U Wind and Hydro Energy

FINANCIAL IMPLICATIONS

None

CALENDAR START DATE (When the course should first appear in the Academic Calendar 2020-2021)

2022-2023

REGISTRATION START DATE (The first time the course will be open for registration e.g. Fall 2020)

ADDITIONAL SUPPORTING INFORMATION (optional; please indicate if you are attaching any additional documentation)

COURSE INFORMATION

Subject Code: MECE	**Course Number:** 4153U
Full Course Title: Wind and Hydro Energy	
Short-Form Course Title (max. 30 characters): Wind & Hydro Energy	

CHANGE TO CALENDAR DESCRIPTION (if required)

Current: MECE 4153U – Wind and Hydro Energy	**Proposed:** MECE 4153U – Wind and Hydro Energy
Turbomachinery fundamentals and analysis, including: angular momentum, pumps, fans, blowers, hydraulic turbines, propellers, and wind turbines. Wind characteristics, location, and wind farm design considerations. Aerodynamics of wind turbines and blade shape. Analysis of horizontal and vertical axis wind turbines. Wind turbine materials, components, and design. Design of dams and reservoirs, and use of rivers and tidal flows. Storage systems including pumped storage. Electrical aspects of wind and hydro energy generation systems. Integration, applications, and environmental impact of wind and hydro energy systems. Implementation of course principles in a design and construction project. Credit hours: 3 Lecture hours: 3 Tutorial hours: 1 Prerequisite(s): MECE 2860U and MECE 3410U and MECE 3260U	Turbomachinery fundamentals and analysis, including: angular momentum, pumps, fans, blowers, hydraulic turbines, propellers, and wind turbines. Wind characteristics, location, and wind farm design considerations. Aerodynamics of wind turbines and blade shape. Analysis of horizontal and vertical axis wind turbines. Wind turbine materials, components, and design. Design of dams and reservoirs, and use of rivers and tidal flows. Storage systems including pumped storage. Electrical aspects of wind and hydro energy generation systems. Integration, applications, and environmental impact of wind and hydro energy systems. Implementation of course principles in a design and construction project. Credit hours: 3 Lecture hours: 3 Tutorial hours: 1 Crosslisting(s): ENEE 4163U Prerequisite(s): MECE 2860U and MECE 3410U and MECE 3260U

CHANGE TO CREDIT AND CONTACT HOURS [if applicable, indicate changes to total contact hours only; changes to frequency (e.g. 1x3 hours to 2X1.5 hours) not required]:

Credit Hours	
Lecture	Lab
Tutorial	Other

OTHER CHANGES (if applicable)

Cross-listings	ENEE 4163U
Prerequisites for Calendar	
Prerequisites for Banner	
Co-requisites	
Prerequisites with concurrency (pre or co-requisite)	
Credit restrictions	☐ **Equivalency***
Recommended Prerequisites	
Course Restrictions	

Course Type	☐ **Core** ☐ **Elective** ☐ **Core or Elective**
Grading scheme	☐ **N (normal alpha grade)** ☐ **P (pass/fail)**

***Equivalency:** If it is equivalent, students can retake either course. If it is not equivalent, students are not allowed to register in the restricted course.

CHANGES TO COURSE INSTRUCTIONAL METHOD (if applicable):

CLS (In Class Delivery)		HYB (In Class and Online Delivery)	
IND (Individual Studies)		OFF (Off Site)	
WB1 (Virtual Meet Time – Synchronous)		WEB (Fully Online – Asynchronous)	
Not Applicable			

CHANGES TO TEACHING AND ASSESSMENT METHODS (if applicable)

CHANGES TO LEARNING OUTCOMES (if applicable; for assistance developing course learning outcomes, please refer to the Teaching and Learning website, or contact them at teachingandlearning@ontariotechu.ca.)

DOES THIS COURSE CONTAIN ANY EXPERIENTIAL LEARNING COMPONENTS?
If yes:

Case Study		Simulated Workplace Project	
Consulting project/workplace project		Applied Research	
Field Experiences			
Other Types of Experiences:			

CONSULTATION (Curriculog contact to complete an Impact Report)

WE HAVE CONSULTED WITH ALL IMPACTED AREAS? ☐ **Yes** ☐ **NA**

DOES THIS COURSE CONTAIN ANY INDIGENOUS CONTENT? ☐ **Yes** ☐ **No** ☐ **Unsure**
For more information on how Indigenous content is defined at Ontario Tech University and how to consult with the Indigenous Education Advisory Circle (IEAC), please refer to the Protocol for Consultation with the Indigenous Education Advisory Circle.

HAS THE IEAC BEEN CONTACTED? ☐ **Yes** ☐ **No**
If yes, when?

WHAT WAS THE ADVICE YOU RECEIVED FROM THE IEAC, AND HOW HAS IT BEEN INCLUDED IN YOUR PROPOSAL?

DID THE IEAC ASK YOU TO RETURN THE PROPOSAL TO THEM FOR REVIEW? ☐ **Yes** ☐ **No**

IF YES, HAVE THEY COMPLETED THEIR REVIEW? ☐ **Yes** ☐ **No** ☐ **N/A**

Pre-Faculty Council Approval Dates (e.g. Curriculum Committee, Program Committee):

Faculty of Social Science & Humanities
COMM1050 – Technical Communications (online)
Course outline for Spring 2020

1. Course Details & Important Dates*

Activity	Instructor / TA	Time	Day	Location	CRN #	Start	End
Lecture	Antonie Scholtz	n/a	n/a	Online recordings	10912	May 4	June 15
Tutorials	See below					May 8	June 12

* For other important dates please visit: https://ontariotechu.ca > Current Students > Important Dates and Deadlines

2. Instructor Contact Information

Instructor	Office	Phone	Email
Dr. Antonie Scholtz	Online		antonie.scholtz@uoit.ca
Office Hours: By appointment (via video conferencing)			
Video Conferencing Address: http://uoit.adobeconnect.com/mm0004-201509-00004/			

Teaching Assistants (Office Hours: By appointment only)	Email	Tutorial
Angelina Naccarato	angelina.naccarato@ontariotechu.net	10917
Daniella Filoso	daniella.filoso@ontariotechu.net	10919
Karli Cruikshank	karli.cruikshank@ontariotechu.net	10919
Michael Magnante	michael.magnante@ontariotechu.net	11273
Renee Bencic	renee.bencic@ontariotechu.net	10921
Ryan Lahay	ryan.lahay@ontariotechu.net	10921

Tutorial	Tutorial Day	Tutorial Time	TA(s)	Adobe Connect URL
10917 / 002	Friday	11:10am - 12:00pm	Angelina Naccarato	http://uoit.adobeconnect.com/comm-1050u-202005-10917/
10919 / 003	Friday	1:10pm - 2:00pm	Daniella Filoso & Karli Cruikshank	http://uoit.adobeconnect.com/comm-1050u-202005-10919/
10921 / 004	Friday	3:10pm - 4:00pm	Ryan Lahay	http://uoit.adobeconnect.com/comm-1050u-202005-10921/
11273 / 005	Friday	11:10am - 12:00pm	Michael Magnante	http://uoit.adobeconnect.com/comm-1050u-202005-11273/

3. Course Description

This section of COMM1050 is online. Lectures are delivered each week via a series of short videos where key principles are linked to examples and to the major project. Tutorials are conducted via Adobe Connect. You should have received information about the time of your tutorial. We will distribute the URLs for the online tutorials early in the semester.

This course will assist students in developing professional writing and presentation skills required for university assignments and for their professional work in the future. It will start with basic writing and speaking skills and will emphasize their application in the preparation of reports and other technical writing. Topics for the course include using correct grammar and punctuation, organizing ideas, formulating persuasive arguments, and preparing narrative and written technical reports. Part of the process will involve students in the critical analysis of the writing and speaking of others as a means of developing one's own skills.

4. Learning Outcomes

On the successful completion of the course, students will be able to:

- Understand the techniques, tools, elements, and processes that apply to technical communication
- Plan, design, and edit memos, proposals, and analytical reports
- Demonstrate a clear understanding of referencing and citing a variety of sources appropriately
- Create and present technical documents that are clear, effective, and well written
- Apply the principles of technical communication to future career pursuits

5. Course Design

Tutorials

Tutorials begin Friday, May 8. They are an essential component to this course. Students are required to attend all tutorials, as grades will be based on formal attendance and participation. Tutorial topics (see the end of this syllabus) provide you with important information and practice opportunities that will help with the successful completion of the assignments.

Weekly Reading Quizzes

The weekly reading quizzes are comprised of multiple choice and true/false questions. Quizzes are open-book and completed through Canvas. Quizzes can be written any time before they close on Thursday evening. More information will be provided in Canvas.

Major Assignment

The major assignment consists of three parts:

1) the proposal,
2) the draft of your analytical report, and
3) the final version of your analytical report.

Students may complete the major assignment individually or in groups of two or three. If completed in a group, partners MUST have the same tutorial leader.

Each of the assignments builds on the previous piece, building toward a successful final report. The proposal is a crucial component to the assignment as it will outline what you and your partner(s) choose to research and analyze for the analytical report. Your proposal must be submitted before the draft of your analytical report is marked.

Students will not receive substantive feedback on the final version of the report; the draft is where feedback and direction will be provided. In the final version of the report, you MUST use Track Changes and the Comment tool to show where changes were made based on feedback provided on the draft. More information on the three parts of this project will be posted on Canvas and discussed in both lecture and tutorial.

Peer-Review Activity

There are two peer-review activities corresponding to the proposal and the draft. Students are required to post each of the parts to the appropriate discussion forum and comment on two pieces of work for both the proposal and draft report. More information on the peer-review activities will be posted on Canvas and discussed in tutorial.

6. Outline of Topics in the Course

See lecture and tutorial schedules at the bottom of this syllabus.

7. Required Texts/Readings

Irish, R. & Weiss, P.E. (2013). *Engineering Communication*. 2nd Ed.. Don Mills, ON: Oxford University Press.

Additional readings may be assigned or recommended during the course.

8. Evaluation Method

Assignment	Grade Percent
Tutorial Participation	20%
Academic Integrity Modules	5%
Proposal	10%
Analytical Report (draft)	10%
Analytical Report (final)	15%
Peer-Review Activities	10%
Weekly Reading Quizzes	30%

Final course grades may be adjusted to conform to program or Faculty grade distribution profiles. Further information on grading can be found in Section 5 of the Academic Calendar.

9. Assignments and Tests

Reading Quizzes
Weekly assessments will consist of multiple choice and true-or-false questions. The quizzes are open-book and can be written from anywhere you have a solid Internet connection. Details on the quizzes are provided in Canvas.

Academic Integrity Quizzes
Please see:
https://academicintegrity.ontariotechu.ca/students/learning-modules.php
These learning modules are designed to help students to better understand the nature of academic integrity and to avoid committing academic offences. Please review:

Module 1: Introduction to Academic Integrity
Module 2: How do I maintain Academic Integrity?
Module 3: I'm taking a Science or Engineering course. What do I need to know?
Module 5: If I am caught for plagiarism or cheating, what will happen to me?

Use the "Print Score Summary" button to generate evidence that you completed the quizzes for modules 1, 2, 3, and 5 (do not use "Print Certificate"). Instructions for submitting evidence of completion will be provided in Canvas.

Major Assignment

The major assignment is made up of three parts. Each part will be graded using a separate rubric.

	Activity	Posted By	Peer Review Comments By	Final Submission By
1	**Proposal**	Wednesday, May 20 @ 6 pm	Thursday, May 21 @ 11 pm	Friday, May 22 @ 11 pm
2	**Analytical Report (Draft)**	Wednesday, June 3 @ 6 pm	Thursday, June 4 @ 11 pm	Friday, June 5 @ 11 pm
3	**Analytical Report (Final)**			Thursday, June 18 @ 11 pm

Non-negotiated Late Assignment

This is an assignment that has been handed in late, after the first ten minutes past the due time without a prior agreement between the student and the professor to extend the time for submission of the assignment. Such assignments will be considered late and the final grade for the assignment will be reduced by 5% per day.

Negotiated Late Assignment

This is an assignment that has been handed in late with the permission of the professor. The professor and student, through discussion, have mutually agreed on the time/extension and penalty (if applicable) that the student will receive.

Missed Course Work

If a student has missed coursework (e.g., quizzes, in-class exercises, assignments) that is less than 26% of the final grade due to physical or psychological illness, she or he must submit a Medical Statement Form directly to the course instructor within 3 days of the missed due date. Note: The medical statement form must be signed by the treating physician or licensed practitioner within 24hrs of the missed date or deadline. If a student has missed coursework (e.g., quizzes, in-class exercises, assignments) that is less than 26% of the final grade due to exceptional circumstances, she or he must submit an Academic Consideration Form, along with supporting documentation, directly to the course instructor within 3 days of the missed due date. Course instructors will review the documentation and inform the student of the outcome of their request in writing via email or Canvas. All missed coursework worth less than 26% will be handled directly by the course instructor for consideration and resolution. It will be at the course instructor's discretion to determine how the missed work will be addressed and resolved (e.g., penalties, re-writes, make-ups, extension, alternate assignment, etc.).

If a student has missed coursework (e.g., quizzes, in-class exercises, assignments) that is equal to or higher than 26% of the final grade due to physical or psychological illness, she or he must submit a Medical Statement Form to the FSSH Academic Advising Office within 3 working days of the missed due date. Note: The medical statement form must be signed by the treating physician or licensed practitioner within 24hrs of the missed date or deadline. If a student has missed coursework (e.g., quizzes, in-class exercises,

assignments) that is equal to or higher than 26% of the final grade due to exceptional circumstances, she or he must submit an Academic Consideration Form, along with supporting documentation, to the FSSH Academic Advising Office within 3 days of the missed due date. The Academic Advising Office will review the documentation and inform the student of the outcome of his or her request in writing via email. It will be at the course instructor's discretion to determine how the missed in-term exam will be addressed and resolved (e.g., make-ups). The most recent version of all forms can be found on MyCampus under the 'Documents' tab. The grading policy can be found at the following: https://usgc.ontariotechu.ca/policy/policy-library/policies/academic/examination-and-grading-policy.php

Missed In-Term Exams and Tests

If a student has missed a scheduled in-term exam (irrespective of weight) due to physical or psychological illness, she or he must submit a Medical Statement, along with supporting documentation, to the FSSH Academic Advising Office within 3 days of the missed exam date. Note: The medical statement form must be signed by the treating physician or licensed practitioner within 24hrs of the missed date or deadline. If a student has missed a scheduled in-term exam (irrespective of weight) due to exceptional circumstances, she or he must submit an Academic Consideration Form, along with supporting documentation, to the FSSH Academic Advising Office within 3 days of the missed exam date. The Academic Advising Office will review the documentation and inform the student of the outcome of his or her request in writing via email. It will be at the course instructor's discretion to determine how the missed in-term exam will be addressed and resolved (e.g., make-ups).

Missed Final Exam

If a student has missed a scheduled final examination due to physical or psychological illness, she or he must apply for a deferral using the Application for Deferred Final Examination within 3 working days of the missed exam date. A Medical Statement, along with supporting documentation and a $45 examination fee (per exam), must be submitted to the Registrar's Office. If a student has missed a scheduled final examination due to exceptional circumstances, she or he must apply for a deferral using the Application for Deferred Final Examination within 3 working days of the missed exam date. An Academic Consideration Form, along with supporting documentation, must be submitted to the Registrar's Office. The most recent version of all forms can be found on MyCampus under the 'OT Documents' tab.

Religious Observance

If a student is requesting consideration for a religious observance for missed coursework (e.g., quizzes, in-class exercises, assignments) that is less than 26% of the final grade, they must submit an Academic Consideration Form directly to the course instructor seven working days prior to the due date. Course instructors will review the form and inform the student of the outcome of their request in writing via email or Canvas. All missed coursework worth less than 26% will be handled directly by the course instructor for consideration and resolution. It will be at the course instructor's discretion to determine how the missed work will be addressed and resolved.

If a student is requesting consideration for a religious observance for any in-term exam (irrespective of weight) or missed coursework (e.g., quizzes, in-class exercises, assignments) that is equal to or higher than 26% of the final grade, they must submit an Academic Consideration Form to the FSSH Academic Advising Office 15 working days

prior to the exam date. The Academic Advising Office will review the form and inform the student of the outcome of his or her request in writing via email. It will be at the course instructor's discretion to determine how the missed in-term exam will be addressed and resolved (e.g., make-ups).

If a student is requesting consideration for a religious observance for a final exam, they must apply for a deferral using the Application for Deferred Final Examination and an Academic Consideration Form 15 working days prior to the first final examination date.

10. Accessibility

Students with disabilities may request to be considered for formal academic accommodation in accordance with the Ontario Human Rights Code. Students seeking accommodation must make their requests through Student Accessibility Services in a timely manner, and provide relevant and recent documentation to verify the effect of their disability and to allow the University to determine appropriate accommodations.

Accommodation decisions will be made in accordance with the Ontario Human Rights Code. Accommodations will be consistent with and supportive of the essential requirements of courses and programs, and provided in a way that respects the dignity of students with disabilities and encourages integration and equality of opportunity.

11. Professional Conduct (if applicable)

Students have a responsibility to familiarize themselves with the university regulations and the conduct that is expected of them while studying. Students are expected to respect the rights of other members of the university community who study, work and live within it and refraining from conduct that endangers the physical and mental well-being, health, safety, civil or human rights and property of self and/or others within the university community or visitors to the university. In general, the university believes that the creators of intellectual property should retain rights in it in cases where the creators are academic personnel. Therefore, students should not share or upload course material that course instructors have created for academic use onto third-party websites or others without their written permission. The learning environment, whether online or F2F, needs to be a place where diverse opinions can be openly shared. All members of this class should treat one another with respect. If you have any concerns about the course, please feel free to discuss them with the instructor and/or your TA.

Attendance
Please ensure you are on time for tutorials and class.

Collaboration
In a fast-paced work environment, you will inevitably work in teams and rely on other people in your future careers. At the very least, others will assess your work, including both professors and employers. This class will incorporate peer review and collaborative learning. The peer review process allows you to interact and experience alternative ways of approaching and writing about a topic. This will take place through reviewing your colleagues' in-lecture activities and working in small teams to produce the Full Analytical Report. We can all learn from each other.

Readings
Students are expected to have read all of the assigned readings for each week prior to lecture or reviewing the video. Information covered in the readings may not be taught during the lecture video; students are responsible for all information in the book whether or not it is covered in the lecture video.

Assignment Submission
Assignments for this course will be submitted electronically via the "Assignments" tool on Canvas. If you are experiencing problems with your laptop or if it is being repaired, please contact the IT Service Desk

Communication
Please check all resources before sending emails to the instructor or your TA. In general, treat emails to the instructor and your TA as practice for your professional life. Emails should be carefully constructed, including salutation, word choice, punctuation, spelling, and capitalization. Most emails will be answered within 48 hours. Emails sent after 4 pm regarding an assignment due the following day are unlikely to be answered. Plan accordingly.

12. Academic Integrity

Students and faculty share an important responsibility to maintain the integrity of the teaching and learning relationship. This relationship is characterized by honesty, fairness and mutual respect for the aims and principles of the pursuit of education. Academic misconduct impedes the activities of the university community and is punishable by appropriate disciplinary action.

Students are expected to be familiar with regulations on Academic Conduct (Section 5.16 of the Academic Calendar) which sets out the kinds of actions that constitute academic misconduct, including plagiarism, copying or allowing one's own work to copied, use of unauthorized aids in examinations and tests, submitting work prepared in collaboration with another student when such collaboration has not been authorized, and other academic offences. The regulations also describe the procedures for dealing with allegations, and the sanctions for any finding of academic misconduct, which can range from a written reprimand to permanent expulsion from the university. A lack of familiarity with the institutions regulations on academic conduct does not constitute a defense against its application.

Further information about academic misconduct can be found in the Academic Integrity link on your laptop. Extra support services are available to all students in academic development, study skills, counseling, and peer mentorship. More information on student support services can be found in the Academic Calendar (Section 8).

13. Turnitin

The institution and faculty members reserve the right to use electronic means to detect and help prevent plagiarism. Students agree that by taking this course all assignments are subject to submission for textual similarity review by Turnitin.com. Assignments submitted to Turnitin.com will be included as source documents in Turnitin.com's restricted access database solely for the purpose of detecting plagiarism in such documents for five academic years. The instructor may require students to submit their assignments electronically to Turnitin.com or the instructor may submit questionable text on behalf of a student. The terms that apply to use of the Turnitin.com service are described on the Turnitin.com website.

Students who do not wish to have their work submitted to Turnitin.com must inform their instructor at the time the work is assigned and provide, with their assignment, a signed Turnitin.com found at:
https://academicintegrity.ontariotechu.ca/policies-and-forms/course-outline-template.php

Further information about Turnitin can be found on the Academic Integrity link on OTU's website.

14. Final Examinations (if applicable)

Final examinations are held during the final examination period at the end of the semester and may take place in a different room and on a different day from the regularly scheduled class. Check the published Examination Schedule for a complete list of days and times.

Students are advised to obtain their Student ID Card well in advance of the examination period as they will not be able to write their examinations without it. Student ID cards can be obtained at the Campus ID Services, in G1004 in the Campus Recreation and Wellness Centre.

Students who are unable to write a final examination when scheduled due to religious obligations may make arrangements to write a deferred examination. These students are required to submit a Request for Accommodation for Religious Obligations to the Faculty concerned as soon as possible and no later than three weeks prior to the first day of the final examination period.

Further information on final examinations can be on the university website.

15. Freedom of Information and Protection of Privacy Act

The following is an important notice regarding the process for submitting course assignments, quizzes and other evaluative material in your courses in the Faculty of Social Science & Humanities.

OntarioTech University is governed by the *Freedom of Information and Protection of Privacy Act* ("FIPPA"). In addition to providing a mechanism for requesting records held by the university, this legislation also requires that the institution not disclose the personal information of its students without their consent.

FIPPA's definition of "personal information" includes, among other things, documents that contain both your name and your Banner ID. For example, this could include graded test papers or assignments. To ensure that your rights to privacy are protected, the Faculty of Social Science & Humanities encourages you to use only your Banner ID on assignments or test papers being submitted for grading. This policy is intended to prevent the inadvertent disclosure of your information where graded papers are returned to groups of students at the same time. If you still wish to write both your name and your Banner ID on your tests and assignments, please be advised that the institution will interpret this as an implied consent to the disclosure of your personal information in the normal course of returning graded materials to students.

If you have any questions or concerns relating to the new policy or the issue of implied consent addressed above, please contact the Chief Privacy Officer at accessandprivacy@uoit.ca.

16. Course Evaluations

Student evaluation of teaching is a highly valued and helpful mechanism for monitoring the quality of programs and instructional effectiveness. To that end, course evaluations are administered by an external company in an online, anonymous process during the last few weeks of classes. Students are encouraged to participate actively in this process and will be notified of the dates. Notifications about course evaluations will be sent via e-mail, and posted on Canvas, Weekly News and signage around the campus.

Faculty of Social Science and Humanities Statement on Inclusivity

The Faculty of Social Science and Humanities is committed to building a truly inclusive educational community where faculty, students, and staff share the responsibility for promoting the values of fairness, justice, and non-discrimination, and for ensuring myriad voices, faces, and experiences are recognized and represented. We embrace and honour the dignity of individuals and groups, and believe that diversity, in all its complex dimensions, lays the foundation for academic excellence and creative learning. The Faculty is, therefore, dedicated to creating a welcoming and supportive campus culture and to challenging all forms of systemic discrimination experienced by historically disadvantaged groups, including but not limited to groups marked by race, ethnicity, sex, religion, age, disability, sexuality, gender identity and expression, and socioeconomic status.

Outline of Topics in the Course

This outline documents the instructor's intentions for this course. Over the period of the term, some modifications may be necessary. Any modifications that may influence student success or the marking scheme will be made only after discussions have taken place with students.

Week of	Lecture Topics & Readings	Assignment/Test
05/04	**Welcome to COMM1050** • Review Syllabus • Review Major Project Instructions o READ: Introduction from course text	*Read the major project instructions and start brainstorming potential project topics.*
05/11	**Writing with Purpose** • Purpose, Genre, Audience o READ: Principles #1-3 (pp. 18-56)	• Submit Academic Integrity Module 1 by 11pm on Monday, May 11 *Review practice quiz ("Quiz 0"). First weekly reading quiz ("Quiz 1") closes at 11pm, Thursday, May 14.*

05/18	**Researching Effectively**
	• Gathering Information
	• Evaluating and Interpreting Data
	Developing a Credible Argument
	• Credibility
	  o READ: Principle #4 (pp. 57-77)
	Organizing Information
	• Rhetorical Tools
	  o READ: Principle #5 (pp. 181-198)
		• Submit Academic Integrity Module 2 by 11pm on Monday, May 18
		
		PROPOSAL MEMO
		• Post to your TA's discussion forum and Turnitin.com by 6 p.m. on Wednesday, May 20;
		• Submit peer-review comments in your TA's discussion forum by 11 p.m. on Thursday, May 21;
		• Submit to Canvas and resubmit to Turnitin.com by 11 p.m. on Friday, May 22

05/25	**Introductions**
	• Effective Introductions
	  o READ: Principles #6 (pp. 199-218)
	Structuring a Paragraph
	• Making Transitions & Designing Paragraphs
	  o READ: Principles #9-10 (pp. 125-154)
		• Submit Academic Integrity Modules 3 and 5 by 11pm on Monday, May 25

06/01	**Understanding Language**
	• Framing Knowledge
	  o READ: Principle #7 (pp. 109-116)
	Positioning Information
	• Building Visible Structures
	  o READ: Principle #8 (pp. 117-124)
	• Moving from Known to New Information
	  o READ: Principle #11 (pp. 155-161)
		DRAFT ANALYTICAL REPORT
		• Post to your TA's discussion forum and Turnitin.com by 6 p.m. on Wednesday, June 3;
		• Submit peer-review comments in your TA's discussion forum by 11 p.m. on Thursday, June 4;
		• Submit to Canvas and resubmit to Turnitin.com by 11 p.m. on Friday, June 5

06/08	**Writing for Readability**
	• Elevating Verbs, Positioning Verbs, Finding the Real Subject
	  o READ: Principles #13-15 (pp. 182-196)
	• Capitalizing on the Power Position
	  o READ: Principle #16 (pp. 197-198)	

06/15	**Ensuring Professional Language and Formatting** • Applying all the principles	**FINAL ANALYTICAL REPORT** • Must be submitted by 11 p.m. on Thursday, June 18

Tutorial Schedule

Tutorials begin May 8; the last tutorial is June 12.

Date	Tutorial Topics

05/08	• Introduction
	• Meet your TA and classmates
	• Email and video conferencing etiquette
	• *Analytical Report – Overview & Questions*
	  ○ Project scope and ideas: What is an appropriate topic?
	  ○ Proposal: preliminary review

05/15	• Finalize topic and partner (you are free to work in groups or individually)
	• *Proposal – Questions and review with TA*
	  ○ Audience analysis
	• Researching and documenting
	  ○ Documentation (APA & IEEE)
	  ○ When are in-text citations necessary?
	  ○ Turnitin.com (Originality Report)

05/22	• *Analytical Report – Overview and questions* • Outlining: Functional + descriptive headings
05/29	• *Analytical Report Draft – Checks and revisions* ○ Editing and proofreading Report Draft

06/05	• *Analytical Report Final Version – Structure and Flow*
	  ○ Applying Principles 7, 8 and 11
	• Fundamentals of sentences
	  ○ Appendix A – Core Sentence Components (pp. 322-327)
	  ○ Appendix B – Sentence Types (pp. 329-336)

06/12	• *Analytical Report Final Version – Sentence level review* ○ Eliminating clutter and passive sentences

Ontario Tech University
Faculty of Engineering and Applied Science
Dean's Office

Course Outline
ENGR 1015U
Introduction to Engineering
Fall 2021

Offering Approval:

Under Revision

Course Description:

An introduction to engineering, the profession and core skills of engineers. Topics include: history of engineering; fields in engineering; how systems work; an overview of computer systems; information technology trends and state-of-the-art applications (scientific computing, communications and signal processing); role of engineers in society; core engineering skills including freehand sketching, basic engineering graphics and drafting techniques, engineering report writing and introduction to MATLAB programming; occupational health and safety, and safety standards.

Major Topics:

- Engineering History
- Engineering Ethics and Professionalism
- Social and Environmental Factors
- Technical Writing and Communication
- Key Engineering Fields Explored
- Economic Considerations
- Basic Sketching and Drawing
- Scientific Computing

Graduate Attributes:

The graduate attributes developed and required by the Canadian Engineering Accreditation Board's Accreditation Criteria and Procedures are listed below, with those covered in the course to some degree (introduced, developed, applied).

Attributes	Covered in this Course
Knowledge base	✓
Problem analysis	✓
Investigation	✗
Design	✓
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	✓

Course Content Breakdown

Math	Basic Science	Complementary Studies	Engineering Science	Engineering Design
0%	0%	30%	45%	25%

Course Outcomes:

Understanding the context under which the engineering discipline developed historically, the role of engineers in society and professional status, exposure to different engineering disciplines with exemplary problems solved in various fields. Learning how engineering systems and processes work, information technology trends and application of computational tools for problem solving, communicating ideas with sketches / drawings & schematics. Laboratory practice covers dissection of engineered products, documenting designs, analyzing operating principles, and communicating potential functional design improvements.

Instructors

Instructor:	Email:	Office:	Office Hours:
Dr. Bale Reddy	bale.reddy@uoit.ca	ACE2022	Tuesdays, 1:00 to 2:00 pm (through Google meet)

Instructor:	Email:	Office:	Office Hours:
Dr. Marc A. Rosen	marc.rosen@uoit.ca	ACE3022	Wednesdays, 2:30 to 3:30 pm (through Google meet)

Instructor:	Email:	Office:	Office Hours:
Dr. Namdar Saniei	namdar.saniei@uoit.ca	ENG 1022	Thursdays, 9:30 to 10:30 am (through Google meet)

Teaching Assistants

TA Name:
TBD TBD

Required Course Text and Other Materials:

- Introduction to Professional Engineering in Canada, G.C.. Andrews et al., 5th Edition, 2019, Pearson
- ENGR 1015U Laboratory Handbook

Reference Books and Information Sources:

- Introduction to Engineering, by Paul Wright, 3rd Edition, 2002, John Wiley & Sons
- Introduction to Engineering, Modeling and Problem Solving, by Jay Brockman, 2009, John Wiley & Sons
- Engineering Drawing and Design, by C. Jensen, J. Helsel, D. Short, 7th edition 2007, McGraw-Hill
- "Exploring Engineering, An Introduction to Engineering and Design", by Philip Kosky, Robert Balmer, William Keat, George Wise, 3rd edition, Elsevier (Academic Press), 2013
- Other material as provided on Canvas

Course Organization and Delivery Mode:

This one-semester course will be delivered by a combination of web-centric supported online lectures using Google Meet, laboratory project work, and tutorials (3 hours of lectures, 3 hours of labs, and 1 hour of tutorials per week). ENGR 1015U is worth 3 credits.

Lectures cover diverse subjects that introduces students to the engineering disciplines to ensure students understand the concepts introduced. Attendance in the lectures is STRONGLY encouraged. Practical tutorial excercises are assigned to students to help them achieve the learning outcomes. The tutorials will allow students to ask questions about the material covered in the lectures and labs. Additional examples will be covered in the tutorial (note that not all tutorial materials will be posted on Canvas, so attendance is STRONGLY encouraged).

Laboratory in Fall 2020 is online. You are expected to attend all scheduled lectures and all scheduled tutorial sessions because learning is motivated through active participation and discussions is the best way to retain material taught in class. You are responsible for all completed work, schedule adjustments, and assigned work addressed during class. It is your responsibility to make arrangements for any planned or unplanned absences (i.e. interviews, illnesses, personal emergencies, etc.).

All communications, including important announcements, will be made online via Canvas. A portion of the lecture notes will be made available to students in Adobe Acrobat format. Students are responsible for checking Canvas REGULARLY for course information and announcements.

Scheduled Regular Class Meeting Times:

Lectures:

Section 001 (Dr. Bale Reddy): Tuesdays and Thursdays 9:40 – 11:00 am (online through Google meet)

Section 002 (Dr. Marc Rosen): Wednesdays and Fridays 3:40 – 5:00 pm (online through Google meet)

Section 005 (Dr. Namdar Saniei): Tuesdays and Fridays 9:40 – 11:00 am (online through Google meet)

Tutorials:

As posted on MyCampus for which you have signed up.

Laboratories:

Please see your Timetable and the ENGR 1015U Laboratory Handbook for specifics (posted on Canvas). There are multiple Laboratory sections, and you must attend the one for which you are signed up (see MyCampus Schedule). All the labs are conducted online during Fall

term 2020. Labs are done in groups. However, group members don't need to meet in-person. Students just need to coordinate their tasks online.

Final Grade Breakdown:

- Assignments: 15%
- Labs: 30%
- Midterm: 15%
- Final Exam: 40%

Passing Grades

- A grade of "D" is required to pass this course.

Deferred Midterm Exams

No deferred or supplementary Midterms will be entertained, and a mark of zero will be assigned if the examination is not written when scheduled. For medical reason or other exceptional circumstances, please see the faculty academic advisor's office immediately (refer to section "Medical Certificates and Deferred Exams" below). In such case, the marks weighting of the missed examination may be transferred to the final exam upon their determination only.

Midterms

Midterm Date:	Midterm Location:
Friday, November 13, 2020 - 17:00 to 18:00	Online for all Sections

Assignments:

Homework will be assigned on a weekly or biweekly basis. Submission dates are nominally 1 week later. Online submission through Canvas should be used. Your marks will be posted online.

Laboratories, Prelab Reports, Notes and Reports

Lab Description:

1. Lab safety policies overview & WHMIS training and test
2. LabVIEW Exercise 1 - Labview tutorial
3. LabVIEW Exercise 2 - Thermocouple measurement and Labview
4. Dissection of a cordless drill (or a similar device) and sketching
5. Dissection & assembly of an engineered product + presentation
6. MATLAB GUI exercise

Prelab Reports, Notes and Reports:

Laboratory Instructors

Labs will be run by the Lab Instructors**. Questions related to labs must be directed to the lab instructor.**

Laboratories

Laboratory exercises are designed to support and supplement engineering topics introduced in the course and also to expose students to relevant engineering applications. Students are expected to work in small groups in order to get maximum benefit from performing the hands-on exercises. A total of 10 experiments will be completed during the semester. You will attend the lab 10 times, and for some experiments also get quizzed on the previously completed experiment. In addition, students will learn about and get familiar with FEAS Health and Safety Policies and related matters, which are enforced in all labs.

The hands-on exercises consist of dissection of engineered products and introduction to basic engineering instrumentation. The lab exercises will help students to develop awareness of the design process for various engineering products. The lab exercises will also develop a foundation of basic engineering knowledge and develop skills that will include but are not limited to:

- Identification of overall function of various engineering products
- Identification of various components, sub-systems and basic mechanisms
- Learning and analysis of how components are assembled and work with each other to fulfill functional requirements of the product
- Preparation of basic record keeping using a logbook e.g. hand sketches of components, bill of materials and relevant notes
- Ability to communicate and share ideas and technical content in small groups as well as to the class
- Development of appreciation of multi-disciplinary engineered products
- Basic engineering instrumentation

Laboratory Attendance

Attendance is mandatory and students are expected to attend all scheduled online lab sessions in the ***assigned section***. Shuttling among sections is not allowed. Students will be randomly divided into groups and will be required to work within the same group. **Please note that the labs will start the first week of classes.**

Please inform the lab instructors or lab TAs if you missed the lab because of incapacitating illness or other valid reason via email as soon as possible (within the timeline defined by FEAS policy). Then, it may be possible for a makeup lab session to be arranged within the same week or the following week. Otherwise, there will be no makeup lab.

Prelab:

Students are expected to have read the lab instructions before coming to the lab. There are no other prelaboratory exercises required.

Reports:

Laboratory reports will be completed during the scheduled laboratory time and in the following week(s)'s sessions and submitted then.

Tutorials:

- Sample problems will be reviewed and solved on line. Questions related to lecture material can be addressed by the TAs.

Computer Experience:

Availability and proficiency in using laptop/desktop computers and the use of Canvas in classrooms wired for computer use and internet access, as well as remotely, is assumed. Students will learn the basics of Excel, MATLAB and LabVIEW.

Summary of Important Dates and Marking Scheme:

Cheating, plagiarism, or any other form of Academic Misconduct as outlined in Section 5.16 of the UOIT Calendar will be PUNISHED to the fullest extent.

Final exam: Scheduled by the university during final exam period.

Detailed Course Content:

1. Understanding Engineering (9 lectures)
    - Course Introduction (1 lecture)
    - History of engineering (1 lecture)
    - Roles of engineers in society (1 lecture)
    - Learning and engineering approach (1 lecture)
    - Professionalism and ethics (2 lectures)
    - Occupational health and safety (2 lectures)
    - Engineering and environmental science (1 lecture)
2. Engineering Skills and Analysis (8 lectures)
    - Units, significant figures (2 lecture)
    - Energy conservation and conversion (1 lecture)
    - Engineering and empirical model, statistics, curve-fits (1 lectures)
    - Engineering drawings, schematic drawings (2 lectures)
    - Technical report writing & communications (1 lecture)
    - Engineering project management and economics (1 lecture)
3. Exploring Engineering Fields (6 lectures)
    - Software and electrical engineering (1 lecture)
    - Information technology and signal processing (1 lecture)
    - Manufacturing and materials engineering (1 lecture)
    - Mechanical engineering and nuclear engineering (1 lecture)
    - Special topics/Guest lecture (to be determined) (1 lecture)
    - Summary lecture and review (1 lecture)

Subject to Change

Medical Certificates and Deferred Exams:

Medical statements and academic consideration forms for any missed student work worth 25% or less (not including midterms or tests) will be submitted directly to the course instructor. This includes missed quizzes, assignments and labs. Missed Midterms or Coursework Worth More than 25% For any missed midterms or tests, regardless of weight, or coursework worth more than 25%, students will need to submit the UOIT Medical statement or academic consideration form to the Engineering Advising Office following the form guidelines.

Guidelines for Medical Statements: Medical statements cover any missed work due to a medical reasons. The student must:

- see a medical doctor within 24 hours of the missed work
- submit the form to the correct individual within 3 working days

Guidelines for Academic Consideration Forms: Academic consideration forms cover any missed work for non-academic grounds, for example, religious observations, court appearance, personal/family emergency, varsity events. The student must provide supporting documentation if deemed necessary.

Should the medical certificate proven to be invalid due to any kind of action by the student, such student's behaviour will be considered as a major misconduct and respective disciplinary actions will be commenced.

Failure to comply with the above will result in an mark of 0 for the exam.

Students with disabilities may request to be considered for formal academic accommodation in accordance with the Ontario Human Rights Code. Students seeking accommodation must make their requests through the Centre for Students with Disabilities in a timely manner, and provide relevant and recent documentation to verify the effect of their disability and to allow the University to determine appropriate accommodations.

Accommodation decisions will be made in accordance with the Ontario Human Rights Code. Accommodations will be consistent with and supportive of the essential requirements of courses and programs, and provided in a way that respects the dignity of students with disabilities and encourages integration and equality of opportunity. Reasonable academic accommodation may require instructors to exercise creativity and flexibility in responding to the needs of students with disabilities while maintaining academic integrity.

Student Support

Any student who faces challenges securing their food or housing and believes this may affect their performance in the course is urged to contact studentlife@ontariotechu.ca for support. Furthermore, please notify your professor if you are comfortable in doing so. This will enable them to provide any resources and help that they can.

Sexual Violence Support and Education

Ontario Tech is committed to the prevention of sexual violence in all is forms. For any student who has experienced Sexual Violence, Ontario Tech can help. We will make accommodations to cater to the diverse backgrounds, cultures, and identities of students when dealing with individual cases. If you think you have been subjected to or witnessed sexual violence:

- Reach out to a Support Worker, a specially trained individual authorized to receive confidential disclosures about incidents of sexual violence. Support Workers can offer help and resolution options which can include safety plans, accommodations, mental health support, and more. To make an appointment with a Support Worker, call 905.721.3392 or email studentlife@ontariotechu.ca
- Learn more about your options at: https://studentlife.ontariotechu.ca/sexualviolence/

Students with Disabilities

Accommodating students with disabilities at Ontario Tech is a responsibility shared among various partners: the students themselves, SAS staff and faculty members. To ensure that disability-related concerns are properly addressed during this course, students with documented disabilities and who may require assistance to participate in this class are encouraged to speak with me as soon as possible. Students who suspect they have a disability that may affect their participation in this course are advised to go to Student Accessibility Services (SAS) as soon as possible. Maintaining communication and working collaboratively with SAS and faculty members will ensure you have the greatest chance of academic success.

Students taking courses on north Oshawa campus can visit Student Accessibility Services in the Student Life Building, U5, East HUB (located in the Founders North parking lot). Students taking courses on the downtown Oshawa campus can visit Student Accessibility Services in the 61 Charles St. Building, 2nd Floor, Room DTA 225 in the Student Life Suite.

Disability-related and accommodation support is available for students with mental health, physical, mobility, sensory, medical, cognitive, or learning challenges. Office hours are 8:30am-4:30pm, Monday to Friday, closed Wednesday's 8:30am – 10:00am. For more information on services provided, you can visit the SAS website at https://studentlife.ontariotechu.ca/services/accessibility/index.php. Students may contact Student Accessibility Services by calling 905-721-3266, or email studentaccessibility@ontariotechu.ca.

Students who require the use of the Test Centre to write tests, midterms, or quizzes MUST register online using the SAS test/exam sign-up module, found here https://disabilityservices.ontariotechu.ca/uoitclockwork/custom/misc/home.aspx. Students must sign up for tests, midterms, or quizzes AT LEAST seven (7) days before the date of the test.

Students must register for final exams by the registration deadline, which is typically two (2) weeks prior to the start of the final examination period. SAS will notify students of the registration deadline date.

Professional Conduct

All students who are enrolled in engineering programs must demonstrate behaviour appropriate to practice in engineering profession. Where Faculty dean determines that behaviour inconsistent with the norms and expectations of the profession has been exhibited by a student, that student may be immediately withdrawn from the program by the dean or subject to one or more of the sanctions described in the professional suitability policy: http://calendar.uoit.ca/content.php?catoid=22&navoid=879#Academic_conduct

A student demonstrating professional unsuitability may be immediately suspended from any practicum, field work or similar activity at the discretion of the dean pending a final decision.

Academic Integrity

Students and faculty at Ontario Tech University share an important responsibility to maintain the integrity of the teaching and learning relationship. This relationship is characterized by honesty, fairness and mutual respect for the aim and principles of the pursuit of education. Academic misconduct impedes the activities of the university community and is punishable by appropriate disciplinary action.

Students are expected to be familiar with and abide by Ontario Tech University's regulations on Academic Conduct which sets out the kinds of actions that constitute academic misconduct, including plagiarism, copying or allowing one's own work to copied, use of unauthorized aids in examinations and tests, submitting work prepared in collaboration with another student when such collaboration has not been authorized, among other academic offences. The regulations also describe the procedures for dealing with allegations, and the sanctions for any finding of academic misconduct, which can range from a resubmission of work to a failing grade to permanent expulsion from the university. A lack of familiarity with these regulations on academic conduct does not constitute a defense against its application. This information can be found at http://calendar.uoit.ca/content.php?catoid=22&navoid=879#Academic_conduct

Extra support services are available to all Ontario Tech University students in academic development, study skills, counseling, and peer mentorship. More information on student support services can be found at https://studentlife.ontariotechu.ca/services/academic-support/index.php

Turnitin

Ontario Tech University and faculty members reserve the right to use electronic means to detect and help prevent plagiarism. Students agree that by taking this course all assignments are subject to submission for textual similarity review by Turnitin.com. Assignments submitted to Turnitin.com will be included as source documents in Turnitin.com's restricted access database solely for the purpose of detecting plagiarism in such documents. The instructor may require students to submit their assignments electronically to Turnitin.com or the instructor may submit questionable text on behalf of a student. The terms that apply to Ontario Tech University's use of the Turnitin.com service are described on the Turnitin.com website.

Students who do not wish to have their work submitted to Turnitin.com must provide with their assignment at the time of submission to the instructor a signed Turnitin.com Assignment Cover sheet:

https://shared.uoit.ca/shared/department/academic-integrity/Forms/assignment-cover-sheet.pdf

Online Test and Exam Proctoring (Virtual Proctoring)

To maintain academic integrity in online testing, your instructor may require the use of Respondus LockDown Browser and Respondus Monitor or a similar virtual proctoring platform. In doing so, you will be required to use a computer with a webcam (either built-in or USB plug in). Please advise your instructor as soon as possible if you do not have a computer with a camera.

This is a link to a short video that explains the basics of Respondus LockDown Browser.

Final Examinations (if applicable)

Final examinations are held during the final examination period at the end of the semester and may take place in a different room and on a different day from the regularly scheduled class. Check the published Examination Schedule for a complete list of days and times.

Students are advised to obtain their Student ID Card well in advance of the examination period as they will not be able to write their examinations without it. Cards are available from the Campus ID office in the Campus Recreation and Wellness Centre, Room G1004.

Students who are unable to write a final examination when scheduled due to religious publications may make arrangements to write a deferred examination. These students are required to submit a Request for Accommodation for Religious Obligations to the Faculty concerned as soon as possible and no later than three weeks prior to the first day of the final examination period.

Further information on final examinations can be found at https://usgc.ontariotechu.ca/policy/policy-library/policies/academic/procedures-for-final-examination-administration.php

Freedom of Information and Protection of Privacy Act

The following is an important notice regarding the process for submitting course assignments, quizzes, and other evaluative material in your courses in the Faculty of Engineering and Applied Science.

Ontario Tech University is governed by the Freedom of Information and Protection of Privacy Act ("FIPPA"). In addition to providing a mechanism for requesting records held by the university, this legislation also requires that the University not disclose the personal information of its students without their consent.

FIPPA's definition of "personal information" includes, among other things, documents that contain both your name and your Banner (student) ID. For example, this could include graded test papers or assignments. To ensure that your rights to privacy are protected, the Faculty of [Insert Faculty name] encourages you to use only your Banner ID on assignments or test papers being submitted for grading. This policy is intended to prevent the inadvertent disclosure of your information where graded papers are returned to groups of students at the same time. If you still wish to write both your name and your Banner ID on your tests and assignments, please be advised that Ontario Tech University will interpret this as an implied consent to the disclosure of your personal information in the normal course of returning graded materials to students.

If you have any questions or concerns relating to the new policy or the issue of implied consent addressed above, please contact accessandprivacy@ontariotechu.ca

Student Course Feedback Surveys

Student evaluation of teaching is a highly valued and helpful mechanism for monitoring the quality of Ontario Tech University's programs and instructional effectiveness. To that end, course evaluations are administered by an external company in an online, anonymous process during the last few weeks of classes. Students are encouraged to participate actively in this process and will be notified of the dates. Notifications about course evaluations will be sent via e-mail, and posted on Canvas, Weekly News, and signage around the campus.

The Accessibility for Ontarians with Disabilities Act (AODA) standards have been considered in the development of this model course outline and it adheres to the principles outlined in the University's Accessibility Policy.

Notice of Collection and Use of Personal Information

Throughout this course, personal information may be collected through the use of certain technologies under the authority of the *University of Ontario Institute of Technology Act, SO 2002, c. 8, Sch. O.* and will be collected, protected, used, disclosed and retained in compliance with Ontario's *Freedom of Information and Protection of Privacy Act R.S.O. 1990, c. F.31.*

This course may use the following technologies that may collect, use, disclose and retain personal information (including images) for the purposes described below:

- Respondus Monitor and Proctortrack to maintain academic integrity for examinations.
- Google Meet and Kaltura Virtual Classroom to facilitate remote instruction and interactive learning.
- Peer-shared applications, services or technologies that may be reviewed, assessed, or used as part of coursework.
- Other applications, services, or technologies that support or enhance online learning.

For more information relating to these technologies, we encourage you to visit: https://tlc.ontariotechu.ca/learning-technology/index.php Questions regarding personal information may be directed to: Ontario Tech University Access and Privacy Office, 2000 Simcoe Street North, Oshawa, ON L1G 0C5, email: accessandprivacy@ontariotechu.ca.

By remaining enrolled in this course, you acknowledge that you have read, understand and agree to the terms and conditions under which the technology provider(s) may collect, use, disclose and retain your personal information. You agree to the university using the technologies and using your personal information for the purposes described in this course outline.

Technology Requirements

To support online learning, the university recommends certain technology requirements for laptops, software and internet connectivity which are available at: https://itsc.ontariotechu.ca/remote-learning.php.

Students experiencing technical difficulties such that they are unable to meet the technology requirements may contact the IT Service Help Desk at: servicedesk@dc-uoit.ca

Students experiencing financial difficulties such that they are unable to meet the technology requirements may contact Student Awards and Financial Aid Office at: connect@ontariotehu.ca

By remaining enrolled in this course, you acknowledge that you have read, understand and agree to observe the Recommended Technology Requirements for accessing university online learning resources, including those minimum requirements that are specific to your faculty and program.

Virtual Monitoring of Examinations

Ontario Tech University will conduct virtual monitoring of examinations in accordance with Ontario privacy legislation and all approved policy instruments.

Sensitive/Offensive Subject Matter

The classroom (both physical and virtual) is intended to provide a safe, open space for the critical and civil exchange of ideas and opinions. Some articles, media and other course materials may contain sensitive content that is offensive and/or disturbing. The Course Instructor will try to identify such material and communicate warnings[MG1] to students in advance of the distribution and use of such materials, affording students the choice to either emotionally prepare for, or not to view or interact with, the content.

Freedom of Expression

Pursuant to Ontario Tech's Freedom of Expression Policy all students are encouraged to express ideas and perspectives freely and respectfully in university space and in the online university environment, subject to certain limitations. Students are reminded that the limits on Freedom of Expression include speech or behaviour that: is illegal or interferes with the university's legal obligations; defames an individual or group; constitutes a threat, harassment or discrimination; is a breach of fiduciary, contractual, privacy or confidentiality obligations or commitments; and unduly disrupts and interferes with the functioning of the university. In the context of working online, different forms of communication are used. Where permitted, students using "chat" functions or other online forms of communication are encouraged to ensure that their communication complies with the Freedom of Expression Policy.

University Response to COVID-19

The government response to the COVID-19 pandemic is continually evolving. As new information becomes available from federal and provincial public health authorities, the Province of Ontario and the Regional Municipality of Durham, Ontario Tech University will remain nimble and prepared to respond to government orders, directives, guidelines and changes in legislation to ensure the health and safety of all members of its campus community. In accordance with public health recommendations, the university may need to adjust the delivery of course instruction and the availability and delivery mode of campus services and co-curricular opportunities. Ontario Tech University appreciates the understanding and flexibility of our students, faculty and staff as we continue to navigate the pandemic and work together to demonstrate our strong commitment to academic, research and service excellence during these challenging and unprecedented times.

FACULTY OF SCIENCE

MATH1010U: Calculus I

Course outline for Fall 2020

1. Course Details & Important Dates*

Course Type	CRN	Day	Time	Kaltura
Lecture	40288	T/R	9:40 – 11 am	Synchronous
	40289	W/F	11:10 am – 12:30 pm	Synchronous
	40290	W/F	2:10 – 3:30 pm	Synchronous
	40291	W/F	2:10 – 3:30 pm	Synchronous

NOTE: all lectures will now take place virtually through Google Meet. See the ACCESS TO MY ONLINE LECTURE/TUTORIAL for more information on how to access your lecture.

Classes Start	Classes End	Final Exam Period
Sept 8, 2020	Dec 7, 2020	Dec 9 – 20, 2020

Tutorials for this course shall start the week of Sept 14!

NOTE: Additional important information will be posted in "Announcements" throughout the semester -- make sure you stay up to date on this. We recommend that you turn on the setting that a copy of announcements be sent to your university e-mail account immediately.

* for other important dates go to: www.ontariotechu.ca >Current Students >Important Dates and Deadlines

2. Instructor Contact Information

Instructor Name	Office	Phone	Email
Paula Di Cato (sections 40290 and 40291)	N/A	N/A	Please use Canvas E-mail
Nicholas Faulkner (section 40289)	N/A	N/A	Please use Canvas E-mail
Lennaert Van Veen (section 40288)	N/A	N/A	Please use Canvas E-mail

Office Hours: **Please refer to the "Office Hours" link on the Homepage of our Canvas site for the complete list of all MATH1010 office hours.** Regardless of which section you're in, any of us will be happy to help you!

NOTE: Ilona Kletskin is the Mobius Administrator and Paula Di Cato is TA Coordinator for this course – if you need to contact them, please use Canvas E-mail.

2. Instructor Contact Information cont…

Laboratory/Teaching Assistant Name	Office	Phone	Email
You will meet your TA in tutorial	N/A	N/A	Please use Canvas E-mail
Office Hours: Again, have a look at the "Office Hours" link in Canvas…you can attend ANY of these.			

3. Course Description

The purpose of this course is to introduce the fundamental concepts, while emphasizing applications in science and engineering. The concepts and solution techniques that are presented are invaluable for use in future courses and in the "real world". This course will focus on the study of limits and continuity, the derivative, Rolle's theorem, the Mean-Value Theorem for Derivatives, Fermat's Theorem, the differential and anti-differentiation, the definite integral, area, the Mean-Value Theorem for Integrals, the Fundamental Theorem of Calculus, and other topics as time permits. Applications to science and engineering will be incorporated. A detailed list of the main topics to be covered is listed below.

4. Learning Outcomes

On the successful completion of the course, students will be able to:

- define, work with, and differentiate the inverse trigonometric functions.
- evaluate limits graphically, numerically, and algebraically
- apply the rules of differentiation
- perform basic calculations related to integration
- apply the interpretations of derivatives and integrals to a variety of application problems
- solve multi-step Calculus problems
- demonstrate an understanding of, and perform calculations involving, formal definitions of limits, derivatives, and integrals
- recognize the appropriate technique to solve a problem
- justify a conclusion to a mathematical problem

5. Course Design

Two 1.5 hour synchronous lectures weekly. One 1.5 hour synchronous tutorial weekly. Maple software will be used in lecture and tutorial; students will take an end-of-year Maple test. Tutorial will allow students to apply knowledge to further questions and use technology to further explore concepts from class. weekly online quizzes will allow for practice and feedback. Two midterms, 1 final exam.

6. Outline of Topics in the Course

Week 1 *Functions and Models; Limits and Continuity*
- trigonometric functions and their inverses, trigonometric formulas;
- limit laws.

Week 2 *Functions and Models; Limits and Continuity*
- graphing with maple;
- limit laws.

Week 3 *Limits and Continuity; Rates of Change*
- more limit laws, continuity;
- intermediate value theorem;
- limits at infinity;
- rates of change, the tangent and velocity problems, applications to the sciences;
- derivatives, the derivative as a function.

Week 4 *Differentiation*
- differentiation formulas; higher order derivatives;
- derivatives of trigonometric functions;
- the chain rule;
- implicit differentiation.

Week 5 *Applications of Differentiation*
- derivatives of inverse trigonometric, logarithmic, and hyperbolic functions;
- logarithmic differentiation.

Week 6 *Applications of Differentiation*
- rates of change in the natural and social sciences;
- related rates;
- linear approximations;
- Fermat's Theorem, Max and Min Values.

Week 7 *Applications of Differentiation*
- the Closed Interval Method;
- Rolle's Theorem, the Mean Value Theorem;
- how derivatives affect the shape of a graph;
- L'Hopital's Rule.

6. Outline of Topics in the Course cont…

Week 8 *Integrals*
- summary of curve sketching;
- optimization problems;
- antiderivatives.

Week 9 *Integrals*
- antiderivatives;
- areas and distances;
- the definite integral.

Week 10 *Integrals*
- the Fundamental Theorem of Calculus;
- indefinite integrals and the Net Change Theorem.

Week 11 *Integrals; Applications of Integration*
- the substitution rule.

Week 12 *Applications of Integration*
- areas between curves, average value.

7. Required Texts/Readings

REQUIRED (free book from E-Campus Ontario):

OpenStax, Calculus Volume 1. OpenStax. 7 March 2016.
http://cnx.org/content/col11964/1.2

NOTE: You may also access the PDF in our "MATH1010 TEXTBOOK" link in Canvas.

NOTE: Solutions to assigned homework problems will be posted in Canvas.

OPTIONAL:

Calculus: Early Transcendentals, James Stewart, Brooks/Cole, 8th edition,

ISBN: 9781285741550

Additional readings may be assigned or recommended during the course.

8. Evaluation Method

The course mark will be calculated as follows (see section 9 for details):

Calculus Readiness Test: 8%
Weekly Online Quizzes: 12%
Assignments: 5%
Maple Test: 5% (Dec 3/4 during your regular lecture time)
Midterm I: 17.5% (Oct 6/7 during your regular lecture time)
Midterm II: 17.5% (Nov 17/18 during your regular lecture time)
Final Exam: 35%

IMPORTANT: You will be required to use Respondus Lockdown Browser and Monitor for the Midterms, Maple Test and Final Exam. You are required to use a webcam. You must show your student ID. <u>You must write the midterms and Maple Test during the timeslot of the lecture section that you are officially registered in.</u> Similarly, you must attend the tutorial section that you are officially registered in.

Final course grades may be adjusted to conform to program or Faculty grade distribution profiles. Further information on grading can be found in Section 5 of the Ontario Tech Academic Calendar.

9. Assignments and Tests

Calculus Readiness Test:
Focusing on high school pre-calculus and calculus concepts, this test will be administered through the online Mobius system. You will receive 4 <u>attempts</u> during the period of availability (**ends September 18 at 8:00 pm**), and the <u>best</u> score will be counted towards your grade. This test will become available on Wednesday Sept 9 at 3:30pm.

Weekly Online Quizzes:
The online quiz will be completed in Mobius following each week of lectures (it will be **available from 8:00 am each Fri until 8:00 am on the following Monday**). It is an opportunity to practice and master basic concepts. You will get 3 attempts at each quiz (this is to account for possible technical issues or syntax mistakes, so if you experience an issue, please just re-take the quiz – we will not make changes to scores), and the best attempt will count. The three lowest online quizzes will not count towards the final grade.

9. Assignments and Tests cont…

Maple Test:

This open-laptop test will take place during our last lecture; it will be an online test within Canvas, and will test you on your ability to use Maple to help you solve problems. It will be based on all the material we covered throughout the course, including assignments. You will require an internet connection to submit your answers and the test will take place during the time slot of the last lecture that you are currently registered in.

NOTE: It is expected that all students have a device that meets the minimum Ontario Tech specifications for their Faculty; it is your responsibility to log into lectures, tutorials and the Maple test with a device that runs Maple.

Assignments:

Assignments are to be completed individually. Assignments will be done by hand and will cover applications and extensions of material presented in class that students will be responsible for on tests; therefore: **it is imperative that students complete honour homework** in order to prepare for online quizzes, midterms, and the final. Assignments are NOT a substitute for this!

You are to submit your hand written assignments to an online dropbox in Canvas. For complete details on this process, please see the "Assignment Submission How To" posted in the "Assignments" folder. The *single* lowest assignment grade will not count towards the final grade.

NOTE: Regarding missed work:

- **If you miss an online quiz or assignment, then you receive a 0 on it. We recognize that times may arise when you are forced to miss a quiz/assignment through no fault of your own, but it is for this very reason that the 3 lowest online quizzes, and the 1 lowest assignment is dropped. This is extremely generous, so no notes will be accepted for missed quizzes and/or assignments. This policy applies to all students.**

  If you miss the Calculus Readiness Test, then you will get a grade of 0 on it. If you missed the test because you registered in the course Sept 18 or later, you must contact Paula Di Cato by Canvas e-mail within 5 business days of registration.

- **If you miss the Maple Test, you will need to provide the appropriate documentation (e.g. Academic Consideration Form) to Science Advising within 3 business days of missing the test.**

9. Assignments and Tests cont…

Midterm Tests and Final Exam:
Midterm tests and the final exam will be done online through Respondus Lockdown Browser and Monitor. A webcam and strong internet access is necessary to complete these tests. A non-graphing, non-programmable calculator is permitted. Although material that will be tested on the first midterm will not be directly tested on the second midterm, understanding of the concepts which appear in the first part of the course will be necessary for the second midterm. The final exam will test all material covered in the course. The midterm tests and final exam may consist of a hand written component OR a timed multiple choice component OR a combination of both.

NOTE: We do not release final exam grades to students; if you would like to view your exam/find out your exam grade, you will need to do an exam view.

Missed Tests:

The new Covid-19 policy on missed (midterm and other) tests is as follows: If you miss a test for a legitimate reason and can provide appropriate documentation, you will not be penalized. Legitimate reasons are illness or death in the family, and appropriate documentation is an Academic Consideration Form or a photocopy of a death certificate. For information about the deadline and associated process, please contact Science Advising immediately (science.advising@ontariotechu.ca). The usual accommodation for a missed midterm test will be to re-weight the grading scheme to allocate the missed test mark to the final exam mark.

If you miss a test without a legitimate reason or do not provide the proper documentation, you will receive a mark of zero. If the test is written, the decision is irreversible. If you are contemplating not writing a test for any reason, please speak to the science academic advisor in advance of the test, as well as informing the instructor.

For further policies and information relating to the Faculty of Science and this course, please refer to https://science.ontariotechu.ca/undergraduate/current-students/academic-policies.php

You can also find the answers to many frequently asked advising questions at: https://science.ontariotechu.ca/undergraduate/current-students/academic-advising/faqs/

10. Technology Requirements

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Students experiencing financial difficulties such that they are unable to meet the technology requirements may contact Student Awards and Financial Aid Office at: connect@ontariotehu.ca

By remaining enrolled in this course, you acknowledge that you have read, understand and agree to observe the Recommended Technology Requirements for accessing university online learning resources, including those minimum requirements that are specific to your faculty and program.

11. Student Support

Any student who faces challenges securing their food or housing and believes this may affect their performance in the course is urged to contact studentlife@ontariotechu.ca for support. Furthermore, please notify your professor if you are comfortable in doing so. This will enable them to provide any resources and help that they can.

12. Sexual Violence Support and Education

Ontario Tech is committed to the prevention of sexual violence in all is forms. For any student who has experienced Sexual Violence, Ontario Tech can help. We will make accommodations to cater to the diverse backgrounds, cultures, and identities of students when dealing with individual cases.

If you think you have been subjected to or witnessed sexual violence:

- Reach out to a Support Worker, a specially trained individual authorized to receive confidential disclosures about incidents of sexual violence. Support Workers can offer help and resolution options which can include safety plans, accommodations, mental health support, and more. To make an appointment with a Support Worker, call 905.721.3392 or email studentlife@ontariotechu.ca
- Learn more about your options at: https://studentlife.ontariotechu.ca/sexualviolence/

13. Students with Disabilities

Accommodating students with disabilities at Ontario Tech is a responsibility shared among various partners: the students themselves, SAS staff and faculty members. To ensure that disability-related concerns are properly addressed during this course, students with documented disabilities and who may require assistance to participate in this class are encouraged to speak with me as soon as possible. **Students who suspect they have a disability that may affect their participation in this course are advised to go to Student Accessibility Services (SAS) as soon as possible.** Maintaining communication and working collaboratively with SAS and faculty members will ensure you have the greatest chance of academic success.

When on campus access is allowed, students taking courses on north Oshawa campus can visit Student Accessibility Services in the Student Life Building, U5, East HUB (located in the Founders North parking lot). Students taking courses on the **downtown Oshawa campus** can visit Student Accessibility Services in the 61 Charles St. Building, 2nd Floor, Room DTA 225 in the Student Life Suite.

Disability-related and accommodation support is available for students with mental health, physical, mobility, sensory, medical, cognitive, or learning challenges. Office hours are 8:30am-4:30pm, Monday to Friday, closed Wednesday's 8:30am – 10:00am. For more information on services provided, you can visit the SAS website at https://studentlife.ontariotechu.ca/services/accessibility/index.php. Students may contact Student Accessibility Services by calling 905-721-3266, or email studentaccessibility@ontariotechu.ca.

When on campus access is allowed, students who require the use of the Test Centre to write tests, midterms, or quizzes MUST register online using the SAS test/exam sign-up module, found here https://disabilityservices.ontariotechu.ca/uoitclockwork/custom/misc/home.aspx. Students must sign up for tests, midterms, or quizzes AT LEAST seven (7) days before the date of the test.

Students must register for final exams by the registration deadline, which is typically two (2) weeks prior to the start of the final examination period. SAS will notify students of the registration deadline date.

14. Academic Integrity

Students and faculty at Ontario Tech University share an important responsibility to maintain the integrity of the teaching and learning relationship. This relationship is characterized by honesty, fairness and mutual respect for the aim and principles of the pursuit of education. Academic misconduct impedes the activities of the university community and is punishable by appropriate disciplinary action.

Students are expected to be familiar with and abide by Ontario Tech University's regulations on Academic Conduct which sets out the kinds of actions that constitute academic misconduct, including plagiarism, copying or allowing one's own work to copied, use of unauthorized aids in examinations and tests, submitting work prepared in collaboration with another student when such collaboration has not been authorized, among other academic offences. The regulations also describe the procedures for dealing with allegations, and the sanctions for any finding of academic misconduct, which can range from a resubmission of work to a failing grade to permanent expulsion from the university. A lack of familiarity with these regulations on academic conduct does not constitute a defense against its application. This information can be found at http://calendar.uoit.ca/content.php?catoid=22&navoid=879#Academic_conduct

Extra support services are available to all Ontario Tech University students in academic development, study skills, counseling, and peer mentorship. More information on student support services can be found at https://studentlife.ontariotechu.ca/services/academic-support/index.php

15. Online Test and Exam Proctoring (Virtual Proctoring)

To maintain academic integrity in online testing, your instructor may require the use of Respondus LockDown Browser and Respondus Monitor or a similar virtual proctoring platform. In doing so, you will be required to use a computer with a webcam (either built-in or USB plug in). Please advise your instructor as soon as possible if you do not have a computer with a camera. This is a link to a short video that explains the basics of Respondus LockDown Browser: https://web.respondus.com/lockdownbrowser-student-video/

16. Final Examinations

Final examinations are held during the final examination period at the end of the semester and **when on campus access is allowed,** may take place in a different room and on a different day from the regularly scheduled class. Check the published Examination Schedule for a complete list of days and times.

While the University remains online, final exams will require online submission, so you will require internet access along with a webcam.

Students are required to show their Student ID card (campus ID) when **in-person examinations are allowed.** Students are advised to obtain their Student ID Card well in advance of the examination period as they will not be able to write their examinations without it. More information on ID cards can be found at https://registrar.ontariotechu.ca/campus-id/index.php.

Students who are unable to write a final examination when scheduled due to religious obligations may make arrangements to write a deferred examination. These students are required to submit a Request for Accommodation for Religious Obligations to the Faculty concerned as soon as possible and no later than three weeks prior to the first day of the final examination period.

Further information on final examinations can be found at https://usgc.ontariotechu.ca/policy/policy-library/policies/academic/procedures-for-final-examination-administration.php

17. Freedom of Information and Protection of Information Act

The following is an important notice regarding the process for submitting course assignments, quizzes, and other evaluative material in your courses in the Faculty of Science.

Ontario Tech University is governed by the Freedom of Information and Protection of Privacy Act ("FIPPA"). In addition to providing a mechanism for requesting records held by the university, this legislation also requires that the University not disclose the personal information of its students without their consent.

FIPPA's definition of "personal information" includes, among other things, documents that contain both your name and your Banner (student) ID. For example, this could include graded test papers or assignments. To ensure that your rights to privacy are protected, the Faculty of Science encourages you to use only your Banner ID on assignments or test papers being submitted for grading. This policy is intended to prevent the inadvertent disclosure of your information where graded papers are returned to groups of students at the same time.

17. Freedom of Information and Protection of Information Act cont…

If you still wish to write both your name and your Banner ID on your tests and assignments, please be advised that Ontario Tech University will interpret this as an implied consent to the disclosure of your personal information in the normal course of returning graded materials to students.

If you have any questions or concerns relating to the new policy or the issue of implied consent addressed above, please contact accessandprivacy@ontariotechu.ca

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Throughout this course, personal information may be collected through the use of certain technologies under the authority of the *University of Ontario Institute of Technology Act, SO 2002, c. 8, Sch. O.* and will be collected, protected, used, disclosed and retained in compliance with Ontario's *Freedom of Information and Protection of Privacy Act R.S.O. 1990, c. F.31.*

This course will use the following technologies that may collect, use, disclose and retain personal information (including images) for the purposes described below:

- Respondus Monitor or Proctortrack to maintain academic integrity for examinations;
- Google Meet and Kaltura Virtual Classroom to facilitate remote instruction and interactive learning;
- Peer-shared applications, services or technologies that may be reviewed, assessed, or used as part of coursework.

For more information relating to these technologies, we encourage you to visit: https://tlc.ontariotechu.ca/learning-technology/index.php Questions regarding personal information may be directed to: Ontario Tech University Access and Privacy Office, 2000 Simcoe Street North, Oshawa, ON L1G 0C5, email: accessandprivacy@ontariotechu.ca.

By remaining enrolled in this course, you acknowledge that you have read, understand, and agree to the terms and conditions under which the technology provider(s) may collect, use, disclose and retain your personal information. You agree to the university using the technologies and using your personal information for the purposes described in this course outline.

18. Freedom of Expression

Pursuant to Ontario Tech's Freedom of Expression Policy all students are encouraged to express ideas and perspectives freely and respectfully in university space and in the online university environment, subject to certain limitations. Students are reminded that the limits on Freedom of Expression include speech or behavior that: is illegal or interferes with the university's legal obligations; defames an individual or group; constitutes a threat, harassment or discrimination; is a breach of fiduciary, contractual, privacy or confidentiality obligations or commitments; and unduly disrupts and interferes with the functioning of the university. In the context of working online, different forms of communication are used. Where permitted, students using "chat" functions or other online forms of communication are encouraged to ensure that their communication complies with the Freedom of Expression Policy.

19. Student Course Feedback Surveys

Student evaluation of teaching is a highly valued and helpful mechanism for monitoring the quality of Ontario Tech University's programs and instructional effectiveness. To that end, course evaluations are administered by an external company in an online, anonymous process during the last few weeks of classes. Students are encouraged to participate actively in this process and will be notified of the dates. Notifications about course evaluations will be sent via e-mail, and posted on Canvas, Weekly News, and signage around the campus.

20. Final Exam Views

NOTE: We do not release final exam grades to students; if you would like to view your exam/find out your exam grade, you will need to do an exam view. Once grades are released on mycampus, if you want to view your final exam/find out your exam grade, you need to **complete the Exam View Request Form for MATH1010 that's available here (copy and paste the link) ->** https://forms.gle/VpjPTzQN66PhHmrW9; you'll need to login with your @ontariotechu.net account to access the form. The form will become available once grades are released on mycampus.

Notes regarding exam views:

-the above form is the only way to request an exam view for this course; e-mail requests are not acceptable.

