Mechanical & Industrial Engineering
UNIVERSITY OF TORONTO

COURSE AND OPTIONS SELECTION HANDBOOK

INDUSTRIAL ENGINEERING

4TH YEAR

CONTENTS

WHAT IS COURSE & OPTIONS SELECTION ?

Each year the Office of the Registrar asks you to provide them with indicators as to which program option and technical elective courses you plan to take in the coming academic year. **The information that you provide to us through Course and Options Selection (COS) helps us identify the demand for program options and courses. This information is used for the course scheduling process and for uploading your course selections to ROSI.** When selecting your technical electives be sure that your selections meet the program requirements for your program of study.

Please be advised that students who do not participate in COS will not be guaranteed a space in technical elective courses, so it is in your interest to submit your selections.

We greatly appreciate your cooperation with this exercise. It can be completed on Degree Explorer at the link below:

degreeexplorer.utoronto.ca

ALL INFORMATION IN THIS HANDBOOK WAS MOST RECENTLY UPDATED IN JANUARY 2021. COURSES, DEGREE REQUIREMENTS, AND DATES MAY CHANGE FROM YEAR TO YEAR, SO BE SURE TO DOUBLE CHECK ON THE CURRENT YEAR'S ACADEMIC CALENDAR

IMPORTANT DATES

DATE	
Mid February to Early March	**COURSE & OPTION SELECTION OPENS** **www.apsc.utoronto.ca/cos** Students may now login and make their curriculum selections for the upcoming academic year
Early March	**LAST DAY FOR STUDENTS TO APPLY TO RE-ENROL OR SWITCH TO FULL-TIME FOR 2014 FALL SESSION***
Mid July	**TIMETABLES BECOME AVAILABLE ON ROSI**
Late July	**COURSE SELECTION (ROUND 1) OPENS** **www.rosi.utoronto.ca** For electives offered by the Faculty of Engineering and Enhanced Enrollment Arts & Science electives. Students may now make changes to their timetable
Early August	**COURSE SELECTION (ROUND 2) OPENS** **www.rosi.utoronto.ca** For electives offered by Arts & Science
Mid/Late August	**MIE490 CAPSTONE PROJECT SELECTION**
Late August	**LAST DAY TO PAY OR DEFER TUITION FEES**
Early September	**ENGINEERING FALL (F) LECTURES BEGIN** Last day to receive a 100% tuition refund if you are choosing to withdraw for the 2019-2020 academic year.
Mid September	**DEADLINE TO SUBMIT TECHNICAL ELECTIVE SUBSTITUTION REQUESTS FOR 4F** **DEADLINE TO SUBMIT THESIS ENROLLMENT FORMS FOR FALL (F) & FULL-YEAR (Y) PROJECTS** **DEADLINE TO SUBMIT COURSE REQUEST FORMS FOR FALL (F) & FULL-YEAR (Y) COURSES**
Late September	**FALL (F) & FULL-YEAR (Y) COURSE ADD DEADLINE** Last day to add or substitute Fall (F) or Full-Year (Y) Session courses Last day to receive a 100% tuition refund (with a minimum charge of $242) if you are choosing to withdraw for the 2019-2020 academic year.

IMPORTANT DATES

DATE	
November 4	**FALL (F) COURSE DROP DEADLINE** Last day to drop Fall (F) Session courses without academic penalty, withdraw from the Fall (F) session without academic penalty, or transfer to part-time studies for the Fall (F) session Last day to receive a 50% tuition refund if you are choosing to withdraw for the 2019-2020 academic year.
Early January	**ENGINEERING WINTER (S) LECTURES BEGIN**
Mid January	**DEADLINE TO SUBMIT TECHNICAL ELECTIVE SUBSTITUTION REQUESTS FOR 4W** **DEADLINE TO SUBMIT THESIS ENROLLMENT FORMS FOR WINTER (S) PROJECTS** **DEADLINE TO SUBMIT COURSE REQUEST FORMS FOR WINTER (S) COURSES**
Mid January	**WINTER (S) COURSE ADD DEADLINE** Last day to add or substitute Winter (S) Session courses
Late January	**DEADLINE TO SUBMIT PER HOURS FOR JUNE CONVOCATION**
Early March	**IRON RING CEREMONY**
Early March	**WINTER (S) & FULL YEAR (Y) COURSE DROP DEADLINE** Last day to drop Winter (S) Session and Full-Year (Y) courses without academic penalty,
Late March	**NAME CHANGE DEADLINE** Deadline to submit any name changes to the Office of Convocation that are to appear on your degree.
June	**CONVOCATION** Congratulations!

