Engineering Practice

Master of Engineering - Engineering Practice (5.0 credits - coursework pathway) (5.25 credits - practicum pathway)

Master of Engineering - Civil Engineering Practice		
Requirements - coursework pathway (5.0 credits)		
1. 2.0 credits from:		2.0
EGEN 5100 [0.5]	Reinforced and Prestressed Concrete Design	
EGEN 5101 [0.5]	Design of Steel Structures	
EGEN 5102 [0.5]	Masonry Behaviour and Design	
EGEN 5103 [0.5]	Infrastructure and Pavement Management	
EGEN 5104 [0.5]	Traffic Engineering	
EGEN 5105 [0.5]	Foundation Engineering	
EGEN 5106 [0.5]	Fundamentals of Fire Safety Engineering	
EGEN 5107 [0.5]	Design for Fire Resistance	
EGEN 5199 [0.5]	Special Topics in Civil Engineering	
EGEN 5099 [0.5]	Directed Studies (with permission of program director only, and support of a full-time faculty member)	
2. 0.5 credit in:		0.5
ECMP 5000 [0.5]	Engineering Communications	
3. 0.5 credit in:		0.5
ECMP 5001 [0.5]	Project Management	
4. 0.5 credit in:		0.5
ECMP 5002 [0.5]	Research Methods for Engineering Practitioners	
5. 1.5 credits from:		1.5
ECMP 5003 [0.5]	Entrepreneurship	
ECMP 5004 [0.5]	Engineering Economics	
ECMP 5005 [0.5]	Data Analytics	
ECMP 5006 [0.5]	Governance, Policy Development and Decision-making	
ECMP 5007 [0.5]	Climate Change and Sustainability	
ECMP 5008 [0.5]	Risk Analysis	
ECMP 5010 [0.5]	Professional and Ethical Practice for Engineers	
6. 0.0 credit in:		0.0
ECMP 5009 [0.0]	Research Seminar	
Total Credits		**5.0**

Master of Engineering - Civil Engineering Practice		
Requirements - practicum pathway (5.25 credits)		
1. 2.0 credits from:		2.0
EGEN 5100 [0.5]	Reinforced and Prestressed Concrete Design	
EGEN 5101 [0.5]	Design of Steel Structures	
EGEN 5102 [0.5]	Masonry Behaviour and Design	
EGEN 5103 [0.5]	Infrastructure and Pavement Management	
EGEN 5104 [0.5]	Traffic Engineering	
EGEN 5105 [0.5]	Foundation Engineering	
EGEN 5106 [0.5]	Fundamentals of Fire Safety Engineering	
EGEN 5107 [0.5]	Design for Fire Resistance	
EGEN 5199 [0.5]	Special Topics in Civil Engineering	
EGEN 5099 [0.5]	Directed Studies (with permission of program director only, and support of a full-time faculty member)	
2. 0.5 credit in:		0.5
ECMP 5000 [0.5]	Engineering Communications	
3. 0.5 credit in:		0.5
ECMP 5001 [0.5]	Project Management	
4. 0.5 credit in:		0.5
ECMP 5002 [0.5]	Research Methods for Engineering Practitioners	
5. 0.25 credit in:		0.25
EWEX 5000 [0.25]	Engineering Practicum Preparation	
6. 1.5 credits from the following list, which must include at least one of EWEX 5001 or EWEX 5002:		1.5
ECMP 5003 [0.5]	Entrepreneurship	
ECMP 5004 [0.5]	Engineering Economics	
ECMP 5005 [0.5]	Data Analytics	
ECMP 5006 [0.5]	Governance, Policy Development and Decision-making	
ECMP 5007 [0.5]	Climate Change and Sustainability	
ECMP 5008 [0.5]	Risk Analysis	
ECMP 5010 [0.5]	Professional and Ethical Practice for Engineers	
EWEX 5001 [0.5]	Engineering Practicum	
EWEX 5002 [0.5]	Engineering Practicum	
7. 0.0 credit in:		0.0
ECMP 5009 [0.0]	Research Seminar	
Total Credits		**5.25**