-as per the University policy, you have 5 business days from the day that marks are released to submit the exam view request form. **Late requests will not be accepted.** Once you complete the exam view request form, it will provide you with a link to register for an exam view appointment timeslot. Missed appointments will not be rescheduled. If you have a course conflict with all of the appointment times, please e-mail your professor in Canvas with a copy of your course schedule from mycampus; only Ontario Tech course conflicts will be accommodated.

-unless there is a clerical mistake, instructors cannot change marks as a result of an exam view

University Response to COVID-19

The government response to the COVID-19 pandemic is continually evolving. As new information becomes available from federal and provincial public health authorities, the Province of Ontario and the Regional Municipality of Durham, Ontario Tech University will remain nimble and prepared to respond to government orders, directives, guidelines and changes in legislation to ensure the health and safety of all members of its campus community. In accordance with public health recommendations, the university may need to adjust the delivery of course instruction and the availability and delivery mode of campus services and co-curricular opportunities. Ontario Tech University appreciates the understanding and flexibility of our students, faculty and staff as we continue to navigate the pandemic and work together to demonstrate our strong commitment to academic, research and service excellence during these challenging and unprecedented times.

The Accessibility for Ontarians with Disabilities Act (AODA) standards have been considered in the development of this model course template and it adheres to the principles outlined in the University's Accessibility Policy.

FACULTY OF SCIENCE

MATH1850U: Linear Algebra for Engineers

Course outline for Fall 2020

1. Course Details & Important Dates*

Term	Course Type	CRN #	Day	Time	Location
F	Lecture	40311	M/R	12:40 – 2:00 pm	Online
F	Lecture	40312	M/R	5:10 – 6:30 pm	Online
F	Lecture	40313	M/R	11:10 – 12:30 pm	Online

NOTE: Lectures will take place synchronously online during the times listed above. The online lecture room can be accessed through Media Gallery in Canvas.

Classes Start	Classes End	Final Exam Period
Sept 8, 2020	Dec 7, 2020	Dec 9 – 20, 2020

Tutorials for this course shall start the week of Sept 21!

NOTE: Additional important information will be posted in "Announcements" throughout the semester -- make sure you stay up to date on this. We recommend that you turn on the setting that a copy of announcements be sent to your university e-mail account immediately.

* for other important dates go to: https://ontariotechu.ca/current-students/academics/important-dates-and-deadlines.php

2. Instructor Contact Information

Instructor Name	Office	Phone	Email
Azar Shakoori (sections 40311 and 40312)	N/A	N/A	Please use Canvas E-mail
Jane Breen (section 40313)	N/A	N/A	Please use Canvas E-mail
Office Hours: **Please refer to our "Office Hours" link in Canvas for the complete list of all MATH1850 office hours.** Regardless of which section you're in, either of us will be happy to help you!			

NOTE: Ilona Kletskin is the Mobius Administrator and TA Coordinator for this course – if you need to contact her, please use Canvas E-mail.

Laboratory/Teaching Assistant Name	Office	Phone	Email
TBA (you'll see your TA's name in the "Access to my Online Lecture/Tutorial" link once class start)	N/A	N/A	Please use Canvas E-mail
Office Hours: Again, have a look at the "Office Hours" link in Canvas…you can attend ANY of these regardless of which tutorial you're in – all of the TAs will be happy to help you, so please stop by as soon as you have any questions!			

3. Course Description

This is a first course on Linear Algebra. Its purpose is to introduce the basics of the subject. Some important concepts and solution techniques will be presented. These are invaluable for any further contact with Linear Algebra, whether it be in future courses or in `the real world'. There will be an emphasis on the application of Linear Algebra. In particular, the students will be expected not only to solve Linear Algebra problems with standard techniques, but also to interpret the relevance of the solutions. The students will also be introduced to the computational package MATLAB, and its use in solving a variety of Linear Algebra problems. A detailed list of the main topics to be covered is listed below.

4. Learning Outcomes

On the successful completion of the course, students will be able to:

- solve systems of equations
- evaluate determinants
- perform basic calculations involving matrices
- perform basic calculations related to vectors
- apply the concepts of linear algebra to problems involving general vector spaces
- compute the eigenvalues and eigenvectors of a given matrix
- apply linear transformations and compute the corresponding transformation matrix
- solve multi-step Linear Algebra problems
- demonstrate an understanding of, and ability to complete simple proofs
- recognize the appropriate technique to solve a problem
- justify a conclusion to a mathematical problem

5. Course Design

Two 1.5 hour lectures weekly. One 1.5 hour tutorial weekly. MATLAB software will be used in lecture and tutorial. Tutorial will allow students to get help with homework, gain additional practice, and use technology to further explore concepts from class. Weekly online quizzes (in Mobius) will allow for practice and feedback. Two midterms, 1 final exam.

6. Outline of Topics in the Course

Week 1 *Linear Systems*
- setting up linear systems;
- matrix operations;
- Gaussian elimination.

Week 2 *Linear Systems cont…*
- invertibility, the inverse matrix;
- elementary matrices;
- diagonal, triangular, and symmetric matrices.

Week 3 *Determinants*
- introduction to determinants, cofactor expansion;
- finding determinants using row reduction;
- properties of determinants.

Week 4 *Euclidean Vector Spaces*
- vectors in 2-space and 3-space;
- norm, dot product, and distance;
- orthogonality;
- cross product;
- lines and planes.

Week 5 *General Vector Spaces*
- real vector spaces.

Week 6 *General Vector Spaces cont...*
- subspaces;
- span;
- linear independence.

Week 7 *General Vector Spaces cont…*
- coordinates and basis.

Week 8 *General Vector Spaces cont...*
- dimension;
- row space, column space, and nullspace;
- rank, nullity, and fundamental matrix spaces.

Week 9 *General Vector Spaces cont…*
- matrix transformations;
- properties of matrix transformations.

Week 10 *Eigenvalues and Eigenvectors*
- eigenvalues and eigenvectors.

Week 11 *Eigenvalues and Eigenvectors cont...*; *Inner Product Spaces*
- diagonalization;
- inner products.

Week 12 *Inner Product Spaces cont...*
- orthogonality;
- orthonormal bases: Gram-Schmidt process.

7. Required Texts/Readings

REQUIRED:

Elementary Linear Algebra: Applications Version. Loose-leaf text.
H. Anton et al., Wiley, 12th edition, ISBN: 9781119282365
[or 9781118474228 is the 11th edition of the text…there are only a few differences]

OR

Online version (includes solutions manual): ISBN : 9781119406716

OPTIONAL:

The solutions manual for this text is optional. [Note that solutions to assigned homework questions will be posted in Canvas.]

The text and solution manual is available on reserve at the library…just ask for MATH1850/2050)

Additional readings may be assigned or recommended during the course.

8. Evaluation Method

The course mark will be calculated as follows:

Assignments: 10%
Online Quizzes: 15%
Midterm I: 20% [During your regular lecture time: Oct 19]
Midterm II: 20% [During your regular lecture time: Nov 16]
Final Exam: 35%

IMPORTANT: You will need ID at the Midterms and Final Exam. <u>You must write the midterms in the lecture section that you are officially registered in</u>.

Final course grades may be adjusted to conform to program or Faculty grade distribution profiles. Further information on grading can be found at:
http://calendar.uoit.ca/content.php?catoid=22&navoid=879#Grading

9. Assignments and Tests

Assignments:
Assignments are to be completed individually and will be submitted electronically through Canvas. The *single* lowest assignment grade will not count towards the final grade.

Online Quizzes:
The online quiz will be completed in Mobius following each week of lectures (it will be **available from 3:00 pm each Thurs until 8:00 am on the following Monday**). It is an opportunity to practice and master basic concepts. You will get 3 attempts at each quiz (this is to account for possible technical issues or syntax mistakes, so if you experience an issue, please just re-take the quiz – we will not make changes to scores), and the best attempt will count. The *three* lowest online quizzes will not count towards the final grade.

NOTE: If you miss a quiz or an assignment, then you receive a 0 on it. We recognize that times may arise when you are forced to miss a quiz/assignment through no fault of your own, but it is for this very reason that the 3 lowest online quizzes, and the single lowest assignment are dropped. This is extremely generous, so <u>no notes will be accepted for missed quizzes and/or assignments, or if you experienced any technical issues.</u> This policy applies to all students.

Midterm Tests and Final Exam:
The midterms and exam will be conducted online, so you will require your laptop, a strong internet connection, and a webcam. A non-graphing, non-programmable calculator is permitted. Although material that will be tested on the first midterm will not be directly tested on the second midterm, understanding of the concepts which appear in the first part of the course will be necessary for the second midterm. The final exam will test all material covered in the course.

Missed Tests:

In the case of a missed midterm, you will need to complete an Academic Consideration form. For information about the deadline and associated process, please contact Science Advising immediately.

For further policies and information relating to the Faculty of Science and this course, please refer to https://science.ontariotechu.ca/undergraduate/academic-advising/academic-policies.php (copy and paste into your browser)

You can also find the answers to many frequently asked advising questions by referring to https://science.ontariotechu.ca/undergraduate/academic-advising/faqs/index.php (copy and paste into your browser)

Final Exam Views:
NOTE: We do not release final exam grades to students; if you would like to view your exam/find out your exam grade, you will need to do an exam view. Once grades are released on mycampus, if you want to view your final exam/find out your exam grade, you need to **complete the Exam View Request Form for MATH1850 that's available here (copy and paste the link) ->** https://forms.gle/VpjPTzQN66PhHmrW9; you'll need to login with your @ontariotechu.net account to access the form. The form will become available once grades are released on mycampus.

Notes regarding exam views:
-the above form is the only way to request an exam view for this course; e-mail requests are not acceptable.

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-unless there is a clerical mistake, instructors cannot change marks as a result of an exam view

10. Technology Requirements

To support online learning, the university recommends certain technology requirements for laptops, software and internet connectivity which are available at: https://itsc.ontariotechu.ca/remote-learning.php.

Students experiencing technical difficulties such that they are unable to meet the technology requirements may contact the IT Service Help Desk at: servicedesk@dc-uoit.ca
Students experiencing financial difficulties such that they are unable to meet the technology requirements may contact Student Awards and Financial Aid Office at: connect@ontariotehu.ca

By remaining enrolled in this course, you acknowledge that you have read, understand and agree to observe the Recommended Technology Requirements for accessing university online learning resources, including those minimum requirements that are specific to your faculty and program.

11. Sensitive/Offensive Subject Matter

The classroom (both physical and virtual) is intended to provide a safe, open space for the critical and civil exchange of ideas and opinions. Some articles, media and other course materials may contain sensitive content that is offensive and/or disturbing. The Course Instructor will try to identify such material and communicate warnings to students in advance of the distribution and use of such materials, affording students the choice to either emotionally prepare for, or not to view or interact with, the content.

12. Student Support

Any student who faces challenges securing their food or housing and believes this may affect their performance in the course is urged to contact studentlife@ontariotechu.ca for support. Furthermore, please notify your professor if you are comfortable in doing so. This will enable them to provide any resources and help that they can.

13. Sexual Violence Support and Education

Ontario Tech is committed to the prevention of sexual violence in all its forms. For any student who has experienced Sexual Violence, Ontario Tech can help. Ontario Tech will

make accommodations to cater to the diverse backgrounds, cultures, and identities of students when dealing with individual cases.

If you think you have been subjected to or witnessed sexual violence:

- Reach out to a Support Worker, a specially trained individual authorized to receive confidential disclosures about incidents of sexual violence. Support Workers can offer help and resolution options which can include safety plans, accommodations, mental health support, and more. To make an appointment with a Support Worker, call 905.721.3392 or email studentlife@ontariotechu.ca
- Learn more about your options at: https://studentlifeontariotechu.ca/sexualviolence

14. Students with Disabilities

Accommodating students with disabilities at Ontario Tech is a responsibility shared among various partners: the students themselves, SAS staff and faculty members. To ensure that disability-related concerns are properly addressed during this course, students with documented disabilities and who may require assistance to participate in this class are encouraged to speak with me as soon as possible. **Students who suspect they have a disability that may affect their participation in this course are advised to go to Student Accessibility Services (SAS) as soon as possible.** Maintaining communication and working collaboratively with SAS and faculty members will ensure you have the greatest chance of academic success.

When on campus access is allowed, students taking courses on north Oshawa campus can visit Student Accessibility Services in the Student Life Building, U5, East HUB (located in the Founders North parking lot). Students taking courses on the **downtown Oshawa campus** can visit Student Accessibility Services in the 61 Charles St. Building, 2nd Floor, Room DTA 225 in the Student Life Suite.

Disability-related and accommodation support is available for students with mental health, physical, mobility, sensory, medical, cognitive, or learning challenges. Office hours are 8:30am-4:30pm, Monday to Friday, closed Wednesday's 8:30am – 10:00am. For more information on services provided, you can visit the SAS website at https://studentlife.ontariotechu.ca/services/accessibility/index.php. Students may contact Student Accessibility Services by calling 905-721-3266, or email studentaccessibility@ontariotechu.ca.

When on campus access is allowed, students who require the use of the Test Centre to write tests, midterms, or quizzes MUST register online using the SAS test/exam sign-up module, found here https://disabilityservices.ontariotechu.ca/uoitclockwork/custom/misc/home.aspx. Students must sign up for tests, midterms, or quizzes AT LEAST seven (7) days before the date of the test.

Students must register for final exams by the registration deadline, which is typically two (2) weeks prior to the start of the final examination period. SAS will notify students of the registration deadline date.

15. Professional Conduct

Additional information on professional suitability can be found at http://calendar.uoit.ca/content.php?catoid=22&navoid=879#Academic_conduct

16. Academic Integrity

Students and faculty at Ontario Tech University share an important responsibility to maintain the integrity of the teaching and learning relationship. This relationship is characterized by honesty, fairness and mutual respect for the aim and principles of the pursuit of education. Academic misconduct impedes the activities of the university community and is punishable by appropriate disciplinary action.

Students are expected to be familiar with and abide by Ontario Tech University's regulations on Academic Conduct which sets out the kinds of actions that constitute academic misconduct, including plagiarism, copying or allowing one's own work to copied, use of unauthorized aids in examinations and tests, submitting work prepared in collaboration with another student when such collaboration has not been authorized, among other academic offences. The regulations also describe the procedures for dealing with allegations, and the sanctions for any finding of academic misconduct, which can range from a resubmission of work to a failing grade to permanent expulsion from the university. A lack of familiarity with these regulations on academic conduct does not constitute a defense against its application. This information can be found at http://calendar.uoit.ca/content.php?catoid=22&navoid=879#Academic_conduct

Extra support services are available to all Ontario Tech University students in academic development, study skills, counseling, and peer mentorship. More information on student support services can be found at https://studentlife.uoit.ca/services/academic-support/index.php

17. Online Test and Exam Proctoring (Virtual Proctoring)

Ontario Tech University will conduct virtual monitoring of examinations in accordance with Ontario privacy legislation and all approved policy instruments. Your instructor may require the use of Respondus LockDown Browser and Respondus Monitor or a similar virtual proctoring platform. In doing so, you will be required to use a computer with a webcam (either built-in or USB plug in).

18. Final Examinations

Final examinations are held during the final examination period at the end of the semester and **when on campus access is allowed,** may take place in a different room and on a different day from the regularly scheduled class. Check the published Examination Schedule for a complete list of days and times.

In the case of exams being conducted virtually, they will require online submission, so you will require internet access.

Students are required to show their Student ID card (campus ID) when **in-person examinations are allowed.** Students are advised to obtain their Student ID Card well in advance of the examination period as they will not be able to write their examinations without it. More information on ID cards can be found at https://registrar.ontariotechu.ca/campus-id/index.php.

Students who are unable to write a final examination when scheduled due to religious obligations may make arrangements to write a deferred examination. These students are required to submit a Request for Accommodation for Religious Obligations to the Faculty concerned as soon as possible and no later than three weeks prior to the first day of the final examination period.

Further information on final examinations can be found at https://usgc.ontariotechu.ca/policy/policy-library/policies/academic/procedures-for-final-examination-administration.php

19. Freedom of Information and Protection of Privacy Act

The following is an important notice regarding the process for submitting course assignments, quizzes, and other evaluative material in your courses in the Faculty of Science.

Ontario Tech University is governed by the Freedom of Information and Protection of Privacy Act (“FIPPA”). In addition to providing a mechanism for requesting records held by the university, this legislation also requires that the University not disclose the personal information of its students without their consent.

FIPPA's definition of "personal information" includes, among other things, documents that contain both your name and your Banner (student) ID. For example, this could include graded test papers or assignments. To ensure that your rights to privacy are protected, the Faculty of [Insert Faculty name] encourages you to use only your Banner ID on assignments or test papers being submitted for grading. This policy is intended to prevent the inadvertent disclosure of your information where graded papers are returned to groups of students at the same time. If you still wish to write both your name and your Banner ID on your tests and assignments, please be advised that Ontario Tech University will interpret this as an implied consent to the disclosure of your personal information in the normal course of returning graded materials to students.

If you have any questions or concerns relating to the new policy or the issue of implied consent addressed above, please contact accessandprivacy@ontariotechu.ca

Notice of Collection and Use of Personal Information
Throughout this course, personal information may be collected through the use of certain technologies under the authority of the *University of Ontario Institute of Technology Act, SO 2002, c. 8, Sch. O.* and will be collected, protected, used, disclosed and retained in compliance with Ontario's *Freedom of Information and Protection of Privacy Act R.S.O. 1990, c. F.31.*

This course may use the following technologies that may collect, use, disclose and retain personal information (including images) for the purposes described below:

- Respondus Monitor and Proctortrack to maintain academic integrity for examinations;
- Google Meet and Kaltura Virtual Classroom to facilitate remote instruction and interactive learning;
- Peer-shared applications, services or technologies that may be reviewed, assessed, or used as part of coursework.
- Other applications, services, or technologies that support or enhance online learning

For more information relating to these technologies, we encourage you to visit: https://tlc.ontariotechu.ca/learning-technology/index.php Questions regarding personal information may be directed to: Ontario Tech University Access and Privacy Office, 2000 Simcoe Street North, Oshawa, ON L1G 0C5, email: accessandprivacy@ontariotechu.ca.

By remaining enrolled in this course, you acknowledge that you have read, understand, and agree to the terms and conditions under which the technology provider(s) may collect, use, disclose and retain your personal information. You agree to the university using the technologies and using your personal information for the purposes described in this course outline.

20. Freedom of Expression

Pursuant to Ontario Tech's Freedom of Expression Policy all students are encouraged to express ideas and perspectives freely and respectfully in university space and in the online university environment, subject to certain limitations. Students are reminded that the limits on Freedom of Expression include speech or behaviour that: is illegal or interferes with the university's legal obligations; defames an individual or group; constitutes a threat, harassment or discrimination; is a breach of fiduciary, contractual, privacy or confidentiality obligations or commitments; and unduly disrupts and interferes with the functioning of the university. In the context of working online, different forms of communication are used. Where permitted, students using "chat" functions or other online forms of communication are encouraged to ensure that their communication complies with the Freedom of Expression Policy.

21. Student Course Feedback Surveys

Student evaluation of teaching is a highly valued and helpful mechanism for monitoring the quality of Ontario Tech University's programs and instructional effectiveness. To that end, course evaluations are administered by an external company in an online, anonymous process during the last few weeks of classes. Students are encouraged to participate actively in this process and will be notified of the dates. Notifications about course evaluations will be sent via e-mail, and posted on Canvas, Weekly News, and signage around the campus.

University Response to COVID-19

The government response to the COVID-19 pandemic is continually evolving. As new information becomes available from federal and provincial public health authorities, the Province of Ontario and the Regional Municipality of Durham, Ontario Tech University will remain nimble and prepared to respond to government orders, directives, guidelines and changes in legislation to ensure the health and safety of all members of its campus community. In accordance with public health recommendations, the university may need to adjust the delivery of course instruction and the availability and delivery mode of campus services and co-curricular opportunities. Ontario Tech University appreciates the understanding and flexibility of our students, faculty and staff as we continue to navigate the pandemic and work together to demonstrate our strong commitment to academic, research and service excellence during these challenging and unprecedented times.

PHY 1010U PHYSICS I
FACULTY OF SCIENCE
FALL 2020

Section	Lecture Times
1 and 2	3:40 pm - 5:00 pm Mondays and Thursdays
3 and 4	12:40 pm - 2:00 pm Wednesdays and Fridays

Dr. Joseph MacMilllan
Course Coordinator
Office: UA 2024
Email: joseph.macmillan@uoit.ca

Dr. Valeri Kapoustine
Laboratory Coordinator
Office: UA 3065
Email: valeri.kapoustine@uoit.ca

1 COURSE DETAILS

This course is an introductory, calculus-based physics course covering the basics of motion. We'll cover kinematics, dynamics, and conservation laws. There will be three different course components to assist you in your learning: lectures, tutorials, and laboratories.

1.1 LECTURES

Lectures will be interactive and you should have writing materials to work during class. Multiple choice questions may be posed throughout lecture and answers must be given using TurningPoint; participation is mandatory.

You will also be expected to read the relevant sections of the textbook before class, watch any appropriate videos, and will be quizzed on this material before coming to class.

Lecture will be held online; for details see the course Canvas.

1.2 LABORATORIES

The laboratories will help you understand physical laws and principles, verify theoretical predictions, and become familiar with physics laboratory equipment and techniques. They will be 3 hour online sessions, every second week, as determined by your individual schedules. For more details, see the *Introduction to Laboratory* section in Canvas.

Since the students will have 2 full weeks to complete lab reports, it is highly recommended that the students start working on the lab experiment as soon as possible. The online session scheduled for the students will help better understand what the students have to do in the lab but since there will be no real experiment the students will not finish the experiment during this session. If some questions appear later, the students will not be able to get answer to them. The students have to do most of the work before the scheduled online lab session. For more details , see the *Lab Policy* file in Canvas.

The lab coordinator is Dr. Valeri Kapoustine; his contact information is above.

The teaching assistants for the labs are

- Waleed Ahmed (CRNs 40371, 41923, 42693, 41973, 40372)
- Haris Ishaq (CRNs 41922, 40378, 41928, 41155)
- Arup Chutia (CRNs 40369, 40368, 40915, 40375)
- Muhammad Tariq (CRNs 40377, 41918, 42334, 42695)
- Chunyu Mao (CRNs 40370, 40914, 41976, 41930)
- Reza Mohammadali Zadeh (CRNs 40374, 42337, 41974, 40379)

You can contact your TA via Canvas.

Lab Carry Forwards: Please be advised that if there are students who are taking this course for the second time, they can carry forward their lab marks from a previous course offering. In order to do so the students should obtain the form via the link `https://science.ontariotechu.ca/undergraduate/academic-advising/forms.php` and formally apply for the lab marks carry forward online during first two weeks of the semester.

Laboratory grading policy: In order to pass this course, a grade of at least 50% in the laboratory component is required.

Labs will start September 21.

1.3 Tutorials

Tutorials will consist of two components: a test for the first 40 minutes, with your Teaching Assistant going over the solutions during the rest of the time. Tests will be conducted online; for more details, see Canvas. Tutorials are held very two weeks, with five tutorial tests in total. Only your four best test grades will count toward your final grade.

The tutorial teaching assistants are

- Cristina Banica (CRNs 42702, 42703, 42970, 42973, 41977, 42976, 42977)
- Pedram Karimipour Fard (CRNs 40380, 41975, 42971)
- Ali Ismael (CRNs 40383, 41919, 42340)
- Khaled Al-Hamed (CRNs 42969, 42335, 42338)
- Kinza Bakhtiar (CRNs 42339, 40381)

Tutorials will start on Monday, September 21, and continue until Friday, December 4.

2 Course Outline

- Kinematics of Straight Line Motion
- Kinematics of Projectile Motion
- Kinematics of Circular Motion
- Dynamics of Straight Line Motion
- Interactions Between Objects
- Dynamics of Circular Motion
- The Momentum Principle

- Mechanical Energy
- Work and the Energy Principle
- Dynamics of Rotating Objects
- Oscillations
- Gravity

3 Important Dates

- Lectures start Tuesday, September 8.
- Tutorial Tests start Monday, September 21.
- Labs start Monday, September 21.
- Final exam period: December 9 - 20.

4 Required Resources

4.1 Textbook

Required textbook: *Physics for Scientists and Engineers, Fourth Edition* by Randall D. Knight.

Note that the second and third editions of the textbook are fine, although there are some differences between the books. These earlier editions may be used, but it is your responsibility to adjust for page changes, question number changes and other alterations between editions. References to the text and questions in lectures will be in regard to the fourth edition only.

This textbook will be used again in next term's PHY 1020U (Physics II) and PHY 1040U (Physics for Biosciences); you will not need a new textbook for those courses.

4.2 Technology Requirements

To support online learning, the university recommends certain technology requirements for laptops, software and internet connectivity which are available at: `https://itsc.ontariotechu.ca/remote-learning.php`.

Students experiencing technical difficulties such that they are unable to meet the technology requirements may contact the IT Service Help Desk at: `servicedesk@dc-uoit.ca`. Students experiencing financial difficulties such that they are unable to meet the technology requirements may contact Student Awards and Financial Aid Office at: `connect@ontariotehu.ca`.

By remaining enrolled in this course, you acknowledge that you have read, understand and agree to observe the Recommended Technology Requirements for accessing university online learning resources, including those minimum requirements that are specific to your faculty and program.

5 Evaluation

5.1 Marking Scheme

- Laboratory: 20%
- Mastery Modules: 10%
- Tutorial Tests: 30%
- Pre-lecture quizzes: 5%
- In-class participation: 5%
- Final Exam: 30%

In order to pass the course you have to obtain at least 50% overall in addition to getting 50% on your total lab mark.

5.2 Pre-lecture Quizzes

Before most Wednesday (sections 3 and 4) and Thursday (sections 1 and 2) classes you will be required to complete a reading/video assignment and answer a short quiz. The pre-lecture quizzes will be due 10 minutes before your lecture start time. See Canvas for more details.

Only your best 10 (of 12) quizzes will count toward your final grade. If you miss one or two quizzes for any reason, including illness, those missed quizzes will count as a dropped grade.

5.3 In-class Participation

During most Wednesday (sections 3 and 4) and Thursday (sections 1 and 2) classes you will be required to answer conceptual-based polling questions; participation (not correctness) will count towards your final grade.

Although I expect you to attend every lecture, it's okay to miss one or two without affecting your participation grade; if you miss more than this you might be penalized.

5.4 Tutorial Tests

Tutorial tests will be held at the start of your individual tutorial section times and will last for 40 minutes. They will be held online (see Canvas for details). You will be allowed to use any course material you like during the test; however, you are not allowed to use non-official online resources (e.g., Google search) or communicate with any other person during the test.

Note that for the Tutorial Tests, only your best four (of five) tests will count toward your final grade. If you miss one test for any reason, including illness, that missed test will count as the dropped grade.

5.5 Mastery Modules

There will be online modules (called "Physics Mastery Modules") that you will need to complete for credit. Each module will be based on a specific topic and will guide you from questions involving conceptual ideas to full, complex physics problems.

See Canvas for more details about how to access the Mastery Modules.

No Mastery Module grade will be dropped; however, the very last Module will be for bonus grade toward your total Mastery Module grade.

5.6 Final Exam

The final exam will be comprehensive and include all topics discussed in the course. The date of the final exam will be determined at a later date. The exam will be held online.

6 Student Support

Any student who faces challenges securing their food or housing and believes this may affect their performance in the course is urged to contact `studentlife@ontariotechu.ca` for support. Furthermore, please notify your professor if you are comfortable in doing so. This will enable them to provide any resources and help that they can.

7 Sexual Violence Policy

Ontario Tech is committed to the prevention of sexual violence in all is forms. For any Ontario Tech student who has experienced Sexual Violence, Ontario Tech can help. Ontario Tech will make accommodations to cater to the diverse backgrounds, cultures, and identities of students when dealing with individual cases. If you think you have been subjected to or witnessed sexual violence:

- Reach out to a Support Worker, who are specially trained individuals authorized to receive confidential disclosures about incidents of sexual violence. Support Workers can offer help and resolutions options which can include safety plans, accommodations, mental health support, and more. To make an appointment with a Support Worker, call 905.721.3392 or email `studentlife@ontariotechu.ca`
- Learn more about your options at: `https://studentlife.ontariotechu.ca/sexualviolence`

8 Students with Disabilities

Accommodating students with disabilities at Ontario Tech is a responsibility shared among various partners: the students themselves, SAS staff and faculty members. To ensure that disability-related concerns are properly addressed during this course, students with documented disabilities and who may require assistance to participate in this class are encouraged to speak with me as soon as possible. *Students who suspect they have a disability that may affect their participation in this course are advised to go to Student Accessibility Services (SAS) as soon as possible*. Maintaining communication and working collaboratively with SAS and faculty members will ensure you have the greatest chance of academic success.

When on campus access is allowed, students taking courses on north Oshawa campus can visit Student Accessibility Services in the Student Life Building, U5, East HUB (located in the Founders North parking lot). Students taking courses on the downtown Oshawa campus can visit Student Accessibility Services in the 61 Charles St. Building, 2nd Floor, Room DTA 225 in the Student Life Suite.

Disability-related and accommodation support is available for students with mental health, physical, mobility, sensory, medical, cognitive, or learning challenges. Office hours are 8:30am-4:30pm, Monday to Friday, closed Wednesday's 8:30am - 10:00am. For more information on services provided, you can visit the SAS website at `https://studentlife.ontariotechu.ca/services/accessibility/index.php`. Students may contact Student Accessibility Services by calling 905-721-3266, or email `studentaccessibility@ontariotechu.ca`.

When on campus access is allowed, students who require the use of the Test Centre to write tests, midterms, or quizzes MUST register online using the SAS test/exam sign-up module, found here https://disabilityservices.ontariotechu.ca/uoitclockwork/custom/misc/home.aspx. Students must sign up for tests, midterms, or quizzes AT LEAST seven (7) days before the date of the test.

Students must register for final exams by the registration deadline, which is typically two (2) weeks prior to the start of the final examination period. SAS will notify students of the registration deadline date.

9 Academic Integrity

Students and faculty at Ontario Tech University share an important responsibility to maintain the integrity of the teaching and learning relationship. This relationship is characterized by honesty, fairness and mutual respect for the aim and principles of the pursuit of education. Academic misconduct impedes the activities of the university community and is punishable by appropriate disciplinary action.

Students are expected to be familiar with and abide by Ontario Tech University's regulations on Academic Conduct which sets out the kinds of actions that constitute academic misconduct, including plagiarism, copying or allowing one's own work to copied, use of unauthorized aids in examinations and tests, submitting work prepared in collaboration with another student when such collaboration has not been authorized, among other academic offences. The regulations also describe the procedures for dealing with allegations, and the sanctions for any finding of academic misconduct, which can range from a resubmission of work to a failing grade to permanent expulsion from the university. A lack of familiarity with these regulations on academic conduct does not constitute a defense against its application. This information can be found athttp://calendar.uoit.ca/content.php?catoid=22&navoid=879#Academic_conduct.

Extra support services are available to all Ontario Tech University students in academic development, study skills, counseling, and peer mentorship. More information on student support services can be found at https://studentlife.ontariotechu.ca/services/academic-support/index.php.

10 Final Examinations

Final examinations are held during the final examination period at the end of the semester and may take place in a different room and on a different day from the regularly scheduled class. Check the published Examination Schedule for a complete list of days and times.

Students are advised to obtain their Student ID Card well in advance of the examination period as they will not be able to write their examinations without it. Student ID cards can be obtained at the Campus ID Services, in the Gordon Willey Building, Room C128.

Students who are unable to write a final examination when scheduled due to religious obligations may make arrangements to write a deferred examination. These students are required to submit a Request for Accommodation for Religious Obligations to the Faculty concerned as soon as possible and no later than three week prior to the first day of the final examination period.

Further information on final examinations can be found in Section 5.25 of the Academic Calendar.

11 Freedom of Information and Protection of Privacy Act

The following is an important notice regarding the process for submitting course assignments, quizzes and other evaluative material in your courses in the Faculty of Science.

As you may know, Ontario Tech is governed by the Freedom of Information and Protection of Privacy Act ("FIPPA"). In addition to providing a mechanism for requesting records held by the university, this legislation also requires that Ontario Tech not disclose the personal information of its students without their consent.

FIPPA's definition of "personal information" includes, among other things, documents that contain both your name and your Banner ID. For example, this could include graded test papers or assignments. To ensure that your rights to privacy are protected, the Faculty of Science encourages you to use only your Banner ID on assignments or test papers being submitted for grading. This policy is intended to prevent the inadvertent disclosure of your information where graded papers are returned to groups of students at the same time. If you still wish to write both your name and your Banner ID on your tests and assignments, please be advised that Ontario Tech will interpret this as an implied consent to the disclosure of your personal information in the normal course of returning graded materials to students.

If you have any questions or concerns relating to the new policy or the issue of implied consent addressed above, please contact `accessandprivacy@ontariotechu.ca`.

11.1 Notice of Collection and Use of Personal Information

Throughout this course, personal information may be collected through the use of certain technologies under the authority of the *University of Ontario Institute of Technology Act, SO 2002, c. 8, Sch. O.* and will be collected, protected, used, disclosed and retained in compliance with Ontario's *Freedom of Information and Protection of Privacy Act R.S.O. 1990, c. F.31.*

This course may use the following technologies that may collect, use, disclose and retain personal information (including images) for the purposes described below:

- Respondus Monitor and Proctortrack to maintain academic integrity for examinations;
- Google Meet and Kaltura Virtual Classroom to facilitate remote instruction and interactive learning;
- Peer-shared applications, services or technologies that may be reviewed, assessed, or used as part of coursework.

For more information relating to these technologies, we encourage you to visit: `https://tlc.ontariotechu.ca/learning-technology/index.php`. Questions regarding personal information may be directed to: Ontario Tech University Access and Privacy Office, 2000 Simcoe Street North, Oshawa, ON L1G 0C5, email: `accessandprivacy@ontariotechu.ca`.

By remaining enrolled in this course, you acknowledge that you have read, understand, and agree to the terms and conditions under which the technology provider(s) may collect, use, disclose and retain your personal information. You agree to the university using the technologies and using your personal information for the purposes described in this course outline.

12 Freedom of Expression

Pursuant to Ontario Tech's Freedom of Expression Policy all students are encouraged to express ideas and perspectives freely and respectfully in university space and in the online university environment, subject to certain limitations. Students are reminded that the limits on Freedom of Expression include speech or behaviour that: is illegal or interferes with the university's legal obligations; defames an individual or group; constitutes a threat, harassment or discrimination; is a breach of fiduciary, contractual, privacy or confidentiality obligations or commitments; and unduly disrupts and interferes with the functioning of the university. In the context of working online, different forms of communication are used. Where permitted, students using "chat" functions or other online forms of communication are encouraged to ensure that their communication complies with the Freedom of Expression Policy.

13 Student Course Feedback Surveys

Student evaluation of teaching is a highly valued and helpful mechanism for monitoring the quality of Ontario Tech University's programs and instructional effectiveness. To that end, course evaluations are

administered by an external company in an online, anonymous process during the last few weeks of classes. Students are encouraged to participate actively in this process and will be notified of the dates. Notifications about course evaluations will be sent via e-mail, and posted on Canvas, Weekly News, and signage around the campus.

14 University Response to COVID-19

The government response to the COVID-19 pandemic is continually evolving. As new information becomes available from federal and provincial public health authorities, the Province of Ontario and the Regional Municipality of Durham, Ontario Tech University will remain nimble and prepared to respond to government orders, directives, guidelines and changes in legislation to ensure the health and safety of all members of its campus community. In accordance with public health recommendations, the university may need to adjust the delivery of course instruction and the availability and delivery mode of campus services and co-curricular opportunities. Ontario Tech University appreciates the understanding and flexibility of our students, faculty and staff as we continue to navigate the pandemic and work together to demonstrate our strong commitment to academic, research and service excellence during these challenging and unprecedented times.

CHEMISTRY FOR ENGINEERS
(CHEM1800) – REMOTE version – 2021

Welcome!

You are welcome here

In this course, all students are welcome, including all races, colours, cultures, ethnicities, genders, sexualities. This course is a space for respect for each other, including students, teaching assistants, staff, and professors. You can reach out at any time.

Image by Anne McNeil and John Megahan.

Professors

Dr. Brian Ikeda – CRN: 72840

Dr. Nelson Lafrenière – CRN: 70066 and 70067

We will have virtual meetings throughout the semester; this will include lectures and office hours. Email addresses can be found below – but we prefer if you contact us through Canvas.

This course is being offered remotely as a result of the COVID-19 Pandemic

This edition of the course is being offered remotely. Essentially that means that we would ideally be having the course in person but because we are not able to do so, we are making a rapid conversion to an online/digital format. Normally, an online course is designed with a team of experts over a long period of time; this edition of the course was rapidly converted over a few months. I hope for your understanding if there are some bumps along the road and we welcome your suggestions any time. We are trying to make the most of a difficult situation, and hope you are staying well and even thriving during the pandemic. *(Adapted from: Flynn, A. and Kerr, J., 2020. Remote teaching: a practical guide with tools, tips, and techniques.)*

1. Course Details & Important Dates*

The objective of this course is to provide an introductory framework for modern chemistry and its application in engineering industries. This course will focus on the four fundamental sub-disciplines of chemistry: analytical, physical, inorganic and organic. The key topics covered include stoichiometry and solutions, electronic structure of atoms and molecules, chemical bonding, thermochemistry, physical chemistry of solids, liquids, and gases, acids and bases, chemical equilibrium, and electrochemistry.

Classes Start	Labs and Tutorials Start	Classes End	Last Day to Drop Courses	Final Exam Period
Week of January 11th	Week of January 18th	Apr. 12, 2021	Consult Science Advising	April 14 – 25, 2021

** For other important dates go to the Academic Calendar*

2. Instructor Contact Information

Instructor Name	Email	Office Hours
Dr. Brian Ikeda	Canvas	TBD
Dr. Nelson Lafreniere	Canvas	TBD

Email Policy:

- In all emails you must include your **student number and CRN**
- Every effort will be made to return emails within **2 business days**
- Content emails sent after 4 pm the day before an assessment **will not be answered.**
- Questions that can be answered by simply referring to the syllabus **may not be answered**

3. Lecture Schedule

CRN 70066	CRN 70067	CRN 72840
Location: ONLINE	Location: ONLINE	Location: ONLINE
TUES - 5:10 – 6:30 PM	WED - 8:10 – 9:30 AM	WED - 9:40 – 11:00 AM
THURS - 5:10 – 6:30 PM	FRI - 8:10 – 9:30 AM	FRI - 9:40 – 11:00 AM
	MON (Apr. 12): 8:10 – 9:30 AM	MON (Apr. 12): 9:40 – 11:00 AM

4. Required Texts

1) McMurry and Fay, Chemistry, 7th edition (Pearson Prentice Hall, 2015).
Available from the bookstore as either:
a. ISBN: 9780321943170 (hardcopy)
b. ISBN: 9780133888942 (e-book, permanent access)
c. ISBN: 9780133891799 (e-book, temporary access for 180 days)

2) Laboratory Manual for Chemistry 1800 (Available through Canvas)

5. Outline of Topics in the Course (order subject to change)

- Chapter 1 – Chemical Tools: Experimentation and Measurement
- Chapter 2 – Atoms, Molecules, and Ions
- Chapter 3 – Mass Relationships in Chemical Reactions
- Chapter 4 – Reactions in Aqueous Solution (online module)
- Chapter 5 – Periodicity and the Electronic Structure of Atoms
- Chapter 6 – Ionic Compounds: Periodic Trends and Bonding Theory
- Chapter 7 – Covalent Bonding and Electron-Dot Structures
- Chapter 8 – Covalent Compounds: Bonding Theories and Molecular Structure
- Chapter 9 – Thermochemistry: Chemical Energy
- Chapter 10 – Gases: Their Properties and Behaviour
- Chapter 11 – Liquids, Solids, and Phase Changes
- Chapter 12 – Solutions and Their Properties
- Chapter 13 – Chemical Kinetics
- Chapter 14 – Chemical Equilibrium
- Chapter 15 – Aqueous Equilibria: Acids and Bases
- Chapter 16 – Applications of Aqueous Equilibria
- Chapter 17 – Thermodynamics: Entropy, Free energy and Equilibrium
- Chapter 18 – Electrochemistry

6. Evaluation

Students will receive a single, final grade assessing their performance in the laboratory, tutorial, and lecture components combined.

Evaluation	% of final mark
Laboratories	15
Tutorials	5
Assignments	10
Term Test 1	22.5
Term Test 2	22.5
Final Exam	25

To receive a passing grade in the course a passing grade must be achieved in *BOTH* of the laboratory (i.e. at least 7.5/15) and the lecture (at least 42.5/85) portions of the course.

Final course grades may be adjusted to conform to program or Faculty grade distribution profiles. Further information regarding grading can be found in Section 5 of the Ontario Tech Academic Calendar.

Note – There are no extra credit assignments in this course to improve your grade at the end of the term. You are responsible for completing all the required assignments, tests and exam, and lab reports to ensure a satisfactory grade. There are no exceptions.

7. Laboratories

Senior Lab Instructor: Dr. Richard Bartholomew (richard.bartholomew@ontariotechu.ca) (Office UA3070.)

- **Labs will begin the week of January 18th**
- Please ensure you attend your correct lab section CRN as listed on MyCampus
- All laboratory-based questions should be addressed to the senior laboratory instructor, Dr. Richard Bartholomew
- You must achieve a grade of **7.5/15** on the laboratories to receive a passing grade in the course.
- The first four laboratory reports must be submitted by the beginning of the next laboratory period. The last laboratory report must be submitted within 24 hours of the end of the laboratory period.

Policy on "Carry Forward" of Laboratory Marks

If you should fail the course but pass the laboratory portion, then you may be eligible to "carry forward" your laboratory marks. This policy means that you may be able to repeat the course without having to redo the laboratory experiments and their associated lab reports. The following conditions must be met in order to qualify for this policy:

- You must have completed all the laboratory work with a passing grade
- You may only "carry forward" the mark to the next offering of Chemistry 1800
- You must apply to a Faculty of Science student advisor (science.advising@uoit.ca), for a "carry forward" no later than the last day to add courses in the term.
- Your application to "carry forward" must be approved by the Dean of the Faculty of Science (or designate).

All questions regarding the carry-forward policy should be addressed to Dr. Bartholomew.

8. Tutorials

- Tutorials will begin the week of January 18th. Students must attend the tutorial on the dates listed in your MyCampus schedule. Students will not be permitted to participate in tutorials to which they are not assigned.
- The tutorials are designed to provide assistance with the course material. Problems relating to the lecture material will be provided to develop problem solving skills and to reinforce the material presented in lectures.
- Each week there will be a worksheet of problems posted on canvas. You should try these problems before the tutorial. Your TA will go through some of these in the tutorial.
- Attendance at each tutorial session is not mandatory, but is strongly recommended**.**
- A participation mark will be awarded for each tutorial attended.

9. Assignments and Tests

There will be two term tests through the course of the semester. They will occur online during regular class time. They will be available through Canvas. The format of the tests will be multiple choice and short answer/calculation.

You are expected to have a functional webcam; some term tests and final exams may require respondus lockdown browser and monitor.

10. Students with Disabilities

Accommodating students with disabilities at Ontario Tech University (UOIT) is a responsibility shared among various partners: the students themselves, SAS staff and faculty members. To ensure that disability-related concerns are properly addressed during this course, students with documented disabilities and who may require assistance to participate in this class are encouraged to speak with me as soon as possible. **Students who suspect they have a disability that may affect their participation in this course are advised to go to Student Accessibility Services (SAS) as soon as possible.** Maintaining communication and working collaboratively with SAS and faculty members will ensure you have the greatest chance of academic success.

Students taking courses on the North Campus Location can visit Student Accessibility Services in the U5 Building located in the Student Life Suite. Students taking courses on the Downtown Oshawa Campus Location can visit Student Accessibility Services in the 61 Charles St. Building, 2nd Floor, Room DTA 225 in the Student Life Suite.

Disability-related support and accommodation support is available for students with mental health, physical, mobility, sensory, medical, cognitive, or learning challenges. Office hours are 8:30am-4:30pm, Mon-Fri. For more information on services provided, you can visit the SAS website at https://studentlife.uoit.ca/services/accessibility/index.php

Students may contact Student Accessibility Services by calling 905-721-3266, or email studentaccessibility@uoit.ca

Students who require the use of the Test Centre to write tests, midterms, or quizzes MUST register online using the SAS test/exam sign-up module, found here. Students must sign up for tests, midterms or quizzes AT LEAST seven (7) days before the date of the test. Students must register for final exams by the registration deadline, which is typically 2 weeks prior to the start of the final examination period. SAS will notify students of the registration deadline date.

11. Professional Conduct

The forensic science profession is guided by various codes of ethics, such as those set in place by the Canadian Society of Forensic Science (www.csfs.ca/code-of-conduct.html). The standards of the Ontario Tech University (UOIT)'s Forensic Science Program reflect the same level of professional conduct. FSP faculty members look to these standards, as well as Ontario Tech University (UOIT) policies, to guide professional relationships with students, and we expect FSP students to adopt these same behaviors and ethics. In particular, students are expected to act in a manner that respects the dignity and rights of all fellow students and faculty, to act in a responsible and mature manner, to recognize that attendance at lectures and laboratories is a professional responsibility (and to alert appropriate faculty well in advance of necessary absences), to maintain positive interpersonal relationships with fellow students and faculty by working with others in effective teams, to respect the confidentiality of information about fellow students and faculty received in confidence, and to demonstrate a sincere commitment to the forensic sciences through active learning, questioning, reading and discussion.

12. Policy Against Sexual Violence

Ontario Tech University is committed to the prevention of sexual violence in all is forms. For any student who has experienced Sexual Violence, **Ontario Tech University can help**. Ontario Tech University will make accommodations to cater to the diverse backgrounds, cultures, and identities of students when dealing with individual cases.

If you think you have been subjected to or witnessed sexual violence:

- Reach out to a Support Worker, who are specially trained individuals authorized to receive confidential disclosures about incidents of sexual violence. Support Workers can offer help and resolutions options which can include safety plans, accommodations, mental health support, and more. To make an appointment with a Support Worker, call 905.721.3392 or email supportworker@uoit.ca
- Learn more about your options at: https://studentlife.uoit.ca/sexualviolence/getsupport.php

13. Academic Integrity

Students and faculty at Ontario Tech University (UOIT) share an important responsibility to maintain the integrity of the teaching and learning relationship. This relationship is characterized by honesty, fairness and mutual respect for the aim and principles of the pursuit of education. Academic misconduct impedes the activities of the university community and is punishable by appropriate disciplinary action.

Students are expected to be familiar with and abide by Ontario Tech University (UOIT)'s regulations on Academic Conduct (Section 5.15 of the Academic Calendar) which sets out the kinds of actions that constitute academic misconduct, including plagiarism, copying or allowing one's own work to copied, use of unauthorized aids in examinations and tests, submitting work prepared in collaboration with another student when such collaboration has not been authorized, among other academic offences. The regulations also describe the procedures for dealing with allegations, and the sanctions for any finding of academic misconduct, which can range from a resubmission of work to a failing grade to permanent expulsion from the university. A lack of familiarity with Ontario Tech University (UOIT)'s regulations on academic conduct does not constitute a defense against its application.

Further information about academic misconduct can be found in the Academic Integrity link on your laptop. Extra support services are available to all Ontario Tech University (UOIT) students in academic development, study skills, counseling, and peer mentorship. More information on student support services can be found in the Academic Calendar (Section 8).

14. Turnitin

Ontario Tech University and faculty members reserve the right to use electronic means to detect and help prevent plagiarism. Students agree that by taking this course all assignments are subject to submission for textual similarity review by Turnitin.com. Assignments submitted to Turnitin.com will be included as source documents in Turnitin.com's restricted access database solely for the purpose of detecting plagiarism in such documents for five academic years. The instructor may require students to submit their assignments electronically to Turnitin.com or the instructor may submit questionable text on behalf of a student. The terms that apply to OTU's use of the Turnitin.com service are described on the Turnitin.com website.

Students who do not wish to have their work submitted to Turnitin.com must provide with their assignment at the time of submission to the instructor a signed Turnitin.com Assignment Cover sheet: http://www.uoit.ca/assets/Academic~Integrity~Site/Forms/Assignment%20Cover%20sheet.pdf

Further information about Turnitin can be found on the Academic Integrity link on your laptop.

15. Final Examinations

Final examinations are held during the final examination period at the end of the semester and may take place in a different room and on a different day from the regularly scheduled class. Check the published Examination Schedule for a complete list of days and times.

Students are advised to obtain their Student ID Card well in advance of the examination period as they will not be able to write their examinations without it. Student ID cards can be obtained at the Campus ID Services, in G1004 in the Campus Recreation and Wellness Centre.

Students who are unable to write a final examination when scheduled due to religious publications may make arrangements to write a deferred examination. These students are required to submit a Request for Accommodation for Religious Obligations to the Faculty concerned as soon as possible and no later than three week prior to the first day of the final examination period.

Further information on final examinations can be found in Section 5.24 of the Academic Calendar

16. Freedom of Information and Protection of Privacy Act

The following is an important notice regarding the process for submitting course assignments, quizzes and other evaluative material in your courses in the Faculty of Science. As you may know, Ontario Tech University (UOIT) is governed by the *Freedom of Information and Protection of Privacy Act* ("FIPPA"). In addition to providing a mechanism for requesting records held by the university, this legislation also requires that Ontario Tech University (UOIT) not disclose the personal information of its students without their consent. FIPPA's definition of "personal information" includes, among other things, documents that contain both your name and your Banner ID. For example, this could include graded test papers or assignments. To ensure that your rights to privacy are protected, the Faculty of [Insert Faculty name] encourages you to use only your Banner ID on assignments or test papers being submitted for grading. This policy is intended to prevent the inadvertent disclosure of your information where graded papers are returned to groups of students at the same time. If you still wish to write both your name and your Banner ID on your tests and assignments, please be advised that Ontario Tech University (UOIT) will interpret this as an implied consent to the disclosure of your personal information in the normal course of returning graded materials to students.

If you have any questions or concerns relating to the new policy or the issue of implied consent addressed above, please contact accessandprivacy@uoit.ca

17. Course Evaluations

Student evaluation of teaching is a highly valued and helpful mechanism for monitoring the quality of Ontario Tech University (UOIT)'s programs and instructional effectiveness. To that end, course evaluations are administered in an online, anonymous process during the last few weeks of classes. Students are encouraged to participate actively in this process and will be notified of the dates. Notifications about course evaluations will be sent via e-mail, and posted on Canvas, Weekly News and signage around the campus.

18. Intellectual Property

Copyright is the sole right to produce or reproduce a work or a substantial part of it in any form. It includes the right to perform the work or any substantial part of it or, in the case of a lecture, to deliver it (Canadian Intellectual Property Office, CIPO).

Students must respect all applicable copyrights in this course, including, but not limited to, lectures, lecture notes, PowerPoints, pdfs, assignments, tests, and laboratory materials.

19. Course Schedule

Students are responsible for all material covered in lectures (in class and online), assignments, laboratories, and textbook readings.

The following is a tentative order of the topics covered this semester. Please note that weeks for delivery of the online lectures are subject to change. You will be notified by your professor of any changes to the course schedule.

Chapters – Topics	Week
1 – Chemical Tools: Experimentation and Measurement*	Self-Study Module
2 – Atoms, Molecules, and Ions	Week of Jan 11
3 – Mass Relationships in Chemical Reactions	Week of Jan 11/18
4 – Reactions in Aqueous Solution*	Week of Jan 18
5 – Periodicity and The Electronic Structure of Atoms	Week of Jan 18/25
6 – Ionic Compounds: Periodic Trends and Bonding Theory	Week of Jan 25
Term Test #1 (Chapters 1-5)	Week of Feb 1st
8 – Covalent Compounds: Bonding Theories and Molecular Structure	Week of Feb 8
Reading Break (no classes)	Week of Feb 15
9 – Thermochemistry: Chemical Energy	Week of Feb 22
17 – Thermodynamics: Entropy, Free energy, and Equilibrium	Week of Feb 22
10 – Gases: Their Properties and Behaviour*	Self-Study Module
11 – Liquids, Solids, and Phase Changes	Week of Mar 1
12 – Solutions and Their Properties	Week of Mar 8
Term Test # 2 (Chapters 6 – 10, 17)	Week of Mar 15
13 – Chemical Kinetics	Week of Mar 15/22
14 – Chemical Equilibrium	Week of Mar 29
15 – Aqueous Equilibria: Acids and Bases*	Self-Study Module
16 – Applications of Aqueous Equilibria*	Self-Study Module
18 – Electrochemistry	Week of Mar 29
Final Exam **(Mainly chapters 11-18 but will require knowledge from previous chapters)** Details will be provided on Canvas.	

Ontario Tech University
Faculty of Engineering and Applied Science
Dean's Office

Course Outline
ENGR 1025U
Engineering Design
Winter 2021

Offering Approval:

Approved

Course Description:

A project-based introduction to the engineering design process, computer-aided drafting, and the use of design tools and software packages for engineering design. Open-ended design-build projects by individuals and groups and written and oral technical communications. Basics of project management including organizing, planning, scheduling, controlling, and application of spreadsheets and project management software.

Major Topics:

- Review the fundamentals of engineering drawings
- Auxiliary Views
- Dimensioning
- Design for Manufacturing Process
- Tolerancing
- Threads, Fasteners, and Springs
- Working Drawings
- Fundamentals of the engineering design
- Concept Selection
- Concept Testing
- Product Architecture
- Prototyping, and Robust Design
- Industrial Design
- Product Development Economics

Graduate Attributes:

The graduate attributes developed and required by the Canadian Engineering Accreditation Board's Accreditation Criteria and Procedures are listed below, with those covered in the course to some degree (introduced, developed, applied).

Attributes	Covered in this Course
Knowledge base	✓
Problem analysis	✓
Investigation	✓
Design	✓
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	✓

Course Content Breakdown

Math	Basic Science	Complementary Studies	Engineering Science	Engineering Design
0%	0%	0%	0%	100%

Course Outcomes:

(i) Read and explain the key characteristics of engineering drawings that are in compliance with Canadian (CSA) and US (ANSI) standards.

(ii) Produce engineering drawings, and show dimensions and tolerances in the design of various objects.

(iii) Perform planning, preparation, documentation and presentation of a problem, using engineering techniques.

(iv) Explain the key uses and utilize a computer-based design and drafting program in the solution of individual and group engineering design projects.

(v) Use a spreadsheet program to perform calculations in at least one aspect of an engineering design.

(vi) Demonstrate the use of project management software in the planning, reporting and control of a group project.

Instructors

Instructor:	Email:	Office:	Phone:
Dr. Yuelei James Yang	Via Canvas Messaging System	ENG1023	ext. 2880

Office Hours:

Thursdays: 12:00-2 PM, and Mondays 1:30-3:30 PM (through Google/meet, check the link through Canvas Frontpage)

Teaching Assistants

TA Name:	Email:
Hao Tan	Through Canvas
TA Name:	**Email:**
Raphael Aranha	Through Canvas
TA Name:	**Email:**
Jianqi Pu	Through Canvas
TA Name:	**Email:**
Zeeshan Khan	Through Canvas

Required Course Text and Other Materials:

- “Product Design and Development” Seventh Edition, McGraw Hill, 2019, Authors: Karl T. Ulrich and Steven D. Eppinger, ISBN # 0073101422.
- "Fundamentals of Ghaphics Communication", seventh edition, McGraw Hill 2018, Author: Gary Bertoline, Eric Wiebe, Nathan Hartman, William Ross.

Reference Books and Information Sources:

- 1. Ullman, David G, “The Mechanical Design Process”, 4/E, ISBN: 0072975741, McGraw Hill 2002.
- 2. Gerard Voland, “Engineering By Design”, 2/E, ISBN: 0-13-140919-0, Prentice Hall 2004
- 3. Steve K. Howell, “Engineering Design and Problem Solving”, 2/E, ISBN: 0-13-093399-6, Prentice Hall 2002.
- 4. Mark N. Horenstein, “Design Concepts for Engineers”, 4/E, ISBN: 0-13-606955-X, Prentice Hall 2010.
- 5. Barry Hyman, “Fundamentals of Engineering Design”, 2/E, ISBN: 0-13-046712-X, Prentice Hall 2003.
- 6. Lieu, D. K. and Sorby, S., “Visualization, Modeling, and Graphics for Engineering Design,” ISBN: 1-4018-4249-6, Delmar, Cengage Learning 2009.
- 7. Yang, Y., "Engineering Design Workbook", 2017

Course Organization and Delivery Mode:

All the lectures, labs and tutorials will be conducted through google/meet. For details, please check the frontpage of your course in Canvas. The instruction hours for each learning element are following:

3-hour lecture per week

0ne hour tutoirial per week

2 hour lab session per week

Final Grade Breakdown:

Homework, In-classs Assignments and Quizzzes	15%
Lab Reports	15%

Midterm	15 %
Course Project	25%
Final	30%

Midterms

Midterm Date:	Midterm Location:
Monday, February 22, 2021 - 15:40 to 17:00	CRN 73493: Online/Canvas
Midterm Date:	**Midterm Location:**
Tuesday, February 23, 2021 - 09:40 to 11:00	CRN 73211 : Online/Canvas
Midterm Date:	**Midterm Location:**
Tuesday, February 23, 2021 - 14:10 to 15:30	CRN 73212 : Online/Canvas

Assignments:

Homework Assignments will be posted on Canvas in order to improve students' proficiencies and performances.

In-class assignments/discussions/quizzes need to be completed within the lecture sessions.

To complete their assignments, students should have a complete set of drawing tools, including: pencils; erasers; compass; 45º and 30º-60º triangles; ruler; protractor; isometric grid paper; and graph paper.

Laboratories, Prelab Reports, Notes and Reports

Lab Description:

1. Lab 1 - From 2D Sketches to 3D Models
2. Lab 2 - Advanced Basics
3. Lab 3 - Advanced Basics II
4. Lab 4 - Design of a Water Pump
5. Lab 5 - Design of a Vice Grip (Creation of Complex Shapes)

Prelab Reports, Notes and Reports:

All laboratory exercises will utilize a custom-written manual developed at Ontario Tech University at FEAS which will include mini design projects following the standard exercises in SOLIDWORKS.

- Laboratory attendance is MANDATORY.

- Failure to attend more than half of all lab sessions will result in an **INC** grade awarded for the course and may result in a **F** grade in the end.

- Lab reports are to be handed in by the specified deadline dates. For details, please contact your Lab instructor or Lab TAs.

- Late lab reports without proper documentation **WILL NOT BE ACCEPTED**.

Tutorials:

Tutorial work will comprise a combination of freehand sketching, engineering grarphics and drawings, brainstorming, design, and synthesis sessions, etc., and will provide additional opportunities to work on the design projects. Tutorials will be conducted by Teaching Assistants. End-of-term tutorials will be used for consultation purposes on the group design project.

Tutorials will be conducted online through Google/meet by TAs on Winter 2021 Semester. For details of tutorial arrangements, please check the frontpage of Canvas course (ENGR1025U)

Computer Experience:

Availability of personal laptop computers and student proficiency in using laptop computers and the use of Canvas, and internet access, is assumed. Lecture notes and assignments will be made available to students in Microsoft PowerPoint, Microsoft Word, or Adobe Acrobat format. The laboratories will provide exposure to hands-on application of SOLIDWORKS software. Microsoft Project will also be introduced to students as part of their tutorial exercises for the purpose of product development planning, scheduling, and delivery. Homework assigned to students will help students to achieve the learning outcomes.

Summary of Important Dates and Marking Scheme:

Due Date of Course Project Report and CAD files: April 9th, 2021.

Date of Course Project Presentation: different groups may have different presentations dates. The presentation schedule will be determined by the instructor, and dates can range from late March to early April 2021, please check the announcements in your Canvas on early March, 2021.

Midterm Date: Different dates for different sections. Please check the section of "Midterm Dates".

Detailed Course Content:

Unit I: Engineering Graphics

Introduction to Graphics Communication

Sketching

Engineering Geometry

Modeling Fundamentals

Multiviews and Visualization

Auxiliary Views

Pictorial Projections

Section Views

Dimensioning and Tolerance Practices

Working Drawings and Assemblies

_____

Unit II: Engineering Design

Development Processes and Organizations

Opportunity Identification

Product Planning

Identifying Customer Needs

Product Specifications

Concept Generation

Concept Selection

Concept Testing

Product Architecture

Industrial Design

Design for Environment

Design for Manufacturing

Prototyping

Robust Design

Patents and Intellectual Property

Design of Services

Product Development Economics

Managing Projects

_____

This first year course helps students to master basic engineering design skills. The laboratory curriculum has been integrated with several mini design projects, which are released as laboratory assignments. Students follow a step-by-step manual to create a base object while learning various Computer Aided Design (CAD) skills and functions. The level of difficulty increases with each subsequent lab. In the end of each lab manual, there is a mini design project, where students design additional features for the base object. Students are required to sketch several concepts, select one of them for their final design, and use the CAD skills they learned to create a 3D model and subsequent multi-view engineering drawings. Expectations increase from basic three-view drawings to full engineering drawings with dimensions, tolerances, assembly drawings, and a bill of materials

Laboratory assignments will begin with the learning of basic CAD functions to create various 3D geometric shapes (prisms, cylinders, spheres, etc.) and combining those using Boolean operations to create an object. Subsequent assignments guide students through the development of more complex objects and assemblies, including the functional, ergonomic, and aesthetic design and assembly of a cabinet while learning advanced functions (including arrays and assembly functions), design of a water pump and a vice grip.

The group term project covers both reverse engineering and creative design. Students are assigned an innovative project task for which they need to produce a new design which includes five independent innovative enhancements. The project begins with brainstorming using initial sketches of feasible deign alternatives, then students need to assess the advantages and drawbacks of their design alternatives with respect to usability and manufacturability. Next, students need to select the optimum design for which they create part models, assembly models, and working drawings. With 3-D software, students check the proposed design concept’s functionality and produce photorealistic renderings and animations. Finally, they are required to create an engineering report accompanied by a one-page owner’s manual/technical specifications/marketing brochure. There is a 10-minute in-class presentation as well.

Medical Certificates and Deferred Exams:

Medical statements and academic consideration forms for any missed student work worth 25% or less (not including midterms or tests) will be submitted directly to the course instructor. This includes missed quizzes, assignments and labs. Missed Midterms or Coursework Worth More than 25% For any missed midterms or tests, regardless of weight, or coursework worth more than 25%, students will need to submit the UOIT Medical statement or academic consideration form to the Engineering Advising Office following the form guidelines.

Guidelines for Medical Statements: Medical statements cover any missed work due to a medical reasons. The student must:

- see a medical doctor within 24 hours of the missed work
- submit the form to the correct individual within 3 working days

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Should the medical certificate proven to be invalid due to any kind of action by the student, such student's behaviour will be considered as a major misconduct and respective disciplinary actions will be commenced.

Failure to comply with the above will result in an mark of 0 for the exam.

Students with disabilities may request to be considered for formal academic accommodation in accordance with the Ontario Human Rights Code. Students seeking accommodation must make their requests through the Centre for Students with Disabilities in a timely manner, and provide relevant and recent documentation to verify the effect of their disability and to allow the University to determine appropriate accommodations.

Accommodation decisions will be made in accordance with the Ontario Human Rights Code. Accommodations will be consistent with and supportive of the essential requirements of courses and programs, and provided in a way that respects the dignity of students with disabilities and encourages integration and equality of opportunity. Reasonable academic accommodation may require instructors to exercise creativity and flexibility in responding to the needs of students with disabilities while maintaining academic integrity.

Student Support

Any student who faces challenges securing their food or housing and believes this may affect their performance in the course is urged to contact studentlife@ontariotechu.ca for support. Furthermore, please notify your professor if you are comfortable in doing so. This will enable them to provide any resources and help that they can.

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- Reach out to a Support Worker, a specially trained individual authorized to receive confidential disclosures about incidents of sexual violence. Support Workers can offer help and resolution options which can include safety plans, accommodations, mental health support, and more. To make an appointment with a Support Worker, call 905.721.3392 or email studentlife@ontariotechu.ca
- Learn more about your options at: https://studentlife.ontariotechu.ca/sexualviolence/

Students with Disabilities

Accommodating students with disabilities at Ontario Tech is a responsibility shared among various partners: the students themselves, SAS staff and faculty members. To ensure that disability-related concerns are properly addressed during this course, students with documented disabilities and who may require assistance to participate in this class are encouraged to speak with me as soon as possible. Students who suspect they have a disability that may affect their participation in this course are advised to go to Student Accessibility Services (SAS) as soon as possible. Maintaining communication and working collaboratively with SAS and faculty members will ensure you have the greatest chance of academic success.

Students taking courses on north Oshawa campus can visit Student Accessibility Services in the Student Life Building, U5, East HUB (located in the Founders North parking lot). Students taking courses on the downtown Oshawa campus can visit Student Accessibility Services in the 61 Charles St. Building, 2nd Floor, Room DTA 225 in the Student Life Suite.

Disability-related and accommodation support is available for students with mental health, physical, mobility, sensory, medical, cognitive, or learning challenges. Office hours are 8:30am-4:30pm, Monday to Friday, closed Wednesday's 8:30am – 10:00am. For more information on services provided, you can visit the SAS website at https://studentlife.ontariotechu.ca/services/accessibility/index.php. Students may contact Student Accessibility Services by calling 905-721-3266, or email studentaccessibility@ontariotechu.ca.

Students who require the use of the Test Centre to write tests, midterms, or quizzes MUST register online using the SAS test/exam sign-up module, found here https://disabilityservices.ontariotechu.ca/uoitclockwork/custom/misc/home.aspx. Students must sign up for tests, midterms, or quizzes AT LEAST seven (7) days before the date of the test.

Students must register for final exams by the registration deadline, which is typically two (2) weeks prior to the start of the final examination period. SAS will notify students of the registration deadline date.

Professional Conduct

All students who are enrolled in engineering programs must demonstrate behaviour appropriate to practice in engineering profession. Where Faculty dean determines that behaviour inconsistent with the norms and expectations of the profession has been exhibited by a student, that student may be immediately withdrawn from the program by the dean or subject to one or more of the sanctions described in the professional suitability policy: http://calendar.uoit.ca/content.php?catoid=22&navoid=879#Academic_conduct

A student demonstrating professional unsuitability may be immediately suspended from any practicum, field work or similar activity at the discretion of the dean pending a final decision.

Academic Integrity

Students and faculty at Ontario Tech University share an important responsibility to maintain the integrity of the teaching and learning relationship. This relationship is characterized by honesty, fairness and mutual respect for the aim and principles of the pursuit of education. Academic misconduct impedes the activities of the university community and is punishable by appropriate disciplinary action.

Students are expected to be familiar with and abide by Ontario Tech University's regulations on Academic Conduct which sets out the kinds of actions that constitute academic misconduct, including plagiarism, copying or allowing one's own work to copied, use of unauthorized aids in examinations and tests, submitting work prepared in collaboration with another student when such collaboration has not been authorized, among other academic offences. The regulations also describe the procedures for dealing with allegations, and the sanctions for any finding of academic misconduct, which can range from a resubmission of work to a failing grade to permanent expulsion from the university. A lack of familiarity with these regulations on academic conduct does not constitute a defense against its application. This information can be found at http://calendar.uoit.ca/content.php?catoid=22&navoid=879#Academic_conduct

Extra support services are available to all Ontario Tech University students in academic development, study skills, counseling, and peer mentorship. More information on student support services can be found at https://studentlife.ontariotechu.ca/services/academic-support/index.php

Turnitin

Ontario Tech University and faculty members reserve the right to use electronic means to detect and help prevent plagiarism. Students agree that by taking this course all assignments are subject to submission for textual similarity review by Turnitin.com. Assignments submitted to Turnitin.com will be included as source documents in Turnitin.com's restricted access database solely for the purpose of detecting plagiarism in such documents. The instructor may require students to submit their assignments electronically to Turnitin.com or the instructor may submit questionable text on behalf of a student. The terms that apply to Ontario Tech University's use of the Turnitin.com service are described on the Turnitin.com website.

Students who do not wish to have their work submitted to Turnitin.com must provide with their assignment at the time of submission to the instructor a signed Turnitin.com Assignment Cover sheet:

https://shared.uoit.ca/shared/department/academic-integrity/Forms/assignment-cover-sheet.pdf

Online Test and Exam Proctoring (Virtual Proctoring)

To maintain academic integrity in online testing, your instructor may require the use of Respondus LockDown Browser and Respondus Monitor or a similar virtual proctoring platform. In doing so, you will be required to use a computer with a webcam (either built-in or USB plug in). Please advise your instructor as soon as possible if you do not have a computer with a camera.

This is a link to a short video that explains the basics of Respondus LockDown Browser.

Final Examinations (if applicable)

Final examinations are held during the final examination period at the end of the semester and may take place in a different room and on a different day from the regularly scheduled class. Check the published Examination Schedule for a complete list of days and times.

Students are advised to obtain their Student ID Card well in advance of the examination period as they will not be able to write their examinations without it. Cards are available from the Campus ID office in the Campus Recreation and Wellness Centre, Room G1004.

Students who are unable to write a final examination when scheduled due to religious publications may make arrangements to write a deferred examination. These students are required to submit a Request for Accommodation for Religious Obligations to the Faculty concerned as soon as possible and no later than three weeks prior to the first day of the final examination period.

Further information on final examinations can be found at https://usgc.ontariotechu.ca/policy/policy-library/policies/academic/procedures-for-final-examination-administration.php

Freedom of Information and Protection of Privacy Act

The following is an important notice regarding the process for submitting course assignments, quizzes, and other evaluative material in your courses in the Faculty of Engineering and Applied Science.

Ontario Tech University is governed by the Freedom of Information and Protection of Privacy Act ("FIPPA"). In addition to providing a mechanism for requesting records held by the university, this legislation also requires that the University not disclose the personal information of its students without their consent.

FIPPA's definition of "personal information" includes, among other things, documents that contain both your name and your Banner (student) ID. For example, this could include graded test papers or assignments. To ensure that your rights to privacy are protected, the Faculty of [Insert Faculty name] encourages you to use only your Banner ID on assignments or test papers being submitted for grading. This policy is intended to prevent the inadvertent disclosure of your information where graded papers are returned to groups of students at the same time. If you still wish to write both your name and your Banner ID on your tests and assignments, please be advised that Ontario Tech University will interpret this as an implied consent to the disclosure of your personal information in the normal course of returning graded materials to students.

If you have any questions or concerns relating to the new policy or the issue of implied consent addressed above, please contact accessandprivacy@ontariotechu.ca

Student Course Feedback Surveys

Student evaluation of teaching is a highly valued and helpful mechanism for monitoring the quality of Ontario Tech University's programs and instructional effectiveness. To that end, course evaluations are administered by an external company in an online, anonymous process during the last few weeks of classes. Students are encouraged to participate actively in this process and will be notified of the dates. Notifications about course evaluations will be sent via e-mail, and posted on Canvas, Weekly News, and signage around the campus.

The Accessibility for Ontarians with Disabilities Act (AODA) standards have been considered in the development of this model course outline and it adheres to the principles outlined in the University's Accessibility Policy.

