COURSE AND OPTIONS SELCTION HANDBOOK

INDUSTRIAL

ENGINEERING

New Curriculum

Mechanical & Industrial Engineering
UNIVERSITY OF TORONTO

CONTENTS

WHAT IS COURSE AND OPTIONS SELECTION (COS)?

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)/ Pre-registration process 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 ACORN. When selecting your courses, be sure that your selections meet the program requirements for your program of study.

The Course and Options selection process is completed in Degree Explorer.

Please note that the Industrial Engineering program is undergoing a major curriculum change. This handbook outlines the requirements for what we refer to as the "new" curriculum. Students who began or continued their second year in the 2023-2024 academic year, or their third year in 2024-2025, will follow this new curriculum.

ALL INFORMATION IN THIS HANDBOOK WAS MOST RECENTLY UPDATED IN NOVEMBER 2024. COURSES, DEGREE REQUIREMENTS, AND DATES MAY CHANGE FROM YEAR TO YEAR. PLEASE REFER TO THE CURRENT YEAR'S ENGINEERING ACADEMIC CALENDAR.

IMPORTANT DATES

DATE	
EARLY FEBRUARY	**3RD YEAR IND CURRICULUM TALK** **4TH YEAR IND CURRICULUM AND CAPSTONE TALK**
MID FEBRUARY	**COURSE & OPTIONS SELECTION OPENS** https://www.acorn.utoronto.ca/degree-explorer/ Students may now login and make their curriculum selections for the upcoming academic year
MID JULY	**COURSE SELECTION (ROUND 1) OPENS *ACORN*** Students may now make changes to their timetable. Electives offered by the Faculty of Engineering and Enhanced Enrollment Arts & Science electives are now open for enrollment
LATE JULY/EARLY AUGUST	**COURSE SELECTION (ROUND 2) OPENS *ACORN*** For courses offered by the Faculty of Arts & Science
MID AUGUST	**LAST DAY TO PAY OR DEFER TUITION FEES**
EARLY SEPTEMBER	**ENGINEERING FALL (F) LECTURES BEGIN**
MID SEPTEMBER	**FALL (F) & FULL-YEAR (Y) COURSE ADD DEADLINE** Deadline to submit technical elective substitution requests for 4F Deadline to submit thesis enrolment forms for fall (f) & full-year (y) projects Deadline to submit course request forms for fall (f) & full-year (y) courses
EARLY NOVEMBER	**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
EARLY JANUARY	**ENGINEERING WINTER (S) LECTURES BEGIN**
MID JANUARY	**WINTER (S) COURSE ADD DEADLINE** Last day to add or substitute Winter (S) courses
EARLY MARCH	**WINTER (S) & FULL YEAR (Y) COURSE DROP DEADLINE**

For a complete list of the Sessional Dates click here
For Fee and Refund Schedule information click here

CURRICULUM OVERVIEW

FALL SESSION – YEAR 3

REQUIRED CORE COURSES	
MIE353H1	Data Modelling
MIE358H1	Engineering Economics
MIE360H1	Systems Modelling and Simulation
MIE370H1	Introduction to Machine Learning
TECHNICAL ELECTIVE (CHOOSE ONE):	
APS360H1	Applied Fundamentals of Deep Learning
CSC384H1	Introduction to Artificial Intelligence
MIE344H1	Ergonomic Design of Information Systems
MIE354H1	Business Process Engineering
MIE365H1	Advanced Operations Research
MIE368H1	Analytics in Action
MIE434H1 (formerly MIE343H1)	Industrial Ergonomics and the Workplace

WINTER SESSION – YEAR 3

REQUIRED CORE COURSES	
MIE350H1	Design and Analysis of Information Systems
MIE359H1	Organization Design
MIE363H1	Operations and Supply Chain Management
TECHNICAL ELECTIVE (CHOOSE ONE):	
APS360H1	Applied Fundamentals of Deep Learning
MIE304H1	Introduction to Quality Control
MIE345H1	Case Studies in Human Factors and Ergonomics
MIE367H1	Cases in Operations Research
MIE369H1	Introduction to Artificial Intelligence
COMPLEMENTARY STUDIES OR HUMANITIES AND SOCIAL SCIENCES ELECTIVE	
CS/HSS ELECTIVE	