CURRICULUM

FALL SESSION - YEAR 4

CORE REQUIRED COURSES		LEC/LAB/TUT/WGT.
Integrated System Design	MIE463H1	3 / - / 2 / 0.5
Capstone Design	MIE490Y1	- / - / 4 / 1.0
TECHNICAL ELECTIVES (TWO OF):		
Financial Engineering	APS502H1	3 / - / - / 0.5
Ergonomic Design of Information Systems	MIE344H1	3 / 3 / - / 0.5
Introduction to Artificial Intelligence	CSC384H1	3/ - / - / 0.5
Business Process Engineering	MIE354H1	3 / 2 / - / 0.5
Operations Research III: Advanced OR	MIE365H1	3 / 2 / 1 / 0.5
Analytics in Action	MIE368H1	3 / 2 / - / 0.5
Engineering Psychology and Human Performance	MIE523H1	3 / 3 / - / 0.5
Design of Innovative Products	MIE440H1	2 / 2 / 1 / 0.5
Decision Support Systems	MIE451H1	3 / 1 / 1 / 0.5
Research Thesis	MIE498H1	- / - / 4 / 0.5
Research Thesis	MIE498Y1	- / - / 4 / 1.0
Scheduling	MIE562H1	3 / - / 2 / 0.5
Decision Analysis	MIE566H1	3 / - / 2 / 0.5
COMPLEMENTARY STUDIES ELECTIVE		
CS Elective	-	- / - / - / 0.5

WHAT'S THE DIFFERENCE BETWEEN AN **AREA OF FOCUS** AND A **STREAM**?

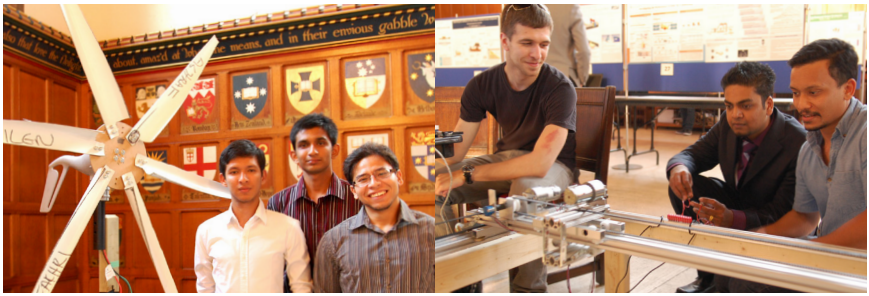
In the Mechanical Engineering program, students select streams. These streams require them to take a continued stream course in 4F from their stream selections in 3W. In the Industrial Engineering program, it is not mandatory to continue with courses in your particular area of focus. If you choose a Human Factors technical elective in third year, you can choose another Human Factors course in fourth year or choose a course in information engineering or operations

CURRICULUM

WINTER SESSION - YEAR 4

CORE REQUIRED COURSES		LEC/LAB/TUT/WGT.
Organization Design	MIE459H1	4 / - / - / 0.5
Capstone Design	MIE490Y1	- / - / 4 / 1.0
TECHNICAL ELECTIVES (TWO OF):		
Artificial Intelligence Fundamentals	APS360H1	3 / - / 1 / 0.5
Cases Studies in Human Factors and Ergonomics	MIE345H1	3 / - / 2 / 0.5
Cases in Operations Research	MIE367H1	3 / - / 2 / 0.5
Knowledge Modelling and Management	MIE457H1	3 / 1 / 1 / 0.5
Reliability and Maintainability Engineering	MIE469H1	3 / - / 2 / 0.5
Research Thesis	MIE498H1	- / - / 4 / 0.5
Research Thesis	MIE498Y1	- / - / 4 / 1.0
Human Factors Integration	MIE542H1	3 / - / 2 / 0.5
Healthcare Systems	MIE561H1	3 / - / 2 / 0.5
Advanced Manufacturing Technologies	MIE519H1	3 / - / - / 0.5
Dynamic & Distributed Decision Making	MIE567H1	3 / - / 2 / 0.5
Introduction to Artificial Intelligence	MIE369H1	
COMPLEMENTARY STUDIES ELECTIVE		
CS Elective		- / - / - / 0.5

MIE490/APS490: CAPSTONE DESIGN



The capstone design course provides an experience in engineering practice through a significant design project. Student teams meet specific client needs through a creative, iterative, and open-ended design process.

Throughout the fourth year of your program, you will work with a faculty Supervisor and an industry Client on a Capstone Design Project. The Capstone Design Project provides you with an opportunity to work on a problem of real value to your Client. You will work with them and your Supervisor to define your project goals (within the scope of the problem identified), to decide how you will go about achieving these goals and to organize yourself to achieve them.