Notice of Collection and Use of Personal Information

Throughout this course, personal information may be collected through the use of certain technologies under the authority of the *University of Ontario Institute of Technology Act, SO 2002, c. 8, Sch. O.* and will be collected, protected, used, disclosed and retained in compliance with Ontario's *Freedom of Information and Protection of Privacy Act R.S.O. 1990, c. F.31.*

This course may use the following technologies that may collect, use, disclose and retain personal information (including images) for the purposes described below:

- Respondus Monitor and Proctortrack to maintain academic integrity for examinations.
- Google Meet and Kaltura Virtual Classroom to facilitate remote instruction and interactive learning.
- Peer-shared applications, services or technologies that may be reviewed, assessed, or used as part of coursework.
- Other applications, services, or technologies that support or enhance online learning.

For more information relating to these technologies, we encourage you to visit: https://tlc.ontariotechu.ca/learning-technology/index.php Questions regarding personal information may be directed to: Ontario Tech University Access and Privacy Office, 2000 Simcoe Street North, Oshawa, ON L1G 0C5, email: accessandprivacy@ontariotechu.ca.

By remaining enrolled in this course, you acknowledge that you have read, understand and agree to the terms and conditions under which the technology provider(s) may collect, use, disclose and retain your personal information. You agree to the university using the technologies and using your personal information for the purposes described in this course outline.

Technology Requirements

To support online learning, the university recommends certain technology requirements for laptops, software and internet connectivity which are available at: https://itsc.ontariotechu.ca/remote-learning.php.

Students experiencing technical difficulties such that they are unable to meet the technology requirements may contact the IT Service Help Desk at: servicedesk@dc-uoit.ca

Students experiencing financial difficulties such that they are unable to meet the technology requirements may contact Student Awards and Financial Aid Office at: connect@ontariotehu.ca

By remaining enrolled in this course, you acknowledge that you have read, understand and agree to observe the Recommended Technology Requirements for accessing university online learning resources, including those minimum requirements that are specific to your faculty and program.

Virtual Monitoring of Examinations

Ontario Tech University will conduct virtual monitoring of examinations in accordance with Ontario privacy legislation and all approved policy instruments.

Sensitive/Offensive Subject Matter

The classroom (both physical and virtual) is intended to provide a safe, open space for the critical and civil exchange of ideas and opinions. Some articles, media and other course materials may contain sensitive content that is offensive and/or disturbing. The Course Instructor will try to identify such material and communicate warnings[MG1] to students in advance of the distribution and use of such materials, affording students the choice to either emotionally prepare for, or not to view or interact with, the content.

Freedom of Expression

Pursuant to Ontario Tech's Freedom of Expression Policy all students are encouraged to express ideas and perspectives freely and respectfully in university space and in the online university environment, subject to certain limitations. Students are reminded that the limits on Freedom of Expression include speech or behaviour that: is illegal or interferes with the university's legal obligations; defames an individual or group; constitutes a threat, harassment or discrimination; is a breach of fiduciary, contractual, privacy or confidentiality obligations or commitments; and unduly disrupts and interferes with the functioning of the university. In the context of working online, different forms of communication are used. Where permitted, students using "chat" functions or other online forms of communication are encouraged to ensure that their communication complies with the Freedom of Expression Policy.

University Response to COVID-19

The government response to the COVID-19 pandemic is continually evolving. As new information becomes available from federal and provincial public health authorities, the Province of Ontario and the Regional Municipality of Durham, Ontario Tech University will remain nimble and prepared to respond to government orders, directives, guidelines and changes in legislation to ensure the health and safety of all members of its campus community. In accordance with public health recommendations, the university may need to adjust the delivery of course instruction and the availability and delivery mode of campus services and co-curricular opportunities. Ontario Tech University appreciates the understanding and flexibility of our students, faculty and staff as we continue to navigate the pandemic and work together to demonstrate our strong commitment to academic, research and service excellence during these challenging and unprecedented times.

Ontario Tech University
Faculty of Engineering and Applied Science
Dean's Office

Course Outline
ENGR 1200U
Introduction to Programming for Engineers
Winter 2021

Offering Approval:

Approved

Course Description:

Introduction to the anatomy of a computer: CPU, memory, machine cycle, input and output devices, data representation; fundamental programming concepts: flowcharting, algorithm design, use of procedures, program control flow, arrays and vectors, arithmetic and logic operations, input and output, data declaration; programming in C++.

Major Topics:

- Introduction to Computers & Data Representation
- Introduction to C++ Programming
- Control Structures
- Working with Data Files
- Modular Programming with Functions
- Arrays & Vectors
- Pointers

Graduate Attributes:

The graduate attributes developed and required by the Canadian Engineering Accreditation Board's Accreditation Criteria and Procedures are listed below, with those covered in the course to some degree (introduced, developed, applied).

Attributes	Covered in this Course
Knowledge base	✓
Problem analysis	✓
Investigation	✓
Design	✓
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	✓

Course Content Breakdown

Math	Basic Science	Complementary Studies	Engineering Science	Engineering Design
0%	0%	0%	100%	0%

Course Outcomes:

Students who successfully complete this course will have reliably demonstrated an understanding of the following areas:
- Describe how the various hardware devices and software programs interact to perform the basic functions of a PC
- Explain how application programs manipulate data to produce the desired results
- Formulate problems for solution by a computer, such as flowcharts, and selection of application programs
- Describe the main characteristics and benefits of structured programming
- Write, debug and test programs in C++ to achieve specified outcomes

Instructors

Instructor:	Email:	Office:	Phone:	Office Hours:
Dr. Anwar Abdalbari	Canvas email	online	9057218686 Ext. 7377	Fridays 4:00 pm to 5:00 pm

Instructor:	Email:	Office:	Phone:	Office Hours:
Dr. Khalid Elgazzar	Khalid.Elgazzar@uoit.ca	online	9057218686 Ext. 7365	Tuesdays 12:30 pm - 01:30 pm

Instructor:	Email:	Office:	Phone:	Office Hours:

Teaching Assistants

TA Name:
Check Blackboard for the list of TAs and their contact information.

Required Course Text and Other Materials:

- Engineering Problem Solving with C++, 4th Edition by Delores M. Etter, Jeanine A. Ingber. Pearson, 2017.

Reference Books and Information Sources:

- Lecture slides and additional material will be posted on Blackboard.

Course Organization and Delivery Mode:

Week	Topic
W1: Jan 6	Introduction to Computing and Programming
W2: Jan 13	Simple C++ Programs
W3: Jan 20	Simple C++ Programs (continued)
W4: Jan 27	Control Structures: Selection
W5: Feb 3	Control Structures: Repetition
W6: Feb 10	Working with Data Files
Feb 15	Working with Data Files (continued)
W7: Feb 17	Midterm Break
W8: Feb 24	Midterm Test (Time TBA)
W9: Mar 2	Modular Programming with Functions
W10: Mar 9	Functions (continued)
W11: Mar 16	One-Dimensional Arrays
W12: Mar 23	Two-Dimensional Arrays and Pointers
W13: Mar 30	Pointers & Review

Scheduled Regular Class Meeting Times:

Section 70607 (Dr. Anwar Abdalbari):

Wednesday and Friday, 5:10 pm - 6:30 pm (Online Synchronous)

Section 70041 (Dr. Khalid Elgazzar):

Tuesday and Thursday, 11:10 am - 12:30 pm (Online Synchronous)

Section 71610 (Dr.Anwar Abdalbari):

Tuesday and Friday, 12:40 pm - 2:00 pm (Online Synchronous)

Final Grade Breakdown:

- **In-Class Quizzes**: 15% (best 9 quizzes will be counted, equal weighting)
- **Midterm Test:** 30% **(Sat., Feb. 27)**
- **In-Tutorial exercises: 10%**
- **Two assignments: 10%**
- **Final Exam**: 35% (to be scheduled by the university during the final exam period)

Note (1): No makeup quizzes or tests will be offered no matter what is the reason.

Note (2): You must pass the final exam to pass the course.

Note (3): The instructors reserve the right to use electronic means to detect and help prevent plagiarism. Students agree that by taking this course that all assessment items are subject to submission for textual similarity review to online (or manual) services for detecting any form of plagiarism.

Note (4): Quizzes must be done in class/online using the lockdown browser. Students should check the IT department for the correct version of the lockdown browser and a network patch cable.

Midterms

Midterm Date:	Midterm Location:
Saturday, February 27, 2021 - 12:00 to 13:15	Online

Assignments:

Submission of assignments will be handled electronically, and hence no late assignments will be accepted no matter what is the reason. You will be given more than enough time to finish each assignment, so start early! The instructors of this course reserve the right to use electronic means to detect and help prevent plagiarism. Students agree that by taking this course all assignments are subject to submission for textual similarity review to online (or manual) services for detecting software/programming plagiarism.

Tutorials:

Please check mycampus for your tutorial section timing. The tutorials will be facilitated by Teaching Assistants (TAs) and will include important hands-on training. There are 10 marks assigned for Tutorial activities, students are highly encouraged to attend the tutorial section they are officially registered in and complete the assigned activities and practice programming -- **because learning to program is a lot like learning how to swim, which cannot be learned simply by reading.**

Other Course Information:

Problem Sets: This course has no take-home assignments that will need to be submitted for graded, however, problem sets and programming for practice will be posted on Canvas.

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Extra support services are available to all Ontario Tech University students in academic development, study skills, counseling, and peer mentorship. More information on student support services can be found at https://studentlife.ontariotechu.ca/services/academic-support/index.php

Turnitin

Ontario Tech University and faculty members reserve the right to use electronic means to detect and help prevent plagiarism. Students agree that by taking this course all assignments are subject to submission for textual similarity review by Turnitin.com. Assignments submitted to Turnitin.com will be included as source documents in Turnitin.com's restricted access database solely for the purpose of detecting plagiarism in such documents. The instructor may require students to submit their assignments electronically to Turnitin.com or the instructor may submit questionable text on behalf of a student. The terms that apply to Ontario Tech University's use of the Turnitin.com service are described on the Turnitin.com website.

Students who do not wish to have their work submitted to Turnitin.com must provide with their assignment at the time of submission to the instructor a signed Turnitin.com Assignment Cover sheet:

https://shared.uoit.ca/shared/department/academic-integrity/Forms/assignment-cover-sheet.pdf

Online Test and Exam Proctoring (Virtual Proctoring)

To maintain academic integrity in online testing, your instructor may require the use of Respondus LockDown Browser and Respondus Monitor or a similar virtual proctoring platform. In doing so, you will be required to use a computer with a webcam (either built-in or USB plug in). Please advise your instructor as soon as possible if you do not have a computer with a camera.

This is a link to a short video that explains the basics of Respondus LockDown Browser.

Final Examinations (if applicable)

Final examinations are held during the final examination period at the end of the semester and may take place in a different room and on a different day from the regularly scheduled class. Check the published Examination Schedule for a complete list of days and times.

Students are advised to obtain their Student ID Card well in advance of the examination period as they will not be able to write their examinations without it. Cards are available from the Campus ID office in the Campus Recreation and Wellness Centre, Room G1004.

Students who are unable to write a final examination when scheduled due to religious publications may make arrangements to write a deferred examination. These students are required to submit a Request for Accommodation for Religious Obligations to the Faculty concerned as soon as possible and no later than three weeks prior to the first day of the final examination period.

Further information on final examinations can be found at https://usgc.ontariotechu.ca/policy/policy-library/policies/academic/procedures-for-final-examination-administration.php

Freedom of Information and Protection of Privacy Act

The following is an important notice regarding the process for submitting course assignments, quizzes, and other evaluative material in your courses in the Faculty of Engineering and Applied Science.

Ontario Tech University is governed by the Freedom of Information and Protection of Privacy Act ("FIPPA"). In addition to providing a mechanism for requesting records held by the university, this legislation also requires that the University not disclose the personal information of its students without their consent.

FIPPA's definition of "personal information" includes, among other things, documents that contain both your name and your Banner (student) ID. For example, this could include graded test papers or assignments. To ensure that your rights to privacy are protected, the Faculty of [Insert Faculty name] encourages you to use only your Banner ID on assignments or test papers being submitted for grading. This policy is intended to prevent the inadvertent disclosure of your information where graded papers are returned to groups of students at the same time. If you still wish to write both your name and your Banner ID on your tests and assignments, please be advised that Ontario Tech University will interpret this as an implied consent to the disclosure of your personal information in the normal course of returning graded materials to students.

If you have any questions or concerns relating to the new policy or the issue of implied consent addressed above, please contact accessandprivacy@ontariotechu.ca

Student Course Feedback Surveys

Student evaluation of teaching is a highly valued and helpful mechanism for monitoring the quality of Ontario Tech University's programs and instructional effectiveness. To that end, course evaluations are administered by an external company in an online, anonymous process during the last few weeks of classes. Students are encouraged to participate actively in this process and will be notified of the dates. Notifications about course evaluations will be sent via e-mail, and posted on Canvas, Weekly News, and signage around the campus.

The Accessibility for Ontarians with Disabilities Act (AODA) standards have been considered in the development of this model course outline and it adheres to the principles outlined in the University's Accessibility Policy.

Notice of Collection and Use of Personal Information

Throughout this course, personal information may be collected through the use of certain technologies under the authority of the *University of Ontario Institute of Technology Act, SO 2002, c. 8, Sch. O.* and will be collected, protected, used, disclosed and retained in compliance with Ontario's *Freedom of Information and Protection of Privacy Act R.S.O. 1990, c. F.31.*

This course may use the following technologies that may collect, use, disclose and retain personal information (including images) for the purposes described below:

- Respondus Monitor and Proctortrack to maintain academic integrity for examinations.
- Google Meet and Kaltura Virtual Classroom to facilitate remote instruction and interactive learning.
- Peer-shared applications, services or technologies that may be reviewed, assessed, or used as part of coursework.
- Other applications, services, or technologies that support or enhance online learning.

For more information relating to these technologies, we encourage you to visit: https://tlc.ontariotechu.ca/learning-technology/index.php Questions regarding personal information may be directed to: Ontario Tech University Access and Privacy Office, 2000 Simcoe Street North, Oshawa, ON L1G 0C5, email: accessandprivacy@ontariotechu.ca.

By remaining enrolled in this course, you acknowledge that you have read, understand and agree to the terms and conditions under which the technology provider(s) may collect, use, disclose and retain your personal information. You agree to the university using the technologies and using your personal information for the purposes described in this course outline.

Technology Requirements

To support online learning, the university recommends certain technology requirements for laptops, software and internet connectivity which are available at: https://itsc.ontariotechu.ca/remote-learning.php.

Students experiencing technical difficulties such that they are unable to meet the technology requirements may contact the IT Service Help Desk at: servicedesk@dc-uoit.ca

Students experiencing financial difficulties such that they are unable to meet the technology requirements may contact Student Awards and Financial Aid Office at: connect@ontariotehu.ca

By remaining enrolled in this course, you acknowledge that you have read, understand and agree to observe the Recommended Technology Requirements for accessing university online learning resources, including those minimum requirements that are specific to your faculty and program.

Virtual Monitoring of Examinations

Ontario Tech University will conduct virtual monitoring of examinations in accordance with Ontario privacy legislation and all approved policy instruments.

Sensitive/Offensive Subject Matter

The classroom (both physical and virtual) is intended to provide a safe, open space for the critical and civil exchange of ideas and opinions. Some articles, media and other course materials may contain sensitive content that is offensive and/or disturbing. The Course Instructor will try to identify such material and communicate warnings[MG1] to students in advance of the distribution and use of such materials, affording students the choice to either emotionally prepare for, or not to view or interact with, the content.

Freedom of Expression

Pursuant to Ontario Tech's Freedom of Expression Policy all students are encouraged to express ideas and perspectives freely and respectfully in university space and in the online university environment, subject to certain limitations. Students are reminded that the limits on Freedom of Expression include speech or behaviour that: is illegal or interferes with the university's legal obligations; defames an individual or group; constitutes a threat, harassment or discrimination; is a breach of fiduciary, contractual, privacy or confidentiality obligations or commitments; and unduly disrupts and interferes with the functioning of the university. In the context of working online, different forms of communication are used. Where permitted, students using "chat" functions or other online forms of communication are encouraged to ensure that their communication complies with the Freedom of Expression Policy.

University Response to COVID-19

The government response to the COVID-19 pandemic is continually evolving. As new information becomes available from federal and provincial public health authorities, the Province of Ontario and the Regional Municipality of Durham, Ontario Tech University will remain nimble and prepared to respond to government orders, directives, guidelines and changes in legislation to ensure the health and safety of all members of its campus community. In accordance with public health recommendations, the university may need to adjust the delivery of course instruction and the availability and delivery mode of campus services and co-curricular opportunities. Ontario Tech University appreciates the understanding and flexibility of our students, faculty and staff as we continue to navigate the pandemic and work together to demonstrate our strong commitment to academic, research and service excellence during these challenging and unprecedented times.

FACULTY OF SCIENCE

MATH1020U: Calculus II

Course outline for Winter 2021

1. Course Details & Important Dates*

Course Type	CRN	Day	Time	Location
Lecture	70154	M/W	5:10 – 6:30 pm	Synchronous
	70155	W/F	12:40 – 2:00 pm	Synchronous
	70167	M/R	11:10 am – 12:30 pm	Synchronous
	70851	T/F	2:10 – 3:30 pm	Synchronous

NOTE: all lectures will take place virtually through either Google Meet or Kaltura. See the ACCESS TO MY ONLINE LECTURE/TUTORIAL for more information on how to access your lecture.

Classes Start	Classes End	Final Exam Period
Jan 11, 2021	Apr 9, 2021	Apr 14 – 25, 2021

Tutorials for this course shall start the week of Jan 18!

NOTE: Additional important information will be posted in "Announcements" throughout the semester -- make sure you stay up to date on this. We recommend that you turn on the setting that a copy of announcements be sent to your university e-mail account immediately.

* for other important dates go to: www.ontariotechu.ca >Current Students >Important Dates and Deadlines

2. Instructor Contact Information

Instructor Name	Office	Phone	Email
Mihai Beligan (sections 70154 and 70167)	N/A	N/A	Please use Canvas E-mail
Ilona Kletskin (section 70155 and 70851)	N/A	N/A	Please use Canvas E-mail
Office Hours: **Please refer to the "Office Hours" link on the Homepage of our Canvas site for the complete list of all MATH1020 office hours.** Regardless of which section you're in, either of us will be happy to help you!			

NOTE: Ilona Kletskin is the Mobius Administrator and Paula Di Cato is TA Coordinator for this course – if you need to contact them, please use Canvas E-mail.

2. Instructor Contact Information cont…

Laboratory/Teaching Assistant Name	Office	Phone	Email
You will meet your TA in tutorial	N/A	N/A	Please use Canvas E-mail
Office Hours: Again, have a look at the "Office Hours" link in Canvas…you can attend ANY of these regardless of which tutorial you're in – all of the TAs will be happy to help you, so please stop by as soon as you have any questions!			

3. Course Description

A continuation of Calculus I and Intro Calculus that addresses techniques of integration, applications of integration to volumes, arc length and surface area, parametric equations, polar coordinates, differential equations, functions of two or more variables, partial derivatives, Taylor and Maclaurin series, double and triple integrals. Applications to physical science, biological science, and Engineering will be incorporated. A detailed list of the main topics to be covered is listed below.

4. Learning Outcomes

On the successful completion of the course, students will be able to:

- apply techniques of integration: parts, trigonometric substitution, and partial fractions, and use mathematics software to find integrals.
- apply integration techniques e.g. volumes, surface areas of revolution, arc length.
- investigate relations defined by parametric equations and polar coordinates.
- solve separable differential equations and perform basic calculations associated with 1^{st} order equations
- investigate relations defined by parametric equations and polar coordinates.
- graph simple functions of 2 variables and define, compute, and interpret partial derivatives.
- evaluate multiple integrals
- find Taylor and MacLaurin series for a given function, and evaluate convergence.
- solve multi-step Calculus problems
- recognize the appropriate technique to solve a problem
- justify a conclusion to a mathematical problem

5. Course Design

Two 1.5 hour synchronous lectures weekly. One 1.5 hour synchronous tutorial weekly. Maple software will be used in lecture and tutorial; students will take an end-of-year Maple test. Tutorial will allow students to work on homework questions and further applications and use technology to further explore concepts from class. Weekly online quizzes will allow for practice and feedback. Two midterms, 1 final exam.

6. Outline of Topics in the Course

Week 1 *Techniques of Integration*
- integration by parts
- trig integration

Week 2 *Techniques of Integration*
- trigonometric substitution
- partial fractions

Week 3 *Techniques of Integration*
- strategy for integration
- numerical integration
- improper integration

Week 4 *Techniques of Integration; Applications of Integration*
- arc length
- surface area and volumes of revolution
- hydrostatic pressure on a dam
- cardiac output
- probability

Week 5 *Applications of Integration*; *Differential Equations*
- introduction to differential equations
- modelling with differential equations
- separable differential equations

******* *Reading Week* ***

Week 6 *Differential Equations; Parametric and Polar Coordinates*
- Midterm
- parametric curves and their derivatives

Week 7 *Parametric and Polar Coordinates; Multivariable Calculus*
- polar coordinates, and calculus with polar curves
- functions of several variables, partial derivatives

6. Outline of Topics in the Course cont…

Week 8 *Multivariate Calculus*
- chain rule; gradient vector
- max/min

Week 9 *Multivariate Calculus*
- double integrals over rectangles; iterated integrals
- double integrals over general regions

Week 10 *Multivariable Calculus; Sequences and Series*
- Midterm
- Taylor and Maclaurin Series

Week 11 *Sequences and Series*
- Taylor and Maclaurin Series
- sequences
- series; tests for divergence/convergence

Week 12 *Sequences and Series*
- ratio and root tests
- power series of functions
- Maple Test

7. Required Texts/Readings

REQUIRED (free book from E-Campus Ontario):

OpenStax, Calculus Volume 2. OpenStax. 7 March 2016.
https://openstax.org/books/calculus-volume-2/pages/1-introduction

OpenStax, Calculus Volume 3. OpenStax. 7 March 2016.
https://openstax.org/books/calculus-volume-3/pages/1-introduction

NOTE: You may also access the PDF in our "TEXTBOOKS" link in Canvas.

NOTE: Solutions to assigned homework problems will be posted in Canvas.

OPTIONAL:

Calculus: Early Transcendentals, James Stewart, Brooks/Cole, 8th edition,

ISBN: 9781285741550

Additional readings may be assigned or recommended during the course.

8. Evaluation Method

The course mark will be calculated as follows (see section 9 for details):

Calculus Readiness Test: 5%
Weekly Online Quizzes: 20%
Maple Test: 5% (Apr 7/8/9 during your regular lecture time)
Midterm I: 17.5% (Feb 22/23/24 during your regular lecture time)
Midterm II: 17.5% (Mar 22/23/24 during your regular lecture time)
Final Exam: 35%
Student Learning Center Bonus: 2%

IMPORTANT: You may be required to use Respondus Lockdown Browser and Monitor for the Midterms and Final Exam. You are required to have a webcam. You must show your student ID. You must write the midterms and Maple Test during the timeslot of the lecture section that you are officially registered in. Similarly, you must attend the tutorial section that you are officially registered in.

Final course grades may be adjusted to conform to program or Faculty grade distribution profiles. Further information on grading can be found in Section 5 of the Ontario Tech Academic Calendar.

9. Assignments and Tests

Calculus Readiness Test:
Administered through the online Mobius system. Four attempts will be allowed during the period of availability (**ends January 20 at 11:59 pm**), and the best score will be counted towards your grade.

Weekly Online Quizzes:
The online quiz will be completed in Mobius following each week of lectures (it will be **available from 8:00 am each Fri until 8:00 am on the following Monday**). It is an opportunity to practice and master basic concepts. The quizzes are cumulative, covering all material learned thus far, but with a focus on the current week. You will get 3 attempts at each quiz (this is to account for possible technical issues or syntax mistakes, so if you experience an issue, please just re-take the quiz – we will not make changes to scores), and the best attempt will count. The three lowest online quizzes will not count towards the final grade.

9. Assignments and Tests cont…

Student Learning Center Bonus:
You will receive 2% bonus marks if you attend 5 of the following MATH1020 offerings: Math Study Hall, Workshops, One-on-one appointments with a specialist or peer tutor. At least two must be a Math Study Hall visit and/or one-on-one appointment. This mark is all or nothing (i.e. if you only attend 4 offerings, you do not get any bonus marks). If you are unable to complete this for any reason including time conflicts, medical reasons, technical issues, or any other reasons, we will not make any accommodations since this is a bonus mark. You have until April 9 to complete this.

Maple Test:
This is an open-laptop test; it will be an online test within Canvas, and will test you on your ability to use Maple to help you solve problems. It will be based on all the material we covered throughout the course. You will require an internet connection to submit your answers.
NOTE: It is expected that all students have a device that meets the minimum Ontario Tech specifications for their Faculty; it is your responsibility to log into lectures, tutorials and the Maple test with a device that runs Maple.

Assignments:
There are no formal assignments in this course however there will be several opportunities for formative assessment throughout the term. These will be optional assignments that you can hand in for feedback only. These assignments are not worth marks but are extremely important to get feedback from your work to help you prepare for tests.

NOTE: Regarding missed work:

- **If you miss an online quiz then you receive a 0 on it. We recognize that times may arise when you are forced to miss a quiz through no fault of your own, but it is for this very reason that the 3 lowest online quizzes are dropped. This is extremely generous, so no notes will be accepted for missed quizzes. This policy applies to all students.**

  If you miss the Calculus Readiness Test, then you will get a grade of 0 on it. If you missed the test because you registered in the course Jan 18 or later, you must contact Paula Di Cato by Canvas e-mail within 5 business days of registration.

- **If you miss the Maple Test, you will need to provide the appropriate documentation (e.g. Academic Consideration Form) to Science Advising within 3 business days of missing the test.**

9. Assignments and Tests cont…

Missed Tests:

The new Covid-19 policy on missed (midterm and other) tests is as follows: If you miss a test for a legitimate reason and can provide appropriate documentation, you will not be penalized. Legitimate reasons are illness or death in the family, and appropriate documentation is an Academic Consideration Form or a photocopy of a death certificate. For information about the deadline and associated process, please contact Science Advising immediately (science.advising@ontariotechu.ca). The usual accommodation for a missed midterm test will be to re-weight the grading scheme to allocate the missed test mark to the final exam mark.

If you miss a test without a legitimate reason or do not provide the proper documentation, you will receive a mark of zero. If the test is written, the decision is irreversible. If you are contemplating not writing a test for any reason, please speak to the science academic advisor in advance of the test, as well as informing the instructor.

For further policies and information relating to the Faculty of Science and this course, please refer to https://science.ontariotechu.ca/undergraduate/current-students/academic-policies.php

You can also find the answers to many frequently asked advising questions at: https://science.ontariotechu.ca/undergraduate/current-students/academic-advising/faqs/

10. Technology Requirements

To support online learning, the university recommends certain technology requirements for laptops, software and internet connectivity which are available at: https://itsc.ontariotechu.ca/remote-learning.php.

Students experiencing technical difficulties such that they are unable to meet the technology requirements may contact the IT Service Help Desk at: servicedesk@dc-uoit.ca
Students experiencing financial difficulties such that they are unable to meet the technology requirements may contact Student Awards and Financial Aid Office at: connect@ontariotehu.ca

By remaining enrolled in this course, you acknowledge that you have read, understand and agree to observe the Recommended Technology Requirements for accessing university online learning resources, including those minimum requirements that are specific to your faculty and program.

11. Student Support

Any student who faces challenges securing their food or housing and believes this may affect their performance in the course is urged to contact studentlife@ontariotechu.ca for support. Furthermore, please notify your professor if you are comfortable in doing so. This will enable them to provide any resources and help that they can.

12. Sexual Violence Support and Education

Ontario Tech is committed to the prevention of sexual violence in all is forms. For any student who has experienced Sexual Violence, Ontario Tech can help. We will make accommodations to cater to the diverse backgrounds, cultures, and identities of students when dealing with individual cases.

If you think you have been subjected to or witnessed sexual violence:

- Reach out to a Support Worker, a specially trained individual authorized to receive confidential disclosures about incidents of sexual violence. Support Workers can offer help and resolution options which can include safety plans, accommodations, mental health support, and more. To make an appointment with a Support Worker, call 905.721.3392 or email studentlife@ontariotechu.ca
- Learn more about your options at: https://studentlife.ontariotechu.ca/sexualviolence/

13. Students with Disabilities

Accommodating students with disabilities at Ontario Tech is a responsibility shared among various partners: the students themselves, SAS staff and faculty members. To ensure that disability-related concerns are properly addressed during this course, students with documented disabilities and who may require assistance to participate in this class are encouraged to speak with me as soon as possible. **Students who suspect they have a disability that may affect their participation in this course are advised to go to Student Accessibility Services (SAS) as soon as possible.** Maintaining communication and working collaboratively with SAS and faculty members will ensure you have the greatest chance of academic success.

When on campus access is allowed, students taking courses on north Oshawa campus can visit Student Accessibility Services in the Student Life Building, U5, East HUB (located in the Founders North parking lot). Students taking courses on the **downtown Oshawa campus** can visit Student Accessibility Services in the 61 Charles St. Building, 2nd Floor, Room DTA 225 in the Student Life Suite.

Disability-related and accommodation support is available for students with mental health, physical, mobility, sensory, medical, cognitive, or learning challenges. Office hours are 8:30am-4:30pm, Monday to Friday, closed Wednesday's 8:30am – 10:00am. For more information on services provided, you can visit the SAS website at https://studentlife.ontariotechu.ca/services/accessibility/index.php. Students may contact Student Accessibility Services by calling 905-721-3266, or email studentaccessibility@ontariotechu.ca.

When on campus access is allowed, students who require the use of the Test Centre to write tests, midterms, or quizzes MUST register online using the SAS test/exam sign-up module, found here https://disabilityservices.ontariotechu.ca/uoitclockwork/custom/misc/home.aspx. Students must sign up for tests, midterms, or quizzes AT LEAST seven (7) days before the date of the test.

Students must register for final exams by the registration deadline, which is typically two (2) weeks prior to the start of the final examination period. SAS will notify students of the registration deadline date.

14. Academic Integrity

Students and faculty at Ontario Tech University share an important responsibility to maintain the integrity of the teaching and learning relationship. This relationship is characterized by honesty, fairness and mutual respect for the aim and principles of the pursuit of education. Academic misconduct impedes the activities of the university community and is punishable by appropriate disciplinary action.

Students are expected to be familiar with and abide by Ontario Tech University's regulations on Academic Conduct which sets out the kinds of actions that constitute academic misconduct, including plagiarism, copying or allowing one's own work to copied, use of unauthorized aids in examinations and tests, submitting work prepared in collaboration with another student when such collaboration has not been authorized, among other academic offences. The regulations also describe the procedures for dealing with allegations, and the sanctions for any finding of academic misconduct, which can range from a resubmission of work to a failing grade to permanent expulsion from the university. A lack of familiarity with these regulations on academic conduct does not constitute a defense against its application. This information can be found at http://calendar.uoit.ca/content.php?catoid=22&navoid=879#Academic_conduct

Extra support services are available to all Ontario Tech University students in academic development, study skills, counseling, and peer mentorship. More information on student support services can be found at https://studentlife.ontariotechu.ca/services/academic-support/index.php

15. Online Test and Exam Proctoring (Virtual Proctoring)

Ontario Tech University will conduct virtual monitoring of examinations in accordance with Ontario privacy legislation and all approved policy instruments. To maintain academic integrity in online testing, your instructor may require the use of Respondus LockDown Browser and Respondus Monitor or a similar virtual proctoring platform. In doing so, you will be required to use a computer with a webcam (either built-in or USB plug in). Please advise your instructor as soon as possible if you do not have a computer with a camera. This is a link to a short video that explains the basics of Respondus LockDown Browser: https://web.respondus.com/lockdownbrowser-student-video/

16. Final Examinations

Final examinations are held during the final examination period at the end of the semester and **when on campus access is allowed,** may take place in a different room and on a different day from the regularly scheduled class. Check the published Examination Schedule for a complete list of days and times.

While the University remains online, final exams will require online submission, so you will require internet access along with a webcam.

Students are required to show their Student ID card (campus ID) when **in-person examinations are allowed.** Students are advised to obtain their Student ID Card well in advance of the examination period as they will not be able to write their examinations without it. More information on ID cards can be found at https://registrar.ontariotechu.ca/campus-id/index.php.

Students who are unable to write a final examination when scheduled due to religious obligations may make arrangements to write a deferred examination. These students are required to submit a Request for Accommodation for Religious Obligations to the Faculty concerned as soon as possible and no later than three weeks prior to the first day of the final examination period.

Further information on final examinations can be found at https://usgc.ontariotechu.ca/policy/policy-library/policies/academic/procedures-for-final-examination-administration.php

17. Freedom of Information and Protection of Information Act

The following is an important notice regarding the process for submitting course assignments, quizzes, and other evaluative material in your courses in the Faculty of Science.

Ontario Tech University is governed by the Freedom of Information and Protection of Privacy Act ("FIPPA"). In addition to providing a mechanism for requesting records held by the university, this legislation also requires that the University not disclose the personal information of its students without their consent.

FIPPA's definition of "personal information" includes, among other things, documents that contain both your name and your Banner (student) ID. For example, this could include graded test papers or assignments. To ensure that your rights to privacy are protected, the Faculty of Science encourages you to use only your Banner ID on assignments or test papers being submitted for grading. This policy is intended to prevent the inadvertent disclosure of your information where graded papers are returned to groups of students at the same time.

17. Freedom of Information and Protection of Information Act cont…

If you still wish to write both your name and your Banner ID on your tests and assignments, please be advised that Ontario Tech University will interpret this as an implied consent to the disclosure of your personal information in the normal course of returning graded materials to students.

If you have any questions or concerns relating to the new policy or the issue of implied consent addressed above, please contact accessandprivacy@ontariotechu.ca

Notice of Collection and Use of Personal Information
Throughout this course, personal information may be collected through the use of certain technologies under the authority of the *University of Ontario Institute of Technology Act, SO 2002, c. 8, Sch. O.* and will be collected, protected, used, disclosed and retained in compliance with Ontario's *Freedom of Information and Protection of Privacy Act R.S.O. 1990, c. F.31.*

This course will use the following technologies that may collect, use, disclose and retain personal information (including images) for the purposes described below:

- Respondus Monitor or Proctortrack to maintain academic integrity for examinations;
- Google Meet and Kaltura Virtual Classroom to facilitate remote instruction and interactive learning;
- Peer-shared applications, services or technologies that may be reviewed, assessed, or used as part of coursework.

For more information relating to these technologies, we encourage you to visit: https://tlc.ontariotechu.ca/learning-technology/index.php Questions regarding personal information may be directed to: Ontario Tech University Access and Privacy Office, 2000 Simcoe Street North, Oshawa, ON L1G 0C5, email: accessandprivacy@ontariotechu.ca.

By remaining enrolled in this course, you acknowledge that you have read, understand, and agree to the terms and conditions under which the technology provider(s) may collect, use, disclose and retain your personal information. You agree to the university using the technologies and using your personal information for the purposes described in this course outline.

18. Freedom of Expression

Pursuant to Ontario Tech's Freedom of Expression Policy all students are encouraged to express ideas and perspectives freely and respectfully in university space and in the online university environment, subject to certain limitations. Students are reminded that the limits on Freedom of Expression include speech or behavior that: is illegal or interferes with the university's legal obligations; defames an individual or group; constitutes a threat, harassment or discrimination; is a breach of fiduciary, contractual, privacy or confidentiality obligations or commitments; and unduly disrupts and interferes with the functioning of the university. In the context of working online, different forms of communication are used. Where permitted, students using "chat" functions or other online forms of communication are encouraged to ensure that their communication complies with the Freedom of Expression Policy.

19. Student Course Feedback Surveys

Student evaluation of teaching is a highly valued and helpful mechanism for monitoring the quality of Ontario Tech University's programs and instructional effectiveness. To that end, course evaluations are administered by an external company in an online, anonymous process during the last few weeks of classes. Students are encouraged to participate actively in this process and will be notified of the dates. Notifications about course evaluations will be sent via e-mail, and posted on Canvas, Weekly News, and signage around the campus.

20. Final Exam Views

NOTE: We do not release final exam grades to students; if you would like to view your exam/find out your exam grade, you will need to do an exam view. Once grades are released on mycampus, if you want to view your final exam/find out your exam grade, you need to **complete the Exam View Request Form for MATH1020 that's available here (copy and paste the link) ->** https://forms.gle/ELWdCHfDyvxcPGZ17; you'll need to login with your @ontariotechu.net account to access the form. The form will become available once grades are released on mycampus.

Notes regarding exam views:

-the above form is the only way to request an exam view for this course; e-mail requests are not acceptable.

-as per the University policy, you have 5 business days from the day that marks are released to submit the exam view request form. **Late requests will not be accepted.** Once you complete the exam view request form, it will provide you with a link to register for an exam view appointment timeslot. Missed appointments will not be rescheduled. If you have a course conflict with all of the appointment times, please e-mail your professor in Canvas with a copy of your course schedule from mycampus; only Ontario Tech course conflicts will be accommodated.

-unless there is a clerical mistake, instructors cannot change marks as a result of an exam view

University Response to COVID-19

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The Accessibility for Ontarians with Disabilities Act (AODA) standards have been considered in the development of this model course template and it adheres to the principles outlined in the University's Accessibility Policy.

PHY 1020U Physics II

Faculty of Science

Course outline for Winter 2021

Section #	Lecture 1	Lecture 2	Google Meet
1	Wednesday 11:10am-12:30pm	Friday 11:10am-12:30pm	https://meet.google.com/bkv-mfce-mzy
2	Wednesday 11:10am-12:30pm	Friday 11:10am-12:30pm	https://meet.google.com/bkv-mfce-mzy
48	Tuesday 9:40-11:00am	Thursday 9:40-11:00am	https://meet.google.com/bkv-mfce-mzy

* Sections 1 and 2 will not have class on April 2nd because of Good Friday. That lecture will be made up on Monday April 12th.
* A livestream will be available for classes that exceed 250 at https://stream.meet.google.com/stream/c89e2038-af05-4765-a233-25cb905c2b98

Classes Start	Classes End	Final Exam Period
January 11	April 12	April 14 to 25

* For other important dates go to: https://ontariotechu.ca/current-students/academics/important-dates-and-deadlines.php

Instructor Name	Email
Dr. Rupinder Brar	please use Canvas email only

Laboratory Coordinator	Email
Dr. Valeri Kapoustine	valeri.kapoustine@ontariotechu.ca

Course Description

Introduction to electromagnetism and optics: electric charge and Coulomb's law; electric field, electric flux, Gauss' law; electrostatic potential, capacitance; Kirchoff's laws in DC circuits. Magnetic forces and magnetic field; Biot-Savart law; Ampere's law; magnetic flux, Faraday's law, inductance; AC circuits. Electromagnetic waves; wave propagation; waves in matter. Geometrical and wave optics; special relativity.

Learning Outcomes

On the successful completion of the course, students will be able to: Demonstrate a sound knowledge of, and be able to apply and solve problems using physics theory related to topics in electromagnetism and optics, including: electric charge, Coulomb's law, electric field, electric flux, Gauss' law, electrostatic potential, capacitance, Kirchoff's laws in DC circuits, magnetic forces and fields, Biot-Savart law, Ampere's law, magnetic flux, Faraday's law, inductance, AC circuits, electromagnetic waves, geometrical and wave optics. Demonstrate a good knowledge of physics laboratory techniques related to electricity, electromagnetism and optics.

Course Design

This course is a continuation of PHY 1010U Physics I and PHY 1030U Introductory Physics. We will cover electricity, magnetism, electrodynamics, the electromagnetic field, and optics. There will be three different course components to assist you in learning: lectures, tutorials, and laboratories.

Lectures

The lectures for the course will be of two types, synchronous (live) and asynchronous (pre-recorded). The asynchronous lectures will appear under modules in Canvas. You will be expected to watch the posted video before the corresponding synchronous lecture. Recorded lectures will provide theory, derivations, and demonstrations. The live lectures will build on this by developing your skills to do physics and problem solve. Lectures comprise the most important part of your physics learning process. Lectures will be interactive and you be working on problems with the instructor and your peers during class. Your instructor may ask questions throughout the lecture, and you may be expected to respond and participate whenever appropriate.

Laboratories

The lab component of the course consists of one online lab every second week, as determined by your individual schedules starting no earlier than January 18 (week 2). The labs are intended to give you practical experience with some concepts seen in lectures. Details on the labs can be found on Canvas.

Tutorials

The tutorial component of the course consists of five 80-minute online sessions every second week determined by your individual schedules, but beginning no earlier than January 18 (week 2). Tutorial worksheets and solutions, when appropriate, will be posted on Canvas.

Each tutorial will be an opportunity for practicing problem solving, with supervision and help, in areas that have been covered previously in Lecture. During each Tutorial students will complete problems some of which will be handed in at the end of the sessions

Outline of Topics in the Course

- Electric Charge
- Coulomb's Law and the Electric Field
- Gauss' Law
- Electric Potential, Capacitors and Capacitance
- Current, Resistance, and DC Circuits
- The Magnetic Field
- Electrodynamics: Faraday's law, inductors and inductance, electromagnetic waves
- AC Circuits
- Light: Wave optics and ray optics
-

Texts and Software

Text

Physics for Scientists and Engineers, Fourth Edition by Randall D. Knight. This textbook is an excellent book, and you will find it useful to read.
Note that earlier editions of the textbook are fine, although there are some differences between the books. Earlier editions may be used, but it is the students' responsibility to adjust for page changes, question number changes and other alterations between editions. References to the text and questions in lectures will be in regard to the fourth edition only. This is the same textbook used in last term's PHY 1010U (Physics I) and PHY 1030U (Introductory Physics); if you took one of those courses last term, you will not need a new textbook. There are no evaluations for marks from the textbook.

Computers and Calculators

Any scientific calculator will be adequate for assignments but a non-programming one is required for exams (same requirements as in Calculus). Laboratory exercises, assignments and some lectures may require your laptop computer and its special software.

Evaluation Method

Mastery Modules

There will be practice Modules assigned from Lon-Capa (an online homework system that you used last semester) for each topic covered in the course. Modules are designed to help you master material introduced in lecture. Modules are marked for correct completeness. https://loncapa.science.uoit.ca/

Active Learning Participation

Asynchronous and Synchronous lectures will both have active learning participation opportunities that will result in marks. Asynchronous lectures will be available to watch in Perusall (https://perusall.com). Perusall will also allow you to annotate the video, and ask and answer questions in small groups. Perusall is free to use for all students. Synchronous lectures may also have questions and surveys that require you to reply to.

Tests and Exams

There will be five tests you will do during your own scheduled lecture slot, and a final exam in April. The tests will mainly cover about 2 weeks of material and the exam will cover material for the whole course. The tests are scheduled for February2/3, February 23/24, March 9/10, March 23/24, April 6/7. Note that for the Tests, only your best four (of five) tests will count toward your final grade. If you miss one test for any reason, including illness, that missed test will count as the dropped grade.

Marking Scheme

- Laboratory: 20%
- Physics Mastery Modules: 7.5%
- Tutorial Work: 7.5%
- Active Learning Participation: 5%
- Tests (4/5): 30%
- Final Exam: 30%

In order to pass the course you have to obtain at least overall 50% in addition to getting at least 50% on your total lab mark.
Missed Work - Any missed work will receive a mark of zero unless reweighing has been agreed to by the instructor in charge of the evaluation. For missed exam please submit academic consideration for to your academic advisor. No doctor's notes needed.

University-wide Policies and Notices

1. Technology Requirements

To support online learning, the university recommends certain technology requirements for laptops, software and internet connectivity which are available at: https://itsc.ontariotechu.ca/remote-learning.php.

Students experiencing technical difficulties such that they are unable to meet the technology requirements may contact the IT Service Help Desk at: servicedesk@dc-uoit.ca
Students experiencing financial difficulties such that they are unable to meet the technology requirements may contact Student Awards and Financial Aid Office at: connect@ontariotehu.ca

By remaining enrolled in this course, you acknowledge that you have read, understand and agree to observe the Recommended Technology Requirements for accessing university online learning resources, including those minimum requirements that are specific to your faculty and program.

2. Student Support

Any student who faces challenges securing their food or housing and believes this may affect their performance in the course is urged to contact studentlife@ontariotechu.ca for support. Furthermore, please notify your professor if you are comfortable in doing so. This will enable them to provide any resources and help that they can.

3. Sexual Violence Support and Education

Ontario Tech is committed to the prevention of sexual violence in all is forms. For any student who has experienced Sexual Violence, Ontario Tech can help. We will make accommodations to cater to the diverse backgrounds, cultures, and identities of students when dealing with individual cases.

If you think you have been subjected to or witnessed sexual violence:

- Reach out to a Support Worker, a specially trained individual authorized to receive confidential disclosures about incidents of sexual violence. Support Workers can offer help and resolution options which can include safety plans, accommodations, mental health support, and more. To make an appointment with a Support Worker, call 905.721.3392 or email studentlife@ontariotechu.ca
- Learn more about your options at: https://studentlife.ontariotechu.ca/sexualviolence/

4. Students with Disabilities

Accommodating students with disabilities at Ontario Tech is a responsibility shared among various partners: the students themselves, SAS staff and faculty members. To ensure that disability-related concerns are properly addressed during this course, students with documented disabilities and who may require assistance to participate in this class are encouraged to speak with me as soon as possible. **Students who suspect they have a disability that may affect their participation in this course are advised to go to Student Accessibility Services (SAS) as soon as possible.** Maintaining communication and working collaboratively with SAS and faculty members will ensure you have the greatest chance of academic success.

When on campus access is allowed, students taking courses on north Oshawa campus can visit Student Accessibility Services in the Student Life Building, U5, East HUB (located in the Founders North parking lot). Students taking courses on the **downtown Oshawa campus** can visit Student Accessibility Services in the 61 Charles St. Building, 2nd Floor, Room DTA 225 in the Student Life Suite.

Disability-related and accommodation support is available for students with mental health, physical, mobility, sensory, medical, cognitive, or learning challenges. Office hours are 8:30am-4:30pm, Monday to Friday, closed Wednesday's 8:30am – 10:00am. For more information on services provided, you can visit the SAS website at https://studentlife.ontariotechu.ca/services/accessibility/index.php. Students may contact Student Accessibility Services by calling 905-721-3266, or email studentaccessibility@ontariotechu.ca.

When on campus access is allowed, students who require the use of the Test Centre to write tests, midterms, or quizzes MUST register online using the SAS test/exam sign-up module, found here https://disabilityservices.ontariotechu.ca/uoitclockwork/custom/misc/home.aspx. Students must sign up for tests, midterms, or quizzes AT LEAST seven (7) days before the date of the test.

Students must register for final exams by the registration deadline, which is typically two (2) weeks prior to the start of the final examination period. SAS will notify students of the registration deadline date.

5. Academic Integrity

Students and faculty at Ontario Tech University share an important responsibility to maintain the integrity of the teaching and learning relationship. This relationship is characterized by honesty, fairness and mutual respect for the aim and principles of the pursuit of education. Academic misconduct impedes the activities of the university community and is punishable by appropriate disciplinary action.

Students are expected to be familiar with and abide by Ontario Tech University's regulations on Academic Conduct which sets out the kinds of actions that constitute academic misconduct, including plagiarism, copying or allowing one's own work to copied, use of unauthorized aids in examinations and tests, submitting work prepared in collaboration with another student when such collaboration has not been authorized, among other academic offences. The regulations also describe the procedures for dealing with allegations, and the sanctions for any finding of academic misconduct, which can range from a resubmission of work to a failing grade to permanent expulsion from the university. A lack of familiarity with these regulations on academic conduct does not constitute a defense against its application. This information can be found at http://calendar.uoit.ca/content.php?catoid=22&navoid=879#Academic_conduct

Extra support services are available to all Ontario Tech University students in academic development, study skills, counseling, and peer mentorship. More information on student support services can be found at https://studentlife.ontariotechu.ca/services/academic-support/index.php

6. Turnitin

Ontario Tech University and faculty members reserve the right to use electronic means to detect and help prevent plagiarism. Students agree that by taking this course all assignments are subject to submission for textual similarity review by Turnitin.com. Assignments submitted to Turnitin.com will be included as source documents in Turnitin.com's restricted access database solely for the purpose of detecting plagiarism in such documents. The instructor may require students to submit their assignments electronically to Turnitin.com or the instructor may submit questionable text on behalf of a student. The terms that apply to Ontario Tech University's use of the Turnitin.com service are described on the Turnitin.com website.

Students who do not wish to have their work submitted to Turnitin.com must provide with their assignment at the time of submission to the instructor a signed Turnitin.com Assignment Cover sheet:
https://shared.uoit.ca/shared/department/academic-integrity/Forms/assignment-cover-sheet.pdf

6. Online Test and Exam Proctoring (Virtual Proctoring)

Ontario Tech University will conduct virtual monitoring of examinations in accordance with Ontario privacy legislation and all approved policy instruments.

7. Final Examinations

Final examinations are held during the final examination period at the end of the semester and **when on campus access is allowed,** may take place in a different room and on a different day from the regularly scheduled class. Check the published Examination Schedule for a complete list of days and times.

Students are required to show their Student ID card (campus ID) when **in-person examinations are allowed.** Students are advised to obtain their Student ID Card well in advance of the examination period as they will not be able to write their examinations without it. More information on ID cards can be found at https://registrar.ontariotechu.ca/campus-id/index.php.

Students who are unable to write a final examination when scheduled due to religious publications may make arrangements to write a deferred examination. These students are required to submit a Request for Accommodation for Religious Obligations to the Faculty concerned as soon as possible and no later than three weeks prior to the first day of the final examination period.

Further information on final examinations can be found at https://usgc.ontariotechu.ca/policy/policy-library/policies/academic/procedures-for-final-examination-administration.php

8. Freedom of Information and Protection of Privacy Act

The following is an important notice regarding the process for submitting course assignments, quizzes, and other evaluative material in your courses in the Faculty of [Insert Faculty name]

Ontario Tech University is governed by the Freedom of Information and Protection of Privacy Act ("FIPPA"). In addition to providing a mechanism for requesting records held by the university, this legislation also requires that the University not disclose the personal information of its students without their consent.

FIPPA's definition of "personal information" includes, among other things, documents that contain both your name and your Banner (student) ID. For example, this could include graded test papers or assignments. To ensure that your rights to privacy are protected, the Faculty of [Insert Faculty name] encourages you to use only your Banner ID on assignments or test papers being submitted for grading. This policy is intended to prevent the inadvertent disclosure of your information where graded papers are returned to groups of students at the same time. If you still wish to write both your name and your Banner ID on your tests and assignments, please be advised that Ontario Tech University will interpret this as an implied consent to the disclosure of your personal information in the normal course of returning graded materials to students.

If you have any questions or concerns relating to the new policy or the issue of implied consent addressed above, please contact accessandprivacy@ontariotechu.ca

Notice of Collection and Use of Personal Information

Throughout this course, personal information may be collected through the use of certain technologies under the authority of the *University of Ontario Institute of Technology Act, SO 2002, c. 8, Sch. O.* and will be collected, protected, used, disclosed and retained in compliance with Ontario's *Freedom of Information and Protection of Privacy Act R.S.O. 1990, c. F.31.*

This course will use the following technologies that may collect, use, disclose and retain personal information (including images) for the purposes described below: [Instructors should edit this section according to the systems and technologies to be used in this specific course (e.g. If using Proctortrack, remove any reference to Respondus)]

- Respondus Monitor and Proctortrack to maintain academic integrity for examinations;
- Google Meet and Kaltura Virtual Classroom to facilitate remote instruction and interactive learning;
- Peer-shared applications, services or technologies that may be reviewed, assessed, or used as part of coursework.

- Other applications, services, or technologies that support or enhance online learning that include, but are not limited to, the following: [Instructor to list all relevant components].

For more information relating to these technologies, we encourage you to visit: https://tlc.ontariotechu.ca/learning-technology/index.php Questions regarding personal information may be directed to: Ontario Tech University Access and Privacy Office, 2000 Simcoe Street North, Oshawa, ON L1G 0C5, email: accessandprivacy@ontariotechu.ca.

By remaining enrolled in this course, you acknowledge that you have read, understand, and agree to the terms and conditions under which the technology provider(s) may collect, use, disclose and retain your personal information. You agree to the university using the technologies and using your personal information for the purposes described in this course outline.

9. Freedom of Expression

Pursuant to Ontario Tech's Freedom of Expression Policy all students are encouraged to express ideas and perspectives freely and respectfully in university space and in the online university environment, subject to certain limitations. Students are reminded that the limits on Freedom of Expression include speech or behaviour that: is illegal or interferes with the university's legal obligations; defames an individual or group; constitutes a threat, harassment or discrimination; is a breach of fiduciary, contractual, privacy or confidentiality obligations or commitments; and unduly disrupts and interferes with the functioning of the university. In the context of working online, different forms of communication are used. Where permitted, students using "chat" functions or other online forms of communication are encouraged to ensure that their communication complies with the Freedom of Expression Policy.

10. Copyright Notice

All teaching materials provided by the instructor throughout the course, including, but not limited to, in whole or in part, recorded lectures, slides, videos, diagrams, case studies, assignments, quizzes, and examinations are subject to the Copyright Act, R.S.C., 1985, c. C-42. Teaching materials are owned by the faculty member, instructor or other third party who creates such works. The copyright owner(s) reserves all intellectual property rights in and to the teaching materials, including the sole right to copy, reproduce, distribute, and modify the teaching materials. Consistent with the university's Intellectual Property Policy, teaching materials are intended only for the educational use of Ontario Tech University students registered in the course that is the subject of this course outline. Any distribution or publishing of this material (e.g. uploading material to a third-party website) is strictly prohibited under the law unless the student has obtained the copyright owner's prior written consent. Any violation of copyright law or the Intellectual Property Policy, if proven, may be subject to sanction as academic misconduct, and/or under the Student Conduct Policy.

11. Student Course Feedback Surveys

Student evaluation of teaching is a highly valued and helpful mechanism for monitoring the quality of Ontario Tech University's programs and instructional effectiveness. To that end, course evaluations are administered by an external company in an online, anonymous process during the last few weeks of classes. Students are encouraged to participate actively in this process and will be notified of the dates. Notifications about course evaluations will be sent via e-mail, and posted on Canvas, Weekly News, and signage around the campus.

Ontario Tech University
Faculty of Social Sciences

Course Outline
SSCI 1470U
Impact of Science and Technology on Society
Winter 2020

Offering Approval:

Under Revision

Course Description:

In this course, students will engage in analyses of scientific and technological developments from the perspective of broad social impacts. Special attention will be paid to controversial issues currently receiving media attention, but the major emphasis will be on ways of thinking critically about both the remediation of already existing problems (e.g. toxic substance clean-up) and the prevention of future problems (e.g. environmental impact analyses and or economic impact analyses). Canadian examples will be of primary concern, but students will also learn to think about impact globally since large-scale problems do not respect political boundaries.

Major Topics:

Graduate Attributes:

The graduate attributes developed and required by the Canadian Engineering Accreditation Board's Accreditation Criteria and Procedures are listed below, with those covered in the course to some degree (introduced, developed, applied).

Attributes	Covered in this Course
Knowledge base	✕
Problem analysis	✕
Investigation	✕
Design	✕
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	✓

Course Content Breakdown

Math	Basic Science	Complementary Studies	Engineering Science	Engineering Design
0%	0%	100%	0%	0%

Medical Certificates and Deferred Exams:

Medical statements and academic consideration forms for any missed student work worth 25% or less (not including midterms or tests) will be submitted directly to the course instructor. This includes missed quizzes, assignments and labs. Missed Midterms or Coursework Worth More than 25% For any missed midterms or tests, regardless of weight, or coursework worth more than 25%, students will need to submit the UOIT Medical statement or academic consideration form to the Engineering Advising Office following the form guidelines.

Guidelines for Medical Statements: Medical statements cover any missed work due to a medical reasons. The student must:

- see a medical doctor within 24 hours of the missed work
- submit the form to the correct individual within 3 working days

Guidelines for Academic Consideration Forms: Academic consideration forms cover any missed work for non-academic grounds, for example, religious observations, court appearance, personal/family emergency, varsity events. The student must provide supporting documentation if deemed necessary.

Should the medical certificate proven to be invalid due to any kind of action by the student, such student's behaviour will be considered as a major misconduct and respective disciplinary actions will be commenced.

Failure to comply with the above will result in an mark of 0 for the exam.

Students with disabilities may request to be considered for formal academic accommodation in accordance with the Ontario Human Rights Code. Students seeking accommodation must make their requests through the Centre for Students with Disabilities in a timely manner, and provide relevant and recent documentation to verify the effect of their disability and to allow the University to determine appropriate accommodations.

Accommodation decisions will be made in accordance with the Ontario Human Rights Code. Accommodations will be consistent with and supportive of the essential requirements of courses and programs, and provided in a way that respects the dignity of students with disabilities and encourages integration and equality of opportunity. Reasonable academic accommodation may require instructors to exercise creativity and flexibility in responding to the needs of students with disabilities while maintaining academic integrity.

Student Support

Any student who faces challenges securing their food or housing and believes this may affect their performance in the course is urged to contact studentlife@ontariotechu.ca for support. Furthermore, please notify your professor if you are comfortable in doing so. This will enable them to provide any resources and help that they can.

Sexual Violence Support and Education

Ontario Tech is committed to the prevention of sexual violence in all is forms. For any student who has experienced Sexual Violence, Ontario Tech can help. We will make accommodations to cater to the diverse backgrounds, cultures, and identities of students when dealing with individual cases. If you think you have been subjected to or witnessed sexual violence:

- Reach out to a Support Worker, a specially trained individual authorized to receive confidential disclosures about incidents of sexual violence. Support Workers can offer help and resolution options which can include safety plans, accommodations, mental health support, and more. To make an appointment with a Support Worker, call 905.721.3392 or email studentlife@ontariotechu.ca
- Learn more about your options at: https://studentlife.ontariotechu.ca/sexualviolence/

Students with Disabilities

Accommodating students with disabilities at Ontario Tech is a responsibility shared among various partners: the students themselves, SAS staff and faculty members. To ensure that disability-related concerns are properly addressed during this course, students with documented disabilities and who may require assistance to participate in this class are encouraged to speak with me as soon as possible. Students who suspect they have a disability that may affect their participation in this course are advised to go to Student Accessibility Services (SAS) as soon as possible. Maintaining communication and working collaboratively with SAS and faculty members will ensure you have the greatest chance of academic success.

Students taking courses on north Oshawa campus can visit Student Accessibility Services in the Student Life Building, U5, East HUB (located in the Founders North parking lot). Students taking courses on the downtown Oshawa campus can visit Student Accessibility Services in the 61 Charles St. Building, 2nd Floor, Room DTA 225 in the Student Life Suite.

Disability-related and accommodation support is available for students with mental health, physical, mobility, sensory, medical, cognitive, or learning challenges. Office hours are 8:30am-4:30pm, Monday to Friday, closed Wednesday's 8:30am – 10:00am. For more information on services provided, you can visit the SAS website at https://studentlife.ontariotechu.ca/services/accessibility/index.php. Students may contact Student Accessibility Services by calling 905-721-3266, or email studentaccessibility@ontariotechu.ca.

Students who require the use of the Test Centre to write tests, midterms, or quizzes MUST register online using the SAS test/exam sign-up module, found here https://disabilityservices.ontariotechu.ca/uoitclockwork/custom/misc/home.aspx. Students must sign up for tests, midterms, or quizzes AT LEAST seven (7) days before the date of the test.

Students must register for final exams by the registration deadline, which is typically two (2) weeks prior to the start of the final examination period. SAS will notify students of the registration deadline date.

Professional Conduct

All students who are enrolled in engineering programs must demonstrate behaviour appropriate to practice in engineering profession. Where Faculty dean determines that behaviour inconsistent with the norms and expectations of the profession has been exhibited by a student, that student may be immediately withdrawn from the program by the dean or subject to one or more of the sanctions described in the professional suitability policy: http://calendar.uoit.ca/content.php?catoid=22&navoid=879#Academic_conduct

A student demonstrating professional unsuitability may be immediately suspended from any practicum, field work or similar activity at the discretion of the dean pending a final decision.

Academic Integrity

Students and faculty at Ontario Tech University share an important responsibility to maintain the integrity of the teaching and learning relationship. This relationship is characterized by honesty, fairness and mutual respect for the aim and principles of the pursuit of education. Academic misconduct impedes the activities of the university community and is punishable by appropriate disciplinary action.

Students are expected to be familiar with and abide by Ontario Tech University's regulations on Academic Conduct which sets out the kinds of actions that constitute academic misconduct, including plagiarism, copying or allowing one's own work to copied, use of unauthorized aids in examinations and tests, submitting work prepared in collaboration with another student when such collaboration has not been authorized, among other academic offences. The regulations also describe the procedures for dealing with allegations, and the sanctions for any finding of academic misconduct, which can range from a resubmission of work to a failing grade to permanent expulsion from the university. A lack of familiarity with these regulations on academic conduct does not constitute a defense against its application. This information can be found at http://calendar.uoit.ca/content.php?catoid=22&navoid=879#Academic_conduct

Extra support services are available to all Ontario Tech University students in academic development, study skills, counseling, and peer mentorship. More information on student support services can be found at https://studentlife.ontariotechu.ca/services/academic-support/index.php

Turnitin

Ontario Tech University and faculty members reserve the right to use electronic means to detect and help prevent plagiarism. Students agree that by taking this course all assignments are subject to submission for textual similarity review by Turnitin.com. Assignments submitted to Turnitin.com will be included as source documents in Turnitin.com's restricted access database solely for the purpose of detecting plagiarism in such documents. The instructor may require students to submit their assignments electronically to Turnitin.com or the instructor may submit questionable text on behalf of a student. The terms that apply to Ontario Tech University's use of the Turnitin.com service are described on the Turnitin.com website.

Students who do not wish to have their work submitted to Turnitin.com must provide with their assignment at the time of submission to the instructor a signed Turnitin.com Assignment Cover sheet:

https://shared.uoit.ca/shared/department/academic-integrity/Forms/assignment-cover-sheet.pdf

Online Test and Exam Proctoring (Virtual Proctoring)

To maintain academic integrity in online testing, your instructor may require the use of Respondus LockDown Browser and Respondus Monitor or a similar virtual proctoring platform. In doing so, you will be required to use a computer with a webcam (either built-in or USB plug in). Please advise your instructor as soon as possible if you do not have a computer with a camera.

This is a link to a short video that explains the basics of Respondus LockDown Browser.

Final Examinations (if applicable)

Final examinations are held during the final examination period at the end of the semester and may take place in a different room and on a different day from the regularly scheduled class. Check the published Examination Schedule for a complete list of days and times.

Students are advised to obtain their Student ID Card well in advance of the examination period as they will not be able to write their examinations without it. Cards are available from the Campus ID office in the Campus Recreation and Wellness Centre, Room G1004.

Students who are unable to write a final examination when scheduled due to religious publications may make arrangements to write a deferred examination. These students are required to submit a Request for Accommodation for Religious Obligations to the Faculty concerned as soon as possible and no later than three weeks prior to the first day of the final examination period.

Further information on final examinations can be found at https://usgc.ontariotechu.ca/policy/policy-library/policies/academic/procedures-for-final-examination-administration.php

Freedom of Information and Protection of Privacy Act

The following is an important notice regarding the process for submitting course assignments, quizzes, and other evaluative material in your courses in the Faculty of Engineering and Applied Science.

Ontario Tech University is governed by the Freedom of Information and Protection of Privacy Act ("FIPPA"). In addition to providing a mechanism for requesting records held by the university, this legislation also requires that the University not disclose the personal information of its students without their consent.

FIPPA's definition of "personal information" includes, among other things, documents that contain both your name and your Banner (student) ID. For example, this could include graded test papers or assignments. To ensure that your rights to privacy are protected, the Faculty of [Insert Faculty name] encourages you to use only your Banner ID on assignments or test papers being submitted for grading. This policy is intended to prevent the inadvertent disclosure of your information where graded papers are returned to groups of students at the same time. If you still wish to write both your name and your Banner ID on your tests and assignments, please be advised that Ontario Tech University will interpret this as an implied consent to the disclosure of your personal information in the normal course of returning graded materials to students.

If you have any questions or concerns relating to the new policy or the issue of implied consent addressed above, please contact accessandprivacy@ontariotechu.ca

Student Course Feedback Surveys

Student evaluation of teaching is a highly valued and helpful mechanism for monitoring the quality of Ontario Tech University's programs and instructional effectiveness. To that end, course evaluations are administered by an external company in an online, anonymous process during the last few weeks of classes. Students are encouraged to participate actively in this process and will be notified of the dates. Notifications about course evaluations will be sent via e-mail, and posted on Canvas, Weekly News, and signage around the campus.

The Accessibility for Ontarians with Disabilities Act (AODA) standards have been considered in the development of this model course outline and it adheres to the principles outlined in the University's Accessibility Policy.

Ontario Tech University
Faculty of Engineering and Applied Science
Department of Mechanical and Manufacturing Engineering-MME

Course Outline
MANE 2220U
Structure and Properties of Materials
Fall 2021

Offering Approval:

Under Revision

Course Description:

Atomic structure and atomic bonding in solids, structure of crystalline solids, solidification and defects, alloys and phase diagrams, mechanical properties of metals and alloys, semiconductors, organics, polymers, crystalline ceramics, glass and fibre optics, composites, biomaterials, magnetic materials.

Major Topics:

- Introduction: Metals, plastics, ceramics, composites And advanced materials
- Structure of Crystalline Solids, Metals
- Structure of Crystalline Solids, Ceramics
- Polymer structures
- Imperfections in Solids, Ceramics & Polymers
- Diffusion in Solids
- Mechanical Properties of Materials
- Dislocations & Strengthening Mechanisms
- Recovery, Re-crystallization, Grain Growth
- Characteristics, Processing and Application of Ceramics, and Polymers
- Phase Diagrams
- Phase Transformations in Metals
- Composite Materials and Their Properties

Graduate Attributes:

The graduate attributes developed and required by the Canadian Engineering Accreditation Board's Accreditation Criteria and Procedures are listed below, with those covered in the course to some degree (introduced, developed, applied).

Attributes	Covered in this Course
Knowledge base	✓
Problem analysis	✓
Investigation	✗
Design	✗
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	✓

Course Content Breakdown

Math	Basic Science	Complementary Studies	Engineering Science	Engineering Design
0%	75%	0%	25%	0%

Course Outcomes:

This course will help you to:

- Understand structures and properties of materials and thereby assess their proper usage.
- Develop an understanding about the relationship between structure and properties and how the structures are affected by the processes that the materials are subjected to.

Instructors

Instructor:	Email:	Office:	Phone:	Office Hours:
Prof. Ghaus Rizvi, PhD	ghaus.rizvi@ontariotechu.ca	ACE 3021	(905) 721 8668 x 5745	Wednesdays: 3:30 – 5:00 pm

Instructor:	Email:	Office:	Phone:	Office Hours:
Dr. Naglaa ElAgamy	Naglaa.Elagamy@uoit.ca	ACE 3023		Fridays: 12 - 2 pm

Required Course Text and Other Materials:

- Materials Science and Engineering: An Introduction, 10th Edition, By: William D. Callister, Jr. and David G. Rethwisch, Wiley

Reference Books and Information Sources:

- Foundations of Materials Science and Engineering, 5th edition, By: W. F. Smith & J. Hashemi, McGraw Hill (2010)
- Engineering Materials: Properties and Selection, 9th edition, By: K. G. Budinski, & M. K. Budinski, Prentice Hall (2010)

- Materials Science for Engineers, 8th edition, By: J. F. Shackelford, Pearson Prentice Hall (2012)

Course Organization and Delivery Mode:

Three lecture hours (2 x 80 minutes) per week for one semester.

Scheduled Regular Class Meeting Times:

See mycampus

Final Grade Breakdown:

Quizzes	10%
Master Quiz	5%
Assignments	15%
Discussion	5%
Labs	20%
Midterm Exam	20%
Final Exam	25%

Midterms

Midterm Date:	Midterm Location:
Thursday, September 24, 2020 - 08:30 to 12:00	Date and Time -tentative

Assignments:

11 assignments x 1.5 marks. Mark of one assignment with lowest score will not be counted.

Laboratories, Prelab Reports, Notes and Reports

Lab Description:

1. A total of five labs scheduled bi-weekly

Prelab Reports, Notes and Reports:

- Of the five labs, three will be in person (Lab 1, 3 and 4) and two will be online (Lab 2 and 5).
- For in person labs, only one student from each group will attend the lab.
- The students are advised to form groups of 4 within their lab section asap but not later than Sept 11.
- Those students who are not able to form groups will be assigned groups by the lab instructor/TA.

Tutorials:

Example problems will be solved by the TA during the tutorial sessions. Note that not all tutorial materials will be posted on Canvas, so online attendance is STRONGLY encouraged.

Computer Experience:

Partial lecture slides will be posted on course websites. Discussion board will be setup to discuss course related problems. Online Quizzes and videos will be used to reinforce the lecture.

Detailed Course Content:

Week		Topics covered	Chapter
Wk 1	Sept 9	Introduction: to engineering and advanced materials	1
Wk 1	Sept 11	Atomic Structure and Interatomic Bonding	2, 3
Wk 2	Sept 16	Structure of Crystalline Solids	3
Wk 2	Sept 18	Imperfections in Solids	4
Wk 3	Sept 23	Imperfections in Solids	4
Wk 3	Sept 25	Diffusion in Solids	5
Wk 4	Sept 30	Diffusion in Solids	5
Wk 4	Oct 2	Diffusion in Solids, Mechanical Properties of Materials	5,6
Wk 5	Oct 7	Mechanical Properties of Materials	6
Wk 5	Oct 9	Mechanical Properties of Materials	6
Oct 12	Oct 16	**Reading week**	
Wk 6	Oct 21	Dislocations & Strengthening Mechanisms	7
Wk 6	Oct 23	Dislocations & Strengthening Mechanisms	7
Midterm	**Oct 24**	**Midterm Exam - Saturday. (Tentative)**	
Wk 7	Oct 28	Phase Diagrams	9
Wk 7	Oct 30	Phase Diagrams	9

Wk 8	Nov 4	Metallic Alloys	11
Wk 8	Nov 6	Applications and Processing of Metallic alloys	11
Wk 9	Nov 11	Structure of Properties of Ceramics	12
Wk 9	Nov 13	Applications and Processing of Ceramics	12, 13
Wk 10	Nov 18	Polymer Structures	14
Wk 10	Nov 20	Characteristics of Polymers	15,
Wk 11	Nov 25	Characteristics, Processing and Application of Polymers	15
Wk 11	Nov 27	Composites	16
Wk 12	Dec 2	Composites	16
Wk 12	Dec 4	Review	
Dec 9		Master Quiz at 12 noon	

Other Course Information:

Tips for Success

- Attend class.
- Check Canvas regularly for announcements, postings, and deadlines.
- Keep up with the readings.
- The PowerPoint lecture slides cannot be considered as a comprehensive replacement for the material covered in the textbook; hence, the students are advised to review the text book as well as other academic resources to broaden their knowledge.
- The lecture slides only provide a condensed summary of the course material, whereas the textbook provides more comprehensive understanding of the material.
- Don’t hesitate to ask questions.

