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 Industrial 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 Industrial Engineering and recommends the program for approval by Board.

BACKGROUND/CONTEXT & RATIONALE:
The Faculty of Engineering and Applied Science is proposing a new degree program in Industrial Engineering. Industrial engineering is an engineering discipline that integrates several branches of engineering education with the objective of optimizing and improving complex engineering processes, systems, or organizations. This is achieved by implementing innovative integrated systems of people, knowledge, and equipment with financial effectiveness. Similar to all other engineering programs, hands-on experience and project-based courses are an integral part of the industrial engineering program. Students enrolled in this program will also have an opportunity to join the co-op option.

There is a high demand for industrial engineers in both Canada and the United States of America. The Faculty of Engineering and Applied Science's Department of Mechanical and

Manufacturing Engineering is well positioned to provide a successful Industrial Engineering program to address the current demand on Industrial Engineers in the market place. The industrial engineering program will utilize courses from FEAS's Mechanical, Manufacturing, and Mechatronics Engineering programs. Only thirteen new core courses will need to be created. Most of these new courses are offered in the third and the fourth years of the program (i.e. in academic years 2024-2025 and 2025-2026). In addition, the industrial engineering program will share the same common first year with all other engineering programs at Ontario Tech. The delivery mode of this program will be in-class.

RESOURCES REQUIRED:
The majority of faculty members required for the program will come from FEAS's existing complement of faculty members. FEAS will be requesting two tenure-track faculty members to teach in the new program when enrolments require this; the expectation is in 2024-2025. As per the other BEng programs at Ontario Tech, FEAS will continue to make use of service courses offered by the Faculty of Science and the Faculty of Social Sciences and Humanities. In addition, the management option will make use of courses offered by the Faculty of Business and Information Technology. All administrative support and technical support for the programs will come from existing FEAS personnel.

CONSULTATION AND APPROVAL:
USC for Recommendation: December 2021
Engineering Faculty Council: 6 December 2021
ARC Review: June 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:	Industrial Engineering/Industrial Engineering & Management
Degree Designation/Credential:	BEng/BEng and Management
Faculty (where the program will be housed):	Department of Mechanical and Manufacturing Engineering Faculty of Engineering and Applied Science
Collaborating Faculty (if applicable):	
Program Delivery Location:	Ontario Tech University/North Campus
Collaborating Institution(s) (if applicable):	
Proposed Program Start Date:	September 2022
Proposal Contact:	Dr. Atef Mohany, Chair of the Mechanical and Manufacturing Engineering Department.
Submission Date:	December 2021
Approved by Dean: (signature and date)	

Table of Contents

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)*

Industrial engineering is an engineering discipline that integrates several branches of engineering education with the objective of optimizing and improving complex engineering processes, systems, or organizations. This is achieved by implementing innovative integrated systems of people, knowledge, and equipment with financial effectiveness.

In addition to the standard industrial engineering program, the Faculty of Engineering and Applied Science (FEAS) will also be offering an industrial engineering and management program. This program will be of the same format as all of FEAS's other management options where students do an additional year of business courses between Years 3 and 4 of their engineering program.

Similar to all other engineering programs (Mechanical, Automotive, Manufacturing, Mechatronics, Electrical and Software Engineering programs), hands-on experience and project-based courses are an integral part of the industrial engineering program and therefore the program will be delivered in-class. The students enrolled in this program will also have an opportunity to join the co-op option.

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*

There is a high demand for industrial engineers in both Canada and the United States of America. According to the Occupational Outlook Handbook[1], it is expected that in the coming 10 years there will be an increased demand for Industrial Engineer by 10%. This is much higher than the average demand for other engineering disciplines (currently at 4%). The Faculty of Engineering and Applied Science's Department of Mechanical and Manufacturing Engineering is well positioned to provide a successful Industrial Engineering program to address the current demand on Industrial Engineers in the market place. The industrial engineering program will utilize courses from FEAS's Mechanical, Manufacturing, and Mechatronics Engineering programs. Only thirteen new core courses will need to be created. Most of these new courses are offered in the third and the fourth years of the program (i.e. in academic years 2024-2025 and 2025-2026). In addition, the industrial engineering program will share the same common first year with all other engineering programs at Ontario Tech. The delivery mode of this program will be in-class.

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*

The mission of Ontario Tech is to "Provide superior undergraduate and graduate programs that are technology-enriched and responsive to the needs of students and the evolving workplace." Adding an Industrial Engineering program will contribute significantly to this mission and will address a strategic area of growth in the market demand for industrial engineers as explained in the previous section. 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. From automotive/transportation

1. https://www.bls.gov/ooh/architecture-and-engineering/industrial-engineers.htm

systems, to consumer products, to energy systems, industrial engineers play a key role in an ever-expanding range of engineering problems. It is imperative that Ontario Tech continues to evolve its programs to meet the needs of the modern workforce. The industrial engineering program will help the Faculty of Engineering and Applied Science (FEAS) and Ontario Tech to remain relevant in the job market and offer programs that the students need and the employers want. The program offers some unique courses, such as Industrial Cyber-Physical Systems (INSE 4248U), Human-System Integration (INSE 4170U), Industrial Data Analytics (INSE 3245U), Industrial Internet of Things (INSE 3142U), and Artificial Intelligence and Machine Learning (ENGR 3150U), that address the rapid industrial evolution and the use of artificial intelligence to solve real world industrial problems. These courses are just an example among many in the program that provide the students with unique learning outcomes to address the evolving workplace and fill a gap in knowledge that is otherwise overlooked in other industrial engineering programs. Thus, the development of an industrial engineering program has been identified as a strategic priority of FEAS to grow the students' enrollment while capitalizing on the strength of our existing programs, in particular, the manufacturing engineering program.

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 already a clearly demonstrated demand amongst undergraduate students in Canada for industrial engineering. The number of undergraduate Industrial Engineering students in Canada has been consistently increasing over the last 5 years, which reflects the needs of the marketplace to industrial engineers[2]. For example, the growth percentage in the number of undergraduate Industrial Engineering students' enrolment in Canada has increased by 30.7% between 2015 and 2019. Moreover, as mentioned in the previous section, the proposed Industrial Engineering program offers unique courses that cover a knowledge gap that is otherwise overlooked in the other Industrial Engineering programs offered in Ontario. Therefore, it makes sense to build upon that and address the growing demand by employers for industrial engineers. This program will also allow Ontario Tech to grow enrollment.

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*

2. https://engineerscanada.ca/reports/canadian-engineers-for-tomorrow-2019#total-undergraduate-student-enrolment

Table 1 presents the projected enrolment for the program. The numbers assume 15% attrition from Years 1 to 2, 5% attrition between Years 2 and 3, 50% net new registrations, 50% movement within existing programs, and +/- for Year 4 for internship and co-op.

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	40	50	60	60	60	60
2nd year		42	51	51	51	51
3rd year			48	48	48	48
4th year				47	47	47
Total Enrolment	40	92	159	206	206	206

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 skill sets that Industrial Engineers acquire are versatile. This allows them to engage in many different activities, such as supply chain management, quality assurance, and project management. These activities are becoming an integral part of many industries and engineering sectors in today's marketplace. Graduates of the Industrial Engineering program will have the expertise to work, analyze, and manage the work of others in areas of research, development, design, analysis, maintenance, and operations. These opportunities arise in a variety of industries and services including automotive, aerospace, heavy and precision machinery, machines and mechanisms, robotics and automation, power generations, oil and gas industries, chemical industries, transportation, information/telecommunications, health care systems, pharmacology, agriculture, construction and site development, and consumer products. Careers are available in private enterprise, as well as government and non-government organizations. Graduates may also choose to pursue further studies for higher degrees or start their own business.
Currently, employers such as GE, Ontario Power Generation, General Motors, Bombardier, and Magna, hire graduates from the existing Mechanical Engineering and

Manufacturing Engineering programs. The enhanced skillset offered by the proposed Industrial Engineering program will only increase the demand for Ontario Tech Industrial Engineering graduates.
As per all engineering programs offered by FEAS, the new Industrial Engineering program has been 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**
University of Toronto	BASc in Industrial Engineering
Link to Program Web Page: https://www.mie.utoronto.ca/programs/undergraduate/industrial-engineering/	
Brief Program Description: As per the University of Toronto website: "The Industrial Engineering undergraduate program at MIE provides students with the foundations of industrial engineering: operations research, programming, and human-centered design. Students learn about improving various environments, from streamlining health-care systems to rethinking supply chains and the online user experience in the era of artificial intelligence. The Industrial Engineering program includes four years of coursework as well as an optional year in the Professional Experience Year (PEY) co-op program. Graduates of the Industrial Engineering undergraduate program receive a Bachelor of Applied Science degree."	
What differentiates the new program from this existing program: The University of Toronto's program is one of only three stand-alone Industrial Engineering programs in Ontario. The program is housed in the Department of Mechanical and Industrial Engineering at the University of Toronto. The UofT program's focus is on operation research and optimization, which is only one aspect of industrial engineering. Ontario Tech's program differs from the UofT program in the implementation of an innovative curriculum with the integration of some unique courses that address the rapid industrial evolution and the use of artificial intelligence to solve real world industrial problems. In addition, the Ontario Tech's program has heavy emphasis on engineering design. Design is the key function of engineers and Ontario	

Tech's FEAS MME engineering programs feature a core engineering design course in every year of the program. This is a signature feature of Ontario Tech's FEAS MME engineering programs and differentiates them from many other programs in the province.

Institution Name	Credential Level and Program Name
University of Windsor	BEng in Industrial Engineering

Link to Program Web Page:
https://future.uwindsor.ca/industrial-engineering

Brief Program Description:
As per the University of Windsor website:
"Industrial engineers answer the needs of organizations to operate efficiently and cost effectively. As an industrial engineer, you may use intelligent processes to streamline production systems or design flexible manufacturing approaches using a wide range of knowledge, including operations research, manufacturing sciences and enterprise resources planning/integration. The University of Windsor is one of only few institutions in Ontario to offer industrial engineering. Your education will begin with a broad base of fundamental sciences, mathematics and engineering knowledge in courses that are common to all programs. Our program will allow you to engineer how systems interact with one another"

What differentiates the new program from this existing program:
Windsor's program is one of only three stand-alone industrial engineering programs in Ontario. The program is housed in the Department of Industrial Engineering. Ontario Tech's program differs from the Windsor program in the implementation of an innovative curriculum with the integration of some unique courses that address the rapid industrial evolution and the use of artificial intelligence to solve real world industrial problems. In addition, the Ontario Tech's program has heavy emphasis on engineering design. Design is the key function of engineers and Ontario Tech's FEAS MME engineering programs feature a core engineering design course in every year of the program. This is a signature feature of Ontario Tech's FEAS MME engineering programs and differentiates them from many other programs in the province.

Institution Name	Credential Level and Program Name
Ryerson University	BEng in Industrial Engineering

Link to Program Web Page:
https://www.ryerson.ca/programs/undergraduate/industrial-engineering

Brief Program Description:
As per Ryerson University website:
"As an industrial engineer, you'll learn how to apply science, mathematics and engineering methods, and have the ability to work with people and understand the system perspective in the design of systems operation. Study computer simulation, production planning, operations research, quality control, ergonomics, information systems, project management and more as you work to make society better, safer and more efficient. As part of your bachelor of engineering (BEng) degree, you can receive valuable work experience by participating in an optional paid co-operative internship program. In third year, you'll gain specialized knowledge, including

operations research, facilities design, experimental design and quality assurance, data analytics and industrial ergonomics. In fourth year, in addition to gaining knowledge in several areas such as information systems, production inventory systems, service operations management and project management, you'll work on a dynamic team-based project. You'll have access to leading-edge labs and facilities, leaving you well-equipped to launch an exciting career"

What differentiates the new program from this existing program:

Ryerson's program is one of only three stand-alone industrial engineering programs in Ontario. The program is housed in the Department of Mechanical and Industrial Engineering. Ontario Tech's program differs from the Ryerson program in the implementation of an innovative curriculum with the integration of some unique courses that address the rapid industrial evolution and the use of artificial intelligence to solve real world industrial problems. In addition, the Ontario Tech's program has heavy emphasis on engineering design. Design is the key function of engineers and Ontario Tech's FEAS MME engineering programs feature a core engineering design course in every year of the program. This is a signature feature of Ontario Tech's FEAS MME engineering programs and differentiates them from many other programs in the province.

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

Currently, only Ryerson University, University of Toronto, and University of Windsor offer standalone accredited undergraduate programs in Industrial Engineering in Ontario. There is clearly a need in Ontario, and in particular the eastern half of the Greater Toronto Area (GTA), for additional universities to offer standalone industrial programs. Ontario Tech is well positioned to meet this need.

Although there is always a possibility of offering programs in conjunction with other institutions, in the case of the proposed program this would not be necessary. This program will benefit from our existing manufacturing engineering program, which is the only accredited undergraduate program in Manufacturing Engineering in Canada.

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*

Like all other engineering programs, this Industrial Engineering program requires strong foundation in English, Math and Physics. That is why 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. For details about applicants with credentials from outside Ontario, please see the admissions section of Future Students at www.ontariotechu.ca.

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 mathematics, 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: MATH 1010U – Calculus I ENGR 1015U – Introduction to Engineering PHY 1010U - Physics I ENGR 1025U – Engineering Design MATH 1020U – Calculus II PHY 1020U – Physics II	-In-class quizzes, assignments, midterm and final exams for MATH 1010U, PHY 1010U, MATH 1020U, PHY 1020U, CHEM 1800, MATH 2860U, ENGR 2100U. - In-class quizzes, assignments, laboratory reports, course project, midterm and final

		CHEM 1800U – Chemistry for Engineers MATH 2860U – Differential Equations for Engineers ENGR 2100U – Computational Engineering Applications	exams for ENGR 1015U, ENGR 1025U.
Understand and apply the engineering design, manufacturing, and production processes to industrial engineering systems	Knowledge of Methodologies	Core design courses featuring a design project, including: ENGR 1025U – Engineering Design INSE 3115U – Workplace and Facilities Design INSE 3140U – Lean Production Systems Engineering INSE 4170U – Human-System Integration ENGR 4970U Capstone System Design for Industrial Engineering I ENGR 4971U Capstone System Design for Industrial Engineering II	-In-class quizzes, midterm, assignments, lab reports, course project and final exam for ENGR 1025U, INSE 3115U, INSE 3140U, INSE 4170U. -Progress reports, final report, final poster, flyer, building prototype and presentation for ENGR 4970U, ENGR 4071U.
Make use of computer-aided engineering software tools to solve problems and to acquire and process data	Knowledge of Implementation Tools and Procedures	Core courses that teach and utilize engineering software tools, including: ENGR 1200U – Introduction to Programming for Engineers SOFE 2710U – Object Oriented Programming and Design	-Assignments, case study and course project for ENGR 1200U, SOFE 2710U - Course project for ENGR 2100U, INSE 3142U - Assignments for INSE 2210U, STAT 2800U, INSE 3110U

		ENGR 2100U – Computational Engineering Applications INSE 2210U – Operations Research I STAT 2800U – Statistics and Probability for Engineers INSE 3110U – Operations Research II INSE 3142U – Industrial Internet of Things ENGR 3150U – Applied Artificial Intelligence and Machine Learning INSE 3245U – Industrial Data Analytics	- Assignments and Course projects for ENGR 3150U, INSE 3245U.
Demonstrate strong independent learning and analytical skills and be an effective member of multi-disciplinary and multi-cultural teams, either as a team member, system analyst or as a project manager	Application of Knowledge	ENGR 4970U Capstone System Design for Industrial Engineering I ENGR 4971U Capstone System Design for Industrial Engineering II	-Progress reports and final report for ENGR 4970U, -Progress reports, final report and building prototype for ENGR 4971U
Communicate effectively in written, spoken, and visual form with both technical experts and with members of the general public on engineering matters	Communication Skills	COMM 1050U – Technical Communication ENGR 4970U Capstone System Design for Industrial Engineering I ENGR 4971U Capstone System Design for Industrial Engineering II	- Assignments for COMM 1050U -Progress reports, final report and presentation for ENGR 4970U, -Progress reports, final report, final poster, flyer, prototype demonstration, exhibition and presentation for ENGR 4971U

Recognize and describe the value of alternative outlooks that people from various social, ethnic and religious backgrounds, as well as professions, may bring to industrial engineering. Understand and apply various knowledge and methodologies for design, analysis and assessment purposes, social, environmental and economic impact assessments.	Awareness of Limits of Knowledge	SSCI 1470U – Impact of Science and Technology on Society INSE 4170U – Human-System Integration MANE 3460U – Industrial Ergonomics INSE 3115U - Workplace and Facility Design, ENGR 3360U – Engineering Economics INSE 2110U- Health, Safety and Sustainability for Engineers	- Assignments for SSCI 1470U, INSE 2110U, MANE 3460U, INSE 4170U - Course project for INSE 3115U and MANE 3460U -Case study and assignments for ENGR 3360U
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	ENGR 4760U – Ethics, Law and Professionalism for Engineers ENGR 4760U, ENGR 4970U, ENGR 4971U	- In-class quizzes and case study for ENGR 4760U - Reports and presentation for ENGR 4970U - Reports, presentation demonstration of the prototype for ENGR 4971U

- *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 industrial 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 on 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 MANE 3460U-Industrial Ergonomics, 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)	ID	Provide engineering students with basic understanding of ergonomics
Problem Analysis (PA)	D	Provide engineering students with ergonomic problems to be analysed and solved.
Investigation (Inv.)		
Design (Des.)	DA	design project
Use of Engineering Tools (Tools)	DA	Ergonomics tools
Individual and Team Work (Team)	DA	Individual work on tests, team work for design project.
Communication Skills (Comm.)	D	Written and graphical communication via project reports and presentations
Professionalism (Prof.)		
Impact of Engineering on Society and the Environment (Impacts)	D	related social issues
Ethics and Equity (Ethics)		
Economics and Project Management (Econ.)		
Life-long Learning (LL)		

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)
Understand the principals of work design and work measurement. Use several effective engineering methods to improve worker performance, health and safety while maintaining productivity.	**Knowledge Base (c)**	Knowledge Base
Solve ergonomicall related problems	**Problem Analysis (a)**	Problem Analysis
Design a job and the workplace to fit the human	**Design (a) (b) (c)**	Design
Using ergonomics tools	**Use of Engineering Tools (a) (b)**	Use of Engineering Tools
Work as a team as well as individually	**Individual and team work (c)**	Individual and Team work
Demonstrate communication skills through presenting ergonomic project.	**Communications (a)**	Communications
Understand the impact of ergonomics solutions in a global and societal context and critically review own capabilities and determine areas for development.	**Impact to the society (a)**	Impact to the society

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
1- Understand the principals of work design and work measurement. Use several effective engineering methods to improve worker performance, health and safety while maintaining productivity.	3 (Exceeds expectations): ≥80% 2 (Adequately meets expectations): 60-80% 1 (Minimally meets expectations): 50-60% 0 (Fails to meet expectations): <50%	Quizzes 1- 5 Midterm Exam: Multiple Choice Questions and Part 2: Question 2 Final Exam: Multiple Choice Questions and Part 2: Questions 1 - 6
2-Solve ergonomicall related problems	3 (Exceeds expectations): ≥80% 2 (Adequately meets expectations): 60-80% 1 (Minimally meets expectations): 50-60% 0 (Fails to meet expectations): <50%	Assignments 2 & 5 Midterm Exam Part 2: Questions 2 and 3 Final Exam Questions Part 2: 7 - 10
3-Design a job and the workplace to fit the human	3 (Exceeds expectations): ≥80% 2 (Adequately meets expectations): 60-80% 1 (Minimally meets expectations): 50-60% 0 (Fails to meet expectations): <50%	Design component of course Project Self-study topics Assignment 5 Final Exam: Question 7
4.Using ergonomics tools	3 (Exceeds expectations): ≥80% 2 (Adequately meets expectations): 60-80% 1 (Minimally meets expectations): 50-60% 0 (Fails to meet expectations): <50%	CAD portion of course project Mid-term: Question 4

5-Work as a team as well as individually	3 (Exceeds expectations): ≥80% 2 (Adequately meets expectations): 60-80% 1 (Minimally meets expectations): 50-60% 0 (Fails to meet expectations): <50%	Project Collaboration
6-Demonstrate communication skills through presenting ergonomic project.	3 (Exceeds expectations): ≥80% 2 (Adequately meets expectations): 60-80% 1 (Minimally meets expectations): 50-60% 0 (Fails to meet expectations): <50%	Presentation of the project
7. Understand the impact of ergonomics solutions in a global and societal context and critically review own capabilities and determine areas for development.	3 (Exceeds expectations): ≥80% 2 (Adequately meets expectations): 60-80% 1 (Minimally meets expectations): 50-60% 0 (Fails to meet expectations): <50%	Social impact portion of Design Project