FALL SESSION – YEAR 4

REQUIRED CORE COURSES	
MIE490Y1/APS490Y1	Capstone
TECHNICAL ELECTIVE (CHOOSE THREE):	
APS360H1	Applied Fundamentals of Deep Learning
APS502H1	Financial Engineering
CSC384H1	Introduction to Artificial Intelligence
MIE344H1	Ergonomic Design of Information Systems
MIE354H1	Business Process Engineering
MIE365H1	Advanced Operations Research
MIE368H1	Analytics in Action
MIE434H1 (formerly MIE343H1)	Industrial Ergonomics and the Workplace
MIE435H1	Early-Stage Design Methods
MIE440H1	Design of Effective Products
MIE451H1	Decision Support Systems
MIE498H1	Research Thesis (half year)
MIE498Y1	Research Thesis (full year)
MIE523H1	Engineering Psychology and Human Performance
MIE524H1	Data Mining
MIE562H1	Scheduling
MIE566H1	Decision Making Under Uncertainty
COMPLEMENTARY STUDIES OR HUMANITIES AND SOCIAL SCIENCES ELECTIVE	
CS/HSS ELECTIVE	

WINTER SESSION – YEAR 4

REQUIRED CORE COURSES	
MIE490Y1/APS490Y1	Capstone Design
TECHNICAL ELECTIVE (CHOOSE THREE):	
APS360H1	Applied Fundamentals of Deep Learning

AP5S02H1	Financial Engineering
BME466H1	Drug Delivery at Biological Barriers and Interfaces
BME488H1	Intro to Immunoengineering
MIE304H1	Introduction to Quality Control
MIE345H1	Case Studies in Human Factors and Ergonomics
MIE367H1	Cases in Operations Research
MIE369H1	Introduction to Artificial Intelligence
MIE424H1	Optimization in Machine Learning
MIE457H1	Knowledge Modelling and Management
MIE469H1	Reliability and Maintainability Engineering
MIE498H1	Research Thesis (half year)
MIE498Y1	Research Thesis (full year)
MIE519H1	Advanced Manufacturing Technologies
MIE535H1	Electrification Via Electricity Markets
MIE542H1	Human Factors Integration
MIE561H1	Case Studies in Healthcare
MIE567H1	Multi-agent Reinforcement Learning
COMPLEMENTARY STUDIES OR HUMANITIES AND SOCIAL SCIENCES ELECTIVE	
CS/HSS ELECTIVE	

For further information, visit the Engineering Academic Calendar.

WHAT IS A CS ELECTIVE?

Complementary Studies (CS) can be broadly defined as studies in humanities, social sciences, arts, management, engineering economics and communication that complements technical curriculum. Engineering, math or science courses—including astronomy and psychology—may not be used to fulfill your CS elective requirement. Additionally, the Rotman School of Management does not typically permit students outside of their faculty to take their courses (i.e. RSM courses).

WHAT IS AN HSS ELECTIVE?

Humanities and Social Science electives (HSS) are a subset of Complementary Studies (CS) Electives; therefore, they can be used to satisfy CS requirements. HSS courses may explore issues that involve the inter-relationship between the individual,

society, the environment, aspects of human culture, including language, literature, history, philosophy, art, architecture, religion, and culture.

To graduate, an Industrial Engineering student following the **new** curriculum is required to complete 1.5 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 third and fourth year, or in the summer (additional tuition fees will be applied). For a list of faculty approved HSS electives, click here.

TECHNICAL ELECTIVES

A Technical Elective is typically an engineering course focused on learning new practical/technical skills and/or applying core engineering principles and domain knowledge to solve realistic/tangible problems. Such courses may more heavily emphasize practical laboratory or project-based learning experiences, with a focus on application of existing domain knowledge.