Medical Certificates and Deferred Exams:

Medical statements and academic consideration forms for any missed student work worth 25% or less (not including midterms or tests) will be submitted directly to the course instructor. This includes missed quizzes, assignments and labs. Missed Midterms or Coursework Worth More than 25% For any missed midterms or tests, regardless of weight, or coursework worth more than 25%, students will need to submit the UOIT Medical statement or academic consideration form to the Engineering Advising Office following the form guidelines.

Guidelines for Medical Statements: Medical statements cover any missed work due to a medical reasons. The student must:

- see a medical doctor within 24 hours of the missed work
- submit the form to the correct individual within 3 working days

Guidelines for Academic Consideration Forms: Academic consideration forms cover any missed work for non-academic grounds, for example, religious observations, court appearance, personal/family emergency, varsity events. The student must provide supporting documentation if deemed necessary.

Should the medical certificate proven to be invalid due to any kind of action by the student, such student's behaviour will be considered as a major misconduct and respective disciplinary actions will be commenced.

Failure to comply with the above will result in an mark of 0 for the exam.

Students with disabilities may request to be considered for formal academic accommodation in accordance with the Ontario Human Rights Code. Students seeking accommodation must make their requests through the Centre for Students with Disabilities in a timely manner, and provide relevant and recent documentation to verify the effect of their disability and to allow the University to determine appropriate accommodations.

Accommodation decisions will be made in accordance with the Ontario Human Rights Code. Accommodations will be consistent with and supportive of the essential requirements of courses and programs, and provided in a way that respects the dignity of students with disabilities and encourages integration and equality of opportunity. Reasonable academic accommodation may require instructors to exercise creativity and flexibility in responding to the needs of students with disabilities while maintaining academic integrity.

Student Support

Any student who faces challenges securing their food or housing and believes this may affect their performance in the course is urged to contact studentlife@ontariotechu.ca for support. Furthermore, please notify your professor if you are comfortable in doing so. This will enable them to provide any resources and help that they can.

Sexual Violence Support and Education

Ontario Tech is committed to the prevention of sexual violence in all is forms. For any student who has experienced Sexual Violence, Ontario Tech can help. We will make accommodations to cater to the diverse backgrounds, cultures, and identities of students when dealing with individual cases. If you think you have been subjected to or witnessed sexual violence:

- Reach out to a Support Worker, a specially trained individual authorized to receive confidential disclosures about incidents of sexual violence. Support Workers can offer help and resolution options which can include safety plans, accommodations, mental health support, and more. To make an appointment with a Support Worker, call 905.721.3392 or email studentlife@ontariotechu.ca
- Learn more about your options at: https://studentlife.ontariotechu.ca/sexualviolence/

Students with Disabilities

Accommodating students with disabilities at Ontario Tech is a responsibility shared among various partners: the students themselves, SAS staff and faculty members. To ensure that disability-related concerns are properly addressed during this course, students with documented disabilities and who may require assistance to participate in this class are encouraged to speak with me as soon as possible. Students who

suspect they have a disability that may affect their participation in this course are advised to go to Student Accessibility Services (SAS) as soon as possible. Maintaining communication and working collaboratively with SAS and faculty members will ensure you have the greatest chance of academic success.

Students taking courses on north Oshawa campus can visit Student Accessibility Services in the Student Life Building, U5, East HUB (located in the Founders North parking lot). Students taking courses on the downtown Oshawa campus can visit Student Accessibility Services in the 61 Charles St. Building, 2nd Floor, Room DTA 225 in the Student Life Suite.

Disability-related and accommodation support is available for students with mental health, physical, mobility, sensory, medical, cognitive, or learning challenges. Office hours are 8:30am-4:30pm, Monday to Friday, closed Wednesday's 8:30am – 10:00am. For more information on services provided, you can visit the SAS website at https://studentlife.ontariotechu.ca/services/accessibility/index.php. Students may contact Student Accessibility Services by calling 905-721-3266, or email studentaccessibility@ontariotechu.ca.

Students who require the use of the Test Centre to write tests, midterms, or quizzes MUST register online using the SAS test/exam sign-up module, found here https://disabilityservices.ontariotechu.ca/uoitclockwork/custom/misc/home.aspx. Students must sign up for tests, midterms, or quizzes AT LEAST seven (7) days before the date of the test.

Students must register for final exams by the registration deadline, which is typically two (2) weeks prior to the start of the final examination period. SAS will notify students of the registration deadline date.

Professional Conduct

All students who are enrolled in engineering programs must demonstrate behaviour appropriate to practice in engineering profession. Where Faculty dean determines that behaviour inconsistent with the norms and expectations of the profession has been exhibited by a student, that student may be immediately withdrawn from the program by the dean or subject to one or more of the sanctions described in the professional suitability policy: http://calendar.uoit.ca/content.php?catoid=22&navoid=879#Academic_conduct

A student demonstrating professional unsuitability may be immediately suspended from any practicum, field work or similar activity at the discretion of the dean pending a final decision.

Academic Integrity

Students and faculty at Ontario Tech University share an important responsibility to maintain the integrity of the teaching and learning relationship. This relationship is characterized by honesty, fairness and mutual respect for the aim and principles of the pursuit of education. Academic misconduct impedes the activities of the university community and is punishable by appropriate disciplinary action.

Students are expected to be familiar with and abide by Ontario Tech University's regulations on Academic Conduct which sets out the kinds of actions that constitute academic misconduct, including plagiarism, copying or allowing one's own work to copied, use of unauthorized aids in examinations and tests, submitting work prepared in collaboration with another student when such collaboration has not been authorized, among other academic offences. The regulations also describe the procedures for dealing with allegations, and the sanctions for any finding of academic misconduct, which can range from a resubmission of work to a failing grade to permanent expulsion from the university. A lack of familiarity with these regulations on academic conduct does not constitute a defense against its application. This information can be found at http://calendar.uoit.ca/content.php?catoid=22&navoid=879#Academic_conduct

Extra support services are available to all Ontario Tech University students in academic development, study skills, counseling, and peer mentorship. More information on student support services can be found at https://studentlife.ontariotechu.ca/services/academic-support/index.php

Turnitin

Ontario Tech University and faculty members reserve the right to use electronic means to detect and help prevent plagiarism. Students agree that by taking this course all assignments are subject to submission for textual similarity review by Turnitin.com. Assignments submitted to Turnitin.com will be included as source documents in Turnitin.com's restricted access database solely for the purpose of detecting plagiarism in such documents. The instructor may require students to submit their assignments electronically to Turnitin.com or the instructor may submit questionable text on behalf of a student. The terms that apply to Ontario Tech University's use of the Turnitin.com service are described on the Turnitin.com website.

Students who do not wish to have their work submitted to Turnitin.com must provide with their assignment at the time of submission to the instructor a signed Turnitin.com Assignment Cover sheet:

https://shared.uoit.ca/shared/department/academic-integrity/Forms/assignment-cover-sheet.pdf

Online Test and Exam Proctoring (Virtual Proctoring)

To maintain academic integrity in online testing, your instructor may require the use of Respondus LockDown Browser and Respondus Monitor or a similar virtual proctoring platform. In doing so, you will be required to use a computer with a webcam (either built-in or USB plug in). Please advise your instructor as soon as possible if you do not have a computer with a camera.

This is a link to a short video that explains the basics of Respondus LockDown Browser.

Final Examinations (if applicable)

Final examinations are held during the final examination period at the end of the semester and may take place in a different room and on a different day from the regularly scheduled class. Check the published Examination Schedule for a complete list of days and times.

Students are advised to obtain their Student ID Card well in advance of the examination period as they will not be able to write their examinations without it. Cards are available from the Campus ID office in the Campus Recreation and Wellness Centre, Room G1004.

Students who are unable to write a final examination when scheduled due to religious publications may make arrangements to write a deferred examination. These students are required to submit a Request for Accommodation for Religious Obligations to the Faculty concerned as soon as possible and no later than three weeks prior to the first day of the final examination period.

Further information on final examinations can be found at https://usgc.ontariotechu.ca/policy/policy-library/policies/academic/procedures-for-final-examination-administration.php

Freedom of Information and Protection of Privacy Act

The following is an important notice regarding the process for submitting course assignments, quizzes, and other evaluative material in your courses in the Faculty of Engineering and Applied Science.

Ontario Tech University is governed by the Freedom of Information and Protection of Privacy Act ("FIPPA"). In addition to providing a mechanism for requesting records held by the university, this legislation also requires that the University not disclose the personal information of its students without their consent.

FIPPA's definition of "personal information" includes, among other things, documents that contain both your name and your Banner (student) ID. For example, this could include graded test papers or assignments. To ensure that your rights to privacy are protected, the Faculty of [Insert Faculty name] encourages you to use only your Banner ID on assignments or test papers being submitted for grading. This policy is intended to prevent the inadvertent disclosure of your information where graded papers are returned to groups of students at the same time. If you still wish to write both your name and your Banner ID on your tests and assignments, please be advised that Ontario Tech University will interpret this as an implied consent to the disclosure of your personal information in the normal course of returning graded materials to students.

If you have any questions or concerns relating to the new policy or the issue of implied consent addressed above, please contact accessandprivacy@ontariotechu.ca

Student Course Feedback Surveys

Student evaluation of teaching is a highly valued and helpful mechanism for monitoring the quality of Ontario Tech University's programs and instructional effectiveness. To that end, course evaluations are administered by an external company in an online, anonymous process during the last few weeks of classes. Students are encouraged to participate actively in this process and will be notified of the dates. Notifications about course evaluations will be sent via e-mail, and posted on Canvas, Weekly News, and signage around the campus.

The Accessibility for Ontarians with Disabilities Act (AODA) standards have been considered in the development of this model course outline and it adheres to the principles outlined in the University's Accessibility Policy.

Notice of Collection and Use of Personal Information

Throughout this course, personal information may be collected through the use of certain technologies under the authority of the *University of Ontario Institute of Technology Act, SO 2002, c. 8, Sch. O.* and will be collected, protected, used, disclosed and retained in compliance with Ontario's *Freedom of Information and Protection of Privacy Act R.S.O. 1990, c. F.31.*

This course may use the following technologies that may collect, use, disclose and retain personal information (including images) for the purposes described below:

- Respondus Monitor and Proctortrack to maintain academic integrity for examinations.
- Google Meet and Kaltura Virtual Classroom to facilitate remote instruction and interactive learning.
- Peer-shared applications, services or technologies that may be reviewed, assessed, or used as part of coursework.
- Other applications, services, or technologies that support or enhance online learning.

For more information relating to these technologies, we encourage you to visit: https://tlc.ontariotechu.ca/learning-technology/index.php Questions regarding personal information may be directed to: Ontario Tech University Access and Privacy Office, 2000 Simcoe Street North, Oshawa, ON L1G 0C5, email: accessandprivacy@ontariotechu.ca.

By remaining enrolled in this course, you acknowledge that you have read, understand and agree to the terms and conditions under which the technology provider(s) may collect, use, disclose and retain your personal information. You agree to the university using the technologies and using your personal information for the purposes described in this course outline.

Technology Requirements

To support online learning, the university recommends certain technology requirements for laptops, software and internet connectivity which are available at: https://itsc.ontariotechu.ca/remote-learning.php.

Students experiencing technical difficulties such that they are unable to meet the technology requirements may contact the IT Service Help Desk at: servicedesk@dc-uoit.ca

Students experiencing financial difficulties such that they are unable to meet the technology requirements may contact Student Awards and Financial Aid Office at: connect@ontariotehu.ca

By remaining enrolled in this course, you acknowledge that you have read, understand and agree to observe the Recommended Technology Requirements for accessing university online learning resources, including those minimum requirements that are specific to your faculty and program.

Virtual Monitoring of Examinations

Ontario Tech University will conduct virtual monitoring of examinations in accordance with Ontario privacy legislation and all approved policy instruments.

Sensitive/Offensive Subject Matter

The classroom (both physical and virtual) is intended to provide a safe, open space for the critical and civil exchange of ideas and opinions. Some articles, media and other course materials may contain sensitive content that is offensive and/or disturbing. The Course Instructor will try to identify such material and communicate warnings[MG1] to students in advance of the distribution and use of such materials, affording students the choice to either emotionally prepare for, or not to view or interact with, the content.

Freedom of Expression

Pursuant to Ontario Tech's Freedom of Expression Policy all students are encouraged to express ideas and perspectives freely and respectfully in university space and in the online university environment, subject to certain limitations. Students are reminded that the limits on Freedom of Expression include speech or behaviour that: is illegal or interferes with the university's legal obligations; defames an individual or group; constitutes a threat, harassment or discrimination; is a breach of fiduciary, contractual, privacy or confidentiality obligations or commitments; and unduly disrupts and interferes with the functioning of the university. In the context of working online, different forms of communication are used. Where permitted, students using "chat" functions or other online forms of communication are encouraged to ensure that their communication complies with the Freedom of Expression Policy.

University Response to COVID-19

The government response to the COVID-19 pandemic is continually evolving. As new information becomes available from federal and provincial public health authorities, the Province of Ontario and the Regional Municipality of Durham, Ontario Tech University will remain nimble and prepared to respond to government orders, directives, guidelines and changes in legislation to ensure the health and safety of all members of its campus community. In accordance with public health recommendations, the university may need to adjust the delivery of course instruction and the availability and delivery mode of campus services and co-curricular opportunities. Ontario Tech University appreciates the understanding and flexibility of our students, faculty and staff as we continue to navigate the pandemic and work together to demonstrate our strong commitment to academic, research and service excellence during these challenging and unprecedented times.

Faculty of Science
MATH2860: Differential Equations for Engineers
Course outline for Fall 2020

1. Course Details & Important Dates*

Term	CRN	Course Type	Day	Time	Location
Fall	40346	LEC	Mon Thu	08:10am-9:30 am 08:10am-9:30 am	Online
	40347	LEC	Mon Thu	11:10am-12:30 pm 11:10am-12:30 pm	Online

Classes Start	Classes End	Final Exam Period
08/09/2020	07/12/2020	Dec.9-20

Tutorials for this course shall start the week of Sep. 10th.

* For other important dates go to: https://ontariotechu.ca/>Current Students >Important Dates and Deadlines

2. Instructor Contact Information

Instructor Name	Office	Phone	Email
Azar Shakoori	UA2042	3615	In Canvas, or ONLY IF Canvas is down: azar.shakoori@ontariotechu.net
Office Hours: See the schedules under the Student Hours Schedule.			

Teaching Assistant Names	CRNs
David Babalola:	40350, 40354, 40348, 40349
Camelia Yazdani:	40351, 40352, 40353, 41338,41656

Note: For updated information on tutorial schedule, always, check MyCampus.

Check Canvas under the Student Hours Schedule full office hours schedule and online locations.
All office hours will be hold Online. All students can attend any office hour regardless of what tutorial section they are enrolled in.

3. Course Description

A study of differential equations that arise as models of phenomena in engineering. Topics include first order equations; linear equations; second order equations and their applications; systems of linear equations; series solutions; Laplace transforms; introduction to partial differential equations. 3 cr, 3 lec, 1 tut. Prerequisite: MATH 1020U. Course requisite: MATH 1850U or MATH 2050U. Credit restriction: MATH 2060U.

4. Learning Outcomes

On the successful completion of the course, students will be able to:
Categorize differential equations and based on this select an appropriate method for solving it. Solve first order and higher order ordinary differential equations. Set up, solve and interpret solutions for various associated applications. Solve systems of first order ordinary differential equations. Memorize various definitions and theorems relating to solutions of ordinary differential equations and associated initial value problems, and definitions and theorems relating to systems of first order differential equations. Find separable solutions for partial differential equations.

5. Course Design

Two lectures of 80 minutes each per week, one tutorial of 50 minutes each week. Typed notes are posted in Canvas ahead of lectures, with completed by hand notes uploaded the day after lecture. Help resources are Office Hours for instructor and teaching assistants, workshops offered by the Student Success Centre, practice tests from prior years posted ahead of midterm.

6. Required Texts/Readings

Differential Equations with Boundary Value Problems, D.G Zill and W.S. Wright, Brooks/Cole, 9th edition, 978-1-305-96579-9, Publisher – CENGAGE Learning.

7. Evaluation Method

The course mark will be calculated as follows:

- Assignments: 20%
- Mobius (Maple TA) Weekly Quizzes: 20% (will be available from 8:00PM every Thursday till 8:00am on the following Monday)
- Midterm: 25% (Thu. October 29th in lectures)
- Final Exam: 35% (During Exam Period)
- Lecture Quizzes on Canvas: Bonus 2%

- A bonus 2% will be awarded to those who obtain a grade of 90%or better by the end of Thu Sep. 17th on the Mobius readiness test. There are maximum of 3 attempts for the readiness test and the best attempt counts. Mobius readiness test will not be available after the deadline under any circumstances. Since there are only 3 attempts do not waste your attempts before you prepare yourself for the test! The readiness test opens at 11:00am on Tuesday Sep. 8th and will close at 11:59pm on Thu. Sep. 17th.

Important!

- If you are an upper year student please note that accessing Mobius (Maple T.A.) has changed this year! Please click on the Mobius link on our course homepage on Canvas. No username/password required.
- **You must bring student ID to the Midterms and Final Exam. You must write the midterm in the lecture section that you are officially registered in.** Otherwise there will be 25% deduction in your grade!

Final course grades may be adjusted to conform to program or Faculty grade distribution profiles.

8. Lecture Weeks and Memos

Week	Date	Days: Mon. & Thu.	Lecture	Name of the PDF file	Tutorials
0 (Half Week)	Sep. 8-11 Thu. Lecture only	Thu. Sep. 10	0 Intro.	_____	No Tutorials
1	Sep. 14-18	Sep. 14, Sep.17	1: First Order Equations: Sec.1.1,1.2,1.3,2.1,2.6,	Lec.1_Part1 Lec.1_Part2	Tutorial 1 Calc. & Lin. Alg. Review Grouping
2	Sep. 21-25	Sep. 21, Sep. 24	2: First Order Equations (Cont'd): Sec. 2.2,2.3, 2.4,	Lec. 2_Part1 Lec. 2_Part2	Tutorial 2 Week 1 materials
3	Sep. 28- Oct. 2	Sep. 28, Oct. 1	3: First Order (Cont'd) Linear Models and Modeling with Systems 3.1,3.3 Higher Order Equations: Sec. 4.1	Lec.3_Part1 Lec.3_Part2	Tutorial 3 Week 2 Materials
4	Oct. 5-9	Oct. 5, Oct. 8	4: Higher Order Equations (Cont'd): Sec. 4.2,4.3 4.4,4.6,	Lec.4_Part1 Lec.4_Part2	Tutorial 4 Week 3 Materials
5	Oct. 12-16	Study Week	No Lectures Lecture notes will be update after break	Reading Week	No Tutorials
6	Oct. 19-23	Oct. 19, Oct. 22	Modeling with Higher Order Equations 5.1 (Cont'd): Sec. 5.1	Lec.5_One_part_only Lec.6_Part1	Tutorial 5 Week 4 Materials
7	Oct. 26-30	Oct. 26, Thu. Oct.29	Modeling with Higher Order Equations (Cont'd) Nonlinear models. Mid. (End of 5.1)	Lec.6_Part2 Oct. 29th Midterms	Tutorial 6 Week 6 Materials
8	Nov.2-6	Nov. 2, Nov. 5	Series Solutions Ch. 6	Lec.7_Part1 Lec.7_Part2	Tutorial 7 Week 7Materials
9	Nov. 9-13	Nov. 9, Nov. 12	Ch. 7 : Laplace Transforms	Lec.8_Part1 Lec.8_Part2	Tutorial 8 Week 8 Materials

10	Nov. 16-20	Nov. 16, Nov. 19	Ch. 7 Cont'd	Lec.9_Part1 Lec.9_Part2	Tutorial 9 Week 9 Materials
11	Nov. 23-27	Nov. 23, Nov. 26	Ch. 7 Cont'd	Lec.10_Part1 Lec.10_Part2	Tutorial 10 Week 10 Materials
12	Nov. 30-Dec. 4	Nov. 30, Dec. 3	Ch. 7 Cont'd, Ch. 9	Lec.11_Part1 Lec.11_Part2	Tutorial 11 Week 11 Materials
13	Dec. 3-5 (half week) No Thu. Lecture	Mon. Dec. 7	Ch. 12.1	Lec.12_BVP_in_rectangular	Tutorials Mon. Tues, Wed . All Sections can attend

The above weekly schedule is a tentative one! Should it become necessary I reserve the right to change this schedule accordingly.

9. Weekly (tentative) Outline of Topics in the Course (See Next Page)

Week 0: Thursday class, only (Introduction)
Week1 First Order Equations: Sec.1.1,1.2,1.3,2.1,2.6,
Definition and classification of differential equations;
Modeling using differential equations;
A Numerical Method
Week 2 First Order Equations (Cont'd): Sec. 2.2,2.3, 2.4,3.1,3.3
Solving separable and linear equations
Linear Models;
Solving exact equations;
Modeling with first order equations.
Week 3 Higher Order Equations: Sec. 4.1,4.2,4.3
Linear independence and the Wronskian;
Reduction of order;
Homogeneous equations with constant coefficients (real distinct and repeated roots).
Week 4 Higher Order Equations (Cont'd): Sec. 4.4,4.6
Homogeneous equations with constant coefficients (complex roots);
Variation of Parameters;
Week 5 Reading Week (No lectures or Tutorials)
Week 6 Modeling with Higher Order Equations (free undamped spring motion) 5.1(Midterm covers)
Modeling with Higher Order Equations (Cont'd): Sec. 5.1
Applications (free damped; external force spring motion; forced vibrations; circuits).
Boundary value problems;
Week 7 Modeling with Higher Order Equations (Cont'd), Midterms Oct. 29th
Nonlinear models.
Week 8 Series Solutions Ch. 6
Overview of series solutions; Special Functions (Bessel).
Week 9 Laplace Transforms
Definition of the Laplace transform;
Inverse Transforms and Transforms of Derivatives;
Properties of Laplace transforms. Ch. 7
Week 10 Laplace Transf. (Cont'd)
Properties of Laplace transforms;
Solution of initial value problems. Ch. 7 cont'd
Week 11 Laplace Transf. (Cont'd); Systems of Linear First-Order Eq'ns
Step functions; Discontinuous forcing functions;
Introduction to systems of equations. Ch. 7 cont'd
Week 12 Systems of Linear First-Order Equations (Cont'd)
Homogeneous linear systems with constant coefficients; Complex and repeated eigenvalues. Ch. 9,
Week13: Partial Differential Equations Sec. 12.1
Introduction, terminology, classification; Separation of Variables; Heat Equation

10. Assignments Quizzes and Tests

• Assignments are to be completed individually and will be submitted electronically through Canvas.
The single lowest assignment mark will not count towards the final grade.
Late assignments are not accepted.
• **The Mobius (MapleTA) online quiz** will be completed following each week of lectures (it will be available from 8:00PM each Thursday to 8:am on the following Monday. You will get 3 attempts at each quiz (this is to account for possible technical issues or syntax mistakes, so if you experience an issue, please just re-take the quiz – we will not make changes to scores), and the best attempt will count. The *three* lowest online quizzes will not count towards the final
• **The Final Exam** will test all material covered in the course.

11. Midterm Tests and Final Exam:

The midterm and exam will be conducted online, so you will require your laptop, a strong internet connection, and a webcam. A non-graphing, non-programmable calculator is permitted. The final exam will test all material covered in the course.

12. Missed Work Policy

- If you miss an online quiz or an assignment then you receive a 0 on it. We recognize that times may arise when you are forced to miss a quiz/assignment through no fault of your own, but it is for this very reason that the single lowest assignment mark, the 3 lowest online quizzes. This is extremely generous, so no notes will be accepted for missed quizzes and/or assignments. This policy applies to all students.
- If you miss the Calculus Readiness Test for any reason, then you will no longer be eligible for those bonus marks.
- **Missed Tests:**
- If you miss a midterm due to illness or bereavement, you must submit appropriate documentation (e.g. Academic Consideration form) to the Science Academic Advising office within three working days of missing the midterm. Please include any supporting documentation, if available, with your submission.
- If you are aware in advance that you cannot write a midterm, you must discuss this with the Science Academic Advising office and the instructor of the course at least two working days before you are scheduled to write it. Exceptions to this deadline include varsity athletics, religious observances and test-course conflicts that have different deadlines. Please visit the Faculty of Science academic policy webpage for more information.
- Failure to submit the appropriate documentation and contact the correct instructor by the deadline will result in a zero grade for course work.For further policies and information relating to the Faculty of Science and this course, please refer to https://science.ontariotechu.ca/undergraduate/academic-advising/academic-policies.php (copy and paste into your browser)

You can also find the answers to many frequently asked advising questions by referring to https://science.ontariotechu.ca/undergraduate/academic-advising/faqs/index.php (copy and paste into your browser)

13. Final Exam Views:

- NOTE: We do not release final exam grades to students; if you would like to view your exam/find out your exam grade, you will need to do an exam view. Once grades are released on mycampus, if you want to view your final exam/find out your exam grade, you need to **complete the Exam View Request Form for MATH2860 that's available here (copy and paste the link) ->**https://forms.gle/NiXPm4vJt3fJLUbK8; you'll need to login with your @ontariotechu.net account to access the form. The form will become available once grades are released on mycampus.
- **Notes regarding exam views:**
  The above form is the only way to request an exam view for this course; e-mail requests are not acceptable.
- As per the University policy, you have 5 business days from the day that marks are released to submit the exam view request form. **Late requests will not be accepted.** Once you complete the exam view request form, it will provide you with a link to register for an exam view appointment timeslot. Missed appointments will not be rescheduled. If you have a course conflict with all of the appointment times, please e-mail your professor in Canvas with a copy of your course schedule from mycampus; only Ontario Tech course conflicts will be accommodated.
- Unless there is a clerical mistake, instructors cannot change marks as a result of an exam view

- **Final Exam Grades:**
  We do not release final exam grades to students; if you would like to view your exam/find out your exam grade, you will need to do an exam view.

14. Technology Requirements

To support online learning, the university recommends certain technology requirements for laptops, software and internet connectivity which are available at: https://itsc.ontariotechu.ca/remote-learning.php.

Students experiencing technical difficulties such that they are unable to meet the technology requirements may contact the IT Service Help Desk at: servicedesk@dc-uoit.ca
Students experiencing financial difficulties such that they are unable to meet the technology requirements may contact Student Awards and Financial Aid Office at: connect@ontariotehu.ca

By remaining enrolled in this course, you acknowledge that you have read, understand and agree to observe the Recommended Technology Requirements for accessing university online learning resources, including those minimum requirements that are specific to your faculty and program.

15. Sensitive/Offensive Subject Matter

The classroom (both physical and virtual) is intended to provide a safe, open space for the critical and civil exchange of ideas and opinions. Some articles, media and other course materials may contain sensitive content that is offensive and/or disturbing. The Course Instructor will try to identify such material and communicate warnings to students in advance of the distribution and use of such materials, affording students the choice to either emotionally prepare for, or not to view or interact with, the content.

16. Student Support

Any student who faces challenges securing their food or housing and believes this may affect their performance in the course is urged to contact studentlife@ontariotechu.ca for support. Furthermore, please notify your professor if you are comfortable in doing so. This will enable them to provide any resources and help that they can.

17. Sexual Violence Support and Education

Ontario Tech is committed to the prevention of sexual violence in all its forms. For any student who has experienced Sexual Violence, Ontario Tech can help. Ontario Tech will make accommodations to cater to the diverse backgrounds, cultures, and identities of students when dealing with individual cases.

If you think you have been subjected to or witnessed sexual violence:

- Reach out to a Support Worker, a specially trained individual authorized to receive confidential disclosures about incidents of sexual violence. Support Workers can offer help and resolution options which can include safety plans, accommodations, mental health support, and more. To make an appointment with a Support Worker, call 905.721.3392 or email studentlife@ontariotechu.ca
- Learn more about your options at: https://studentlifeontariotechu.ca/sexualviolence

18. Students with Disabilities

Accommodating students with disabilities at Ontario Tech is a responsibility shared among various partners: the students themselves, SAS staff and faculty members. To ensure that disability-related concerns are properly addressed during this course, students with documented disabilities and who may require assistance to participate in this class are encouraged to speak with me as soon as possible. **Students who suspect they have a disability that may affect their participation in this course are advised to go to Student Accessibility Services (SAS) as soon as possible.** Maintaining communication and working collaboratively with SAS and faculty members will ensure you have the greatest chance of academic success.

When on campus access is allowed, students taking courses on north Oshawa campus can visit Student Accessibility Services in the Student Life Building, U5, East HUB (located in the Founders North parking lot). Students taking courses on the **downtown Oshawa campus** can visit Student Accessibility Services in the 61 Charles St. Building, 2nd Floor, Room DTA 225 in the Student Life Suite.

Disability-related and accommodation support is available for students with mental health, physical, mobility, sensory, medical, cognitive, or learning challenges. Office hours are 8:30am-4:30pm, Monday to Friday, closed Wednesday's 8:30am – 10:00am. For more information on services provided, you can visit the SAS website at https://studentlife.ontariotechu.ca/services/accessibility/index.php. Students may contact Student Accessibility Services by calling 905-721-3266, or email studentaccessibility@ontariotechu.ca.

19. When on campus access is allowed, students who require the use of the Test Centre to write tests, midterms, or quizzes MUST register online using the SAS test/exam sign-up module, found here https://disabilityservices.ontariotechu.ca/uoitclockwork/custom/misc/home.aspx. Students must sign up for tests, midterms, or quizzes AT LEAST seven (7) days before the date of the test.

Students must register for final exams by the registration deadline, which is typically two (2) weeks prior to the start of the final examination period. SAS will notify students of the registration deadline date.

20. Professional Conduct

Additional information on professional suitability can be found at http://calendar.uoit.ca/content.php?catoid=22&navoid=879#Academic_conduct

21. Academic Integrity

Students and faculty at Ontario Tech University share an important responsibility to maintain the integrity of the teaching and learning relationship. This relationship is characterized by honesty, fairness and mutual respect for the aim and principles of the pursuit of education. Academic misconduct impedes the activities of the university community and is punishable by appropriate disciplinary action.

Students are expected to be familiar with and abide by Ontario Tech University's regulations on Academic Conduct which sets out the kinds of actions that constitute academic misconduct, including plagiarism, copying or allowing one's own work to copied, use of unauthorized aids in examinations and tests, submitting work prepared in collaboration with another student when such collaboration has not been authorized, among other academic offences. The regulations also describe the procedures for dealing with allegations, and the sanctions for any finding of academic misconduct, which can range from a resubmission of work to a failing grade to permanent expulsion from the university. A lack of familiarity with these regulations on academic conduct does not constitute a defense against its application. This information can be found at http://calendar.uoit.ca/content.php?catoid=22&navoid=879#Academic_conduct

Extra support services are available to all Ontario Tech University students in academic development, study skills, counseling, and peer mentorship. More information on student support services can be found at https://studentlife.uoit.ca/services/academic-support/index.php

22. Online Test and Exam Proctoring (Virtual Proctoring)

Ontario Tech University will conduct virtual monitoring of examinations in accordance with Ontario privacy legislation and all approved policy instruments. Your instructor may require the use of Respondus LockDown Browser and Respondus Monitor or a similar virtual proctoring platform. In doing so, you will be required to use a computer with a webcam (either built-in or USB plug in).

23. Final Examinations

Final examinations are held during the final examination period at the end of the semester and **when on campus access is allowed,** may take place in a different room and on a different day from the regularly scheduled class. Check the published Examination Schedule for a complete list of days and times.

In the case of exams being conducted virtually, they will require online submission, so you will require internet access.

Students are required to show their Student ID card (campus ID) when **in-person examinations are allowed.** Students are advised to obtain their Student ID Card well in advance of the examination period as they will not be able to write their examinations without it. More information on ID cards can be found at https://registrar.ontariotechu.ca/campus-id/index.php.

Students who are unable to write a final examination when scheduled due to religious obligations may make arrangements to write a deferred examination. These students are required to submit a Request for Accommodation for Religious Obligations to the Faculty concerned as soon as possible and no later than three weeks prior to the first day of the final examination period.

Further information on final examinations can be found at https://usgc.ontariotechu.ca/policy/policy-library/policies/academic/procedures-for-final-examination-administration.php

24. Freedom of Information and Protection of Privacy Act

The following is an important notice regarding the process for submitting course assignments, quizzes, and other evaluative material in your courses in the Faculty of Science.

Ontario Tech University is governed by the Freedom of Information and Protection of Privacy Act (“FIPPA”). In addition to providing a mechanism for requesting records

held by the university, this legislation also requires that the University not disclose the personal information of its students without their consent.

FIPPA's definition of "personal information" includes, among other things, documents that contain both your name and your Banner (student) ID. For example, this could include graded test papers or assignments. To ensure that your rights to privacy are protected, the Faculty of [Insert Faculty name] encourages you to use only your Banner ID on assignments or test papers being submitted for grading. This policy is intended to prevent the inadvertent disclosure of your information where graded papers are returned to groups of students at the same time. If you still wish to write both your name and your Banner ID on your tests and assignments, please be advised that Ontario Tech University will interpret this as an implied consent to the disclosure of your personal information in the normal course of returning graded materials to students.

If you have any questions or concerns relating to the new policy or the issue of implied consent addressed above, please contact accessandprivacy@ontariotechu.ca

Notice of Collection and Use of Personal Information
Throughout this course, personal information may be collected through the use of certain technologies under the authority of the *University of Ontario Institute of Technology Act, SO 2002, c. 8, Sch. O.* and will be collected, protected, used, disclosed and retained in compliance with Ontario's *Freedom of Information and Protection of Privacy Act R.S.O. 1990, c. F.31.*

This course may use the following technologies that may collect, use, disclose and retain personal information (including images) for the purposes described below:

- Respondus Monitor and Proctortrack to maintain academic integrity for examinations;
- Google Meet and Kaltura Virtual Classroom to facilitate remote instruction and interactive learning;
- Peer-shared applications, services or technologies that may be reviewed, assessed, or used as part of coursework.
- Other applications, services, or technologies that support or enhance online learning

For more information relating to these technologies, we encourage you to visit: https://tlc.ontariotechu.ca/learning-technology/index.php Questions regarding personal information may be directed to: Ontario Tech University Access and Privacy Office, 2000 Simcoe Street North, Oshawa, ON L1G 0C5, email: accessandprivacy@ontariotechu.ca.

By remaining enrolled in this course, you acknowledge that you have read, understand, and agree to the terms and conditions under which the technology provider(s) may collect, use, disclose and retain your personal

information. You agree to the university using the technologies and using your personal information for the purposes described in this course outline.

25. Freedom of Expression

Pursuant to Ontario Tech's Freedom of Expression Policy all students are encouraged to express ideas and perspectives freely and respectfully in university space and in the online university environment, subject to certain limitations. Students are reminded that the limits on Freedom of Expression include speech or behaviour that: is illegal or interferes with the university's legal obligations; defames an individual or group; constitutes a threat, harassment or discrimination; is a breach of fiduciary, contractual, privacy or confidentiality obligations or commitments; and unduly disrupts and interferes with the functioning of the university. In the context of working online, different forms of communication are used. Where permitted, students using "chat" functions or other online forms of communication are encouraged to ensure that their communication complies with the Freedom of Expression Policy.

26. Student Course Feedback Surveys

Student evaluation of teaching is a highly valued and helpful mechanism for monitoring the quality of Ontario Tech University's programs and instructional effectiveness. To that end, course evaluations are administered by an external company in an online, anonymous process during the last few weeks of classes. Students are encouraged to participate actively in this process and will be notified of the dates. Notifications about course evaluations will be sent via e-mail, and posted on Canvas, Weekly News, and signage around the campus.

University Response to COVID-19

The government response to the COVID-19 pandemic is continually evolving. As new information becomes available from federal and provincial public health authorities, the Province of Ontario and the Regional Municipality of Durham, Ontario Tech University will remain nimble and prepared to respond to government orders, directives, guidelines and changes in legislation to ensure the health and safety of all members of its campus community. In accordance with public health recommendations, the university may need to adjust the delivery of course instruction and the availability and delivery mode of campus services and co-curricular opportunities. Ontario Tech University appreciates the understanding and flexibility of our students, faculty and staff as we continue to navigate the pandemic and work together to demonstrate our strong commitment to academic, research and service excellence during these challenging and unprecedented times.

The Accessibility for Ontarians with Disabilities Act (AODA) standards have been considered in the development of this model course template and it adheres to the principles outlined in the University's Accessibility Policy.

Ontario Tech University

Faculty of Energy Systems and Nuclear Science

Course Outline

ENGR 2140U

Problem Solving, Modelling and Simulation

Fall 2021

Offering Approval:

Under Revision

Course Description:

Students will explore processes and skills needed to define, evaluate and develop a range of solutions to design problems while working alone or as members of a group. Topics include: methods for estimating and verifying the results and levels of accuracy of alternate designs; mathematical modelling of simple processes and equipment; computer programs for solving systems of equations; use of simulation in the design and visualization of continuous and discrete process.

Major Topics:

Graduate Attributes:

The graduate attributes developed and required by the Canadian Engineering Accreditation Board's Accreditation Criteria and Procedures are listed below, with those covered in the course to some degree (introduced, developed, applied).

Attributes	Covered in this Course
Knowledge base	✓
Problem analysis	✓
Investigation	✗
Design	✓
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	✗

Course Content Breakdown

Math	Basic Science	Complementary Studies	Engineering Science	Engineering Design
0%	0%	0%	67%	33%

Course Outcomes:

- Methods for estimating and verifying results including statistical analysis and levels of accuracy; Visual display of quantitative information.
- Simulating simple systems and Computational Modelling.
- Mathematical modelling of processes.
- Applying problem solving techniques to analyse a complex problem.
- Steps of problems solving: definition, generation, decision, implementation, evaluation.
- Experimental Design.
- Programming with MATLAB.

Instructors

Instructor:	Email:	Office:	Phone:
Dr. Matthew Haigh Kaye, BASc (Toronto), MASc (Queens), PhD (Queens)	Matthew.Kaye@uoit.ca	ERC 4082	5524

Office Hours:

Week days 09h00-16h00; Virtual Office Hours: Just about anytime

Teaching Assistants

TA Name:	Email:	Office:	Office Hours:
Jelena Vucicevic	jelena.vucicevic@uoit.net	ERC 4100	TBA

TA Name:	Email:	Office:	Office Hours:

Paul Gelautz paul.gelautz@uoit.net ERC 4100 TBA

Required Course Text and Other Materials:

- David M. Smith, "Engineering Computation with MATLAB 7", Pearson Educational (Addison Wesley), 2007.

Course Organization and Delivery Mode:

3 lecture hours (usually as two 1.5 hour sessions) and 1 tutorial hour biweekly for one semester.

Scheduled Regular Class Meeting Times:

ERC 2056 Time: Monday 11h10 – 12h30

ERC 2056 Time: Wednesday 11h10 – 12h30

Tutorials: UA 3240 Time: Monday 12h40 – 14h00, (alternate weeks)

Final Grade Breakdown:

Assignments (approximately 8-10 total)	20%
Group problem solving	25%
Quizzes (2 @ 12.5% each)	25%
Final exam	30%
Total	100%

Midterms

Midterm Date:	Midterm Location:
Wednesday, October 9, 2019 - 11:10 to 12:30	ERC 2056
Midterm Date:	**Midterm Location:**
Monday, November 18, 2019 - 11:10 to 12:30	ERC 2056

Tutorials:

Tutorials: UA 3240 Time: Monday 12h40 – 14h00, (alternate weeks)

Detailed Course Content:

This course will explore processes and skills required to define, evaluate and develop solutions to design and scientific problems, while working alone or as group members. This course is designed to instruct you on effective strategies to solve problems. Part of the problem solving process involves modeling problems and simulating system performance.

The underlying emphasis of this course is to allow you to develop your own problem solving strategies, both individually and in groups. Direction will be given on how to look at problems from different perspectives, and how to determine the proper root problem statement. Computational aspects of problem solving will be explored using the MATLAB computer code.

A number of case studies will be presented as both example and problems to the student. Emphasis will be placed on solutions to problems of interest to nuclear engineers, energy systems engineers, and radiation scientists.

Specific course goals include:

- The building blocks of problems solving: definition, generation, decision, implementation and evaluation;
- Methods for estimating and verifying results including statistical analysis and levels of accuracy;
- Visual display of quantitative information;
- Simulating simple systems;
- Mathematical modeling of processes;
- Computational modeling.

Other Course Information:

Professionalism in the Nuclear Industry

Students expecting to work in the nuclear industry should be aware that a high degree of professionalism is expected. The industry is small and unprofessional acts can have long term career consequences. As such, students are encouraged in this course and program to practice the professional conduct including interactions with the course instructor, teaching assistants, guest lecturers, academic advisors, and staff. Professional conduct expected in this faculty includes but is not limited to (academic) integrity, accountability and respect for your colleagues' and educators' work. As professionals and our future colleagues you are responsible for educating yourself on the details of the university's rules on those subjects. Any concerns regarding professionalism can be brought to the attention the Undergraduate Program Director or the Dean of the Faculty.

Medical Certificates and Deferred Exams:

Medical statements and academic consideration forms for any missed student work worth 25% or less (not including midterms or tests) will be submitted directly to the course instructor. This includes missed quizzes, assignments and labs. Missed Midterms or Coursework Worth More than 25% For any missed midterms or tests, regardless of weight, or coursework worth more than 25%, students will need to submit the UOIT Medical statement or academic consideration form to the Engineering Advising Office following the form guidelines.

Guidelines for Medical Statements: Medical statements cover any missed work due to a medical reasons. The student must:

- see a medical doctor within 24 hours of the missed work
- submit the form to the correct individual within 3 working days

Guidelines for Academic Consideration Forms: Academic consideration forms cover any missed work for non-academic grounds, for example, religious observations, court appearance, personal/family emergency, varsity events. The student must provide supporting documentation if deemed necessary.

Should the medical certificate proven to be invalid due to any kind of action by the student, such student's behaviour will be considered as a major misconduct and respective disciplinary actions will be commenced.

Failure to comply with the above will result in an mark of 0 for the exam.

Students with disabilities may request to be considered for formal academic accommodation in accordance with the Ontario Human Rights Code. Students seeking accommodation must make their requests through the Centre for Students with Disabilities in a timely manner, and provide relevant and recent documentation to verify the effect of their disability and to allow the University to determine appropriate accommodations.

Accommodation decisions will be made in accordance with the Ontario Human Rights Code. Accommodations will be consistent with and supportive of the essential requirements of courses and programs, and provided in a way that respects the dignity of students with disabilities and encourages integration and equality of opportunity. Reasonable academic accommodation may require instructors to exercise creativity and flexibility in responding to the needs of students with disabilities while maintaining academic integrity.

Student Support

Any student who faces challenges securing their food or housing and believes this may affect their performance in the course is urged to contact studentlife@ontariotechu.ca for support. Furthermore, please notify your professor if you are comfortable in doing so. This will enable them to provide any resources and help that they can.

Sexual Violence Support and Education

Ontario Tech is committed to the prevention of sexual violence in all is forms. For any student who has experienced Sexual Violence, Ontario Tech can help. We will make accommodations to cater to the diverse backgrounds, cultures, and identities of students when dealing with individual cases. If you think you have been subjected to or witnessed sexual violence:

- Reach out to a Support Worker, a specially trained individual authorized to receive confidential disclosures about incidents of sexual violence. Support Workers can offer help and resolution options which can include safety plans, accommodations, mental health support, and more. To make an appointment with a Support Worker, call 905.721.3392 or email studentlife@ontariotechu.ca
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Students with Disabilities

Accommodating students with disabilities at Ontario Tech is a responsibility shared among various partners: the students themselves, SAS staff and faculty members. To ensure that disability-related concerns are properly addressed during this course, students with documented disabilities and who may require assistance to participate in this class are encouraged to speak with me as soon as possible. Students who suspect they have a disability that may affect their participation in this course are advised to go to Student Accessibility Services (SAS) as soon as possible. Maintaining communication and working collaboratively with SAS and faculty members will ensure you have the greatest chance of academic success.

Students taking courses on north Oshawa campus can visit Student Accessibility Services in the Student Life Building, U5, East HUB (located in the Founders North parking lot). Students taking courses on the downtown Oshawa campus can visit Student Accessibility Services in the 61 Charles St. Building, 2nd Floor, Room DTA 225 in the Student Life Suite.

Disability-related and accommodation support is available for students with mental health, physical, mobility, sensory, medical, cognitive, or learning challenges. Office hours are 8:30am-4:30pm, Monday to Friday, closed Wednesday's 8:30am – 10:00am. For more information on services provided, you can visit the SAS website at https://studentlife.ontariotechu.ca/services/accessibility/index.php. Students may contact Student Accessibility Services by calling 905-721-3266, or email studentaccessibility@ontariotechu.ca.

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Students must register for final exams by the registration deadline, which is typically two (2) weeks prior to the start of the final examination period. SAS will notify students of the registration deadline date.

Professional Conduct

All students who are enrolled in engineering programs must demonstrate behaviour appropriate to practice in engineering profession. Where Faculty dean determines that behaviour inconsistent with the norms and expectations of the profession has been exhibited by a student, that student may be immediately withdrawn from the program by the dean or subject to one or more of the sanctions described in the professional suitability policy: http://calendar.uoit.ca/content.php?catoid=22&navoid=879#Academic_conduct

A student demonstrating professional unsuitability may be immediately suspended from any practicum, field work or similar activity at the discretion of the dean pending a final decision.

Academic Integrity

Students and faculty at Ontario Tech University share an important responsibility to maintain the integrity of the teaching and learning relationship. This relationship is characterized by honesty, fairness and mutual respect for the aim and principles of the pursuit of education. Academic misconduct impedes the activities of the university community and is punishable by appropriate disciplinary action.

Students are expected to be familiar with and abide by Ontario Tech University's regulations on Academic Conduct which sets out the kinds of actions that constitute academic misconduct, including plagiarism, copying or allowing one's own work to copied, use of unauthorized aids in examinations and tests, submitting work prepared in collaboration with another student when such collaboration has not been authorized, among other academic offences. The regulations also describe the procedures for dealing with allegations, and the sanctions for any finding of academic misconduct, which can range from a resubmission of work to a failing grade to permanent expulsion from the university. A lack of familiarity with these regulations on academic conduct does not constitute a defense against its application. This information can be found at http://calendar.uoit.ca/content.php?catoid=22&navoid=879#Academic_conduct

Extra support services are available to all Ontario Tech University students in academic development, study skills, counseling, and peer mentorship. More information on student support services can be found at https://studentlife.ontariotechu.ca/services/academic-support/index.php

Turnitin

Ontario Tech University and faculty members reserve the right to use electronic means to detect and help prevent plagiarism. Students agree that by taking this course all assignments are subject to submission for textual similarity review by Turnitin.com. Assignments submitted to Turnitin.com will be included as source documents in Turnitin.com's restricted access database solely for the purpose of detecting plagiarism in such documents. The instructor may require students to submit their assignments electronically to Turnitin.com or the instructor may submit questionable text on behalf of a student. The terms that apply to Ontario Tech University's use of the Turnitin.com service are described on the Turnitin.com website.

Students who do not wish to have their work submitted to Turnitin.com must provide with their assignment at the time of submission to the instructor a signed Turnitin.com Assignment Cover sheet:

https://shared.uoit.ca/shared/department/academic-integrity/Forms/assignment-cover-sheet.pdf

Online Test and Exam Proctoring (Virtual Proctoring)

To maintain academic integrity in online testing, your instructor may require the use of Respondus LockDown Browser and Respondus Monitor or a similar virtual proctoring platform. In doing so, you will be required to use a computer with a webcam (either built-in or USB plug in). Please advise your instructor as soon as possible if you do not have a computer with a camera.

This is a link to a short video that explains the basics of Respondus LockDown Browser.

Final Examinations (if applicable)

Final examinations are held during the final examination period at the end of the semester and may take place in a different room and on a different day from the regularly scheduled class. Check the published Examination Schedule for a complete list of days and times.

Students are advised to obtain their Student ID Card well in advance of the examination period as they will not be able to write their examinations without it. Cards are available from the Campus ID office in the Campus Recreation and Wellness Centre, Room G1004.

Students who are unable to write a final examination when scheduled due to religious publications may make arrangements to write a deferred examination. These students are required to submit a Request for Accommodation for Religious Obligations to the Faculty concerned as soon as possible and no later than three weeks prior to the first day of the final examination period.

Further information on final examinations can be found at https://usgc.ontariotechu.ca/policy/policy-library/policies/academic/procedures-for-final-examination-administration.php

Freedom of Information and Protection of Privacy Act

The following is an important notice regarding the process for submitting course assignments, quizzes, and other evaluative material in your courses in the Faculty of Engineering and Applied Science.

Ontario Tech University is governed by the Freedom of Information and Protection of Privacy Act ("FIPPA"). In addition to providing a mechanism for requesting records held by the university, this legislation also requires that the University not disclose the personal information of its students without their consent.

FIPPA's definition of "personal information" includes, among other things, documents that contain both your name and your Banner (student) ID. For example, this could include graded test papers or assignments. To ensure that your rights to privacy are protected, the Faculty of [Insert Faculty name] encourages you to use only your Banner ID on assignments or test papers being submitted for grading. This policy is intended to prevent the inadvertent disclosure of your information where graded papers are returned to groups of students at the same time. If you still wish to write both your name and your Banner ID on your tests and assignments, please be advised that Ontario Tech University will interpret this as an implied consent to the disclosure of your personal information in the normal course of returning graded materials to students.

If you have any questions or concerns relating to the new policy or the issue of implied consent addressed above, please contact accessandprivacy@ontariotechu.ca

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This course may use the following technologies that may collect, use, disclose and retain personal information (including images) for the purposes described below:

- Respondus Monitor and Proctortrack to maintain academic integrity for examinations.
- Google Meet and Kaltura Virtual Classroom to facilitate remote instruction and interactive learning.
- Peer-shared applications, services or technologies that may be reviewed, assessed, or used as part of coursework.
- Other applications, services, or technologies that support or enhance online learning.

For more information relating to these technologies, we encourage you to visit: https://tlc.ontariotechu.ca/learning-technology/index.php Questions regarding personal information may be directed to: Ontario Tech University Access and Privacy Office, 2000 Simcoe Street North, Oshawa, ON L1G 0C5, email: accessandprivacy@ontariotechu.ca.

By remaining enrolled in this course, you acknowledge that you have read, understand and agree to the terms and conditions under which the technology provider(s) may collect, use, disclose and retain your personal information. You agree to the university using the technologies and using your personal information for the purposes described in this course outline.

Technology Requirements

To support online learning, the university recommends certain technology requirements for laptops, software and internet connectivity which are available at: https://itsc.ontariotechu.ca/remote-learning.php.

Students experiencing technical difficulties such that they are unable to meet the technology requirements may contact the IT Service Help Desk at: servicedesk@dc-uoit.ca

Students experiencing financial difficulties such that they are unable to meet the technology requirements may contact Student Awards and Financial Aid Office at: connect@ontariotehu.ca

By remaining enrolled in this course, you acknowledge that you have read, understand and agree to observe the Recommended Technology Requirements for accessing university online learning resources, including those minimum requirements that are specific to your faculty and program.

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Pursuant to Ontario Tech's Freedom of Expression Policy all students are encouraged to express ideas and perspectives freely and respectfully in university space and in the online university environment, subject to certain limitations. Students are reminded that the limits on Freedom of Expression include speech or behaviour that: is illegal or interferes with the university's legal obligations; defames an individual or group; constitutes a threat, harassment or discrimination; is a breach of fiduciary, contractual, privacy or confidentiality obligations or commitments; and unduly disrupts and interferes with the functioning of the university. In the context of working online, different forms of communication are used. Where permitted, students using "chat" functions or other online forms of communication are encouraged to ensure that their communication complies with the Freedom of Expression Policy.

University Response to COVID-19

The government response to the COVID-19 pandemic is continually evolving. As new information becomes available from federal and provincial public health authorities, the Province of Ontario and the Regional Municipality of Durham, Ontario Tech University will remain nimble and prepared to respond to government orders, directives, guidelines and changes in legislation to ensure the health and safety of all members of its campus community. In accordance with public health recommendations, the university may need to adjust the delivery of course instruction and the availability and delivery mode of campus services and co-curricular opportunities. Ontario Tech University appreciates the understanding and flexibility of our students, faculty and staff as we continue to navigate the pandemic and work together to demonstrate our strong commitment to academic, research and service excellence during these challenging and unprecedented times.

Ontario Tech University

Faculty of Energy Systems and Nuclear Science

Course Outline

NUCL 2860U

Fluid Mechanics

Fall 2021

Offering Approval:

Under Revision

Course Description:

Fundamentals of fluid mechanics, including: properties of fluids and their units; fluid static. Kinematics of fluids, conservation of mass and the continuity equation. Dynamics of fluids; Euler equation; Bernoulli equation. The energy equation; energy grade lines. Flow of viscous fluids; laminar and turbulent flows; flow in pipes and fittings; the Moody diagram. Flows around immersed bodies; lift and drag on bodies. Boundary layers; flow separation. Flow measurement techniques.

Major Topics:

Graduate Attributes:

The graduate attributes developed and required by the Canadian Engineering Accreditation Board's Accreditation Criteria and Procedures are listed below, with those covered in the course to some degree (introduced, developed, applied).

Attributes	Covered in this Course
Knowledge base	✓
Problem analysis	✓
Investigation	✓
Design	✗
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	✗

Course Content Breakdown

Math	Basic Science	Complementary Studies	Engineering Science	Engineering Design
0%	0%	0%	100%	0%

Course Outcomes:

Students who successfully complete this course will have reliably demonstrated the ability to:

- Describe fundamental fluid mechanics concepts.
- Solve fluid mechanics problems related to fluid statics, dynamics, and kinematics; conservation of mass; flow of viscous fluids; and flows around immersed bodies.
- Analyse and interpret data collected in fluid mechanics laboratories, and effectively communicate the results in a written report.

Instructors

Instructor:	Email:	Office:	Phone:	Office Hours:
Dr. Jennifer McKellar	Canvas (jennifer.mckellar@ontariotechu.ca if urgent)	ERC 4022	x5498	To be determined; see Canvas

Teaching Assistants

TA Name:	Email:
See Canvas	Canvas

TA Name:	Email:
See Canvas	Canvas

Required Course Text and Other Materials:

- Gerhart, P.M., Gerhart, A.L., Hochstein, J.I. 2016. Munson, Young and Okiishi's Fundamentals of Fluid Mechanics, 8th Edition. Wiley: Hoboken, NJ.
- You may use a previous edition of this textbook, but remember that page numbers, etc. will differ between editions.
- Remember to use a formal reference style (e.g., MLA, APA, Chicago) when citing external works in lab work, assignments and the project..
- Additional readings may be assigned or recommended during the course.

Course Organization and Delivery Mode:

Delivery of this course includes online lectures, tutorials, and labs. The majority of the delivery will be on a fixed schedule. Note however, that occasional lectures may be cancelled and replaced by presentations from visiting scholars or industrial engineers and some classes may be recorded and delivered online due to travel commitments. Changes to the course schedule will be advertised on Canvas and students will be expected to monitor Canvas announcements for changes routinely. Time equivalent to that spent in class is expected to be spent by students on self-study.

N.B. Lectures, tutorials and possibly synchronous lab sessions will be livestreamed and recorded and made available on Canvas. If you participate in the session and/or have your webcam turned on, **you may be captured in these recordings. Do not share** recorded content with others.

Scheduled Regular Class Meeting Times:

Wednesdays, 8:10 a.m. - 9:30 a.m., Online (access via Canvas)

Fridays, 8:10 a.m. - 9:30 a.m., Online (access via Canvas)

Final Grade Breakdown:

Evaluation will be done based on assignments (8), labs (6), one quiz, one midterm examination, one major project and the final examination, according to the following scheme:

Category	Value
Assignments	16%
Laboratories	18%
Quiz	2%
Midterm	20%
Project	20%
Final	24%

Final course grades may be adjusted to conform to program or Faculty grade distribution profiles. Further information on grading can be found in the Ontario Tech Academic Calendar.

Midterms

Midterm Date:	Midterm Location:
Friday, October 23, 2020 - 08:10 to 09:30	Online, access via Canvas

Assignments:

There are eight (8) assignments and one (1) major project.

A tentative list of assignment due dates will be posted on Canvas. It is the student's responsibility to monitor Canvas for changes to these dates.

Laboratories, Prelab Reports, Notes and Reports

Lab Description:

1. Fluid Velocity Measurements and Flow Visualisation
2. Hydrostatic Pressure Unit
3. Bernoulli's Theorem Demonstration Apparatus
4. Impact of a Jet
5. Pipe Friction Apparatus
6. Boundary Layer

Prelab Reports, Notes and Reports:

For 2020, laboratory experiments will be recorded by Instructors and the recordings made available via Canvas. They may also be livestreamed and recorded to allow students to ask questions. Students will not be physically present in the laboratories. See note above regarding course recordings.

Students will still be expected to complete safety quizzes, and complete and submit lab reports, as well as any additional analytical and/or design work assigned along with each lab. The document Lab Schedule outlines due dates for the semester, and indicates overall requirements for each lab.

Lab reports and additional lab assignments will be completed and submitted in groups, as described in the documents: Lab Schedule and Lab Report Requirements. Lab reports are to be submitted electronically via Canvas.

It is each group member's responsibility to ensure that the entire report is completed in compliance with the University's policy on Academic Conduct. See below. If a portion of the report is found to have been plagiarized, *etc.* (including the falsification of data), the entire group may be penalized, regardless of which group member(s) is/are at fault.

Tutorials:

Tutorials are weekly, 1 hr each; 2 sections. Tutorials will be livestreamed and recorded. See note above regarding course recordings.

Tutorials will cover practice problems. The first tutorial of each section will also cover lab report expectations.

Summary of Important Dates and Marking Scheme:

Dates

- *Quiz* September 30, 2020 8:10 a.m.
  - Closed book. No notes, no aids, no calculators. Length: 30 minutes. Due to the course being offered online in 2020, the exact time at which the quiz will start may be adjusted. Students will be advised at least one week in advance of any change/flexibility in quiz start- and end-times.

- *Midterm* October 23, 2020 8:10 a.m.
  - Closed book. No notes, no aids (permissible calculators allowed as described in lecture before the midterm and in instructions provided with the test). Equation sheets will be provided with the midterm. Length: 1 hour 20 minutes. Due to the course being offered online in 2020, the exact time at which the midterm will start may be adjusted. Students will be advised at least one week in advance of any change/flexibility in midterm start- and end-times.
- *Assignments* A tentative list of dates will be posted on Canvas. It is the student's responsibility to monitor Canvas for changes to these dates.
- *Laboratory submissions* The document Lab Schedule outlines due dates for the semester, and indicates overall requirements for each lab.
- *Project* Report due: November 30, 2020 5:00 p.m.; Presentation: December 2 and/or December 4, 2020.

Late Policy

Assignments, laboratory work and projects not submitted as instructed by the appointed time are subject to the following penalties:

- Same day, after appointed time: -5% (it is strongly suggested that you upload your assignment, laboratory work and project well before the deadline in case of technical difficulties)
- Next day: -10%
- Each additional day after, to a maximum of three (3) calendar days after deadline: -10% (work submitted more than three (3) days late will receive a grade of zero)

Absences/Missed Work

In the event course work, the quiz or the midterm are missed due to illness, appropriate documentation must be submitted; see the section on Medical Certificates below. See also the section on Grade Reappraisal in the Academic Calendar.

In the event course work, the quiz or the midterm are missed due to other extenuating circumstances, contact the Professor.

Detailed Course Content:

Course schedule is approximate and may be adjusted as needed as the semester progresses. Each week will include synchronous and asynchronous components (*e.g.*, videos to watch before or after class). These details will be provided on Canvas. Any updates to this schedule will be announced in class and posted on Canvas.

Week	Topic (synchronous & asynchronous parts)	Relevant Text Readings
1 (Sept 9, Sept 11)	Introduction - Fluid Mechanics in Nuclear Energy Systems - Fundamental concepts	Chapter 1
2 (Sept 16, Sept 18)	Fluid Statics - Pressure	Chapter 2
3 (Sept 23, Sept 25)	Fluid Statics, cont'd - Hydrostatic force - Bouyancy, flotation, stability Fluid Dynamics - Bernoulli equation	Chapter 2 Chapter 3
4 (Sept 30, Oct 2)	**Quiz** (September 30) Fluid Dynamics, cont'd - Free jets, confined flows, measuring flows - Energy line, hydraulic grade line	Chapter 3
5 (Oct 7, Oct 9)	Fluid Kinematics - Velocity and acceleration fields - Control volumes & systems - Reynolds Transport Theorem	Chapter 4
6 (Oct 21, Oct 23)	Finite Control Volume Analysis - Continuity equation - Linear momentum equation **Midterm** (October 23)	Chapter 5
7 (Oct 28, Oct 30)	Finite Control Volume Analysis, cont'd - Moment of Momentum Equation - First & Second Laws	Chapter 5
8 (Nov 4, Nov 6)	Differential Analysis of Fluid Flow	Chapter 6

9 (Nov 11, Nov 13)	Dimensional Analysis Viscous Flow in Pipes - Laminar and turbulent flows - Dimensional analysis	Chapter 7 Chapter 8
10 (Nov 18, Nov 20)	Viscous Flow in Pipes, cont'd - Losses, Moody chart - Pipe flowrate measurements	Chapter 8
11 (Nov 25, Nov 27)	Immersed Bodies - External flow characteristics - Boundary layers - Drag, Lift	Chapter 9
12 (Dec 2, Dec 4)	Turbomachines **Project Presentations** Exam Review	Chapter 12
Final Exam		

Other Course Information:

Professional conduct is required during online lectures, tutorials and laboratories, in written work submitted during the course, and in all communications with classmates, the Professor, the Teaching Assistants and other University employees. "Professional unsuitability" is discussed in the Academic Calendar.

The following rules apply to this course:

- Safety first. Any violation related to safety will result in dismissal from the class, tutorial or laboratory and the student will require the Professor's permission to return.
- No illegal activities.
- Respect each other. No disruptive influences.
- Follow school policies.

Medical Certificates and Deferred Exams:

Medical statements and academic consideration forms for any missed student work worth 25% or less (not including midterms or tests) will be submitted directly to the course instructor. This includes missed quizzes, assignments and labs. Missed Midterms or Coursework Worth More than 25% For any missed midterms or tests, regardless of weight, or coursework worth more than 25%, students will need to submit the UOIT Medical statement or academic consideration form to the Engineering Advising Office following the form guidelines.

Guidelines for Medical Statements: Medical statements cover any missed work due to a medical reasons. The student must:

- see a medical doctor within 24 hours of the missed work
- submit the form to the correct individual within 3 working days

Guidelines for Academic Consideration Forms: Academic consideration forms cover any missed work for non-academic grounds, for example, religious observations, court appearance, personal/family emergency, varsity events. The student must provide supporting documentation if deemed necessary.

Should the medical certificate proven to be invalid due to any kind of action by the student, such student's behaviour will be considered as a major misconduct and respective disciplinary actions will be commenced.

Failure to comply with the above will result in an mark of 0 for the exam.

Students with disabilities may request to be considered for formal academic accommodation in accordance with the Ontario Human Rights Code. Students seeking accommodation must make their requests through the Centre for Students with Disabilities in a timely manner, and provide relevant and recent documentation to verify the effect of their disability and to allow the University to determine appropriate accommodations.

Accommodation decisions will be made in accordance with the Ontario Human Rights Code. Accommodations will be consistent with and supportive of the essential requirements of courses and programs, and provided in a way that respects the dignity of students with disabilities and encourages integration and equality of opportunity. Reasonable academic accommodation may require instructors to exercise creativity and flexibility in responding to the needs of students with disabilities while maintaining academic integrity.

Student Support

Any student who faces challenges securing their food or housing and believes this may affect their performance in the course is urged to contact studentlife@ontariotechu.ca for support. Furthermore, please notify your professor if you are comfortable in doing so. This will enable them to provide any resources and help that they can.

Sexual Violence Support and Education

Ontario Tech is committed to the prevention of sexual violence in all is forms. For any student who has experienced Sexual Violence, Ontario Tech can help. We will make accommodations to cater to the diverse backgrounds, cultures, and identities of students when dealing with individual cases. If you think you have been subjected to or witnessed sexual violence:

- Reach out to a Support Worker, a specially trained individual authorized to receive confidential disclosures about incidents of sexual violence. Support Workers can offer help and resolution options which can include safety plans, accommodations, mental health support, and more. To make an appointment with a Support Worker, call 905.721.3392 or email studentlife@ontariotechu.ca
- Learn more about your options at: https://studentlife.ontariotechu.ca/sexualviolence/

Students with Disabilities

Accommodating students with disabilities at Ontario Tech is a responsibility shared among various partners: the students themselves, SAS staff and faculty members. To ensure that disability-related concerns are properly addressed during this course, students with documented disabilities and who may require assistance to participate in this class are encouraged to speak with me as soon as possible. Students who suspect they have a disability that may affect their participation in this course are advised to go to Student Accessibility Services (SAS) as soon as possible. Maintaining communication and working collaboratively with SAS and faculty members will ensure you have the greatest chance of academic success.

Students taking courses on north Oshawa campus can visit Student Accessibility Services in the Student Life Building, U5, East HUB (located in the Founders North parking lot). Students taking courses on the downtown Oshawa campus can visit Student Accessibility Services in the 61 Charles St. Building, 2nd Floor, Room DTA 225 in the Student Life Suite.

Disability-related and accommodation support is available for students with mental health, physical, mobility, sensory, medical, cognitive, or learning challenges. Office hours are 8:30am-4:30pm, Monday to Friday, closed Wednesday's 8:30am – 10:00am. For more information on

services provided, you can visit the SAS website at https://studentlife.ontariotechu.ca/services/accessibility/index.php. Students may contact Student Accessibility Services by calling 905-721-3266, or email studentaccessibility@ontariotechu.ca.

Students who require the use of the Test Centre to write tests, midterms, or quizzes MUST register online using the SAS test/exam sign-up module, found here https://disabilityservices.ontariotechu.ca/uoitclockwork/custom/misc/home.aspx. Students must sign up for tests, midterms, or quizzes AT LEAST seven (7) days before the date of the test.

Students must register for final exams by the registration deadline, which is typically two (2) weeks prior to the start of the final examination period. SAS will notify students of the registration deadline date.

Professional Conduct

All students who are enrolled in engineering programs must demonstrate behaviour appropriate to practice in engineering profession. Where Faculty dean determines that behaviour inconsistent with the norms and expectations of the profession has been exhibited by a student, that student may be immediately withdrawn from the program by the dean or subject to one or more of the sanctions described in the professional suitability policy: http://calendar.uoit.ca/content.php?catoid=22&navoid=879#Academic_conduct

A student demonstrating professional unsuitability may be immediately suspended from any practicum, field work or similar activity at the discretion of the dean pending a final decision.

Academic Integrity

Students and faculty at Ontario Tech University share an important responsibility to maintain the integrity of the teaching and learning relationship. This relationship is characterized by honesty, fairness and mutual respect for the aim and principles of the pursuit of education. Academic misconduct impedes the activities of the university community and is punishable by appropriate disciplinary action.

Students are expected to be familiar with and abide by Ontario Tech University's regulations on Academic Conduct which sets out the kinds of actions that constitute academic misconduct, including plagiarism, copying or allowing one's own work to copied, use of unauthorized aids in examinations and tests, submitting work prepared in collaboration with another student when such collaboration has not been authorized, among other academic offences. The regulations also describe the procedures for dealing with allegations, and the sanctions for any finding of academic misconduct, which can range from a resubmission of work to a failing grade to permanent expulsion from the university. A lack of familiarity with these regulations on academic conduct does not constitute a defense against its application. This information can be found at http://calendar.uoit.ca/content.php?catoid=22&navoid=879#Academic_conduct

Extra support services are available to all Ontario Tech University students in academic development, study skills, counseling, and peer mentorship. More information on student support services can be found at https://studentlife.ontariotechu.ca/services/academic-support/index.php

Turnitin

Ontario Tech University and faculty members reserve the right to use electronic means to detect and help prevent plagiarism. Students agree that by taking this course all assignments are subject to submission for textual similarity review by Turnitin.com. Assignments submitted to Turnitin.com will be included as source documents in Turnitin.com's restricted access database solely for the purpose of detecting plagiarism in such documents. The instructor may require students to submit their assignments electronically to Turnitin.com or the instructor may submit questionable text on behalf of a student. The terms that apply to Ontario Tech University's use of the Turnitin.com service are described on the Turnitin.com website.

Students who do not wish to have their work submitted to Turnitin.com must provide with their assignment at the time of submission to the instructor a signed Turnitin.com Assignment Cover sheet:

https://shared.uoit.ca/shared/department/academic-integrity/Forms/assignment-cover-sheet.pdf

Online Test and Exam Proctoring (Virtual Proctoring)

To maintain academic integrity in online testing, your instructor may require the use of Respondus LockDown Browser and Respondus Monitor or a similar virtual proctoring platform. In doing so, you will be required to use a computer with a webcam (either built-in or USB plug in). Please advise your instructor as soon as possible if you do not have a computer with a camera.

This is a link to a short video that explains the basics of Respondus LockDown Browser.

Final Examinations (if applicable)

Final examinations are held during the final examination period at the end of the semester and may take place in a different room and on a different day from the regularly scheduled class. Check the published Examination Schedule for a complete list of days and times.

Students are advised to obtain their Student ID Card well in advance of the examination period as they will not be able to write their examinations without it. Cards are available from the Campus ID office in the Campus Recreation and Wellness Centre, Room G1004.

Students who are unable to write a final examination when scheduled due to religious publications may make arrangements to write a deferred examination. These students are required to submit a Request for Accommodation for Religious Obligations to the Faculty concerned as soon as possible and no later than three weeks prior to the first day of the final examination period.

Further information on final examinations can be found at https://usgc.ontariotechu.ca/policy/policy-library/policies/academic/procedures-for-final-examination-administration.php

Freedom of Information and Protection of Privacy Act

The following is an important notice regarding the process for submitting course assignments, quizzes, and other evaluative material in your courses in the Faculty of Engineering and Applied Science.

Ontario Tech University is governed by the Freedom of Information and Protection of Privacy Act ("FIPPA"). In addition to providing a mechanism for requesting records held by the university, this legislation also requires that the University not disclose the personal information of its students without their consent.

FIPPA's definition of "personal information" includes, among other things, documents that contain both your name and your Banner (student) ID. For example, this could include graded test papers or assignments. To ensure that your rights to privacy are protected, the Faculty of [Insert Faculty name] encourages you to use only your Banner ID on assignments or test papers being submitted for grading. This policy is intended to prevent the inadvertent disclosure of your information where graded papers are returned to groups of students at the same time. If you still wish to write both your name and your Banner ID on your tests and assignments, please be advised that Ontario Tech University will interpret this as an implied consent to the disclosure of your personal information in the normal course of returning graded materials to students.