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

Course Outcome (Course GA Indicator)	Performance Level
Understand the principals of work design and work measurement. Use several effective engineering methods to improve worker performance, health and safety while maintaining productivity.	3: Excellent performance in course (≥80%) 2: Good to very good performance in course (60-80%) 1: Marginally acceptable performance in course (50-60%) 0: Unacceptable performance in course (<50%)
Solve ergonomicall related problems	3: Excellent performance in course (≥80%) 2: Good to very good performance in course (60-80%) 1: Marginally acceptable performance in course (50-60%) 0: Unacceptable performance in course (<50%)

Design a job and the workplace to fit the human	3: Excellent performance in course (≥80%) 2: Good to very good performance in course (60-80%) 1: Marginally acceptable performance in course (50-60%) 0: Unacceptable performance in course (<50%)
Using ergonomics tools	3: Excellent performance in course (≥80%) 2: Good to very good performance in course (60-80%) 1: Marginally acceptable performance in course (50-60%) 0: Unacceptable performance in course (<50%)
Work as a team as well as individually to solve ergonomicall related problems	3: Excellent performance in course (≥80%) 2: Good to very good performance in course (60-80%) 1: Marginally acceptable performance in course (50-60%) 0: Unacceptable performance in course (<50%)
Demonstrate communication skills	3: Excellent performance in course (≥80%) 2: Good to very good performance in course (60-80%) 1: Marginally acceptable performance in course (50-60%) 0: Unacceptable performance in course (<50%)
Understand the impact of ergonomics solutions in a global and societal context and critically review own capabilities and determine areas for development.	3: Excellent performance in course (≥80%) 2: Good to very good performance in course (60-80%) 1: Marginally acceptable performance in course (50-60%) 0: Unacceptable performance in course (<50%)

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

<table>
<tr><th>Course Outcome (Course GA Indicator)</th><th>Performance Level Breakdown (Student Numbers)*</th><th>Analysis, Conclusions and Recommendations</th></tr>
<tr><td>1- Knowledge Base</td><td><table><tr><td>KB</td><td></td><td></td></tr><tr><td>>80%</td><td>110</td><td>77%</td></tr><tr><td>60%-80%</td><td>22</td><td>15%</td></tr><tr><td>50%-60%</td><td>11</td><td>8%</td></tr><tr><td><50%</td><td>0</td><td>0%</td></tr><tr><td>total</td><td>143</td><td></td></tr></table></td><td>Analysis and Conclusions:
Most students can successfully achieve this objective
Recommendations for the course:
None
Recommendations for Program:
None</td></tr>
<tr><td>2- Problem Analysis</td><td><table><tr><td>PA</td><td></td><td></td></tr><tr><td>>80%</td><td>110</td><td>77%</td></tr><tr><td>60%-80%</td><td>22</td><td>15%</td></tr><tr><td>50%-60%</td><td>11</td><td>8%</td></tr><tr><td><50%</td><td>0</td><td>0%</td></tr><tr><td>total</td><td>143</td><td></td></tr></table></td><td>Analysis and Conclusions:
Most students can successfully achieve this objective
Recommendations for the course:
None
Recommendations for Program:
None</td></tr>
<tr><td>3- Design</td><td><table><tr><td>Design</td><td></td><td></td></tr><tr><td>>80%</td><td>83</td><td>58%</td></tr><tr><td>60%-80%</td><td>45</td><td>31%</td></tr><tr><td>50%-60%</td><td>13</td><td>9%</td></tr><tr><td><50%</td><td>2</td><td>1%</td></tr><tr><td>total</td><td>143</td><td></td></tr></table></td><td>Analysis and Conclusions:
Most students can successfully achieve this objective
Recommendations for the course:
Add more assignments involving the design aspect
Recommendations for Program:
None</td></tr>
<tr><td>4. Use of Engineering Tools</td><td><table><tr><td>Tools</td><td></td><td></td></tr><tr><td>>80%</td><td>110</td><td>77%</td></tr><tr><td>60%-80%</td><td>22</td><td>15%</td></tr><tr><td>50%-60%</td><td>9</td><td>6%</td></tr><tr><td><50%</td><td>2</td><td>1%</td></tr><tr><td>total</td><td>143</td><td></td></tr></table></td><td>Analysis and Conclusions:
Most students can successfully achieve this objective
Recommendations for the course:
Add more minor projects in addition to the term project
Recommendations for Program:
None</td></tr>
</table>

<table>
<tr>
<td>5- Individual and team work</td>
<td>
<table>
<tr><td>Team</td><td></td><td></td></tr>
<tr><td>>80%</td><td>55</td><td>38%</td></tr>
<tr><td>60%-80%</td><td>77</td><td>54%</td></tr>
<tr><td>50%-60%</td><td>9</td><td>6%</td></tr>
<tr><td><50%</td><td>2</td><td>1%</td></tr>
<tr><td>total</td><td>143</td><td></td></tr>
</table>
</td>
<td>Analysis and Conclusions:
Most students can successfully achieve this objective
Recommendations for the course: None
Recommendations for Program: None</td>
</tr>
<tr>
<td>6- Communication Skills</td>
<td>
<table>
<tr><td>Com</td><td></td><td></td></tr>
<tr><td>>80%</td><td>55</td><td>38%</td></tr>
<tr><td>60%-80%</td><td>77</td><td>54%</td></tr>
<tr><td>50%-60%</td><td>9</td><td>6%</td></tr>
<tr><td><50%</td><td>2</td><td>1%</td></tr>
<tr><td>total</td><td>143</td><td></td></tr>
</table>
</td>
<td>Analysis and Conclusions:
Most students can successfully achieve this objective
Recommendations for the course: None
Recommendations for Program: None</td>
</tr>
<tr>
<td>7. Impact of Engineering on Society and the Environment (Impacts)</td>
<td>
<table>
<tr><td>Impact</td><td></td></tr>
<tr><td>>80%</td><td>46</td></tr>
<tr><td>60%-80%</td><td>89</td></tr>
<tr><td>50%-60%</td><td>4</td></tr>
<tr><td><50%</td><td>4</td></tr>
<tr><td>total</td><td>143</td></tr>
</table>
</td>
<td>Analysis and Conclusions:
Most students can successfully achieve this objective
Recommendations for the course: None
Recommendations for Program: None</td>
</tr>
</table>

In addition to showing 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 covered in their program.

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*
- *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 industrial engineering program structure will be similar to all Engineering programs in FEAS. The program will have a common first year courses for all engineering disciplines providing the background and multiphysics knowledge base. In addition, industrial engineering students will have introduction to engineering and core design courses in the first two years of the program. Currently, the Curriculum Committee is revising the ENGR 1015U which will include indigenous component and introduction to equity, diversity and inclusion (EDI). In this course, the indigenous and EDI added components are planned to be delivered through online modules and will have more emphasis on the labs. Thus, will be the first engineering hybrid course offered. The fundamental concepts in this program map is to integrate cyber and physical components in industrial engineering systems. This includes integrations of computation, networking, and physical processes. Since industrial engineering deals with elements from mathematics, statistics, manufacturing, mechanical, mechatronics, electrical, software, and control, the industrial engineering program features courses from all of these disciplines. The program maps for the BEng Industrial Engineering and the BEng Industrial Engineering and Management programs can be found in Appendix B.

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

The Faculty of Engineering and Applied Science is one of a handful of universities in Canada that offers an accredited Manufacturing Engineering program. Based on the available resources, experience, and considering the increasing demand from the industry, it has been determined that offering an Industrial Engineering program is beneficial and invites more students to the Ontario Tech engineering community. The program provides graduates with the knowledge and skills required to work in wide spectrum of high-tech companies requiring the combination of technical and system analytics skills aligned with the needs of advanced cyber-physical systems, industry 4.0, and factories of the future.

Developed in consultation with industry, the industrial engineering curriculum provides a solid grounding in the fundamentals of mathematics, computing and science, with significant content in engineering sciences, design, and analysis. In addition to classroom lectures, students participate in tutorials, laboratories, computer simulations, field visits, independent research and design tasks, individual and group projects, as well as presentations to both technical and non-technical audiences.

Complementary studies including liberal studies electives, collaborative leadership, economics, and ethics and law for professionals promote a broader understanding of the needs of society and technology's impact on it. Students gain technical expertise along

with the understanding of business and humanities required for an integrated approach to Industrial Engineering.

- *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.

Currently we have over 100 companies where our students have taken co-op. These companies include, for example, OPG, Bruce Power, Enbridge, GM, Toyota, Tesla, and Bombardier.

- *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*

Existing FEAS resources will handle all student support requirements, such as Academic Advising.

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.*

Please see Appendix B for proposed calendar copy. Please see Appendix C for a full list of courses in the program.

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*

We don't expect significant impact on other engineering programs. However, there will be some impact on the enrollment of the first-year engineering courses and well as some of the upper year common courses. It is important to note that most of these courses are running in more than one section and addition 30 (expect) students will not present a challenge. The Dean of Science is aware of this program initiative and the Dean's office has planned for the expected enrollment. The proposal was shared with members of the department industry advisory board (IAB) for feedback. All members of the IAB have unanimously praised the program, as it will address the current need in the market place for industrial engineers with interdisciplinary and innovative skill sets that will be covered in the current program. Please see the support letters from industry in Appendix G.

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?

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 inviting projects from Indigenous communities, which will provide more opportunity for Indigenizing the curriculum and provide students with the needed exposure and skills.

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.*

The proposed Industrial Engineering program has no impact on enrollment agreements with other institutions/external partners.

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*

The majority of faculty members required for the program will come from FEAS's existing complement of faculty members. FEAS will be requesting two tenure-track faculty members to teach in the new program.

The following Department of Mechanical and Manufacturing Engineering faculty may be involved in the program:

- Jana Abou-Ziki, BSc, PhD (Concordia)
- Martin Agelin-Chaab, BSc, MEng, MSc, PhD (Manitoba), PEng
- Ahmad Barari, BSc, MSc, PhD (Western), PEng
- Ibrahim Dincer, BSc, MSc, PhD (Istanbul Technical), PEng
- Naglaa Elagamy, BSc, MASc, PhD (Carleton)
- Ramona Fayazfar, BSc, MSc, PhD (Sharif University of Technology)
- Kamiel Gabriel, BSc, MSc, MBA, PhD (Manitoba), PEng
- Sayyed Ali Hosseini BSc, MSc, PhD (Ontario Tech), PEng
- Dima Jawad, BE, MSc, PhD (Rutgers)
- Anand Joshi, BS, MS, PhD (Indian Institute of Technology Delhi), PEng
- Amirkianoosh Kiani, BSc, MSc, PhD (Ryerson University), PEng
- Seema Koohi, BASc, MASc, PhD (Ontario Tech), PEng
- Brendan MacDonald, BASc, MASc, PhD (Toronto)
- Atef Mohany, BSc, MSc, PhD (McMaster), PEng
- Remon Pop-Iliev, BASc, MASc, PhD (Toronto), PEng
- Bale Reddy, BTech, MTech, PhD (Indian Institute of Technology)
- Ghaus Rizvi, BE, MS, MASc, PhD (Toronto), PEng
- Marc Rosen, BASc, MASc, PhD (Toronto), PEng
- Yuelei Yang, BEng, MS, PhD (Cincinnati), PEng

The following Department of Automotive and Mechatronics Engineering faculty may be involved in the program:

- Murat Aydin, BSc, MS, PhD (Imperial College)

The following Department of Electrical, Computer, and Software Engineering faculty may be involved in the program:

- Mikael Eklund, BSc, MSc, PhD (Queen's), PEng
- Walid Morsi Ibrahim, BSc, MSc, PhD (Dalhousie), PEng
- Qusay Mahmoud, BSc, MCS, PhD (Middlesex, UK), PEng
- Shahryar Rahnamayan, BSc, MSc, PhD (Waterloo), PEng

The following Faculty of Science faculty members may be involved:

- Mihai Beligan, PhD
- Rupinder Brar, PhD
- Paula Di Cato, MSc
- Nicholas Faulkner
- Franco Gaspari, PhD
- Brian Ikeda
- Ilona Kletskin, MSc
- Nelson Lafreniere, PhD
- Joseph MacMillan, PhD
- Azar Shakoori, PhD
- Issac Ye

The following Faculty of Social Science & Humanities

- Andrew Muncaster
- Antoine Scholtz
- Maggie Reber

Please refer to Appendix D for Detailed Listing of Faculty Committed to the Program

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***

As per the other BEng programs at Ontario Tech, FEAS will continue to make use of service courses offered by the Faculty of Science and the Faculty of Social Sciences and Humanities. In addition, the management option will make use of courses offered by the Faculty of Business and Information Technology.

All administrative support and technical support for the programs will come from existing FEAS personnel.

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 is currently being reorganized. Emphasis will be made on proactive advising thru central training of all our advisors.

The FEAS Academic Advising Office empowers all engineering students to take ownership of their education by providing personalized, comprehensive academic advising in a confidential and safe environment. The office strives to promote the personal growth of students by instilling a sense of responsibility and independence.

The FEAS Academic Advising Office is comprised of four full-time advisors. They include one First Year Advisor and three Upper Years Advisors, as well as a Manager, Academic Advising who oversees the advising unit in the Faculty of Engineering and Applied Science and the Faculty of Science.

The advisors provide the following services:

- Addresses questions and concerns related to all aspects of student life
- Helps establish realistic educational goals and future planning
- Assists in appropriate course planning and sequencing according to the approved program map
- Assess and discusses academic performance, progress, and standing
- Provides strategies and resources for academic success
- Interprets academic policies and procedures
- Ensures all degree requirements are met for timely and successful graduation

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***

Existing FEAS lab space will be utilized to run the labs required for the courses. The table below summarizes the FEAS lab space that will be utilized for the program

Space	Current (SqM)
ENG1030	90
ENG1035	90

ENG1040	90
ENG1045	78
ENG1050	120
ENG2030	90
ENG2035	90
ENG2040	90
ENG2045	78
ENG2050	90
ENG3030	90
ENG3040	78
ENG3045	90
ENG3050	90
SIRC2010	160
SIRC2030	160
SIRC2070	150

Existing library will be utilized for the program. Appendix E contains the Library Report.

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*

The Department of Mechanical and Manufacturing Engineering, where the Industrial Engineering program will reside, includes 21 faculty members with extensive industrial and academic experience in areas that will directly contribute to the quality of the Industrial Engineering program and its success. Some of the key research areas include human factors, automated systems, human system integration and ergonomics, operations research, process design, stochastic modeling and industrial data analytics.
Moreover, the Industrial Engineering program will benefit from our existing engineering programs, namely the Manufacturing Engineering program. The Manufacturing Engineering program is a niche program at Ontario Tech and it is the only accredited undergraduate program in Canada. Our faculty members are well recognized nationally and internationally. They are performing innovative research in collaboration with many industrial partners in Canada. The students benefit from these research activities through the introduction of industrial case studies in the different courses or by directly participating in the research projects as undergraduate research students.

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. Detailed Listing of Faculty Committed to the Program
E. Library Report
F. Budget Spreadsheet Summary
G. Feedback from Stakeholders

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

			Industrial Engineering Program	MC	LEC	Lab/Tut	S = Lec + 0.5 (L or T)	Math %	NS%	CS%	ES%	ED%	Math AU	NS AU	CS AU	ES AU	ED AU	ES AU + ED AU	Math AU + NS AU
YEAR 1	1	COMM 1050U	Technical Communications	X	3	1	44.8	0	0	100	0	0	0	0	44.8	0	0	0	0
	2	ENGR 1015U	Introduction to Engineering	X	3	4	64.0	0	0	30	45	25	0	0	19.2	28.8	16	44.8	0
	3	MATH 1010U	Calculus I	X	3	1.5	48.0	100	0	0	0	0	48	0	0	0	0	0	48
	4	MATH 1850U	Linear Algebra for Engineers	X	3	1.5	48.0	100	0	0	0	0	48	0	0	0	0	0	48
	5	PHY 1010U	Physics I	X	3	2.25	52.8	0	100	0	0	0	0	52.8	0	0	0	0	52.8
	6	CHEM 1800U	Chemistry for Engineers	X	3	1.75	49.6	0	100	0	0	0	0	49.6	0	0	0	0	49.6
	7	SSCI 1470U	Impact of Science and Technology on Society	X	3	0	38.4	0	0	100	0	0	0	0	38.4	0	0	0	0
	8	ENGR 1200U	Introduction to Programming for Engineers	X	3	2	51.2	0	0	0	100	0	0	0	0	51.2	0	51.2	0
	9	ENGR 1025U	Engineering Design	X	3	1.5	48.0	0	0	0	0	100	0	0	0	0	48	48	0
	10	MATH 1020U	Calculus II	X	3	1.5	48.0	100	0	0	0	0	48	0	0	0	0	0	48
	11	PHY 1020U	Physics II	X	3	2.25	52.8	0	100	0	0	0	0	52.8	0	0	0	0	52.8
YEAR 2	12	MECE 2230U	Statics	X	3	1	44.8	0	25	0	75	0	0	11.2	0	33.6	0	33.6	11.2
	13	MECE 2310U	Concurrent Eng and Des	X	3	2	51.2	0	0	25	25	50	0	0	12.8	12.8	25.6	38.4	0
	14	SOFE 2710U	Object Oriented Programming and Design	X	3	2	51.2	0	0	0	75	25	0	0.0	0.0	38.4	12.8	51.2	0.0
	15	MATH 2860U	Differential Equations	X	3	1	44.8	100	0	0	0	0	44.8	0.0	0.0	0.0	0.0	0.0	44.8
	16	MANE 2220U	Structure and Properties of Materials	X	3	0	38.4	0	75	0	25	0	0	28.8	0.0	9.6	0.0	9.6	28.8
	17	INSE 2110U	Health, Safety and Sustainability for Engineers	X	3	0	38.4	0	0	100	0	0	0	0.0	38.4	0.0	0.0	0.0	0.0
	18	INSE 2210U	Operations Research I (Deterministic)	X	3	1	44.8	25	0	0	75	0	11.2	0.0	0.0	33.6	0.0	33.6	11.2
	19	ELEE 2790U	Electric Circuits	X	3	2.5	54.4	0	0	0	100	0	0	0.0	0.0	54.4	0.0	54.4	0.0
	20	MANE 3460U	Industrial Ergonomics	X	3	1	44.8	0	25	0	50	25	0	11.2	0.0	22.4	11.2	33.6	11.2
	21	ENGR 2100U	Computational Engineering Applications	X	3	3	57.6	50	0	0	50	0	28.8	0.0	0.0	28.8	0.0	28.8	28.8
	22	MECE 2420U	Solid Mechanics I	X	3	2	51.2	0	0	0	100	0	0	0.0	0.0	51.2	0.0	51.2	0.0
	23	STAT 2800U	Statistics & Probability for Engineers	X	3	0	38.4	100	0	0	0	0	38.4	0.0	0.0	0.0	0.0	0.0	38.4
YEAR 3	24	INSE 3110U	Operations Research II (Stochastic)	X	3	1	44.8	25	0	0	75	0	11.2	0.0	0.0	33.6	0.0	33.6	11.2
	25	INSE 3140U	Lean Production Systems Engineering	X	3	1	44.8	0	0	0	75	25	0	0.0	0.0	33.6	11.2	44.8	0.0
	26	INSE 3115U	Workplace and Facilities Design	X	3	1	44.8	0	0	0	75	25	0	0.0	0.0	33.6	11.2	44.8	0.0
	27	INSE 3142U	Industrial Internet of Things	X	3	2	51.2	0	0	0	100	0	0	0.0	0.0	51.2	0.0	51.2	0.0
	28	INSE 3150U	(Applied) Artificial Intelegence and Machine Learning	X	3	2	51.2	0	0	0	75	25	0	0.0	0.0	38.4	12.8	51.2	0.0
	29	MANE 3190U	Manufacturing and Production Processes	X	3	1	44.8	0	0	0	100	0	0	0.0	0.0	44.8	0.0	44.8	0.0
	30	ENGR 3360U	Engineering Economics	X	3	0	38.4	0	0	100	0	0	0	0.0	38.4	0.0	0.0	0.0	0.0
	31	MANE 3330U	Integrated Manufacturing Systems	X	3	2	51.2	0	0	0	75	25	0	0.0	0.0	38.4	12.8	51.2	0.0
	32	MANE 4045U	Quality Control	X	3	1	44.8	0	0	0	100	0	0	0.0	0.0	44.8	0.0	44.8	0.0
	33	INSE 3245U	Industrial Data Analytics	X	3	1	44.8	0	0	0	100	0	0	0.0	0.0	44.8	0.0	44.8	0.0
	34	METE 4200U	Industrial Automation	X	3	1	44.8	0	0	0	75	25	0	0.0	0.0	33.6	11.2	44.8	0.0
	35	ENGR 3215U	Engineering Project Management	X	3	0	38.4	0	0	75	25	0	0	0.0	28.8	9.6	0.0	9.6	0.0
YEAR 4	36	ENGR 4760U	Ethics, Law, Prof for Engs	X	3	0	38.4	0	0	100	0	0	0	0.0	38.4	0.0	0.0	0.0	0.0
	37	ENGR 4970U	Capstone System Design for Industrial Engineering I	X	3	3	57.6	0	0	0	0	100	0	0.0	0.0	0.0	57.6	57.6	0.0
	38	INSE 4170U	Human-System Integration	X	3	2	51.2	0	0	0	75	25	0	0.0	0.0	38.4	12.8	51.2	0.0
	39	MANE 4390U	Modeling Manufacturing Systems	X	4	2	64.0	0	0	0	100	0	0	0.0	0.0	64.0	0.0	64.0	0.0
	40	EE	ENGR Elective (see below as part of min path)	E	3	0	38.4						0	0.0	0.0	0.0	0.0	0.0	0.0
	41	LSE	Liberal Studies Elective	LS	3	0	38.4	0	0	100	0	0	0	0.0	38.4	0.0	0.0	0.0	0.0
	42	ENGR 4971U	Capstone System Design for Industrial Engineering II	X	0	4	25.6	0	0	0	0	100	0	0.0	0.0	0.0	25.6	25.6	0.0
	43	MANE 4015U	Reliability and Maintenance	X	3	1	44.8	0	0	0	100	0	0	0.0	0.0	44.8	0.0	44.8	0.0
	44	INSE 4248U	Industrial Cyber-Physical Systems	X	3	2	51.2	0	0	0	100	0	0	0.0	0.0	51.2	0.0	51.2	0.0
	45	EE	ENGR Elective (see below as part of min path)	E	3	1	41.6						0	0.0	0.0	0.0	0.0	0.0	0.0
	46	LSE	Liberal Studies Elective	LS	3	0	38.4	0	0	100	0	0	0	0.0	38.4	0.0	0.0	0.0	0.0
Engineering Electives		AUTE 3010U	Introduction to Automotive Engineering	E	3	1	44.8	0	0	0	60	40	0.0	0.0	0.0	26.9	17.9	44.8	0.0
		MANE 3120U	Thermo-Mechanical Processing of Materials	E	3	1	44.8	0	0	0	100	0	0.0	0.0	0.0	44.8	0.0	44.8	0.0
		MANE 4190U	Principles of Material Removal Processes	E	3	0	38.4	0	0	0	100	0	0.0	0.0	0.0	38.4	0.0	38.4	0.0
		MECE 2640U	Thermodynamics and Heat Transfer	E	3	1	44.8	0	25	0	75	0	0.0	11.2	0.0	33.6	0.0	33.6	11.2
		MECE 3030U	Computer-Aided Design	E	3	2	51.2	0	0	0	25	75	0.0	0.0	0.0	12.8	38.4	51.2	0.0
		MECE 3210U	Mechanical Vibrations	E	3	2	51.2	0	0	0	70	30	0.0	0.0	0.0	35.8	15.4	51.2	0.0
		MECE 4250U	Advanced Materials Engineering	E	3	1	44.8	0	0	0	75	25	0.0	0.0	0.0	33.6	11.2	44.8	0.0
		MANE 4380U	Life Cycle Engineering	E	3	0.5	41.6	0	0	50	25	25	0.0	0.0	20.8	10.4	10.4	20.8	0.0
		MECE 4290U	Finite Element Methods	E	3	2	51.2	0	0	0	100	0	0.0	0.0	0.0	51.2	0.0	51.2	0.0
			Minimum Path for 2 Engineering Electives		136		2139.2						0.0	0.0	20.8	48.8	10.4	59.2	0.0
		MATH	278.4						Current AUs				278.4	206.4	356.8	1018.4	279.2	1297.6	484.8
		ED MC	279.2						CEAB Minimum Required				195	195	225	225	225	900	420
		ES MC	1018.4																
		NS MC	206.4										Math AU	NS AU	CS AU	ES AU	ED AU	ES AU + ED AU	Math AU + NS AU
		CS MC	356.8																
		MC TOTALS	2139.2																
		K FACTOR	15.73																