Students following the **new** curriculum are required to complete 4.0 technical elective credits from the list of approved electives. Fourth-year students in good standing may request to substitute 0.5 technical elective credit in each of the 4F and 4W terms.

Fourth-year students may request to substitute 0.5 technical elective credit in each of the 4F and 4W terms.

DEGREE EXPLORER

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 able to enrol in a course on ACORN does not mean it will fulfill your degree requirements.

PRACTICAL EXPERIENCE REQUIREMENT (PER)

Every student must complete a minimum of 600 hours of practical work before graduation. The nature of the work should form an integral part of a student's education and career development. It therefore must contain a good measure of responsibility (e.g., management of programs, systems, equipment, personnel, or

finances), sound judgment and effective communication, and be supportive of the professional career of the student after graduation.

Students who receive credit for PEY Co-op will automatically complete the practical experience requirement. Student who do not receive credit for PEY Co-op or did not participate in the PEY Co-op program must submit a PER form to the MIE Undergraduate Office.

ENGINEERING MINORS & CERTIFICATES

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 generally take six (6) to eight (8) courses in a particular field. A certificate typically requires three (3) courses.

Minors and Certificates are managed by the Cross-Disciplinary Programs (CDP) Office and all inquiries associated with the minors should be addressed to engineering.minors@utoronto.ca. For further information on the types of minors available etc. click here.

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 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 at 6AM 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 transcript until later. You can also visit the Cross-Disciplinary Programs Office to cancel your enrolment 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.

ENROLLMENT & REGISTRATION

OVERLOADS

- To enrol in more than 2.5 credits in a semester, you must receive approval from the Undergrad Office
- Minimum CGPA required: 2.7

"EXT" OR EXTRA COURSES

- All courses that are above and beyond a student's degree requirements must be marked as "Extra."
- The grade for an extra/EXT course will be displayed on the transcript, but it will not be factored into the GPA or sessional average.
- Extra courses can be used to fulfill the requirements of a minor or certificate.

FAILED COURSES

If you have failed a core 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 course, please 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 elective, you may do so yourself on the course selection dates.

AREAS OF FOCUS

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. People's behaviour in work organisations is examined from the point of view of individual and social psychology. These studies lead to important conclusions concerning managerial and leadership styles, organisational goals and incentives, employee relations, and the implementation of planned change.

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

COURSE CODE	COURSE TITLE
MIE434H1 (formerly MIE343H1)	Industrial Ergonomics and the Workplace
MIE344H1	Ergonomic Design of Information Systems

MIE345H1	Case Studies in Human Factors and Ergonomics
MIE435H1	Early-Stage Design Methods
MIE440H1	Design of Effective Products
MIE523H1	Engineering Psychology and Human Performance
MIE457H1	Knowledge Modelling and Management
MIE542H1	Human Factors Integration
MIE561H1	Case Studies in Healthcare
MIE567H1	Multi-agent Reinforcement Learning

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. Design, develop and use simulation models for improved decision making.

SUGGESTED TECHNICAL ELECTIVES

COURSE CODE	COURSE TITLE
APS502H1	Financial Engineering
MIE354H1	Business Process Engineering
MIE365H1	Advanced Operations Research
MIE367H1	Cases in Operations Research
MIE368H1	Analytics in Action
MIE469H1	Reliability and Maintainability Engineering
MIE451H1	Decision Support Systems
MIE566H1	Decision Making Under Uncertainty
MIE562H1	Scheduling
MIE519H1	Advanced Manufacturing Technologies
MIE561H1	Case Studies in Healthcare

FIELDS OF APPLICATION

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

ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

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.

SUGGESTED TECHNICAL ELECTIVES

COURSE CODE	COURSE TITLE
APS360H1	Applied Fundamentals of Deep Learning
MIE368H1	Analytics in Action
MIE369H1	Introduction to Artificial Intelligence
MIE451H1	Decision Support Systems
MIE566H1	Decision Making Under Uncertainty
MIE424H1	Optimization in Machine Learning
MIE457H1	Knowledge Modelling and Management

INFORMATION ENGINEERING

The Information Engineering specialization of the Industrial Engineering program 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.