Master of Engineering - Software Engineering Practice		
Requirements - coursework pathway (5.0 credits)		
1. 2.0 credits from:		2.0
EGEN 5200 [0.5]	Operating Systems	
EGEN 5201 [0.5]	Embedded Systems Development	
EGEN 5202 [0.5]	Secure Systems Engineering	
EGEN 5203 [0.5]	Test-driven and Agile Software Development	
EGEN 5205 [0.5]	Software Development for Parallel and Distributed Architectures	
EGEN 5206 [0.5]	Web and Mobile Software Development	
EGEN 5208 [0.5]	Databases for Software Engineers	
EGEN 5209 [0.5]	Tools for Software Engineering	
EGEN 5210 [0.5]	Practical Introduction to Data Analysis and Machine Learning	
EGEN 5299 [0.5]	Special Topics in Software Engineering	
EGEN 5099 [0.5]	Directed Studies (with permission of program director only, and support of a full-time faculty member)	
2. 0.5 credit in:		0.5
ECMP 5000 [0.5]	Engineering Communications	
3. 0.5 credit in:		0.5
ECMP 5001 [0.5]	Project Management	
4. 0.5 credit in:		0.5

ECMP 5002 [0.5]	Research Methods for Engineering Practitioners	
5. 1.5 credits from:		1.5
ECMP 5003 [0.5]	Entrepreneurship	
ECMP 5004 [0.5]	Engineering Economics	
ECMP 5005 [0.5]	Data Analytics	
ECMP 5006 [0.5]	Governance, Policy Development and Decision-making	
ECMP 5007 [0.5]	Climate Change and Sustainability	
ECMP 5008 [0.5]	Risk Analysis	
ECMP 5010 [0.5]	Professional and Ethical Practice for Engineers	
6. 0.0 credit in:		0.0
ECMP 5009 [0.0]	Research Seminar	
Total Credits		**5.0**

Master of Engineering - Software Engineering Practice

Requirements - practicum pathway (5.25 credits)		
1. 2.0 credits from:		2.0
EGEN 5200 [0.5]	Operating Systems	
EGEN 5201 [0.5]	Embedded Systems Development	
EGEN 5202 [0.5]	Secure Systems Engineering	
EGEN 5203 [0.5]	Test-driven and Agile Software Development	
EGEN 5205 [0.5]	Software Development for Parallel and Distributed Architectures	
EGEN 5206 [0.5]	Web and Mobile Software Development	
EGEN 5208 [0.5]	Databases for Software Engineers	
EGEN 5209 [0.5]	Tools for Software Engineering	
EGEN 5210 [0.5]	Practical Introduction to Data Analysis and Machine Learning	
EGEN 5299 [0.5]	Special Topics in Software Engineering	
EGEN 5099 [0.5]	Directed Studies (with permission of the program director only, and support of a full-time faculty member)	
2. 0.5 credit in:		0.5
ECMP 5000 [0.5]	Engineering Communications	
3. 0.5 credit in:		0.5
ECMP 5001 [0.5]	Project Management	
4. 0.5 credit in:		0.5
ECMP 5002 [0.5]	Research Methods for Engineering Practitioners	
5. 0.25 credit in:		0.25
EWEX 5000 [0.25]	Engineering Practicum Preparation	
6. 1.5 credits from the following list, which must include at least one of EWEX 5001 or EWEX 5002:		1.5
ECMP 5003 [0.5]	Entrepreneurship	
ECMP 5004 [0.5]	Engineering Economics	
ECMP 5005 [0.5]	Data Analytics	
ECMP 5006 [0.5]	Governance, Policy Development and Decision-making	
ECMP 5007 [0.5]	Climate Change and Sustainability	
ECMP 5008 [0.5]	Risk Analysis	
ECMP 5010 [0.5]	Professional and Ethical Practice for Engineers	
EWEX 5001 [0.5]	Engineering Practicum	
EWEX 5002 [0.5]	Engineering Practicum	
7. 0.0 credit in:		
ECMP 5009 [0.0]	Research Seminar	
Total Credits		**5.25**