INDUSTRIAL ENGINEERING
ATTRIBUTE & IDA (Introduced, Developed, Applied) MAPPING
Industrial Engineering Program Curriculum

			KBE	PA	INV	DES	UET	ITW	COM	PRO	ISE	ETH	EPM	LLL
YEAR 1	COMM 1050U	Technical Communications							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 for Engineers	D	D										
	PHY 1010U	Physics I	D	D										
	CHEM 1800U	Chemistry for Engineers	D	I							I			I
	SSCI 1470U	Impact of Science and Technology on Society									A	I		D
	ENGR 1200U	Introduction to Programming for Engineers	ID	ID	ID	I	IA	I						I
	ENGR 1025U	Engineering Design	ID	ID	ID	IDA	IDA	DA	DA		DA		ID	DA
	MATH 1020U	Calculus II	D	D										
	PHY 1020U	Physics II	D	D										
YEAR 2	MECE 2230U	Statics	D	D										
	MECE 2310U	Concurrent Eng and Des	IDA	IDA	IDA	DA	DA	DA	DA	I	DA		I	DA
	SOFE 2710U	Object Oriented Programming and Design	ID	ID	ID	IDA	IA			I				I
	MATH 2860U	Differential Equations	D	D										
	MANE 2220U	Structure and Properties of Materials	I	I			I							I
	INSE 2110U	Health, Safety and Sustainability for Engineers								I	ID	ID		
	INSE 2210U	Operations Research I (Deterministic)	I	D			D	D	D					
	ELEE 2790U	Electric Circuits	ID	ID	ID		IA		I					ID
	MANE 3460U	Industrial Ergonomics	ID	D		DA	DA	DA	D		D			
	ENGR 2100U	Computational Engineering Applications	IDA	IDA	DA		I	A	A					I
	MECE 2420U	Solid Mechanics I	D				I		D					
	STAT 2800U	Statistics & Probability for Engineers	DA	DA										
YEAR 3	INSE 3110U	Operations Research II (Stochastic)	D	D			D	D	D					
	INSE 3140U	Lean Production Systems Engineering	ID	D	D	D	IDA	D	D					
	INSE 3115U	Workplace and Facilities Design	ID	D	D	D	IDA	D	D					
	INSE 3142U	Industrial Internet of Things	ID	ID	ID		I							
	ENGR3150U	(Applied) Artificial Intelegence and Machine Learning	ID	ID	ID	ID	ID	ID						I
	MANE 3190U	Manufacturing and Production Processes	DA	D			I							
	ENGR 3360U	Engineering Economics	I	IDA	IDA		IDA	IDA	IDA				IDA	IDA
	MANE 3330U	Integrated Manufacturing Systems	D	A	A	A	A	D	D				I	
	MANE 4045U	Quality Control	D	A		DA	A	A						
	INSE 3245U	Industrial Data Analytics	ID	ID	ID		I							
	METE 4200U	Industrial Automation	IDA	DA	A	DA	IDA	A	A					IDA
	ENGR 3215U	Engineering Project Management						D	D	I	I	I	IDA	

INDUSTRIAL ENGINEERING
ATTRIBUTE & IDA (Introduced, Developed, Applied) MAPPING
Industrial Engineering Program Curriculum

			KBE	PA	INV	DES	UET	ITW	COM	PRO	ISE	ETH	EPM	LLL
YEAR 4	ENGR 4760U	Ethics, Law, Prof for Engs		IDA	IDA				DA	DA	IDA	IDA	DA	IDA
	ENGR 4970U	Capstone System Design for Industrial Engineering I	A	DA	DA	DA	DA	DA	A	A	A	A	A	A
	INSE 4170U	Human-System Integration	D	DA		D	DA				D	D		
	MANE 4390U	Modeling Manufacturing Systems	D	D			A						D	
	ENGR 4971U	Capstone System Design for Industrial Engineering II	A	A	A	A	A	A	A	A	A	A	A	A
	MANE 4015U	Reliability and Maintenance	D	A	ID		A	D	D				D	
	INSE 4248U	Industrial Cyber-Physical Systems		DA			DA	D	D	D	D		D	
ELECTIVES	AUTE 3010U	Introduction to Automotive Engineering	D	D	D	D								
	MANE 3120U	Thermo-Mechanical Processing of Materials	DA	A			A							
	MANE 4190U	Principles of Material Removal Processes	DA	A										
	MECE 2640U	Thermodynamics and Heat Transfer	I	I			I	I	I		I		I	I
	MECE 3030U	Computer-Aided Design	DA	DA	DA	DA	DA	DA	DA				DA	DA
	MECE 3210U	Mechanical Vibrations	IDA	IDA	I	I	I	IDA						
	MECE 4250U	Advanced Materials Engineering	IDA	DA	DA	A	DA	A	A	A		A	A	DA
	MANE 4380U	Life Cycle Engineering	DA	DA	A	A	A				DA		DA	
	MECE 4290U	Finite Element Methods	A	A			A	D	DA					
			KBE	PA	INV	DES	UET	ITW	COM	PRO	ISE	ETH	EPM	LLL

Appendix B – Calendar Copy with Program Maps

Proposed calendar copy

Industrial Engineering

General Information

Industrial engineering is an engineering discipline that integrates several branches of engineering education with the objective of optimizing and improving complex processes, systems, or organizations. This is achieved by implementing innovative integrated systems of people, knowledge, and equipment with financial effectiveness. Graduates of the Industrial Engineering program will have the expertise to work, analyze, and manage the work of others in areas of research, development, design, analysis, maintenance, and operations. These opportunities arise in a variety of industries and services including automotive, aerospace, heavy and precision machinery, robotics and automation, power generations, oil and gas industries, chemical industries, transportation, information/telecommunications, health care systems, pharmacology, agriculture, construction and site development, and consumer products.

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 Industrial 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 honors Bachelor of Engineering degree in Industrial Engineering, students must successfully complete 135 credit hours, including all courses outlined here.

All courses in Year 1, except SSCI 1470U, are prerequisites to all non-elective courses in Year 2. All courses in Years 1 and 2, except SSCI 1470U, are prerequisites to all non-elective courses in Years 3 and 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. Below is a breakdown of the courses offered in the Industrial Engineering program:

YEAR 1
Semester 1 (15 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

Semester 2 (18 credit hours)

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
Semester 1 (18 credit hours)

MANE 2220U Structure and Properties of Materials
MATH 2860U Differential Equations for Engineers
MECE 2230U Statics
MECE 2310U Concurrent Engineering and Design
SOFE 2710U Object Oriented Programming and Design
INSE 2110U Health, Safety and Sustainability for Engineers

Semester 2 (18 credit hours)

ELEE 2790U Electric Circuits
ENGR 2100U Computational Engineering Applications
MECE 2420U Solid Mechanics I
MANE 3460U Industrial Ergonomics
INSE 2210U Operations Research I: Deterministic
STAT 2800U Statistics and Probability for Engineers

YEAR 3
Semester 1 (18 credit hours)

ENGR 3150 (Applied) Artificial Intelligence and Machine Learning
INSE 3110U Operations Research II: Stochastic
INSE 3115U Workplace and Facilities Design
INSE 3142U Industrial Internet of Things
MANE 3190U Manufacturing and Production Processes
INSE 3140U Lean Production Systems

Semester 2 (18 credit hours)

ENGR 3215U Engineering Project Management
MANE 3300U Integrated Manufacturing Systems
ENGR 3360U Engineering Economics+
MANE 4045U Quality Control
INSE 3245U Industrial Data Analytics
METE 4200U Industrial Automation

+Students in an Engineering and Management program take BUSI 1700U Introduction to Entrepreneurship, or a similar management course approved by the Faculty of Engineering and Applied Science, in place of ENGR 3360U Engineering Economics.

YEAR 4
Semester 1 (18 credit hours)

ENGR 4760U Ethics, Law and Professionalism for Engineers
ENGR 4970U Capstone System Design for Industrial Engineering I
INSE 4170U Human System Integration
MANE 4390U Modeling Manufacturing Systems
Engineering Elective*
Liberal Studies Elective

Semester 2 (15 credit hours)
ENGR 4971U Capstone System Design for Industrial Engineering II
MANE 4015U Reliability and Maintenance
INSE 4248U Industrial Cyber Physical Systems
Engineering Elective*
Liberal Studies Elective*

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 3010U Introduction to Automotive Engineering
MANE 3120U Thermo-Mechanical Processing of Materials
MANE 4190U Principles of Material Removal Processes
MANE 4380U Life Cycle Engineering
MECE 2640U Thermodynamics and Heat Transfer
MECE 3030U Computer-Aided Design
MECE 3210U Mechanical Vibration
MECE 4250U Advanced Engineering Materials
MECE 4290U Finite Element Methods

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.

Program map for reference/course sequence illustrative purposes only)

Proposed Industrial Engineering 2022-2023						
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	**MECE 2230U Statics (MATH 1020U, PHY 1010U)**	**MECE 2310U Concurrent Engineering and Design (ESNS 1200U or ENGR 1025U)**	**SOFE 2710U Object Oriented Programming and Design (ENGR 1200U)**	**MATH 2860U Differential Equations for Engineers (MATH 1020U, Coreq: MATH 1850U)**	**MANE 2220U Structure and Properties of Materials (CHEM 1800U)**	**INSE 2110U Health, Safety and Sustainability for Engineers (ENGR 1015U)**
2-2	**INSE 2210U Operations Research I (Deterministic) (MATH 1010U, MATH 1850U)**	**ELEE 2790U Electric Circuits (PHY 1020U, MATH 1020U, MATH 1850U)**	**MANE 3460U Industrial Ergonomics**	**ENGR 2100U Computational Engineering Applications (ENGR 1200U, MATH 1850U, MATH 2860U)**	**MECE 2420U Solid Mechanics I (MECE 2230U)**	**STAT 2800U Statistics and Probability for Engineers (MATH 1020U)**
3-1	**INSE 3110U Operations Research II (Stochastic) (INSE 2210U, STAT 2800U)**	**INSE 3140U Lean Production Systems Engineering (MECE 2310U, Co-requisite: MANE 3190U)**	**INSE 3115U Workplace and Facilities Design (MECE 2310U, MANE 3460U, Co-requisites: MANE 3190U & INSE 3140U)**	**INSE 3142U Industrial Internet of Things (ENGR 1200U, SOFE 2710U)**	**ENGR 3150U (Applied) Artificial Intelligence and Machine Learning (STAT 2800U, SOFE 2710U)**	**MANE 3190U Manufacturing and Production Processes (MANE 2220U)**
3-2	**ENGR 3360U Engineering Economics**	**MANE 3300U Integrated Manufacturing Systems (MANE 3190U)**	**MANE 4045U Quality Control (STAT 2800U)**	**INSE 3245U Industrial Data Analytics (STAT 2800U, SOFE 2710U, ENGR 3150U, INSE 3140U)**	**METE 4200U Industrial Automation**	**ENGR 3215U Engineering Project Management (Co-requisite: ENGR 3360U)**
4-1	**ENGR 4760U Ethics, Law and Professionalism for Engineers**	**ENGR 4970U Capstone System Design for Industrial Engineering I (Successful completion of all non-elective courses in year three)**	**INSE 4170U Human-System Integration (MANE 3300U or MANE 3190U, MANE 3460U, METE4200U)**	**MANE 4390U Modeling Manufacturing Systems (MANE 3300U)**	**Engineering Elective**	**Liberal Studies Elective**
4-2	**ENGR 4971U Capstone System Design for Industrial Engineering II (ENGR 4970U)**	**MANE 4015U Reliability and Maintenance (STAT 2800U)**	**INSE 4248U Industrial Cyber-Physical Systems (MANE 3300U or MANE 3190U, INSE 3142U, ENGR 3150U)**	**Engineering Elective**	**Liberal Studies Elective**	

Program map for reference/course sequence illustrative purposes only)

Proposed Industrial Engineering and Management 2022-2023						
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	MECE 2230U Statics (MATH 1020U, PHY 1010U)	MECE 2310U Concurrent Engineering and Design (ESNS 1200U or ENGR 1025U)	SOFE 2710U Object Oriented Programming and Design (ENGR 1200U)	MATH 2860U Differential Equations for Engineers (MATH 1020U, Coreq: MATH 1850U)	MANE 2220U Structure and Properties of Materials (CHEM 1800U)	INSE 2110U Health, Safety and Sustainability for Engineers (ENGR 1015U)
2-2	INSE 2210U Operations Research I (Deterministic) (MATH 1010U, MATH 1850U)	ELEE 2790U Electric Circuits (PHY 1020U, MATH 1020U, MATH 1850U)	MANE 3460U Industrial Ergonomics	ENGR 2100U Computational Engineering Applications (ENGR 1200U, MATH 1850U, MATH 2860U)	MECE 2420U Solid Mechanics I (MECE 2230U)	STAT 2800U Statistics and Probability for Engineers (MATH 1020U)
3-1	INSE 3110U Operations Research II (Stochastic) (INSE 2210U, STAT 2800U)	INSE 3140U Lean Production Systems Engineering (MECE 2310U, Co-requisite: MANE 3190U)	INSE 3115U Workplace and Facilities Design (MECE 2310U, MANE 3460U, Co-requisites: MANE 3190U & INSE 3140U)	INSE 3142U Industrial Internet of Things (ENGR 1200U, SOFE 2710U)	ENGR 3150U (Applied) Artificial Intelligence and Machine Learning (STAT 2800U, SOFE 2710U)	MANE 3190U Manufacturing and Production Processes (MANE 2220U)
3-2	ENGR 3360U Engineering Economics	MANE 3300U Integrated Manufacturing Systems (MANE 3190U)	MANE 4045U Quality Control (STAT 2800U)	INSE 3245U Industrial Data Analytics (STAT 2800U, SOFE 2710U, ENGR 3150U, INSE 3140U)	METE 4200U Industrial Automation	ENGR 3215U Engineering Project Management (Co-requisite: ENGR 3360U)
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	ENGR 4760U Ethics, Law and Professionalism for Engineers	ENGR 4970U Capstone System Design for Industrial Engineering I (Successful completion of all non-elective courses in year three)	INSE 4170U Human-System Integration (MANE 3300U or MANE 3190U, MANE 3460U, METE4200U)	MANE 4390U Modeling Manufacturing Systems (MANE 3300U)	Engineering Elective	Liberal Studies Elective
5-2	ENGR 4971U Capstone System Design for Industrial Engineering II (ENGR 4970U)	MANE 4015U Reliability and Maintenance (STAT 2800U)	INSE 4248U Industrial Cyber-Physical Systems (MANE 3300U or MANE 3190U, INSE 3142U, ENGR 3150U)	Engineering Elective	Liberal Studies Elective	

Appendix C 1– List of Program Courses, New Course Proposals, Required Course Changes

Industrial 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 for Engineers	Existing Course – course outline attached
	MECE 2230U	Statics	Existing Course – course outline attached
	MECE 2310U	Concurrent Engineering and Design	Existing Course – course outline attached
	SOFE 2710I	Object Oriented Programming and Design	Existing Course – course outline attached
	INSE 2110U	Health, Safety and Sustainability for Engineers	NEW course template below
	ELEE 2790U	Electric Circuits	Existing Course – course outline attached
	ENGR 2100U	Computational Engineering Applications	Existing Course – course outline attached
	MECE 2420U	Solid Mechanics I	Existing Course – course outline attached
	MANE 3460U	Industrial Ergonomics	Existing Course – course outline attached
	INSE 2210U	Operations Research I: Deterministic	NEW course template below
	STAT 2800U	Statistics and Probability for Engineers	Existing Course – course outline attached
Year 3	INSE 3115U	Workplace and Facilities Design	NEW course template below
	MANE 3190U	Manufacturing and Production Processes	Existing Course – course outline attached
	INSE 3140U	Lean Production Systems	NEW course template below
	INSE 3142U	Industrial Internet of Things	NEW course template below
	ENGR 3150U	Artificial Intelligence & Machine Learning	NEW course template below
	INSE 3110U	Operations Research II: Stochastic	NEW course template below
	ENGR 3215U	Engineering Project Management	NEW course template below
	MANE 3300U	Integrated Manufacturing Systems	Course change template below
	ENGR 3360U	Engineering Economics	Existing Course – course outline attached
	MANE 4045U	Quality Control	Existing Course – course outline attached
	INSE 3245U	Industrial Data Analytics	NEW course template below
	METE 4200U	Industrial Automation	Course change template below

Year 4	ENGR 4760U	Ethics, Law and Professionalism for Engineers	Existing Course – course outline attached
	ENGR 4970U	Capstone System Design for Industrial Engineering I	NEW course template below
	INSE 4170U	Human System Integration	NEW course template below
	MANE 4390U	Modeling Manufacturing Systems	Existing Course – course outline attached
	ENG Elective	Engineering Elective	
	ENGR 4971U	Capstone System Design for Industrial Engineering II	NEW course template below
	MANE 4015U	Reliability & Maintenance	Existing Course – course outline attached
	INSE 4248U	Industrial Cyber Physical Systems	NEW course template below
	ENG Elective	Engineering Elective	
	LSE Elective	Liberal Studies Elective	
	LSE Elective	Liberal Studies Elective	

New Course Template and Course Change forms listed below:

Appendix C 2Course Syllabi for Existing Courses - Course Outlines attached

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: Engineering and Applied Science

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.]