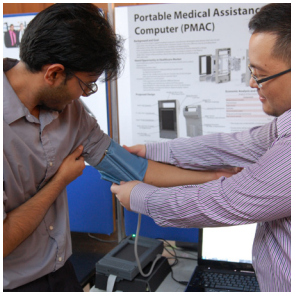
All capstone projects fall into one of the following categories:

STANDARD CAPSTONE PROJECT: These projects are sourced by Capstone Coordinators and each project is supervised by a single MIE Faculty member. Students are matched with projects in early September.

STUDENT-SOURCED CAPSTONE PROJECT: These projects are sourced by students through PEY, eSIP employer or other industry contacts. Students must form a team and find a single MIE faculty member to supervise their project. Students interested in this type of project must submit for approval by mid-June.

CAPSTONE INNOVATION PROJECTS: The projects are sourced by University or MIE faculty members. These projects entail the design of new and patentable technologies, and come along with high risk, high visibility, and high impact potential. Students are supervised by a single MIE faculty member. ***Competitive Selection**

MIE490/APS490: CAPSTONE DESIGN



MULTIDISCIPLINARY PROJECTS (APS490Y): These projects are sourced by capstone coordinators across the Faculty of Applied Science and the Multidisciplinary Capstone course coordinator. These projects require team members from at least two disciplines and are supervised by a single engineering faculty member. ***These projects have an accelerated self-selection and matching process, and require a competitive interview.**

INTERNATIONAL CAPSTONE PROJECTS: These projects are sourced by the International Capstone coordinator. In these projects, students work with University partners from China, Hong Kong and USA. ***Competitive Interview Required**

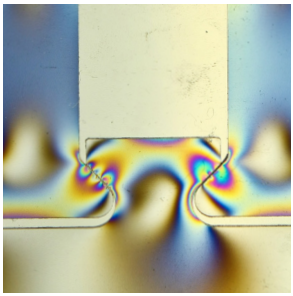
PROJECT SELECTION

For those interested in the **Multidisciplinary** or **International** Capstone Projects, you must submit your name by **Late February.**

For those interested in the **Student-sourced** projects, you must submit your project for review by **Mid June.**

For those interested in **Standard Capstone Projects** or **Capstone Innovation Projects**, you will be contacted mid-August to initiate the matching process.

MIE498H1/Y1: RESEARCH THESIS



The purpose of MIE498 is two-fold: to let students pursue a technical project of interest, and to improve their communication skills. **It is particularly useful for students thinking about graduate school and who want to learn more about engineering research**. Preparing a Progress Report and a Thesis gives students experience in technical writing, and making oral presentations about their projects helps students improve their oral communication skills. MIE498 is an important course in the curriculum because an engineering graduate should be able to present to prospective employers proficiently.

Formal approval to register for the fourth-year thesis must be obtained from the Undergraduate Office. **Enrollment in our thesis course is restricted to students with an overall average of 75%.** This criterion can be relaxed under exceptional circumstances with the written approval of the supervisor.

At the beginning of the term, students will establish with the supervisor, in writing, which reports are to be submitted, the content of these reports, their due dates, and the grading scheme. **The Thesis Topic Form, however, must be submitted to the undergraduate office by one week before the course add date and is not negotiable.** Notice that your supervisor may choose to follow these guidelines, but modifications may be desirable to best fit the nature of the thesis.

In the event your thesis project is not approved, as part of COS and on course selection day, please select a back-up approved curriculum technical elective. By submitting your thesis form on time, you will receive a decision before the course add deadline.

ENROLLMENT PROCEDURE

1. Find a supervisor and a thesis topic:
   You can independently contact MIE faculty members who you are interested in working with, to discuss a research topic.

MIE498: THESIS

2. Once you have found a faculty member who will supervise you, complete a thesis enrollment form. Ensure that your supervisor signs the form. This form is available at **https://www.mie.utoronto.ca/wp-content/uploads/2019/07/ThesisEnrollmentForm.pdf**

3. Attach a 1-page outline of the project you plan to undertake:

    - Explain how the research project builds upon one or more aspects of engineering science introduced in the student's academic program

    - Provide an estimate of a level of effort not less than 40 productive hours of work per term

    - Specify a deliverable in each term to be submitted by the last day of lectures

4. Submit your completed thesis enrollment form and 1-page outline to the MIE Undergraduate Office by the following deadlines:

    - **Mid September** for a Fall-term (MIE498H1F) or full year (MIE498Y1Y) thesis

    - **Mid January** for a Winter-term (MIE498H1S) thesis

5. If approved, your research thesis will be added to your transcript on ROSI by the MIE Undergraduate Office. If it is not approved, we will notify you by email.