If you have any questions or concerns relating to the new policy or the issue of implied consent addressed above, please contact accessandprivacy@ontariotechu.ca

Student Course Feedback Surveys

Student evaluation of teaching is a highly valued and helpful mechanism for monitoring the quality of Ontario Tech University's programs and instructional effectiveness. To that end, course evaluations are administered by an external company in an online, anonymous process during the last few weeks of classes. Students are encouraged to participate actively in this process and will be notified of the dates. Notifications about course evaluations will be sent via e-mail, and posted on Canvas, Weekly News, and signage around the campus.

The Accessibility for Ontarians with Disabilities Act (AODA) standards have been considered in the development of this model course outline and it adheres to the principles outlined in the University's Accessibility Policy.

Notice of Collection and Use of Personal Information

Throughout this course, personal information may be collected through the use of certain technologies under the authority of the *University of Ontario Institute of Technology Act, SO 2002, c. 8, Sch. O.* and will be collected, protected, used, disclosed and retained in compliance with Ontario's *Freedom of Information and Protection of Privacy Act R.S.O. 1990, c. F.31.*

This course may use the following technologies that may collect, use, disclose and retain personal information (including images) for the purposes described below:

- Respondus Monitor and Proctortrack to maintain academic integrity for examinations.
- Google Meet and Kaltura Virtual Classroom to facilitate remote instruction and interactive learning.
- Peer-shared applications, services or technologies that may be reviewed, assessed, or used as part of coursework.
- Other applications, services, or technologies that support or enhance online learning.

For more information relating to these technologies, we encourage you to visit: https://tlc.ontariotechu.ca/learning-technology/index.php Questions regarding personal information may be directed to: Ontario Tech University Access and Privacy Office, 2000 Simcoe Street North, Oshawa, ON L1G 0C5, email: accessandprivacy@ontariotechu.ca.

By remaining enrolled in this course, you acknowledge that you have read, understand and agree to the terms and conditions under which the technology provider(s) may collect, use, disclose and retain your personal information. You agree to the university using the technologies and using your personal information for the purposes described in this course outline.

Technology Requirements

To support online learning, the university recommends certain technology requirements for laptops, software and internet connectivity which are available at: https://itsc.ontariotechu.ca/remote-learning.php.

Students experiencing technical difficulties such that they are unable to meet the technology requirements may contact the IT Service Help Desk at: servicedesk@dc-uoit.ca

Students experiencing financial difficulties such that they are unable to meet the technology requirements may contact Student Awards and Financial Aid Office at: connect@ontariotehu.ca

By remaining enrolled in this course, you acknowledge that you have read, understand and agree to observe the Recommended Technology Requirements for accessing university online learning resources, including those minimum requirements that are specific to your faculty and program.

Virtual Monitoring of Examinations

Ontario Tech University will conduct virtual monitoring of examinations in accordance with Ontario privacy legislation and all approved policy instruments.

Sensitive/Offensive Subject Matter

The classroom (both physical and virtual) is intended to provide a safe, open space for the critical and civil exchange of ideas and opinions. Some articles, media and other course materials may contain sensitive content that is offensive and/or disturbing. The Course Instructor will try to identify such material and communicate warnings[MG1] to students in advance of the distribution and use of such materials, affording students the choice to either emotionally prepare for, or not to view or interact with, the content.

Freedom of Expression

Pursuant to Ontario Tech's Freedom of Expression Policy all students are encouraged to express ideas and perspectives freely and respectfully in university space and in the online university environment, subject to certain limitations. Students are reminded that the limits on Freedom of Expression include speech or behaviour that: is illegal or interferes with the university's legal obligations; defames an individual or group; constitutes a threat, harassment or discrimination; is a breach of fiduciary, contractual, privacy or confidentiality obligations or commitments; and unduly disrupts and interferes with the functioning of the university. In the context of working online, different forms of communication are used. Where permitted, students using "chat" functions or other online forms of communication are encouraged to ensure that their communication complies with the Freedom of Expression Policy.

University Response to COVID-19

The government response to the COVID-19 pandemic is continually evolving. As new information becomes available from federal and provincial public health authorities, the Province of Ontario and the Regional Municipality of Durham, Ontario Tech University will remain nimble and prepared to respond to government orders, directives, guidelines and changes in legislation to ensure the health and safety of all members of its campus community. In accordance with public health recommendations, the university may need to adjust the delivery of course instruction and the availability and delivery mode of campus services and co-curricular opportunities. Ontario Tech University appreciates the understanding and flexibility of our students, faculty and staff as we continue to navigate the pandemic and work together to demonstrate our strong commitment to academic, research and service excellence during these challenging and unprecedented times.

Ontario Tech University
Faculty of Engineering and Applied Science
Department of Electrical, Computer and Software Engineering

Course Outline
ELEE 2790U
Electric Circuits
Winter 2021

Offering Approval:

Approved

Course Description:

Basic concepts of electricity, magnetism and electric circuits; DC and AC driven circuits; series and parallel circuits; Ohm Law, Kirchhoff Laws, Thevenin Theorem, Norton Theorem, operation of electrical equipment such as instruments, motors, generators; response to step functions; response to sinusoids, steady state AC, resonance, parallel resonance, AC power, power factor, power factor correction; introduction to magnetic circuits: coils, solenoids, transformers; single and three phase circuits, basic operation of electrical measuring equipment; basics of electronics: diodes, transistors, operational amplifiers.

Major Topics:

Graduate Attributes:

The graduate attributes developed and required by the Canadian Engineering Accreditation Board's Accreditation Criteria and Procedures are listed below, with those covered in the course to some degree (introduced, developed, applied).

Attributes	Covered in this Course
Knowledge base	✓
Problem analysis	✓
Investigation	✓
Design	✗
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	✓

Course Content Breakdown

Math	Basic Science	Complementary Studies	Engineering Science	Engineering Design
0%	0%	0%	100%	0%

Course Outcomes:

1. Demonstrate sound understanding and ability to analyze and solve problems related to electric circuits. This includes the ability to
   a. Understand the DC and AC circuits' quantities including charges, energy, current, voltage, power, complex power, and power factor and perform calculation for these quantities.
   b. Demonstrate and apply knowledge of Kirchhoff's (Current and Volt) law, Resistance law, Equivalent Circuit, Superposition principle, Thevenin & Norton theorems and perform relevant calculations.
   c. Develop and perform node and mesh analysis for circuits with resistors, capacitors and inductors.
   d. Analyze AC Circuits and perform network analysis using Phasor algebra.
   e. Understand three phase basic circuits, transformers, amplifiers, diodes, and transistors basic circuits and perform relevant calculation.

2. Demonstrate a good knowledge of the different types of electric circuits, components and designs, and be able to apply this knowledge in analysis and design activities and to investigate transient response, frequency response, complex power, and power factor correction of systems.
3. Develop and conduct experiments related to electric circuit, use laboratory measuring instruments to collect data, and analyze and interpret data using relevant software.
4. Communicate the project analysis, results of design details, and investigation activities.

Instructors

Instructor:	Email:	Office:	Phone:	Office Hours:
Dr. Lixuan Lu	Lixuan.Lu@uoit.ca	ERC4084	x5526	Wednesday 5:00 PM - 6:00 PM

Teaching Assistants

TA Name:	Email:	Office:	Office Hours:

Youssef El Haj	xiangqi.su@ontariotechu.net	TBA	TBA

TA Name:	Email:	Office:	Office Hours:
Ahmed Sheir	ahmed.sheir@ontariotechu.net	TBA	TBA

TA Name:	Email:	Office:	Office Hours:
Ehsan Fayazi Barjini	Ehsan.Fayazibarjini@uoit.ca	TBA	TBA

TA Name:	Email:	Office:	Office Hours:
		TBA	TBA

Reference Books and Information Sources:

- Fundamentals of Electric Circuits, 6th Edition, Charles K. Alexander and Matthew N.O. Sadiku, ISBN13: 9780078028229, McGraw-Hill Education (2017)
- Engineering Circuit Analysis, 9th Edition, William H. Hayt & Jack E. Kemmerly, ISBN13: 9780073545516, McGraw-Hill Education (2019)
- The Analysis and Design of Linear Circuits, 8th Edition, Roland E. Thomas, Albert J. Rosa, Gregory J. Toussaint, ISBN: 978-1119235385 Dec 2015
- Shaum's Outline Electric Circuits, 7th Edition, Mahmood Nahvi, Joseph A. Edminister, ISBN: 978-1-260-01197-5 2018

Course Organization and Delivery Mode:

3 lecture hours (two 1.5-hour slots) and 1.5 tutorial hours per week and 2 laboratory hours bi-weekly (five lab sessions in total).

Scheduled Regular Class Meeting Times:

Monday and Wednesday 3:40-5:00pm

Final Grade Breakdown:

- Midterm Test - 15%
- Assignments - 20%
- Lab Work and Lab Reports - 15%
- Final Exam - 50%
- in-class bonus 5%

Midterms

Midterm Location:

open book

Assignments:

Assignments:

Refer to CANVAS

Laboratories, Prelab Reports, Notes and Reports

Lab Description:

1. Lab Equipment and Software Familiarity
2. Measuring Voltage and Current, Verification of Ohm's and Kirchhoff's Law
3. Voltage and Current Dividers, Wheatstone Bridge
4. Basic Network Theorems
5. AC Signals and RC Circuits (Mechanical and Nuclear Programs)

Prelab Reports, Notes and Reports:

Lab Instructor: Leon Wu --- Email: Leon.Wu@uoit.ca

For any questions or concerns about the Labs, you need to contact Leon Wu directly.

Please note the following information pertaining to labs:

- Lab attendance, performance and reports are worth 15% of your grade.
- Labs run on an alternate week schedule. You must attend the lab session for which you have registered.
- Prior to commencing the first lab, ALL students are required to watch the training videos before coming to the lab.
- There are five regularly scheduled labs. These are listed in the course outline. The first lab is an introduction to the lab equiptment and software.
- In the first lab you will choose your lab partners. Labs will be done in groups of 2.
- Unless extenuating circumstances exist, you will remain in the same lab group for the entire semester. If extenuating circumstances exist, you may approach the lab coordinator to change your lab groups. This will be done at the sole discression of the lab coordinator.
- The laboratory evaluation will consist of three parts: Pre-lab Report; Conduct in the lab; Laboratory Report.
- Students are required to complete the Pre-lab Report and hand it in to the Laboratory coordinator at the start of the lab. They will not be permitted to start the lab until they have completed a satisfactory Pre-lab Report.
- You are expected to arrive to the laboratory promptly for the beggining of your session. Marks will be deducted from your lab grade if you arrive more than 15 minutes late to your laboratory session.
- Conduct in the lab will be evaluated by the Laboratory coordinator. Students are expected to be prepared for the lab, to conduct themselves effectively and safely, and to keep a notebook of laboratory experimental results. The results recorded in the notebook must be signed by the laboratory coordinator at the end of the experiment before leaving the laboratory, and the student is expected to have this notebook available throughout the term for inspection by the Instructor and/or Laboratory coordinator. The results reported in the laboratory reports must agree with the experimental results recorded in these notebooks. Further details are provided in the course laboratory manual.
- All lab reports are due two weeks after your scheduled laboratory session - lab reports must be submitted in the first 10 minutes of your next lab session. All lab reports must be submitted to the lab coordinator directly.
- Late laboratory reports will not be accepted. If a lab report is not received on time, it will receive a grade of zero.
- For those with labs in the week preceeding reading week, the lab coordinator will let the entire group know how/where to hand in your reports. This will be announced in the lab and if you are not able to follow the directions for the entire group you can try to make alternate arrangments with the lab coordinator.
- Missed labs can only be made up if a deferral for the lab is approved by the faculty academic advisor within four days after the missed lab. In this case, a specific time for a make up lab will be given to you by the lab coordinator.
- Any deferred lab will be individual work and you will be responsible for doing the work for that lab by yourself.
- Without approval for a deferral, missed labs will receive a grade of zero for that laboratory. No lab report can be submmitted if you have not attended the actual laboratory session.

Tutorials:

Tutorial times are listed above. Please take careful note of the information here.

- Tutorials will commence after the first week of classes.
- There are no tutorials during reading week.
- You must attend the tutorial section for which you have registered.

Computer Experience:

Students will extend their current knowledge in designing electric circuit using modeling and simulation tool such as Matlab, Simulink, LabVIEW, and Multisim, to design and evaluate and simulate different electric circuits. Although no specific simulation software is required, students are highly recommended to actively use circuit simulation software throughout the course to enhance their understanding of course material.

Summary of Important Dates and Marking Scheme:

- January 11 - First day of class
- April 9 - Last day of Class

- Midterm Test - 15%
- Assignments - 20%
- Lab Work and Lab Reports - 15%
- Final Exam - 50%
- in-class bonus 5%

Detailed Course Content:

Topics Covered Include:

- DC, Charges, Energy, Current, Voltage, Power
- Passive and Active Circuit ElementsKirchhoff's (Current and Volt) LawResistance Law, Equivalent Circuits
  - Resistors, Capacitors, Inductors,
  - Independent Voltage and Current Sources,
  - Dependent Sources,
  - Diodes, Op Amps, Transformers, etc.
- Node analysis, Mesh Analysis
- Superposition Principle
- Thevenin & Norton Theorem
- Capacitor in DC Circuits, Transient Analysis
- Magnetism, Inductance in DC Circuits, Transient Analysis
- AC Circuits, Network Analysis, Series / Parallel
- Phasor Solutions
- AC Power, Complex Power, Power Factor
- Frequency Response, Resonance
- Three phase circuits
- Introduction to Transformers / Amplifiers / Diodes / Transistors

Other Course Information:

Deferred Midterm Exam

No deferred or supplementary Midterms will be entertained, and a mark of zero will be assigned if the examination is not written when scheduled. For medical reason or other exceptional circumstances, please see the faculty academic advisor's office immediately (refer to section "Medical Certificates and Deferred Exams" below). In such case, the marks weighting of the missed examination may be transferred to the final exam upon the academic advisor's determination only.

Medical Certificates and Deferred Exams:

Medical statements and academic consideration forms for any missed student work worth 25% or less (not including midterms or tests) will be submitted directly to the course instructor. This includes missed quizzes, assignments and labs. Missed Midterms or Coursework Worth More than 25% For any missed midterms or tests, regardless of weight, or coursework worth more than 25%, students will need to submit the UOIT Medical statement or academic consideration form to the Engineering Advising Office following the form guidelines.

Guidelines for Medical Statements: Medical statements cover any missed work due to a medical reasons. The student must:

- see a medical doctor within 24 hours of the missed work
- submit the form to the correct individual within 3 working days

Guidelines for Academic Consideration Forms: Academic consideration forms cover any missed work for non-academic grounds, for example, religious observations, court appearance, personal/family emergency, varsity events. The student must provide supporting documentation if deemed necessary.

Should the medical certificate proven to be invalid due to any kind of action by the student, such student's behaviour will be considered as a major misconduct and respective disciplinary actions will be commenced.

Failure to comply with the above will result in an mark of 0 for the exam.

Students with disabilities may request to be considered for formal academic accommodation in accordance with the Ontario Human Rights Code. Students seeking accommodation must make their requests through the Centre for Students with Disabilities in a timely manner, and provide relevant and recent documentation to verify the effect of their disability and to allow the University to determine appropriate accommodations.

Accommodation decisions will be made in accordance with the Ontario Human Rights Code. Accommodations will be consistent with and supportive of the essential requirements of courses and programs, and provided in a way that respects the dignity of students with disabilities and encourages integration and equality of opportunity. Reasonable academic accommodation may require instructors to exercise creativity and flexibility in responding to the needs of students with disabilities while maintaining academic integrity.

Student Support

Any student who faces challenges securing their food or housing and believes this may affect their performance in the course is urged to contact studentlife@ontariotechu.ca for support. Furthermore, please notify your professor if you are comfortable in doing so. This will enable them to provide any resources and help that they can.

Sexual Violence Support and Education

Ontario Tech is committed to the prevention of sexual violence in all is forms. For any student who has experienced Sexual Violence, Ontario Tech can help. We will make accommodations to cater to the diverse backgrounds, cultures, and identities of students when dealing with individual cases. If you think you have been subjected to or witnessed sexual violence:

- Reach out to a Support Worker, a specially trained individual authorized to receive confidential disclosures about incidents of sexual violence. Support Workers can offer help and resolution options which can include safety plans, accommodations, mental health support, and more. To make an appointment with a Support Worker, call 905.721.3392 or email studentlife@ontariotechu.ca
- Learn more about your options at: https://studentlife.ontariotechu.ca/sexualviolence/

Students with Disabilities

Accommodating students with disabilities at Ontario Tech is a responsibility shared among various partners: the students themselves, SAS staff and faculty members. To ensure that disability-related concerns are properly addressed during this course, students with documented disabilities and who may require assistance to participate in this class are encouraged to speak with me as soon as possible. Students who suspect they have a disability that may affect their participation in this course are advised to go to Student Accessibility Services (SAS) as soon as possible. Maintaining communication and working collaboratively with SAS and faculty members will ensure you have the greatest chance of academic success.

Students taking courses on north Oshawa campus can visit Student Accessibility Services in the Student Life Building, U5, East HUB (located in the Founders North parking lot). Students taking courses on the downtown Oshawa campus can visit Student Accessibility Services in the 61 Charles St. Building, 2nd Floor, Room DTA 225 in the Student Life Suite.

Disability-related and accommodation support is available for students with mental health, physical, mobility, sensory, medical, cognitive, or learning challenges. Office hours are 8:30am-4:30pm, Monday to Friday, closed Wednesday's 8:30am – 10:00am. For more information on services provided, you can visit the SAS website at https://studentlife.ontariotechu.ca/services/accessibility/index.php. Students may contact Student Accessibility Services by calling 905-721-3266, or email studentaccessibility@ontariotechu.ca.

Students who require the use of the Test Centre to write tests, midterms, or quizzes MUST register online using the SAS test/exam sign-up module, found here https://disabilityservices.ontariotechu.ca/uoitclockwork/custom/misc/home.aspx. Students must sign up for tests, midterms, or quizzes AT LEAST seven (7) days before the date of the test.

Students must register for final exams by the registration deadline, which is typically two (2) weeks prior to the start of the final examination period. SAS will notify students of the registration deadline date.

Professional Conduct

All students who are enrolled in engineering programs must demonstrate behaviour appropriate to practice in engineering profession. Where Faculty dean determines that behaviour inconsistent with the norms and expectations of the profession has been exhibited by a student, that student may be immediately withdrawn from the program by the dean or subject to one or more of the sanctions described in the professional suitability policy: http://calendar.uoit.ca/content.php?catoid=22&navoid=879#Academic_conduct

A student demonstrating professional unsuitability may be immediately suspended from any practicum, field work or similar activity at the discretion of the dean pending a final decision.

Academic Integrity

Students and faculty at Ontario Tech University share an important responsibility to maintain the integrity of the teaching and learning relationship. This relationship is characterized by honesty, fairness and mutual respect for the aim and principles of the pursuit of education. Academic misconduct impedes the activities of the university community and is punishable by appropriate disciplinary action.

Students are expected to be familiar with and abide by Ontario Tech University's regulations on Academic Conduct which sets out the kinds of actions that constitute academic misconduct, including plagiarism, copying or allowing one's own work to copied, use of unauthorized aids in examinations and tests, submitting work prepared in collaboration with another student when such collaboration has not been authorized, among other academic offences. The regulations also describe the procedures for dealing with allegations, and the sanctions for any finding of academic misconduct, which can range from a resubmission of work to a failing grade to permanent expulsion from the

university. A lack of familiarity with these regulations on academic conduct does not constitute a defense against its application. This information can be found at http://calendar.uoit.ca/content.php?catoid=22&navoid=879#Academic_conduct

Extra support services are available to all Ontario Tech University students in academic development, study skills, counseling, and peer mentorship. More information on student support services can be found at https://studentlife.ontariotechu.ca/services/academic-support/index.php

Turnitin

Ontario Tech University and faculty members reserve the right to use electronic means to detect and help prevent plagiarism. Students agree that by taking this course all assignments are subject to submission for textual similarity review by Turnitin.com. Assignments submitted to Turnitin.com will be included as source documents in Turnitin.com's restricted access database solely for the purpose of detecting plagiarism in such documents. The instructor may require students to submit their assignments electronically to Turnitin.com or the instructor may submit questionable text on behalf of a student. The terms that apply to Ontario Tech University's use of the Turnitin.com service are described on the Turnitin.com website.

Students who do not wish to have their work submitted to Turnitin.com must provide with their assignment at the time of submission to the instructor a signed Turnitin.com Assignment Cover sheet:

https://shared.uoit.ca/shared/department/academic-integrity/Forms/assignment-cover-sheet.pdf

Online Test and Exam Proctoring (Virtual Proctoring)

To maintain academic integrity in online testing, your instructor may require the use of Respondus LockDown Browser and Respondus Monitor or a similar virtual proctoring platform. In doing so, you will be required to use a computer with a webcam (either built-in or USB plug in). Please advise your instructor as soon as possible if you do not have a computer with a camera.

This is a link to a short video that explains the basics of Respondus LockDown Browser.

Final Examinations (if applicable)

Final examinations are held during the final examination period at the end of the semester and may take place in a different room and on a different day from the regularly scheduled class. Check the published Examination Schedule for a complete list of days and times.

Students are advised to obtain their Student ID Card well in advance of the examination period as they will not be able to write their examinations without it. Cards are available from the Campus ID office in the Campus Recreation and Wellness Centre, Room G1004.

Students who are unable to write a final examination when scheduled due to religious publications may make arrangements to write a deferred examination. These students are required to submit a Request for Accommodation for Religious Obligations to the Faculty concerned as soon as possible and no later than three weeks prior to the first day of the final examination period.

Further information on final examinations can be found at https://usgc.ontariotechu.ca/policy/policy-library/policies/academic/procedures-for-final-examination-administration.php

Freedom of Information and Protection of Privacy Act

The following is an important notice regarding the process for submitting course assignments, quizzes, and other evaluative material in your courses in the Faculty of Engineering and Applied Science.

Ontario Tech University is governed by the Freedom of Information and Protection of Privacy Act ("FIPPA"). In addition to providing a mechanism for requesting records held by the university, this legislation also requires that the University not disclose the personal

information of its students without their consent.

FIPPA's definition of "personal information" includes, among other things, documents that contain both your name and your Banner (student) ID. For example, this could include graded test papers or assignments. To ensure that your rights to privacy are protected, the Faculty of [Insert Faculty name] encourages you to use only your Banner ID on assignments or test papers being submitted for grading. This policy is intended to prevent the inadvertent disclosure of your information where graded papers are returned to groups of students at the same time. If you still wish to write both your name and your Banner ID on your tests and assignments, please be advised that Ontario Tech University will interpret this as an implied consent to the disclosure of your personal information in the normal course of returning graded materials to students.

If you have any questions or concerns relating to the new policy or the issue of implied consent addressed above, please contact accessandprivacy@ontariotechu.ca

Student Course Feedback Surveys

Student evaluation of teaching is a highly valued and helpful mechanism for monitoring the quality of Ontario Tech University's programs and instructional effectiveness. To that end, course evaluations are administered by an external company in an online, anonymous process during the last few weeks of classes. Students are encouraged to participate actively in this process and will be notified of the dates. Notifications about course evaluations will be sent via e-mail, and posted on Canvas, Weekly News, and signage around the campus.

The Accessibility for Ontarians with Disabilities Act (AODA) standards have been considered in the development of this model course outline and it adheres to the principles outlined in the University's Accessibility Policy.

Notice of Collection and Use of Personal Information

Throughout this course, personal information may be collected through the use of certain technologies under the authority of the *University of Ontario Institute of Technology Act, SO 2002, c. 8, Sch. O.* and will be collected, protected, used, disclosed and retained in compliance with Ontario's *Freedom of Information and Protection of Privacy Act R.S.O. 1990, c. F.31.*

This course may use the following technologies that may collect, use, disclose and retain personal information (including images) for the purposes described below:

- Respondus Monitor and Proctortrack to maintain academic integrity for examinations.
- Google Meet and Kaltura Virtual Classroom to facilitate remote instruction and interactive learning.
- Peer-shared applications, services or technologies that may be reviewed, assessed, or used as part of coursework.
- Other applications, services, or technologies that support or enhance online learning.

For more information relating to these technologies, we encourage you to visit: https://tlc.ontariotechu.ca/learning-technology/index.php Questions regarding personal information may be directed to: Ontario Tech University Access and Privacy Office, 2000 Simcoe Street North, Oshawa, ON L1G 0C5, email: accessandprivacy@ontariotechu.ca.

By remaining enrolled in this course, you acknowledge that you have read, understand and agree to the terms and conditions under which the technology provider(s) may collect, use, disclose and retain your personal information. You agree to the university using the technologies and using your personal information for the purposes described in this course outline.

Technology Requirements

To support online learning, the university recommends certain technology requirements for laptops, software and internet connectivity which are available at: https://itsc.ontariotechu.ca/remote-learning.php.

Students experiencing technical difficulties such that they are unable to meet the technology requirements may contact the IT Service Help Desk at: servicedesk@dc-uoit.ca

Students experiencing financial difficulties such that they are unable to meet the technology requirements may contact Student Awards and Financial Aid Office at: connect@ontariotehu.ca

By remaining enrolled in this course, you acknowledge that you have read, understand and agree to observe the Recommended Technology Requirements for accessing university online learning resources, including those minimum requirements that are specific to your faculty and program.

Virtual Monitoring of Examinations

Ontario Tech University will conduct virtual monitoring of examinations in accordance with Ontario privacy legislation and all approved policy instruments.

Sensitive/Offensive Subject Matter

The classroom (both physical and virtual) is intended to provide a safe, open space for the critical and civil exchange of ideas and opinions. Some articles, media and other course materials may contain sensitive content that is offensive and/or disturbing. The Course Instructor will try to identify such material and communicate warnings[MG1] to students in advance of the distribution and use of such materials, affording students the choice to either emotionally prepare for, or not to view or interact with, the content.

Freedom of Expression

Pursuant to Ontario Tech's Freedom of Expression Policy all students are encouraged to express ideas and perspectives freely and respectfully in university space and in the online university environment, subject to certain limitations. Students are reminded that the limits on Freedom of Expression include speech or behaviour that: is illegal or interferes with the university's legal obligations; defames an individual or group; constitutes a threat, harassment or discrimination; is a breach of fiduciary, contractual, privacy or confidentiality obligations or commitments; and unduly disrupts and interferes with the functioning of the university. In the context of working online, different forms of communication are used. Where permitted, students using "chat" functions or other online forms of communication are encouraged to ensure that their communication complies with the Freedom of Expression Policy.

University Response to COVID-19

The government response to the COVID-19 pandemic is continually evolving. As new information becomes available from federal and provincial public health authorities, the Province of Ontario and the Regional Municipality of Durham, Ontario Tech University will remain nimble and prepared to respond to government orders, directives, guidelines and changes in legislation to ensure the health and safety of all members of its campus community. In accordance with public health recommendations, the university may need to adjust the delivery of course instruction and the availability and delivery mode of campus services and co-curricular opportunities. Ontario Tech University appreciates the understanding and flexibility of our students, faculty and staff as we continue to navigate the pandemic and work together to demonstrate our strong commitment to academic, research and service excellence during these challenging and unprecedented times.

Ontario Tech University
Faculty of Engineering and Applied Science
Department of Electrical, Computer and Software Engineering

Course Outline
ENGR 2100U
Computational Engineering Applications
Winter 2021

Offering Approval:

Approved

Course Description:

Introduction to MATLAB, the engineering applications of MATLAB to the following areas: solving systems of linear algebraic equations, interpolation and curve fitting, finding the roots of equations, numerical differentiation and numerical integration using MATLAB, solving initial value problems, solving two-point boundary value problems, solving symmetric matrix eigenvalue problems, introduction to engineering design optimization using MATLAB.

Major Topics:

Graduate Attributes:

The graduate attributes developed and required by the Canadian Engineering Accreditation Board's Accreditation Criteria and Procedures are listed below, with those covered in the course to some degree (introduced, developed, applied).

Attributes	Covered in this Course
Knowledge base	✓
Problem analysis	✓
Investigation	✓
Design	✗
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	✓

Course Content Breakdown

Math	Basic Science	Complementary Studies	Engineering Science	Engineering Design
50%	0%	0%	50%	0%

Instructors

Instructor:	Email:	Office:	Phone:	Office Hours:
Dr. Masoud Farzam	masoud.farzam@uoit.ca	ENG3040A	905-721-8668(X2851)	Fridays 12:30pm-1:30pm

Teaching Assistants

TA Name:	Email:	Office:
Sara Sharifi	sara.Sharifi@uoit.ca	TBD

TA Name:	Email:	Office:

Required Course Text and Other Materials:

- Applied Numerical Methods with MATLAB® for Engineers and Scientists, 4/e" by Chopra. ISBN-13: 978-0073397962

Reference Books and Information Sources:

- Programming with MATLAB for Engineers, James B. Riggs

Course Organization and Delivery Mode:

- 3 lecture hours per week and 1.5 laboratory hours weekly for one semester
- Lectures: Tuesday and Thursday 11:10 am - 12:30, Location: Online through google classroom . Class code is : **inj7w7r**
- Labs: 3:40-5pm , Mondays Location: online through google classroom

- Tutorials: Mondays 11:10 -12:30, Location: Online through google meet

Scheduled Regular Class Meeting Times:

Tuesday and Thursday 11:10 am - 12:30,

Final Grade Breakdown:

Assignments	11%	11 assignments.
Labs	32 %	10 labs including the lab project
In-class assignments	22%	11 in-class assignment during lectures
Final Exam	30 %	Comprehensive exam including the entire course materials
Final Project	5 %	Curse project

Midterms

Midterm Location:

There is no midterm

Assignments:

- Assignments will be given roughly every weeks. Solutions to the assignment will be posted on Blackboard. Some problems will be solved in tutorial time by course TA.
- The problems may be used for questions in midterm . Thus, doing the assignments are very important and useful, and leads to better test/exam grade.

Laboratories, Prelab Reports, Notes and Reports

Lab Description:

1. Intro lab
2. Programming in Matlab
3. Finding roots of equations

4. Linear algebraic equations
5. Interpolation and curve fitting
6. Optimization
7. Matrix eigenvalue problems
8. Numerical differentiation and integration
9. Solving initial value problems
10. Lab project

Prelab Reports, Notes and Reports:

- **You need to pass the lab (minimum of 60% of total lab mark) to pass the course**
- **Lab project is mandatory and has 5% mark**
- All matters related to the lab must be brought to the attention of your lab instructor
- There are 9 equally-valued experiments with a lab project
- All information relevant to the lab (i.e., lab manual and equipment manual) are posted on Canvas. They must be read carefully and followed thoroughly before going to the lab, so that you will have the pre-lab work ready and know what you are supposed to do in the lab. It may be useful to have a print-out of the experiment sheets for each lab.
- **Lab activity has to be completed in the lab. TA will check the activities in the lab and ask questions from random groups to verify your work. The wrong answer to the question will result in losing the 20% activity mark.**
- There should be four students in a group. Students must actively involve in the lab work.
- There will be no makeup for labs. For any lab missed by the students due to medical emergencies, the average of previous and next mark will be considered. It is the student's responsibility to submit proper documents and proofs. Missing a lab with no approval will result in a zero mark.
- A single file Lab report (Word or PDF) including prelab and screenshot of lab activities as well as Matlab files will be submitted by the end of each lab session.

The breakdown of the mark for each lab:
– Pre-Lab activity: 50%
– Lab activity: 50%

- Lab report: 70%

Tutorials:

All matters related to the lab must be brought to the attention of your Lab TA .

The tutorials will be conducted by the TA for the following purposes

- Providing example problems related to the theory learned in the class and detailed methods of solution in front of class. Problems similar to exam questions will be solved.
- Discussing selected previous assignment problems.
- Answering questions about the course materials and assignments.

Computer Experience:

- Google classroom will be used for lecture and labs
- Computer is used for simulating systems and for lab report preparation.
- MATLAB and Simulink will be used.
- Canvas will be used to provide course material and assignments.

Summary of Important Dates and Marking Scheme:

The final will be closed-book and closed-note. It is the university policy that every student must show his/her own student ID to the exam. Fail to do so will fail the course.

Please check the policy on Medical Certificates and Deferred Exams. Failure to comply with the above will result in a zero for the midterm.

Detailed Course Content:

1. Introduction to Matlab
2. Programming in Matlab
3. Simulink tools
4. Finding roots of equations
5. Linear algebraic equations
6. Interpolation and curve fitting
7. Optimization
8. Matrix eigenvalue problems
9. Numerical differentiation and integration
10. Solving initial value problems

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Ontario Tech University and faculty members reserve the right to use electronic means to detect and help prevent plagiarism. Students agree that by taking this course all assignments are subject to submission for textual similarity review by Turnitin.com. Assignments submitted to Turnitin.com will be included as source documents in Turnitin.com's restricted access database solely for the purpose of detecting plagiarism in such documents. The instructor may require students to submit their assignments electronically to Turnitin.com or the instructor may submit questionable text on behalf of a student. The terms that apply to Ontario Tech University's use of the Turnitin.com service are described on the Turnitin.com website.

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https://shared.uoit.ca/shared/department/academic-integrity/Forms/assignment-cover-sheet.pdf

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Final examinations are held during the final examination period at the end of the semester and may take place in a different room and on a different day from the regularly scheduled class. Check the published Examination Schedule for a complete list of days and times.

Students are advised to obtain their Student ID Card well in advance of the examination period as they will not be able to write their examinations without it. Cards are available from the Campus ID office in the Campus Recreation and Wellness Centre, Room G1004.

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FIPPA's definition of "personal information" includes, among other things, documents that contain both your name and your Banner (student) ID. For example, this could include graded test papers or assignments. To ensure that your rights to privacy are protected, the Faculty of [Insert Faculty name] encourages you to use only your Banner ID on assignments or test papers being submitted for grading. This policy is intended to prevent the inadvertent disclosure of your information where graded papers are returned to groups of students at the same time. If you still wish to write both your name and your Banner ID on your tests and assignments, please be advised that Ontario Tech University will interpret this as an implied consent to the disclosure of your personal information in the normal course of returning graded materials to students.

If you have any questions or concerns relating to the new policy or the issue of implied consent addressed above, please contact accessandprivacy@ontariotechu.ca

Student Course Feedback Surveys

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The Accessibility for Ontarians with Disabilities Act (AODA) standards have been considered in the development of this model course outline and it adheres to the principles outlined in the University's Accessibility Policy.

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Throughout this course, personal information may be collected through the use of certain technologies under the authority of the *University of Ontario Institute of Technology Act, SO 2002, c. 8, Sch. O.* and will be collected, protected, used, disclosed and retained in compliance with Ontario's *Freedom of Information and Protection of Privacy Act R.S.O. 1990, c. F.31.*

This course may use the following technologies that may collect, use, disclose and retain personal information (including images) for the purposes described below:

- Respondus Monitor and Proctortrack to maintain academic integrity for examinations.
- Google Meet and Kaltura Virtual Classroom to facilitate remote instruction and interactive learning.
- Peer-shared applications, services or technologies that may be reviewed, assessed, or used as part of coursework.
- Other applications, services, or technologies that support or enhance online learning.

For more information relating to these technologies, we encourage you to visit: https://tlc.ontariotechu.ca/learning-technology/index.php Questions regarding personal information may be directed to: Ontario Tech University Access and Privacy Office, 2000 Simcoe Street North, Oshawa, ON L1G 0C5, email: accessandprivacy@ontariotechu.ca.

By remaining enrolled in this course, you acknowledge that you have read, understand and agree to the terms and conditions under which the technology provider(s) may collect, use, disclose and retain your personal information. You agree to the university using the technologies and using your personal information for the purposes described in this course outline.

Technology Requirements

To support online learning, the university recommends certain technology requirements for laptops, software and internet connectivity which are available at: https://itsc.ontariotechu.ca/remote-learning.php.

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Ontario Tech University

Faculty of Energy Systems and Nuclear Science

Course Outline

NUCL 1530U

Radiation and Nuclear Technologies

Winter 2021

Offering Approval:

Approved

Course Description:

This course provides an introduction and overview of the application of radiation and nuclear technologies in society with particular emphasis on energy production, the environment and medicine. The importance of safety in general and radiation safety in particular is also covered. A principal aim of the course is to provide students with a broad overview of the many practical applications of radiation and nuclear technologies and the role of scientists and engineers in the development of these technologies for the betterment of society and the protection of the environment.

Major Topics:

Graduate Attributes:

The graduate attributes developed and required by the Canadian Engineering Accreditation Board's Accreditation Criteria and Procedures are listed below, with those covered in the course to some degree (introduced, developed, applied).

Attributes	Covered in this Course
Knowledge base	✓
Problem analysis	✕
Investigation	✕
Design	✕
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	✓

Course Content Breakdown

Math	Basic Science	Complementary Studies	Engineering Science	Engineering Design
0%	50%	0%	50%	0%

Course Outcomes:

- Understand the nuclear profession and what `Nuclear Professionalism' is and requires.
- Understand conventional safety basics and what is expected in the workplace.
- Understand how to use resources (digital, operating experience, input from others…) to make best decisions and stay current.
- Understand the basics of radiation interaction with matter and radiation measurement.
- Understand the role nuclear generation serves in the world today, and its future possibilities.
- Understand the importance of and the approach of regulation in the industry.
- Understand the role of nuclear with respect to society and the environment.
- Understand the program, and the importance of the program content, and techniques to be successful at university.
- Understand the history and evolution of nuclear power.

Instructors

Instructor:	Email:	Office:	Phone:	Office Hours:
Dr. Glenn Harvel, B. Eng., M. Eng. PhD., P. Eng.	glenn.harvel@ontariotechu.ca	ERC4032	9057218668 x5508	Friday 11:00 to 12:30

Teaching Assistants

TA Name:	Email:	Office:	Office Hours:
Nicholas Somer	nicholas.somer@ontariotechu.net	ERC4100	Friday 2:00-3:00

Required Course Text and Other Materials:

- NA

Reference Books and Information Sources:

- Radioactivity Radionuclides Radiation, J.Magil and J. Galy (optional)

Course Organization and Delivery Mode:

The course is composed of twenty four 1 ½ lecture modules. Scheduling may change from year to year and may involve 1 ½ hour modules scheduled back to back to accommodate specific aspects of the course such as field activity. There will be a series of twelve one hour tutorials to support the learning.

Scheduled Regular Class Meeting Times:

two lectures of 1.5 hours each week with one office hour with the instructure and one office hour with the teachining assistant.

Every other week, there is a 1.5 hour tutorial.

Final Grade Breakdown:

Assignments	20%
White Paper	10%
Mini-Project	10%
Midterm Exam	25%
Final Exam	35%

Midterms

Midterm Date:	Midterm Location:
Thursday, February 25, 2021 - 11:10 to 12:30	Online during class

Assignments:

There are four assignments to be completed during the term. Students will have at least 2 weeks to complete each assignment. The assignments will be marked by the TA.

There will be a White Paper project to be completed individually and a mini-project to be completed as a group.

Laboratories, Prelab Reports, Notes and Reports

Lab Description:

1. NA

Prelab Reports, Notes and Reports:

NA

Tutorials:

The semester will feature six, 1 ½ tutorial Bi weekly (9hours total) of tutorial designed to support student learning for the radiation science portion of the course. This may involve fieldwork activities.

Computer Experience:

Students will be expected to use MS Word and MS Excel or similar products to complete the assignments and projects.

Summary of Important Dates and Marking Scheme:

Midterm: February 23, 2021

Assignments: Approximately every other week

Note: We may be able to access the Minerva course material regarding Safety. If possible, then the Minerva course 100 and 200 completion by end of the semester is planned

Detailed Course Content:

This course is the only nuclear engineering and radiation science course delivered in your first year. It is the basis for all subsequent courses, and it represents a kernel introduction to your nuclear engineering/radiation science program. The course is delivered in the form of a series of modules and provides an overview of nuclear and radiation technologies in modern society. Module topics cover fundamentals of nuclear and radiation science, basics of the fuel cycle, radiation sources type and classifications, principle of radiation detection, and radiation applications. The course also provides an overview of safety and quality fundamentals and their applications in nuclear systems and technologies. This includes an introduction to nuclear reactors, basics of safety management & culture, concepts of defense in depth, basics of safety analysis, human performance and quality management and what it means to be a nuclear engineer. The course also explores briefly careers in nuclear engineering/radiological and health physics.

Other Course Information:

NUCL 1530U introduces concepts that produce the following outcomes. The successful student:

- Understands the nuclear profession and what `Nuclear Professionalism' is and requires
- Understands conventional safety basics and what is expected in the workplace
- Understands how to use resources (digital, operating experience, input from others…) to make best decisions and stay current
- Understands the basics of radiation interaction with matter
- Understands the role nuclear generation serves in the world today, and its future possibilities
- Understands the importance of and the approach of regulation in the industry
- Understands the role of nuclear with respect to society and the environment
- Understands the UTO / FESNS program, and the importance of the program content, and techniques to be successful at university
- Understands the history, evolution of nuclear power

Medical Certificates and Deferred Exams:

Medical statements and academic consideration forms for any missed student work worth 25% or less (not including midterms or tests) will be submitted directly to the course instructor. This includes missed quizzes, assignments and labs. Missed Midterms or Coursework Worth More than 25% For any missed midterms or tests, regardless of weight, or coursework worth more than 25%, students will need to submit the UOIT Medical statement or academic consideration form to the Engineering Advising Office following the form guidelines.

Guidelines for Medical Statements: Medical statements cover any missed work due to a medical reasons. The student must:

- see a medical doctor within 24 hours of the missed work
- submit the form to the correct individual within 3 working days

Guidelines for Academic Consideration Forms: Academic consideration forms cover any missed work for non-academic grounds, for example, religious observations, court appearance, personal/family emergency, varsity events. The student must provide supporting documentation if deemed necessary.

Should the medical certificate proven to be invalid due to any kind of action by the student, such student's behaviour will be considered as a major misconduct and respective disciplinary actions will be commenced.

Failure to comply with the above will result in an mark of 0 for the exam.

Students with disabilities may request to be considered for formal academic accommodation in accordance with the Ontario Human Rights Code. Students seeking accommodation must make their requests through the Centre for Students with Disabilities in a timely manner, and provide relevant and recent documentation to verify the effect of their disability and to allow the University to determine appropriate accommodations.

Accommodation decisions will be made in accordance with the Ontario Human Rights Code. Accommodations will be consistent with and supportive of the essential requirements of courses and programs, and provided in a way that respects the dignity of students with disabilities and encourages integration and equality of opportunity. Reasonable academic accommodation may require instructors to exercise creativity and flexibility in responding to the needs of students with disabilities while maintaining academic integrity.

Student Support

Any student who faces challenges securing their food or housing and believes this may affect their performance in the course is urged to contact studentlife@ontariotechu.ca for support. Furthermore, please notify your professor if you are comfortable in doing so. This will enable them to provide any resources and help that they can.

Sexual Violence Support and Education

Ontario Tech is committed to the prevention of sexual violence in all is forms. For any student who has experienced Sexual Violence, Ontario Tech can help. We will make accommodations to cater to the diverse backgrounds, cultures, and identities of students when dealing with individual cases. If you think you have been subjected to or witnessed sexual violence:

- Reach out to a Support Worker, a specially trained individual authorized to receive confidential disclosures about incidents of sexual violence. Support Workers can offer help and resolution options which can include safety plans, accommodations, mental health support, and more. To make an appointment with a Support Worker, call 905.721.3392 or email studentlife@ontariotechu.ca
- Learn more about your options at: https://studentlife.ontariotechu.ca/sexualviolence/

Students with Disabilities

Accommodating students with disabilities at Ontario Tech is a responsibility shared among various partners: the students themselves, SAS staff and faculty members. To ensure that disability-related concerns are properly addressed during this course, students with documented disabilities and who may require assistance to participate in this class are encouraged to speak with me as soon as possible. Students who suspect they have a disability that may affect their participation in this course are advised to go to Student Accessibility Services (SAS) as soon as possible. Maintaining communication and working collaboratively with SAS and faculty members will ensure you have the greatest chance of academic success.

Students taking courses on north Oshawa campus can visit Student Accessibility Services in the Student Life Building, U5, East HUB (located in the Founders North parking lot). Students taking courses on the downtown Oshawa campus can visit Student Accessibility Services in the 61 Charles St. Building, 2nd Floor, Room DTA 225 in the Student Life Suite.

Disability-related and accommodation support is available for students with mental health, physical, mobility, sensory, medical, cognitive, or learning challenges. Office hours are 8:30am-4:30pm, Monday to Friday, closed Wednesday's 8:30am – 10:00am. For more information on services provided, you can visit the SAS website at https://studentlife.ontariotechu.ca/services/accessibility/index.php. Students may contact Student Accessibility Services by calling 905-721-3266, or email studentaccessibility@ontariotechu.ca.

Students who require the use of the Test Centre to write tests, midterms, or quizzes MUST register online using the SAS test/exam sign-up module, found here https://disabilityservices.ontariotechu.ca/uoitclockwork/custom/misc/home.aspx. Students must sign up for tests, midterms, or quizzes AT LEAST seven (7) days before the date of the test.

Students must register for final exams by the registration deadline, which is typically two (2) weeks prior to the start of the final examination period. SAS will notify students of the registration deadline date.

Professional Conduct

All students who are enrolled in engineering programs must demonstrate behaviour appropriate to practice in engineering profession. Where Faculty dean determines that behaviour inconsistent with the norms and expectations of the profession has been exhibited by a student, that student may be immediately withdrawn from the program by the dean or subject to one or more of the sanctions described in the professional suitability policy: http://calendar.uoit.ca/content.php?catoid=22&navoid=879#Academic_conduct

A student demonstrating professional unsuitability may be immediately suspended from any practicum, field work or similar activity at the discretion of the dean pending a final decision.

Academic Integrity

Students and faculty at Ontario Tech University share an important responsibility to maintain the integrity of the teaching and learning relationship. This relationship is characterized by honesty, fairness and mutual respect for the aim and principles of the pursuit of education. Academic misconduct impedes the activities of the university community and is punishable by appropriate disciplinary action.

Students are expected to be familiar with and abide by Ontario Tech University's regulations on Academic Conduct which sets out the kinds of actions that constitute academic misconduct, including plagiarism, copying or allowing one's own work to copied, use of unauthorized aids in examinations and tests, submitting work prepared in collaboration with another student when such collaboration has not been authorized, among other academic offences. The regulations also describe the procedures for dealing with allegations, and the sanctions for any finding of academic misconduct, which can range from a resubmission of work to a failing grade to permanent expulsion from the university. A lack of familiarity with these regulations on academic conduct does not constitute a defense against its application. This information can be found at http://calendar.uoit.ca/content.php?catoid=22&navoid=879#Academic_conduct

Extra support services are available to all Ontario Tech University students in academic development, study skills, counseling, and peer mentorship. More information on student support services can be found at https://studentlife.ontariotechu.ca/services/academic-support/index.php

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FACULTY OF SCIENCE

STAT2800U: Statistics & Probability for Engineers
&
STAT2010U: Statistics & Probability for Physical Sciences

Course outline for Winter, 2021

1. Course Details & Important Dates*

Course Type	CRN	Day	Time	Location
Synchronous Lecture	74558 70247 70248	T/R T/R T/R	11:10-12:30 pm 11:10-12:30 pm 12:40-2 pm	Synchronous Synchronous Synchronous

Classes Start	Classes End	Final Exam Period
Jan 11, 2021	Apr 9, 2021	Apr 14 – 25, 2021

See below "Outline of Topics in this Course" for a detailed week by week breakdown of synchronous lectures.

NOTE: every lecture will be a synchronous lecture that will take place virtually using Google Meet. See announcements for more information on how to access your lecture.

NOTE: Additional important information will be posted in "Announcements" throughout the semester -- make sure you stay up to date on this. We recommend that you turn on the setting that a copy of announcements be sent to your university e-mail account immediately.

* for other important dates go to: www.ontariotechu.ca >Current Students >Important Dates and Deadlines

2. Instructor Contact Information

Instructor Name	Office	Phone	Email
Paula Di Cato (all sections)	N/A	N/A	Please use Canvas E-mail
Office Hours: See the office hours link in Canvas for day/time. To access office hours, use the following link: https://meet.google.com/dct-tdtc-xfi			

Grader/Teaching Assistant Name	Office	Phone	Email
Ruth Li	N/A	N/A	Please use Canvas E-mail
Sophie Castel	N/A	N/A	Please use Canvas E-mail
Office Hours: See the office hours link in Canvas for day/time/google meet link.			

3. Course Description

This course introduces the concepts and techniques of statistics and probability to collect, present, analyze and interpret data, and make decisions in the presence of variability. Students study a selection of topics relevant to engineering science, selected from basic concepts of probability theory: data, populations and samples; probabilities for discrete and continuous distributions; mean, variance, and moments for a variety of distributions; estimation; hypothesis testing; analysis of variance; introduction to quality control; regression analysis; applications to problems in science and engineering. SAS statistical software will be used as an integral part of the course.

4. Learning Outcomes

On the successful completion of the course, students will be able to:
Describe, interpret and analyze data. Calculate summary statistics such as central tendencies, dispersion, quartiles and percentiles. Graphically display data using histograms, stem-and-leaf plots and boxplots. Describe shape and skewness of data. Compute the probability of an event, marginal, joint and conditional probabilities. Describe the concept of random variables, and setting up a discrete mass function. Identify a variety of probability distributions, both discrete and continuous and the ability to calculate various probabilities, and distribution summary statistics. Computing confidence intervals for both large and small sample sizes based on a single mean. Distinguish between independent, paired or pooled data and calculating confidence intervals based on the difference between two means. Write a testable hypothesis and explain the difference between the null and alternative hypothesis. Define statistical significance and explain the meaning of a p-value. Carry out a hypothesis test for both univariate (large and small sample size) and bivariate data (independent, paired or pooled). Describe the purpose and calculate Pearson Correlation Coefficient as well as the least squares line and goodness of fit. Applying all learning outcomes stated above in SAS (statistical analysis system).

5. Course Design

Each week you will have 2 synchronous lectures (through Google Meet). Your 1st synchronous lecture will be on Tuesday Jan 12. A total of 6 online timed quizzes (in Mobius) will be completed throughout the duration of the course, consisting of 10 multiple choice/true false/fill in the blank questions (see below "Assignment and Tests" to view a detailed breakdown of quiz dates). 10 assignments will be completed based on the material taught throughout the course. Pop quizzes in lecture will allow for practice and feedback. SAS software will be used near the end of the semester in lectures, quizzes and assignments. One midterm and 1 final exam.

6. Outline of Topics in the Course

Week 1 (Jan 11-15) *Chapter 1: Sampling and Descriptive Statistics*

- Sampling (Section 1.1);
- Summary Statistics (Section 1.2);

- Graphical Summaries (Section 1.3).

Week 2 (Jan 18-22) *Chapter 2: Probability*

- Basic Ideas (Section 2.1).

- Counting Methods (Section 2.2);
- Conditional Probability and Independence (Section 2.3).

Week 3 (Jan 25-29) *Chapter 2: Probability & Chapter 4: Commonly Used Dist'n*

- Random Variables (Section 2.4).

- Random Variables –Cont'd (Section 2.4);
- The Binomial Distribution (Section 4.2).

Week 4 (Feb 1-5) *Chapter 4: Commonly Used Distributions*

- The Binomial Distribution – Cont'd (Section 4.2);
- The Poisson Distribution (Section 4.3).

- The Normal Distribution (Section 4.5).

6. Outline of Topics in the Course cont…

***Week 5* (Feb 8-12)** *Chapter 4: Commonly Used Distributions*

- The Normal Distribution – Cont'd (Section 4.5);
- The Lognormal Distribution (Section 4.6);
- The Exponential Distribution (Section 4.7);

- The Exponential Distribution –Cont'd (Section 4.7);
- The Weibull Distribution (Section 4.8).

READING WEEK (Feb 15-19)

***Week 6* (Feb 22-26)** *Chapter 4 (Cont'd) & Chapter 5: Confidence Intervals*

- The Central Limit Theorem (Section 4.11);
- Large-Sample Confidence Intervals for a Population Mean (Section 5.1).

- Large-Sample Confidence Intervals for a Population Mean – Cont'd (Section 5.1);
- Small-Sample Confidence Intervals for a Population Mean (Section 5.3).

Week 7 (Mar 1-5) *Chapter 5: Confidence Intervals & Chapter 6: Hypothesis Testing*

- Small-Sample Confidence Intervals for a Population Mean – Cont'd (Section 5.3);
- Confidence Intervals for the Difference Between Two Means [Independent] (Section 5.4);
- Small-Sample Confidence Intervals for the Difference Between Two Means [Independent and Pooled] (Section 5.6);
- Confidence Intervals with Paired Data (Section 5.7).

- Large-Sample Tests for a Population Mean (Section 6.1);
- Drawing Conclusions from the Results of Hypothesis Tests (Section 6.2).

MIDTERM DURING LECTURE ON MARCH 9 (Date with highest vote won)

Week 8 (Mar 8-12) *Chapter 6: Hypothesis Testing & Midterm*

- Midterm

- Small-Sample Tests for a Population Mean (Section 6.4).

6. Outline of Topics in the Course cont…

***Week 9* (Mar 15-19)** *Chapter 6: Hypothesis Testing*

- Large-Sample Tests for the Difference Between Two Means [Independent] (Section 6.5);
- Small-Sample Tests for the Difference Between Two Means [Independent] (Section 6.7).

- Small-Sample Tests for the Difference Between Two Means – Cont'd [Pooled] (Section 6.7);
- Tests with Paired Data (Section 6.8).

Week 10 (Mar 22-26) *Chapter 7: Correlation and Simple Linear Regression*

- Correlation (Section 7.1);
- The Least-Squares Line (Section 7.2).

- The Least-Squares Line – Cont'd (Section 7.2).

Week 11 (Mar 29- Apr 2) *SAS Statistical Program & Chapter 10: Statistical Quality Control*

- Introductory to SAS;
- Understanding the Basic Concepts of SAS;
- Understanding How to Read SAS output.

- Ability to interpret SAS output;
- Hypothesis tests and Regression in SAS;
- Basic Ideas (Section 10.1).

Week 12 (Apr 5–9) *Chapter 10: Statistical Quality Control*

- Control Charts for Variables (Section 10.2).

- Control Charts for Variables – Cont'd (Section 10.2).
- Control Charts for Attributes (Section 10.3).

7. Required Texts/Readings

REQUIRED:

Statistics for Engineers Connect W/Ebook 5th Edition – ISBN – 9781260430967

OR

Statistics for Engineers and Scientists, 5th Edition, Navidi – ISBN – 9781260547887

Solutions to homework questions posted in CANVAS

Additional readings may be assigned or recommended during the course.

8. Evaluation Method

The course mark will be calculated as follows:

In lecture pop quizzes: 10%
Online quizzes: 13%
Assignments: 7%
Midterm: 30% **(Tuesday Mar 9, in lecture based on Canvas survey vote)**
Final Exam: 40%

IMPORTANT: You will be required to use Respondus Lockdown Browser and Monitor for the Midterm and Final Exam. You are required to use a webcam. You must show your student ID or Government issued ID. You must write the midterm during the timeslot of the lecture section that you are officially registered in.

Final course grades may be adjusted to conform to program or Faculty grade distribution profiles. Further information on grading can be found in Section 5 of the Ontario Tech Academic Calendar.

9. Assignments and Tests

In lecture Pop Quizzes:

These short quizzes will take place using Canvas and must be completed in your synchronous lecture section. They will not be announced in advance, and can occur at any point during the synchronous lecture but will typically occur at the end of lecture. They will be completed in groups, within a breakout room. The lowest *two* in lecture pop quizzes will not count towards your final grade.

Online Quizzes:

Online quizzes will be completed in Mobius and are to be completed individually. There will be 6 online quizzes throughout this course. *Your lowest quiz will be dropped.* Quizzes will consist of 10 multiple choice/fill in the blank questions and you will have 30 minutes to complete each quiz. Each quiz will be made available for 4 days, and you have TWO attempts at each quiz (this is to account for possible technical issues or syntax mistakes, so if you experience an issue, please just re-take the quiz – we will not make changes to scores). Your best attempt counts. The quiz schedule is as follows:

Quiz 1 – covers lectures 1 and 2. Must be taken sometime between 8am Sunday January 17 and 8:00pm Wednesday January 20.

Quiz 2 – covers lectures 3, 4, 5 and 6. Must be taken sometime between 8am Sunday January 31 and 8:00pm Wednesday February 3.

Quiz 3 – covers lectures 7, 8, 9 and 10. Must be taken sometime between 8am Sunday February 21 and 8:00pm Wednesday February 24.

*Quiz 4 – covers lectures 11, 12 and 13. Must be taken sometime between 8am Sunday March 14 and 8:00pm Wednesday March 17.

Quiz 5 – covers lectures 14, 15, 16 and 17. Must be taken sometime between 8am Sunday March 21 and 8:00pm Wednesday March 24.

Quiz 6 – covers lectures 18, 19, 20 and 21. Must be taken sometime between 8am Sunday April 4 and 8:00pm Wednesday April 7.

9. Assignments and Tests cont…

Assignments:

Assignments are to be completed individually. There will be 10 assignments throughout this course. *Your lowest 3 assignments will be dropped.* Assignments will be submitted as a quiz format within Canvas and final answers are graded only. You must submit your final answers via the quiz format within Canvas on time as the Assignment quiz closes precisely at the due date/time. Assignment submission is typically open for 1 full week and you can enter/re-enter the assignment submission as many times as you like during that week.

Late assignments are not accepted in this course for any reason whether it be medical, technical or other. This is why I am dropping the lowest 3 assignments. Do not email your Professor asking for an extension or exception as those emails will not receive a response. Each assignment clearly states the topics covered. Here is the assignment schedule:

-Assignment 1 is posted Thursday, Jan 14 and is due on Friday, Jan 22 at 1:00pm in Canvas Assignment 1 quiz submission

-Assignment 2 is posted on Thursday, Jan 21 and is due on Friday, Jan 29 at 1:00pm in Canvas Assignment 2 quiz submission

-Assignment 3 is posted on Thursday, Jan 28 and is due on Friday, Feb 5 at 1:00pm in Canvas Assignment 3 quiz submission

-Assignment 4 is posted on Thursday, Feb 4 and is due on Friday, Feb 12 at 1:00pm in Canvas Assignment 4 quiz submission

-Assignment 5 is posted on Thursday, Feb 11 and is due on Friday, Feb 26 At 1:00pm in Canvas Assignment 5 quiz submission

-Assignment 6 is posted on Thursday, Feb 25 and is due on Friday, Mar 12 At 1:00pm in Canvas Assignment 6 quiz submission

-Assignment 7 is posted on Thursday, Mar 11 and is due on Friday, Mar 19 At 1:00pm in Canvas Assignment 7 quiz submission

-Assignment 8 is posted on Thursday, Mar 18 and is due on Friday, Mar 26 At 1:00pm in Canvas Assignment 8 quiz submission

-Assignment 9 is posted on Thursday, Mar 25 and is due on Monday, Apr 5 At 1:00pm in Canvas Assignment 9 quiz submission **(ext. due to Good Fri)**

-Assignment 10 is posted on Thursday, Apr 1 and is due on Friday, Apr 9 at 1:00pm in Canvas Assignment 10 quiz submission

9. Assignments and Tests cont…

NOTE: Regarding missed work:

If you miss an online quiz, in lecture pop quiz or an assignment, then you receive a 0 on it. We recognize that times may arise when you are forced to miss a quiz/assignment, but it is for this very reason that the single lowest online quiz mark, 2 lowest in lecture pop quizzes and 3 lowest assignment marks are dropped. This is extremely generous, so no notes will be accepted for missed quizzes and/or assignments. This policy applies to all students.

Midterm Tests and Final Exam:

Midterm tests and the final exam will be done online through Respondus Lockdown Browser and Monitor. A webcam and strong internet access is necessary to complete these tests. A non-graphing, non-programmable calculator is permitted. The final exam will test all material covered in the course. The midterm test and final exam may consist of a hand written component OR a timed multiple choice component OR a combination of both. You will be provided a formula sheet for both the midterm and the final exam. If there is a hand written portion on either test, it is to be submitted to a virtual dropbox within Canvas. You are to take pictures of your written work, copy and paste them into a single word document, then submit the single word document to the virtual dropbox (full instructions can be found in Canvas). You are given exactly 15 minutes from the time you leave Respondus to submit your long answers to the dropbox. Late submissions are not accepted.

Missed Tests (Midterm or Final Exam):

The new Covid-19 policy on missed (midterm and other) tests is as follows: If you miss a test for a legitimate reason and can provide appropriate documentation, you will not be penalized. Legitimate reasons are illness or death in the family, and appropriate documentation is an Academic Consideration Form or a photocopy of a death certificate. For information about the deadline and associated process, please contact Science Advising immediately (science.advising@ontariotechu.ca). The usual accommodation for a missed midterm test will be to re-weight the grading scheme to allocate the missed test mark to the final exam mark.

If you miss a test without a legitimate reason or do not provide the proper documentation, you will receive a mark of zero. If the test is written, the decision is irreversible. If you are contemplating not writing a test for any reason, please speak to the science academic advisor in advance of the test, as well as informing the instructor.

For further policies and information relating to the Faculty of Science and this course, please refer to https://science.ontariotechu.ca/undergraduate/current-students/academic-policies.php

You can also find the answers to many frequently asked advising questions at: https://science.ontariotechu.ca/undergraduate/current-students/academic-advising/faqs/

10. Technology Requirements

To support online learning, the university recommends certain technology requirements for laptops, software and internet connectivity which are available at: https://itsc.ontariotechu.ca/remote-learning.php.

Students experiencing technical difficulties such that they are unable to meet the technology requirements may contact the IT Service Help Desk at: servicedesk@dc-uoit.ca
Students experiencing financial difficulties such that they are unable to meet the technology requirements may contact Student Awards and Financial Aid Office at: connect@ontariotehu.ca

By remaining enrolled in this course, you acknowledge that you have read, understand and agree to observe the Recommended Technology Requirements for accessing university online learning resources, including those minimum requirements that are specific to your faculty and program.

11. Student Support

Any student who faces challenges securing their food or housing and believes this may affect their performance in the course is urged to contact studentlife@ontariotechu.ca for support. Furthermore, please notify your professor if you are comfortable in doing so. This will enable them to provide any resources and help that they can.

12. Sexual Violence Support and Education

Ontario Tech is committed to the prevention of sexual violence in all is forms. For any student who has experienced Sexual Violence, Ontario Tech can help. We will make accommodations to cater to the diverse backgrounds, cultures, and identities of students when dealing with individual cases.

If you think you have been subjected to or witnessed sexual violence:

- Reach out to a Support Worker, a specially trained individual authorized to receive confidential disclosures about incidents of sexual violence. Support Workers can offer help and resolution options which can include safety plans, accommodations, mental health support, and more. To make an appointment with a Support Worker, call 905.721.3392 or email studentlife@ontariotechu.ca
- Learn more about your options at: https://studentlife.ontariotechu.ca/sexualviolence/

13. Students with Disabilities

Accommodating students with disabilities at Ontario Tech is a responsibility shared among various partners: the students themselves, SAS staff and faculty members. To ensure that disability-related concerns are properly addressed during this course, students with documented disabilities and who may require assistance to participate in this class are encouraged to speak with me as soon as possible. **Students who suspect they have a disability that may affect their participation in this course are advised to go to Student Accessibility Services (SAS) as soon as possible.** Maintaining communication and working collaboratively with SAS and faculty members will ensure you have the greatest chance of academic success.

When on campus access is allowed, students taking courses on north Oshawa campus can visit Student Accessibility Services in the Student Life Building, U5, East HUB (located in the Founders North parking lot). Students taking courses on the **downtown Oshawa campus** can visit Student Accessibility Services in the 61 Charles St. Building, 2nd Floor, Room DTA 225 in the Student Life Suite.

Disability-related and accommodation support is available for students with mental health, physical, mobility, sensory, medical, cognitive, or learning challenges. Office hours are 8:30am-4:30pm, Monday to Friday, closed Wednesday's 8:30am – 10:00am. For more information on services provided, you can visit the SAS website at https://studentlife.ontariotechu.ca/services/accessibility/index.php. Students may contact Student Accessibility Services by calling 905-721-3266, or email studentaccessibility@ontariotechu.ca.

When on campus access is allowed, students who require the use of the Test Centre to write tests, midterms, or quizzes MUST register online using the SAS test/exam sign-up module, found here https://disabilityservices.ontariotechu.ca/uoitclockwork/custom/misc/home.aspx. Students must sign up for tests, midterms, or quizzes AT LEAST seven (7) days before the date of the test.

Students must register for final exams by the registration deadline, which is typically two (2) weeks prior to the start of the final examination period. SAS will notify students of the registration deadline date.

14. Academic Integrity

Students and faculty at Ontario Tech University share an important responsibility to maintain the integrity of the teaching and learning relationship. This relationship is characterized by honesty, fairness and mutual respect for the aim and principles of the pursuit of education. Academic misconduct impedes the activities of the university community and is punishable by appropriate disciplinary action.

Students are expected to be familiar with and abide by Ontario Tech University's regulations on Academic Conduct which sets out the kinds of actions that constitute academic misconduct, including plagiarism, copying or allowing one's own work to copied, use of unauthorized aids in examinations and tests, submitting work prepared in collaboration with another student when such collaboration has not been authorized, among other academic offences. The regulations also describe the procedures for dealing with allegations, and the sanctions for any finding of academic misconduct, which can range from a resubmission of work to a failing grade to permanent expulsion from the university. A lack of familiarity with these regulations on academic conduct does not constitute a defense against its application. This information can be found at http://calendar.uoit.ca/content.php?catoid=22&navoid=879#Academic_conduct

Extra support services are available to all Ontario Tech University students in academic development, study skills, counseling, and peer mentorship. More information on student support services can be found at https://studentlife.ontariotechu.ca/services/academic-support/index.php

15. Online Test and Exam Proctoring (Virtual Proctoring)

To maintain academic integrity in online testing, your instructor may require the use of Respondus LockDown Browser and Respondus Monitor or a similar virtual proctoring platform. In doing so, you will be required to use a computer with a webcam (either built-in or USB plug in). Please advise your instructor as soon as possible if you do not have a computer with a camera. This is a link to a short video that explains the basics of Respondus LockDown Browser: https://web.respondus.com/lockdownbrowser-student-video/

16. Final Examinations

Final examinations are held during the final examination period at the end of the semester and **when on campus access is allowed,** may take place in a different room and on a different day from the regularly scheduled class. Check the published Examination Schedule for a complete list of days and times.

While the University remains online, final exams will require online submission, so you will require internet access along with a webcam.

Students are required to show their Student ID card (campus ID) when **in-person examinations are allowed.** Students are advised to obtain their Student ID Card well in advance of the examination period as they will not be able to write their examinations without it. More information on ID cards can be found at https://registrar.ontariotechu.ca/campus-id/index.php.

Students who are unable to write a final examination when scheduled due to religious obligations may make arrangements to write a deferred examination. These students are required to submit a Request for Accommodation for Religious Obligations to the Faculty concerned as soon as possible and no later than three weeks prior to the first day of the final examination period.

Further information on final examinations can be found at https://usgc.ontariotechu.ca/policy/policy-library/policies/academic/procedures-for-final-examination-administration.php

17. Freedom of Information and Protection of Information Act

The following is an important notice regarding the process for submitting course assignments, quizzes, and other evaluative material in your courses in the Faculty of Science.

Ontario Tech University is governed by the Freedom of Information and Protection of Privacy Act ("FIPPA"). In addition to providing a mechanism for requesting records held by the university, this legislation also requires that the University not disclose the personal information of its students without their consent.

FIPPA's definition of "personal information" includes, among other things, documents that contain both your name and your Banner (student) ID. For example, this could include graded test papers or assignments. To ensure that your rights to privacy are protected, the Faculty of Science encourages you to use only your Banner ID on assignments or test papers being submitted for grading. This policy is intended to prevent the inadvertent disclosure of your information where graded papers are returned to groups of students at the same time.

17. Freedom of Information and Protection of Information Act cont…

If you still wish to write both your name and your Banner ID on your tests and assignments, please be advised that Ontario Tech University will interpret this as an implied consent to the disclosure of your personal information in the normal course of returning graded materials to students.

If you have any questions or concerns relating to the new policy or the issue of implied consent addressed above, please contact accessandprivacy@ontariotechu.ca

Notice of Collection and Use of Personal Information
Throughout this course, personal information may be collected through the use of certain technologies under the authority of the *University of Ontario Institute of Technology Act, SO 2002, c. 8, Sch. O.* and will be collected, protected, used, disclosed and retained in compliance with Ontario's *Freedom of Information and Protection of Privacy Act R.S.O. 1990, c. F.31.*

This course will use the following technologies that may collect, use, disclose and retain personal information (including images) for the purposes described below:

- Respondus Monitor or Proctortrack to maintain academic integrity for examinations;
- Google Meet and Kaltura Virtual Classroom to facilitate remote instruction and interactive learning;
- Peer-shared applications, services or technologies that may be reviewed, assessed, or used as part of coursework.

For more information relating to these technologies, we encourage you to visit: https://tlc.ontariotechu.ca/learning-technology/index.php Questions regarding personal information may be directed to: Ontario Tech University Access and Privacy Office, 2000 Simcoe Street North, Oshawa, ON L1G 0C5, email: accessandprivacy@ontariotechu.ca.

By remaining enrolled in this course, you acknowledge that you have read, understand, and agree to the terms and conditions under which the technology provider(s) may collect, use, disclose and retain your personal information. You agree to the university using the technologies and using your personal information for the purposes described in this course outline.

18. Freedom of Expression

Pursuant to Ontario Tech's Freedom of Expression Policy all students are encouraged to express ideas and perspectives freely and respectfully in university space and in the online university environment, subject to certain limitations. Students are reminded that the limits on Freedom of Expression include speech or behavior that: is illegal or interferes with the university's legal obligations; defames an individual or group; constitutes a threat, harassment or discrimination; is a breach of fiduciary, contractual, privacy or confidentiality obligations or commitments; and unduly disrupts and interferes with the functioning of the university. In the context of working online, different forms of communication are used. Where permitted, students using "chat" functions or other online forms of communication are encouraged to ensure that their communication complies with the Freedom of Expression Policy.

19. Student Course Feedback Surveys

Student evaluation of teaching is a highly valued and helpful mechanism for monitoring the quality of Ontario Tech University's programs and instructional effectiveness. To that end, course evaluations are administered by an external company in an online, anonymous process during the last few weeks of classes. Students are encouraged to participate actively in this process and will be notified of the dates. Notifications about course evaluations will be sent via e-mail, and posted on Canvas, Weekly News, and signage around the campus.

20. Final Exam Views

Once grades are released in mycampus, if you want to view your final exam/find out your exam grade, you need to **complete the Exam View Request Form for STAT2800 that's available here (copy and paste the link) ->** https://science.ontariotechu.ca/undergraduate/current-students/academic-advising/forms.php

Notes regarding exam views:

-the above form is the only way to request an exam view for this course; e-mail me the form within canvas.

-as per the University policy, you have 5 business days from the day that marks are released to submit the exam view request form. **Late requests will not be accepted.** Once the form is submitted, your instructor will then contact you regarding a date/time to view your exam.