Industrial Engineering

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

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: INSE	**Course Number: 2110U**
Full Course Title: Health, Safety and Sustainability for Engineers	
Short-Form Course Title (max. 30 characters)**: Health, Safety & Sustainability**	

Course Description

The course covers the fundamentals of health and safety management in the context of the legal & social environment necessary for engineers. The course enables engineering professionals and managers to facilitate their interactions within peer groups and units and to acquire a broadened perspective of the corporate's roles and responsibility of health and safety in the workplace. Topics include overview of the main elements in occupational health and safety including accidents investigation, assessment of main hazards and their prevention and control, health and safety training, ethics and corporate responsibility, and the legal framework governing health and safety. The concepts of sustainability and environmental management are also introduced in the course.

Credit Hours: 3			
Contact Hours – please indicate total number of hours for each component			
Lecture: 3		**Lab:**	
Tutorial:		**Other:**	
Cross-listings			
Prerequisites for Calendar	**ENGR 1015U**		
Prerequisites for Banner	**ENGR 1015U**		
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:** Two courses are similar enough in content that they are considered equivalent so students can register in either course but they will only receive credit for one course in their program.

Course instructional method:

CLS (In Class Delivery)	Yes	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:

Lectures - Assignments – Case Studies - Midterm Exam – 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, students should be able to: - Be familiar with the Safety and Health Movement Then and Now - Understand Accidents and Their Effects as well as the Theories of Accident Causation - Conduct Hazard Assessment, Prevention, and Control (Mechanical and Machine Safeguarding, temperature, fire, radiation, noise and vibration, Industrial Hygiene and Confined Spaces) - Have a grasp of Laws and Regulations governing health and safety: The OSH Policies, Standards, and Liability, The Legislative Framework in Canada - Recognize Ethical Behavior in Organizations & Company's Role - Know the Sustainability Concepts & Human-Centered Design as well as Environmental Standards and ISO 14000 (Environmental Management)

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

If yes:

Case Study	Yes	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:

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

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: Engineering and Applied Science
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.]

Industrial 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: INSE	**Course Number: 2210U** *ensure the course code has not been previously used
Full Course Title: Operations Research I (Deterministic)	
Short-Form Course Title (max. 30 characters)**: Operations Research I**	

Course Description

Operations research I introduces the fundamental aspects and applications of a broad range of methods and techniques to provide effective and efficient solutions for problems that involve decision-making. Major deterministic techniques of operations research such as linear programming, integer programming, simplex method, duality, network analysis, and dynamic programming, and their application to decision making problems will be presented in this course.

Credit Hours: 3.00		
Contact Hours – please indicate total number of hours for each component		
Lecture: 3.00		**Lab:**
Tutorial: 1.00		**Other:**
Cross-listings		
Prerequisites for Calendar	**MATH 1010U and MATH 1850U**	
Prerequisites for Banner	**MATH 1010U and MATH 1850U**	
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 – Tutorials – Midterm Exam – Term Projects – 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.)

Upon the successful completion of this course, the students will be able to formulate engineering decision problems as mathematical models and solve them. The students will also be able summarize and interpret the results and use them to recommend solutions to engineering decision making problems. Major topics include: ● Linear programming ● Integer programming

- Simplex method
- Branch-and-bound methods
- Duality theory
- Network models
- Graph theory
- Dynamic programming

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:

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

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: Engineering and Applied Science
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.]

Industrial 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: INSE	**Course Number: 3115U** *ensure the course code has not been previously used
Full Course Title: Workplace and Facilities Design	
Short-Form Course Title (max. 30 characters)**: Workplace & Facilities Design**	

Course Description

This course focuses on two main fields of study: work analysis and facilities planning. The course introduces fundamental concepts for creating a well-designed workplace that eliminates waste and optimizes material, people, and information flow as well as basic concepts in facilities planning such as process analysis, flow design, facility location and layout, and material handling systems to optimize material, people, and information flow, as well as improve quality and reduce lead times. Work methods design, motion and time study, and work sampling are also covered. The students will have hands-on exposure to 3D manufacturing simulation software (e.g., Visual Components 4.2, or else).

Credit Hours: 3.00		
Contact Hours – please indicate total number of hours for each component		
Lecture: 3.00		**Lab: 1.00**
Tutorial:		**Other:**
Cross-listings		
Prerequisites for Calendar	**MECE 2310U, MANE 3460U**	
Prerequisites for Banner	**MECE 2310U, MANE 3460U**	
Co-requisites	**MANE 3190U, INSE 3140 (Lean Production Systems Engineering)**	
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 – Case Studies - Midterm Exam – Design 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.)

Students who successfully complete the course should have reliably demonstrated sound subject knowledge and the ability to apply several well-established workplace and facilities design best practices, methods and/or

engineering tools as well as hands-on proficiency in utilizing 3D manufacturing simulation software. Assessment tools will include solving individual assignments and exams as well as conducting group case studies and a major workplace and facilities design project through which successful students in this course will demonstrate the ability to analyze, understand and solve engineering problems by implementing lean concepts and principles related to the following topics:

- Designing a workplace that meets ergonomic principles. Designing individual workstations. Ergonomic layout of workstations.
- Decisions about the resources and the high-level requirements. Identification of the work system constraints and requirements. Identification of the users' needs. Setting specific design goals. Spatial arrangement of work artifacts. Design of workstation prototype(s).
- Facilitating task execution, (i.e., ensuring effortless information exchange with the environment). Minimizing the physical constraints, physical strain and workload of the working person.
- Achieving ease of use of the various workplace elements (e.g., seat, the working surfaces, the desk, the equipment, the tools, the controls and displays used during the work, but also the passages, the windows, the heating/cooling equipment, etc.)
- Ensuring occupational health and safety.
- Manufacturing facilities design and material handling. Sources of information for manufacturing facilities design.
- Time study. Process design. Flow analysis techniques. Activity relationship analysis.
- Ergonomics and workstation design space requirements. Auxiliary services requirement space requirements. Employee services space requirements.
- Material handling. Material handling equipment.
- Office layout techniques and space requirements. Area allocation.
- Facilities layout design. Application of computer simulation and modeling. "Selling" the layout.

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

If yes:

Case Study	X	Simulated Workplace Project	X
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:

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

There will be a need to purchase lab equipment for this course in addition to the following software:
Visual Components version 4.4 or higher. It allows design, build, and simulate a factory using ready-made components.

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: Engineering and Applied Science
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.]

Industrial 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: INSE	**Course Number: 3140U** *ensure the course code has not been previously used
Full Course Title: Lean Production Systems Engineering	
Short-Form Course Title (max. 30 characters)**: Lean Prod. Sys. Eng.**	

Course Description

This course is about customer-centric methodologies that improve processes by eliminating waste and by focusing on value-added tasks. Based on analytically and systematically established customer requirements the course addresses strategies on how to decrease the development lead time for a product/process/system or service and how to establish an integrated lean workflow process that reduces waste and improves quality, design, manufacture, assembly, maintenance and aftersales support. Students will apply these concepts in design activities in labs and a major project. The project will require implementing lean initiatives in addressing process mapping and current and future value stream mapping. The students will have hands-on exposure to 3D manufacturing simulation software (e.g., Visual Components 4.2, or else).

Credit Hours: 3.00		
Contact Hours – please indicate total number of hours for each component		
Lecture: 3.00		**Lab: 1.00**
Tutorial:		**Other:**
Cross-listings		
Prerequisites for Calendar	**MECE 2310U**	
Prerequisites for Banner		
Co-requisites	MANE 3190U	
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 – Case Studies - Midterm Exam – Design 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.)

Students who successfully complete the course should have reliably demonstrated sound subject knowledge and the ability to apply several well-established Lean Production Systems Engineering best practices, methods and/or engineering tools as well as hands-on proficiency in utilizing 3D manufacturing simulation software. Assessment tools will include solving individual assignments and exams as well as conducting group case studies and a major lean engineering design project through which successful students in this course will demonstrate the ability to analyze, understand and solve engineering problems by implementing lean concepts and principles related to the following topics:

- Need for Lean. Lean Terminology. Understanding the Lean Manufacturing Philosophy.
- Eliminate Waste with Lean. Components of Lean.
- Understanding the Toyota Production System (TPS). Jidoka, Just-in-Time, & 4P (Philosophy, People, Process, and Problem Solving) concepts.
- Value Stream Analysis. Lean Thinking.
- Value Stream Mapping. Workplace Organization.
- Predictability & Consistency. Set-up Reduction.
- Total Productive Maintenance (TPM). Need, Pillars, and Implementation of TPM.
- Visual Factory. Support Processes. Continuous Improvement.
- Lean Six Sigma (LSS) basics and overview. DMAIC. DMADV.
- Lean Starts with People. Data Drives Lean.
- Layout Options. Overall Equipment Effectiveness (OEE). Lean Inventory Practices.
- Meeting stake holder's requirements. Lean Manufacturing project documentation.
- Roadmap for Lean. Pitfalls with Lean.

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

If yes:

Case Study	X	Simulated Workplace Project	X
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:

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

There will be a need to purchase the following software: Planview - Lean Portfolio Management solution. It provides solutions for agility by planning, funding, and delivering products and solutions

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: Engineering and Applied Science
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.]

Industrial 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: INSE	**Course Number: 3142U** *ensure the course code has not been previously used
Full Course Title: Industrial Internet of Things	
Short-Form Course Title (max. 30 characters)**: Industrial Internet of Things**	

Course Description

This course covers fundamental aspects of the Industrial Internet of Things (IoT), which include predictive and preventative maintenance, condition-based monitoring of the machines, production optimization, energy optimization, supply-chain optimization and uptime of manufacturing utilities etc. The students will also learn how this technology is used to build smart factories, develop communication protocols, and manage data storage. This course will also examine relevant case studies of IoT security vulnerabilities and their economic impacts. Specific topics include mechanism of security breach, privacy enhancing technologies, encryption and cryptography implementation of IoT data, security standard for available platforms, device authentication…etc.

Credit Hours: 3.00		
Contact Hours – please indicate total number of hours for each component		
Lecture: 3.00	**Lab: 2.00**	
Tutorial:	**Other:**	
Cross-listings		
Prerequisites for Calendar	**ENGR 1200, SOFE 2710**	
Prerequisites for Banner	**ENGR 1200, SOFE 2710**	
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 – Midterm Exam –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.)

This course is designed to introduce the students to the internet of things and their application in industrial engineering. Students will learn the following principle topics including:

- Introduction to IoT and technologies that led to evolution of IOT

- Industrial Process and Devices Technical Requirements
- Network, Linking & Loading
- Communication Protocols
- Interoperability in IoT
- Introduction to micro-computer Programming
- Integration of Sensors and Actuators with micro-computers
- Cloud Computing
- Cloud and IoT Integration
- Cloud Evolution
- Security and Privacy Issues.

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:

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

There will be a need to purchase the following software:
MindSphere. It is a leading industrial IoT as a service solution developed by Siemens for applications in the context of the Internet of Things (IoT).

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

NEW COURSE TEMPLATE

For changes to existing courses see Course Change Template

Faculty: Faculty of Engineering and Applied Science	
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 Sequencing or Course Placement*

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

Note: If the new course is for a new program, you do not need to show course placement as it will be captured in the new program proposal.

This course will be a new core course in the Industrial Engineering program and an engineering elective course in the Mechatronics Engineering program.

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

BEng and BEngM – Industrial Engineering
BEng and BEngM – Mechatronics 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)

None

Subject Code: ENGR	**Course Number: 3150U** *ensure the course code has not been previously used
Full Course Title: Artificial Intelligence and Machine Learning	

Short-Form Course Title (max. 30 characters)**:**
AI and Machine Learning

Course Description

This course covers the fundamental aspects of Artificial Intelligence and Machine Learning. The students will learn the concept and history of AI, discuss the advantages and disadvantages of some basic AI applications, understand the various AI models, learn what the latest generation of artificial intelligence techniques can actually do, and learn the basics of machine learning to solve problems including real world industrial problems. Course topics include: knowledge, reasoning, planning, uncertainty, decision trees, ensemble learning, reinforcement learning, evolutionary computation, neural networks, heuristic search strategies, supervised vs. unsupervised learning, search and optimization, probabilistic methods, and pattern recognition.

Credit Hours: 3.0		
Contact Hours – please indicate total number of hours for each component		
Lecture: 3		**Lab:** 2 (bi-weekly)
Tutorial:		**Other:**
Cross-listings		
Prerequisites for Calendar	STAT 2800U, SOFE 2710U	
Prerequisites for Banner	STAT 2800U, SOFE 2710U	
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, midterms, project, and final exam as determined by the instructor.

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

Upon successful completion of this course, the students should be able to:

- Demonstrate a sound understanding of the fundamentals of artificial intelligence and machine learning
- Select the appropriate artificial intelligence or machine learning method for a give problem
- Apply artificial intelligence and machine learning methods to engineering problems

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** ☒ **N/A**

Process of consultation, if applicable:

N/A

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

The course will be offered as part of the normal offering of electives for the program in fourth year for the Mechatronics Engineering program as well as being delivered as a core course in the Industrial Engineering program.

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: Engineering and Applied Science
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.]

Industrial 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: INSE	**Course Number: 3110U** *ensure the course code has not been previously used
Full Course Title: Operations Research II (Stochastic)	
Short-Form Course Title (max. 30 characters)**: Operations Research II**	

Course Description

Operations research II presents mathematical models and techniques for the analysis and optimization of complex systems subject to uncertainty and randomness. Complex systems that change over time with a chance component involved are very common in engineering systems, manufacturing and production, logistics, health care, management science, and economics. This course will build upon the principles learned in INSE 2210U and presents important probabilistic and nonlinear models in operations research such as decision analysis, dynamic programming, Markov chains, queuing theory, and stochastic processes.

Credit Hours: 3.00		
Contact Hours – please indicate total number of hours for each component		
Lecture: 3.00		**Lab:**
Tutorial: 1.00		**Other:**
Cross-listings		
Prerequisites for Calendar	**INSE 2210 (Operations Research I) and STAT 2800U**	
Prerequisites for Banner	**INSE 2210 (Operations Research I) and STAT 2800U**	
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 – Tutorials – Midterm Exam – Term Projects – 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.)

- Upon the successful completion of this course, the students will be able to Identify complex systems that operate under randomness and uncertainty and develop mathematical models for the analysis and optimization of such systems with the focus on real life engineering scenarios. Major topics include:

- Dynamic programing
- Introduction to decision analysis
- Bernoulli and Poisson processes
- Markov chains
- Queuing theory
- Stochastic optimization
- Non-linear programing

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:

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

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: Engineering and Applied Science
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.]

Industrial 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: ENGR	**Course Number: 3215U** *ensure the course code has not been previously used
Full Course Title: Engineering Project Management	
Short-Form Course Title (max. 30 characters)**: Engineering Project Management**	

Course Description

This course introduces students to the fundamentals of engineering project management. It covers the basic functions in this field that include planning, organizing, executing, leading, and controlling. Topics include workforce and resource allocation, scheduling, forecasting, cost management, risk management and quality management. The impacts on the external environment, safety and regulatory constraints will be considered in the management of engineering systems.

Credit Hours: 3.00		
Contact Hours – please indicate total number of hours for each component		
Lecture: 3.00	**Lab:**	
Tutorial:	**Other:**	
Cross-listings		
Prerequisites for Calendar		
Prerequisites for Banner		
Co-requisites	**ENGR 3360U**	
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 – Case Studies - Midterm Exam – 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.)

This course is designed to provide engineering students with the fundamentals, methods, and various applications that are used in engineering project management. After completion of this course, students will be able to understand and apply principles of:

- Scope management, work breakdown structure, project tasks, activities
- Time management, duration estimation, critical path method, PERT, precedence diagram

- Cost management: cost estimation, parametric estimation, analogous estimation, earned value management
- Resource management, resource allocation, resource leveling
- Quality management in projects
- Risk management techniques, qualitative vs quantitative
- Project monitoring and control

Theories in human resource management and leadership

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

If yes:

Case Study	X	Simulated Workplace Project	X
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:

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

N/A

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: Engineering and Applied Science	
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

With the introduction of the new industrial engineering program, students in the program will not be taking MECE 3030U – Computer Aided Design, but will be taking MANE 3190U. Moreover, this course doesn't require extensive knowledge in CAD. Therefore, it is required to update the prerequisites to allow students in the Industrial Engineering Program to take this course that is offered in the Manufacturing Engineering Program.

FINANCIAL IMPLICATIONS

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)

COURSE INFORMATION

Subject Code: MANE	**Course Number: 3300U**
Full Course Title: Integrated Manufacturing System	
Short-Form Course Title (max. 30 characters):	

CHANGE TO CALENDAR DESCRIPTION (if required)

Current	**Proposed**
• MANE 3300U – Integrated Manufacturing Systems Facility layout; cellular manufacturing; fundamentals of automation; automatically-guided vehicles; flexible manufacturing; group technology; computer aided process planning; forecasting; inventory management and control; production planning and control; production activity control systems. **Credit hours:** 3 **Lecture hours:** 3 **Laboratory hours:** 2 (biweekly) **Tutorial hours:** 1 **Prerequisite(s):** MECE 3030U and MANE 3190U	• MANE 3300U – Integrated Manufacturing Systems Facility layout; cellular manufacturing; fundamentals of automation; automatically-guided vehicles; flexible manufacturing; group technology; computer aided process planning; forecasting; inventory management and control; production planning and control; production activity control systems. **Credit hours:** 3 **Lecture hours:** 3 **Laboratory hours:** 2 (biweekly) **Tutorial hours:** 1 **Prerequisite(s):** MANE 3190U

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	**MANE 3190U**
Prerequisites for Banner	**MANE 3190U**
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):

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: Engineering and Applied Science
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.]

Industrial 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: INSE	**Course Number: 3245U** *ensure the course code has not been previously used
Full Course Title: Industrial Data Analytics	
Short-Form Course Title (max. 30 characters)**: Industrial Data Analytics**	

Course Description

This course introduces the different techniques of data gathering, description, and analysis. The students will use advanced statistical tools to make decisions on operations, risk management, finance, marketing of industrial systems. Analysis is done targeting economic and financial decisions in complex systems that involve multiple partners. Topics include probability, statistics, hypothesis testing, selection and shrinkage methods for regression, linear discriminant approaches for classification, data clustering, decision trees, industrial forecasting, and data anomalies…etc.

Credit Hours: 3.00		
Contact Hours – please indicate total number of hours for each component		
Lecture: 3.00		**Lab:**
Tutorial: 1.00		**Other:**
Cross-listings		
Prerequisites for Calendar	STAT 2800, SOFE 2710, ENGR 3150U (Artificial Intelligence & Machine Learning) INSE 3140U Lean Production Systems Engineering)	
Prerequisites for Banner	STAT 2800, SOFE 2710, ENGR 3150U (Artificial Intelligence & Machine Learning INSE 3140U Lean Production Systems Engineering)	
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 – Midterm Exam –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.)

This course is designed to equip students with necessary techniques for industrial data analytics. Students will learn the following principle topics including:

- Introduction, Data Summarization and Visualization
- Linear and Nonlinear Regression
- Mathematical Modeling process
- Model Selection
- Classification, Logistic Regression
- Clustering
- Association Rules
- Decision Trees
- Industrial Forecasting and Six Sigma

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:

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

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: Engineering and Applied Science	
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

With the introduction of the new industrial engineering program, not all the students taking Mete 4200U will have taken the prerequisite of MANE 4280U Robotics and Automation. Therefore, it is required to remove the prerequisite. The students in industrial engineering will have the adequate background to proceed in the course. However, it is required to restrict registration in this course to 3rd year students only.

FINANCIAL IMPLICATIONS

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)

COURSE INFORMATION

Subject Code: METE	**Course Number: 4200U**
Full Course Title: Industrial Automation	
Short-Form Course Title (max. 30 characters): Industrial Automation	

CHANGE TO CALENDAR DESCRIPTION (if required)

Current	**Proposed**
• METE 4200U – Industrial Automation • This course covers the fundamentals of Programmable Logic Controllers (PLCs). Students will learn the basics of PLCs, including how PLCs function, how to program PLCs, and how to design automated systems that are controlled by PLCs. In addition, students will learn the fundamentals of pneumatics and hydraulics including the design and control of systems that incorporate pneumatic and/or hydraulic components. **Credit hours:** 3 **Lecture hours:** 3 **Laboratory hours:** 2 (biweekly) **Prerequisite(s):** MANE 4280U	• METE 4200U – Industrial Automation • This course covers the fundamentals of Programmable Logic Controllers (PLCs). Students will learn the basics of PLCs, including how PLCs function, how to program PLCs, and how to design automated systems that are controlled by PLCs. In addition, students will learn the fundamentals of pneumatics and hydraulics including the design and control of systems that incorporate pneumatic and/or hydraulic components. **Credit hours:** 3 **Lecture hours:** 3 **Laboratory hours:** 2 (biweekly) **Prerequisite(s):** none

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	
Prerequisites for Banner	

Co-requisites	
Prerequisites with concurrency (pre or co-requisite)	
Credit restrictions	Must be registered in third year ☐ **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):

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: Engineering and Applied Science
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.]