HUMAN FACTORS

Industrial Engineers also improve productivity and efficiency by studying and improving the actual physical work environment. Human factors engineering is the study of people as workers and as managers, both from the physiological and psychological points of view. The study of human physiology, particularly the nervous system, leads to fascinating discoveries concerning reaction to stimuli, sensory perception, human performance at operator tasks, and people's ability to process information. These principles are applied to the design of human-machine systems, with particular attention to problems of information display, control layout, compensatory controls systems, and the design of work environments.

For example, a mechanical engineer may design a new car, and a human factors engineer would be responsible for the design of the interior: control layout, seating, vision, reachability, usability in unusual circumstances, etc. A nuclear engineer will design a nuclear generator, and a human factors engineer will design the control system displays to minimise the probability of human error.

SUGGESTED TECHNICAL ELECTIVES

4F – MIE344H1F – ERGONOMIC DESIGN OF INFORMATION SYSTEMS

The goal of this course is to provide an understanding of how humans and machines can be integrated with information systems. By the end of the course, students will be able to: Observe, and engage in dialogue with, users in ways that clarify users' views, needs, and capabilities; Develop all phases of the user interface design process in response to the needs of a user interface design project; Demonstrate initiative, personal responsibility and accountability in both personal and group contexts; Communicate information, analyses, and solutions accurately, reliably, orally, and in writing to a range of audiences (e.g., the professor, the TAs, classmates, users); Extend the insights they have gained from their experience through the course in their future interactions with users in the workplace; Use the completed project to promote their candidacy for employment opportunities.

4W – MIE345H1S – CASE STUDIES IN HUMAN FACTORS AND ERGONOMICS

A detailed analysis will be made of several cases in which human factors methods have been applied to improve the efficiency with which human-machine systems operate. Examples will be chosen both from the area of basic ergonomics and from high technology. Emphasis will be placed on the practical use of material learned in earlier human factors courses.

HUMAN FACTORS

4F – MIE448H1F – ENGINEERING PSYCHOLOGY AND HUMAN PERFORMANCE

The aim of the course is to study, and model, the relationship between human information processing and the design of human-machine systems, especially for complex workplaces.

4W – MIE542H1S – HUMAN FACTORS INTEGRATION

The aim of this course is to develop an understanding of approaches to integrating human factors in systems design engineering, for complex, safety-critical environments; describe and apply methods and approaches for integrating Human Factors into design processes; understand systems design processes and cycle; develop an understanding of the roles and responsibilities of Human Factors practitioners within the design process and team; develop an understanding of how to communicate requirements arising from human factors integration analyses and methods; develop design concepts which meet the identified requirements; and to prepare for continuous learning through professional practice of HFI methods.

4W - MIE57H1 – KNOWLEDGE MODELLING AND MANAGEMENT

This course explores both the modelling of knowledge and its management within and among organizations. Knowledge modelling will focus on knowledge types and their semantic representation. It will review emerging representations for knowledge on the World Wide Web (e.g., schemas, RDF). Knowledge management will explore the acquisition, indexing, distribution and evolution of knowledge within and among organizations. Emerging Knowledge Management System software will be used in the laboratory.

4W - MIE440H1 - DESIGN OF INNOVATIVE PRODUCTS

Recently developed methods applied at different stages of the design process include: Identification of unmet/underserved user needs through a modified definition of lead users (those who experience needs in advance of the mainstream population) including identifying/studying lead users, identifying which lead-user needs are relevant to the general population; Roles of function and affordance in successful products; Obstacles of fixation and cognitive bias to creativity; Concept generation methods including TRIZ/TIPS (Theory of Inventive Problem Solving, use of unrelated stimuli and analogy (e.g., from biology); Configuration design methods including design for transformation, design for assembly and end-of-life, e.g., reuse, repair and recycling. Hands-on experience of these topics in lectures, tutorials, and labs support successful application of the methods for the course project, as well as future design activities.

FIELDS OF APPLICATION

Transportation, Communication, Healthcare, Military, Energy, Banking

OPERATIONS RESEARCH

Operations research and management science involve the mathematical modelling of real systems and processes with a view to being able to predict and optimally control their performance. For example, we can use statistics to determine how much inventory should be carried in a warehouse to minimise expected costs of carrying the stock and of shortages. We use queueing theory to analyse the waiting time of people or jobs waiting for service in banks, emergency rooms and production facilities. We use linear algebra (called linear programming) to determine the optimal product mix to maximise profit subject to capacity constraints on resources, or the optimal allocation of service facilities (like fire stations) to minimize the expected service time. Areas include scheduling, reliability, maintenance, forecasting, queueing, value analysis and decision making under uncertainty.