-unless there is a clerical mistake, instructors cannot change marks as a result of an exam view

University Response to COVID-19

The government response to the COVID-19 pandemic is continually evolving. As new information becomes available from federal and provincial public health authorities, the Province of Ontario and the Regional Municipality of Durham, Ontario Tech University will remain nimble and prepared to respond to government orders, directives, guidelines and changes in legislation to ensure the health and safety of all members of its campus community. In accordance with public health recommendations, the university may need to adjust the delivery of course instruction and the availability and delivery mode of campus services and co-curricular opportunities. Ontario Tech University appreciates the understanding and flexibility of our students, faculty and staff as we continue to navigate the pandemic and work together to demonstrate our strong commitment to academic, research and service excellence during these challenging and unprecedented times.

The Accessibility for Ontarians with Disabilities Act (AODA) standards have been considered in the development of this model course template and it adheres to the principles outlined in the University's Accessibility Policy.

Ontario Tech University

Faculty of Energy Systems and Nuclear Science

Course Outline
NUCL 2010U
Thermodynamic Cycles
Winter 2021

Offering Approval:

Awaiting Approval

Course Description:

Introduction and basic concepts; energy, energy transfer, and general energy analysis; properties of pure substances (regular fluids, supercritical fluids, gases, and reactor coolants); energy analysis of closed systems; First Law of Thermodynamics; mass and energy analysis of control volumes; Second Law of Thermodynamics; entropy; exergy; Carnot cycle; gas-power cycles; vapor- and combined-power cycles; supercritical-pressure Rankine cycle; nuclear-plants power cycles; and refrigeration cycles. Nuclear power plant and supercritical plant layouts. Thermodynamic-property relations; T-s diagrams; gas mixtures; gas-vapor mixtures, and air-conditioning; chemical reactions; chemical and phase equilibrium; and compressible flow.

Major Topics:

Graduate Attributes:

The graduate attributes developed and required by the Canadian Engineering Accreditation Board's Accreditation Criteria and Procedures are listed below, with those covered in the course to some degree (introduced, developed, applied).

Attributes	Covered in this Course
Knowledge base	✓
Problem analysis	✓
Investigation	✓
Design	✕
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	✕

Course Content Breakdown

Math	Basic Science	Complementary Studies	Engineering Science	Engineering Design
0%	25%	0%	75%	0%

Course Outcomes:

- Demonstrate competence in natural sciences and engineering fundamentals in support of thermodynamics cycles.
- Demonstrate ability to identify, characterize, and execute solution for an engineering problem.
- Demonstrate the ability to define a problem, execute a plan to solve a problem, and through a critical analysis to reach valid conclusions supported with experiments.
- Demonstrate ability to use fundamental modern techniques, resources, and engineering tools.
- Demonstrate ability to establish and monitor team structure and functionality, and demonstrate success in a team based project.
- Demonstrate ability to identify and credibly communicate engineering knowledge.
- Demonstrate understanding of the relationships between technology and level of living of society
- Demonstrate ability to identify and choose alternative ways of various impacts on society.

Instructors

Instructor:	Email:	Office:	Phone:
Prof. Igor Pioro	Igor.Pioro@ontariotechu.ca	ERC 4083	5528

Teaching Assistants

TA Name:	Email:	Office:	Office Hours:
Nikita Dort-Goltz	nikita.dortgoltz@ontariotechu.net	ERC 4100	TBA

TA Name:	Email:	Office:	Office Hours:
Lekhnath Ghimire	Lekhnath.Ghimire@ontariotechu.net	ERC 4100	TBA

Required Course Text and Other Materials:

- Thermodynamics: An Engineering Approach, Y.A. Cengel, M.A. Boles, and M. Kanoglu, 9th Edition, McGraw-Hill, New York, USA, 2019, 984 pages
- Laboratory Manuals by laboratory-equipment manufacturers
- Handbook of Generation IV Nuclear Reactors, 2016. Editor: I.L. Pioro, Elsevier – Woodhead Publishing (WP), Duxford, UK, 940 pages; Chapter 1 & appendices: A1-A3, A6
- Recommendations on proper technical writing and presentation, plagiarism (Dr. I. Pioro notes)

Reference Books and Information Sources:

- 1. Pioro, I., Duffey, R.B., Kirillov, P.L., and Dort-Goltz, N., 2020. Current Status of Reactors Deployment and Small Modular Reactors Development in the World, ASME J. Nuclear Eng. & Radiation Science, Vol. 6, No. 4, 24 pages. Free download from: https://asmedigitalcollection.asme.org/nuclearengineering/article/6/4/044001/1085654/Current-Status-of-Reactors-Deployment-and-Small.
- 2. Pioro, I., Duffey, R.B., Kirillov, P.L., et al., 2019. Current Status and Future Developments in Nuclear-Power Industry of the World, ASME J. Nuclear Eng. & Radiation Science, Vol. 5, No. 2, 27 pages. Free download from: https://asmedigitalcollection.asme.org/nuclearengineering/article/doi/10.1115/1.4042194/725884/Current-Status-and-Future-Developments-in-Nuclear.
- 3. Dragunov, A., Saltanov, Eu., Pioro, I., et al., 2015. Power Cycles of Generation III and III+ Nuclear Power Plants, ASME J. Nuclear Eng. & Radiation Science, Vol. 1, No. 2, 10 pages.

Course Organization and Delivery Mode:

The course is composed of twelve 3-hour lecture modules. There will be a series of twelve 1 ½ hour tutorials and a series of six 1 ½ hour labs (biweekly) to support the learning.

Scheduled Regular Class Meeting Times:

Lectures Friday 11:10 - 14:00 January 15 - April 12, 2021

Final Grade Breakdown:

The course is 100 points (or %): 5 laboratories with reports (each 2 points) and 1 lab without a report; 11 assignments of approximately 5 problems to each chapter (1 point each); quiz (5 points); midterm exam (20 points); and final exam (54 points).

Midterms

Midterm Date:	Midterm Location:
Friday, February 26, 2021 - 11:10 to 14:00	TBA

Assignments:

11 assignments of approximately 5 problems to each chapter (1 point each), marked by TA.

Laboratories, Prelab Reports, Notes and Reports

Lab Description:

1. Understanding basics of experimental techniques and safety of laboratories

2. Steam boiler
3. Compressor
4. Steam turbine
5. Gas turbine
6. Refrigeration & heat pump

Prelab Reports, Notes and Reports:

1.5 hour lab (biweekly) run by TA - 5 Lab reports each worth 2 points (marked by TA).

Tutorials:

1.5 hour tutorial per week, run by TA.

Computer Experience:

Microsoft Office, Matlab, ESS (Engineering Equation Solution), NIST REFPROP (REference PROPerties), and Sigma Plot.

Summary of Important Dates and Marking Scheme:

January 15, 2021 - Lectures start; April 12, 2021 - lectures end.

5 laboratories with reports (each 2 points) and 1 lab without a report, marked by TA; 11 assignments of approximately 5 problems to each chapter (1 point each), marked by TA; quiz (5 points), marked by TA; midterm exam (20 points), marked by Professor; and final exam (54 points), marked by Professor.

Detailed Course Content:

Main part: Introduction (modern industrial methods of electricity generation from thermodynamics point of view, their comparison, and impact on society and environment) and basic concepts; energy, energy transfer, and general energy analysis; properties of pure substances (regular fluids, supercritical fluids, gases, and reactor coolants); energy analysis of closed systems; First Law of Thermodynamics; mass and energy analysis of control volumes; Second Law of Thermodynamics; entropy; exergy; Carnot cycle; gas power cycles; vapor and combined power cycles; supercritical-pressure Rankine cycle; nuclear power plants power cycles; and refrigeration cycles. Complimentary part: Thermodynamic property relations; gas mixtures; gas-vapor mixtures and air-conditioning; chemical reactions; chemical and phase equilibrium; compressible flow.

Medical Certificates and Deferred Exams:

Medical statements and academic consideration forms for any missed student work worth 25% or less (not including midterms or tests) will be submitted directly to the course instructor. This includes missed quizzes, assignments and labs. Missed Midterms or Coursework Worth More than 25% For any missed midterms or tests, regardless of weight, or coursework worth more than 25%, students will need to submit the UOIT Medical statement or academic consideration form to the Engineering Advising Office following the form guidelines.

Guidelines for Medical Statements: Medical statements cover any missed work due to a medical reasons. The student must:

- see a medical doctor within 24 hours of the missed work
- submit the form to the correct individual within 3 working days

Guidelines for Academic Consideration Forms: Academic consideration forms cover any missed work for non-academic grounds, for example, religious observations, court appearance, personal/family emergency, varsity events. The student must provide supporting documentation if deemed necessary.

Should the medical certificate proven to be invalid due to any kind of action by the student, such student's behaviour will be considered as a major misconduct and respective disciplinary actions will be commenced.

Failure to comply with the above will result in an mark of 0 for the exam.

Students with disabilities may request to be considered for formal academic accommodation in accordance with the Ontario Human Rights Code. Students seeking accommodation must make their requests through the Centre for Students with Disabilities in a timely manner, and provide relevant and recent documentation to verify the effect of their disability and to allow the University to determine appropriate accommodations.

Accommodation decisions will be made in accordance with the Ontario Human Rights Code. Accommodations will be consistent with and supportive of the essential requirements of courses and programs, and provided in a way that respects the dignity of students with disabilities and encourages integration and equality of opportunity. Reasonable academic accommodation may require instructors to exercise creativity and flexibility in responding to the needs of students with disabilities while maintaining academic integrity.

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- Reach out to a Support Worker, a specially trained individual authorized to receive confidential disclosures about incidents of sexual violence. Support Workers can offer help and resolution options which can include safety plans, accommodations, mental health support, and more. To make an appointment with a Support Worker, call 905.721.3392 or email studentlife@ontariotechu.ca
- Learn more about your options at: https://studentlife.ontariotechu.ca/sexualviolence/

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Accommodating students with disabilities at Ontario Tech is a responsibility shared among various partners: the students themselves, SAS staff and faculty members. To ensure that disability-related concerns are properly addressed during this course, students with documented disabilities and who may require assistance to participate in this class are encouraged to speak with me as soon as possible. Students who suspect they have a disability that may affect their participation in this course are advised to go to Student Accessibility Services (SAS) as soon as possible. Maintaining communication and working collaboratively with SAS and faculty members will ensure you have the greatest chance of academic success.

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A student demonstrating professional unsuitability may be immediately suspended from any practicum, field work or similar activity at the discretion of the dean pending a final decision.

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FIPPA's definition of "personal information" includes, among other things, documents that contain both your name and your Banner (student) ID. For example, this could include graded test papers or assignments. To ensure that your rights to privacy are protected, the Faculty of [Insert Faculty name] encourages you to use only your Banner ID on assignments or test papers being submitted for grading. This policy is intended to prevent the inadvertent disclosure of your information where graded papers are returned to groups of students at the same time. If you still wish to write both your name and your Banner ID on your tests and assignments, please be advised that Ontario Tech University will interpret this as an implied consent to the disclosure of your personal information in the normal course of returning graded materials to students.

If you have any questions or concerns relating to the new policy or the issue of implied consent addressed above, please contact accessandprivacy@ontariotechu.ca

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The Accessibility for Ontarians with Disabilities Act (AODA) standards have been considered in the development of this model course outline and it adheres to the principles outlined in the University's Accessibility Policy.

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Throughout this course, personal information may be collected through the use of certain technologies under the authority of the *University of Ontario Institute of Technology Act, SO 2002, c. 8, Sch. O.* and will be collected, protected, used, disclosed and retained in compliance with Ontario's *Freedom of Information and Protection of Privacy Act R.S.O. 1990, c. F.31.*

This course may use the following technologies that may collect, use, disclose and retain personal information (including images) for the purposes described below:

- Respondus Monitor and Proctortrack to maintain academic integrity for examinations.
- Google Meet and Kaltura Virtual Classroom to facilitate remote instruction and interactive learning.
- Peer-shared applications, services or technologies that may be reviewed, assessed, or used as part of coursework.
- Other applications, services, or technologies that support or enhance online learning.

For more information relating to these technologies, we encourage you to visit: https://tlc.ontariotechu.ca/learning-technology/index.php Questions regarding personal information may be directed to: Ontario Tech University Access and Privacy Office, 2000 Simcoe Street North, Oshawa, ON L1G 0C5, email: accessandprivacy@ontariotechu.ca.

By remaining enrolled in this course, you acknowledge that you have read, understand and agree to the terms and conditions under which the technology provider(s) may collect, use, disclose and retain your personal information. You agree to the university using the technologies and using your personal information for the purposes described in this course outline.

Technology Requirements

To support online learning, the university recommends certain technology requirements for laptops, software and internet connectivity which are available at: https://itsc.ontariotechu.ca/remote-learning.php.

Students experiencing technical difficulties such that they are unable to meet the technology requirements may contact the IT Service Help Desk at: servicedesk@dc-uoit.ca

Students experiencing financial difficulties such that they are unable to meet the technology requirements may contact Student Awards and Financial Aid Office at: connect@ontariotehu.ca

By remaining enrolled in this course, you acknowledge that you have read, understand and agree to observe the Recommended Technology Requirements for accessing university online learning resources, including those minimum requirements that are specific to your faculty and program.

Virtual Monitoring of Examinations

Ontario Tech University will conduct virtual monitoring of examinations in accordance with Ontario privacy legislation and all approved policy instruments.

Sensitive/Offensive Subject Matter

The classroom (both physical and virtual) is intended to provide a safe, open space for the critical and civil exchange of ideas and opinions. Some articles, media and other course materials may contain sensitive content that is offensive and/or disturbing. The Course Instructor will try to identify such material and communicate warnings[MG1] to students in advance of the distribution and use of such materials, affording students the choice to either emotionally prepare for, or not to view or interact with, the content.

Freedom of Expression

Pursuant to Ontario Tech's Freedom of Expression Policy all students are encouraged to express ideas and perspectives freely and respectfully in university space and in the online university environment, subject to certain limitations. Students are reminded that the limits on Freedom of Expression include speech or behaviour that: is illegal or interferes with the university's legal obligations; defames an individual or group; constitutes a threat, harassment or discrimination; is a breach of fiduciary, contractual, privacy or confidentiality obligations or commitments; and unduly disrupts and interferes with the functioning of the university. In the context of working online, different forms of communication are used. Where permitted, students using "chat" functions or other online forms of communication are encouraged to ensure that their communication complies with the Freedom of Expression Policy.

University Response to COVID-19

The government response to the COVID-19 pandemic is continually evolving. As new information becomes available from federal and provincial public health authorities, the Province of Ontario and the Regional Municipality of Durham, Ontario Tech University will remain nimble and prepared to respond to government orders, directives, guidelines and changes in legislation to ensure the health and safety of all members of its campus community. In accordance with public health recommendations, the university may need to adjust the delivery of course instruction and the availability and delivery mode of campus services and co-curricular opportunities. Ontario Tech University appreciates the understanding and flexibility of our students, faculty and staff as we continue to navigate the pandemic and work together to demonstrate our strong commitment to academic, research and service excellence during these challenging and unprecedented times.

Ontario Tech University
Faculty of Engineering and Applied Science
Department of Mechanical and Manufacturing Engineering-MME

Course Outline
MECE 3260U
Introduction to Energy Systems
Fall 2021

Offering Approval:

Under Revision

Course Description:

Energy systems, resources and use; energy classifications and terminology; energy sources and currencies; energy supply and demand; energy conversion and utilization technologies; energy storage and distribution; energy use in countries and sectors of economies; energy intensity; global energy flows and utilization patterns; principal fuels; fuel science and technology: origins of fuels, classifications and physical and chemical properties of fuels, fuel handling and fire hazards, non-conventional fuels; sustainability, sustainable development and energy; clean energy systems. Environmental impact of energy systems such as power generation, industrial processes and transportation; air, soil and water pollution and their effects on the environment; generation mechanisms of chemical pollutants, photochemical pollutants and smog. Introduction to renewable energy resources (solar, wind, geothermal, biomass), photovoltaics, microturbines. Introduction to energy storage systems. Introduction to hydrogen and fuel cells. Introduction to life cycle assessment, industrial ecology, and key environmental tools. Application of energy and exergy analysis to energy systems.

Major Topics:

- Thermodynamics
- Energy

Graduate Attributes:

The graduate attributes developed and required by the Canadian Engineering Accreditation Board's Accreditation Criteria and Procedures are listed below, with those covered in the course to some degree (introduced, developed, applied).

Attributes	Covered in this Course
Knowledge base	✓
Problem analysis	✓
Investigation	✓
Design	✓
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	✗

Course Content Breakdown

Math	Basic Science	Complementary Studies	Engineering Science	Engineering Design
0%	0%	0%	75%	25%

Course Outcomes:

By the end of this course, the student should be able to:

- Demonstrate a knowledge of the basic technical and operational aspects of energy systems and applications.
- Understand how thermodynamic principles govern the behavior of various energy systems and applications
- Apply appropriate simplifying assumptions and the laws of thermodynamics to energy systems and processes.
- Demonstrate a knowledge of methods of analysis, design and performance improvement of energy systems.
- Use thermodynamic tables, charts, equations and software to obtain thermodynamic data in terms of pressure, temperature, specific volume, internal energy, enthalpy, and entropy and determine their relationships for system analysis.
- Use Engineering Equation Solver (EES) appropriately and effectively for system analysis.

Instructors

Instructor:	Email:	Office:	Phone:	Office Hours:
Dr. Ibrahim Dincer	Ibrahim.Dincer@uoit.ca	ACE3024	5723	2:00-3:30 pm on Mondays and 10:00-11:30 am on Thursdays

Teaching Assistants

TA Name:	Email:	Office:	Office Hours:
Osamah Siddiqui	Osamah.Siddiqui@ontariotechu.net	Online	2:00-3:30 pm on Mondays and 10:00-11:30 am on Thursdays

Required Course Text and Other Materials:

- Sustainable Energy Systems and Applications, I. Dincer and C. Zamfirescu. Springer Verlag, New York (2011).
- The course notes and slides which will be available on the website.

Reference Books and Information Sources:

- Alternative Energy Resources, P. Kruger, Wiley, NY (2006).
- Integration of Alternative Sources of Energy, F.A. Farret and M.G. Simoes, Wiley, NY (2006).
- Thermodynamics: An Engineering Approach, Y.A. Cengel and M.A. Boles, 8th ed., McGraw-Hill, New York (2015).
- Refrigeration Systems and Applications, I. Dincer, Wiley, 3rd ed., NY (2017).
- Thermodynamics: A Smart Approach, I. Dincer, Wiley, NY (2020).

Course Organization and Delivery Mode:

Three lecture hours per week for one semester.

Scheduled Regular Class Meeting Times:

Scheduled Meeting Times

Week	Time	Days	Where	Date Range	Schedule Type	Instructors
	2:10 pm - 3:30 pm	T	Synchronous SYN	Sep 08, 2020 - Dec 07, 2020	Lecture	Ibrahim Dincer (P)
	2:10 pm - 3:30 pm	R	Synchronous SYN	Sep 08, 2020 - Dec 07, 2020	Lecture	Ibrahim Dincer (P)

Final Grade Breakdown:

Course Evaluation

Online Quizzes	25%
Design Project	25%
Online Midterm Test	15%
Final Exam	35%
Total	100%

Midterms

Midterm Date:	Midterm Location:
Tuesday, October 27, 2020 - 14:10 to 15:30	Online

Assignments:

Late design project submissions will not be accepted without appropriate official documentation and justification.

Computer Experience:

Engineering Equation Solver (EES) will be used in course design project.

Summary of Important Dates and Marking Scheme:

- Midterm Exam will be given online at class time 2:10-3:30pm on Tuesday, 27 October 2020.
- Design Project due date: Tuesday, December 01, 2020 before 5:00 pm.

Detailed Course Content:

Information Session on Course Matters	1/2 lecture
Energy and Environment Perspectives	1/2 lecture
Sustainability of Energy Resources	1 lecture
Thermodynamic Analyses of Systems	3 lectures
Fuels and Combustion	2 lectures
Solar Energy Systems	2 lectures
Wind Energy Systems	2 lectures
Geothermal Energy Systems	2 lectures
Biofuels and Biomass Systems	2 lectures
Other Renewables (Hydro, Tidal, Ocean Thermal, etc.)	2 lectures
Renewable-Based Integrated Systems	1 lecture
Nuclear Power	1 lecture
Hydrogen Energy Technologies	1 lecture
Fuel Cell Systems	1 lectures
Thermal Energy Storage Systems	1 lecture
Life Cycle Assessment	1/2 lecture
Industrial Ecology	1/2 lecture
Midterm test	1 lecture

Note: The length of each lecture is 80 minutes.

Other Course Information:

- Students are encouraged to use the discussion board in Canvas for information exchange and discussion on course-related matters only in a professional and respectful manner. The instructor may join the discussion for clarification or answer if necessary.
- Canvas e-mail is an essential tool for communication with the instructor. It is expected to be used for crucial/urgent items only.

Medical Certificates and Deferred Exams:

Medical statements and academic consideration forms for any missed student work worth 25% or less (not including midterms or tests) will be submitted directly to the course instructor. This includes missed quizzes, assignments and labs. Missed Midterms or Coursework Worth More than 25% For any missed midterms or tests, regardless of weight, or coursework worth more than 25%, students will need to submit the UOIT Medical statement or academic consideration form to the Engineering Advising Office following the form guidelines.

Guidelines for Medical Statements: Medical statements cover any missed work due to a medical reasons. The student must:

- see a medical doctor within 24 hours of the missed work
- submit the form to the correct individual within 3 working days

Guidelines for Academic Consideration Forms: Academic consideration forms cover any missed work for non-academic grounds, for example, religious observations, court appearance, personal/family emergency, varsity events. The student must provide supporting documentation if deemed necessary.

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University Response to COVID-19

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Ontario Tech University

Faculty of Energy Systems and Nuclear Science

Course Outline

NUCL 3930U

Heat Transfer

Fall 2020

Offering Approval:

Approved

Course Description:

Introduction and basic concepts: conduction, convection and radiation. Properties of solids and fluids. Heat conduction equations. Steady-state and transient conduction. Numerical methods in heat conduction. Fundamentals of convection. External and internal forced convection. Natural convection. Boiling and condensation phenomena. Heat exchangers. Fundamentals of thermal radiation and radiation heat transfer.

Major Topics:

Graduate Attributes:

The graduate attributes developed and required by the Canadian Engineering Accreditation Board's Accreditation Criteria and Procedures are listed below, with those covered in the course to some degree (introduced, developed, applied).

Attributes	Covered in this Course
Knowledge base	✓
Problem analysis	✓
Investigation	✓
Design	✕
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	✕

Course Content Breakdown

Math	Basic Science	Complementary Studies	Engineering Science	Engineering Design
0%	25%	0%	75%	0%

Course Outcomes:

- Demonstrate competence in natural sciences and engineering fundamentals in support of three modes of heat transfer.
- Demonstrate ability to identify, characterize, and execute solution for an engineering problem.
- Demonstrate the ability to define a problem, execute a plan to solve a problem, and through a critical analysis to reach valid conclusions supported with experiments.
- Demonstrate ability to use fundamental modern techniques, resources, and engineering tools.
- Demonstrate ability to work individually and to establish and monitor team structure and functionality, and demonstrate success in a team based project.
- Demonstrate understanding of the relationships between technology and level of living of society, demonstrate ability to identify and choose alternative ways of various impacts on society.

Instructors

Instructor:	Email:	Office:	Phone:	Office Hours:
Dr. Jennifer McKellar	Canvas (jennifer.mckellar@ontariotechu.ca if urgent)	ERC 4022	x5498	To be determined; see Canvas

Teaching Assistants

TA Name:	Email:
See Canvas	Canvas

TA Name:	Email:
See Canvas	Canvas

Required Course Text and Other Materials:

- Cengel, Y.A., Ghajar, A.J. 2020. Heat and Mass Transfer: Fundamentals and Applications, 6th Edition. McGraw-Hill Education: New York, NY.
- You may use a previous edition of this textbook, but remember that page numbers, etc. will differ between editions.
- Remember to use a formal reference style (e.g., MLA, APA, Chicago) when citing external works in lab work, assignments, and the project.
- Additional readings may be assigned or recommended during the course.

Course Organization and Delivery Mode:

Delivery of this course includes online lectures, tutorials, and labs. The majority of the delivery will be on a fixed schedule. Note however, that occasional lectures may be cancelled and replaced by presentations from visiting scholars or industrial engineers and some classes may be recorded and delivered online due to travel commitments. Changes to the course schedule will be advertised on Canvas and students will be expected to monitor Canvas announcements for changes routinely. Time equivalent to that spent in class is expected to be spent by students on self-study.

N.B. Lectures, tutorials and possibly synchronous lab sessions will be livestreamed and recorded and made available on Canvas. If you participate in the session and/or have your webcam turned on, **you may be captured in these recordings. Do not share** recorded content with others.

Scheduled Regular Class Meeting Times:

Mondays, 3:40 p.m. - 5:00 p.m., Online (access via Canvas)

Thursdays, 3:40 p.m. - 5:00 p.m., Online (access via Canvas)

Final Grade Breakdown:

Evaluation will be done based on assignments (8), labs (6), one quiz, one midterm examination, one major project and the final examination, according to the following scheme:

Category	Value
Assignments	16%
Laboratories	18%
Quiz	2%
Midterm	20%
Project	20%
Final	24%

Final course grades may be adjusted to conform to program or Faculty grade distribution profiles. Further information on grading can be found in the Ontario Tech Academic Calendar.

Midterms

Midterm Date:	Midterm Location:
Thursday, October 22, 2020 - 15:40 to 17:00	Online, access via Canvas

Assignments:

There are eight (8) assignments and one major project.

A tentative list of assignment due dates will be posted on Canvas. It is the student's responsibility to monitor Canvas for changes to these dates.

Laboratories, Prelab Reports, Notes and Reports

Lab Description:

1. Heat Conduction Unit
2. Free & Forced Convection
3. Shell and Tube Heat Exchanger
4. Thermal Radiation Unit
5. Boiling & Condensation Unit
6. Design Laboratory

Prelab Reports, Notes and Reports:

For 2020, laboratory experiments will be recorded by Instructors and the recordings made available via Canvas. They may also be livestreamed and recorded so that students may ask questions. Students will not be physically present in the laboratories. See note above regarding course recordings.

Students will still be expected to complete safety quizzes, and complete and submit lab reports, as well as any additional analytical and/or design work assigned along with each lab. The document Lab Schedule outlines due dates for the semester, and indicates overall requirements for each lab.

Lab reports and additional lab assignments will be completed and submitted in groups, as described in the documents: Lab Schedule and Lab Report Requirements. Lab reports are to be submitted electronically via Canvas.

It is each group member's responsibility to ensure that the entire report is completed in compliance with the University's policy on Academic Conduct. See below. If a portion of the report is found to have been plagiarized, *etc.* (including the falsification of data), the entire group may be penalized, regardless of which group member(s) is/are at fault.

Tutorials:

Tutorials are weekly, 1 hr each; 2 sections. Tutorials will be livestreamed and recorded. See note above regarding course recordings.

Tutorials will cover practice problems.

Summary of Important Dates and Marking Scheme:

Dates

- *Quiz* October 1, 2020 3:40 p.m.
  - Closed book. No notes, no aids, no calculators. Length: 30 minutes. Due to the course being offered online in 2020, the exact time at which the quiz will start may be adjusted. Students will be advised at least one week in advance of any change/flexibility in quiz start- and end-times.
- *Midterm* October 22, 2020 3:40 p.m.
  - Closed book. No notes, no aids (permissible calculators allowed as described in lecture before the midterm and in instructions provided with the test). Equation sheets will be provided with the midterm. Length: 1 hour 20 minutes. Due to the course being

offered online in 2020, the exact time at which the midterm will start may be adjusted. Students will be advised at least one week in advance of any change/flexibility in midterm start- and end-times.

- *Assignments* A tentative list of dates will be posted on Canvas. It is the student's responsibility to monitor Canvas for changes to these dates.
- *Laboratory submissions* The document Lab Schedule outlines due dates for the semester, and indicates overall requirements for each lab.
- *Project* Report due: November 30, 2020 5:00 p.m.; Presentation: December 7, 2020.

Late Policy

Assignments, projects and laboratory work not submitted as instructed by the appointed time are subject to the following penalties:

- Same day, after appointed time: -5% (it is strongly suggested that you upload your assignment, laboratory work and project well before the deadline in case of technical difficulties)
- Next day: -10%
- Each additional day after, to a maximum of three (3) calendar days after deadline: -10% (work submitted more than three (3) days late will receive a grade of zero)

Absences/Missed Work

In the event course work, the quiz or the midterm are missed due to illness, appropriate documentation must be submitted; see the section on Medical Certificates below. See also the section on Grade Reappraisal in the Academic Calendar.

In the event course work, the quiz or the midterm are missed due to other extenuating circumstances, contact the Professor.

Detailed Course Content:

Course schedule is approximate and may be adjusted as needed as the semester progresses. Each week will include synchronous and asynchronous components (*e.g.*, videos to watch before or after class). These details will be provided on Canvas. Any updates to this schedule will be announced in class and posted on Canvas.

Week	Topic (synchronous & asynchronous parts)	Relevant Text Readings
1 (Sept 10, Sept 14)	Introduction & Review Mechanisms of Heat Transfer	Chapter 1
2 (Sept 17, Sept 21)	Conduction	Chapter 2
3 (Sept 24,Sept 28)	Steady Conduction	Chapter 3
4 (Oct 1, Oct 5)	**Quiz** (October 1) Transient Conduction	Chapter 4
5 (Oct 8, Oct 19)	Numerical Methods Convection Fundamentals	Chapter 5 Chapter 6
6 (Oct 22, Oct 26)	**Midterm** (October 22) Convection Fundamentals	Chapter 6
7 (Oct 29, Nov 2)	External Forced Convection	Chapter 7
8 (Nov 5, Nov 9)	Internal Forced Convection	Chapter 8
9 (Nov 12, Nov 16)	Natural Convection Boiling & Condensation	Chapter 9 Chapter 10
10 (Nov 19, Nov 23)	Boiling & Condensation, cont'd Heat Exchangers	Chapter 10 Chapter 11
11 (Nov 26, Nov 30)	Heat Exchangers Introduction to Radiation	Chapter 11 Chapter 12
12 (Dec 3, Dec 7)	Radiation Heat Transfer Project Presentations	Chapter 13

	Exam Review	
Final Exam		

Other Course Information:

Professional conduct is required during online lectures, tutorials and laboratories, in written work submitted during the course, and in all communications with classmates, the Professor, the Teaching Assistants and other University employees. “Professional unsuitability” is discussed in the Academic Calendar.

The following rules apply to this course:

- Safety first. Any violation related to safety will result in dismissal from the class, tutorial or laboratory and the student will require the Professor’s permission to return.
- No illegal activities.
- Respect each other. No disruptive influences.
- Follow school policies.

Medical Certificates and Deferred Exams:

Medical statements and academic consideration forms for any missed student work worth 25% or less (not including midterms or tests) will be submitted directly to the course instructor. This includes missed quizzes, assignments and labs. Missed Midterms or Coursework Worth More than 25% For any missed midterms or tests, regardless of weight, or coursework worth more than 25%, students will need to submit the UOIT Medical statement or academic consideration form to the Engineering Advising Office following the form guidelines.

Guidelines for Medical Statements: Medical statements cover any missed work due to a medical reasons. The student must:

- see a medical doctor within 24 hours of the missed work
- submit the form to the correct individual within 3 working days

Guidelines for Academic Consideration Forms: Academic consideration forms cover any missed work for non-academic grounds, for example, religious observations, court appearance, personal/family emergency, varsity events. The student must provide supporting documentation if deemed necessary.

Should the medical certificate proven to be invalid due to any kind of action by the student, such student's behaviour will be considered as a major misconduct and respective disciplinary actions will be commenced.

Failure to comply with the above will result in an mark of 0 for the exam.

Students with disabilities may request to be considered for formal academic accommodation in accordance with the Ontario Human Rights Code. Students seeking accommodation must make their requests through the Centre for Students with Disabilities in a timely manner, and provide relevant and recent documentation to verify the effect of their disability and to allow the University to determine appropriate accommodations.

Accommodation decisions will be made in accordance with the Ontario Human Rights Code. Accommodations will be consistent with and supportive of the essential requirements of courses and programs, and provided in a way that respects the dignity of students with disabilities and encourages integration and equality of opportunity. Reasonable academic accommodation may require instructors to exercise creativity and flexibility in responding to the needs of students with disabilities while maintaining academic integrity.

Student Support

Any student who faces challenges securing their food or housing and believes this may affect their performance in the course is urged to contact studentlife@ontariotechu.ca for support. Furthermore, please notify your professor if you are comfortable in doing so. This will enable them to provide any resources and help that they can.

Sexual Violence Support and Education

Ontario Tech is committed to the prevention of sexual violence in all is forms. For any student who has experienced Sexual Violence, Ontario Tech can help. We will make accommodations to cater to the diverse backgrounds, cultures, and identities of students when dealing with individual cases. If you think you have been subjected to or witnessed sexual violence:

- Reach out to a Support Worker, a specially trained individual authorized to receive confidential disclosures about incidents of sexual violence. Support Workers can offer help and resolution options which can include safety plans, accommodations, mental health support, and more. To make an appointment with a Support Worker, call 905.721.3392 or email studentlife@ontariotechu.ca
- Learn more about your options at: https://studentlife.ontariotechu.ca/sexualviolence/

Students with Disabilities

Accommodating students with disabilities at Ontario Tech is a responsibility shared among various partners: the students themselves, SAS staff and faculty members. To ensure that disability-related concerns are properly addressed during this course, students with documented disabilities and who may require assistance to participate in this class are encouraged to speak with me as soon as possible. Students who suspect they have a disability that may affect their participation in this course are advised to go to Student Accessibility Services (SAS) as soon as possible. Maintaining communication and working collaboratively with SAS and faculty members will ensure you have the greatest chance of academic success.

Students taking courses on north Oshawa campus can visit Student Accessibility Services in the Student Life Building, U5, East HUB (located in the Founders North parking lot). Students taking courses on the downtown Oshawa campus can visit Student Accessibility Services in the 61 Charles St. Building, 2nd Floor, Room DTA 225 in the Student Life Suite.

Disability-related and accommodation support is available for students with mental health, physical, mobility, sensory, medical, cognitive, or learning challenges. Office hours are 8:30am-4:30pm, Monday to Friday, closed Wednesday's 8:30am – 10:00am. For more information on services provided, you can visit the SAS website at https://studentlife.ontariotechu.ca/services/accessibility/index.php. Students may contact Student Accessibility Services by calling 905-721-3266, or email studentaccessibility@ontariotechu.ca.

Students who require the use of the Test Centre to write tests, midterms, or quizzes MUST register online using the SAS test/exam sign-up module, found here https://disabilityservices.ontariotechu.ca/uoitclockwork/custom/misc/home.aspx. Students must sign up for tests, midterms, or quizzes AT LEAST seven (7) days before the date of the test.

Students must register for final exams by the registration deadline, which is typically two (2) weeks prior to the start of the final examination period. SAS will notify students of the registration deadline date.

Professional Conduct

All students who are enrolled in engineering programs must demonstrate behaviour appropriate to practice in engineering profession. Where Faculty dean determines that behaviour inconsistent with the norms and expectations of the profession has been exhibited by a student, that student may be immediately withdrawn from the program by the dean or subject to one or more of the sanctions described in the professional suitability policy: http://calendar.uoit.ca/content.php?catoid=22&navoid=879#Academic_conduct

A student demonstrating professional unsuitability may be immediately suspended from any practicum, field work or similar activity at the discretion of the dean pending a final decision.

Academic Integrity

Students and faculty at Ontario Tech University share an important responsibility to maintain the integrity of the teaching and learning relationship. This relationship is characterized by honesty, fairness and mutual respect for the aim and principles of the pursuit of education. Academic misconduct impedes the activities of the university community and is punishable by appropriate disciplinary action.

Students are expected to be familiar with and abide by Ontario Tech University's regulations on Academic Conduct which sets out the kinds of actions that constitute academic misconduct, including plagiarism, copying or allowing one's own work to copied, use of unauthorized aids in examinations and tests, submitting work prepared in collaboration with another student when such collaboration has not been authorized, among other academic offences. The regulations also describe the procedures for dealing with allegations, and the sanctions for any finding of academic misconduct, which can range from a resubmission of work to a failing grade to permanent expulsion from the university. A lack of familiarity with these regulations on academic conduct does not constitute a defense against its application. This information can be found at http://calendar.uoit.ca/content.php?catoid=22&navoid=879#Academic_conduct

Extra support services are available to all Ontario Tech University students in academic development, study skills, counseling, and peer mentorship. More information on student support services can be found at https://studentlife.ontariotechu.ca/services/academic-support/index.php

Turnitin

Ontario Tech University and faculty members reserve the right to use electronic means to detect and help prevent plagiarism. Students agree that by taking this course all assignments are subject to submission for textual similarity review by Turnitin.com. Assignments submitted to Turnitin.com will be included as source documents in Turnitin.com's restricted access database solely for the purpose of detecting plagiarism in such documents. The instructor may require students to submit their assignments electronically to Turnitin.com or the instructor may submit questionable text on behalf of a student. The terms that apply to Ontario Tech University's use of the Turnitin.com service are described on the Turnitin.com website.

Students who do not wish to have their work submitted to Turnitin.com must provide with their assignment at the time of submission to the instructor a signed Turnitin.com Assignment Cover sheet:

https://shared.uoit.ca/shared/department/academic-integrity/Forms/assignment-cover-sheet.pdf

Online Test and Exam Proctoring (Virtual Proctoring)

To maintain academic integrity in online testing, your instructor may require the use of Respondus LockDown Browser and Respondus Monitor or a similar virtual proctoring platform. In doing so, you will be required to use a computer with a webcam (either built-in or USB plug in). Please advise your instructor as soon as possible if you do not have a computer with a camera.

This is a link to a short video that explains the basics of Respondus LockDown Browser.

Final Examinations (if applicable)

Final examinations are held during the final examination period at the end of the semester and may take place in a different room and on a different day from the regularly scheduled class. Check the published Examination Schedule for a complete list of days and times.

Students are advised to obtain their Student ID Card well in advance of the examination period as they will not be able to write their examinations without it. Cards are available from the Campus ID office in the Campus Recreation and Wellness Centre, Room G1004.

Students who are unable to write a final examination when scheduled due to religious publications may make arrangements to write a deferred examination. These students are required to submit a Request for Accommodation for Religious Obligations to the Faculty concerned as soon as possible and no later than three weeks prior to the first day of the final examination period.

Further information on final examinations can be found at https://usgc.ontariotechu.ca/policy/policy-library/policies/academic/procedures-for-final-examination-administration.php

Freedom of Information and Protection of Privacy Act

The following is an important notice regarding the process for submitting course assignments, quizzes, and other evaluative material in your courses in the Faculty of Engineering and Applied Science.

Ontario Tech University is governed by the Freedom of Information and Protection of Privacy Act ("FIPPA"). In addition to providing a mechanism for requesting records held by the university, this legislation also requires that the University not disclose the personal information of its students without their consent.

FIPPA's definition of "personal information" includes, among other things, documents that contain both your name and your Banner (student) ID. For example, this could include graded test papers or assignments. To ensure that your rights to privacy are protected, the Faculty of [Insert Faculty name] encourages you to use only your Banner ID on assignments or test papers being submitted for grading. This policy is intended to prevent the inadvertent disclosure of your information where graded papers are returned to groups of students at the same time. If you still wish to write both your name and your Banner ID on your tests and assignments, please be advised that Ontario Tech University will interpret this as an implied consent to the disclosure of your personal information in the normal course of returning graded materials to students.

If you have any questions or concerns relating to the new policy or the issue of implied consent addressed above, please contact accessandprivacy@ontariotechu.ca

Student Course Feedback Surveys

Student evaluation of teaching is a highly valued and helpful mechanism for monitoring the quality of Ontario Tech University's programs and instructional effectiveness. To that end, course evaluations are administered by an external company in an online, anonymous process during the last few weeks of classes. Students are encouraged to participate actively in this process and will be notified of the dates. Notifications about course evaluations will be sent via e-mail, and posted on Canvas, Weekly News, and signage around the campus.

The Accessibility for Ontarians with Disabilities Act (AODA) standards have been considered in the development of this model course outline and it adheres to the principles outlined in the University's Accessibility Policy.

Notice of Collection and Use of Personal Information

Throughout this course, personal information may be collected through the use of certain technologies under the authority of the *University of Ontario Institute of Technology Act, SO 2002, c. 8, Sch. O.* and will be collected, protected, used, disclosed and retained in compliance with Ontario's *Freedom of Information and Protection of Privacy Act R.S.O. 1990, c. F.31.*

This course may use the following technologies that may collect, use, disclose and retain personal information (including images) for the purposes described below:

- Respondus Monitor and Proctortrack to maintain academic integrity for examinations.
- Google Meet and Kaltura Virtual Classroom to facilitate remote instruction and interactive learning.
- Peer-shared applications, services or technologies that may be reviewed, assessed, or used as part of coursework.
- Other applications, services, or technologies that support or enhance online learning.

For more information relating to these technologies, we encourage you to visit: https://tlc.ontariotechu.ca/learning-technology/index.php Questions regarding personal information may be directed to: Ontario Tech University Access and Privacy Office, 2000 Simcoe Street North, Oshawa, ON L1G 0C5, email: accessandprivacy@ontariotechu.ca.

By remaining enrolled in this course, you acknowledge that you have read, understand and agree to the terms and conditions under which the technology provider(s) may collect, use, disclose and retain your personal information. You agree to the university using the technologies and using your personal information for the purposes described in this course outline.

Technology Requirements

To support online learning, the university recommends certain technology requirements for laptops, software and internet connectivity which are available at: https://itsc.ontariotechu.ca/remote-learning.php.

Students experiencing technical difficulties such that they are unable to meet the technology requirements may contact the IT Service Help Desk at: servicedesk@dc-uoit.ca

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Ontario Tech University
Faculty of Engineering and Applied Science
Department of Automotive and Mechatronics Engineering-AME

Course Outline
MECE 3350U
Control Systems
Fall 2021

Offering Approval:

Under Revision

Course Description:

Analysis and synthesis of linear feedback systems by classical and state space techniques. Nonlinear and optimal control systems. Modelling of dynamic systems; analysis of stability, transient and steady state characteristics of dynamic systems; characteristics of feedback systems; design of PID control laws using frequency response methods and the root locus technique. Introduction to nonlinear and optimal control systems.

Major Topics:

- Analysis and synthesis of linear feedback systems by classical and state-space techniques
- An introduction to the nonlinear and optimal control systems
- Modeling of dynamical systems
- analysis of stability, transient and the steady-state characteristics of dynamic systems
- characteristics of feedback systems
- design of PID control laws using frequent response methods and the root locus technique

Graduate Attributes:

The graduate attributes developed and required by the Canadian Engineering Accreditation Board's Accreditation Criteria and Procedures are listed below, with those covered in the course to some degree (introduced, developed, applied).

Attributes	Covered in this Course
Knowledge base	✓
Problem analysis	✓
Investigation	✓
Design	✗
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	✗

Course Content Breakdown

Math	Basic Science	Complementary Studies	Engineering Science	Engineering Design
0%	0%	0%	100%	0%

Course Outcomes:

Students who successfully pass the course have reliably gained the ability to:

- carry out analysis and synthesis of linear feedback systems using classical and state space techniques;
- model control systems in a wide variety of engineering scenarios;
- perform stability and steady–state analyses of dynamic systems;
- understand the characteristics of feedback control systems;
- work with the PID controller laws and be able to design systems using frequency response methods and the root locus technique;
- apply the theory established in the course to some common systems that incorporate active control systems;
- use software and computer tools for the design and simulation of control systems.

Instructors

Instructor:	Email:	Office:	Phone:	Office Hours:
Dr. Carlos Rossa	carlos.rossa@ontariotechu.net	see url	(905) 721-8668 Ext 7340	Monday 11:30-13:30 & Wednesday 9:00-11:00

Teaching Assistants

TA Name:	Email:	Office:	Office Hours:
Olivia Wilz	olivia.wilz@ontariotechu.net	see url below	Thursday 13:30-13:30

TA Name:	Email:	Office:	Office Hours:
Conor McDermott	conor.mcdermott@ontariotechu.net	see url below	Friday 16:30-17:30

TA Name:	Email:	Office:	Office Hours:

Ben DeBoer	benjamin.deboer1@ontariotechu.net	see url below	Tuesday 8:30-9:30

TA Name:	Email:	Office:	Office Hours:
Rick Tan	hao.tan1@ontariotechu.net		Wednesday 11:00-12:00

Required Course Text and Other Materials:

- Matlab and Simulink
- Laptop computer

Reference Books and Information Sources:

- Modern Control Systems - Richard C. Dorf and Robert H. Bishop - Pearson

Course Organization and Delivery Mode:

The course is composed of:

- 23 Lectures - Three hours of recorded lectures per week
- 11 Tutorials - One hour of recorded tutorial sessions per week
- 5 Labs - Two hours of laboratory sessions every two weeks

Prerequisites: ELEE2790U: Electric Circuits or ENGR2790U: Electric Circuits; and MATH2860U: Differential Equations.

Students are strongly encouraged to attend all virtual office hours as needed.

Scheduled Regular Class Meeting Times:

Class	CRN	Room	Day-Time
Lectures	43480 - 44725	Online	1.5 hours of recorded lectures and exercises will be released two times a week (3h total).
Lecture office hours	43480 - 44725	https://meet.google.com/zax-dpgv-jjd	Monday 11:30 - 13:30 Wednesday 9:00 - 11:00
Tutorials	43477 - 43478 - 43479 - 43961	Online	1h or recorded tutorials will be released once a week.
Tutorials office hours	43477 - 43478 - 43479 - 43961	https://meet.google.com/zax-dpgv-jjd	Thursday 12:30-13:30 Tuesday 8:30-9:30
Lab	43470 - 43471 - 43472 - 43473	SIRC 2030 in person	W 18:10-20:00
Lab	43474 - 43475 - 44706 - 44707	SIRC 2030 in person	F 18:10-20:00
Lab office hours	All lab sessions	Online	Monday 13:00-14:00 Thursday 14:00-16:00 Wednesday 11:00-12:00

Final Grade Breakdown:

Grading policy

Assignments 0 %

Lab Reports	20 %
Midterm 1	22.5 %
Midterm 2	22.5%
Final Exam	35 %
Total	100%

Additional bonus marks, up to a maximum of 5%, will be offered at the discretion of the course instructor at a random time during the week.

Final Examination: The final exam is a comprehensive three–hour written exam. It will reflect the material covered throughout the whole course; this includes lectures, tutorials, labs, and assignments.

Passing grade

In addition to obtaining a weighted average mark of more than 50% following the grading policy detailed above, students are also required to obtain a minimum score of at least **35%** in the final examination in order to pass the course (without including bonus marks). Furthermore, a mark of less than **50%** on the final examination will result in at most a **D** for the course final grade. Less than 35% on the final examination will result in a final grade of **F** for the course.

Midterms

Midterm Date:	**Midterm Location:**
Tuesday, October 6, 2020 - 18:00 to 20:00	N/A
Midterm Date:	**Midterm Location:**
Tuesday, November 17, 2020 - 18:00 to 20:30	N/A

Assignments:

There will be **up to** 6 assignments.

Assignments will be given throughout the semester, due on the date and time indicated on each assignment. The solutions to assignments will be posted on Canvas. **Assignments will not be marked** but students are strongly encouraged and expected to solve all assignments. Neglecting the assignments will likely result in failing midterms and the final exam.

MATLAB/Simulink will be used to solve assignment problems and pre-labs.

Posting assignments to Chegg, CourseHero, or any external website, or using these sources to solve the assignments is not permitted. It constitutes a breach of Ontario Tech academic regulations and will lead to **academic misconduct charges**. Any form of plagiarism will not be tolerated. Any incidence of plagiarism will be penalized to the full extent of the academic regulations.

Laboratories, Prelab Reports, Notes and Reports

Lab Description:

1. Five experiments covering different aspects of control systems theory will be performed.

Prelab Reports, Notes and Reports:

Laboratories: Labs are delivered in person on campus at SIRC 2030. Five experiments will be run throughout the semester, for five different systems. The lab manual and time-table will be posted on Canvas. Lab reports will be handed to the **Lab instructor** prior to the beginning of the next Lab. Late submission will not be accepted. Students must attend their registered lab sessions. There will be a schedule to limit the number of students attending, i.e., only one member per lab group will be attending on behalf of their group for each lab. The person required to attend will rotate during the semester.

Students are required to complete the pre-labs before each lab session and present it to the lab instructors and/or teaching assistants, as applicable. Failure to complete the pre-lab assignments before each session will result in a zero mark for that part of the lab report.

Lab #1	Modelling and estimation of temporal response
Lab #2	Feedback control
Lab #3	Design and implementation of PID controllers
Lab #4	Controller design for stabilization of an unstable plant
Lab #5	Bode plots, Nyquist stability, and frequency response

Tutorials:

Tutorial will be recorded and released every week. In each one-hour tutorial, the Teaching Assistants will solve problems assigned by the course instructor as a practice demonstration. Stunts are expected to follow the contents of the tutorials on a weekly basis and keep up with the tutorial contents.

In addition, TAs will assist students in general course problems and aspects of the assignments.

Students are expected to have a laptop with Matlab and Simulink to follow tutorial sessions (as well as lectures and labs).

Computer Experience:

MATLAB and Simulink software will be used in class as well to solve assignments, problems, pre-labs, and lab reports. Students are expected to install this software prior to the first lecture. Students are also expected to have access to the software during all lecture and tutorial sessions.

Summary of Important Dates and Marking Scheme:

First midterm examination

October 06 from 18:00 to 20:00 - Lectures 1 to 8

Second midterm examination

November 17 from 18:00 to 20:30 - Lectures 1 to 17

Final examination

The final examination will take place during the final examination period (Dec 9 to 19). Date, location, and time, to be determined. Lecture covered: 1-23.

Summary of grading policy

Assignments	0 %
Lab Reports	20 %
Midterm 1	22.5 %
Midterm 2	22.5 %
Final Exam	35 %
Total	100 %

A missed midterm examination for legitimate reasons will be reweighted onto the final exam accordingly, provided that a formal request is submitted to and approved by the academic council. Late assignments or lab reports will not be accepted.

Detailed Course Content:

The primary objective of this course is to introduce the students to the subject of feedback control systems; modelling of dynamical systems; analysis of single input– single output (SISO) systems and their components; linear behaviour of systems and their components; derivation of input-output relationships, using ordinary differential equations and Laplace transforms; definition of design requirements for control systems; design of controllers for SISO systems to meet design requirements. There will be tutorial sessions and laboratory experiments that will provide students with the opportunities to ask more questions about specific sample problems, and become more familiar with the control theories and experiments.

September	Week 37 Sep 7-13	Lecture 1	Course overview and introduction to control systems
		Lecture 2	Dynamic models
	Week 38 Sep 14-20	Lecture 3	Laplace transformation in control systems
		Lecture 4	Transfer functions
	Week 39 Sep 21-27	Lecture 5	Effect of pole locations
		Lecture 6	Block diagram models
	Week 40 Sep 28 - 04	Lecture 7	Steady-state error
		Lecture 8	Transient response
October	Oct 06	Midterm 1	Lectures 1 to 8 (18:00-20:00)
	Week 41 Oct 05 - 11	Lecture 9	Dominant poles and zeros
	Week 42 Oct 11 - 17	No class	Reading week
	Week 43 Oct 16 - 25	Lecture 10	Routh-Hurwitz stability criterion
		Lecture 11	The root-locus method 1/2
	Week 44 Oct 26 - 01	Lecture 12	The root-locus method 2/2
		Lecture 13	PID controllers

November	Week 45 Nov 02 - 08	Lecture 14	Implementing PID controllers
		Lecture 15	Review and practice exercises lectured 1-14 handed out
	Week 46 Nov 09 - 15	Lecture 16	Bode Plots 1/2
		Lecture 17	Bode Plots 2/2
	Nov 17	Midterm 2	Lectures 1 to 17 (18:00-20:30)
	Week 47 Nov 16 - 22	Lecture 18	Nyquist stability criterion
	Week 48 Nov 23 - 29	Lecture 19	Nyquist plot
		Lecture 20	Stability margins
	Week 49 Nov 30- 6	Lecture 21	State-space models
		Lecture 22	Bode plot exercises
December	Week 50 Dec 6 - 8	Lecture 23	Final examination review
	Week 50-51 Dec 9-19	Final exam	Lectures 1 to 23

Other Course Information:

Asynchronous classes: Classes are not delivered live, they will be recorded as posted so that students can study at their own pace. Students are strongly encouraged to keep up with the lectures and tutorial content on a weekly basis and attend the virtual office hours as needed. Students are encouraged to study the materials given in lectures continuously and visit the course content on Canvas regularly for deadlines, announcements, and the solutions to assignments, quizzes, and tests. There are 11h of office hours every week. Additional meetings can be scheduled as needed.

Assignments: Assignments will not be marked. Posting assignments to Chegg, CourseHero, or any external website, or using these sources to solve the assignments is not permitted. It constitutes a breach of Ontario Tech academic regulations and will lead to misconduct charges. Any form of plagiarism will not be tolerated.

Academic misconduct: Cheating, plagiarism or any other form of academic misconduct as outlined in Section 5.15 of the Ontario Tech Academic Calendar will be punished to the fullest extent.

Email: Please do not contact the course instruction and TAs via Canvas. Email the instructor and TAs directly for a faster response.

Missed exams: A missed midterm examination for legitimate reasons will be reweighted onto the final exam accordingly, provided that a formal request is submitted to and approved by the academic council. Late assignments or lab reports will not be considered.

Note: The above topics and outline are subjected to adjustments and changes as needed.

Content share: Students are **NOT** allowed to share the contents posted on BlackBoard on CourseHero, Chegg or any other external website. This includes lecture notes, assignments, tutorials, lab manuals, quizzes, and tests. Any unauthorized copying, distribution, posting, or use of these contents constitutes a breach of Regulation 5.16.5 of Ontario Tech's academic calendar and will lead to **academic misconduct charges**. Any incidence of plagiarism (including Chegg) will not be tolerated, will lead to academic misconduct charges, and will be penalized to the full extent of the academic regulations. Any unauthorized use of the course materials must be reported to the course instructor immediately.

Medical Certificates and Deferred Exams:

Medical statements and academic consideration forms for any missed student work worth 25% or less (not including midterms or tests) will be submitted directly to the course instructor. This includes missed quizzes, assignments and labs. Missed Midterms or Coursework Worth More than 25% For any missed midterms or tests, regardless of weight, or coursework worth more than 25%, students will need to submit the UOIT Medical statement or academic consideration form to the Engineering Advising Office following the form guidelines.

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Should the medical certificate proven to be invalid due to any kind of action by the student, such student's behaviour will be considered as a major misconduct and respective disciplinary actions will be commenced.

Failure to comply with the above will result in an mark of 0 for the exam.

Students with disabilities may request to be considered for formal academic accommodation in accordance with the Ontario Human Rights Code. Students seeking accommodation must make their requests through the Centre for Students with Disabilities in a timely manner, and provide relevant and recent documentation to verify the effect of their disability and to allow the University to determine appropriate accommodations.

Accommodation decisions will be made in accordance with the Ontario Human Rights Code. Accommodations will be consistent with and supportive of the essential requirements of courses and programs, and provided in a way that respects the dignity of students with disabilities and encourages integration and equality of opportunity. Reasonable academic accommodation may require instructors to exercise creativity and flexibility in responding to the needs of students with disabilities while maintaining academic integrity.

Student Support

Any student who faces challenges securing their food or housing and believes this may affect their performance in the course is urged to contact studentlife@ontariotechu.ca for support. Furthermore, please notify your professor if you are comfortable in doing so. This will enable them to provide any resources and help that they can.

Sexual Violence Support and Education

Ontario Tech is committed to the prevention of sexual violence in all is forms. For any student who has experienced Sexual Violence, Ontario Tech can help. We will make accommodations to cater to the diverse backgrounds, cultures, and identities of students when dealing with individual cases. If you think you have been subjected to or witnessed sexual violence:

- Reach out to a Support Worker, a specially trained individual authorized to receive confidential disclosures about incidents of sexual violence. Support Workers can offer help and resolution options which can include safety plans, accommodations, mental health support, and more. To make an appointment with a Support Worker, call 905.721.3392 or email studentlife@ontariotechu.ca
- Learn more about your options at: https://studentlife.ontariotechu.ca/sexualviolence/

Students with Disabilities

Accommodating students with disabilities at Ontario Tech is a responsibility shared among various partners: the students themselves, SAS staff and faculty members. To ensure that disability-related concerns are properly addressed during this course, students with documented disabilities and who may require assistance to participate in this class are encouraged to speak with me as soon as possible. Students who suspect they have a disability that may affect their participation in this course are advised to go to Student Accessibility Services (SAS) as soon as possible. Maintaining communication and working collaboratively with SAS and faculty members will ensure you have the greatest chance of academic success.

Students taking courses on north Oshawa campus can visit Student Accessibility Services in the Student Life Building, U5, East HUB (located in the Founders North parking lot). Students taking courses on the downtown Oshawa campus can visit Student Accessibility Services in the 61 Charles St. Building, 2nd Floor, Room DTA 225 in the Student Life Suite.

Disability-related and accommodation support is available for students with mental health, physical, mobility, sensory, medical, cognitive, or learning challenges. Office hours are 8:30am-4:30pm, Monday to Friday, closed Wednesday's 8:30am – 10:00am. For more information on services provided, you can visit the SAS website at https://studentlife.ontariotechu.ca/services/accessibility/index.php. Students may contact Student Accessibility Services by calling 905-721-3266, or email studentaccessibility@ontariotechu.ca.

Students who require the use of the Test Centre to write tests, midterms, or quizzes MUST register online using the SAS test/exam sign-up module, found here https://disabilityservices.ontariotechu.ca/uoitclockwork/custom/misc/home.aspx. Students must sign up for tests, midterms, or quizzes AT LEAST seven (7) days before the date of the test.

Students must register for final exams by the registration deadline, which is typically two (2) weeks prior to the start of the final examination period. SAS will notify students of the registration deadline date.

Professional Conduct

All students who are enrolled in engineering programs must demonstrate behaviour appropriate to practice in engineering profession. Where Faculty dean determines that behaviour inconsistent with the norms and expectations of the profession has been exhibited by a

student, that student may be immediately withdrawn from the program by the dean or subject to one or more of the sanctions described in the professional suitability policy: http://calendar.uoit.ca/content.php?catoid=22&navoid=879#Academic_conduct

A student demonstrating professional unsuitability may be immediately suspended from any practicum, field work or similar activity at the discretion of the dean pending a final decision.

Academic Integrity

Students and faculty at Ontario Tech University share an important responsibility to maintain the integrity of the teaching and learning relationship. This relationship is characterized by honesty, fairness and mutual respect for the aim and principles of the pursuit of education. Academic misconduct impedes the activities of the university community and is punishable by appropriate disciplinary action.

Students are expected to be familiar with and abide by Ontario Tech University's regulations on Academic Conduct which sets out the kinds of actions that constitute academic misconduct, including plagiarism, copying or allowing one's own work to copied, use of unauthorized aids in examinations and tests, submitting work prepared in collaboration with another student when such collaboration has not been authorized, among other academic offences. The regulations also describe the procedures for dealing with allegations, and the sanctions for any finding of academic misconduct, which can range from a resubmission of work to a failing grade to permanent expulsion from the university. A lack of familiarity with these regulations on academic conduct does not constitute a defense against its application. This information can be found at http://calendar.uoit.ca/content.php?catoid=22&navoid=879#Academic_conduct

Extra support services are available to all Ontario Tech University students in academic development, study skills, counseling, and peer mentorship. More information on student support services can be found at https://studentlife.ontariotechu.ca/services/academic-support/index.php

Turnitin

Ontario Tech University and faculty members reserve the right to use electronic means to detect and help prevent plagiarism. Students agree that by taking this course all assignments are subject to submission for textual similarity review by Turnitin.com. Assignments submitted to Turnitin.com will be included as source documents in Turnitin.com's restricted access database solely for the purpose of detecting plagiarism in such documents. The instructor may require students to submit their assignments electronically to Turnitin.com or the instructor may submit questionable text on behalf of a student. The terms that apply to Ontario Tech University's use of the Turnitin.com service are described on the Turnitin.com website.

Students who do not wish to have their work submitted to Turnitin.com must provide with their assignment at the time of submission to the instructor a signed Turnitin.com Assignment Cover sheet:

https://shared.uoit.ca/shared/department/academic-integrity/Forms/assignment-cover-sheet.pdf

Online Test and Exam Proctoring (Virtual Proctoring)

To maintain academic integrity in online testing, your instructor may require the use of Respondus LockDown Browser and Respondus Monitor or a similar virtual proctoring platform. In doing so, you will be required to use a computer with a webcam (either built-in or USB plug in). Please advise your instructor as soon as possible if you do not have a computer with a camera.

This is a link to a short video that explains the basics of Respondus LockDown Browser.

Final Examinations (if applicable)

Final examinations are held during the final examination period at the end of the semester and may take place in a different room and on a different day from the regularly scheduled class. Check the published Examination Schedule for a complete list of days and times.

Students are advised to obtain their Student ID Card well in advance of the examination period as they will not be able to write their examinations without it. Cards are available from the Campus ID office in the Campus Recreation and Wellness Centre, Room G1004.

Students who are unable to write a final examination when scheduled due to religious publications may make arrangements to write a deferred examination. These students are required to submit a Request for Accommodation for Religious Obligations to the Faculty concerned as soon as possible and no later than three weeks prior to the first day of the final examination period.

Further information on final examinations can be found at https://usgc.ontariotechu.ca/policy/policy-library/policies/academic/procedures-for-final-examination-administration.php

Freedom of Information and Protection of Privacy Act

The following is an important notice regarding the process for submitting course assignments, quizzes, and other evaluative material in your courses in the Faculty of Engineering and Applied Science.

Ontario Tech University is governed by the Freedom of Information and Protection of Privacy Act ("FIPPA"). In addition to providing a mechanism for requesting records held by the university, this legislation also requires that the University not disclose the personal information of its students without their consent.

FIPPA's definition of "personal information" includes, among other things, documents that contain both your name and your Banner (student) ID. For example, this could include graded test papers or assignments. To ensure that your rights to privacy are protected, the Faculty of [Insert Faculty name] encourages you to use only your Banner ID on assignments or test papers being submitted for grading. This policy is intended to prevent the inadvertent disclosure of your information where graded papers are returned to groups of students at the same time. If you still wish to write both your name and your Banner ID on your tests and assignments, please be advised that Ontario Tech University will interpret this as an implied consent to the disclosure of your personal information in the normal course of returning graded materials to students.

If you have any questions or concerns relating to the new policy or the issue of implied consent addressed above, please contact accessandprivacy@ontariotechu.ca

Student Course Feedback Surveys

Student evaluation of teaching is a highly valued and helpful mechanism for monitoring the quality of Ontario Tech University's programs and instructional effectiveness. To that end, course evaluations are administered by an external company in an online, anonymous process during the last few weeks of classes. Students are encouraged to participate actively in this process and will be notified of the dates. Notifications about course evaluations will be sent via e-mail, and posted on Canvas, Weekly News, and signage around the campus.

The Accessibility for Ontarians with Disabilities Act (AODA) standards have been considered in the development of this model course outline and it adheres to the principles outlined in the University's Accessibility Policy.

Notice of Collection and Use of Personal Information

Throughout this course, personal information may be collected through the use of certain technologies under the authority of the *University of Ontario Institute of Technology Act, SO 2002, c. 8, Sch. O.* and will be collected, protected, used, disclosed and retained in compliance with Ontario's *Freedom of Information and Protection of Privacy Act R.S.O. 1990, c. F.31.*

This course may use the following technologies that may collect, use, disclose and retain personal information (including images) for the purposes described below:

- Respondus Monitor and Proctortrack to maintain academic integrity for examinations.
- Google Meet and Kaltura Virtual Classroom to facilitate remote instruction and interactive learning.

- Peer-shared applications, services or technologies that may be reviewed, assessed, or used as part of coursework.
- Other applications, services, or technologies that support or enhance online learning.

For more information relating to these technologies, we encourage you to visit: https://tlc.ontariotechu.ca/learning-technology/index.php Questions regarding personal information may be directed to: Ontario Tech University Access and Privacy Office, 2000 Simcoe Street North, Oshawa, ON L1G 0C5, email: accessandprivacy@ontariotechu.ca.

By remaining enrolled in this course, you acknowledge that you have read, understand and agree to the terms and conditions under which the technology provider(s) may collect, use, disclose and retain your personal information. You agree to the university using the technologies and using your personal information for the purposes described in this course outline.

Technology Requirements

To support online learning, the university recommends certain technology requirements for laptops, software and internet connectivity which are available at: https://itsc.ontariotechu.ca/remote-learning.php.

Students experiencing technical difficulties such that they are unable to meet the technology requirements may contact the IT Service Help Desk at: servicedesk@dc-uoit.ca

Students experiencing financial difficulties such that they are unable to meet the technology requirements may contact Student Awards and Financial Aid Office at: connect@ontariotehu.ca

By remaining enrolled in this course, you acknowledge that you have read, understand and agree to observe the Recommended Technology Requirements for accessing university online learning resources, including those minimum requirements that are specific to your faculty and program.

Virtual Monitoring of Examinations

Ontario Tech University will conduct virtual monitoring of examinations in accordance with Ontario privacy legislation and all approved policy instruments.

Sensitive/Offensive Subject Matter

The classroom (both physical and virtual) is intended to provide a safe, open space for the critical and civil exchange of ideas and opinions. Some articles, media and other course materials may contain sensitive content that is offensive and/or disturbing. The Course Instructor will try to identify such material and communicate warnings[MG1] to students in advance of the distribution and use of such materials, affording students the choice to either emotionally prepare for, or not to view or interact with, the content.

Freedom of Expression

Pursuant to Ontario Tech's Freedom of Expression Policy all students are encouraged to express ideas and perspectives freely and respectfully in university space and in the online university environment, subject to certain limitations. Students are reminded that the limits on Freedom of Expression include speech or behaviour that: is illegal or interferes with the university's legal obligations; defames an

individual or group; constitutes a threat, harassment or discrimination; is a breach of fiduciary, contractual, privacy or confidentiality obligations or commitments; and unduly disrupts and interferes with the functioning of the university. In the context of working online, different forms of communication are used. Where permitted, students using “chat” functions or other online forms of communication are encouraged to ensure that their communication complies with the Freedom of Expression Policy.

University Response to COVID-19

The government response to the COVID-19 pandemic is continually evolving. As new information becomes available from federal and provincial public health authorities, the Province of Ontario and the Regional Municipality of Durham, Ontario Tech University will remain nimble and prepared to respond to government orders, directives, guidelines and changes in legislation to ensure the health and safety of all members of its campus community. In accordance with public health recommendations, the university may need to adjust the delivery of course instruction and the availability and delivery mode of campus services and co-curricular opportunities. Ontario Tech University appreciates the understanding and flexibility of our students, faculty and staff as we continue to navigate the pandemic and work together to demonstrate our strong commitment to academic, research and service excellence during these challenging and unprecedented times.

Ontario Tech University

Faculty of Energy Systems and Nuclear Science

Course Outline

ESNS 3380U

Strength of Materials

Fall 2020

Offering Approval:

29

Course Description:

Principles of statics as applied to deformable solid bodies; stress and strain; Hooke's law, elastic behaviour of simple members under axial force, tension, compression, shear, torsion; bending and deflection of beams; design of beams, trusses, frames and shafts; column loads and buckling; impact loading; stability of structures.

Major Topics:

Graduate Attributes:

The graduate attributes developed and required by the Canadian Engineering Accreditation Board's Accreditation Criteria and Procedures are listed below, with those covered in the course to some degree (introduced, developed, applied).

Attributes	Covered in this Course
Knowledge base	✓
Problem analysis	✓
Investigation	✓
Design	✓
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	✗

Course Content Breakdown

Math	Basic Science	Complementary Studies	Engineering Science	Engineering Design
0%	0%	0%	70%	30%

Course Outcomes:

- Mechanical properties of materials.
- Resolve force vectors and force systems including moments.
- Analyze rigid bodies and structures.
- Compute the centre of gravity, centre of mass, centroids, and moments of inertia.
- Understand axial load, torsion, bending moments, transverse shear, and stress and strain in materials.
- Design beams, shafts, and structures.

Instructors

Instructor:	Email:	Office:	Phone:
Dr. Matthew Haigh Kaye, BASc (Toronto), MASc (Queens), PhD (Queens)	Matthew.Kaye@uoit.ca	ERC 4082	X5524

Office Hours:

Week days 09h00-16h00; Virtual Office Hours: Just about anytime

Teaching Assistants

TA Name:	Email:	Office:	Office Hours:
Isaac Hassen	Isaac.Hassen@ontariotechu.net	ERC 4100	TBA

TA Name:	Email:	Office:	Office Hours:
Lekhnath Ghimire	Lekhnath.Ghimire@ontariotechu.net	ERC 4100	TBA

Required Course Text and Other Materials:

- Statics and Mechanics of Materials, 4/E, Russell C. Hibbeler, ©2014 | Prentice Hall | Published: 07/23/2013 ISBN-10: 0133451607 | ISBN-13: 9780133451603

Course Organization and Delivery Mode:

The course material has been divided into 12 learning modules, with power point lecture slides and sample problems (with solutions released on a time delay) appropriate to each module. Over the course of the 12 weeks, the lecture material will be presented with an emphasis on solving problems in class to illustrate the concepts (technical theory) provided as part of the slide material. The lecture material is broken up into small pieces (learning chunks) that deal with one or two of the module's learning concepts. At regular intervals, typically at the end of the week, a module test will be given to the class. A passing mark (to be discussed later) on a module test is required before the student can move forward to the next module. Students are required to complete at least 7 modules to pass the course.

Module #0 – Course Outline, Course Information, and Introduction

Module #1 – General Principles

Module #2 –Force System Resultants and Moments

Module #3 – Equilibrium of Rigid Bodies

Module #4 – Structures

Module #5 – Centroids and Moments of Inertia

Module #6 – Shear and Bending Moments

Module #7 – Material Properties

Module #8 – Axial Loads and Torsion

Module #9 – Bending and Transverse Shear

Module #10 – Design of Beams and Shafts

Module #11 – Deflection of Beams (time permitting)

The passing marks for these modules is:

Modules 1 - 3: 70%

Modules 4 - 7: 65%

Modules 8 - 11: 60%

Student that fail any given module will be allowed to retest that module, usually within a week. If the student is still unsuccessful further tests will be offerred as time permits. Students that have passed a module may retake an earlier test to improve the mark. The recorded mark for a module test will be subjected to the following constraint: For a given module the first two testing opportunities won't have a penalty applied after the mark is calculated. For every subsequent test, the recorded mark will have 5% per number of attempts after the second (*i.e.*, the fifth attempt would be penalized (5-3) x 5% = 15%). Passing the module will be based on the raw mark, not the recorded

mark (*e.g.*, for a Module 3 test, taken for the fourth time has a raw mark of 70%, would be recorded as 60%, but would be considered a passing grade alowing the student to progress to the next module).