Industrial 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: INSE	**Course Number: 4170U** *ensure the course code has not been previously used
Full Course Title: Human-System Integration (Human Machine Interface)	
Short-Form Course Title (max. 30 characters)**: Human-Sys. Integration**	

Course Description

This course remarks the growing importance of human-system integration (HSI) achieving adaptability to a changing environment while relying on the augmentation of humans' knowledge, skills and abilities employing the presence of trustworthy and intelligent products and assets. Provided with the capabilities of smart factories based on the diffused use of Artificial Intelligence, HIS features a high level of trustworthiness in order to effectively take place in the manufacturing decision-making routine. Students in this course will learn the principles in interaction of humans and machines, human and machine collaborations, Human- machine interface, and design of cognitive work. Human Machine Interface (HMI) as a major component of the course focuses on the methodologies for more efficient and mutual adaptability in humans and machines interactions to cover a wide range of interfaces in industrial applications.

Credit Hours: 3.00		
Contact Hours – please indicate total number of hours for each component		
Lecture: 3.00		**Lab: 2.00**
Tutorial:		**Other:**
Cross-listings		
Prerequisites for Calendar	MANE 3300U, (or MANE 3190U), MANE 3460U, PLC	
Prerequisites for Banner	MANE 3300U, (or MANE 3190U), MANE 3460U, PLC	
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 – Midterm Exam – Laboratory Projects – 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.)

This course is designed to give students fundamentals, methods, and theories involving various levels of Human-Systems Integration. Students will learn the following principle topics including:

- Human Abilities and Limitations
- Sensors and Equipment for Data collection and recording
- Event logging methods
- Event Triggering methodologies
- Information Theory: Human Information Processing models, Human Reception, Signal Detection Theory
- Human Memory
- Decision Making, Response Selection and Response Execution
- Cognitive Capacity for Attention
- Display Design: Dimensioning, Modality, Display Coding methods, Compatibility Schemes, Redundancy for Critical Situations, Consistency Maintenance
- Principles of Displaying Visual Information
- Display of Auditory Information
- Human Computer Interaction: Hardware and Software
- Applications of Haptic Systems
- Emotional Human-Machine Interaction: Facial Expressions, biosignals
- Applications of Collaborative Robots (Cobots)
- Centralized control unit for manufacturing lines

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

If yes:

Case Study		Simulated Workplace Project	X
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:

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

There will be a need to purchase equipment for the lab of this course. Also, there will be a need to purchase the following software:
- Tecnomatix
- Visual Components

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: Engineering and Applied Science
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.]

Industrial 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: INSE	**Course Number: 4248U** *ensure the course code has not been previously used
Full Course Title: Industrial Cyber-Physical Systems	
Short-Form Course Title (max. 30 characters)**: Industrial Cyber-Physical Sys.**	

Course Description

The scope of the course moves towards the implementation of Industry 4.0 principles in manufacturing systems while looking at Industry 4.0-based characteristics that lead to build smart factories. This includes the requirement for digitalization, sensors and inspection, data collection, connectivity, data analytics, computational tasks, closed-loop feedbacks, and control capabilities. This course covers the theoretical and technological aspects of Cyber-Physical Systems (CPS) requirement for the fourth industrial revolution. CPS are envisioned as one of the most promising transformative technological concepts leading to build the smart factories. CPS combine a cyber side including computation and networking with the physical side including processes (eg. mechanical, electrical, or manufacturing) and hardware logistics in an industrial platform to enhance the capabilities of production systems in terms of their agility, dependability, sustainability, and resilience.

Credit Hours: 3.00	
Contact Hours – please indicate total number of hours for each component	
Lecture: 3.00	**Lab: 2.00**
Tutorial:	**Other:**
Cross-listings	
Prerequisites for Calendar	**MANE 3300U (or MANE 3190U), ENGR 3150U AI, INSE 3142U IOT**
Prerequisites for Banner	**MANE 3300U (or MANE 3190U), ENGR 3150U AI, INSE 3142U IOT**
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 – Midterm Exam – Laboratory Projects – 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.)

This course is designed to give students fundamentals, methods, and theories involving various levels of CPS in Connection Level, Conversion Level, Computation Level, Cognition Level, and Configuration Level. Students will learn various principle topics in cyber-physical levels including:

- CPS Architectures
- CPS Theory and Technologies

- CPS Engineering Methods and Tools: Lifecycle Management, Integration, Human Interface, Safety
- CPS Connection Level: Plug and Play systems, Tether-free communication, Sensor network
- Digital Inspection procedures: Integrated Inspection Systems, Inspection Planning, Inspection Data collection, Inspection Data Processing.
- CPS Conversion Level: Conversion of Data to Information, Smart analytics for component machine health, Multi-dimensional data correlation, Degradation and performance prediction
- CPS Computation Level: Digital twin model for components and machines, Variation identification and historic analysis, Clustering for similarity in data mining
- CPS Cognition Level: Integrated simulation and synthesis, Remote visualization for human, Collaborative diagnostic and decision making
- CPS Configuration Level: Self-configuration for resilience, Self-adjust for variation, Self-optimize for disturbance
- Industry 4.0 Applications in various industries
- Smart Factory Management and Ecosystems
- Smart Factory Social Aspects: Digital Society, Sustainability, Machine Ethics

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

If yes:

Case Study		Simulated Workplace Project	X
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:

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

There will be a need to purchase equipment for the lab of this course.

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: Engineering and Applied Science	
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

This course doesn't require extensive knowledge in CAD. Therefore, it is required to update the prerequisites to allow students in the Industrial Engineering Program to take this course as technical elective.

FINANCIAL IMPLICATIONS

N/A

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)

COURSE INFORMATION

Subject Code: MANE	Course Number: 4380U
Full Course Title: Life Cycle Engineering	
Short-Form Course Title (max. 30 characters): Life Cycle Engineering	

CHANGE TO CALENDAR DESCRIPTION (if required)

Current	Proposed
MANE 4380U – Life Cycle Engineering 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. **Credit hours:** 3. **Lecture hours:** 3 **Tutorial hours:** 1 (biweekly) **Prerequisite(s):** MECE 3030U	MANE 4380U – Life Cycle Engineering 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. **Credit hours:** 3. **Lecture hours:** 3 **Tutorial hours:** 1 (biweekly) **Prerequisite(s):** none

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	**Remove MECE 3030U from prerequisite**
Prerequisites for Banner	**Remove MECE 3030U from prerequisite**
Co-requisites	
Prerequisites with concurrency (pre or co-requisite)	

Credit restrictions	Must be registered in third year ☐ **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):

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: Engineering and Applied Science	
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.]

Industrial 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: ENGR	**Course Number:** 4970U *ensure the course code has not been previously used
Full Course Title: Capstone System Design for Industrial Engineering I	
Short-Form Course Title Capstone Sys Design I	

Course Description

This course requires that students integrate skills and knowledge from across multiple engineering disciplines. The course provides a unique and culminating major teamwork design experience for qualified engineering students specializing in the areas of industrial, mechanical, automotive, mechatronics, manufacturing, electrical, software, and nuclear engineering. Team members from these different engineering disciplines collaborate in a supervised group environment to design and develop solutions for contemporary open-ended multidisciplinary engineering design-related product, process, technology, service or system development topics in industrial engineering. The course is intended for exceptional fourth-year engineering students (subject to approved application) who are looking for a unique and challenging capstone design experience in industrial engineering in lieu of their regular core capstone course under identical prerequisite requirements.

Credit Hours: 3.00	
Contact Hours – please indicate total number of hours for each component	
Lecture: 3.00	**Lab:** 3.00
Tutorial:	**Other:**
Cross-listings	FEAS, 4 Programs: Mechanical; Manufacturing; Automotive; Mechatronics (in lieu of ENGR4950U). FEAS, 2 Programs: Electrical; Software (in lieu of ENGR 4940U). FESNS, 1 Program: Nuclear Engineering (in lieu of NUCL 4994).
Prerequisites for Calendar	Identical with the prerequisites required for registering into the Fall capstone design course in the respective engineering program the student is enrolled in at the time of applying.
Prerequisites for Banner	Identical with the prerequisites required for registering into the Fall capstone design course in the respective engineering program the student is enrolled in at the time of applying.
Co-requisites	NONE
Prerequisites with concurrency (pre or co-requisite)	
Credit restrictions	ENGR4950U; ENGR 4940U; or NUCL 4994U, respectively. ☒ **Equivalency***
Recommended	
Course Restrictions	ENGR4950U; ENGR 4940U; or NUCL 4994U, respectively.
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:** Two courses are similar enough in content that they are considered equivalent so students can register in either course but they will only receive credit for one course in their program.

Course instructional method:

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			

Teaching and assessment methods:

Teaching Method: This course is part of a two-semester multidisciplinary capstone systems design project-based experience. The course will be delivered through web-centric supported classroom lectures using Canvas LMS related to project work. Students are expected to dedicate to this course 4 to 6 hours per week outside of class. Strong emphasis is given to teamwork.

Assessment Method: Midterm and final exams will NOT be assigned in this course. However, the progressive development of the capstone design project by each student group will be accessed via a variety of assessment tools of unequal level of difficulty, which will be marked proportionally by both the course instructor and the respective faculty advisor(s). Throughout the term, students will be assigned and required to submit/present the following deliverables related to their specific multidisciplinary capstone design project: Progress Reports; Preliminary Prototype Demonstration and Oral Presentation and Final Engineering Term Report. A mandatory Self and Peer Evaluation Sheet will be used as a basis to determine individual students' contributions to the project group deliverables.

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

The enrolled students will complete a significant open-ended design engineering project challenge in industrial engineering systems in a multidisciplinary environment that includes the field of their individual specialization. The primary specific learning and training outcomes include:

- Identify, formulate, investigate and solve multidisciplinary, interdisciplinary or transdisciplinary industrial engineering problems;
- Gain experience in multidisciplinary engineering practice based around a significant industrial engineering design project by applying knowledge, skills and processes from several disciplines to conduct engineering analysis and practice engineering design;
  a. Design a multidisciplinary component, process, technology, service, or system to meet desired design needs;
  b. Use appropriately engineering practice techniques, skills, and modern engineering tools from various disciplines;
  c. Apply knowledge of mathematics, science, and other engineering disciplines;
  d. Design and conduct experiments and analyze and interpret experimental data;
  e. Demonstrate engineering judgment as they integrate economic, health, safety, environmental, social, and other pertinent interdisciplinary factors;
- Function on multidisciplinary teams and incorporate teamwork, project management, and direct stakeholder and client interaction, and
- Communicate effectively their work and prove the feasibility of their design concepts through appropriate interactive simulation and/or proof-of-concept physical prototyping.

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: Interaction with industrial partners.			

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

Process of consultation, if applicable:

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

In addition to mandatory cash and in-kind industrial partner sponsorships, it is envisioned that the respective participating departments will also proportionally provide cash and in-kind support for building of project-related proof-of-concept virtual and/or physical prototypes.

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: Engineering and Applied Science	
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.]

Industrial 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)

Winter 2023

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

Subject Code: ENGR	**Course Number:** 4971U *ensure the course code has not been previously used
Full Course Title: Capstone System Design for Industrial Engineering II	
Short-Form Course Title (max. 30 characters)**:** Capstone Sys. Design II	

Course Description

This course constitutes the second part (continuation) of a two-term capstone design endeavour which started in the 4-1 fall term course ENGR 4970U Capstone System Design for Industrial Engineering I. Students will complete the multidisciplinary design project that they first started in the ENGR 4970U course on a project topic 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 complex industrial engineering system requiring multidisciplinary expertise. By the end of this course students will have completed the entire design process for their multidisciplinary projects including the following tasks: design refinements based on findings from proof-of-concept prototype; detailed design and engineering analysis; test plan; test results and product validation; final project presentation; final project report; and virtual and/or physical prototype system demonstration during the annual engineering exhibition.

Credit Hours: 3.00	
Contact Hours – please indicate total number of hours for each component	
Lecture:	**Lab:** 3.00
Tutorial: 1.00	**Other:**
Cross-listings	FEAS, 4 Programs: Mechanical; Manufacturing; Automotive; Mechatronics (in lieu of ENGR4951U). FEAS, 2 Programs: Electrical; Software (in lieu of ENGR 4941U). FESNS, 1 Program: Nuclear Engineering (in lieu of NUCL 4998).
Prerequisites for	ENGR 4970U
Prerequisites for	ENGR 4970U
Co-requisites	NONE
Prerequisites with concurrency (pre or co-requisite)	
Credit restrictions	ENGR4951U; ENGR 4941U; or NUCL 4998U, respectively. ☒ **Equivalency***
Recommended	
Course Restrictions	ENGR4951U; ENGR 4941U; or NUCL 4998U, respectively.
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:** Two courses are similar enough in content that they are considered equivalent so students can register in either course but they will only receive credit for one course in their program.

Course instructional method:

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			

Teaching and assessment methods:

Teaching Method: This course is the final part of a two-semester multidisciplinary capstone design in industrial systems major project-based experience. This one-semester course is worth 3 credits. The course has three laboratory hours and 1 tutorial hour once per week. The laboratories are open "by demand" sessions that give students access to some of the facilities and will provide exposure to some available software and hardware tools and equipment. The tutorials normally constitute weekly meetings of the project team with the dedicated respective project supervisor(s) and/or industrial partner advisors. Students are expected to dedicate to this course 4 to 6 hours per week outside of class. Both the course instructor and the TAs mainly conduct online course related communication via Canvas LMS.

Assessment Method: Midterm and final exams will NOT be assigned in this course. However, the progressive development of the capstone design project by each student group will be accessed via a variety of assessment tools of unequal level of difficulty, which will be marked proportionally by both the course instructor and the respective faculty advisor(s). Throughout the term, students will be assigned and required to submit/present the following deliverables related to their specific multidisciplinary capstone design project: Progress Reports; Final Oral Presentation; Capstone Design Annual Exhibition Mandatory Group Participation, and Final Engineering Project Report. A mandatory Self and Peer Evaluation Sheet will be used as a basis to determine individual students' contributions to the project group deliverables.

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

The enrolled students will complete a significant open-ended design engineering project challenge in industrial engineering systems in a multidisciplinary environment that includes the field of their individual specialization. The primary specific learning and training outcomes include:

- Identify, formulate, investigate and solve multidisciplinary, interdisciplinary or transdisciplinary industrial engineering problems;
- Gain experience in multidisciplinary engineering practice based around a significant industrial engineering design project by applying knowledge, skills and processes from several disciplines to conduct engineering analysis and practice engineering design;
    a. Design a multidisciplinary component, process, technology, service, or system to meet desired design needs;
    b. Use appropriately engineering practice techniques, skills, and modern engineering tools from various disciplines;
    c. Apply knowledge of mathematics, science, and other engineering disciplines;
    d. Design and conduct experiments and analyze and interpret experimental data;
    e. Demonstrate engineering judgment as they integrate economic, health, safety, environmental, social, and other pertinent interdisciplinary factors;
- Function on multidisciplinary teams and incorporate teamwork, project management, and direct stakeholder and client interaction, and
- Communicate effectively their work and prove the feasibility of their design concepts through appropriate interactive simulation and/or proof-of-concept physical prototyping.

In this context, upon successful completion of this course the students will especially reinforce and capitalize on engineering competences related to the 12 graduate attributes defined by CEAB. It is also assumed that graduates will continue to build on the foundations that their engineering education has provided beyond their

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: Interaction with industrial partners.			

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

Process of consultation, if applicable:

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

In addition to mandatory cash and in-kind industrial partner sponsorships, it is envisioned that the respective participating departments will also proportionally provide cash and in-kind support for building of project-related proof-of-concept virtual and/or physical

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

Appendix C2: Course Syllabi for Existing Courses

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*
	  o Project scope and ideas: What is an appropriate topic?
	  o Proposal: preliminary review

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

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

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

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

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

Course Outline
ENGR 1015U
Introduction to Engineering
Winter 2021

Offering Approval:

Approved

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:	Phone:	Office Hours:
Dr. Naglaa ElAgamy	Naglaa.Elagamy@ontariotechu.ca	ACE 3022	ext. 2330	Google Meet, Fridays, 12:00 p.m. - 02:00 p.m.

Teaching Assistants

TA Name:	Email:	Office:
TBA TBA	TBA	TBA

Required Course Text and Other Materials:

- Introduction to Professional Engineering in Canada, G.C. Andrews et al, 5th Edition, 2018, Pearson
- ENGR 1015U Laboratory Handbook
- A bound laboratory notebook (spiral bound is not acceptable)

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 Blackboard

Course Organization and Delivery Mode:

This one-semester course will be delivered by a combination of web-centric supported classroom lectures using Canvas, laboratory project work, and tutorials

ENGR 1015U is worth 3 credits.

(3 hours of lectures, 3 hours of labs, and 1 hour of tutorials per week).

Lectures are designed to ensure that students understand the concepts introduced.

The tutorials will be open sessions for students to **ASK** questions about the suggested problems.

The online course related communication will be conducted 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: (Asynchronous) - recorded lectures will be made available

Tutorials: As posted by Ontario Tech - **(Synchronous)**

Labs: (Synchronous) / in-person

Laboratories:

Please see the ENGR 1015U Laboratory Handbook for specifics (posted on Canvas).

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:
Saturday, February 27, 2021 - 09:00 to 10:30	Online

Assignments:

See Canvas

Laboratories, Prelab Reports, Notes and Reports

Lab Description:

1. Lab safety policies overview & WHMIS training and test
2. LabVIEW Exercise 1 - Simulated Signal
3. LabVIEW Exercise 2 - Thermocouple Data Acquisition
4. Dissection of a cordless drill and sketching
5. Dissection & assembly of an engineered product + presentation
6. Weigh scale dissection & MATLAB exercise

Prelab Reports, Notes and Reports:

Laboratory Instructors

The laboratories will be run by the Lab Instructors**.**

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 5 hands-on exercises will be completed during the semester. You will attend the lab 6 times (biweekly schedule), and also get quizzed on the previously completed lab. 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

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, with select solutions worked out.
- Basic instructions will be given for running the computer software, along with sketching and drawing exercises in preparation for assignments, etc.

Computer Experience:

Availability and proficiency in using laptop/desktop computers and the use of Blackboard 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 Ontario Tech 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 (7 lectures)
    - Units, significant figures (1 lecture)
    - Energy conservation and conversion (1 lecture)
    - Engineering and empirical model, statistics, curve-fits (1 lecture)
    - Engineering drawings, schematic drawings (2 lectures)
    - Technical report writing & communications (1 lecture)
    - Engineering project management and economics (1 lecture)
3. Exploring Engineering Fields (7 lectures)
    - Software and electrical engineering (1 lecture)
    - Information technology and signal processing (1 lecture)
    - Manufacturing and materials engineering (1 lecture)
    - Mechanical engineering (1 lecture)
    - Special topics (to be determined) (1 lecture)
    - Special topics (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. 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:
Focusing on high school pre-calculus and calculus concepts, this test will be administered through the online Mobius system. You will receive 4 attempts during the period of availability (**ends September 18 at 8:00 pm**), and the best 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

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

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)

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Final Exam Views:
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Notes regarding exam views:
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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.

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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

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7 Sexual Violence Policy

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- 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

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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

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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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14 University Response to COVID-19

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Ontario Tech University
Faculty of Science

Course Outline
CHEM 1800U
Chemistry for Engineering
Winter 2020

Offering Approval:

Under Revision

Course Description:

Introduction to the four sub-disciplines of modern chemistry: analytical, inorganic, organic and physical. Atoms, molecules, stoichiometry and gas laws; reactions, chemical kinetics, thermochemistry, entropy and free energy; electronic structure of atoms, bonding and molecular structure with emphasis on organic molecules; intermolecular forces, liquids and solids; electrochemistry, fuel cells and electrolytic cells.

Major Topics:

- Chemistry: Matter and Measurements
- Atoms molecules and ions
- Formulas, equations and moles
- Reactions in aqueous solution
- Ionic bonds, Covalent bonds and Molecular structure
- Thermodynamics: hemical Energy and Gases
- Liquids, Solids and Phase Changes
- Chemical Kinetics
- Thermodynamics: Entropy, Free Energy and Equilibrium
- Chemical Equilibrium: aqueous equilibria
- Electrochemistry and other 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%	100%	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

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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
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Professional Conduct

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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.

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:

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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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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
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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.

Medical Certificates and Deferred Exams:

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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 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

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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

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

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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 Science

Course Outline

MATH 1020U

Calculus II

Winter 2020

Offering Approval:

Under Revision

Course Description:

A continuation of Calculus I or Introductory Calculus emphasizing integral calculus: problem solving, calculations and applications. Applications to volumes, arc length, polar co-ordinates and functions of two or more variables. Multivariable calculus: partial derivatives, differential equations, Taylor and MacLauren series, double integrals.

Major Topics:

- techniques of integration
- applications of integration
- introduction to differential equations
- parametric and polar curves
- sequences and series
- partial derivatives
- multiple integrals

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
100%	0%	0%	0%	0%

Other Course Information:

Graduate Attributes:

Indicator #1 (KB): Demonstrate a sound understanding of, and be able to apply and solve problems using the techniques of Calculus. This outcome includes the ability to:

-evaluate integrals

-solve separable differential equations

-find derivatives of parametric and polar curves

-find partial derivatives

-evaluate multiple integrals

-understand convergence/divergence of simple sequences and series

-find a Taylor series

Indicator #2 (PA): Be able to apply knowledge of Calculus to solve a variety of applied problems, such as:

-hydrostatic force on a dam

-arclength, surface area, and volumes of revolution

-setting up models for differential equations

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 Science

Course Outline

PHY 1020U

Physics II

Winter 2020

Offering Approval:

Under Revision

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.