Master of Engineering - Electrical Engineering Practice

Requirements - coursework pathway (5.0 credits)		
1. 2.0 credits from:		2.0
EGEN 5300 [0.5]	Signal Processing Electronics	
EGEN 5301 [0.5]	VLSI Design	
EGEN 5302 [0.5]	Modeling and Simulation of Electrical Circuits	
EGEN 5303 [0.5]	Silicon Sensors	
EGEN 5304 [0.5]	Microprocessor Systems	
EGEN 5305 [0.5]	Power Systems	
EGEN 5306 [0.5]	Telecommunications Systems	
EGEN 5307 [0.5]	Control Systems and Robotics	
EGEN 5308 [0.5]	Integrated Circuit and Device Technology	
EGEN 5399 [0.5]	Special Topics in Electrical Engineering	
EGEN 5099 [0.5]	Directed Studies (with permission of program director only, and support of a full-time faculty member)	
2. 0.5 credit in:		0.5
ECMP 5000 [0.5]	Engineering Communications	
3. 0.5 credit in:		0.5
ECMP 5001 [0.5]	Project Management	
4. 0.5 credit in:		0.5
ECMP 5002 [0.5]	Research Methods for Engineering Practitioners	
5. 1.5 credits from:		1.5
ECMP 5003 [0.5]	Entrepreneurship	
ECMP 5004 [0.5]	Engineering Economics	
ECMP 5005 [0.5]	Data Analytics	
ECMP 5006 [0.5]	Governance, Policy Development and Decision-making	
ECMP 5007 [0.5]	Climate Change and Sustainability	
ECMP 5008 [0.5]	Risk Analysis	
ECMP 5010 [0.5]	Professional and Ethical Practice for Engineers	
6. 0.0 credit in:		0.0
ECMP 5009 [0.0]	Research Seminar	
Total Credits		**5.0**

Master of Engineering - Electrical Engineering Practice

Requirements - practicum pathway (5.25 credits)		
1. 2.0 credits from:		2.0
EGEN 5300 [0.5]	Signal Processing Electronics	
EGEN 5301 [0.5]	VLSI Design	
EGEN 5302 [0.5]	Modeling and Simulation of Electrical Circuits	
EGEN 5303 [0.5]	Silicon Sensors	
EGEN 5304 [0.5]	Microprocessor Systems	
EGEN 5305 [0.5]	Power Systems	
EGEN 5306 [0.5]	Telecommunications Systems	
EGEN 5307 [0.5]	Control Systems and Robotics	

EGEN 5308 [0.5]	Integrated Circuit and Device Technology	
EGEN 5399 [0.5]	Special Topics in Electrical Engineering	
EGEN 5099 [0.5]	Directed Studies (with permission of the program director only, and support of a full-time faculty member)	
2. 0.5 credit in:		0.5
ECMP 5000 [0.5]	Engineering Communications	
3. 0.5 credit in:		0.5
ECMP 5001 [0.5]	Project Management	
4. 0.5 credit in:		0.5
ECMP 5002 [0.5]	Research Methods for Engineering Practitioners	
5. 0.25 credit in:		0.25
EWEX 5000 [0.25]	Engineering Practicum Preparation	
6. 1.5 credits from the following list, which must include at least one of EWEX 5001 or EWEX 5002:		1.5
ECMP 5003 [0.5]	Entrepreneurship	
ECMP 5004 [0.5]	Engineering Economics	
ECMP 5005 [0.5]	Data Analytics	
ECMP 5006 [0.5]	Governance, Policy Development and Decision-making	
ECMP 5007 [0.5]	Climate Change and Sustainability	
ECMP 5008 [0.5]	Risk Analysis	
ECMP 5010 [0.5]	Professional and Ethical Practice for Engineers	
EWEX 5001 [0.5]	Engineering Practicum	
EWEX 5002 [0.5]	Engineering Practicum	
7. 0.0 credit in:		0.0
ECMP 5009 [0.0]	Research Seminar	
Total Credits		**5.25**