Scheduled Regular Class Meeting Times:

Schedule Meeting Times:

Wednesday 12h40 - 14h00 (nominally a lecture) - online and will be recorded

Friday 12h40 - 14h00 (nominally a lecture) - online and will be recorded

Monday 14h00 - 15h00 (nominally a tutorial) - online and will be recorded

Tuesday 10h00 - 11h00 (nominally a reserve tutorial) - online and will be recorded

Laboratory Times Scheduled (if in person labs occur)

Tuesday 10h00 - 12h00 ENG 1050 (alternate weeks)

Thursday 10h00 - 12h00 ENG 1050 (alternate weeks)

Final Grade Breakdown:

Laboratory Reports 20%

Module Tests 80% (must pass 7)

Assignments:

There are no formal assignments (for marks), but each module includes several representative problems which if completed for practice will suitably prepare the student for passing the module test.

Laboratories, Prelab Reports, Notes and Reports

Lab Description:

1. Shear Force Experiment
2. Bending Moment Experiment
3. Tensile Testing Experiment
4. Torsion Testing Experiment
5. Thin Cylinder Experiment

Prelab Reports, Notes and Reports:

Material for the lab report requirements and the lab report marking scheme will be available through CANVAS.

Because of COVID-19 concerns, in person labs many not be medically safe. Should this be the case, the labs will be performed by the course instructor, TAs, and supporting staff. Data for the lab will be then made available along with useful videos and other supporting materials.

Tutorials:

Formal tutorials, distinct from lectures, will not be occurring this delivery. Instead, the course material will be presented with multiple examples and class participation to solve these problems. Instead the theory and practice willbe blended over the course delivery. Students are expected to have read the lecture material before class to facilitate this process.

Detailed Course Content:

Module #0 – Course Outline, Course Information, and Introduction

Module #1 – General Principles

Module #2 –Force System Resultants and Moments

Module #3 – Equilibrium of Rigid Bodies

Module #4 – Structures

Module #5 – Centroids and Moments of Inertia

Module #6 – Shear and Bending Moments

Module #7 – Material Properties

Module #8 – Axial Loads and Torsion

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Failure to comply with the above will result in an mark of 0 for the exam.

Students with disabilities may request to be considered for formal academic accommodation in accordance with the Ontario Human Rights Code. Students seeking accommodation must make their requests through the Centre for Students with Disabilities in a timely manner, and provide relevant and recent documentation to verify the effect of their disability and to allow the University to determine appropriate accommodations.

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- Reach out to a Support Worker, a specially trained individual authorized to receive confidential disclosures about incidents of sexual violence. Support Workers can offer help and resolution options which can include safety plans, accommodations, mental health support, and more. To make an appointment with a Support Worker, call 905.721.3392 or email studentlife@ontariotechu.ca
- Learn more about your options at: https://studentlife.ontariotechu.ca/sexualviolence/

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suspect they have a disability that may affect their participation in this course are advised to go to Student Accessibility Services (SAS) as soon as possible. Maintaining communication and working collaboratively with SAS and faculty members will ensure you have the greatest chance of academic success.

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The Accessibility for Ontarians with Disabilities Act (AODA) standards have been considered in the development of this model course outline and it adheres to the principles outlined in the University's Accessibility Policy.

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This course may use the following technologies that may collect, use, disclose and retain personal information (including images) for the purposes described below:

- Respondus Monitor and Proctortrack to maintain academic integrity for examinations.
- Google Meet and Kaltura Virtual Classroom to facilitate remote instruction and interactive learning.
- Peer-shared applications, services or technologies that may be reviewed, assessed, or used as part of coursework.
- Other applications, services, or technologies that support or enhance online learning.

For more information relating to these technologies, we encourage you to visit: https://tlc.ontariotechu.ca/learning-technology/index.php Questions regarding personal information may be directed to: Ontario Tech University Access and Privacy Office, 2000 Simcoe Street North, Oshawa, ON L1G 0C5, email: accessandprivacy@ontariotechu.ca.

By remaining enrolled in this course, you acknowledge that you have read, understand and agree to the terms and conditions under which the technology provider(s) may collect, use, disclose and retain your personal information. You agree to the university using the technologies and using your personal information for the purposes described in this course outline.

Technology Requirements

To support online learning, the university recommends certain technology requirements for laptops, software and internet connectivity which are available at: https://itsc.ontariotechu.ca/remote-learning.php.

Students experiencing technical difficulties such that they are unable to meet the technology requirements may contact the IT Service Help Desk at: servicedesk@dc-uoit.ca

Students experiencing financial difficulties such that they are unable to meet the technology requirements may contact Student Awards and Financial Aid Office at: connect@ontariotehu.ca

By remaining enrolled in this course, you acknowledge that you have read, understand and agree to observe the Recommended Technology Requirements for accessing university online learning resources, including those minimum requirements that are specific to your faculty and program.

Virtual Monitoring of Examinations

Ontario Tech University will conduct virtual monitoring of examinations in accordance with Ontario privacy legislation and all approved policy instruments.

Sensitive/Offensive Subject Matter

The classroom (both physical and virtual) is intended to provide a safe, open space for the critical and civil exchange of ideas and opinions. Some articles, media and other course materials may contain sensitive content that is offensive and/or disturbing. The Course Instructor will try to identify such material and communicate warnings[MG1] to students in advance of the distribution and use of such materials, affording students the choice to either emotionally prepare for, or not to view or interact with, the content.

Freedom of Expression

Pursuant to Ontario Tech's Freedom of Expression Policy all students are encouraged to express ideas and perspectives freely and respectfully in university space and in the online university environment, subject to certain limitations. Students are reminded that the limits on Freedom of Expression include speech or behaviour that: is illegal or interferes with the university's legal obligations; defames an individual or group; constitutes a threat, harassment or discrimination; is a breach of fiduciary, contractual, privacy or confidentiality obligations or commitments; and unduly disrupts and interferes with the functioning of the university. In the context of working online, different forms of communication are used. Where permitted, students using "chat" functions or other online forms of communication are encouraged to ensure that their communication complies with the Freedom of Expression Policy.

University Response to COVID-19

The government response to the COVID-19 pandemic is continually evolving. As new information becomes available from federal and provincial public health authorities, the Province of Ontario and the Regional Municipality of Durham, Ontario Tech University will remain nimble and prepared to respond to government orders, directives, guidelines and changes in legislation to ensure the health and safety of all members of its campus community. In accordance with public health recommendations, the university may need to adjust the delivery of course instruction and the availability and delivery mode of campus services and co-curricular opportunities. Ontario Tech University appreciates the understanding and flexibility of our students, faculty and staff as we continue to navigate the pandemic and work together to demonstrate our strong commitment to academic, research and service excellence during these challenging and unprecedented times.

Ontario Tech University
Faculty of Engineering and Applied Science
Dean's Office

Course Outline
ENGR 3360U
Engineering Economics
Winter 2021

Offering Approval:

Approved

Course Description:

Aspects of theoretical and applied economics relevant to engineers, including an introduction to fundamental principles of micro and macroeconomics. Microeconomics topics include scarcity, opportunity cost, diminishing returns, elasticity, industrial organization, economies of scale and concentration. Macroeconomics topics include unemployment, inflation, economic growth, the multiplier, equilibrium, fiscal policy and monetary policy. The principle of money and banking are introduced along with the role of the Bank of Canada. Applied economics topics covered include cost concepts, time value of money, comparison of alternatives, depreciation, tax considerations, economic analysis of projects, breakeven, sensitivity and risk, and decision models. Other topics covered include: economic decision analysis applied to private and public sector capital projects, discounted cash flow methods, lease analysis, replacement decisions, inflation impacts and public sector project analysis.

Major Topics:

- Introduction to Engineering Economics
- General Economics
- Engineering Estimation
- Interest and Equivalence
- Present Worth Analysis
- Annual Cash Flow
- Rate of Return Analysis
- Benefit/Cost Analysis
- Making Choices
- Uncertainty and Risk
- Income and Depreciation
- After-tax Cash Flows
- Replacement Analysis

- Inflation
- MARR Selection
- Public Sector Issues
- Accounting
- Personal Economics for the Engineer

Graduate Attributes:

The graduate attributes developed and required by the Canadian Engineering Accreditation Board's Accreditation Criteria and Procedures are listed below, with those covered in the course to some degree (introduced, developed, applied).

Attributes	Covered in this Course
Knowledge base	✓
Problem analysis	✓
Investigation	✓
Design	✗
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	✓

Course Content Breakdown

Math	Basic Science	Complementary Studies	Engineering Science	Engineering Design
0%	0%	100%	0%	0%

Course Outcomes:

1. The graduate will be able to “speak” the language of CEOs, CFOs, accountants, etc. and understand the economic implications of engineering decisions.

2. She/he will understand the fundamentals of our economy, the purpose of the Bank of Canada, the ecomonic effects of inflation, oil costs, dollar costs etc.

3. She/he will be able to write and understand basic business tools such as Business Plans, financial accounting sheets, stock and bond prices, etc.

4. She/he will be able to demonstrate the ability to define a business problem and solve it.

5. She/he will be able to understand the limitations of models used.

6. She/he will be able to demonstrate success in a team environment.

7. She/he will be able to communicate project results.

8. She/he will be able to demonstrate the ability to estimate costs, read financial statementts and compare alternate solutions.

9. She/he will be able to understand key ecomonic indicators and their relationship to effective engineering.

All communications and submissions will be electronic, in Word and through BlackBoard.

Instructors

Instructor:	Email:	Office:	Phone:	Office Hours:
Dr. Seama Koohi, PhD, PEng	via Canvas	ERC3084	905.721.8668 ext. 5518	Tues and Thurs at 5:00PM-6:30PM (via appointment)

Teaching Assistants

TA Name:	Email:	Office:	Office Hours:
Michael Peiris	via Canvas	TBA	TBA

TA Name:	Email:	Office:	Office Hours:
Jonathan Couture	via Canvas	TBA	TBA

TA Name:	Email:	Office:	Office Hours:
Bogachan Gungor	via Canvas	TBA	TBA

TA Name:	Email:	Office:	Office Hours:
Mert Temiz	via Canvas	TBA	TBA

TA Name:	Email:	Office:	Office Hours:
TBA	TBA		

Required Course Text and Other Materials:

- Engineering Economic Analysis, 4th Canadian edition, 2018. Authors: Newnan, Jones, Whittaker, Eschenbach, Lavelle, Oxford UP

Reference Books and Information Sources:

- Any standard Economics textbook, preferably Canadian edition.
- Chan, C.S. Contemporary Engineering Economics 6th edition, Pearson, Prentice-Hall, 20015
- Fraser, Jewkes, Bernhardt, Tajma Engineering Economics in Canada, 3rd edition Pearson, Prentice-Hall
- Engineering Economics: Blank and Tarquin, 2nd Canadian Edition, McGraw-Hill 2014

Course Organization and Delivery Mode:

Three lecture hours per week delivered online in a synchronous and asynchrnous format, depending on the topics covered.

All communications and submissions will be electronic and through Canvas.

Scheduled Regular Class Meeting Times:

CRN 70767

From Jan 11, 2021 to Apr 09, 2021, on Wednesdays & Fridays at 5:10 PM to 6:30 PM

and on Monday, Apr 12, 2021 at 5:10 PM to 6:30 PM.

CRN 72799

From Jan 11, 2021 to Apr 09, 2021, on Wednesdays & Fridays at 9:40 AM to 11:00 AM

and on Monday, Apr 12, 2021 at 9:40 AM to 11:00 AM.

Final Grade Breakdown:

Term Group Project	25%
Quizzes	20%
Midterm exam	15%
Final Exam	40%
Total	100%

Midterms

Midterm Date:	Midterm Location:
Saturday, March 6, 2021 - 12:00 to 13:30	Online

Assignments:

Term Group Project :

The project will be performed in groups. Group formation is done by students in Canvas. There will be three submissions during the course semester that are described in the project description sheet on Canvas.

1. Initial project topic: Jan. 25, 2021

2. Interim progress report: Feb. 28, 2021

3. Final project submission: Apr. 4, 2021

Prelab Reports, Notes and Reports:

There are no labs scheduled for this course.

Tutorials:

There are no tutorials scheduled for this course.

Summary of Important Dates and Marking Scheme:

All dates are tentative and will be communicated at a later date.:

Quizzes: Online quizzes during lecture time.

Project deliverable 1: Feb. 28, 2021

Midterm: March 6, 2021 at 12:00PM-1:30PM

Project deliverable 2: Apr. 4, 2021

Detailed Course Content:

1. General Introduction to Engineering Economics
2. General Economics
    1. Microeconomics
    2. Macroeconomics
    3. Money and the Bank of Canada
3. Engineering Estimation
4. Interest and Equivalence
5. Present Worth Analysis
6. Annual Cash Flow
7. Rate of Return Analysis

8. Benefit/Cost Analysis
9. Making Choices
10. Uncertainty and Risk
11. Income and Depreciation
12. After-tax Cash Flows
13. Replacement Analysis
14. Inflation
15. MARR Selection
16. Accounting

Other Course Information:

IMPORTANT: First lecture of the semester will explain the course organization, expectations, evaluation breakdown, rubrics, important dates, and other details.

Medical Certificates and Deferred Exams:

Medical statements and academic consideration forms for any missed student work worth 25% or less (not including midterms or tests) will be submitted directly to the course instructor. This includes missed quizzes, assignments and labs. Missed Midterms or Coursework Worth More than 25% For any missed midterms or tests, regardless of weight, or coursework worth more than 25%, students will need to submit the UOIT Medical statement or academic consideration form to the Engineering Advising Office following the form guidelines.

Guidelines for Medical Statements: Medical statements cover any missed work due to a medical reasons. The student must:

- see a medical doctor within 24 hours of the missed work
- submit the form to the correct individual within 3 working days

Guidelines for Academic Consideration Forms: Academic consideration forms cover any missed work for non-academic grounds, for example, religious observations, court appearance, personal/family emergency, varsity events. The student must provide supporting documentation if deemed necessary.

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- Other applications, services, or technologies that support or enhance online learning.

For more information relating to these technologies, we encourage you to visit: https://tlc.ontariotechu.ca/learning-technology/index.php Questions regarding personal information may be directed to: Ontario Tech University Access and Privacy Office, 2000 Simcoe Street North, Oshawa, ON L1G 0C5, email: accessandprivacy@ontariotechu.ca.

By remaining enrolled in this course, you acknowledge that you have read, understand and agree to the terms and conditions under which the technology provider(s) may collect, use, disclose and retain your personal information. You agree to the university using the technologies and using your personal information for the purposes described in this course outline.

Technology Requirements

To support online learning, the university recommends certain technology requirements for laptops, software and internet connectivity which are available at: https://itsc.ontariotechu.ca/remote-learning.php.

Students experiencing technical difficulties such that they are unable to meet the technology requirements may contact the IT Service Help Desk at: servicedesk@dc-uoit.ca

Students experiencing financial difficulties such that they are unable to meet the technology requirements may contact Student Awards and Financial Aid Office at: connect@ontariotehu.ca

By remaining enrolled in this course, you acknowledge that you have read, understand and agree to observe the Recommended Technology Requirements for accessing university online learning resources, including those minimum requirements that are specific to your faculty and program.

Virtual Monitoring of Examinations

Ontario Tech University will conduct virtual monitoring of examinations in accordance with Ontario privacy legislation and all approved policy instruments.

Sensitive/Offensive Subject Matter

The classroom (both physical and virtual) is intended to provide a safe, open space for the critical and civil exchange of ideas and opinions. Some articles, media and other course materials may contain sensitive content that is offensive and/or disturbing. The Course Instructor will try to identify such material and communicate warnings[MG1] to students in advance of the distribution and use of such materials, affording students the choice to either emotionally prepare for, or not to view or interact with, the content.

Freedom of Expression

Pursuant to Ontario Tech's Freedom of Expression Policy all students are encouraged to express ideas and perspectives freely and respectfully in university space and in the online university environment, subject to certain limitations. Students are reminded that the limits on Freedom of Expression include speech or behaviour that: is illegal or interferes with the university's legal obligations; defames an individual or group; constitutes a threat, harassment or discrimination; is a breach of fiduciary, contractual, privacy or confidentiality obligations or commitments; and unduly disrupts and interferes with the functioning of the university. In the context of working online, different forms of communication are used. Where permitted, students using "chat" functions or other online forms of communication are encouraged to ensure that their communication complies with the Freedom of Expression Policy.

University Response to COVID-19

The government response to the COVID-19 pandemic is continually evolving. As new information becomes available from federal and provincial public health authorities, the Province of Ontario and the Regional Municipality of Durham, Ontario Tech University will remain nimble and prepared to respond to government orders, directives, guidelines and changes in legislation to ensure the health and safety of all members of its campus community. In accordance with public health recommendations, the university may need to adjust the delivery of course instruction and the availability and delivery mode of campus services and co-curricular opportunities. Ontario Tech University appreciates the understanding and flexibility of our students, faculty and staff as we continue to navigate the pandemic and work together to demonstrate our strong commitment to academic, research and service excellence during these challenging and unprecedented times.

Ontario Tech University
Faculty of Engineering and Applied Science
Department of Automotive and Mechatronics Engineering-AME

Course Outline
MANE 4160U
Artificial Intelligence in Engineering
Winter 2021

Offering Approval:

Under Revision

Course Description:

Introduction to artificial intelligence; knowledge-based systems, state space representation, search strategies, knowledge representation, reasoning with uncertainty; fuzzy sets, membership functions and operations, fuzzy relations, fuzzy reasoning; neural networks, basic neuron modelling, multi-layer perceptron, self-organization networks and adaptive theory; genetic algorithms for optimization and search; applications of artificial intelligence in engineering, design and manufacturing.

Major Topics:

Graduate Attributes:

The graduate attributes developed and required by the Canadian Engineering Accreditation Board's Accreditation Criteria and Procedures are listed below, with those covered in the course to some degree (introduced, developed, applied).

Attributes	Covered in this Course
Knowledge base	✕
Problem analysis	✕
Investigation	✕
Design	✕
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	✕

Course Content Breakdown

Math	Basic Science	Complementary Studies	Engineering Science	Engineering Design
0%	0%	0%	0%	0%

Medical Certificates and Deferred Exams:

Medical statements and academic consideration forms for any missed student work worth 25% or less (not including midterms or tests) will be submitted directly to the course instructor. This includes missed quizzes, assignments and labs. Missed Midterms or Coursework Worth More than 25% For any missed midterms or tests, regardless of weight, or coursework worth more than 25%, students will need to submit the UOIT Medical statement or academic consideration form to the Engineering Advising Office following the form guidelines.

Guidelines for Medical Statements: Medical statements cover any missed work due to a medical reasons. The student must:

- see a medical doctor within 24 hours of the missed work
- submit the form to the correct individual within 3 working days

Guidelines for Academic Consideration Forms: Academic consideration forms cover any missed work for non-academic grounds, for example, religious observations, court appearance, personal/family emergency, varsity events. The student must provide supporting documentation if deemed necessary.

Should the medical certificate proven to be invalid due to any kind of action by the student, such student's behaviour will be considered as a major misconduct and respective disciplinary actions will be commenced.

Failure to comply with the above will result in an mark of 0 for the exam.

Students with disabilities may request to be considered for formal academic accommodation in accordance with the Ontario Human Rights Code. Students seeking accommodation must make their requests through the Centre for Students with Disabilities in a timely manner, and provide relevant and recent documentation to verify the effect of their disability and to allow the University to determine appropriate accommodations.

Accommodation decisions will be made in accordance with the Ontario Human Rights Code. Accommodations will be consistent with and supportive of the essential requirements of courses and programs, and provided in a way that respects the dignity of students with disabilities and encourages integration and equality of opportunity. Reasonable academic accommodation may require instructors to exercise creativity and flexibility in responding to the needs of students with disabilities while maintaining academic integrity.

Student Support

Any student who faces challenges securing their food or housing and believes this may affect their performance in the course is urged to contact studentlife@ontariotechu.ca for support. Furthermore, please notify your professor if you are comfortable in doing so. This will enable them to provide any resources and help that they can.

Sexual Violence Support and Education

Ontario Tech is committed to the prevention of sexual violence in all is forms. For any student who has experienced Sexual Violence, Ontario Tech can help. We will make accommodations to cater to the diverse backgrounds, cultures, and identities of students when dealing with individual cases. If you think you have been subjected to or witnessed sexual violence:

- Reach out to a Support Worker, a specially trained individual authorized to receive confidential disclosures about incidents of sexual violence. Support Workers can offer help and resolution options which can include safety plans, accommodations, mental health support, and more. To make an appointment with a Support Worker, call 905.721.3392 or email studentlife@ontariotechu.ca
- Learn more about your options at: https://studentlife.ontariotechu.ca/sexualviolence/

Students with Disabilities

Accommodating students with disabilities at Ontario Tech is a responsibility shared among various partners: the students themselves, SAS staff and faculty members. To ensure that disability-related concerns are properly addressed during this course, students with documented disabilities and who may require assistance to participate in this class are encouraged to speak with me as soon as possible. Students who suspect they have a disability that may affect their participation in this course are advised to go to Student Accessibility Services (SAS) as soon as possible. Maintaining communication and working collaboratively with SAS and faculty members will ensure you have the greatest chance of academic success.

Students taking courses on north Oshawa campus can visit Student Accessibility Services in the Student Life Building, U5, East HUB (located in the Founders North parking lot). Students taking courses on the downtown Oshawa campus can visit Student Accessibility Services in the 61 Charles St. Building, 2nd Floor, Room DTA 225 in the Student Life Suite.

Disability-related and accommodation support is available for students with mental health, physical, mobility, sensory, medical, cognitive, or learning challenges. Office hours are 8:30am-4:30pm, Monday to Friday, closed Wednesday's 8:30am – 10:00am. For more information on services provided, you can visit the SAS website at https://studentlife.ontariotechu.ca/services/accessibility/index.php. Students may contact Student Accessibility Services by calling 905-721-3266, or email studentaccessibility@ontariotechu.ca.

Students who require the use of the Test Centre to write tests, midterms, or quizzes MUST register online using the SAS test/exam sign-up module, found here https://disabilityservices.ontariotechu.ca/uoitclockwork/custom/misc/home.aspx. Students must sign up for tests, midterms, or quizzes AT LEAST seven (7) days before the date of the test.

Students must register for final exams by the registration deadline, which is typically two (2) weeks prior to the start of the final examination period. SAS will notify students of the registration deadline date.

Professional Conduct

All students who are enrolled in engineering programs must demonstrate behaviour appropriate to practice in engineering profession. Where Faculty dean determines that behaviour inconsistent with the norms and expectations of the profession has been exhibited by a student, that student may be immediately withdrawn from the program by the dean or subject to one or more of the sanctions described in the professional suitability policy: http://calendar.uoit.ca/content.php?catoid=22&navoid=879#Academic_conduct

A student demonstrating professional unsuitability may be immediately suspended from any practicum, field work or similar activity at the discretion of the dean pending a final decision.

Academic Integrity

Students and faculty at Ontario Tech University share an important responsibility to maintain the integrity of the teaching and learning relationship. This relationship is characterized by honesty, fairness and mutual respect for the aim and principles of the pursuit of education. Academic misconduct impedes the activities of the university community and is punishable by appropriate disciplinary action.

Students are expected to be familiar with and abide by Ontario Tech University's regulations on Academic Conduct which sets out the kinds of actions that constitute academic misconduct, including plagiarism, copying or allowing one's own work to copied, use of unauthorized aids in examinations and tests, submitting work prepared in collaboration with another student when such collaboration has not been authorized, among other academic offences. The regulations also describe the procedures for dealing with allegations, and the sanctions for any finding of academic misconduct, which can range from a resubmission of work to a failing grade to permanent expulsion from the university. A lack of familiarity with these regulations on academic conduct does not constitute a defense against its application. This information can be found at http://calendar.uoit.ca/content.php?catoid=22&navoid=879#Academic_conduct

Extra support services are available to all Ontario Tech University students in academic development, study skills, counseling, and peer mentorship. More information on student support services can be found at https://studentlife.ontariotechu.ca/services/academic-support/index.php

Turnitin

Ontario Tech University and faculty members reserve the right to use electronic means to detect and help prevent plagiarism. Students agree that by taking this course all assignments are subject to submission for textual similarity review by Turnitin.com. Assignments submitted to Turnitin.com will be included as source documents in Turnitin.com's restricted access database solely for the purpose of detecting plagiarism in such documents. The instructor may require students to submit their assignments electronically to Turnitin.com or the instructor may submit questionable text on behalf of a student. The terms that apply to Ontario Tech University's use of the Turnitin.com service are described on the Turnitin.com website.

Students who do not wish to have their work submitted to Turnitin.com must provide with their assignment at the time of submission to the instructor a signed Turnitin.com Assignment Cover sheet:

https://shared.uoit.ca/shared/department/academic-integrity/Forms/assignment-cover-sheet.pdf

Online Test and Exam Proctoring (Virtual Proctoring)

To maintain academic integrity in online testing, your instructor may require the use of Respondus LockDown Browser and Respondus Monitor or a similar virtual proctoring platform. In doing so, you will be required to use a computer with a webcam (either built-in or USB plug in). Please advise your instructor as soon as possible if you do not have a computer with a camera.

This is a link to a short video that explains the basics of Respondus LockDown Browser.

Final Examinations (if applicable)

Final examinations are held during the final examination period at the end of the semester and may take place in a different room and on a different day from the regularly scheduled class. Check the published Examination Schedule for a complete list of days and times.

Students are advised to obtain their Student ID Card well in advance of the examination period as they will not be able to write their examinations without it. Cards are available from the Campus ID office in the Campus Recreation and Wellness Centre, Room G1004.

Students who are unable to write a final examination when scheduled due to religious publications may make arrangements to write a deferred examination. These students are required to submit a Request for Accommodation for Religious Obligations to the Faculty concerned as soon as possible and no later than three weeks prior to the first day of the final examination period.

Further information on final examinations can be found at https://usgc.ontariotechu.ca/policy/policy-library/policies/academic/procedures-for-final-examination-administration.php

Freedom of Information and Protection of Privacy Act

The following is an important notice regarding the process for submitting course assignments, quizzes, and other evaluative material in your courses in the Faculty of Engineering and Applied Science.

Ontario Tech University is governed by the Freedom of Information and Protection of Privacy Act ("FIPPA"). In addition to providing a mechanism for requesting records held by the university, this legislation also requires that the University not disclose the personal information of its students without their consent.

FIPPA's definition of "personal information" includes, among other things, documents that contain both your name and your Banner (student) ID. For example, this could include graded test papers or assignments. To ensure that your rights to privacy are protected, the Faculty of [Insert Faculty name] encourages you to use only your Banner ID on assignments or test papers being submitted for grading. This policy is intended to prevent the inadvertent disclosure of your information where graded papers are returned to groups of students at the same time. If you still wish to write both your name and your Banner ID on your tests and assignments, please be advised that Ontario Tech University will interpret this as an implied consent to the disclosure of your personal information in the normal course of returning graded materials to students.

If you have any questions or concerns relating to the new policy or the issue of implied consent addressed above, please contact accessandprivacy@ontariotechu.ca

Student Course Feedback Surveys

Student evaluation of teaching is a highly valued and helpful mechanism for monitoring the quality of Ontario Tech University's programs and instructional effectiveness. To that end, course evaluations are administered by an external company in an online, anonymous process during the last few weeks of classes. Students are encouraged to participate actively in this process and will be notified of the dates. Notifications about course evaluations will be sent via e-mail, and posted on Canvas, Weekly News, and signage around the campus.

The Accessibility for Ontarians with Disabilities Act (AODA) standards have been considered in the development of this model course outline and it adheres to the principles outlined in the University's Accessibility Policy.

Notice of Collection and Use of Personal Information

Throughout this course, personal information may be collected through the use of certain technologies under the authority of the *University of Ontario Institute of Technology Act, SO 2002, c. 8, Sch. O.* and will be collected, protected, used, disclosed and retained in compliance with Ontario's *Freedom of Information and Protection of Privacy Act R.S.O. 1990, c. F.31.*

This course may use the following technologies that may collect, use, disclose and retain personal information (including images) for the purposes described below:

- Respondus Monitor and Proctortrack to maintain academic integrity for examinations.
- Google Meet and Kaltura Virtual Classroom to facilitate remote instruction and interactive learning.
- Peer-shared applications, services or technologies that may be reviewed, assessed, or used as part of coursework.
- Other applications, services, or technologies that support or enhance online learning.

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Ontario Tech University
Faculty of Engineering and Applied Science
Department of Mechanical and Manufacturing Engineering-MME

Course Outline
MECE 3410U
Electromechanical Energy Conversion
Winter 2021

Offering Approval:

Approved

Course Description:

This course provides an understanding of the principles of electromechanical energy conversion and introduces some common devices employed in the process. Specific topics covered include the principles of electromechanical energy conversion; ferromagnetic materials and their properties; basic operating concepts and steady state models for transformers, dc machines, and ac machines; electromechanical test and measurement procedures; characteristics and behaviour of machines.

Major Topics:

- the principles of electromechanical energy conversion
- ferromagnetic materials and their properties
- electromechanical energy conversion
- basic operating concepts and steady state models for transformers
- dc machines
- Induction machines
- Synchronous Machince
- electromechanical test and measurement procedures

Graduate Attributes:

The graduate attributes developed and required by the Canadian Engineering Accreditation Board's Accreditation Criteria and Procedures are listed below, with those covered in the course to some degree (introduced, developed, applied).

Attributes	Covered in this Course
Knowledge base	✓
Problem analysis	✓
Investigation	✗
Design	✓
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	✗

Course Content Breakdown

Math	Basic Science	Complementary Studies	Engineering Science	Engineering Design
0%	0%	0%	70%	30%

Instructors

Instructor:	Email:	Office Hours:
Dr. Murat Aydin	murat.aydin@uoit.ca	Tuesday 2-3 pm, Thursday 2-3 pm, online through https://meet.google.com/fgh-tifc-qze

Teaching Assistants

TA Name:	Email:
Conor Mcdermott	Conor.Mcdermott@Ontariotechu.net

TA Name:	Email:
Abdulrahman Al-shanoon	Abdulrahman.Al-shanoon@uoit.ca

Required Course Text and Other Materials:

- “Electrical Machines, Drives, and Power Systems”, by Theodore Wildi; 6th edition, published by Pearson, 2006.

Reference Books and Information Sources:

- “Electric Machinery”, by A. E. Fitzgerald et al; published by McGraw Hill, 2002.
- “Modeling and high-performance control of electric machines”, by John Chiasson; Published by Wiley-Interscience, 2005.
- “Principles of Electric Machines and Power Electronics”, by P. C. Sen; published by Wiley Inc., 2012.
- “Electric machines” by Charles A. Gross; Published by CRC Press, 2007

Course Organization and Delivery Mode:

Three lecture hours

One tutorial hour per week and two laboratory hours (biweekly) for one semester

Scheduled Regular Class Meeting Times:

Time	Days	Where	Date Range	Schedule Type	Instructors
9:40 am - 11:00 am	W	meet.google.com/jan-tzhg-yhd	Jan 11, 2021 - Apr 09, 2021	Lecture	Murat Aydin
9:40 am - 11:00 am	F	meet.google.com/jan-tzhg-yhd	Jan 11, 2021 - Apr 09, 2021	Lecture	Murat Aydin

On Mon, April 12, 2021 from 9:40 am - 11:00 am we will have a class to compensate our lecture hours lost due to Good Friday.

Final Grade Breakdown:

Quizzes: 15%

Laboratories: 10%

Group Project: 15%

Midterms: 20%

Final Exam: 40%

Midterms

Midterm Location:

Online through Canvas

Laboratories, Prelab Reports, Notes and Reports

Lab Description:

1. Experiment 1: Transformers
2. Experiment 2: DC Machines
3. Experiment 3: Three-Phases Asynchronous Machines
4. Experiment 4: Synchronous Machines
5. Experiment 5: Slip-ring Rotor Machines

Prelab Reports, Notes and Reports:

Lab sessions will be conducted by the lab instructors.

Please follow the instructions from the lab instructors.

The lab reports should be submitted to the lab instrutors as well.

Tutorials:

There is one tutorial hour per week,

In each tutorial session TA will solve 2-3 problems.

Computer Experience:

Software systems needed for this course include: windows office & MATLAB or similar.

Detailed Course Content:

This course provides an understanding of the principles of electromechanical energy conversion and introduces some common devices employed in the process. Specific topics covered include the principles of electromechanical energy conversion; ferromagnetic materials and their properties; Electromagnets; basic operating concepts and steady-state models for transformers, dc machines, and ac machines; characteristics and behavior of machines.

Other Course Information:

1. Deferred Midterm Exams

There is no deferred midterm exam. A student who misses the midterm due to a medical reason will get his/her weight of midterm exam added to that of his/her final.

Medical Certificates and Deferred Exams:

Medical statements and academic consideration forms for any missed student work worth 25% or less (not including midterms or tests) will be submitted directly to the course instructor. This includes missed quizzes, assignments and labs. Missed Midterms or Coursework Worth More than 25% For any missed midterms or tests, regardless of weight, or coursework worth more than 25%, students will need to submit the UOIT Medical statement or academic consideration form to the Engineering Advising Office following the form guidelines.

Guidelines for Medical Statements: Medical statements cover any missed work due to a medical reasons. The student must:

- see a medical doctor within 24 hours of the missed work
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Failure to comply with the above will result in an mark of 0 for the exam.

Students with disabilities may request to be considered for formal academic accommodation in accordance with the Ontario Human Rights Code. Students seeking accommodation must make their requests through the Centre for Students with Disabilities in a timely manner, and provide relevant and recent documentation to verify the effect of their disability and to allow the University to determine appropriate accommodations.

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Turnitin

Ontario Tech University and faculty members reserve the right to use electronic means to detect and help prevent plagiarism. Students agree that by taking this course all assignments are subject to submission for textual similarity review by Turnitin.com. Assignments submitted to Turnitin.com will be included as source documents in Turnitin.com's restricted access database solely for the purpose of detecting plagiarism in such documents. The instructor may require students to submit their assignments electronically to Turnitin.com or the instructor may submit questionable text on behalf of a student. The terms that apply to Ontario Tech University's use of the Turnitin.com service are described on the Turnitin.com website.

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This is a link to a short video that explains the basics of Respondus LockDown Browser.

Final Examinations (if applicable)

Final examinations are held during the final examination period at the end of the semester and may take place in a different room and on a different day from the regularly scheduled class. Check the published Examination Schedule for a complete list of days and times.

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Freedom of Information and Protection of Privacy Act

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FIPPA's definition of "personal information" includes, among other things, documents that contain both your name and your Banner (student) ID. For example, this could include graded test papers or assignments. To ensure that your rights to privacy are protected, the Faculty of [Insert Faculty name] encourages you to use only your Banner ID on assignments or test papers being submitted for grading. This policy is intended to prevent the inadvertent disclosure of your information where graded papers are returned to groups of students at the same time. If you still wish to write both your name and your Banner ID on your tests and assignments, please be advised that Ontario Tech University will interpret this as an implied consent to the disclosure of your personal information in the normal course of returning graded materials to students.

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Student Course Feedback Surveys

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The Accessibility for Ontarians with Disabilities Act (AODA) standards have been considered in the development of this model course outline and it adheres to the principles outlined in the University's Accessibility Policy.

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This course may use the following technologies that may collect, use, disclose and retain personal information (including images) for the purposes described below:

- Respondus Monitor and Proctortrack to maintain academic integrity for examinations.
- Google Meet and Kaltura Virtual Classroom to facilitate remote instruction and interactive learning.
- Peer-shared applications, services or technologies that may be reviewed, assessed, or used as part of coursework.
- Other applications, services, or technologies that support or enhance online learning.

For more information relating to these technologies, we encourage you to visit: https://tlc.ontariotechu.ca/learning-technology/index.php Questions regarding personal information may be directed to: Ontario Tech University Access and Privacy Office, 2000 Simcoe Street North, Oshawa, ON L1G 0C5, email: accessandprivacy@ontariotechu.ca.

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Ontario Tech University
Faculty of Engineering and Applied Science
Department of Electrical, Computer and Software Engineering

Course Outline
ELEE 4115U
Fundamentals of Smart Grid
Fall 2021

Offering Approval:

Under Revision

Course Description:

This course starts by introducing the basic components making the smart grid and the drivers/benefits of implementing it. The course will focus on the role/impacts of the various smart grid components on the electric energy systems, including renewable, plug-in hybrid electric vehicles, demand side management, and greenhouse gas (GHG) emissions reductions. Topics such as smart metering, smart energy pricing and policies, grid optimization, distribution system automation and management, transmission system operation, power electronics and energy storage in smart grid and power quality will be introduced. The related standards to inter-operability and design will also be covered in this course. 3 cr. 3 lec.

Major Topics:

Graduate Attributes:

The graduate attributes developed and required by the Canadian Engineering Accreditation Board's Accreditation Criteria and Procedures are listed below, with those covered in the course to some degree (introduced, developed, applied).

Attributes	Covered in this Course
Knowledge base	✓
Problem analysis	✓
Investigation	✕
Design	✕
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	✕

Course Content Breakdown

Math	Basic Science	Complementary Studies	Engineering Science	Engineering Design
0%	0%	0%	100%	0%

Course Outcomes:

1) To grasp the fundamentals of smart grid and their technologies.
2) To introduce the students to the modern view of the electric power grid considering the three main sections; generation, transmission and distribution.
3) To provide the students with an in-depth knowledge about the smart grid design
4) To learn about the stakeholders in smart grid industry
5) To recognize various performance and stability analysis tools
6) To present the students a perspective of the transformation of the existing grid into smart, reliable and sustainable electric grid
7) To learn about the impacts of different components such as electric vehicles, renewable energy, and smart homes on the power grid

Instructors

Instructor:	Email:	Office:	Phone:
Dr. Walid Morsi Ibrahim	walidmorsi.ibrahim@uoit.ca; walidmorsi.ibrahim@ontariotechu.ca	ERC3065	905-721-8668 X 5483

Office Hours:

Wednesdays 10:30 am to 12:30 pm

Teaching Assistants

TA Name:	Email:	Office:
Kandarp Gandhi	kandarp.gandhi@ontariotechu.net	ERC3100

Reference Books and Information Sources:

- Smart Grid: Fundamentals of Design and Analysis by James Momoh, 1st Edition, Wiley IEEE Press, 2012

Course Organization and Delivery Mode:

Three hours of lectures per week for one semester.

Teaching Methods:

Lecturing will be used in explaining the fundamentals of the smart grid components, operation and design.

Projects: The students will interact with each other through working on smart grid related projects

Course Delivery Mode: OT-Online.

Scheduled Regular Class Meeting Times:

Monday: 5:10 pm to 6:30 pm

Wednesday: 5:10 pm to 6:30 pm

All lectures are in Synchronous mode

Final Grade Breakdown:

20% Quiz 1

20% Quiz 2

30% Project (= 25% completion of project/presentation + 5% final report)

30% Final Exam

Passing Grades
D
The grading scheme is shown below:

Mark	Grade	GPA
90 – 100	A+	4.3
85 – 89	A	4.0
80 – 84	A-	3.7
77 – 79	B+	3.3
73 – 76	B	3.0

70 – 72	B-	2.7
67 – 69	C+	2.3
60 – 66	C	2.0
50 – 59	D	1.0
0 – 49	F	0.0

Summary of Important Dates and Marking Scheme:

Quiz 1: Oct. 21st from 5:15 pm to 6:15 pm on Canvas

Quiz 2: Nov. 18th from 5:15 pm to 6:15 pm on Canvas

Projects presentations will be scheduled during the last three weeks

Project final reports+codes are due on Dec 4 by 12:00 pm

Final Examination date will be set by the Registrar Office.

Detailed Course Content:

All parts will be evaluated in the final Exam. Note that this outline is subject to change and may be modified at the Instructor's discretion.

Part I: Introduction

Week 1: Introduction to Smart Grid

Part II: Electric Power Quality

Week 2: Electric power quality definitions, classification and analysis

Week 3: Electric power quality impacts and solutions

Part III: Distributed Energy Resources (DERs)

Week 4: Renwable energy sources (e.g., Solar, wind, hydro, tidal, ect.), plug-in electric vehicles and energy storage

Week 5: Interfacing and compensation

Part IV: Transmission System Operation

Week 6: Fall Study Break

Week 7: Bulk generation and the transmission system

Week 8: Energy management systems (EMS) and wide area applications

Part V: Distribution Automation (DA)

Week 9: Distribution systems, substation automation, fault management and voltage regulation

Part VI: Distribution Management Systems (DMS)

Week 10: Integration of DMS into Smart Grid, DMS modeling, analysis tools and applications

Part VII: Smart Metering and Demand Side Integration (DSI)

Week 11: Automatic metering infrastructure (AMI), demand response (DR), DSI support

Part VIII: Interoperability Standards and Cyber Security

Week 12: Interoperability standards and Introduction to Information security

Other Course Information:

Medical Certificates and Deferred Exams:
Medical certificates MUST be sent DIRECTLY from the Doctor's Office or Hospital within five (5) days by mail or preferably by fax to the Academic Advisor of FEAS (Fax: 905.721.3370, Attn: Academic Advising Team).

Should the medical certificate proven to be invalid due to any kind of action by the student, such student's behaviour will be considered as a major misconduct and respective disciplinary actions will be commenced. Failure to comply with the above will result in an mark of 0 for the exam.
Accessibility:
Students with disabilities may request to be considered for formal academic accommodation in accordance with the Ontario Human Rights Code. Students seeking accommodation must make their requests through the Centre for Students with Disabilities in a timely manner, and provide relevant and recent documentation to verify the effect of their disability and to allow the University to determine appropriate accommodations.

Accommodation decisions will be made in accordance with the Ontario Human Rights Code. Accommodations will be consistent with and supportive of the essential requirements of courses and programs, and provided in a way that respects the dignity of students with disabilities and encourages integration and equality of opportunity. Reasonable academic accommodation may require instructors to exercise creativity and flexibility in responding to the needs of students with disabilities while maintaining academic integrity.

Academic Integrity and Conduct:
Students and faculty at UOIT share an important responsibility to maintain the integrity of the teaching and learning relationship. This relationship is characterized by honesty, fairness and mutual respect for the aim and principles of the pursuit of education. Academic misconduct impedes the activities of the university community and is punishable by appropriate disciplinary action.
Students are expected to be familiar with UOIT's regulations on Academic Conduct (Section 5.15 of the Academic Calendar) which sets out the kinds of actions that constitute academic misconduct, including plagiarism, copying or allowing one's own work to copied, use of unauthorized aids in examinations and tests, submitting work prepared in collaboration with another student when such collaboration has not been authorized, and other academic offences. The regulations also describe the procedures for dealing with allegations, and the sanctions for

any finding of academic misconduct, which can range from a written reprimand to permanent expulsion from the university. A lack of familiarity with UOIT's regulations on academic conduct does not constitute a defense against its application.

Further information about academic misconduct can be found in the Academic Integrity link on your laptop.
Turnitin:
UOIT and faculty members reserve the right to use electronic means to detect and help prevent plagiarism. Students agree that by taking this course all assignments are subject to submission for textual similarity review by Turnitin.com. Assignments submitted to Turnitin.com will be included as source documents in Turnitin.com's restricted access database solely for the purpose of detecting plagiarism in such documents for five academic years.

The instructor may require students to submit their assignments electronically to Turnitin.com or the instructor may submit questionable text on behalf of a student. The terms that apply to UOIT's use of the Turnitin.com service are described on the Turnitin.com website.
Students who do not wish to have their work submitted to Turnitin.com must provide with their assignment at the time of submission to the instructor a signed Turnitin.com Assignment Cover sheet:
http://www.uoit.ca/assets/Academic~Integrity~Site/Forms/Assignment%20Cover%20sheet.pdf
Further information about Turnitin can be found on the Academic Integrity link on your laptop.

Freedom of Information and Protection of Information Act:
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FIPPA’s definition of “personal information” includes, among other things, documents that contain both your name and your Banner ID. For example, this could include graded test papers or assignments. To ensure that your rights to privacy are protected, UOIT encourages you to use only your Banner ID on assignments or test papers being submitted for grading. This policy is intended to prevent the inadvertent disclosure of your information where graded papers are returned to groups of students at the same time. If you still wish to write both your name and your Banner ID on your tests and assignments, please be advised that UOIT will interpret this as an implied consent to the disclosure of your personal information in the normal course of returning graded materials to students.

If you have any questions or concerns relating to the new policy or the issue of implied consent addressed above, please contact the UOIT privacy office.

Medical Certificates and Deferred Exams:

Medical statements and academic consideration forms for any missed student work worth 25% or less (not including midterms or tests) will be submitted directly to the course instructor. This includes missed quizzes, assignments and labs. Missed Midterms or Coursework Worth More than 25% For any missed midterms or tests, regardless of weight, or coursework worth more than 25%, students will need to submit the UOIT Medical statement or academic consideration form to the Engineering Advising Office following the form guidelines.

Guidelines for Medical Statements: Medical statements cover any missed work due to a medical reasons. The student must:

- see a medical doctor within 24 hours of the missed work
- submit the form to the correct individual within 3 working days

Guidelines for Academic Consideration Forms: Academic consideration forms cover any missed work for non-academic grounds, for example, religious observations, court appearance, personal/family emergency, varsity events. The student must provide supporting documentation if deemed necessary.

Should the medical certificate proven to be invalid due to any kind of action by the student, such student's behaviour will be considered as a major misconduct and respective disciplinary actions will be commenced.

Failure to comply with the above will result in an mark of 0 for the exam.

Students with disabilities may request to be considered for formal academic accommodation in accordance with the Ontario Human Rights Code. Students seeking accommodation must make their requests through the Centre for Students with Disabilities in a timely manner, and provide relevant and recent documentation to verify the effect of their disability and to allow the University to determine appropriate accommodations.

Accommodation decisions will be made in accordance with the Ontario Human Rights Code. Accommodations will be consistent with and supportive of the essential requirements of courses and programs, and provided in a way that respects the dignity of students with disabilities and encourages integration and equality of opportunity. Reasonable academic accommodation may require instructors to exercise creativity and flexibility in responding to the needs of students with disabilities while maintaining academic integrity.

Student Support

Any student who faces challenges securing their food or housing and believes this may affect their performance in the course is urged to contact studentlife@ontariotechu.ca for support. Furthermore, please notify your professor if you are comfortable in doing so. This will enable them to provide any resources and help that they can.

Sexual Violence Support and Education

Ontario Tech is committed to the prevention of sexual violence in all is forms. For any student who has experienced Sexual Violence, Ontario Tech can help. We will make accommodations to cater to the diverse backgrounds, cultures, and identities of students when dealing with individual cases. If you think you have been subjected to or witnessed sexual violence:

- Reach out to a Support Worker, a specially trained individual authorized to receive confidential disclosures about incidents of sexual violence. Support Workers can offer help and resolution options which can include safety plans, accommodations, mental health support, and more. To make an appointment with a Support Worker, call 905.721.3392 or email studentlife@ontariotechu.ca
- Learn more about your options at: https://studentlife.ontariotechu.ca/sexualviolence/

Students with Disabilities

Accommodating students with disabilities at Ontario Tech is a responsibility shared among various partners: the students themselves, SAS staff and faculty members. To ensure that disability-related concerns are properly addressed during this course, students with documented disabilities and who may require assistance to participate in this class are encouraged to speak with me as soon as possible. Students who suspect they have a disability that may affect their participation in this course are advised to go to Student Accessibility Services (SAS) as soon as possible. Maintaining communication and working collaboratively with SAS and faculty members will ensure you have the greatest chance of academic success.

Students taking courses on north Oshawa campus can visit Student Accessibility Services in the Student Life Building, U5, East HUB (located in the Founders North parking lot). Students taking courses on the downtown Oshawa campus can visit Student Accessibility Services in the 61 Charles St. Building, 2nd Floor, Room DTA 225 in the Student Life Suite.

Disability-related and accommodation support is available for students with mental health, physical, mobility, sensory, medical, cognitive, or learning challenges. Office hours are 8:30am-4:30pm, Monday to Friday, closed Wednesday's 8:30am – 10:00am. For more information on services provided, you can visit the SAS website at https://studentlife.ontariotechu.ca/services/accessibility/index.php. Students may contact Student Accessibility Services by calling 905-721-3266, or email studentaccessibility@ontariotechu.ca.

Students who require the use of the Test Centre to write tests, midterms, or quizzes MUST register online using the SAS test/exam sign-up module, found here https://disabilityservices.ontariotechu.ca/uoitclockwork/custom/misc/home.aspx. Students must sign up for tests, midterms, or quizzes AT LEAST seven (7) days before the date of the test.

Students must register for final exams by the registration deadline, which is typically two (2) weeks prior to the start of the final examination period. SAS will notify students of the registration deadline date.

Professional Conduct

All students who are enrolled in engineering programs must demonstrate behaviour appropriate to practice in engineering profession. Where Faculty dean determines that behaviour inconsistent with the norms and expectations of the profession has been exhibited by a student, that student may be immediately withdrawn from the program by the dean or subject to one or more of the sanctions described in the professional suitability policy: http://calendar.uoit.ca/content.php?catoid=22&navoid=879#Academic_conduct

A student demonstrating professional unsuitability may be immediately suspended from any practicum, field work or similar activity at the discretion of the dean pending a final decision.

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Extra support services are available to all Ontario Tech University students in academic development, study skills, counseling, and peer mentorship. More information on student support services can be found at https://studentlife.ontariotechu.ca/services/academic-support/index.php

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Online Test and Exam Proctoring (Virtual Proctoring)

To maintain academic integrity in online testing, your instructor may require the use of Respondus LockDown Browser and Respondus Monitor or a similar virtual proctoring platform. In doing so, you will be required to use a computer with a webcam (either built-in or USB plug in). Please advise your instructor as soon as possible if you do not have a computer with a camera.

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Ontario Tech University
Faculty of Engineering and Applied Science
Dean's Office

Course Outline
ENGR 4760U
Ethics, Law and Professionalism for Engineers
Winter 2021

Offering Approval:

Approved

Course Description:

Legal aspects of engineering practice; business organizations and corporations; intellectual and industrial property; conflict resolution; tort liability and contract law; employment and labour law; public safety and health considerations; occupational health and safety and WHMIS; Canadian and international engineering standards and commercial practices; international trade; environmental laws and regulations; environmental stewardship and sustainable development; corporate social responsibility; equity. Ethics and moral philosophy; applied ethics; ethical aspects of engineering practice; engineering codes of ethics and ethical obligations of engineers; detecting ethical dilemmas and methods for resolving them; research ethics. The engineering profession and its history; engineering associations and societies; engineering licensure; the role and responsibilities of the professional engineer in society; engineers in industry, management and private practice.

Major Topics:

- Introduction to the Engineering Profession
- Ethics
- Engineering Law
- Intellectual and Industrial Property
- Conflict Resolution
- Contract law
- Other Legal Issues for Professional Engineers
- Occupational Health and Safety
- Privacy Issues
- Legal Landmines on the Internet
- International Trade
- Environmental Laws and Regulations

Graduate Attributes:

The graduate attributes developed and required by the Canadian Engineering Accreditation Board's Accreditation Criteria and Procedures are listed below, with those covered in the course to some degree (introduced, developed, applied).

Attributes	Covered in this Course
Knowledge base	✕
Problem analysis	✓
Investigation	✓
Design	✕
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	✓

Course Content Breakdown

Math	Basic Science	Complementary Studies	Engineering Science	Engineering Design
0%	0%	100%	0%	0%

Course Outcomes:

This course examines legal, social and ethical issues that Professional Engineers must face during professional practice. Specific topics covered include legislation relating to engineering projects (existing and proposed), contract issues, off-shoring projects, risk analysis, ethical scenarios, protection of privacy rights, public well-being, computers and law enforcement, safety considerations, environmental issues and the role of the Professional Engineer as governed by the Professional Engineer's Act of Ontario.

Course Outcomes

The graduate of this course will understand the above and be in an excellent position to write the Professional Engineers of Ontario (PEO)'s Professional Practice Examination [PPE].

Instructors

Instructor:	Email:	Office:	Office Hours:
Dr. Nasim Moallemi	nasim.moallemi@uoit.ca	ERC 3064	Monday 2:00 - 3:30 PM, Friday 12:30 - 2:00 PM

Teaching Assistants

TA Name:
TBA TBA

Required Course Text and Other Materials:

- Practical Law of Architecture, Engineering and Geoscience, 3rd Canadian Edition, Brian M. Samuels & Doug R. Sanders
- Canadian Professional Engineering and Geoscience: Practice and Ethics, 6th Edition, Gordon C. Andrews
- A Guide to Patents, Canadian Intellectual Property Office, Available at http://publications.gc.ca/collections/Collection/RG43-33-2000E.pdf
- A Guide to Copyrights, Canadian Intellectual Property Office, Available at http://publications.gc.ca/collections/Collection/RG43-27-2000E.pdf
- A Guide to Integrated Circuit Topographies, Canadian Intellectual Property Office, Available at http://publications.gc.ca/collections/Collection/Iu71-4-7-2005E.pdf
- A Guide to Industrial Design, Canadian Intellectual Property Office, Available at http://publications.gc.ca/collections/Collection/Iu71-4-6-2005E.pdf
- A Guide to Trade Marks, Canadian Intellectual Property Office, Available at http://publications.gc.ca/collections/collection_2011/opic-cipo/Iu71-4-5-2008-eng.pdf

Reference Books and Information Sources:

- Law for Professional Engineers, 4th Edition, D. L. Marston

Course Organization and Delivery Mode:

Asynchronous online

Scheduled Regular Class Meeting Times:

As posted by UOIT (unless otherwise announced)

Weekly asynchronous lecture and assignments will be posted on Canvas.

Final Grade Breakdown:

Quizzes : 36%

Discussion: 12%

Final Exam: 52%

Summary of Important Dates and Marking Scheme:

Weekly assignments (quiz, discussion) will be posted on Canvas. Students have one week to complete each module.

Final Exam: As per university schedule

Detailed Course Content:

- Introduction to the Engineering Profession
- Ethics
- Engineering Law

- Intellectual and Industrial Property
- Conflict Resolution
- Contract law
- Other Legal Issues for Professional Engineers
- Occupational Health and Safety
- Privacy Issues
- Legal Landmines on the Internet
- International Trade
- Environmental Laws and Regulations.

Medical Certificates and Deferred Exams:

Medical statements and academic consideration forms for any missed student work worth 25% or less (not including midterms or tests) will be submitted directly to the course instructor. This includes missed quizzes, assignments and labs. Missed Midterms or Coursework Worth More than 25% For any missed midterms or tests, regardless of weight, or coursework worth more than 25%, students will need to submit the UOIT Medical statement or academic consideration form to the Engineering Advising Office following the form guidelines.

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Failure to comply with the above will result in an mark of 0 for the exam.

Students with disabilities may request to be considered for formal academic accommodation in accordance with the Ontario Human Rights Code. Students seeking accommodation must make their requests through the Centre for Students with Disabilities in a timely manner, and provide relevant and recent documentation to verify the effect of their disability and to allow the University to determine appropriate accommodations.

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individual cases. If you think you have been subjected to or witnessed sexual violence:

- Reach out to a Support Worker, a specially trained individual authorized to receive confidential disclosures about incidents of sexual violence. Support Workers can offer help and resolution options which can include safety plans, accommodations, mental health support, and more. To make an appointment with a Support Worker, call 905.721.3392 or email studentlife@ontariotechu.ca
- Learn more about your options at: https://studentlife.ontariotechu.ca/sexualviolence/

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Students must register for final exams by the registration deadline, which is typically two (2) weeks prior to the start of the final examination period. SAS will notify students of the registration deadline date.

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A student demonstrating professional unsuitability may be immediately suspended from any practicum, field work or similar activity at the discretion of the dean pending a final decision.

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authorized, among other academic offences. The regulations also describe the procedures for dealing with allegations, and the sanctions for any finding of academic misconduct, which can range from a resubmission of work to a failing grade to permanent expulsion from the university. A lack of familiarity with these regulations on academic conduct does not constitute a defense against its application. This information can be found at http://calendar.uoit.ca/content.php?catoid=22&navoid=879#Academic_conduct

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Turnitin

Ontario Tech University and faculty members reserve the right to use electronic means to detect and help prevent plagiarism. Students agree that by taking this course all assignments are subject to submission for textual similarity review by Turnitin.com. Assignments submitted to Turnitin.com will be included as source documents in Turnitin.com's restricted access database solely for the purpose of detecting plagiarism in such documents. The instructor may require students to submit their assignments electronically to Turnitin.com or the instructor may submit questionable text on behalf of a student. The terms that apply to Ontario Tech University's use of the Turnitin.com service are described on the Turnitin.com website.

Students who do not wish to have their work submitted to Turnitin.com must provide with their assignment at the time of submission to the instructor a signed Turnitin.com Assignment Cover sheet:

https://shared.uoit.ca/shared/department/academic-integrity/Forms/assignment-cover-sheet.pdf

Online Test and Exam Proctoring (Virtual Proctoring)

To maintain academic integrity in online testing, your instructor may require the use of Respondus LockDown Browser and Respondus Monitor or a similar virtual proctoring platform. In doing so, you will be required to use a computer with a webcam (either built-in or USB plug in). Please advise your instructor as soon as possible if you do not have a computer with a camera.

This is a link to a short video that explains the basics of Respondus LockDown Browser.

Final Examinations (if applicable)

Final examinations are held during the final examination period at the end of the semester and may take place in a different room and on a different day from the regularly scheduled class. Check the published Examination Schedule for a complete list of days and times.

Students are advised to obtain their Student ID Card well in advance of the examination period as they will not be able to write their examinations without it. Cards are available from the Campus ID office in the Campus Recreation and Wellness Centre, Room G1004.

Students who are unable to write a final examination when scheduled due to religious publications may make arrangements to write a deferred examination. These students are required to submit a Request for Accommodation for Religious Obligations to the Faculty concerned as soon as possible and no later than three weeks prior to the first day of the final examination period.

Further information on final examinations can be found at https://usgc.ontariotechu.ca/policy/policy-library/policies/academic/procedures-for-final-examination-administration.php

Freedom of Information and Protection of Privacy Act

The following is an important notice regarding the process for submitting course assignments, quizzes, and other evaluative material in your courses in the Faculty of Engineering and Applied Science.

Ontario Tech University is governed by the Freedom of Information and Protection of Privacy Act ("FIPPA"). In addition to providing a mechanism for requesting records held by the university, this legislation also requires that the University not disclose the personal information of its students without their consent.

FIPPA's definition of "personal information" includes, among other things, documents that contain both your name and your Banner (student) ID. For example, this could include graded test papers or assignments. To ensure that your rights to privacy are protected, the Faculty of [Insert Faculty name] encourages you to use only your Banner ID on assignments or test papers being submitted for grading. This policy is intended to prevent the inadvertent disclosure of your information where graded papers are returned to groups of students at the same time. If you still wish to write both your name and your Banner ID on your tests and assignments, please be advised that Ontario Tech University will interpret this as an implied consent to the disclosure of your personal information in the normal course of returning graded materials to students.

If you have any questions or concerns relating to the new policy or the issue of implied consent addressed above, please contact accessandprivacy@ontariotechu.ca

Student Course Feedback Surveys

Student evaluation of teaching is a highly valued and helpful mechanism for monitoring the quality of Ontario Tech University's programs and instructional effectiveness. To that end, course evaluations are administered by an external company in an online, anonymous process during the last few weeks of classes. Students are encouraged to participate actively in this process and will be notified of the dates. Notifications about course evaluations will be sent via e-mail, and posted on Canvas, Weekly News, and signage around the campus.

The Accessibility for Ontarians with Disabilities Act (AODA) standards have been considered in the development of this model course outline and it adheres to the principles outlined in the University's Accessibility Policy.

Notice of Collection and Use of Personal Information

Throughout this course, personal information may be collected through the use of certain technologies under the authority of the *University of Ontario Institute of Technology Act, SO 2002, c. 8, Sch. O.* and will be collected, protected, used, disclosed and retained in compliance with Ontario's *Freedom of Information and Protection of Privacy Act R.S.O. 1990, c. F.31.*

This course may use the following technologies that may collect, use, disclose and retain personal information (including images) for the purposes described below:

- Respondus Monitor and Proctortrack to maintain academic integrity for examinations.
- Google Meet and Kaltura Virtual Classroom to facilitate remote instruction and interactive learning.
- Peer-shared applications, services or technologies that may be reviewed, assessed, or used as part of coursework.
- Other applications, services, or technologies that support or enhance online learning.

For more information relating to these technologies, we encourage you to visit: https://tlc.ontariotechu.ca/learning-technology/index.php Questions regarding personal information may be directed to: Ontario Tech University Access and Privacy Office, 2000 Simcoe Street North, Oshawa, ON L1G 0C5, email: accessandprivacy@ontariotechu.ca.

By remaining enrolled in this course, you acknowledge that you have read, understand and agree to the terms and conditions under which the technology provider(s) may collect, use, disclose and retain your personal information. You agree to the university using the technologies and using your personal information for the purposes described in this course outline.

Technology Requirements

To support online learning, the university recommends certain technology requirements for laptops, software and internet connectivity which are available at: https://itsc.ontariotechu.ca/remote-learning.php.

Students experiencing technical difficulties such that they are unable to meet the technology requirements may contact the IT Service Help Desk at: servicedesk@dc-uoit.ca

Students experiencing financial difficulties such that they are unable to meet the technology requirements may contact Student Awards and Financial Aid Office at: connect@ontariotehu.ca

By remaining enrolled in this course, you acknowledge that you have read, understand and agree to observe the Recommended Technology Requirements for accessing university online learning resources, including those minimum requirements that are specific to your faculty and program.

Virtual Monitoring of Examinations

Ontario Tech University will conduct virtual monitoring of examinations in accordance with Ontario privacy legislation and all approved policy instruments.

Sensitive/Offensive Subject Matter

The classroom (both physical and virtual) is intended to provide a safe, open space for the critical and civil exchange of ideas and opinions. Some articles, media and other course materials may contain sensitive content that is offensive and/or disturbing. The Course Instructor will try to identify such material and communicate warnings[MG1] to students in advance of the distribution and use of such materials, affording students the choice to either emotionally prepare for, or not to view or interact with, the content.

Freedom of Expression

Pursuant to Ontario Tech's Freedom of Expression Policy all students are encouraged to express ideas and perspectives freely and respectfully in university space and in the online university environment, subject to certain limitations. Students are reminded that the limits on Freedom of Expression include speech or behaviour that: is illegal or interferes with the university's legal obligations; defames an individual or group; constitutes a threat, harassment or discrimination; is a breach of fiduciary, contractual, privacy or confidentiality obligations or commitments; and unduly disrupts and interferes with the functioning of the university. In the context of working online, different forms of communication are used. Where permitted, students using "chat" functions or other online forms of communication are encouraged to ensure that their communication complies with the Freedom of Expression Policy.

University Response to COVID-19

The government response to the COVID-19 pandemic is continually evolving. As new information becomes available from federal and provincial public health authorities, the Province of Ontario and the Regional Municipality of Durham, Ontario Tech University will remain nimble and prepared to respond to government orders, directives, guidelines and changes in legislation to ensure the health and safety of all members of its campus community. In accordance with public health recommendations, the university may need to adjust the delivery of course instruction and the availability and delivery mode of campus services and co-curricular opportunities. Ontario Tech University

appreciates the understanding and flexibility of our students, faculty and staff as we continue to navigate the pandemic and work together to demonstrate our strong commitment to academic, research and service excellence during these challenging and unprecedented times.

Ontario Tech University
Faculty of Engineering and Applied Science
Department of Mechanical and Manufacturing Engineering-MME

Course Outline
MANE 4380U
Life Cycle Engineering
Fall 2021

Offering Approval:

Under Revision

Course Description:

The course introduces the fundamentals of both product and process engineering with an emphasis on life cycle models. A mixture of practical and theoretical topics, methodologies, principles, and techniques of life cycle engineering are covered such as design reviews, re-engineering, mass customization, product modularity, cost/benefit analysis, value engineering, and life-cycle design [e.g. Design for Assembly (DFA), Design for Manufacturing (DFM), Design for Serviceability (DFS), Reliability design etc.]. Students develop an understanding of the performance, cost, and environmental implications of both product design and manufacture and become capable of translating these into engineering cradle-to-grave responsibility requirements, goals, and specifications in order to maximize the values of products and the effectiveness of supply chain management while containing the costs to the manufacturer, the user, and society. Energy utilization is considered throughout along with energy-related life cycle methods.

Major Topics:

- Human and Technology
- Sustainability
- Technological evolution and risk assessment
- Life Cycle Design (DfX)
- Life Cycle Assessment (LCA)

Graduate Attributes:

The graduate attributes developed and required by the Canadian Engineering Accreditation Board's Accreditation Criteria and Procedures are listed below, with those covered in the course to some degree (introduced, developed, applied).

Attributes	Covered in this Course
Knowledge base	✓
Problem analysis	✓
Investigation	✓
Design	✓
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	✗

Course Content Breakdown

Math	Basic Science	Complementary Studies	Engineering Science	Engineering Design
0%	0%	50%	25%	25%

Course Outcomes:

Upon completion of this course, students should be able to competently do the following:

- Understand basic concepts about the life cycle engineering and sustainable engineering;
- Analyze engineering problems with life cycle assessment methods;
- Conduct investigation for life cycle analysis;
- Explain the interaction between humanity and technologies, the historical patterns in technological evolution and risk assessment, identify the product development challenges as well as their impacts to the environment and human society;
- Describe the Life Cycle Design and how to reflect them in the product design and development processes;
  - Design for Manufacturing (DFM)
  - Design for Assembly (DFA)
  - Design for Disassembly (DFD)
  - Design for Serviceability (DFS)
  - Design for Reliability (DFR)
  - Design for Environment (DFE)
- Demonstrate proficiency with LCA tools;
- Understand and evaluate the benefits of the Life Cycle Assessment to the project management.

Instructors

Instructor:	Email:	Office:	Phone:	Office Hours:
Dr. Seama Koohi	Through Canvas email	ERC3084	905-721-8668 ext. 5518	Tuesday 5:00PM-6:00PM; Fridays 2:30PM-3:30PM

Teaching Assistants

TA Name:	Email:	Office Hours:

Amr Salem	Amr.Salem@Ontariotechu.ca	TBD

Required Course Text and Other Materials:

- Industrial Ecology and Sustainable Engineering; by T.E. Graedel & B.R. Allenby; Prentice Hall (2010)

Reference Books and Information Sources:

- The Theory and Practice of Sustainable Engineering; B.R. Allenby; Prentice Hall (2012)
- Life Cycle Assessment, Theory and Practice; M.Z. Hauschild, R.K. Rosenbaum, S. Irving Olsen; Springer (2018)

Course Organization and Delivery Mode:

- 3 lecture hours (weekly);
- 1 Tutorial hour (bi-weekly);

Scheduled Regular Class Meeting Times:

- Lectures: Wednesdays and Fridays at 5:10 pm - 6:30 pm Note: This course is delivered in both synchroneous and asynchrpneous manners, depending on lecture topics.
- Tutorial: Fridays at 2:10 pm - 3:00 pm

Final Grade Breakdown:

- Final exam 40 %
- Midterm exam 20 %
- Quizzes 10%
- Assignments 5%
- Project 25%

Midterms

Midterm Date:	Midterm Location:
Friday, October 23, 2020 - 17:10 to 18:30	Online

Assignments:

Quizzes

In-class quizzes will be assigned during the lecture without notice in advance. Format of quiz questions could be multiple choice or short answer.

Assignments

There will be two assignments. Detailes and due dates will be announced during the lecture and on Canvas.

Group Project

This is a group activity. Students will be utilizing all of the DfX methods and life cyce assessment practiced in the course to complete their project. More information will be provided in class. Use of the Sustainable Minds software or SimaPro is required.

Tutorials:

Bi-weekly tutorial sessions are used for group collaborations on additional exercises as well as introduction to the tool that is used for the project.

Computer Experience:

This course makes use of specialized engineering software. In order to complete this course, students **MUST** have a laptop that meets the minimum specifications as outlined by ITS here: https://itsc.uoit.ca/telemodels/byod-tele/faculty-of-engineering-and-applied-science-year-1.php. Failure to abide by this requirement may result in an F grade being assigned for this course.

Students are expected to be able to use:

- Canvas: Lecture notes, handouts, grading, and course information will be made available through Canvas.
- Microsoft Office
- Life Cycle Assessment software: Sustainable Minds or SimaPro. Information on how to access the software will be shared in Canvas and a demo tutorial will be provided during Tutorial 4.

Summary of Important Dates and Marking Scheme:

Project Release Date: Oct 20th, 2020 Details of the marking scheme for the project will be released on the same date.

Midtem Exam Date: Oct 23rd, 2020

Project Due Date: Dec 1, 2020

Detailed Course Content:

Week	Major Topics
Week 1	Introduction, Sustainability
Week 2	Industrial Ecology, Industrial Metabolism, Industrial Food Web
Week 3	Industrial ecosystems, Material flow analysis, National Material Accounts
Week 4	Energy and Water in Life Cycle Engineering
Week 5	Urban Metabolism, DfX and House of Quality
Week 6	Design for Environment and Sustainability
Week 7	Product Life Cycle Assessment (LCA)
Week 8	Life Cycle Impacts, The status of mineral, energy and water resources
Week 9	LCA Interpretation and Limitations, Streamlined LCA, Process LCA
Week 10	Life Cycle Costing, Social Considerations in LCA
Week 11	Cultural Impacts on Sustainable Development, Cradle To Cradle Approach
Week 12	LCA Examples

Please note that the above schedule is tentative and might change. Depending on class discussions on particular topics and/or unforseen circumstances, the instructor might extend or shorten the length of topics that are covered.

Other Course Information:

Late or Missed Assignments/Exams

Only medical or emergency conditions constitute exceptions that a student can be excused and given appropriate time to complete missed work such as assignments or exams. Any foreseeable excuse should be discussed with the instructor at least 3 days before any due date. Assignments submitted later than the indicated due date will not be accepted. If you miss an exam please contact your student advisor with proper documentation within 5 days of the missed deadline.

Attendance and Class Participation

Class participation is highly encouraged. Class participation during the last week of the semester is mandatory.

Prerequisites

ENGR 3030U or MECE 3030U.

Religious Observances:

Students are required to identify any scheduling conflicts due to religious observances by the second week of classes with the professor and student advisor. After that date, the course schedule will be finalized.

Please see the UOIT Website (www.uoit.ca) for further details regarding policies.

Medical Certificates and Deferred Exams:

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Extra support services are available to all Ontario Tech University students in academic development, study skills, counseling, and peer mentorship. More information on student support services can be found at https://studentlife.ontariotechu.ca/services/academic-support/index.php

Turnitin

Ontario Tech University and faculty members reserve the right to use electronic means to detect and help prevent plagiarism. Students agree that by taking this course all assignments are subject to submission for textual similarity review by Turnitin.com. Assignments submitted to Turnitin.com will be included as source documents in Turnitin.com's restricted access database solely for the purpose of detecting plagiarism in such documents. The instructor may require students to submit their assignments electronically to Turnitin.com or the instructor may submit questionable text on behalf of a student. The terms that apply to Ontario Tech University's use of the Turnitin.com service are described on the Turnitin.com website.