Major Topics:

- Electric charge and fields
- Gauss' Law
- Electric Potential
- Capacitance, current, and resistance
- Circuits
- Magnetic Fields
- Induction and Inductance
- Alternating current
- Electromagnetic waves
- Images, interference, diffraction
- Relativity

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%	100%	0%	0%	0%

Other Course Information:

Outcomes

#1 (KB/PA): Demonstrate a sound knowledge of, and be able to apply and solve problems using, physics theory related to electricity and magnetism, including:

a. Understand and calculate electric fields for point charges and continuous charge distributions.

b. Understand and calculate magnetic fields for point charges and currents.

c. Understand the role of changing electric and magnetic fields and calculate the induced electric field for a time varying magnetic flux.

d. Demonstrate and apply knowledge of electric and magnetic fields to the development of simple dc and ac circuits.

e. Demonstrate and apply knowledge of electromagnetism to optics and image formation.

#2 (KB): Demonstrate a good knowledge of physics laboratory techniques related to electricity and magnetism, including circuits and optics.

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:

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)
Jana Abou-Ziki Assistant Professor	PhD	FEAS	Manufacturing, Spark Assisted Chemical engraving, Hybrid additive-subtractive micro-manufacturing, surface functionalization, microfluidic devices, advanced manufacturing	Teaching Manufacturing Engineering courses, supervision of Capstone & core course developer	3-4 courses Manufacturing Engineering
Martin Agelin-Chaab Associate Professor	PhD	FEAS	Aerodynamics, Energy, Thermal Management	Teaching Thermo Fluid courses & supervision of Capstone	3-4 courses Mechanical Engineering
Ahmad Barari Associate Professor	PhD	FEAS	Advanced Manufacturing Technologies, Digital Manufacturing, Additive Manufacturing & Rapid Prototyping of Sculpted Surfaces, Manufacturing Surface Integrity, Surface Tribology, Topology Optimization, Measurement Uncertainty, Reverse Engineering/Surface Reconstruction	Teaching Manufacturing Engineering courses, supervision of Capstone & core course developer	3-4 courses Manufacturing Engineering
Ibrahim Dincer Professor	PhD	FEAS	Energy & Exergy Analysis, Energy Conversion & Management, Heat & Mass Transfer, Hydrogen and Fuel Cell Systems, Refrigeration,	Teaching Thermo Fluid courses, supervision of Capstone & core course developer	3-4 courses Mechanical Engineering

			Renewable Energies, Thermal Energy Storage, Thermodynamics		
Naglaa Elagamy Associate Teaching Professor	PhD	FEAS	Advanced Composite Materials Micro Commuted Tomography, Stress Simulation, Fatigue Assessment of Composite Structures, Prediction of Progressive Damage in Materials	Teaching – Fundamental Mechanical courses	6-7 courses Mechanical Engineering
Ramona Fayazfar Assistant Professor	PhD	FEAS	Additive Manufacturing, Innovative Material Development, Nanostructured Composites/Hybrid Materials, Surface Engineering/Surface Qualification of Additively Manufactured Parts, Advanced Coatings with Smart Properties, Electrochemical Synthesis Methods for Nanostructured Metals, Polymers and Composites, Smart Sensors for Point-of-Care Diagnostics, Batteries and Electro-catalysts	Teaching Manufacturing Engineering courses	3-4 courses Manufacturing Engineering
Kamiel Gabriel Professor	PhD	FEAS	Boiling and two-phase flows, Energy Conservation, Fluid Physics & Heat Transfer at Reduced Gravity, Heat-Recovery Systems	Teaching - Thermo Fluid courses & supervision of Capstone	3-4 courses Mechanical Engineering
Sayyed Ali Hosseini **Assistant Professor**	PhD	FEAS	Advanced Manufacturing, Machining Difficult-to-Cut-Materials, Surface Integrity Design & Optimization	Teaching Manufacturing Engineering courses, supervision of	3-4 courses Manufacturing Engineering

				Capstone & core course developer	
Dima Jawad Associate Teaching Professor	PhD	FEAS	Engineering Management	Teaching Engineering management courses	6-7 courses
Anand Joshi Academic Associate	PhD	FEAS	Renewable Energy, Hydrogen Energy, Thermal Energy	Teaching Fundamental Mechanical courses	6-7 courses Mechanical Engineering
Amirkianoosh Kiani Associate Professor	PhD	FEAS	Advanced Materials, Nanofabrication, Laser micro/nano fabrication	Teaching Manufacturing Engineering courses & supervision of Capstone	3-4 courses Manufacturing Engineering
Seama Koohi Associate Teaching Professor	PhD	FEAS	Energy Systems, Thermofluids, Renewable Energy, Heat Transfer, Energy Modelling and Simulation, Sustainable Energy	Teaching Fundamental Mechanical courses	6-7 courses Mechanical Engineering
Brendan MacDonald Associate Professor	PhD	FEAS	Fluid Mechanics, Thermodynamics, Sustainable Energy, External Heat Engines	Teaching - Mechanical courses & supervision of Capstone	3-4 courses Mechanical Engineering
Atef Mohany **Department Chair and Professor**	PhD	FEAS	Fluid-Structure Interactions, Aeroacoustics, Noise and Vibration Control	Teaching - Mechanical courses, supervision of Capstone & core course developer	3-4 courses Mechanical Engineering
Remon Pop-Iliev **Professor**	PhD	FEAS	Mechanical Engineering, Polymer Processing Technologies, Design Engineering, Manufacturing Engineering, Engineering Materials	Teaching - Mechanical Design courses, supervision of Capstone & core course developer	3-4 courses Manufacturing Engineering
Bale Reddy Professor	PhD	FEAS	Energy Systems, Solar Energy, Combustion & Gasification	Teaching - Thermo Fluid courses	3-4 courses Mechanical Engineering

Ghaus Rizvi Professor	PhD	FEAS	Polymers & Composites, Nano Composites, Polymer Processing, Bio Materials & Tissue Scaffols, Nano Fibres	Teaching - Material courses & supervision of Capstone	3-4 courses Manufacturing Engineering
Marc Rosen Professor	PhD	FEAS	Thermodynamics, Energy, Sustainability, Heat Transfer	Teaching - Thermo Fluid courses	3-4 courses Mechanical Engineering
Yuelei Yang **Senior Teaching Professor**	PhD	FEAS	Thermal/Fluid Systems, Engineering Design, Engineering Education	Teaching Mechanical courses, supervision of Capstone & core course developer	6-7 courses Mechanical Engineering
Murat Aydin Associate Teaching Professor	PhD	FEAS	Thermal Fluids, Thermodynamics, Computational Fluid Dynamics, Automotive Aerodynamics, Aerosol Transport, Fuel Cells, Constructal Theory	Teaching Fundamental courses & supervision of Capstone	6-7 courses Automotive/Mechatronic Engineering
Mikael Eklund Associate Professor	PhD	FEAS	Autonomous Systems, Nonlinear System Identification and Control, Medical Image Processing, Health Informatics, Pervasive & Mobile Commuting	Teaching Electrical Engineering courses	3-4 courses Electrical Engineering
Walid Morsi Ibrahim Professor	PhD	FEAS	Smart Grid, Signal Processing & Data Analytics, Automation, Protection, & Management of Power Systems	Teaching Electrical Engineering courses	3-4 courses Electrical Engineering
Qusay Mahmoud Associate Dean Experiential Learning and Engineering Outreach, Professor	PhD	FEAS	Software Systems, Web Engineering, Mobile Computing, Engineering Education	Teaching Software Engineering courses	3-4 courses Electrical/Software Engineering

Shahryar Rahnamayan Professor	PhD	FEAS	Software Engineering, Machine Intelligence, Opposition-Based Computation, Metaheuristics, Image Processing & Computer Vision, Parallel Processing, Multi-Objective & Large-Scale Optimization, Simulation of Discrete & Continuous Systems	Teaching Software Engineering courses	3-4 courses Software Engineering
Dr. Mihai Beligan Associate Teaching Professor	PhD	FSCI	Linear Algebra, Algebraic Structures, Calculus, Discrete Mathematics	Teaching – Foundational Mathematics courses (MATH 1010U, MATH 1020U, MATH 1850U)	7 courses • Applied and Industrial Mathematics Program • 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),	Contract dependent • Applied and Industrial Mathematics Program

				some advanced Mathematics (MATH 2860U)	• 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)

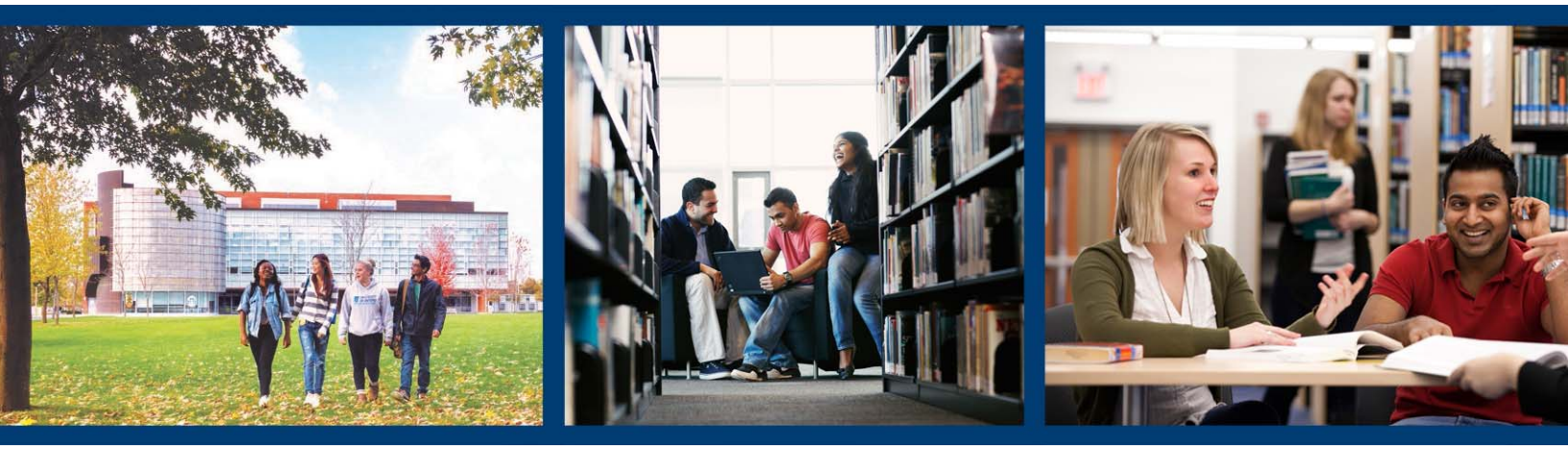
Dr. Joseph Macmillan Associate Teaching Professor	PhD	FSCI	Physics, Astrophysics, Cosmology, Physics Education Research	Teaching – Foundational Physics (PHY 1010U, PHY 1020U)	7 courses • Physics • Service Physics Courses (Science/Engineering)
Dr. Azar Shakoori Associate Teaching Professor	PhD	FSCI	Numerical 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 Industrial Engineering

Library Statement of Support Provided to Ontario Tech University

Prepared by: Kate Gibbings, Engineering and Applied Science Liaison Librarian, January 22, 2021



OntarioTech Library

Contents

1 Summary

Ontario Tech University Library's holdings for the Faculty of Engineering and Applied Science are strong, with a solid foundation of resources to support the Industrial Engineering program.

The Library collection includes coverage of core subjects such as Calculus, Physics and Chemistry; Manufacturing and Mechanical Engineering areas such as materials, solid mechanics, manufacturing systems, industrial automation and quality control; and Industrial Engineering areas such as operations research and human system integration.

Further, the collection has robust coverage of related and interdisciplinary subjects such as business, project management, programming, data analysis, artificial intelligence and machine learning.

The Library's research holdings, as well as archives and special collections, total more than 102,131 print volumes and 100,754 journal subscriptions. The Library provides access to more than 865,736 e-books and primary source materials. Collection strengths support the research and instructional programs at Ontario Tech University.

1.1 Resource Requirements

Include a summary of any resource requirements to support the program, indicating one time startup or ongoing funding requests:

Resource	Rationale	Budget Requirement	OTO or Ongoing
Books & eBooks	Address gaps in Library Collections	$5,000.00	OTO
Subscription Resources	Provide access to McGraw Hill Access Engineering digital resources	$12,000.00	Ongoing
Total		$17,000	

2 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 purchased by both Ontario Tech and Durham College. Additionally, the Library provides access to online resources including e-books and online databases that are selected to meet the teaching and research needs of Ontario Tech programs. Students and faculty are served 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.

3 Library Collections

The Library's collections expenditures across all disciplines total $1,664,480. Approximately 90% of this budget is allocated for the purchase of subscription online resources. The remainder of the budget is allocated for the acquisition of print and online resources to support the curriculum including journals, books and e-books, multimedia and other specialized material.

Our collections are well placed to support Industrial Engineering given the program's shared courses with existing programs, particularly Manufacturing Engineering. The Library collection includes coverage of core subjects such as Calculus, Physics and Chemistry; Manufacturing and Mechanical Engineering areas such as materials, solid mechanics, manufacturing systems, industrial automation and quality control; and Industrial Engineering areas such as operations research and human system integration.

Further, the collection has robust coverage of related and interdisciplinary subjects such as business, project management, programming, data analysis and artificial intelligence.

Gaps in specific subject areas relevant to this program will be addressed with targeted startup funds. Ongoing funding for a subscription to McGraw Hill Access Engineering will support not only this program, but other Engineering programs as well.

Suggestions for purchases from members of the University community are welcome. Faculty and students may suggest material for purchase using an online form. All recommended purchases are evaluated according to the Collection Development Policy and with consideration to budget constraints.

3.1 Consortial Licensing

By virtue of our membership in two key consortia, Ontario Tech University Library is able to take advantage of the increased bargaining power of a collective through which we subscribe to a wide array of scholarly content. Canada Research Knowledge Network (CRKN) members represent 81 institutions across Canada that include world-class academic libraries and research institutions, two national libraries, and Canada's largest public library system. Through the coordinated leadership of librarians, researchers, administrators and other stakeholders in the

research community, CRKN undertakes large-scale content acquisition and licensing initiatives in order to build knowledge infrastructure, research, and teaching capacity in Canada's universities.

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.

3.2 Journals

The Library almost exclusively acquires online journals and provides access to more than 100,754 across all disciplines. The Library's collection of academic journals in disciplines related to Industrial Engineering is strong, including coverage related to Manufacturing, Mechanical, Electrical, and Software Engineering as well as Business.

Students and researchers can access nearly complete journal suites, in many cases including archives, from publishers such as:

- ACM
- ASME
- ASTM
- 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 Industrial and Manufacturing Engineering categories of Scimago's Journal and Country Rank (2019) and Clarivate's Journal Citation Reports database (2018).

By subject category:

Subject Category	Ontario Tech Access	Select Titles
Industrial and Manufacturing Engineering (Scimago Journal and Country Rank, 2019)	50 of Top 50	• International Journal of Machine Tools and Manufacture • Journal of Operations Management • International Journal of Production Economics • Additive Manufacturing • Journal of Manufacturing Systems • Reliability Engineering and Systems Safety • Journal of Industrial Information Integration
Engineering, Mechanical (Clarivate Journal Citation Reports, 2018)	108 of Top 115	• IEEE-ASME Transactions on Mechatronics • Mechanism and Machine Theory • Journal of Vibration and Control • Journal of Manufacturing Science and Engineering

3.3
3.4 Books & E-Books

Targeted **startup funding of $5,000** will enable us to acquire books and ebooks to address gaps identified in the collection in the following subject areas:

- Industrial ergonomics
- Internet of Things
- Cyber-physical systems
- Machine learning
- Life cycle engineering
- Lean manufacturing

Ongoing funding of $12,000 is required in order to purchase subscription access to:

- **McGraw Hill Access Engineering**: Digital library of Engineering textbooks, handbooks, reference works, videos and data tools. Includes more than 64,000 entries relevant to Industrial Engineering. McGraw Hill does not typically license individual textbooks and reference works to Libraries and a subscription to Access Engineering is the only way we

are able to provide access to this content. This subscription will support other Engineering programs as well.

The Library at Ontario Tech University provides access to 102,131 print books and 865,736 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:

- Butterworth-Heinemann
- Cengage
- CRC Press
- Elsevier (including Woodhead)
- IEEE
- IET
- Industrial Press
- Morgan & Claypool
- Pearson
- Routledge/Taylor & Francis
- Springer
- Wiley

The following table highlights Library holdings by subject heading for print books and e-books that encompass the Library's Industrial Engineering collection.

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.

Subject	# Print Books	# E-Books
Industrial engineering	41	2,334
Engineering design	158	2,907
Materials	1,106	20,902
Human engineering, Human system integration (Industrial ergonomics)	77	430
Operations research	42	4,943

Subject	# Print Books	# E-Books
Plant engineering, Plant layout	29	1,999
Manufacturing processes	162	619
Production engineering	63	2,213
Lean manufacturing	30	77
Internet of Things	10	643
Artificial intelligence	121	19,704
Machine learning	34	1,770
Computer integrated manufacturing systems	30	112
Engineering economy	21	2,717
Quality control	376	4,450
Reliability, Plant maintenance	167	3,268
Data analytics, Big data (Industrial)	14	1,119
Automation (Industrial)	71	4,499
Systems engineering	97	3,719
Product life cycle	24	163
Cyber-physical systems	1	286
Engineering ethics	41	481
Project management	200	1,337

3.5 Search Tools

The Library subscribes to many research databases and indexes that provide access to the literature in Industrial 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: Multidisciplinary & Business	Relevant Databases: Standards
• ACM • ASME • ASTM Digital Library • Engineering Village (Inspec and Compendex) • Elsevier ScienceDirect • IEEE Xplore • SciTech Premium Collection • SpringerLINK	• Scopus • Web of Science • Business Source Complete • ABI/Inform Complete • CBCA: Business • Mergent • Statista	• CSA OnDemand • ASME Standards • ASTM Standards • Techstreet Enterprise

3.6 Other Resources

3.6.1 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.

3.6.2 Statistics & Data Resources

To support research that requires statistics and datasets, the Library subscribes to four main resources. Statista provides access to Canadian and international statistics and data from over 18,000 sources including industry reports. Datasets are available from Statistics Canada's Data Liberation Initiative (DLI), odesi, and the Interuniversity Consortium for Political and Social Research (ICPSR).

The Library also provides access to Dataverse, a repository that supports research data management and open access data requirements for Tri-Agency research funding compliance.

3.6.3 Multimedia Resources

The Library acquires DVD and streaming video resources that are relevant to Faculty of Engineering and Applied Science programs. 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.

3.6.3.1 Relevant Streaming Video Collections

Streaming Video Collection	Relevant Titles
Kanopy	• Engineering: 254 videos • Business: 1,124
CBC Curio	• Math, Science & Technology: 1,203

3.6.3.2 Select Multimedia Titles

- The Future of Work and Death: The Impact of Technological Advances on Human Life. (2015). First Run Features.
- Leaner, Meaner Production. (2015). The Great Courses: Critical Business Skills.
- Manufacturing Adapts to Keep up with Demand During Pandemic. (2020). The National (CBC).

4 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.

4.1 Research Support

The Library plays a vital role in supporting student and faculty research at Ontario Tech.

4.1.1 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 are available for individualized research consultations with students and faculty, in person or online. 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.

4.1.2 Open Access & Research Data Management

The Library provides 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 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). The Library has a Research Data Management guide

(http://guides.library.uoit.ca/rdm) to support faculty and students in creating data management plans and sharing research data.

During the 2019-20 academic year, these guides were viewed 572 times.

4.1.2.1 Research Metrics & Impact

The Library 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.

4.1.3 Theses & Dissertations

The Library ensures that the Ontario Tech community has access to national and international thesis and dissertation databases. 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.

4.2 Teaching & Learning Support

As partners in teaching and learning at Ontario Tech, the Library provides a range of instructional and curriculum supports, both in person and online.

4.2.1 Information Literacy Instruction

In collaboration with teaching faculty, Librarians deliver customized information literacy instruction that support 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 direct 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. The following courses have been identified 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.

- **SSCI 1470: Impact of Science and Technology on Society**
- **ENGR 4950: Capstone Systems Design for Mechanical, Automotive, Mechatronics and Manufacturing Engineering I**
- **ENGR 4951: Capstone Systems Design for Mechanical, Automotive, Mechatronics and Manufacturing Engineering II**

4.2.1.1 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:

- 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.

4.2.2 Online Research Guides

Subject specialist librarians create custom Research Guides for each subject area that are available from the Library 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 Industrial Engineering include:

- Library Research for Engineering Students: https://guides.library.uoit.ca/engineering
- Manufacturing Engineering: https://guides.library.uoit.ca/man-eng
- Mechanical Engineering: https://guides.library.uoit.ca/mech-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 3,612 times. The Library's Citation guide was viewed 6,447 times.