Master of Engineering - Environmental Engineering Practice

Requirements - coursework pathway (5.0 credits)		
1. 2.0 credits from:		2.0
EGEN 5400 [0.5]	Overview of Environmental Engineering Principles	
EGEN 5401 [0.5]	Physico-Chemical Processes in Water and Wastewater Treatment	
EGEN 5402 [0.5]	Biological Processes in Water and Wastewater Treatment	
EGEN 5403 [0.5]	Groundwater and Soil Remediation	
EGEN 5404 [0.5]	Solid Wastes and Landfill	
EGEN 5405 [0.5]	Air Pollution and Emission Control	
EGEN 5406 [0.5]	Climate Change and Engineering	
EGEN 5407 [0.5]	Environmental Impact Assessment	
EGEN 5499 [0.5]	Special Topics in Environmental Engineering	
EGEN 5099 [0.5]	Directed Studies (with permission of program director only, and support of a full-time faculty member)	
2. 0.5 credit in:		0.5
ECMP 5000 [0.5]	Engineering Communications	
3. 0.5 credit in:		0.5
ECMP 5001 [0.5]	Project Management	
4. 0.5 credit in:		0.5
ECMP 5002 [0.5]	Research Methods for Engineering Practitioners	
5. 1.5 credits from:		1.5
ECMP 5003 [0.5]	Entrepreneurship	
ECMP 5004 [0.5]	Engineering Economics	
ECMP 5005 [0.5]	Data Analytics	
ECMP 5006 [0.5]	Governance, Policy Development and Decision-making	
ECMP 5007 [0.5]	Climate Change and Sustainability	
ECMP 5008 [0.5]	Risk Analysis	
ECMP 5010 [0.5]	Professional and Ethical Practice for Engineers	
6. 0.0 credit in:		0.0
ECMP 5009 [0.0]	Research Seminar	
Total Credits		**5.0**

Master of Engineering - Environmental Engineering Practice

Requirements - practicum pathway (5.25 credits)		
1. 2.0 credits from:		2.0
EGEN 5400 [0.5]	Overview of Environmental Engineering Principles	
EGEN 5401 [0.5]	Physico-Chemical Processes in Water and Wastewater Treatment	
EGEN 5402 [0.5]	Biological Processes in Water and Wastewater Treatment	
EGEN 5403 [0.5]	Groundwater and Soil Remediation	
EGEN 5404 [0.5]	Solid Wastes and Landfill	
EGEN 5405 [0.5]	Air Pollution and Emission Control	
EGEN 5406 [0.5]	Climate Change and Engineering	
EGEN 5407 [0.5]	Environmental Impact Assessment	
EGEN 5499 [0.5]	Special Topics in Environmental Engineering	
EGEN 5099 [0.5]	Directed Studies (with permission of the program director only, and support of a full-time faculty member)	
2. 0.5 credit in:		0.5
ECMP 5000 [0.5]	Engineering Communications	
3. 0.5 credit in:		0.5
ECMP 5001 [0.5]	Project Management	
4. 0.5 credit in:		0.5
ECMP 5002 [0.5]	Research Methods for Engineering Practitioners	
5. 0.25 credit in:		0.25
EWEX 5000 [0.25]	Engineering Practicum Preparation	
6. 1.5 credits from the following list, which must include at least one of EWEX 5001 or EWEX 5002:		1.5
ECMP 5003 [0.5]	Entrepreneurship	
ECMP 5004 [0.5]	Engineering Economics	
ECMP 5005 [0.5]	Data Analytics	
ECMP 5006 [0.5]	Governance, Policy Development and Decision-making	
ECMP 5007 [0.5]	Climate Change and Sustainability	
ECMP 5008 [0.5]	Risk Analysis	
ECMP 5010 [0.5]	Professional and Ethical Practice for Engineers	
EWEX 5001 [0.5]	Engineering Practicum	
EWEX 5002 [0.5]	Engineering Practicum	

7. 0.0 credit in:		0.0
ECMP 5009 [0.0]	Research Seminar	
Total Credits		**5.25**

Master of Engineering - Mechanical Engineering Practice

Requirements - coursework pathway (5.0 credits)		
1. 2.0 credits from:		2.0
EGEN 5500 [0.5]	Applied Fluid Mechanics	
EGEN 5501 [0.5]	Computational Fluid Mechanics	
EGEN 5502 [0.5]	Thermodynamics and Energy Systems	
EGEN 5503 [0.5]	Transport Phenomena (Heat and Mass)	
EGEN 5504 [0.5]	Kinematics and Dynamics of Human Movement	
EGEN 5505 [0.5]	Controls and Robotics	
EGEN 5506 [0.5]	Mechanics and Fracture	
EGEN 5507 [0.5]	Surfaces and Interfacial Phenomena	
EGEN 5508 [0.5]	Introduction to Advanced Materials	
EGEN 5509 [0.5]	Engineering Vibrations	
EGEN 5599 [0.5]	Special Topics in Mechanical Engineering	
EGEN 5099 [0.5]	Directed Studies (with permission of program director only, and support of a full-time faculty member)	
2. 0.5 credit in:		0.5
ECMP 5000 [0.5]	Engineering Communications	
3. 0.5 credit in:		0.5
ECMP 5001 [0.5]	Project Management	
4. 0.5 credit in:		0.5
ECMP 5002 [0.5]	Research Methods for Engineering Practitioners	
5. 1.5 credits from:		1.5
ECMP 5003 [0.5]	Entrepreneurship	
ECMP 5004 [0.5]	Engineering Economics	
ECMP 5005 [0.5]	Data Analytics	
ECMP 5006 [0.5]	Governance, Policy Development and Decision-making	
ECMP 5007 [0.5]	Climate Change and Sustainability	
ECMP 5008 [0.5]	Risk Analysis	
ECMP 5010 [0.5]	Professional and Ethical Practice for Engineers	
6. 0.0 credit in:		0.0
ECMP 5009 [0.0]	Research Seminar	
Total Credits		**5.0**