Operations Research came into its own during the Second World War, when it became apparent that many problems of scheduling and deployment of resources, which had previously been managed intuitively, could be quantitatively modelled and solved analytically. Since the war, operations research techniques and models have been applied in an ever-increasing variety of industries, from finance to healthcare to government. The modern manager can no longer rely on seat-of-the-pants judgement, but must take a scientific approach to decision making. Much of today's industrial engineering activity is the application of management science in support of decision making at all levels of any organisation.

OPERATIONS RESEARCH

SUGGESTED TECHNICAL ELECTIVES

4F – MIE354H1F – BUSINESS PROCESS ENGINEERING

This course focuses on grouping, assessing, designing and implementing appropriately integrated and distributed information systems to support enterprise objectives. The emphasis is on understanding how Business Process Management techniques and tools can contribute to align an organization's business and information technology perspectives, as well as the characteristics of application and system types and the implications for their design, operation, and support of information needs. The course reviews platforms and technology infrastructure, including; legacy systems, client/server, the Internet, the World Wide Web, and the emergence of a web-service-based service oriented architecture. Students will work in the laboratory to develop a business process. The course covers Information Systems concepts, tools and techniques, and it is addressed primarily to an audience of process/business analysts instead of targeting an audience of developers/programmers.

4F – MIE365H1F – OPERATIONS RESEARCH III: ADVANCED OR

Design of operations research models to solve a variety of open-ended problems. Linear programming extensions are presented: goal programming, column generation, Dantzig-Wolfe decomposition, and interior point solution methods. Non-linear programming solution methods are developed: optimality conditions, quadratic programming. Solutions to advances stochastic models: stochastic programming, Robust Optimization and Semi-Definite Programming.

4W – MIE367H1S – CASES IN OPERATIONS RESEARCH

To provide students with the experience and confidence to apply Operational Research techniques to solve a variety of cases that industrial engineers may face in their professional life. The course will use one case per week which describes a real situation. Students will be required to analyze the case on their own, in a small group and with the class. Extensive preparation of each case prior to class participation is essential. After initial discussion, students will be required to fully solve the case, including a numerical solution.

4W – MIE468H1S – FACILITY PLANNING***

Fundamentals of developing efficient layouts of production/ service systems and determining optimal locations of facilities in a network. Activity relationships, manufacturing flow patterns, layout procedure types (construction and improvement algorithms), manual and computerized layout techniques, single and multiple facility location, and supply chain (location) network-distribution design.

OPERATIONS RESEARCH

4W – MIE469H1S – RELIABILITY AND MAINTAINABILITY ENGINEERING

An introduction to the life-cycle costing concept for equipment acquisition, operation, and replacement decision-making. Designing for reliability and determination of optimal maintenance and replacement policies for both capital equipment and components. Topics include: identification of an item's failure distribution and reliability function, reliability of series, parallel, and redundant systems design configurations, time-to-repair and maintainability function, age and block replacement policies for components, the economic life for capital equipment, provisioning of spare parts.

4W – MIE561H1S – HEALTHCARE SYSTEMS

This course gives students an opportunity to integrate the engineering tools learned in previous courses by applying them to real world problems. While the specific focus of the case studies used to illustrate the application of engineering will be the Canadian health care system, the approach to problem solving adopted in this course will be applicable to any setting. This course will: Provide a framework for identifying and resolving problems in a complex, unstructured decision-making environment; Give students the opportunity to apply a problem identification framework through real world case studies; Provide insight into the appropriate uses (and abuses) of engineering techniques in a practical setting; Prepare students to become productive, practising engineers; Make students aware of the implications of context on the practice of engineering

4F – MIE562H1F – SCHEDULING

This course takes a practical approach to scheduling problems and solution techniques, motivating the different mathematical definitions of scheduling with real world scheduling systems and problems. The linking theme for the course is the use of search (partition, relaxation, and inference) to solve hard combinatorial problems. A group project will require the implementation of two or more scheduling algorithms. Evaluation will be based on two terms tests, two assignments, the project, and the final exam. Students should have a basic knowledge of standard optimization techniques as taught in second and third year MIE courses.

4F – MIE566H1F – DECISION ANALYSIS

Students taking this course will attain competence in formulating Bayesian decision analysis models, attain an understanding of methods for solving such models, and attain competence in using commercial software for solving such models.