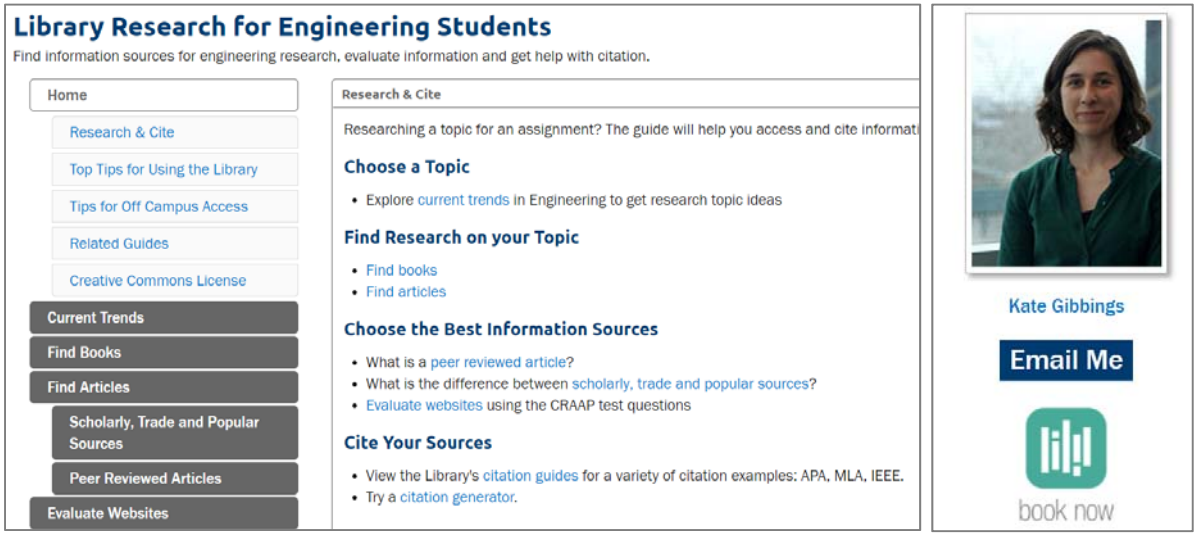


Figure 1 Library Research for Engineering Students Guide

4.2.3 Copyright & Academic Integrity

The Library provides copyright advice for faculty and students. Library staff advise on license terms and the integration of content into the Learning Management System (LMS). The Library also helps 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.

4.2.4 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.

4.2.5 3D Printing & Equipment Loans

Students have access to 3D printers and 3D printing workshops and can borrow equipment such as laptops and device chargers.

4.3 Library Staffing

The anticipated intake for students in the Industrial Engineering program for years 1-5 is as follows:

- Year 1: 40 students
- Year 5: anticipated program growth to 50 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.

5 Conclusion

The Library is well-positioned to support the Industrial 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 advanced instruction in courses such as ENGR 4950, ENGR 4951, and other courses with research components.

We look forward to working in collaboration with students and faculty in this new program.

Enrolement	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28
Year 1	40	50	60	60	60	60
Year 2	0	34	43	51	51	51
Year 3	0	0	32	40	48	48
Year 4	0	0	0	31	38	46
Year 5	0	0	0	0	29	38
TOTAL New Students	**40**	**82**	**129**	**173**	**217**	**232**

Revenue	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28
Domestic Tuition	$440,935	$931,034	$1,508,616	$2,083,879	$2,692,299	$2,964,755
International Tuition	$122,123	$257,863	$417,832	$577,159	$745,670	$821,130
Grant	$161,060	$268,214	$463,535	$624,913	$775,991	$834,362
Total Revenue	**$724,119**	**$1,457,111**	**$ 2,389,984**	**$ 3,285,952**	**$ 4,213,960**	**$ 4,620,248**

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	18	40	56	68.5	68.5	68.5
# of tutorials	11.75	22.25	38	49.5	49.5	49.5

Required Hires	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28
# of TTT	0	1	3	5	5	5
# 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	$ -	$ 139,113	$ 429,859	$ 737,924	$ 760,062	$ 782,864
FT Benefits (18.5%)	$ -	$ 25,736	$ 79,524	$ 136,516	$ 140,611	$ 144,830
FT Total	**$ -**	**$ 164,849**	**$ 509,383**	**$ 874,440**	**$ 900,674**	**$ 927,694**
PT Faculty	$ -	$ -	$ -	$ -	$ -	$ -
Additional TAships	$ 16,466	$ 36,151	$ 57,763	$ 65,849	$ 69,142	$ 72,599
TAs	$ 70,356	$ 139,888	$ 250,855	$ 343,110	$ 360,266	$ 378,279
Lab Instructors	$113,451	$ 264,720	$ 389,138	$ 499,799	$ 524,789	$ 551,028
PT Benefits (11%)	$22,030	$48,483	$76,753	$99,963	$104,962	$110,210
PT Total	**$222,303**	**$ 489,242**	**$ 774,509**	**$ 1,008,722**	**$ 1,059,158**	**$ 1,112,116**
Total Academic Salaries	**$222,303**	**$ 654,090**	**$ 1,283,891**	**$ 1,883,162**	**$ 1,959,832**	**$ 2,039,810**

Support Staff Salaries	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28
Engineering Lab Technician	$0	$61,596	$61,596	$61,596	$61,596	$61,596
0	$0	$0	$0	$0	$0	$0
0	$0	$0	$0	$0	$0	$0
0	$0	$0	$0	$0	$0	$0
0	$0	$0	$0	$0	$0	$0
Benefits (18.5%)	$0	$11,395	$11,395	$11,395	$11,395	$11,395
Total Support Staff Salaries	**$0**	**$72,991**	**$72,991**	**$72,991**	**$72,991**	**$72,991**

Operational Expense	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28
Instructional Supplies	$22,000	$17,000	$17,000	$29,000	$29,000	$29,000
Start-up	$0	$30,000	$90,000	$120,000	$60,000	$0
PD ($2,000/ faculty)	$0	$2,275	$6,825	$11,375	$11,375	$11,375
Travel	$0	$0	$0	$0	$0	$0
Recruitment/Moving Expenses	$0	$16,000	$32,000	$32,000	$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	$20,000	$20,000	$20,000	$20,000
TOTAL Operating	**$22,000**	**$65,275**	**$165,825**	**$212,375**	**$120,375**	**$60,375**

Capital	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28

initial lab equipment	$0	$350,000	$0	$0	$0	$0
0	$0	$0	$0	$0	$0	$0
0	$0	$0	$0	$0	$0	$0
TOTAL Capital	$0	$350,000	$0	$0	$0	$0

Total Expenses	$244,303	$1,142,357	$1,522,708	$2,168,529	$2,153,198	$2,173,176

NET Income with Grant	$479,816	$314,754	$867,276	$1,117,423	$2,060,762	$2,447,071
NET Income without Grant	$318,755	$46,541	$403,741	$492,509	$1,284,771	$1,612,709

Appendix G – Feedback from Stakeholders

Atef Mohany, PhD., P.Eng., Professor and Chair
Department of Mechanical and Manufacturing Engineering Faculty of Engineering and Applied Science
Ontario Tech
University 2000
Simcoe Street North
Oshawa, ON, Canada L1H 7K4
email: Atef.Mohany@ontariotechu.ca

November 25, 2021/#6686681

Subject: Professional Opinion letter on the value of Ontario Tech Proposed new Undergraduate Program- Industrial Engineering/Industrial Engineering & Management

Dear Professor Mohany,

It is my pleasure and honour to write this letter to provide my professional opinion on the value of the newly proposed undergraduate program of Industrial Engineering/Industrial Engineering & Management.

Let me start this letter by recognizing how important it is that universities and colleges prepare students highly skilled in science, technology, engineering and mathematics (STEM) so they can contribute to the ability of Canada to support technological innovation. Continuous and disrupting innovations in technologies and manufacturing, changes in nature and how we do the work along with shifts in demographics and expansions in the scope of occupations needing a STEM competent workforce raises questions about how well the current education system is meeting the full array of 21st century needs. Throughout my work, I was blessed with the opportunity to work with several dozens of students coming to our organization for the summer or co-op employment and have first hand experience that students are not adequately prepared to translate their knowledge into impact in possibly multiple careers.

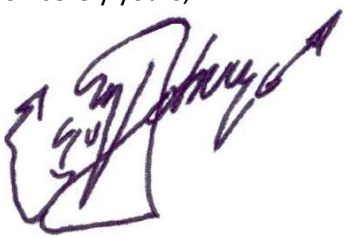
It was quite encouraging to review the newly proposed program in Industrial Engineering/ Industrial Engineering and Management. The Ontario Tech University program builds on the substantial strengths of the current education program but better meets the evolving needs of its students, a wide range of industries, and the whole nation. We are witnessing how big data, artificial intelligence, machine learning, advanced/additive manufacturing and other developments in science and technology are expanding the ways industry thinks about applying these advances. Proposed program in Industrial Engineering and Management actively embraces and integrates these new areas in educating and training

the STEM workforce of the 21st century. The proposed program will produce modern engineers, stimulate their curiosity and enable them to develop intellectual capacity to identify, formulate and design solutions for complex problems.

In my opinion, students would acquire broad technical literacy coupled with deep engineering design and problem-solving specialization. They would acquire core competencies and knowledge base, but also would have multiple opportunities to understand better and to practice teamwork and people management skills, to learn to consider ethical issues and societal impact associated with their work as engineers. This program would help students to develop skills that transcend disciplines and apply in a range of industries and governments. This is especially important as the modern industries and businesses are characterized by the convergence of traditionally narrowly defined scientific and engineering disciplines.

In summary, the Ontario Tech University proposed program in Industrial Engineering/Industrial Engineering and Management meets market and workforce demand in good part since it is flexible and it opens multiple career pathways for students. The program will create employment and economic growth benefits for Ontario and Canada, support technical infrastructure and capacity for technological innovation as well as to broaden expertise to address global issues such as energy reliability and climate change.

Sincerely yours,



Jovica R Riznic, *PhD.*, *P.Eng.*, *FASME*

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About the Reviewer

Jovica R Riznic, *PhD., P.Eng., FASME, FNureth* is a Technical Specialist at the Canadian Nuclear Safety Commission (CNSC), working on regulatory analysis and assessment of technical issues with operating nuclear power plants (NPP). He served CNSC on various position, including nuclear safety analysis and managing the CNSC Research and Support Program. He is an adjunct professor/thesis advisor at the University of Waterloo and Purdue Universities and a faculty at Algonquin College in Ottawa in the School of Business and the Centre for Continuing and Online. He conducted research at Argonne National Laboratory, Purdue University and University of Wisconsin-Milwaukee

in the areas of heat and mass transfer, nuclear reactor thermal hydraulics, multi- phase thermo-fluid systems, nuclear reactor safety and reliability, and engineering management. He is currently coordinating a team providing Canadian contribution to a number of international research projects with US Nuclear Regulatory Commission (NRC), Nuclear Energy Agency of the Organization for Economic Cooperation and Development (OECD NEA) and International Atomic Energy Agency (IAEA) to address issues of material degradation and safe operation of piping components and steam generators of CANDU and Light Water Reactors. Also, he leads a team of researchers working with Purdue University on refining the CANTIA methodology for steam generator tube integrity and leakage inspection and probabilistic assessment. Currently he serves as the Chair of the ASME Nuclear Engineering Division Committee of Past Chairs. Jovica is recipient of 2021 George Westinghouse Gold Medal awarded by the American Society of Mechanical Engineers.

KINECTRICS

November 20th, 2021

Atef Mohany, PhD., P.Eng., Professor and Chair Department of Mechanical
and Manufacturing Engineering Faculty of Engineering and Applied Science
Ontario Tech University 2000 Simcoe
Street North
Oshawa, ON, Canada L1H 7K4

Dear Prof. Mohany,

This letter is prepared in support of the Faculty of Engineering & Applied Science's proposal to introduce new undergraduate programs for Industrial Engineering and Industrial Engineering & Management at Ontario Tech University. As technical engineering experts with Kinectrics Inc., we strongly support this initiative to a growing need for engineers that have the necessary skills to solve interdisciplinary challenges in a variety of engineering fields such as power generations, oil and gas industries, construction, and site development.

As a worldwide category leader in providing engineering & management services for the electricity industry, Kinectrics collaborates with utilities to ensure that their assets perform safely, reliably, and efficiently throughout their entire life cycle from initial design and type testing to managing operational and maintenance issues. Our expertise in engineering, testing, inspection, and certification is backed by our independent laboratory and testing facilities, a diverse fleet of field inspection equipment and an award-winning team of over 1,000 multi-disciplinary engineers and technical experts.

We, the undersigned, have reviewed the proposed programs for Industrial Engineering and Industrial Engineering & Management. It is our opinion, that the programs are quite detailed and offer undergraduate students the potential for a wide enhanced versatile skillset via well designed hands-on and project-based courses led by internationally renowned staff, the faculty's research lab including its infamous Automotive Centre of Excellence (ACE) facility, and the on-campus facilities and student support programs. The proposed programs fulfil recognized demands for engineers who

KINECTRICS

have been trained in key fields such as human factors, automated systems, human system integration and ergonomics, process design, stochastic modeling, and industrial data analytics. In other words, the proposed programs integrate several engineering disciplines to optimize complex engineering processes by implementing innovative integrated systems of people, knowledge, and equipment with financial effectiveness.

We recognize the benefits of the proposed industrial engineering undergraduate programs at Ontario Tech University. Graduates of the programs will fill the recognized demand in the workforce for trained professionals who can engage in many activities, such as supply chain management, quality assurance, and project management, that are becoming integral parts of many industries. Kinectrics as many other engineering sectors in today's marketplace should benefit from graduates of the proposed programs.

We look forward to hearing about the success of the Industrial Engineering and Industrial Engineering & Management programs and engaging with their graduates.

Sincerely,

Ayman Saudy, P.Eng., PhD Senior
Technical Expert Design
Engineering & Sites

Email: ayman.saudy@kinectrics.com

Concurred by:

Tamer B. Sabrah, PhD, P.Eng.
Director, Engineering Programs
Design Engineering & Sites

Email: tamer.sabrah@kinectrics.com

November 22, 2021

Atef Mohany, PhD., P.Eng., Professor and Chair

Department of Mechanical and Manufacturing Engineering

Faculty of Engineering and Applied Science

Ontario Tech University

2000 Simcoe Street North

Oshawa, ON, Canada L1H 7K4

Dear Dr. Mohany,

As a member of the Industry Advisory Committee, Mechanical and Manufacturing Engineering at Ontario Tech University, I am in support of the Faculty of Engineering & Applied Science's proposal to introduce new undergraduate programs for Industrial Engineering and Industrial Engineering & Management at Ontario Tech University. I firmly believe that this initiative is timely and necessary to address the growing demand for industrial engineers in the marketplace.

As an engineering professional with over the past 20+ years in a variety of industries including automotive manufacturing, digital media, technology, banking, and management consulting, I have seen first-hand the value of engineers who are able to work cross-functionally across disciplines, understanding the end-to-end processes in order to develop robust and sustainable solutions.

The proposed program for Industrial Engineering and Industrial Engineering & Management are quite detailed and offer undergraduate students a versatile skillset and will set them up for success. The program adapts an innovative curriculum with the integration of some unique courses that address the rapid industrial evolution and the use of artificial intelligence to solve real world industrial problems. Examples of these courses include Industrial Cyber-Physical Systems (INSE 4248U), Human-System Integration (INSE 4170U), Industrial Data Analytics (INSE 3245U), Industrial Internet of Things (INSE 3142U), and Artificial Intelligence and Machine Learning (ENGR 3150U),

The learning outcomes of the program will equip the graduates with unique skillsets to address the evolving workplace and fulfill the current demand in the workforce for well-trained industrial engineers that are integral parts of many industries. These graduates will be highly sought after, including in technology, banking and financial services, and management consulting.

I look forward to hearing about the success of the Industrial Engineering and Industrial Engineering & Management programs and engaging with their graduates.

Sincerely,

Karen Chan

Karen Chan, FEC, P.Eng, MBA
Founding Member and Senior Coach, ADAPTOVATE Toronto

Past-President and Chair, Ontario Society of Professional Engineers

Dear Dr. Mohany,

As a member of the Industry Advisory Board at the Department of Mechanical and Manufacturing Engineering, Ontario Tech University, I have had the opportunity to read the full proposal to start an Industrial Engineering (IE) Bachelor of Engineering (BEng.) program, starting on the school year 2022-2023.

I would like to advise your respectful committee that I am in support of this program and would strongly encourage a decision to approve its commencement as proposed.

The reasons for my support of the proposed program are summarized as follows:

1- The program proactively responds to confirmed global increase in demand for industrial engineers over the coming decades, in a way well vested to secure a lead for the Canadian academic institutions and its graduates both on the national and international levels in this engineering specialization.

2- The proposed program even advances its graduates several steps ahead of graduates of other more classical IE programs, thanks to the proposed inclusion of many state-of-the-art topics such as Artificial Intelligence (AI), Machine Learning (ML), Internet of Things (IoT) and Data Analytics in support of the program's innovative focus on the design of Cyber-Physical systems.

3- Based on my experience in the nuclear power industry and tracking the trends in job market required skills, the program courses equip the graduates well for meeting emerging challenges in these areas (e.g., AI/ML/IoT). There is high demand by employers in various business sectors for these skills to support and sustain initiatives related to, e.g. digital transformation and remote monitoring, analysis and control of complex systems and big data, preferably combined with proper knowledge and skills in engineering and management.

4- The well prepared proposal, schedule and financial projection, as well as the proven success records of Ontario Tech University faculty and facilities demonstrate adequate preparedness for effectively proceeding with the program and sustaining its growth, while meeting and exceeding the applicable accreditation criteria.

Based on the above, I would like to invite your respectful committee to approve the proposed Industrial Engineering program as it will be a valuable addition to the highly reputable academic portfolio of the MME department at Ontario Tech University.

Sincerely,

Ahmed Omar November 22, 2021

Ahmed Omar, PhD., PEng., MCPM
Operations Training Specialist, Ontario
Power Generation

Enbridge Gas Inc.
500 Consumers Road
North York, Ontario M2J 1P8
Canada

November 29, 2021

Atef Mohany, PhD.,
P.Eng Professor and
Chair
Department of Mechanical and Manufacturing Engineering
Faculty of Engineering and Applied Science
Ontario Tech
University 2000
Simcoe Street North
Oshawa, ON, Canada L1H 7K4

Re: Letter of Support for the Industrial Engineering and Industrial Engineering & Management Program

Dear Atef Mohany,

Enbridge Gas Inc. is pleased to provide our support for the proposed new undergraduate program for the Industrial Engineering and Industrial Engineering & Management discipline. Enbridge has been a part of the Industry Advisor Committee for the Mechanical and Manufacturing Engineering Department of the Ontario Tech University since 2017 and have observed significant progress in program designs to meet industry needs. We believe that the proposed new Industrial Engineering program will help address the current demand for Industrial Engineers in the marketplace.

Enbridge Gas is North America 's largest natural gas storage, transmission and distribution company, serving over 3.8 million customers, and heating over 75 percent of homes across Ontario. We use our assets to deliver affordable energy to our customers. We also deliver a range of energy conservation programs which improve the energy efficiency of our customer's homes and businesses. Furthermore, Enbridge Gas is advancing the development of innovative low carbon technology solutions to help achieve Canada's net-zero emission goal by 2050.

Enbridge recognizes that there is a growing need for engineers to have the necessary skills to solve the complex interdisciplinary challenges along the path to energy transition towards a low carbon economy. The proposed program includes several courses such as Artificial Intelligence and Machine Learning, Internet of Things and Human-System Integration that will prepare students to meet the growing demand for these skillsets from various industries including energy companies such as Enbridge.

We look forward to our continued engagement with the Industry Advisory Committee, in particular, with a view to providing direct industry input in order to help prepare graduates of this program successfully enter the marketplace.

Wishing you all the best for a successful launch of this exciting new Program.

Sincerely,

Aqeel Zaidi, P.Eng.

Supervisor, Technology and
Development Enbridge Gas Inc.

Reviewers' Report on the Proposed Bachelor of Engineering in Industrial Engineering Program at Ontario Tech University

J. Pemberton Cyrus, Ph.D., P.Eng., FEC

Head, Department of Industrial Engineering

Dalhousie University

PO BOX 15000

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Waguih ElMaraghy, Ph.D., P.Eng., OOH, FEC, FCAE, FCSME, FASME, FCIRP, FSME

Professor, and Director, Intelligent Manufacturing Systems Centre (IMSC)

Department of Mechanical, Automotive, and Materials Engineering (MAME), Faculty of Engineering, University of Windsor,

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Canada N9B 3P4

Email: wem@uwindsor.ca

1. OUTLINE OF THE REVIEW

The site visit was virtual, with meetings on Google Meet and video tours of labs and other facilities.