Master of Engineering - Mechanical Engineering Practice

Requirements - practicum pathway (5.25 credits)		
1. 2.0 credits from:		2.0
EGEN 5500 [0.5]	Applied Fluid Mechanics	
EGEN 5501 [0.5]	Computational Fluid Mechanics	
EGEN 5502 [0.5]	Thermodynamics and Energy Systems	
EGEN 5503 [0.5]	Transport Phenomena (Heat and Mass)	
EGEN 5504 [0.5]	Kinematics and Dynamics of Human Movement	
EGEN 5505 [0.5]	Controls and Robotics	
EGEN 5506 [0.5]	Mechanics and Fracture	
EGEN 5507 [0.5]	Surfaces and Interfacial Phenomena	
EGEN 5508 [0.5]	Introduction to Advanced Materials	
EGEN 5509 [0.5]	Engineering Vibrations	
EGEN 5599 [0.5]	Special Topics in Mechanical Engineering	
EGEN 5099 [0.5]	Directed Studies (with permission of the program director only, and support of a full-time faculty member)	
2. 0.5 credit in:		0.5
ECMP 5000 [0.5]	Engineering Communications	
3. 0.5 credit in:		0.5
ECMP 5001 [0.5]	Project Management	
4. 0.5 credit in:		0.5
ECMP 5002 [0.5]	Research Methods for Engineering Practitioners	
5. 0.25 credit in:		0.25
EWEX 5000 [0.25]	Engineering Practicum Preparation	
6. 1.5 credits from the following list, which must include at least one of EWEX 5001 or EWEX 5002:		1.5
ECMP 5003 [0.5]	Entrepreneurship	
ECMP 5004 [0.5]	Engineering Economics	
ECMP 5005 [0.5]	Data Analytics	
ECMP 5006 [0.5]	Governance, Policy Development and Decision-making	
ECMP 5007 [0.5]	Climate Change and Sustainability	
ECMP 5008 [0.5]	Risk Analysis	
ECMP 5010 [0.5]	Professional and Ethical Practice for Engineers	
EWEX 5001 [0.5]	Engineering Practicum	
EWEX 5002 [0.5]	Engineering Practicum	
7. 0.0 credit in:		0.0
ECMP 5009 [0.0]	Research Seminar	
Total Credits		**5.25**

Admission

The requirement for admission to the M. Engineering - Engineering Practice is a four-year bachelor's degree in civil, computer, electrical, environmental, mechanical engineering, or software (students with other engineering degree disciplines should contact the Faculty for special consideration) from an institution recognized by Engineers Canada under the Washington Accord, with an average of at least B+. Applicants should note that simply meeting the minimum standards for admission will not guarantee admission to the program as there are only a limited number of positions available each year.

Transfer and Transfer Credit

Graduate students currently registered in other graduate programs in Engineering at Carleton University, and who hold a four-year bachelor's degree in engineering from an institution recognized by Engineers Canada under the Washington Accord can transfer into this program. Transfer credit will be awarded for courses where a grade

of B or higher was earned in other graduate programs in Engineering at Carleton University towards the fulfilment of discipline specific Engineering course requirements.

Regulations

See the General Regulations section of this Calendar.

Regularly Scheduled Break

For immigration purposes, the summer term (May to August) for the Master of Engineering - Engineering Practice is considered a regularly scheduled break approved by the University. Students should resume full-time studies in September.

Note: a Regularly Scheduled Break as described for immigration purposes does not supersede the requirement for continuous registration in Thesis, Research Essay, or Independent Research Project as described in Section 8.2 of the Graduate General Regulations.