OPERATIONS RESEARCH

4F – APS502H1 – FINANCIAL ENGINEERING

This course will focus on capital budgeting, financial optimization, and project evaluation models and their solution techniques. In particular, linear, non-linear, and integer programming models and their solution techniques will be studied. The course will give engineering students a background in modern capital budgeting and financial techniques that are relevant in practical engineering and commercial settings.

4W – MIE566H1 - DECISION ANALYSIS

The purpose of this course is to provide a working knowledge of methods of analysis of problem and of decision making in the face of uncertainty. Topics include decision trees, subjective probability assessment, multi-attribute utility approaches, goal programming, Analytic Hierarchy Process and the psychology of decision making.

4W – MIE567H1 - DYNAMIC AND DISTRIBUTED DECISION MAKING

Fundamental concepts and mathematical frameworks for scientific sequential decision making in the presence of uncertainty. Utility theory, uncertainty modeling, theory of games, dynamic programming, and multi-agent system. Discussion of how the decision theories can be applied to design algorithms and processes for real-world cases.

FIELDS OF APPLICATION

Logistics, Supply Chain Management, Healthcare, Production System, Financial Engineering, Maintenance

ARTIFICIAL INTELLIGENCE & MACHINE LEARNING MINOR

Artificial intelligence (AI) is the study of computational processes that simulate intelligent behaviour. These processes include knowledge representation and reasoning, optimal sequential decision-making under uncertainty, and learning from past experience. Specifically, the last area comprises the subfield of AI known as Machine learning (ML) that focuses on computational and statistical methods for learning patterns from historical data for descriptive and predictive purposes.

Together, AI and ML represent the forefront of technology innovation powering a wide range of industrial applications including search engines, conversational assistants, e-commerce, autonomous driving, intelligent logistics scheduling, digital marketing, adaptive user interfaces, and health applications ranging from prediction of adverse outcomes to automated diagnosis in medical imaging. AI and ML both contribute to and benefit from techniques developed in Operations Research (OR) although AI and ML techniques often tend to focus more heavily on the computational and algorithmic aspects of proposed solutions.

To this end, strong preparation in programming and software design is an essential skill for AI and ML practitioners. AI and ML expertise is in high demand in industry with employment in all of the aforementioned application areas and many more; it is also an excellent course of study for those wishing to pursue future research careers in this field with rapidly expanding frontiers.

CORE COURSES

3W - MIE335H1S - ALGORITHMS & NUMERICAL METHODS

Algorithmic analysis, big-O asymptotic analysis; numerical linear algebra, solution techniques for linear and non-linear systems of equations; matrix factorization, LU and Cholesky factorization, factorization in the revised simplex method; Newton's method, Gale-Shapley method, greedy methods for combinatorial optimization, branch-and-bound search methods; graph theory and graph theoretic algorithms; design and implementation of algorithms to optimize mathematical models.

TECHNICAL ELECTIVES

4S - MIE424H1S - OPTIMIZATION IN MACHINE LEARNING

1. To enable deeper understanding and more flexible use of standard machine learning methods, through development of machine learning from an Optimization perspective.
2. To enable students to apply these machine learning methods to problems in finance and marketing, such as stock return forecasting, credit risk scoring, portfolio management, fraud detection and customer segmentation.

3F - MIE368H1F - ANALYTICS IN ACTION (FORMERLY MIE465)

This course showcases the impact of analytics focusing on real world examples and case studies. Particular focus on decision analytics, where data and models are combined to ultimately improve decision-making. Methods include: linear and logistic regression, classification and regression trees, clustering, linear and integer optimization. Application areas include: healthcare, business, sports, manufacturing, finance, transportation, public sector.

4F - MIE451H1F - DECISION SUPPORT SYSTEMS

This course provides students with an understanding of the role of a decision support system in an organization, its components, and the theories and techniques used to construct them. The course will cover basic technologies for information analysis, knowledge-based problem solving methods such as heuristic search, automated deduction, constraint satisfaction, and natural language understanding.

4S - MIE457H1S - KNOWLEDGE MODELING AND MANAGEMENT

This course explores both the modeling of knowledge and its management within and among organizations. Knowledge modeling will focus on knowledge types and their semantic representation. It will review emerging representations for knowledge on the World Wide Web (e.g., schemas, RDF). Knowledge management will explore the acquisition, indexing, distribution and evolution of knowledge within and among organizations. Emerging Knowledge Management System software will be used in the laboratory.

4F - MIE566H1F - DECISION ANALYSIS

The purpose of this course is to provide a working knowledge of methods of analysis of problem and of decision making in the face of uncertainty. Topics include decision trees, subjective probability assessment, multi-attribute utility approaches, goal programming, Analytic Hierarchy Process and the psychology of decision making.