SUGGESTED TECHNICAL ELECTIVES

COURSE CODE	COURSE TITLE
APS502H1	Financial Engineering
MIE354H1	Business Process Engineering
MIE344H1	Ergonomic Design of Information Systems
MIE368H1	Analytics in Action
MIE451H1	Decision Support Systems
MIE566H1	Decision Making Under Uncertainty

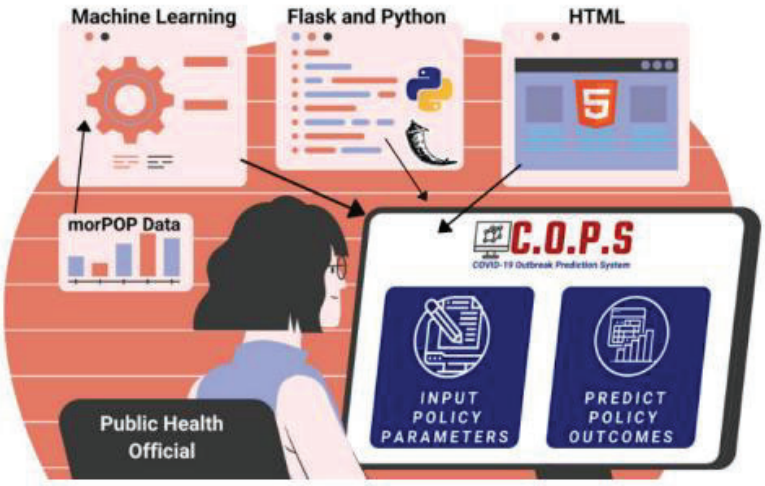
MIE562H1	Scheduling
MIE519H1	Advanced Manufacturing Technologies
MIE561H1	Case Studies in Healthcare

FIELDS OF APPLICATION

Data Analysis, Database Design, Business Process Modelling, Information Systems, Ontologies

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, interactive, 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 MIE Capstone Coordinators/MIE faculty members and each project is supervised by a single MIE faculty member.

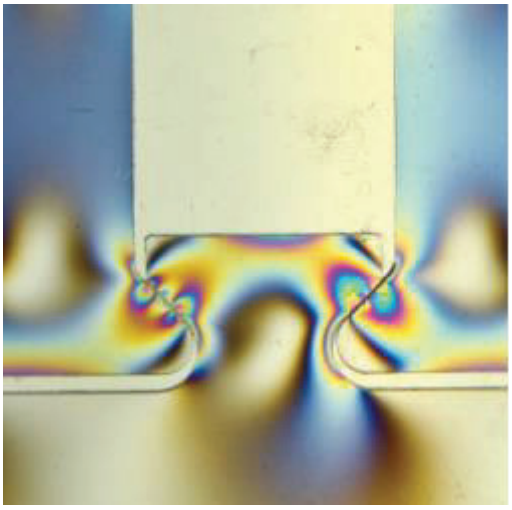
STUDENT-SOURCED CAPSTONE PROJECT: These projects are sourced by students through PEY Co-op or other industry contacts. Students must form a team and find a single MIE faculty member to supervise their project. Students interested in this type of project must submit their proposed project for approval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

MULTIDISCIPLINARY PROJECTS (APS490Y): These projects are sourced by capstone coordinators across the Faculty of Applied Science and the Multidisciplinary Capstone course coordinator. They 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 may require a competitive interview.

PROJECT SELECTION

For those interested in the **Multidisciplinary** and/or **Standard Capstone Projects,** you can apply as soon as the projects are posted (typically in May). Matching will be finalized by mid-August. ***Competitive selection**