Engineering Complementary Courses (ECMP) Courses

ECMP 5000 [0.5 credit]
Engineering Communications
Designed to advance the student's ability to communicate technical ideas and conclusions effectively to peers and stakeholders. The course is divided into three sections involving the principles and practice of written, verbal, and graphical communication modes.
Prerequisite(s): enrolment in the M.Eng.- Engineering Practice program.

ECMP 5001 [0.5 credit]
Project Management
Introduction to project management tools, techniques, templates, and methodologies. This course examines the eight knowledge areas of the Project Management Institute (PMI) which provide an integrated approach to managing engineering projects.
Prerequisite(s): enrolment in the M.Eng.- Engineering Practice program.

ECMP 5002 [0.5 credit]
Research Methods for Engineering Practitioners
The course focuses on equipping students with the skills to carry out R&D projects while integrating advanced tools like AI in an ethical way in this rapidly changing landscape. The course remains flexible to accommodate evolving technologies and industry needs.
Prerequisite(s): enrolment in the M.Eng.- Engineering Practice program.

ECMP 5003 [0.5 credit]
Entrepreneurship
Introduction to the conceptual and practical considerations in developing new products. The theory and practice of project management, innovation and entrepreneurship, business planning, marketing, and mobilizing human and financial resources applied to the creation of new business activities and ventures will be discussed.
Prerequisite(s): enrolment in the M.Eng.- Engineering Practice program.

ECMP 5004 [0.5 credit]
Engineering Economics
The application of engineering economics, financial analysis and market assessment to engineering alternatives in the planning, development and ongoing management of industrial enterprises.
Prerequisite(s): enrolment in the M.Eng.- Engineering Practice program.

ECMP 5005 [0.5 credit]
Data Analytics
Introduction to data analytics, including visualization and knowledge discovery in massive datasets; unsupervised learning: clustering algorithms; dimension reduction; supervised learning: pattern recognition, smoothing techniques, classification. Computer software will be used.

Prerequisite(s): enrolment in the M.Eng. - Engineering Practice program.

ECMP 5006 [0.5 credit]
Governance, Policy Development and Decision-making
Provide a foundational knowledge level of key governance structures and political institutions at the Canadian federal, provincial, and municipal levels, as well as Indigenous structures. Scholarship on policy development, strategic thinking and decision making is introduced, along with the role of information.
Prerequisite(s): enrolment in the M.Eng.- Engineering Practice program.

ECMP 5007 [0.5 credit]
Climate Change and Sustainability
The complex and multifaceted elements of climate change and sustainable living are introduced in terms of the humanities, sciences, engineering, business and public policy perspectives, as well as root causes and potential adaptive responses.
Prerequisite(s): enrolment in the M.Eng.- Engineering Practice program.

ECMP 5008 [0.5 credit]
Risk Analysis
The challenge of living and operating responsibly within a finite level of risk is a ubiquitous aspect of engineered systems. A framework for the identification and evaluation of risk is provided through examples, and discussions include means to manage ongoing risk.
Prerequisite(s): enrolment in the M.Eng.- Engineering Practice program.

ECMP 5009 [0.0 credit]
Research Seminar
A series of invited lectures to present the motivation, methodologies, results, and societal implications of ongoing engineering research projects occurring within the Faculty. Graded SAT/UNS.
Prerequisite(s): enrolment in the M.Eng.- Engineering Practice program.

ECMP 5010 [0.5 credit]
Professional and Ethical Practice for Engineers
This course adapts to current industry challenges and emerging ethical issues, providing students with a broad understanding of professional responsibility in areas such as public safety, AI, sustainability, and technological ethics.
Prerequisite(s): enrolment in the M.Eng.- Engineering Practice program.

Engineering General (EGEN) Courses

EGEN 5099 [0.5 credit]
Directed Studies
Independent research project supervised by a full time faculty member who will provide mentorship for the project.
Prerequisite(s): enrolment in the M.Eng.- Engineering Practice program.

EGEN 5100 [0.5 credit]
Reinforced and Prestressed Concrete Design
Introduction to design of reinforced and prestressed concrete elements using CSA A23.3. Behaviour and design of beams, columns and slabs. Prestressed concrete concepts including flexural analysis, shear, deflections and prestress loss.
Prerequisite(s): enrolment in the M.Eng.- Engineering Practice program.