For additional info on Minor in Artificial Intelligence:
https://undergrad.engineering.utoronto.ca/academics-registration/minors-certificates/undergraduate-engineering-minors/minor-in-artificial-intelligence/

INFORMATION ENGINEERING

The Information Engineering specialization creates professionals that address the challenge of successfully applying information technology to help people and organizations innovate and become more efficient.

Our graduates have outstanding employment opportunities in numerous private and public organizations as well as in the global consulting firms that service them. There is current and future demand for professionals that combine expertise in process design and management, business analysis, project management, systems integration, and a fusion of industry knowledge and information technology skills.

Information engineering provides exciting and diverse career opportunities that encompass the development and evolution of information systems. Our graduates address the following challenging issues: how to provide doctors and nurses with timely access to electronic patient data wherever is needed, how to design information systems that run the business of online stores such as music download sites and bookstores, how to reduce large volumes of data into information that is useful to the decision-making processes of government officials, and how to take advantage of information technology to plan, coordinate and support disaster recovery and relief efforts

CORE COURSES

4F – MIE463H1F – INTEGRATED SYSTEM DESIGN (FOURTH YEAR CORE)

4W – MIE459H1S – ORGANIZATIONAL DESIGN (FOURTH YEAR CORE)

TECHNICAL ELECTIVES

4F – MIE344H1F – ERGONOMIC DESIGN OF INFORMATION SYSTEMS
See page 11.

4F – MIE354H1F – BUSINESS PROCESS ENGINEERING
See page 14.

INFORMATION ENGINEERING

4F – MIE451H1F – DECISION SUPPORT SYSTEMS
This course provides students with an understanding of the role of a decision support system in an organization, its components, and the theories and techniques used to construct them. The course will cover basic technologies for information analysis, knowledge-based problem solving methods such as heuristic search, automated deduction, constraint satisfaction, and knowledge representation.

4F – MIE562H1F – SCHEDULING
See page 15.

4F – MIE566H1F – DECISION ANALYSIS
See page 15.

4W – MIE457H1S – KNOWLEDGE MODELING AND MANAGEMENT
MIE457 explores both the modelling of knowledge and its management within and among organizations. Knowledge modelling will focus on knowledge types and their semantic representation. It will review emerging representations for knowledge on the World Wide Web (e.g. RDF and ontologies) . Emerging knowledge modelling and automated reasoning software will be used in the laboratory.

4W – MIE561H1S – HEALTHCARE SYSTEMS
See page 15.

FIELDS OF APPLICATION
Data Analysis, Database Design, Business Process Modelling, Information Systems, Ontologies

LINKS
Association for Information Systems
aisnet.org

DEGREE REQUIRMENTS

DEGREE EXPLORER degreeexplorer.utoronto.ca

Degree Explorer is a planning tool designed to help students and advisors evaluate academic progress towards completion of requirements for graduation. It is not a transcript. It allows you to map out your degree and can help you determine if you are on track. Just because you are eble to enrol in a course on ACORN does not mean it will fullfill your degree requirements.

TO GRADUATE, YOU NEED

- All Core Courses
- 2.0 CS Credits (1.0 or more must be HSS)
- 3.0 Technical Elective Credits
- 600 hours of professional experience, or PEY credit

COMPLEMENTARY STUDIES (CS) AND HUMANITIES & SOCIAL STUDIES (HSS)

To graduate, you must take 2.0 credits in complementary studies, of which at least 1.0 credits are HSS courses. 0.5 credits = 1 half year course. These are typically taken in second and fourth year, or in the summer (have to pay extra tuition). For a list of faculty approved elective lists, please consult the following links. You can also request other A&S courses to act as a substitute:

HSS Courses https://undergrad.engineering.utoronto.ca/academics-registration/electives/humanities-social-science-hss-electives/
CS Courses https://undergrad.engineering.utoronto.ca/academics-registration/electives/complementary-studies-cs-electives/

TECHNICAL ELECTIVES

- One in each semester 3rd year, two in each semester in 4th year
- Select from list of approved electives
- Can apply for another course to substitute for a Technical Elective
- Can substitute at most two technical electives

PRACTICAL EXPERIENCE REQUIREMENT (PER)

- Minimum of 600 hours to graduate
- Work should support professional career of student
- Must contain a good measure of responsiblity
- Form must be filled out and submitted to MIE Undergrad Office
- If you do PEY, you do not need to submit PER form

ENGINEERING MINORS & CERTIFICATES

In addition to academic programs in Core 8 subjects/TrackOne and Engineering Science, undergraduate Engineering students may pursue a number of minors and certificates that add breadth and depth to their academic careers.
To obtain a minor, students must take six (6) courses in a particular field. A certificate requires three (3) courses. There are many minors and certificates, which are listed and detailed at **uoft.me/engminors.** Enroling for a minor puts it on your Degree Explorer, which can help you plan. You can de-enrol at any point.