MIE498H1/Y1: RESEARCH THESIS



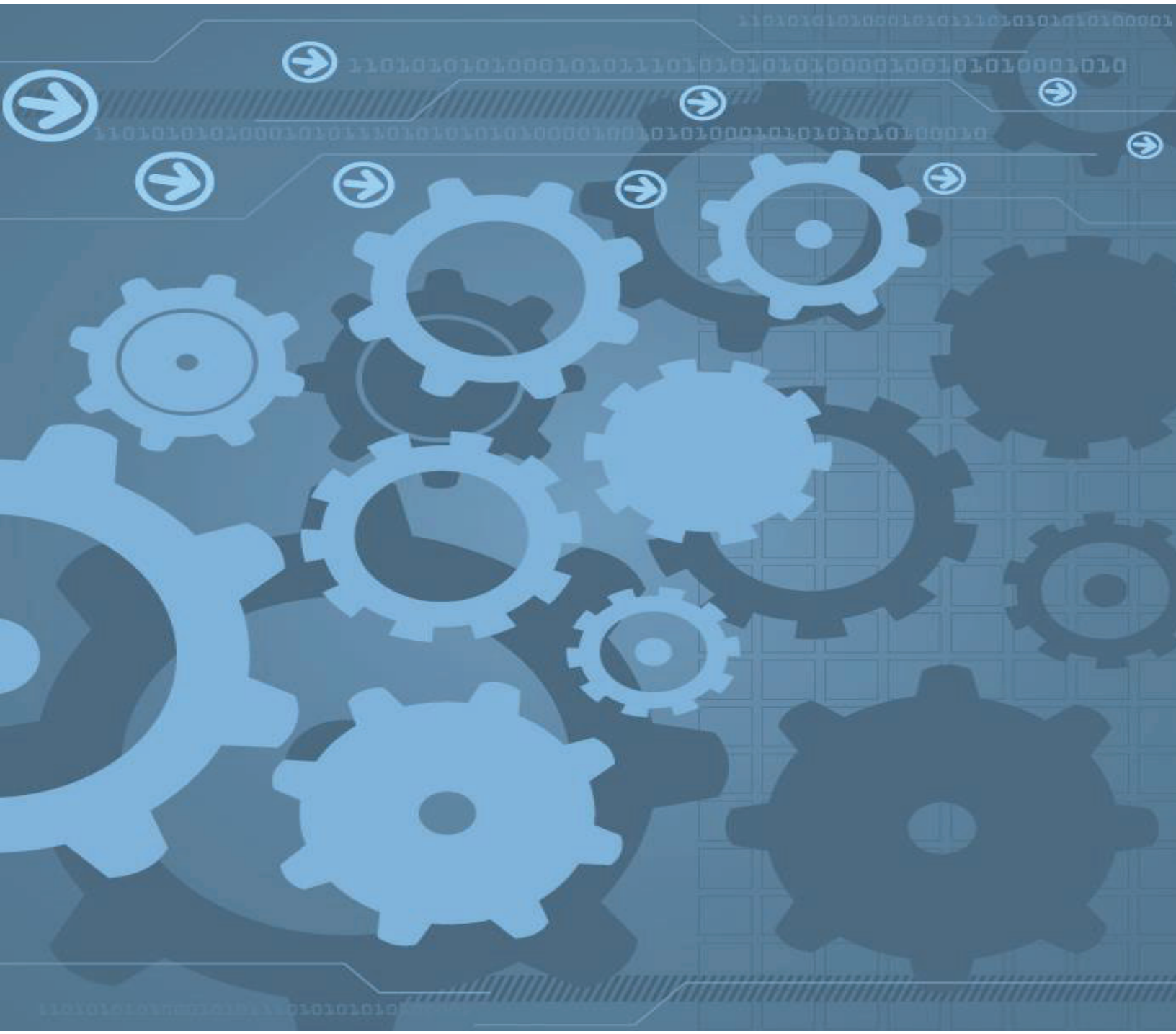
The purpose of MIE498 is two-fold: to enable students to pursue a technical project of interest, and to improve their communication skills. **It is particularly useful for students thinking about graduate school and who want to learn more about engineering research.** Preparing a Progress Report and 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. **Enrolment in our thesis course is restricted to students with an overall CGPA of at least 2.7** 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 Enrolment Form and research proposal, however, must be submitted to the Undergraduate Office by one week before the course add date and is not negotiable.**

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.

Enrolment Procedure: Please review the guidelines here.



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