EGEN 5101 [0.5 credit]
Design of Steel Structures
Introduction to CAN/CSA - S16, design and behaviour concepts; shear lag, block shear, local plate buckling, lateral torsional buckling, inelastic strength and stability. Design of tension members, axially loaded columns, beams, composite beams, plate girders, stability of structures and members.
Prerequisite(s): enrolment in the M.Eng.- Engineering Practice program.

EGEN 5102 [0.5 credit]
Masonry Behaviour and Design
Introduction to design of reinforced masonry using CSA S304. Properties of masonry materials and assemblages. Behaviour and design of walls, beams and columns. Applications to low-rise construction.
Prerequisite(s): enrolment in the M.Eng.- Engineering Practice program.

EGEN 5103 [0.5 credit]
Infrastructure and Pavement Management
Advanced pavement management, network and project level management, data collection and management, pavement evaluation, pavement design, rehabilitation and maintenance, pavement performance models, life cycle analysis, implementation of pavement management systems, future directions and research needs.
Prerequisite(s): enrolment in the M.Eng.- Engineering Practice program.

EGEN 5104 [0.5 credit]
Traffic Engineering
Traffic control devices, signal warrants, principles of signalized intersection design, signal timing and components, signal optimization and coordination, traffic delay estimation, actuated control, freeway access control.

Prerequisite(s): enrolment in the M.Eng.- Engineering Practice program.

EGEN 5105 [0.5 credit]
Foundation Engineering
Review of methods of estimating the shear strength of soils; use of in-situ testing for design purposes; bearing capacity and performance of shallow and deep foundations; pile groups.
Prerequisite(s): enrolment in the M.Eng.- Engineering Practice program.

EGEN 5106 [0.5 credit]
Fundamentals of Fire Safety Engineering
Explores the fire safety system, covering performance-based design, heat transfer, fire development, active fire protection systems, evacuation, life hazard assessment, wildland fires, fire investigation, and fire risk analysis. Compliance with building codes and standards is integrated.
Prerequisite(s): enrolment in the M.Eng.- Engineering Practice program.

EGEN 5107 [0.5 credit]
Design for Fire Resistance
Fire safety in buildings, fire and heat, compartment fires; pre- and post-flashover fires; design fires; behaviour of materials and structures at elevated temperatures; fire-resistance tests; fire-resistance ratings; building code requirements; real-world fires; assessing the fire resistance of steel, concrete, and wood building assemblies.
Prerequisite(s): enrolment in the M.Eng.- Civil Engineering Practice program.

EGEN 5199 [0.5 credit]
Special Topics in Civil Engineering
The course tackles specific issues within the field of civil engineering that may not be covered by existing approved courses.
Prerequisite(s): enrolment in the M.Eng.- Engineering Practice program.

EGEN 5200 [0.5 credit]
Operating Systems
Introduction to operating system principles. Structure of an operating system; management of CPU, processes, and memory; dead-lock problems, file systems. Concurrent programming.
Prerequisite(s): enrolment in the M.Eng.- Engineering Practice program.

EGEN 5201 [0.5 credit]
Embedded Systems Development
Applications of embedded systems and challenges of embedded systems design; embedded processors, embedded reconfigurable hardware, embedded software; specification, modeling, design and verification of embedded systems; real time systems; construction of event-driven systems; performance issues; practical examples.
Prerequisite(s): enrolment in the M.Eng.- Engineering Practice program and an undergraduate degree in Computer or Software Engineering or permission of the Director.

EGEN 5202 [0.5 credit]
Secure Systems Engineering
Causes and consequences of computer system failure. Structure of fault-tolerant computer systems. Methods for protecting software and data against computer failure. Quantification of system reliability. Introduction to formal methods for safety-critical systems. Computer and computer network security.
Prerequisite(s): enrolment in the M.Eng.- Engineering Practice program and an undergraduate degree in Computer or Software Engineering or permission of the Director.

EGEN 5203 [0.5 credit]
Test-driven and Agile Software Development
Practice of object-oriented design principles, design patterns, object-oriented frameworks, refactoring, unit-testing, test-driven development, Agile software development principles.
Prerequisite(s): enrolment in the M.Eng.- Engineering Practice program.