Students who do not wish to have their work submitted to Turnitin.com must provide with their assignment at the time of submission to the instructor a signed Turnitin.com Assignment Cover sheet:

https://shared.uoit.ca/shared/department/academic-integrity/Forms/assignment-cover-sheet.pdf

Online Test and Exam Proctoring (Virtual Proctoring)

To maintain academic integrity in online testing, your instructor may require the use of Respondus LockDown Browser and Respondus Monitor or a similar virtual proctoring platform. In doing so, you will be required to use a computer with a webcam (either built-in or USB plug in). Please advise your instructor as soon as possible if you do not have a computer with a camera.

This is a link to a short video that explains the basics of Respondus LockDown Browser.

Final Examinations (if applicable)

Final examinations are held during the final examination period at the end of the semester and may take place in a different room and on a different day from the regularly scheduled class. Check the published Examination Schedule for a complete list of days and times.

Students are advised to obtain their Student ID Card well in advance of the examination period as they will not be able to write their examinations without it. Cards are available from the Campus ID office in the Campus Recreation and Wellness Centre, Room G1004.

Students who are unable to write a final examination when scheduled due to religious publications may make arrangements to write a deferred examination. These students are required to submit a Request for Accommodation for Religious Obligations to the Faculty concerned as soon as possible and no later than three weeks prior to the first day of the final examination period.

Further information on final examinations can be found at https://usgc.ontariotechu.ca/policy/policy-library/policies/academic/procedures-for-final-examination-administration.php

Freedom of Information and Protection of Privacy Act

The following is an important notice regarding the process for submitting course assignments, quizzes, and other evaluative material in your courses in the Faculty of Engineering and Applied Science.

Ontario Tech University is governed by the Freedom of Information and Protection of Privacy Act ("FIPPA"). In addition to providing a mechanism for requesting records held by the university, this legislation also requires that the University not disclose the personal information of its students without their consent.

FIPPA's definition of "personal information" includes, among other things, documents that contain both your name and your Banner (student) ID. For example, this could include graded test papers or assignments. To ensure that your rights to privacy are protected, the Faculty of [Insert Faculty name] encourages you to use only your Banner ID on assignments or test papers being submitted for grading. This policy is intended to prevent the inadvertent disclosure of your information where graded papers are returned to groups of students at the same time. If you still wish to write both your name and your Banner ID on your tests and assignments, please be advised that Ontario Tech University will interpret this as an implied consent to the disclosure of your personal information in the normal course of returning graded materials to students.

If you have any questions or concerns relating to the new policy or the issue of implied consent addressed above, please contact accessandprivacy@ontariotechu.ca

Student Course Feedback Surveys

Student evaluation of teaching is a highly valued and helpful mechanism for monitoring the quality of Ontario Tech University's programs and instructional effectiveness. To that end, course evaluations are administered by an external company in an online, anonymous process during the last few weeks of classes. Students are encouraged to participate actively in this process and will be notified of the dates. Notifications about course evaluations will be sent via e-mail, and posted on Canvas, Weekly News, and signage around the campus.

The Accessibility for Ontarians with Disabilities Act (AODA) standards have been considered in the development of this model course outline and it adheres to the principles outlined in the University's Accessibility Policy.

Notice of Collection and Use of Personal Information

Throughout this course, personal information may be collected through the use of certain technologies under the authority of the *University of Ontario Institute of Technology Act, SO 2002, c. 8, Sch. O.* and will be collected, protected, used, disclosed and retained in compliance with Ontario's *Freedom of Information and Protection of Privacy Act R.S.O. 1990, c. F.31.*

This course may use the following technologies that may collect, use, disclose and retain personal information (including images) for the purposes described below:

- Respondus Monitor and Proctortrack to maintain academic integrity for examinations.
- Google Meet and Kaltura Virtual Classroom to facilitate remote instruction and interactive learning.
- Peer-shared applications, services or technologies that may be reviewed, assessed, or used as part of coursework.
- Other applications, services, or technologies that support or enhance online learning.

For more information relating to these technologies, we encourage you to visit: https://tlc.ontariotechu.ca/learning-technology/index.php Questions regarding personal information may be directed to: Ontario Tech University Access and Privacy Office, 2000 Simcoe Street North, Oshawa, ON L1G 0C5, email: accessandprivacy@ontariotechu.ca.

By remaining enrolled in this course, you acknowledge that you have read, understand and agree to the terms and conditions under which the technology provider(s) may collect, use, disclose and retain your personal information. You agree to the university using the technologies and using your personal information for the purposes described in this course outline.

Technology Requirements

To support online learning, the university recommends certain technology requirements for laptops, software and internet connectivity which are available at: https://itsc.ontariotechu.ca/remote-learning.php.

Students experiencing technical difficulties such that they are unable to meet the technology requirements may contact the IT Service Help Desk at: servicedesk@dc-uoit.ca

Students experiencing financial difficulties such that they are unable to meet the technology requirements may contact Student Awards and Financial Aid Office at: connect@ontariotehu.ca

By remaining enrolled in this course, you acknowledge that you have read, understand and agree to observe the Recommended Technology Requirements for accessing university online learning resources, including those minimum requirements that are specific to your faculty and program.

Virtual Monitoring of Examinations

Ontario Tech University will conduct virtual monitoring of examinations in accordance with Ontario privacy legislation and all approved policy instruments.

Sensitive/Offensive Subject Matter

The classroom (both physical and virtual) is intended to provide a safe, open space for the critical and civil exchange of ideas and opinions. Some articles, media and other course materials may contain sensitive content that is offensive and/or disturbing. The Course Instructor will try to identify such material and communicate warnings[MG1] to students in advance of the distribution and use of such materials, affording students the choice to either emotionally prepare for, or not to view or interact with, the content.

Freedom of Expression

Pursuant to Ontario Tech's Freedom of Expression Policy all students are encouraged to express ideas and perspectives freely and respectfully in university space and in the online university environment, subject to certain limitations. Students are reminded that the limits on Freedom of Expression include speech or behaviour that: is illegal or interferes with the university's legal obligations; defames an individual or group; constitutes a threat, harassment or discrimination; is a breach of fiduciary, contractual, privacy or confidentiality obligations or commitments; and unduly disrupts and interferes with the functioning of the university. In the context of working online,

different forms of communication are used. Where permitted, students using “chat” functions or other online forms of communication are encouraged to ensure that their communication complies with the Freedom of Expression Policy.

University Response to COVID-19

The government response to the COVID-19 pandemic is continually evolving. As new information becomes available from federal and provincial public health authorities, the Province of Ontario and the Regional Municipality of Durham, Ontario Tech University will remain nimble and prepared to respond to government orders, directives, guidelines and changes in legislation to ensure the health and safety of all members of its campus community. In accordance with public health recommendations, the university may need to adjust the delivery of course instruction and the availability and delivery mode of campus services and co-curricular opportunities. Ontario Tech University appreciates the understanding and flexibility of our students, faculty and staff as we continue to navigate the pandemic and work together to demonstrate our strong commitment to academic, research and service excellence during these challenging and unprecedented times.

Appendix D - Faculty Information

Please include here only those currently at the institution and affiliated with the program.

Faculty members by home unit, rank, and supervisory privileges; Bold indicates core course developer for New Program

Name and Faculty Status/Rank	Terminal Degree	Home Faculty/Unit	Areas of Expertise	Role in New Program	Total Undergraduate Teaching (including New Program)
Dr. Anwar Abdalbari Associate Teaching Professor	PhD	FEAS	Electrical, Computer and Software Engineering	Teaching - ENGR 1200U	6-7 courses Software/Electrical Engineering
Dr. Martin Agelin-Chaab Associate Professor	PhD	FEAS	Bluff body/ground vehicle aerodynamics, Turbulent flows and jets, Vehicle and battery thermal analyses, Sustainable energy systems	Teaching Thermo Fluid courses & supervision of Capstone	3-4 courses Mechanical Engineering
Dr. Walid Morsi Ibrahim Professor	PhD	FEAS	Smart Grid: Design, analysis, operation management and control, Signal Processing and data analytics of power systems, Automation, protection and management of power systems	Teaching - ELEE 4115U	3-4 courses Electrical Engineering
Dr. Murat Aydin Associate Teaching Professor	PhD	FEAS	Computational Fluid Dynamics, Automotive Aerodynamics, Aerosol Transport, Fuel Cells, Constructal theory	Teaching & supervision of Capstone	6-7 courses Automotive Engineering
Dr. Ibrahim Dincer **Professor**	PhD	FEAS	Drying, Energy and exergy analyses, Energy conversion and management, Heat and mass transfer, Hydrogen and fuel cell systems, Refrigeration, Renewable energies, Thermal energy storage, Thermodynamics	Teaching - ENEE courses, supervision of Capstone & course development	3-4 courses Mechanical Engineering
Dr. Naglaa Elagamy Associate Teaching Professor	PhD	FEAS	Advanced Composite Materials Micro Commuted Tomography (microCT), Stress Simulation, Fatigue Assessment of Composite Structures, Prediction of Progressive Damage in Materials	Teaching - Fundamental Mechanical courses	6-7 courses Mechanical Engineering

Dr. Khalid Elgazzar Assistant Professor	PhD	FEAS	Internet of things, Ubiquitous computing, distributed systems, context-aware and self-adaptive systems, mobile cloud services	Teaching - ENGR 1200U	3-4 courses Software Engineering
Masoud Farzam Associate Teaching Professor	PhD	FEAS		Teaching labs & ENGR 2100U	6-7 courses Laboratory
Dr. Kamiel Gabriel Professor	PhD	FEAS	Boiling and two-phase flows, Energy conservation, Fluid physics and heat transfer at reduced gravity (microgravity space sciences), Heat-recovery systems and Thermofluids in power plants.	Teaching - Thermo Fluid courses & supervision of Capstone	3-4 courses Mechanical Engineering
Dr. Seama Koohi Associate Teaching Professor	PhD	FEAS	Building energy modeling and simulation, Cogeneration, District Energy, Entropy generation minimization analysis, Energy performance improvement, Energy system modelling and simulation, Heat transfer, Renewable energy, Sustainable energy	Teaching Fundamental courses & ENEE courses	6-7 courses Mechanical Engineering
Dr Lixuan Lu Associate Professor	PhD	FEAS/FESNS	Nuclear power plant instrumentation and control, distributed control, network control systems, reliability and safety of I & C Systems, risk-informed decision making, nuclear based hydrogen generation	Teaching - ELEE courses	3-4 courses Electrical/Nuclear Engineering
Dr. Nasim Moallemi Associate Teaching Professor	PhD	FEAS	Electric Circuit, Electronics, Digital Systems, and Electrical Engineering Fundamentals, Microprocessor and Embedded Systems	Teaching - ENGR 4760U & ENGR 3360U	6-7 courses Mechatronics Engineering
Dr. Remon Pop-Iliev Professor	PhD	FEAS	Engineering Design, Manufacturing Engineering, Engineering Materials and	Teaching - Mechanical Design courses &	3-4 courses Manufacturing Engineering

			Technologies for the Manufacture of Cellular Materials and Composites	supervision of Capstone	
Dr. Bale Reddy Professor	PhD	FEAS	Biomass Combustion and Gasification, Fluidized Bed Combustors, Combined Cycle Power Generation, Exergy Analysis, Thermal Design and Optimization, Cogeneration, Waste Heat Recovery, Heat Transfer, Advanced Energy Systems, Advanced Power Plant Cycles, Gas-Solid Flows in Advanced Combustors, Energy Conservation, Solar Energy	Teaching - Thermo Fluid courses & ENEE courses	3-4 courses Mechanical Engineering
Dr. Ghaus Rizvi Professor	PhD	FEAS	Polymers and composites processing and characterization, Smart and advanced materials, Compounding of colours in plastics, Wood-plastic composites, "Green" Composites, Nano-composites, Processes and materials for tissue scaffolds and skeletal structures, Corrosion of ceramic coatings	Teaching - Material courses	3-4 courses Manufacturing Engineering
Dr. Marc Rosen Professor	PhD	FEAS	Cogeneration, District energy, Efficiency improvement, Electricity generation, Energy Environmental impact assessment and reduction, Exergy analysis, Heat transfer, Hydrogen energy and fuel cells, Integrated energy systems, Modelling and simulation of energy systems, Renewable energy, Solar energy, Sustainable energy, Wind energy, Thermal energy storage, Thermodynamics	Teaching - Thermo Fluid courses & ENEE courses	3-4 courses Mechanical Engineering

Dr. Namdar Saniei Associate Teaching Professor	PhD	FEAS	Electronics (circuit design)	Teaching - Electrical Circuit courses	6-7 courses Electrical Engineering
Dr. Vijay Sood Associate Professor	PhD	FEAS	HVDC and FACTS Controllers for power transmission systems, Modeling of Power Electronics Converters and Control and protection of power systems	Teaching - ELEE 3260U	3-4 courses Electrical Engineering
Dr. Sheldon Williamson Professor	PhD	FEAS	Autonomous Mobility/Transportation, Batteries, Charging, Electric Energy Storage Systems, Electric Machines, Motor Drives, Power Electronics, Renewable Energy Systems, Transportation Electrification	Teaching - Electrical & Power courses	3-4 courses Electrical Engineering
Dr. Yuelei Yang Senior Teaching Professor	PhD	FEAS	Thermal/Fluid Systems, Engineering Design, Engineering Education	Teaching - MECE courses & supervision of Capstone	6-7 courses Mechanical Engineering
Dr. Filippo Genco Associate Teaching Professor	PhD	FESNS	Nuclear Fusion, Plasma material interactions, advanced numerical methods, Nanofluids & Nanopatterning applications, Alternative technologies and hybridization of nuclear energy systems, sustainability of renewable energy systems, use of decision-making tools for energy policy	Teaching - NUCL courses & ENEE courses	6-7 courses
Dr. Hossam Gaber Professor	PhD	FESNS/FEAS	Smart energy systems; nuclear-renewable hybrid energy systems; interconnected micro energy grids; energy-water grids; transportation electrification; resilient energy system; intelligent control system; safety systems; modeling and simulation of hybrid energy systems; AI applications on nuclear and energy systems	Teaching ELEE courses & supervision of Capstone	3-4 courses Electrical/Nuclear Engineering

Dr. Glenn Harvel Professor	PhD	FESNS	Small Nuclear Reactors, Nuclear plant aging and design, decommissioning, multiphase flow, instrumentation for multiphase flow, neutron radiography	Teaching - NUCL courses & supervision of Capstone	3-4 courses Nuclear Engineering
Dr. Daniel Hoornweg **Associate Professor**	PhD	FESNS	Energy and material flows of cities, urban systems, sustainability, smart cities, renewable energy, waste management, integrated energy and transportation systems	Teaching - ENEE courses, supervision of Capstone & course development	3-4 courses Nuclear Engineering
Dr. Matthew Kaye Associate Professor	PhD	FESNS	Nuclear materials, high temperature materials chemistry, phase diagram development, nuclear fuel behaviour, aqueous chemistry of nuclear materials and corrosion.	Teaching - NUCL courses & ESNS 2140U	3-4 courses Nuclear Engineering
Dr. Rachid Machrafi Professor	PhD	FESNS	Radiation Science and health physics, dosimetry, radiation detection technology, radiation techniques, space radiation, Monte Carlo modelling and education technology	Teaching - NUCL courses	3-4 courses Nuclear Engineering
Dr. Jennifer McKellar Associate Professor	PhD	FESNS	Techno-economic and environmental assessments of energy systems. Conventional and unconventional fuels. Options for improving the sustainability of energy systems. Tools in support of decision-making	Teaching - ENEE courses & supervision of Capstone	3-4 courses Nuclear Engineering
Dr. Igor Pioro Professor	PhD	FESNS	Thermalhydraulics of nuclear reactors and Generation IV reactor concepts, boiling and forced convection including supercritical pressures, two-phase thermosyphons, heat exchangers, and heat recovery systems	Teaching - Thermo Fluid courses & supervision of Capstone	3-4 courses Nuclear Engineering
Dr. Mihai Beligan Associate Teaching Professor	PhD	FSCI	Linear Algebra, Algebraic Structures, Calculus, Discrete Mathematics	Teaching – Foundational Mathematics courses	7 courses • Applied and Industrial Mathematics Program

				(MATH 1010U, MATH 1020U, MATH 1850U)	• Service Mathematics courses (Science/Engineering)
Dr. Rupinder Brar Associate Teaching Professor	PhD	FSCI	Physics Astronomy, Radio Astronomy, Space Exploration, Extra-galactic Astronomy	Teaching – Foundational Physics courses (PHY 1010U, PHY 1020U)	7 courses • Physics • Service Physics Courses (Science/Engineering)
Prof. Paula Di Cato Associate Teaching Professor	MSc	FSCI	Statistics, Probability, Calculus, Biostatistics	Teaching – Foundational Mathematics Courses (MATH 1010U, MATH 1020U) and Statistics Course (STAT 2800U)	7 courses • Applied and Industrial Mathematics Program • Service Mathematics and Statistics courses (Science/Engineering)
Prof. Nicholas Faulkner Sessional Instructor	MSc	FSCI	Calculus, Differential Equations, Calculus, Linear Algebra	Teaching – Foundational Mathematics Courses (MATH 1010U, MATH 1020U, MATH 1850U), some advanced Mathematics (MATH 2860U)	Contract dependent • Applied and Industrial Mathematics Program • Service Mathematics courses (Science/Engineering)
Dr. Franco Gaspari Professor	PhD	FSCI	Photovoltaics, Nanomaterials, Forensic Physics	Teaching – Foundational Physics (PHY 1010U, PHY 1020U)	4 courses • Physics • Service Physics Courses (Science/Engineering)
Dr. Brian Ikeda Associate Professor	PhD	FESNS	Electrochemistry, Physical Chemistry, Corrosion, Nuclear Waste and Radiation,	Teaching – Foundational Chemistry (CHEM 1800U)	4 courses • Nuclear Engineering Program • Health Physics and Radiation Science • Service Chemistry Course (Engineering)

Dr. Ilona Kletskin Senior Teaching Professor	MSc	FSCI	Mathematical Modelling, Mathematics Education, Online Assessment in Mathematics	Teaching – Foundational Mathematics (MATH 1010U, MATH 1020U, MATH 1850U)	7 courses • Applied and Industrial Mathematics Program • Service Mathematics courses (Science/Engineering/Health Science)
Dr. Nelson Lafreniere Associate Teaching Professor	PhD	FSCI	Chemistry, Analytical Chemistry, Forensic Chemistry, Mass Spectrometry	Teaching – Foundational Chemistry (CHEM 1800U)	7 courses • Forensic Science Program • Service Chemistry Course (Engineering)
Dr. Joseph Macmillan Associate Teaching Professor	PhD	FSCI	Physics, Astrophysics, Cosmology, Physics Education Research	Teaching – Foundational Physics (PHY 1010U, PHY 1020U)	7 courses • Physics • Service Physics Courses (Science/Engineering)
Dr. Azar Shakoori Associate Teaching Professor	PhD	FSCI	Numerical Methods, Differential Equations, Calculus, Linear Algebra	Teaching – Foundational Mathematics (MATH 1010U, MATH 1020U, MATH 1850U), Advanced Mathematics (MATH 2070U, MATH 2860U)	7 courses • Applied and Industrial Mathematics Program • Service Mathematics courses (Science/Engineering)
Dr. Isaac Ye Sessional Instructor	PhD	FSCI	Calculus, Differential Equations, Calculus, Linear Algebra, Statistics, Probability	Teaching – Foundational Mathematics Courses (MATH 1010U, MATH 1020U), Advanced Mathematics (MATH 2070U, MATH 2860U) and Statistics Course (STAT 2800U)	Contract dependent • Applied and Industrial Mathematics Program • Service Mathematics and Statistics courses (Science/Engineering)

Appendix E – Library Report

New Program Assessment: Bachelor of Engineering in Energy Engineering

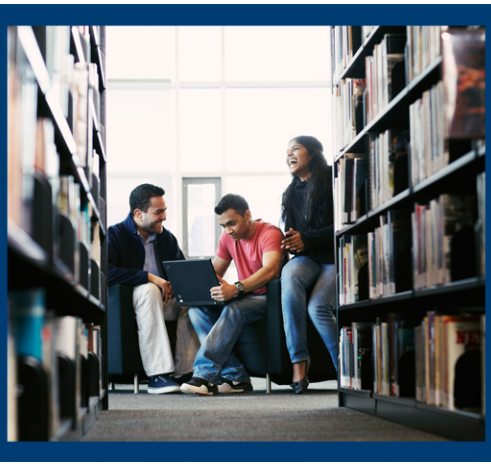
Library Statement of Support Provided to Ontario Tech University

Prepared by:

Kaelan Caspary, Faculty of Energy Systems and Nuclear Science Liaison Librarian

Kate Gibbings, Engineering and Applied Science Liaison Librarian

March 1, 2021


OntarioTech Library

Contents

Summary

Ontario Tech University's Library holdings for the proposed Energy Engineering program are strong, with a solid foundation of resources already supporting existing Faculty of Engineering and Applied Science and Faculty of Energy Systems and Nuclear Science courses.

The Library collection includes coverage of core subjects such as Calculus, Algebra, Physics and Chemistry; Engineering subjects such as engineering design, materials, fluid mechanics, thermodynamics, electric circuits, CAD, and control systems; and Energy and Nuclear Engineering subjects such as power systems, fuel cells, alternative fuels, smart grid, renewable energy sources, energy storage, nuclear power, and nuclear plant operation.

Further, the collection has robust coverage of interdisciplinary subjects such as sustainability, science and technology in society, programming, and statistics and probability.

The Library's research and special collections holdings total more than 102,131 print volumes and 100,754 journal subscriptions. In addition, our holdings include more than 865,736 e-books, and primary source materials. Collection strengths support the research and instructional programs at Ontario Tech University.

Resource Requirements

Resource	Rationale	Budget Requirement	OTO or Ongoing
Subscription Resources	Provide access to McGraw Hill's Access Engineering digital Resources	$12,000* Note: this resource request is also included in the B.Eng Industrial Engineering assessment, and the resource includes content to support all FEAS and FESNS program areas	Ongoing
Total		$12,000	Ongoing

Introduction

The Library supports the teaching, learning and research missions of Ontario Tech University and Durham College. Ontario Tech students have access to a joint collection of more than 102,131 print books. Additionally, our collections include extensive online resources including e-books and online databases that are selected to meet curricular needs. Students and faculty are supported by a team of subject specialist librarians and trained library technicians who provide an array of research and teaching support services including information literacy instruction, workshops, research help and reference service.

Library Collections

The Library's collections expenditures across all disciplines for 2019-20 totaled $1,664,480. Approximately 95% of this budget is allocated for the purchase of subscription online resources. The remainder of the budget is allocated for the acquisition other formats, including journals, books, multimedia and other specialized material.

With respect to the proposed Bachelor in Energy Engineering program, our collection spans core subjects such as Calculus, Algebra, Physics and Chemistry; Engineering subjects such as engineering design, materials, fluid mechanics, thermodynamics, electric circuits, CAD, and control systems; and Energy and Nuclear Engineering subjects such as power systems, fuel cells, alternative fuels, smart grid, renewable energy sources, energy storage, nuclear power, and nuclear plant operation.

Further, the collection has robust coverage of interdisciplinary subjects such as sustainability, science and technology in society, programming, and statistics and probability.

Our collections are well placed to support Energy Engineering given the program's shared courses with existing programs. While there are no major gaps in the Library's collections, it will be important to continue to add to relevant subject areas and maintain subscriptions.

Suggestions for purchases from members of the University community are welcome. Faculty and students are encouraged to contact their subject specialist to recommend material for the collection. All recommended purchases are evaluated according to the Collection Development Policy and with consideration to budget constraints.

Consortial Licensing

By virtue of our membership in two key consortia, the Ontario Tech University community benefits from the increased bargaining power of a collective through which we subscribe to a wide array of scholarly content. Canada Research Knowledge Network (CRKN) is comprised of 81 institutions across Canada that include world-class research institutions, innovative teaching-focused institutions, as well as two national libraries, and Canada's largest public library system. CRKN is dedicated to expanding digital content for the academic research and teaching enterprise in Canada.

The Ontario Council of University Libraries (OCUL) is a consortium of Ontario's 21 university libraries which works together to maximize our collective expertise and resources. OCUL enhances information services in Ontario and beyond through collective purchasing and shared digital information

infrastructure, collaborative planning, advocacy, assessment, research, partnerships, communications, and professional development.

Journals

Membership in these consortia allow us to provide access to more than 100,000 ejournals that span all disciplines. Our journal holdings in disciplines related to Energy Engineering are strong, including coverage related to Energy Systems and Mechanical, Electrical, and Nuclear Engineering.

Students and researchers can access nearly complete journal suites, in many cases including archives, from publishers such as:

- ACM
- ASME
- ASTM
- AIP
- Elsevier
- IEEE
- IOP
- Oxford
- RSC
- SIAM
- Springer
- Taylor & Francis
- Wiley

The Library provides access, through subscription, to most of the highly ranked journals in the following categories of Clarivate's Journal Citation Reports database (2019).

By subject category:

Subject Category	Ontario Tech Access	Select Titles
Energy & Fuels	48 of the top 50	• Advanced Energy Materials • Energy & Environmental Science • Nature Energy • Progress in Energy and Combustion Science
Nuclear Science & Technology	31 out of 34	• International Journal of Energy Research • International Journal of Radiation Biology • Journal of Nuclear Materials • Nuclear Materials and Energy • Radiation Physics and Chemistry

Subject Category	Ontario Tech Access	Select Titles
Physics, Multidisciplinary	72 out of 85	• Reviews of Modern Physics • Physics Reports-Review • Section of Physics Letters • Nature Physics • Reports on Progress in Physics Physical Review X
Mechanical Engineering	46 of top 50	• Advances in Applied Mechanics • Proceedings of the Combustion Institute • International Journal of Heat and Mass Transfer • International Journal of Mechanics and Materials in Design
Electrical and Electronic Engineering	49 of top 50	• Proceedings of the IEEE • IEEE Transactions on Smart Grid • IEEE Transactions on Control Systems Technology • IEEE Transactions on Sustainable Energy

Books & E-Books

As noted, we provide access to more than 100,000 print books and 865,000 e-books that support teaching, learning and research across all programs and disciplines. Students and faculty have access to collections of books and e-books from major academic publishers, including:

- American Nuclear Society
- ASME
- ASM International
- Butterworth-Heinemann
- Cengage
- CRC Press
- Elsevier (including Woodhead)
- IEEE
- IET
- Industrial Press
- McGraw-Hill
- MIT Press
- Morgan & Claypool
- Pearson
- Routledge/Taylor & Francis
- Springer
- Wiley

A new Demand Driven Acquisition pilot program launched in 2020-21 enables students and faculty to access thousands of ebook titles across Engineering disciplines. Purchases are based on usage of the content, enabling us to maximize the value of our collections budget and ensure that the ebooks we acquire are being used. This is the first example of Demand Driven Acquisitions at Ontario Tech, and the results of this program will help inform our collection management strategy going forward.

The following table highlights Library holdings by subject heading for print books and e-books that encompass the Library's Energy Engineering collection. There are no major gaps in the collection, but we must continue to add new titles and maintain subscriptions to support this program.

While e-books are a preferred format due to their accessibility for students, not all titles or publishers are available for the Library to license in electronic format. For this reason, selecting print books in many of the subject areas below will also be a collection development focus, particularly for key publishers that do not license e-book titles to libraries.

We work in close consultation with faculty to identify essential topics for collection development.

Subject	# Print Books	# E-Books
Engineering Design	196	3,104
Materials	1,106	20,902
Modeling and Simulation	155	6,012
Fluid Mechanics	58	1,913
Thermodynamics	137	3,087
Heat Transfer	75	888
Electric Circuits	31	184
Numerical Methods	122	4,808
Statistics and Probability for Engineering	34	4,194
Programming for Engineering	45	9,991
Computer-aided Design	67	1,351
Control Systems	196	6,860
Energy Systems and Sources, Fuel, Renewable Energy	612	7,040
Energy, Environmental Aspects	2,930	51,729
Radiation and Nuclear Technologies	1,046	9,929
Geothermal	21	79,359
Biofuels	51	48,239
Atomic Energy	186	23,292
Radioactivity	53	34,186

Subject	# Print Books	# E-Books
Nuclear Physics	189	172,199
Radiation Physics	53	430

Search Tools

The Library subscribes to many research databases and indexes that provide access to the literature in Energy Engineering. Systematic searching of these resources enables students and faculty to access journals and other academic resources such as conference proceedings, theses and dissertations, trade publications, and reports.

Highly Relevant Databases: Engineering & Science Focus	Relevant Databases: General Science	Relevant Databases: Standards
ACM American Nuclear Society ASME ASTM Digital Library Engineering Village (Inspec and Compendex) Elsevier ScienceDirect IEEE Xplore SciTech Premium Collection SpringerLINK	American Institute of Physics (AIP) Journals Environment Complete PROLA - Physical Review Online Archive SciTech Premium Scopus Web of Science	CSA OnDemand ASME Standards ASTM Standards Techstreet Enterprise

Other Resources

Nuclear Reports

The Library holds an extensive Special Collection of Nuclear Reports. The collection is comprised of approximately 1600 Canadian and international technical papers, annual reports, and specialists meetings. These materials are available in both print and electronic formats. Abstracts for this collection are available in the Library's open access repository: http://dspace.library.dc-uoit.ca/uoit/handle/dcuoit/1

Archival Holdings

Our Library Archives include extensive holdings related to the history of engineering in Canada. Through relationships with national engineering organizations, the Archival collections include holdings from the Engineering Institute of Canada, Canadian Nuclear Society, Canadian Nuclear Association, and the Canadian Academy of Engineering, among others. We also hold collections of professional papers from the personal collections of individual engineers.

A complete list of Archival collections, descriptions and finding aids are available on our website: https://guides.library.uoit.ca/archives

Standards and Codes

In addition to single-publisher collections for CSA, ASME and ASTM standards, the Library also subscribes to the Techstreet platform. Through Techstreet, the Library can purchase individual electronic standards by request from hundreds of publishers.

Statistics & Data Resources

To support research that requires statistics and datasets, our subscriptions include four main resources. Statista provides access to Canadian and international statistics and data from over 18,000 sources including industry reports. Datasets are also available from Statistics Canada's Data Liberation Initiative (DLI), odesi, and the Interuniversity Consortium for Political and Social Research (ICPSR).

Additionally, we provide access and support for Dataverse, a repository that supports research data management and open access data requirements for Tri-Agency research funding compliance.

Multimedia Resources

We acquire DVD and streaming video resources that are relevant to Energy Engineering. Multimedia resources are selected individually or as part of standing subscriptions. Faculty may request streaming videos which the Library can license through its streaming platforms.

Our collection includes 1,081 DVDs and 109,200 Streaming Video titles. Of these multimedia resources, the following are particularly relevant to the curriculum in Industrial Engineering.

- *Relevant Streaming Video Collections*

Streaming Video Collection	Relevant Titles
Kanopy	• Engineering: 254 videos • Sustainable Energy: 10 videos • Energy: 53 videos • Nuclear: 21 videos • Physics: 621 videos
CBC Curio	• Math, Science & Technology: 1,203 videos • Environmental Science: 310 videos

Select Multimedia Titles

- Future of Energy. (2015).
- To the Ends of the Earth: The Rise of Extreme Energy. (2016). Green Planet Films.
- The Science of Nuclear Power. (2016). The Great Courses.

Library Services

A range of Library services support teaching, learning and research at the University. Students and faculty in the Faculty of Engineering and Applied Science have access to services in-person, online and via email or telephone.

Research Support

The Library team plays a vital role in supporting student and faculty research at Ontario Tech.

Reference Service & Research Consultations

Students and faculty have access to research support in-person and online, via telephone, email and through online chat help. **In the 2019-20 academic year, library staff answered 14,630 research questions from the Ontario Tech community.**

Librarians provide individualized research consultations with students and faculty. These consultations are tailored to meet the needs of individual researchers and can cover a range of topics from basic introductions to more advanced search techniques and support for literature reviews.

Open Access & Research Data Management

We provide support to faculty and students in complying with the Tri-Agency Open Access Policy (SSHRC, NSERC, CIHR). Faculty and students can make their work open by publishing in an open access or hybrid journal, by depositing their work in a subject repository, or by depositing their work in Ontario Tech's institutional repository, E-Scholar (https://ir.library.dc-uoit.ca).

We also provide direct support to Faculties through dedicated subject specialist Liaison Librarians and online guidance with the Library's Open Access Guide (http://guides.library.uoit.ca/openaccess). Our Research Data Management guide (http://guides.library.uoit.ca/rdm) supports faculty and students in creating data management plans and sharing research data.

During the 2019-20 academic year, these guides were viewed 572 times.

Research Metrics & Impact

The Library team supports various departments on campus by fielding requests for reports on author, article, journal and institutional metrics. Subscribed tools include: Web of Science, Scopus and Journal Citation Reports (JCR).

The Research Metrics guide (http://guides.library.uoit.ca/researchmetrics) provides background information and support for these tools.

Theses & Dissertations

The Ontario Tech community has access to national and international thesis and dissertation databases through Library subscriptions. Access to PQDT (ProQuest Dissertations and Theses) and the Theses Canada Portal is provided through the Library website. The Library plays a key role in the dissemination and preservation of Ontario Tech theses, managing copies in the institutional open-access digital repository, E-Scholar, as well as maintaining print copies in the Library archives.

Teaching & Learning Support

As partners in teaching and learning at Ontario Tech, Librarians provide a range of instructional and curriculum supports, both in person and online.

Information Literacy Instruction

In collaboration with teaching faculty, Librarians deliver customized information literacy instruction that supports the development of students' 21st century skills to successfully search, evaluate and ethically use scholarly resources in their course requirements. These library services are aligned with the Association of College and Research Libraries (ACRL) Framework for Information Literacy for Higher Education. Information literacy sessions are tailored to the specific requirements of the course or

assignment. Information literacy may be delivered synchronously or asynchronously to classes, in person or online. Library information literacy modules are available in the Canvas Learning Management System and can be adapted and added directly into courses, or instructors can opt for asynchronous recordings.

In the 2019-20 academic year, 203 students in the Faculty of Engineering and Applied Science received instructional support from a Librarian. Information literacy instruction is integrated in the Faculty of Engineering and Applied Science in the following courses, both in person and online:

- COMM 1050: Technical Communications
- ENGR 5003: MASc Seminar for Automotive and Mechanical Engineering
- ENGR 5007: MASc Seminar for ECE
- ENGR 5945G: Mobile Robotic Systems

Students may also receive Information Literacy instruction from a Librarian in their elective courses.

Ideally, Information Literacy instruction is scaffolded across the required curriculum, enabling students to build increasingly sophisticated research skills throughout their program of study. We have identified key courses as potential Information Literacy touchpoints. Students beginning capstone design projects would benefit from advanced Information Literacy instruction so that they can select and evaluate a variety of information sources for background research, from technical documents and industry reports to trade publications and journal articles. As well, students would benefit from introductory Information Literacy Instruction at the start of their Bachelor of Engineering in Energy Engineering studies and visits to the below key introductory courses would help achieve this objective.

- SSCI 1470: Impact of Science and Technology on Society
- PHY 1010: Physics I
- Capstone Systems Design I
- Capstone Systems Design II

Co-curricular Workshops

In addition to Information Literacy instruction that is integrated into the curriculum, the Library offers a number of co-curricular workshops that help develop student and faculty skills. Some examples of workshops offered to Ontario Tech students in the past, both online and in person, include:

- Library 101: Introduction to the Library
- Long Night Against Procrastination Library Workshop
- 3D Printing
- Trending Topics: How Find Highly Cited Journals, Articles and Authors
- Citation Made Easy with EndNote
- Graduate Professional Skills

Workshop offerings are regularly updated in response to the changing needs of the community.

Online Research Guides

Subject specialist Librarians create custom Research Guides for each subject area that are available from our website. Research Guides include program and course guides that are directly related to the

program and course curriculum, as well as topic guides that have cross-disciplinary relevance. Research Guides of particular importance to students in Energy Engineering include:

- Library Research for Engineering Students: https://guides.library.uoit.ca/engineering
- Mechanical Engineering: https://guides.library.uoit.ca/mech-eng
- Nuclear Science & Engineering: https://guides.library.uoit.ca/nuclear/home
- Electrical Engineering: https://guides.library.uoit.ca/elec-eng
- Standards and Codes: https://guides.library.uoit.ca/standards
- Patents: https://guides.library.uoit.ca/patents

During the 2019-20 academic year, these guides were viewed a combined 4,822 times. The Library's Citation guide was viewed 6,447 times.

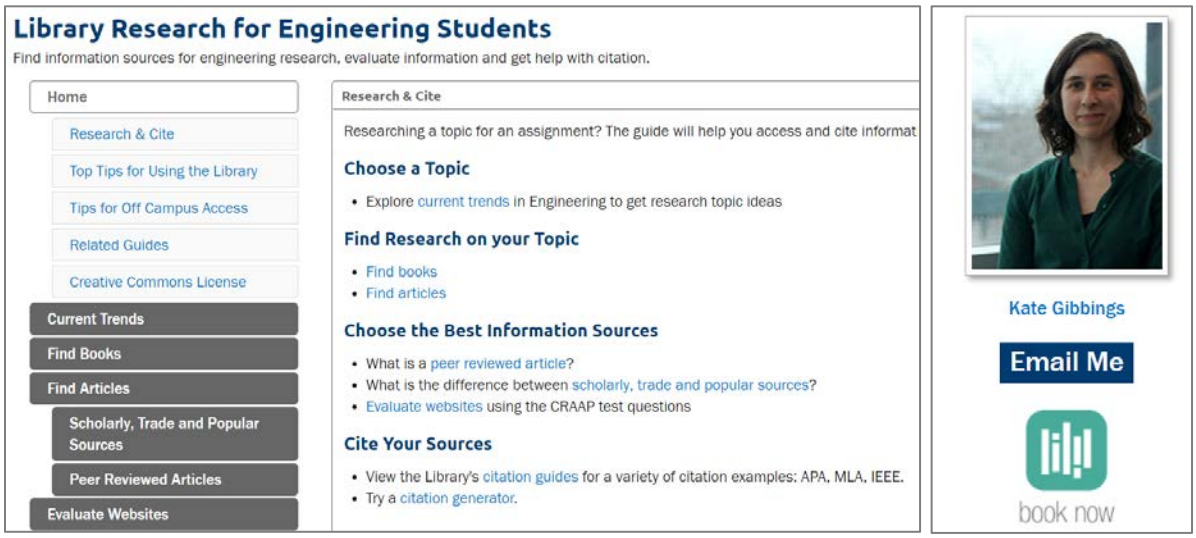


Figure 1 Library Research for Engineering Students Guide

Copyright & Academic Integrity

The Library team provides copyright advice for faculty and students. Library staff advise on license terms and the integration of content into the Learning Management System (LMS). We also help faculty find, evaluate and integrate Open Educational Resources into their courses.

The Library's research support services including our citation guides help students avoid plagiarism and comply with the University's Academic Conduct policy.

Course Reserves

Instructors can place material that is in high demand on course reserve in the library. Reserve material is available to students on shorter loan periods, ensuring equitable access to required textbooks and readings. Electronic course reserves play an increasingly important role, including resources that are born digital and print resources that are digitized through the Library's digitization service. Electronic reserves are subject to copyright compliance and copyright restrictions.

Online course readings are also available through the new Leganto Course Readings system in the University's Canvas LMS.

3D Printing & Equipment Loans

Students have access to 3D printers and 3D printing workshops and can borrow equipment such as laptops and device chargers.

Library Staffing

The anticipated intake for students in the Industrial Engineering program for years 1-5 is as follows:

- Year 1: 30 students
- Year 5: 112 students

The Library anticipates that there will be additional staffing requirements associated with growth in graduate and undergraduate degree programs across the University. These requests will be part of the regular budget planning process, following a fulsome and strategic analysis of our staffing needs.

Conclusion

The Library is well-positioned to support the Energy Engineering program. With some targeted funding for the acquisition of key subscription resources, our suite of services and programs will meet the needs of students and faculty in this program. Students typically gain introductory information literacy skills through Library instruction in COMM 1050, but would benefit from more introductory instruction in PHY 1010. Advanced instruction is recommended in Capstone Systems Design I and II and other courses with research components.

We look forward to working in collaboration with students and faculty in this new program.

Enrollment	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28
Year 1	30	40	50	50	50	50
Year 2	0	24	32	40	40	38
Year 3	0	0	22	29	36	36
Year 4	0	0	0	22	29	36
Year 5	0	0	0	0	22	29
TOTAL New Students	**30**	**64**	**104**	**141**	**177**	**191**

Revenue	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28
Domestic Tuition	$330,701	$726,661	$1,216,249	$1,698,421	$2,196,023	$2,440,811
International Tuition	$91,592	$201,259	$336,857	$470,402	$608,219	$676,017
Grant	$120,795	$204,353	$357,093	$484,136	$607,745	$648,949
Total Revenue	**$543,089**	**$ 1,132,273**	**$ 1,910,199**	**$ 2,652,959**	**$ 3,411,987**	**$ 3,765,776**

Course Summary	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28
# of lecture sections	0	0	0	0	0	0
# of labs	0	0	0	0	0	0
# of tutorials	0	0	0	0	0	0

Required Hires	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28
# of TTT	0	0	0	0	0	0
# of TF	0	0	0	0	0	0
# of PT Faculty	0	0	0	0	0	0

Expenses						
Academic Salaries	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28
FT Faculty	$ -	$ -	$ -	$ -	$ -	$ -
FT Benefits (18.5%)	$ -	$ -	$ -	$ -	$ -	$ -
FT Total	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
PT Faculty	$ -	$ -	$ -	$ -	$ -	$ -
Additional TAships	$ 14,969	$ 15,718	$ 33,007	$ 51,986	$ 72,781	$ 76,420
TAs	$ -	$ -	$ -	$ -	$ -	$ -
Lab Instructors	$ -	$ -	$ -	$ -	$ -	$ -
PT Benefits (11%)	$1,647	$1,729	$3,631	$5,719	$8,006	$8,406
PT Total	**$ 16,616**	**$ 17,447**	**$ 36,638**	**$ 57,705**	**$ 80,787**	**$ 84,826**
Total Academic Salaries	**$ 16,616**	**$ 17,447**	**$ 36,638**	**$ 57,705**	**$ 80,787**	**$ 84,826**

Support Staff Salaries	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28
0	$0	$0	$0	$0	$0	$0
Benefits (18.5%)	$0	$0	$0	$0	$0	$0
Total Support Staff Salaries	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**

Operational Expense	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28
Instructional Supplies	$0	$0	$0	$0	$0	$0
Start-up	$0	$0	$0	$0	$0	$0
PD ($2,000/ faculty)	$0	$0	$0	$0	$0	$0
Travel	$0	$0	$0	$0	$0	$0
Recruitment/Moving Expenses	$0	$0	$0	$0	$0	$0
Promotion	$0	$0	$0	$0	$0	$0
Telecommunication	$0	$0	$0	$0	$0	$0
Office Supplies	$0	$0	$0	$0	$0	$0
Equipment	$0	$0	$0	$0	$0	$0
TOTAL Operating	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**

Capital	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28
0	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
TOTAL Capital	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**

Total Expenses	**$16,616**	**$17,447**	**$36,638**	**$57,705**	**$80,787**	**$84,826**
NET Income with Grant	**$526,473**	**$1,114,827**	**$1,873,561**	**$2,595,254**	**$3,331,201**	**$3,680,950**
NET Income without Grant	**$405,678**	**$910,473**	**$1,516,468**	**$2,111,118**	**$2,723,455**	**$3,032,002**

Appendix G – Letters of Support

December 1, 2021

To whom it may concern:

Re: OTU Energy Engineering Program

On behalf of the Heating, Refrigeration and Air Conditioning Institute of Canada (HRAI), I am pleased to provide this letter of support for the new Energy Engineering program being proposed by Ontario Tech University (OTU).

Founded in 1968, the Heating, Refrigeration and Air Conditioning Institute of Canada (HRAI) is Canada's national trade association for the heating, ventilation, air conditioning and refrigeration (HVACR) industry. HRAI represents more than 1,250 manufacturers, wholesalers and contractor member companies across the country. Collectively, our members employ more than 50,000 people in Canada and deliver more than $12B annually to the Canadian economy.

The HVACR industry is in a position to deliver significant improvements in how we heat and cool homes and buildings in Canada -- improvements that will reduce energy use and carbon emissions while improving comfort and indoor air quality for occupants. Technology is not the key barrier to progress in the transition to low-carbon energy; we have solutions at the ready. Rather, the most significant barrier to change is the lack of qualified personnel in the sector who have the expertise needed to deliver on this potential.

Our industry faces a desperate need for tradespersons and service technicians, but also for appropriately trained and qualified engineers who are prepared to apply an integrated building systems approach when tackling new construction and building retrofit projects. Some of the new technologies that our industry brings to optimize energy use and eliminate carbon – VRF systems, geothermal heat pumps, advanced building control systems, to name a few -- are not sufficiently well understood in the engineering community, and too often the best solutions are set aside in favour of "tried and true" options.

HRAI welcomes any program that aims to produce the kinds of professionals that will be needed for the timely transition to a low carbon economy and we applaud OTU for its initiative in bringing such a program to market.

Yours sincerely,

Martin Luymes
Vice President, Government and Stakeholder Relations

cc Dr. Daniel Hoornweg, OTU

100 Simcoe Street South, Oshawa, Ontario L1H 7M7 • Tel. (905) 723-4623 • Fax (905) 723-7947 • E-mail contactus@opuc.on.ca

November 19, 2021

RE: ENERGY ENGINEERING PROGRAM @ ONTARIO TECH UNIVERSITY

To whom it may concern,

The purpose of this letter is to support the proposed Energy Engineering program at Ontario Tech University.

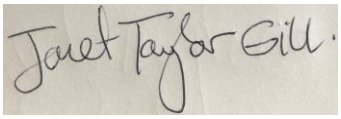
As a leading organization with competencies, assets and strategic imperatives across the regulated and unregulated energy and communications sectors, Oshawa Power and Utilities Corporation would like to commend Ontario Tech University for continuing to develop holistic energy-focused programs.

The program that has been envisioned will reduce silos between the knowledge centers required to design and deploy well-considered energy systems, which will support climate change mitigation and economic affordability going forward.

Additionally, we feel this program will assist with growing a pipeline of talent that will fuel clean energy jobs and Just Transition here in Ontario, as well as across Canada. We look forward to supporting the University with collaborative efforts, knowledge-sharing and access to our resources. We will also continue to work with Ontario Tech University to develop employment opportunities to support the development of ongoing students and recent grads.

Please don't hesitate to reach out with any questions or comments.

Sincerely,



Janet Taylor
Manager – Sustainability and Business Advocacy
Oshawa Power and Utilities Corporation
jtaylor@opuc.on.ca I (905) 723-4626 x 5249

CC:

Ivano Labricciosa, President and CEO of Oshawa Power and Utilities Corporation

ONTARIO POWER GENERATION

Darlington Nuclear, 1855 Energy Drive, Courtice, Ontario L1E 0E7

November 22, 2021

To Whom it May Concern:

As Ontario's primary electricity generator, Ontario Power Generation (OPG) has been working to advance energy, innovation and skilled trades initiatives over the last many years. As a multi-year partner in these efforts, Ontario Tech University continues to demonstrate sound awareness and understanding of the demands faced by Ontario manufacturers and businesses, including particularly those in the Energy sector.

The partnership between OPG and Ontario Tech University has been in place for 16+years; with the partnership supporting OPG initiatives including training and upskilling of employees, as well as providing support for OPG's diverse portfolios, including climate change, electrification and nuclear generation.

The expertise provided by Ontario Tech University staff has ensured that their current Nuclear Engineering and Health Physics program is robust in the areas of life cycle analysis and sustainable energy systems. Ontario Tech's proposed Energy Engineering Program would assist OPG and similar organizations by tapping into the ingenuity of next-gen students as we seek to power Ontario while also doing our part to tackle climate change.

In closing, OPG supports the ongoing efforts of Ontario Tech to build an engineering workforce with specialized knowledge and skills to meet industry needs – a workforce capable of assisting Durham and Ontario in meeting their Net-Zero targets through the proposed Energy Engineering Program.

Sincerely,

Jennifer Knox
Director, Nuclear Stakeholder Relations
Ontario Power Generation
(905) 697-7443 | (289) 385-1011 | jennifer.knox@opg.com

solarship

November 15, 2021

To whom it may concern,

I write this letter in support of the proposed Energy Engineering program at Ontario Tech University. As Chief Operating Officer of Solar Ship, I can speak to the need for engineering graduates who understand the broader system dynamics of our energy transition, and the role of engineering within.

Solar Ship is a pioneer in the development of solar powered buoyant aircraft. We rely on the availability of engineers with technical capabilities complemented by energy system awareness. This informs their role in effecting system shift. Our company is currently undergoing the transition to hydrogen in our operations, and we are directly experiencing the contrast between those engineers with interdisciplinary understanding, and those without.

The recruitment of engineers who understand the dynamics of the energy system is a present need for our company, and one I believe that will intensify and expand as the pathway to net-zero becomes ever more clear.

I strongly endorse the creation of this program.

Sincerely,

Sarah Heynen, COO
Solar Ship Inc.

455 Phillip Street,
Waterloo, Ontario N2L3X2
Canada
www.ghd.com

Re: Support for the new Energy Engineering Program proposed by Ontario Tech University

18 November 2021

To Whom It May Concern:

GHD is a global professional services company that leads through engineering, construction and architectural expertise. Our forward-looking, innovative approaches connect and sustain communities around the world. Delivering extraordinary social and economic outcomes, we are focused on building lasting relationships with our partners and clients.

As a Global Leader of the recently established arm of GHD called Future Energy, I am very acutely aware of the need to foster an expanded view of energy, recognizing the challenges associated with energy transition to renewable and sustainable sources.

Quoting from this year's COP26 Draft Decision perhaps offers the most appropriate endorsement for the Energy Engineering Program proposed at Ontario Tech University.

> "6. Emphasizes the urgency of scaling up action and support, including finance, capacitybuilding and technology transfer, to enhance adaptive capacity, strengthen resilience and reduce vulnerability to climate change in line with the best available science, taking into account the priorities and needs of developing country Parties;"

I am proud to have devoted nearly a quarter century working with young academics pursuing careers in STEM. As a professor and an engineering professional, I strongly support a program that will help shape young minds to seek energy innovation as part of their core curriculum.

Beyond this letter, please consider GHD's support should you require industry's input or assistance. We are happy to help where appropriate.

Regards

Dr. Tej Gidda
Vice-President and Global Leader – Future Energy

+1 (519) 340-3941
Tej.Gidda@ghd.com

Copy to: RD

PLUG 'N DRIVE

The Electric Vehicle Discovery Centre
1126 Finch Ave. W, Unit 1
North York, ON, M3J 3J6

November 11, 2021

To Whom it May Concern:

Re: Support for the new Energy Engineering Program proposed by Ontario Tech University

Plug'n Drive is a not for profit that is accelerating the adoption of electric vehicles for their environmental and economic benefits. We are a leader in the space, educating consumers to help them make the switch from gas to electric.

I am pleased to provide a letter of support for the new Energy Engineering program proposed by Ontario Tech University. As CEO of Plug'n Drive, promoting the shift to electric vehicles, EVs, I can confirm the ongoing need for engineering graduates, who are able to take a broader systems approach to our energy transition, while also being well-versed on the technical aspects of key components. For example, EVs may well be an integral component to energy storage as our electricity systems transition to meet net-zero targets. Engineers who appreciate these possibilities and technologies are urgently needed in Ontario and Canada.

We need to begin training young people for the jobs of the future, not the jobs of the past. This program is an important step in that direction. Do not hesitate to contact me for further information.

Sincerely,

Cara Clairman
President and CEO
Plug'n Drive
647-717-6941

The Regional Municipality of Durham

Office of the Regional Chair

605 Rossland Rd. E.
Level 5
PO Box 623
Whitby, ON L1N 6A3
Canada

905-668-7711
1-800-372-1102
john.henry@durham.ca

durham.ca

John Henry
Regional Chair and CEO

Sent via email

December 3, 2021

Ministry of Education
Mowat Block, 900 Bay Street
Toronto, ON M7A 1L2

To Whom It May Concern:

Re: Support for Proposed Energy Engineering Program at Ontario Tech University

On behalf of the Region of Durham, I am writing to share my support for the proposed Energy Engineering Program at Ontario Tech University.

The proposed program aligns with Regional objectives and plans. Durham Region is implementing the Durham Community Energy Plan which seeks to transition to a clean energy economy, while simultaneously achieving multiple economic and social benefits. We are working with our partners to accelerate energy transition and there is a need for broad system understanding as well as specific technical knowledge. We see opportunities to engage with Ontario Tech students in this program through our existing CityStudio Durham collaboration.

Further, Durham Region's business community is at the forefront of accelerating energy innovation and includes a vibrant cluster of energy, environmental and engineering businesses—the strongest of its kind in Canada. There is a great demand from these businesses for recruiting top talent into their organizations. Graduates of an accredited energy engineering program focused on a broad systems approach to energy will be sought after.

Durham Region is home to the workforce of today. We are excited to be home to Ontario Tech and their innovative programs to help develop the workforce of the future. If you need more information, please don't hesitate to reach out to me (chair@durham.ca).

Sincerely,

John Henry
Regional Chair and CEO

Ministry of Energy

77 Grenville Street
6th Floor
Toronto ON M7A 2C1

Tel: (289) 980-8124

Ministère de l'Énergie

77, rue Grenville
6e étage
Toronto ON M7A 2C1

Tél: (289) 980-8124

Strategic, Network and Agency Policy Division
Division des politiques relatives aux stratégies, aux réseaux et aux organismes

December 08, 2021

Prof. Daniel Hoornweg
Richard Marceau Chair
Faculty of Energy Systems and Nuclear Science
Ontario Tech University

Proposed Energy Engineering Program

To whom it may concern:

I am pleased to write in support of Ontario Tech University's proposed Energy Engineering Program. While I am not able to speak to specific curriculum design questions, I hope the following contextual information is helpful.

Ontario Tech is an innovative engineering-focused public university with deep, collaborative ties to the energy industry in Ontario. Ontario Tech graduates enjoy a high reputation across the sector, and the university plays a critical role in educating nuclear engineers that operate Ontario's nuclear generating stations.

A well-developed pool of highly qualified people is crucial for the sector and the broader Ontario economy. The energy sector is expected to undergo significant transformation over the coming decades as the economy shifts to a clean growth paradigm, and will require a steady stream of new talent, especially engineers, who are able to apply a whole system lens to developing innovative solutions and evaluating alternative energy options.

Sincerely,

J. Wittenbrinck

Joerg Wittenbrinck
Manager (A), Strategic Policy and Research

REVIEWERS' REPORT FOR NEW PROGRAMS

Reviewers' Report on the Proposed Bachelor of Engineering in Energy Engineering Program at Ontario Tech University

Dr. Mohamed Hamed
Department of Mechanical Engineering
McMaster University
1280 Main St W
Hamilton, ON
L8S 4L8

Dr. Ziad Saghir
Department of Mechanical and Industrial Engineering
Ryerson University
350 Victoria St
Toronto, ON M5B 2K3

Ontario Tech University has a distinct and clearly articulated mission that is appropriate to an institution of higher education, focused upon its identity, its educational and other goals, and the students and communities it wishes to serve.

The proposed energy and management program and courses are appropriate to its mission. Ontario Tech University assesses the need for a new Engineering program focussed on the job market in Ontario and Canada. The institution team is aware of the potential job market, competition in the sector, and focuses on prospective student interest, and does have the required resources and infrastructure.

The proposed curricula comprise an appropriate sequence and mix of courses between the Faculty of Engineering and Applied Sciences and the Faculty of Energy Systems and Nuclear Science. It comprises well-defined quantity and quality of work of sufficient rigor. The institution clearly defines the learning outcomes for the proposed engineering degree and demonstrates that the graduates of the proposed program will attain a measurable and effective skill set in the important field of Energy and its applications. This learning outcome is in line with other engineering programs offered in this institution. A few questions should be addressed in the proposal:

1. What is the main difference between the proposed program and the existing energy minors offered in Mechanical Engineering and Nuclear?
2. Can the institution identify a unique learning outcome not existing in other Canadian institutions?
3. Would the close interaction between municipalities, industries in the region with students lead to a unique learning outcome?
4. The institution has a sufficient number of appropriately qualified faculty members and technical to meet all requirements of the proposed program.

1. OUTLINE OF THE REVIEW

Due to the COVID pandemic, the review was conducted via a virtual visit using Google meet. The review started with a general discussion with the top management and top-level questions were raised. Educational facilities within the faculty of engineering were virtually

visited. Further discussion took place with several faculty members and a team of advisors responsible for the proposed program.

2. EVALUATION CRITERIA

2.1 Program Objectives

In the entire document, the reviewers did not read a single sentence on the proposed program objectives. However, during our virtual site visit, the objectives were presented. The reviewers believe that the proposed curriculum is appropriate for an engineering degree. The proposed program is consistent with the institution's mission and academic plan. It complements the already existing programs. In the background and rationale section, it is recommended to indicate the objectives of this program. For example, such objectives could be:

1. Meet the student's needs and interest in different sectors of energy
2. Meet the industry need in the surrounding area by naming them
3. Meet the international demand from the organization around the world and the commitment of the institution with IAEE
4. Meet the municipalities need in the region
5. To upgrade the current energy program at the institution to be the leader in Canada in the Energy sector
6. To train undergraduate and graduate students to be successful in the Canadian market.

It is important at the beginning of the proposal to identify the novelty of this program. The uniqueness of the courses offered is presented but the needs should be addressed in the proposal.

2.2 Program requirements

The program structure is similar to other engineering programs at Ontario Tech University. The proposed model is fair and fine and the curriculum addresses the proposed area of study very clearly. However, it is noticeable that some courses content contains a large number of topics that would be very difficult to cover in 13 weeks unless the instructor develops an innovative self-learning methodology. For instance, the only thermodynamics course combines the equivalent of two normal thermodynamics courses in other engineering curricula. However, the reviewers believe that the proposed program structure and the program level outcomes meet the undergraduate and graduate-level expectations. The proposed mode of delivery will facilitate the successful completion of the program-level learning outcomes for all students enrolled.

2.3 Program requirements for graduate programs only

In the current proposal, the focus is mainly on the undergraduate program and no mention of the graduate program. However, a discussion took place about allowing students to take fourth-year courses toward their graduate degree by adding an extra component/assignment to the 4^{th} year content.

2.4 Assessment of teaching and learning

It is mentioned that the assessment of students will be carried out through midterms, final exams, and projects. This approach is similar to the current one used in the institution and it is well documented. For the projects, the reviewers noticed an assessment is made by involving the students with industrial companies in the surrounding. This is found to be a positive approach and unique to this proposed program. With such training, the students will achieve program-level learning outcomes. It was also discussed that the resulting information will be documented and used to provide continuous program improvement. It is recommended that the institution conduct a survey amongst the currently enrolled student and assess whether students will switch to this new program if accredited. Many courses contain design components, thus offering another way to assess students' learning.

2.5 Admission requirements

Admission to this program is standard to the institution and follows similar requirements as other engineering programs. This is expected because the proposed program is identical in format to other accredited engineering programs offered at the institution.

2.6 Resources for all programs

A unique feature of the proposed program can be attributed to the location of the institution. Ontario Tech University is located at the center of the Energy sector and enjoys unique access to many industries and government labs. However, these resources are not stated in the proposal. It is recommended to be included to highlight the uniqueness of the proposed program. Based on our site visit, a sufficient number and quality of core faculty members well known in the proposed field will be involved in this program. By examining their curriculum vitae, the reviewers believe that the faculty members are competent in teaching and supervising students at all levels. They are well known in the international community. By examining the course distributions amongst faculty members, the utilization of physical and financial resources is appropriate. The proposed facilities are adequate to train students and enhance further the learning outcomes The availability of part-time faculty and adjunct faculty member capable to assist in case of need were also discussed during our visit. In summary, the institution has enough resources and facilities to successfully deliver the proposed program

2.7 Resources for graduate programs only

Not applicable

2.8 Quality and other indicators

It is important to indicate that the high quality of faculty members is well noted in this institution. Their involvement in national and international conferences, keynote speeches, and high-level research is evident in their resumes

The undergraduate and graduate labs are quite impressive and meet the demand for hands-on experience. The institution has the needed facilities to deliver this proposed undergraduate program. What is unique and is recommended to be added to the proposal is a hands-on experience of the wind energy and geothermal facilities available in the region. It is recommended that the institution highlights in the proposal these facilities and their availability to be accessed by faculty members and students.

3. OTHER ISSUES

Minor corrections

1. Two minors typing errors in Table 3 replace “athematics” with “mathematics”
2. On page 17, line 4 in program structure and content delete “in”

Syllabi

Since the engineering program curriculum comprises of existing courses between the faculty of engineering and applied science and the faculty of energy and nuclear science, it is recommended that the course syllabi format be identical for this proposed program.

Advising

Centralized advising is in place serving different faculties at the same time. It is recommended to include in your proposal a chart explaining the structure and reporting of the advising office. This chart will address any concerns from the accreditation board. Can the institution highlight the importance of centralized advising?

Need for this program

It is recommended to conduct surveys of potential employers, regional industries, and students currently enrolled in engineering and seek their opinion on this new program. These surveys should also be sent to Alumni to seek their opinion. It is recommended to seek letters of support from relevant industries, government agencies, and municipalities.

Curiosity questions

Some proposed courses in the fourth year are non-existing in a Canadian institution. Would the institution be interested in mentioning that in the proposal?

Also, would the institution have an interest in providing these courses to the communities of engineers and researchers in Ontario as part of continuing education courses?

Would the institution be interested in mentioning that using this program, will serve the entire community not only the enrolled students?

4. SUMMARY AND RECOMMENDATIONS

In our opinion, based on the two-day virtual visit, the proposed program is unique and needed in Canada. However, we recommend the following points to be clearly indicated in the proposal:

1. The program main objectives.
2. Its uniqueness and novelty.
3. The program diversity with respect to different disciplines in energy.

Signature: 

Date: **October 7, 2021**

Signature: 

Date: October 7, 2021

Faculty Response to the External Review for the

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BACHELOR OF ENGINEERING IN ENERGY ENGINEERING

Submitted By:

Professors Martin Agelin-Chaab, Daniel Hoornweg Ibrahim Dincer, Jennifer McKellar

Dean Dr. Hossam Kishawy

November 30, 2021

Introduction

The review visit and subsequent report by Drs, Mohammad Hamed and Ziad Saghir Brief was well-received and provided practical and targeted suggestions to enhance the program. The reviewers are enthusiastic and overall very supportive of the proposed program. Suggestions on how to better promote, differentiate, and take advantage of Ontario Tech's broad array of assets in the energy sector, are particularly helpful.

Suggestions and recommendations from the reviewers are incorporated in the revised proposal and the program launch remains on schedule.

Summary of Recommendations and Faculty Responses

- *Restate the recommendations summarized in the external reviewers' report and provide the Program's comments and responses*
- *The Dean should then provide summative comments/responses from an overarching Faculty perspective for each recommendation and program response*

Recommendation 1
Clarify the difference between the proposed program and existing minors offered in Mechanical and Nuclear Engineering

Program's Response
The proposed Energy Engineering program differs considerably from the existing specializations in Mechanical Engineering and Nuclear Engineering in that a full suite of energy courses is provided through the new program. The Energy option in Mechanical Engineering was intended to provide a limited specialization with a set of five additional courses. The proposed Energy Engineering program is fully energy engineering focused and builds upon the experience of the existing programs using the expertise of core faculty members in this field. In particular, the proposed program combines courses in electrical, mechanical, and nuclear engineering in addition to other renewable energy courses and specialized integration courses to offer a set of unique program outcomes. This further allows for better utilization of existing courses across the various programs, in addition to new core courses to allow graduating students to develop the needed skills for the energy engineering sector. There are several courses cross-listed with, and slightly modified from, existing courses to serve the program. Furthermore, it focuses on some critical subjects, such as renewable energies, hydrogen and fuel cells, energy storage, smart grid, etc. which will attract students with a wide range of interests. Graduates from the proposed program are expected to gain specialized skills needed to design entire energy systems, e.g. remote communities vs rapidly growing megacities, while also having the depth of knowledge to appreciate the complexities of transitioning traditional energy systems to low-carbon, resilient, safe and cost-effective alternatives.

Dean's response
Dean agrees with the program's response. The new program capitalizes on existing courses and new developed/modified courses to develop a diverse skill set required by industrial energy sector.

Recommendation 2
Identify a unique learning outcome not existing in other Canadian institutions. Discuss the uniqueness of courses offered.

Program's Response
The proposed Energy Engineering program is unique as it capitalizes on the University's strong leadership in various key areas, including hydrogen energy, energy storage, nuclear and other recognized expertise. In addition, the proximity of the University to a diverse range of energy systems and applications, and its existing strong partnerships with these energy related institutions provide the program a unique opportunity to expose students in the proposed program to hands-on applications that do not existing anywhere in Canada. The outcome-based assessment is essential in every course of the proposed program and covers the following: introducing clearly what students should be able to do, measuring the student performance and using the data to improve the quality of the learning environment. In this regard, the CEAB graduate attributes are diligently considered and evaluated. There are specific advantages offered to students that there are the result of strong ties with the City of Oshawa (such as Teaching City program) and Durham Region (on various subjects where students are involved in various projects related to energy efficiency and conservation, district energy systems, waste to energy options, etc.) as well as numerous projects coming from the local industries for capstone course design projects where students are allowed to have direct experience and cooperative work and enhance their experiential learning. These really make the program unique.

Graduates of the proposed Energy Engineering program will possess a unique 'system-wide' understanding of energy applications in Canada. Graduates will also understand how provincial systems (electricity, space heating and cooling, transportation) may, or may not be, integrated, and how they are all undergoing intensifying stresses in a changing climate and with much greater demands for lower-carbon energy. Graduates have a unique opportunity to learn about individual aspects of energy systems, e.g. nuclear with wind and solar, as well as how the components need to be integrated in an overall resilient and economic system. Several courses, particularly in third and fourth year, are unique to this program. These include specific courses in wind, solar, geothermal, smart grid, fuel cells, and emerging and detailed energy systems design.

Dean's response
Dean agrees with the program's response.

Recommendation 3
Show how the close interaction between students and municipalities and industries in the region would lead to a unique learning outcome

Program's Response
The program is fortunate to have durable partnerships with local municipalities, regional offices and industries. Geographically, there is likely no other area in Canada with such a diverse range of energy applications. The program requires students to make a number of field trips through which they will understand and familiarize themselves with the following energy applications:

- Durham-York Energy from Waste Facility (Covanta);
- hydrogen generation (CERL at Ontario Tech);
- smart-grid applications (Ontario Tech has one of Canada's largest isolated grids, with battery back-up);

- Combined Heat and Power facility (Ontario Tech has an operating 2MW CHP on campus – supporting campus ability to serve as an isolated relief node in case of emergency);
- access to Darlington and Bruce Nuclear Generating Stations (two of the largest nuclear facilities in the world, OPG and Bruce Power operations);
- York Region's geothermal household heating/cooling facility in Markham;
- two of Canada's largest geothermal heating and cooling fields (Ontario Tech and Durham College);
- Kawartha Ethanol plant, Havelock;
- Adam Beck Hydroelectric (OPG, Niagara Falls);
- Enwave deep-lake heating and cooling and Norstar compressed air storage pilot project, Toronto;
- anaerobic digestion at local farms;
- Henvey Inlet Wind Energy Center;
- local solar facilities;
- Markham District Energy:
- General Motors plant operations and CHP.

Dean's response
Dean agrees with the program's response.

Recommendation 4
In the background and rationale section indicate the objectives of the program.

Program's Response
The proposed Energy Engineering program will meet several complementary objectives, including:

- Meet student needs and interests in an engaging, timely and engineering sector that is in high, and growing demand;
- Meet the demand of local and global industries and utilities, e.g. Oshawa PUC, General Motors, OPG;
- Meet the demand of local municipalities and remote communities;
- Meet international demand from institutions and dedicated agencies in the energy sector (provincial, national and international);
- Support Ontario Tech University's strategic priority area in energy;
- Support Canada, and other countries, as they embark on a massive energy transition over the next 30 years;
- Play a key role in the rush to de-carbonize energy systems (more than 100 countries, 1,000 corporations and 10,000 sub-sovereign governments have declared net-zero carbon targets – meeting these targets is likely the most difficult challenge humanity has faced).

Dean's response
Dean agrees with the program's response.

Recommendation 5
Conduct a survey of students and industry to assess interest in the program.

Program's Response
Although it has not yet been possible to conduct a detailed survey of students and industry to assess the specific interest in such a program, there have been clear evidences from past university fairs, open houses, outreach activities and more especially the industrial advisory boards, as well as local engagements with various partners, companies, government offices, etc. about launching a well-focussed Energy Engineering program. Furthermore, there are strong support letters from representative industry and government partners attached. Moreover, an informal survey of existing high-school students in Durham-Northumberland was undertaken through the Durham Region Roundtable on Climate Change. Members of the Youth and Climate Change group are especially interested in the program ('addressing climate change at scale').

Dean's response
Dean agrees with the program's response. Also, the new program develops more skills than the ones offered by the existing energy specialization in the mechanical engineering program, which is popular among the students, and provides more exposure to diversified energy system which leads to believe that the students will be interested in this program.

Recommendation 6
Include a chart explaining the structure and reporting of the advising office.

Program's Response
The is a new advising structure governed by the deputy provost office and thus we will leave it to the dean to response.

Dean's response
This is a new advising structure that is currently evolving. The new structure mimics the structure of the School of Graduate Studies within a university setting which will provide university wide consistency in processes and training to ensure high quality service to our students. Within engineering academic advising there is a Manager to whom all academic advisors report to. The Manager has dual reporting to the Faculty, for all issues pertaining to the academic program and students' issues, and to the university wide Academic Advising Director for advising on skill set and communication/process improvement across the university. All academic decisions are governed by the Faculty and under the authority of the Associate Dean, Academic. The Faculty will continue to provide the necessary feedback to ensure the students are well-served and the program integrity is preserved to meet the CEAB requirements and standards.

Suggested Revisions for the Proposal following External Review

- *All recommendations are incorporated in the revised proposal.*

Summary of Changes Made to the Proposal Following External Review

List all revisions (based on the feedback provided by the external reviewers), noting the Section number from the proposal document. Include this form with the final proposal.

1. A minor revision is made on the purpose of the proposed program in Section 1a.
2. A further clarification about the differences between the proposed program and existing minors offered in Mechanical and Nuclear Engineering is provided in Section 1b.
3. A further clarification about unique learning outcomes not existing in other Canadian institutions and uniqueness of courses offered is provided in Section 1c.
4. A further clarification is provided in Section 1d about how the close interaction between students and municipalities and industries in the region would lead to a unique learning outcome.
5. Letters of Support from Industry have been added (Appendix G).