HOW DO I ENROL IN A MINOR?

Each minor has a specific enrolment form for you to complete and submit to the Cross-Disciplinary Programs Office. Please visit **undergrad.engineering.utoronto.ca**

Please note that enrolling in a minor does not guarantee you a spot in any of the engineering minor electives, as they are open to everyone. To avoid disappointment, plan ahead and select courses 6 AM on course selection days. You are responsible for making sure you fulfill the requirements.

I DIDN'T GET INTO THE COURSES I WANTED TO, AND I'M WORRIED I WONT FINISH MY MINOR BEFORE GRADUATION. WHAT DO I DO?

Due to popularity, many engineering minor courses are offered in the summer. You are also welcome to complete those courses following graduation, it just may not appear on your degree until later. You can also visit the Cross-Displinary Programs Office to de-enrol you in a minor.

WILL MY HSS/CS ELECTIVES BE ADDED TO MY TIMETABLE AUTOMATICALLY? WHAT IF I AM ENROLLED IN A MINOR THAT REQUIRES THAT COURSE?

No, you must add them yourself on course selection days. Enrolling in a minor does not guarantee you a spot in its required courses.

I'M NOT SURE WHICH ELECTIVES TO TAKE.

The Arts & Science Student's Union puts together a publication called the Anti-Calendar, which provides honest student feedback about many arts & science elective courses offered. **http://assu.ca/anti-calendar**.

ENROLLMENT AND REGISTRATION

OVERLOADS

- To take more than 5 courses in a semester, must get approval from undergrad office
- Need to have 75%+ average in previous semester or extenuating circumstances

"EXT" OR EXTRA COURSES

- If taking a course not needed for your degree, you can apply to designate it as EXT
- Mark will not count towards your GPA, but till shows on transcript
- Credit can be used for minors/certificates
- Deadline to designate EXT is the same as drop deadline

FAILED COURSES

If you have failed a core curriculum course, you must re-take it at the next available opportunity. Many first year engineering courses are offered during the summer. If you were unsuccessful in a second or third year course that is a pre-requisite for an upper level course, you must retake the pre-requisite course first. To add a core curriculum course, submit the **Course Request Form** (https://www.mie.utoronto.ca/programs/undergraduate/forms-policies/) to the Undergraduate Office by one week before the add course deadline. To add a failed stream course or HSS/CS elective, you may do so yourself on the course selection dates.

ENROLLMENT & REGISTRATION QUICKLINKS

COURSE FINDER — coursefinder.utoronto.ca
- Timetable, enrolment, waitlists

DEGREE EXPLORER — degreeexplorer.utoronto.ca
- Plan and check on track to graduate

ENGSOC TIMETABLE BUILDER — schedule.skule.ca
- Visual timetable builder

ARTS & SCIENCE ANTI-CALENDAR — assu.ca/anti-calendar
- Course descriptions and reviews

MIE UNDERGRADUATE FORMS — https://www.mie.utoronto.ca/programs/undergraduate/forms-policies/
- PER, Course request, TES, etc.

ENGINEERING EMPLOYMENT RESOURCES

JOB SEARCH SUPPORT

University of Toronto Engineering Career Centre
engineeringcareers.utoronto.ca

University of Toronto Career Centre
www.careers.utoronto.ca

WEBSITES

EngineeringJobs.com
www.engineerjobs.com/jobs/canada/ontario/toronto.php

EngineeringCareers
https://www.engineeringcareers.ca/jobs/toronto-on/

Careerbuilder
www.careerbuilder.ca/Jobs/Toronto/Keyword/Engineering

UofT Career Centre Graduating Students Employment Service
www.careers.utoronto.ca/gradBeyond/gses.aspx

LinkedIn
www.linkedin.com/job/guest

Talent Egg
talentegg.ca/career-guides/engineering

Internships for New Grads
(monthly stipend of $2,016.67 before required deductions)
www.careeredge.ca

RECRUITING AGENCIES FOR ENGINEERS

Randstad
www.randstad.ca/engineering

Hays
www.hays.ca/enhance-your-career

MIE UNDERGRADUATE OFFICE

Room 109, Mechanical Building, 5 King's College Rd.

EMAIL undergrad@mie.utoronto.ca

PHONE (416) 978 6420

HOURS Monday - Friday, 9 AM to 4 PM

WWW.MIE.UTORONTO.CA