Personnel Interviewed:

- Langis Roy, Interim Deputy Provost
- Hossam Kishawy, Dean, Faculty of Engineering and Applied Science
- Atef Mohany, Department Chair and Professor (Chair, New Program Committee)
- Min Dong, Associate Dean, Chair of Engineering Curriculum Committee
- Remon Pop-Iliev, NSERC-GMCL Chair in Innovative Design Engineering, Professor
- Hidayat Shahid, Associate Dean (teaching labs)
- Govind Rehal, Manager, Technical Services
- Ahmad Barari, Faculty
- Dima Jawad, Faculty
- Jana Abou Ziki, Faculty
- Reman Pop-Iliev, Faculty
- Sayyad Ali Hosseini, Faculty
- Krishma Karim, staff
- Stephanie Costanza, staff
- Bryan Lee, staff
- Candace Chard, staff
- Lindsay Smith, staff
- Kerry Morrison, staff

Labs visited:

- Manufacturing Process
- Fluid and Heat Transfer
- Combustion and HVAC
- Machine Shop
- Automotive Engineering (component testing)
- Component Design
- Automotive Engineering (auto subsystems)
- Vibrations
- Design Engineering
- Alternative Energy
- Electrical Machines, Communications and Power
- Control Systems
- Robotics and Automation
- Electronics
- Robotics and Mechatronics
- Design Studio

The following documents were reviewed:

- Integrated Academic-Research Plan
- 2020-2025 Strategic Mandate Agreement: Ontario Tech University
- Faculty CV's
- Industrial Engineering (New Undergraduate Program Proposal)
- Ontario Universities Quality Assurance Framework
- Vision, mission and values (Ontario Tech University)

2. EVALUATION CRITERIA

NOTE: Reviewers are asked to provide feedback on each of the following Evaluation Criteria (Quality Assurance Framework 2021, page 17).

2.1 Program Objectives

The objective is to start a new Industrial Engineering program, with an option to integrate a year of management education to produce an "Industrial Engineering and Management" stream. The program will be heavily experiential and will have the opportunity for coop.

The program objectives were clearly stated. There is a need to support the choice of program objectives by including a narrative that connects the recommendations of the industrial advisory board to the development of the program.

The name of the degree is appropriate for these program objectives.

This new program is consistent with the university's mission to "Embrace technology with a conscience…". Industrial Engineering, as a "people-oriented" discipline, will advance this mission.

2.2 Program requirements

The program is structured like the existing engineering programs: a strong two-year education in natural science, mathematics, and engineering science followed in the latter two years by specialized engineering science and engineering design. There is an appropriate level of complementary studies as represented by arts, social science, and financial modelling courses. The engineering courses are very heavy on lab experience, with coop options available to students.

The program is built on courses from the existing mechanical, mechatronics and manufacturing engineering programs, with ten new industrial engineering courses to create the new specialty. The new courses target emerging and trendy topics such as Industry 4.0, data analytics, and the internet of things – this is one of the strong points of the program design.

The program structure and requirements are appropriate for its objectives and program-level learning outcomes.

The program structure, requirements, and program-level learning outcomes are appropriate to meet undergraduate degree level expectations for an engineering program: twelve years of primary and secondary education which includes education in English, mathematics, and the physical sciences, followed by four

years of engineering education. The heavy focus on labs ensures that the students receive the experiential education needed for an engineer.

The curriculum addresses the current state of the discipline. The foci on the Internet of Things, Industry 4.0, and data analytics are commendable. There is, however, insufficient focus on the use of software tools – the primary method by which current and future industrial engineers operate.

2.4 Assessment of teaching and learning

The program-level learning outcomes are based on the Engineering Graduate Attributes and are stated as follows:

1. Apply knowledge of mathematics, physics, chemistry, engineering science, and engineering design to identify, formulate, analyze, and solve problems.
2. Understand and apply engineering design, manufacturing, and production processes to industrial engineering systems.
3. Make use of computer-aided engineering software tools to solve problems and to acquire and process data.
4. Demonstrate strong independent learning and analytical skills and be an effective member of multidisciplinary and multi-cultural teams, either as a team member, system analyst or as a project manager.
5. Communicate effectively in written, spoken, and visual form with both technical experts and with members of the general public on engineering matters.
6. Recognize and describe the value of alternative outlooks that people from various social, ethnic and religious backgrounds, as well as professions, may bring to industrial engineering. Understand and apply various knowledge and methodologies for design, analysis and assessment purposes, social, environmental and economic impact assessments.
7. 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.

These program-level learning outcomes map to the engineering graduate attributes required for engineering accreditation of the program:

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

The assessment methods for the courses are appropriate and mapped to the graduate attributes and learning outcomes. Plans for using the Engineering Graduate Attributes as a target for assessment will ensure the achievement of learning outcomes. The graduate attributes will also be used in the program's and faculty's continuous improvement processes, ensuring that, in time, improvements will conform to the achievement of the graduate attributes.

2.5 Admission requirements

The plan is to use the engineering admission standards currently in use. This ensures that students entering the program have 12 years of primary and secondary education and strong preparation in mathematics, the physical sciences, and English. These admission requirements are sufficient.

2.6 Resources for all programs

The department has well-equipped labs in mechanical and manufacturing engineering but no laboratories in industrial engineering. The existing labs will have enough capacity for the new students.

Within the department, there is a strong group of nineteen faculty members with very good research programs and extensive teaching experience in mechanical and manufacturing engineering who will be available to teach in the new industrial engineering program. Seven faculty members are "*core course developers for the New Program*". Only a couple of these faculty members could be considered within the industrial engineering discipline (engineering management, engineering design, manufacturing systems, and data analytics). In addition, sixteen more faculty

members in other departments and Faculties will be available to teach preparatory, core, and elective courses.

There are insufficient industrial engineering (IE) faculty currently – this deficit is entirely because of the department's lack of industrial engineering specialists. This is understandable because the industrial engineering program does not yet exist. The plan to hire five new industrial engineering faculty will provide the minimum coverage needed for: “industrial engineering” specific courses, supervision of capstone projects in IE, and leadership of IE labs. To attract high-quality new faculty, plans must be made to create new IE labs in ergonomics, work design, and manufacturing system integration. These labs will also be needed to provide the IE students with experiential education in the core areas of their discipline. If they have spare capacity, efforts should be made to share lab facilities available in other faculties and colleges nearby.

The proposed six-year enrollment projection and personnel budget seem reasonable, including provision for new faculty, technician staff and support staff such as TA's and lab instructors. There is no provision for part-time, adjunct or limited term faculty. The operational expense budget is too low and seems unrealistic. We note that there is no provision for capital expenditure, but this will be needed if new labs are to be built.

The library report concludes that there are sufficient resources to support the new program initially. Still, some targeted funding will be necessary to augment the library holdings as the enrollment and faculty members grow.

2.8 Quality and other indicators

The existing faculty are of high quality and are highly qualified to teach the current courses used in the program's core. Still, there is a lack of industrial engineers in the Faculty complement. There is a need to hire multiple faculty who specialize in industrial engineering in order to create the credibility of the new program.

3. OTHER ISSUES

It is not clear how stakeholders were consulted in preparing this proposal. In particular, the industry advisory board (IAB) should be asked to provide letters of support, and the IAB's need for industrial engineering graduates should be referenced as support for this new program. Active consultation with the indigenous community will strengthen this proposal.

4. SUMMARY AND RECOMMENDATIONS

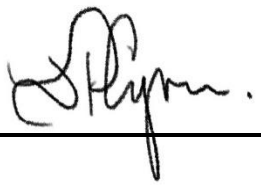
Summary:

This is an exciting new approach to industrial engineering that uses the latest ideas in Internet of Things, system integration and industry 4.0 – it builds on the faculty's significant existing resources in manufacturing and mechanical engineering. The proposal needs some amendments as indicated in this reviewer's report.

Recommendations:

1. Create industrial engineering specific capstone projects in cooperation with industrial partners.
2. In multi-disciplinary projects, ensure that there are at least two industrial engineering students in a team.
3. Prioritize hiring industrial engineering Faculty first in ergonomics, operations research and systems, to fill the gaps in industrial engineering knowledge.
4. Integration of knowledge from multiple courses should be attempted, e.g. by using dual-course projects as done in the past. It is important for students to remove the silos around knowledge areas and use them in solving "big" industrial engineering problems.
5. Document the stakeholder consultation with industry and the indigenous community.
6. List all existing software to be introduced in the courses, and specify examples of new industrial engineering software to be purchased.
7. Develop new labs in the areas of ergonomics, work design and manufacturing systems integration.
8. Explore the use of appropriate labs in Faculties and Colleges in close proximity to the Faculty of Engineering and Applied Science.
9. The Graduate Attribute mapping (learning outcomes) needs to be revised to more closely match the level of the course outcomes to the "IDA" mappings (there are many "A" mappings which may not be appropriate.)
10. The AU tables need to be revised with careful attention to design units, and especially to assignment of Accreditation Units where engineering design must be taught by licensed engineers.
11. The mechanical and manufacturing engineering content in the program can be reduced in the future when there are enough industrial engineering faculty members to teach new courses. This could allow the program to focus more on systems ideas.
12. Advising staff is new; there is a duplication of effort and advisors should report to the program or faculty. The Associate Dean should be the sign-off for student advice.
13. Health, safety and sustainability (economic and environmental) should be explicitly included in the curriculum.
14. Recent changes to the accreditation criteria allow less courses in a degree. A lower workload per semester may be advisable. This will reduce the stress on students, improving mental health outcomes.

15. Revise the budget to account for capital and operational costs, and part-time instructors (if relevant).

Signature: 

Date: **2021-10-28**

Signature: 

Date: 28 October 2021

Undergraduate New Program Virtual Site Visit Agenda

Industrial Engineering - Faculty of Engineering and Applied Science

October 5-6, 2021

Reviewer(s):
Dr. J. Pemberton Cyrus, Dalhousie University
Dr. Waguih ElMaraghy, University of Windsor

All meetings will take place with the google meet link below:

Google Meeting Room Information:

Day 1 – Tuesday, October 5, 2021

Time	Location	Details	People
9:15-9:30 a.m.		Checking of tech requirements	**Kimberley McCartney,** CIQE **Kelly Crocker**, FEAS
9:30-10:00 a.m. 10:30-11:00 a.m. (Atlantic Standard Time)		Welcome Review of Agenda	**Dr. Langis Roy**, Interim Deputy Provost **Dr. Hossam Kishawy**, Dean of Faculty of Engineering & Applied Science (FEAS) **Dr. Atef Mohany**, Chair of New Program Committee **Dr. Min Dong**, Chair of Engineering Curriculum Committee **Kimberley McCartney,** Curriculum and Pathways Analyst, CIQE
Break – only reviewers present			
10:15-11:45 a.m. 11:15 a.m. -12:45 p.m. (Atlantic Standard Time)		Overview of the program	**Dr. Hossam Kishawy**, Dean of Faculty of Engineering & Applied Science **Dr. Atef Mohany**, Chair of New Program Committee **Dr Min Dong**, Chair of Engineering Curriculum Committee
11:45-12:45 Lunch Break 12:45 p.m. -1:45 p.m. (Atlantic Standard Time)			
12:45-1:30 p.m. 1:45-2:30 p.m. (Atlantic Standard Time)		Tour of labs/other facilities	**Hidayat Shahid**, Assistant Dean and Associate Teaching Professor **Govind Rehal**, Manager – Technical Services
Break – only reviewers present			

1:45-2:30 p.m. 2:45-3:30 p.m. (Atlantic Standard Time)		Conclusion and summary of Day 1 Plans for the following day	**Dr. Hossam Kishawy**, Dean of Faculty of Engineering & Applied Science **Dr. Atef Mohany**, Chair of New Program Committee **Dr Min Dong**, Chair of Engineering Curriculum Committee

Day 2 – Wednesday, October 6, 2021

Time	Location	Details	People
10:00-10:15 a.m. 11:00-11:15 a.m. (Atlantic Standard Time)		Welcome to Day 2	**Dr. Atef Mohany**, Chair of New Program Committee
Break – only reviewers present			
10:30-11:30 a.m. 11:30 a.m. -12:30 p.m. (Atlantic Standard Time)		Meeting with faculty members	**Dr. Atef Mohany** **Dr. Remon Pop-Iliev** **Dr. Dima Jawad** **Dr. Ahmad Barari** **Dr. Sayyed Ali Hosseini**
Break – only reviewers present			
12:00-12:30 p.m. 1:00-1:30 p.m. (Atlantic Standard Time)		Meeting with staff	**Karishma Karim,** MME Department Program Assistant **Kerry Morrison**, Manager, Academic Advising **Bryan Lee,** Senior Academic Advisor **Stephanie Costanza**, Senior Academic Advisor **Lindsay Smith**, Senior Academic Advisor **Candace Chard**, Co-op & Internship Officer
12:30-1:30 p.m. 1:30-2:30 p.m. (Atlantic Standard Time)		Reviewers' Discussion	Only reviewers present
1:30-2:30 p.m. 2:30-3:30 p.m. (Atlantic Standard Time)		Conclusion and discussion of issues	**Dr. Hossam Kishawy**, Dean of Faculty of Engineering & Applied Science **Dr. Atef Mohany**, Chair of New Program Committee **Dr Min Dong**, Chair of Engineering Curriculum Committee

Faculty Response to the External Review for the

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BACHELOR OF ENGINEERING IN INDUSTRIAL ENGINEERING

Submitted By: Dr. Atef Mohany

Dean Dr. Hossam Kishawy

Date: November 26, 2021

Introduction

The external reviewers have provided very positive feedback on the proposed industrial engineering program. They commended on the innovative curriculum of the industrial engineering program and the integration of state-of-the-art courses such as internet of things, industrial data analytics, industry 4.0, and artificial intelligence, in the program. The external reviewers have made some recommendations to further improve the program. We have addressed all of them and updated the proposal accordingly. Below is a summary of the reviewers' comments and our response.

Summary of Recommendations and Faculty Responses

Recommendation 1
Create industrial engineering specific capstone projects in cooperation with industrial partners.

Program's Response
Multidisciplinary capstone courses are now included in the program to address this recommendation. The capstone projects will be offered at least with Industrial partners represented in the Industrial Advisory Board of the program.

Dean's response
The Dean agrees with the Program's response.

Recommendation 2
In multi-disciplinary projects, ensure that there are at least two industrial engineering students in a team.

Program's Response
The industrial engineering multidisciplinary capstone courses will be open for enrolment to qualified students of other engineering disciplines from Ontario Tech.

Dean's response
The program will ensure each capstone project will have a diversified group of students related to the subject area of the capstone project including industrial engineering students.

Recommendation 3
Prioritize hiring industrial engineering Faculty first in ergonomics, operations research and systems, to fill the gaps in industrial engineering knowledge.

Program's Response
We agree with the external reviewers' recommendation. Once the program commences, the Department of Mechanical and Manufacturing Engineering where the industrial engineering program resides will hire additional 5 faculty members.

Dean's response
The Faculty is planning to hire 5 new faculty members and we will ensure that they have the background to cover the above-mentioned areas/expertise.

Recommendation 4
Integration of knowledge from multiple courses should be attempted, e.g. by using dual-course projects as done in the past. It is important for students to remove the silos around knowledge areas and use them in solving "big" industrial engineering problems.

Program's Response
We have implemented this approach for existing courses in other engineering programs. It requires diligent co-ordination between the instructors of the different courses. We will consider the same approach for the industrial engineering program.

Dean's response
Agrees with the comment as it develops communication skills and team work. As a Faculty we have always fostered a collaborative educational environment but as the program community highlighted it will always require collaboration among instructors. As a Dean, I will work with Department Chair to encourage collaborative working environment among instructors of different courses.

Recommendation 5
Document the stakeholder consultation with industry and the indigenous community.

Program's Response
Our industry advisory board is actively engaged with our existing engineering programs. They provide feedback on curriculum development through face-to-face meetings, online meetings, or email circulation. The same will apply for the industrial engineering program. We have added in the proposal the comments received by the industry advisory board as well as letter of support for external stakeholders on the proposed program.

Dean's response
The Dean agrees with the program's response.

Recommendation 6
List all existing software to be introduced in the courses, and specify examples of new industrial engineering software to be purchased.

Program's Response
A list with all the required/recommended software is now included in the proposal.

Dean's response
Please see the response from program's response.

Recommendation 7
Develop new labs in the areas of ergonomics, work design and manufacturing systems integration.

Program's Response
Adding three new laboratories, namely "Industrial Ergonomics", "Workplace and Facilities Design" and "Engineering Systems Integration" has been explored. These three labs will be added to the industrial engineering curriculum in year three and four, subject to budget approval.

Dean's response
Please see the response from program's response.

Recommendation 8
Explore the use of appropriate labs in Faculties and Colleges in close proximity to the Faculty of Engineering and Applied Science.

Program's Response
This has been explored prior to proposing/developing new laboratories. However, scheduling conflicts and restrictions make this option unsustainable.

Dean's response
We will always consider better utilization of existing facilities across the university.

Recommendation 9
The Graduate Attribute mapping (learning outcomes) needs to be revised to more closely match the level of the course outcomes to the "IDA" mappings (there are many "A" mappings which may not be appropriate.)

Program's Response
The Graduate Attribute of INSE course mapping has been updated. However, changes have been proposed with respect to IDA tables belonging to cross-listed engineering courses participating in the program. Their update is subjected to academic procedural curriculum matters.

Dean's response
Please see the program's response.

Recommendation 10
The AU tables need to be revised with careful attention to design units, and especially to assignment of Accreditation Units where engineering design must be taught by licensed engineers.

Program's Response
The AU tables have been revised. The engineering design is well above the minimum required by CEAB.

Dean's response
Please see the program's response.

Recommendation 11
The mechanical and manufacturing engineering content in the program can be reduced in the future when there are enough industrial engineering faculty members to teach new courses. This could allow the program to focus more on systems ideas.

Program's Response
This will be explored later when the program commences as part of the continuous improvement cycle.

Dean's response
This recommendation will be considered as the program evolves.

Recommendation 12
Advising staff is new; there is a duplication of effort and advisors should report to the program or faculty. The Associate Dean should be the sign-off for student advice.

Program's Response
We fully agree with the external reviewers. Unfortunately, it is currently outside of the program jurisdiction.

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.

Recommendation 13
Health, safety and sustainability (economic and environmental) should be explicitly included in the curriculum.

Program's Response
A new course on "Health, Safety and Sustainability for Engineers (INSE 2110U)" is now introduced in year 2 term 1 of the program.

Dean's response
Please see the program's response.

Recommendation 14
Recent changes to the accreditation criteria allow less courses in a degree. A lower workload per semester may be advisable. This will reduce the stress on students, improving mental health outcomes.

Program's Response
This will be explored later when the program commences as part of the continuous improvement cycle.

Dean's response
Agree with the program's response.

Recommendation 15
Revise the budget to account for capital and operational costs, and part-time instructors (if relevant).

Program's Response
The budget has been updated accordingly.

Dean's response
Please see the new budget.

Suggested Revisions for the Proposal following External Review

- *Program to list all suggested revisions to the proposal*
- *For each suggested revision, the Dean should include a comment indicating whether the revision will proceed. If the revision will not proceed, please indicate a rationale*

All recommendations are incorporated in the revised proposal. Please check the document 'Summary of changes made to proposal of external report.'

Summary of Changes Made to the Proposal Following External Review

List all revisions, noting the Section number from the proposal document. Include this form with the final proposal.

1. New courses for Multidisciplinary Capstone (ENGR 4970/4971U Capstone Systems Design for Industrial Engineering I and Capstone Systems Design for Industrial Engineering II) have been added to the proposal in Appendices A, B and C. (Recommendation 1 & 2)
2. A list with all the required/recommended software is now included in the proposal. (Recommendation 6)
3. The Graduate Attributes and AU tables have been revised Appendices A, B and C. (Recommendations 9 &10)
    - Moved Liberal Studies 2-1 to 4-1 in Industrial Engineering.
    - Moved Liberal Studies 2-1 to 5-1 in Industrial Engineering and Management.
    - Added new course, INSE 2110U, 2-1 (CS 100%)
    - Removed ENGR 4950U/4951U Capstone
    - Added new Multidisciplinary Capstone ENGR 4970/4971U
    - INSE 2210U, removed 'A' from (Tools, Teamwork)
    - INSE 3110U, removed 'A' from (PA, COMM). Updated 'A' to 'D' for (Tools, Teamwork)
    - INSE 3140U, removed 'A' from (KB). Updated 'A' to 'D' for (PA, INV, DES, Teamwork, COMM)
    - INSE 3115U, removed 'A' from (KB). Updated 'A' to 'D' for (PA, INV, DES, Teamwork, COMM)
    - INSE 4170U, added 'A' (PA, Tools), Updated 'A' to 'D' (DES, Impact, Ethics)
    - INSE 4248U, added 'D' to (PA, Tools). Updated 'A' to 'D' for (Teamwork, COMM, PRO)
4. Health, Safety and Sustainability for Engineers (INSE 2110U) has been added to the proposal and the program map has also been updated Appendices A, B and C. (Recommendation 13)
5. Added Appendix G which includes letters of support from the Industrial Advisory Board. (Stakeholders Consultations)