EGEN 5205 [0.5 credit]
Software Development for Parallel and Distributed Architectures
Advanced parallel programming and distributed systems, and high-performance computing in engineering. Both shared-memory parallel computers and distributed-memory multicomputers are considered. Aspects of the practice of parallelism will be covered. Emphasis is on thread programming, data-parallel programming, and performance evaluation.
Prerequisite(s): enrolment in the M.Eng.- Engineering Practice program and an undergraduate degree in Computer or Software Engineering or permission of the Director.

EGEN 5206 [0.5 credit]
Web and Mobile Software Development
Developing web and mobile applications. Topics include: client-side/mobile programming language, development tools, graphical user interface patterns (e.g., event-driven programming, separation of content and presentation, layout policies) and framework, interactions with the server-side.
Prerequisite(s): enrolment in the M.Eng.- Engineering Practice program.

EGEN 5208 [0.5 credit]
Databases for Software Engineers
The relational database model and its logical underpinnings, mapping requirements to a database schema, the Entity-Relationship model, normalization, joins, SQL, indexes and views, transactions, object-relational mapping, migrations, noSQL databases.
Prerequisite(s): enrolment in the M.Eng.- Engineering Practice program.

EGEN 5209 [0.5 credit]
Tools for Software Engineering
Proficiency with everyday software engineering tools: the command line, shell tools and scripting, text processing (regular expressions, grep, sed, awk), basic text editors (vim), graphing (gnuplot/matplotlib, graphviz), version control (git), networking tools (telnet, ssh, scp, curl), build and package management tools (make, apt-get).
Prerequisite(s): enrolment in the M.Eng.- Engineering Practice program.

EGEN 5210 [0.5 credit]
Practical Introduction to Data Analysis and Machine Learning
Tabular data exploration and visualization (pandas, matplotlib), data-fitting basics (scikit-learn), k-nearest neighbours, linear regression, decision trees, data pre-processing, model evaluation metrics, overfitting vs underfitting, bias/variance, cross-validation, introduction to neural networks, hyperparameter tuning, feature selection, feature importance.
Prerequisite(s): enrolment in the M.Eng.- Software Engineering Practice program.

EGEN 5299 [0.5 credit]
Special Topics in Software Engineering
The course tackles specific issues within the field of software engineering that may not be covered by existing approved courses.
Prerequisite(s): enrolment in the M.Eng.- Engineering Practice program.

EGEN 5300 [0.5 credit]
Signal Processing Electronics
Overview of analysis and design of analog and mixed-signal circuit building blocks in continuous- and discrete-time signal processing. Topics: analysis and design of continuous-time filters; discrete-time signal analysis using z-transform; discrete-time filter design; fundamental techniques for digital-to-analog and analog-to-digital converters.
Prerequisite(s): enrolment in the M.Eng.- Engineering Practice program.

EGEN 5301 [0.5 credit]
VLSI Design
Very Large-Scale Integration (VLSI) design techniques and their application. CMOS devices and technology. Modular Design Approach and use of CAD tools in an integrated circuit design flow. Building blocks of CMOS analog and digital circuits. Advanced digital logic circuit techniques.
Prerequisite(s): enrolment in the M.Eng.- Engineering Practice program.

EGEN 5302 [0.5 credit]
Modeling and Simulation of Electrical Circuits
Basic principles of Computer-Aided Design tools used for analysis and design of VLSI circuits and systems. Automated formulation of circuit equations, Frequency, DC and time-domain analysis. Noise and distortion analysis. Interconnect analysis. Sensitivity analysis, and circuit performance optimization.
Prerequisite(s): enrolment in the M.Eng.- Engineering Practice program.

EGEN 5303 [0.5 credit]
Silicon Sensors
Overview of sensor technologies with emphasis on devices suitable for integration with silicon integrated circuits. Sensor design and signal conditioning. Sensor circuitry and adaptations for automotive, biomedical, and other instrumentation applications.
Prerequisite(s): enrolment in the M.Eng.- Engineering Practice program.

EGEN 5304 [0.5 credit]
Microprocessor Systems
Interfacing aspects in microprocessor systems. Microprocessors and bus structures, internal architecture, instruction set and pin functions. Memory interfacing, input-output, interrupts, direct memory accesses, special processors and multiprocessor systems.
Prerequisite(s): enrolment in the M.Eng.- Engineering Practice program.

EGEN 5305 [0.5 credit]
Power Systems
Introduction to power system and their transient states. Power system voltage stability; PV and QV curve methods. Power system angular stability; transient stability and equal area criterion; steady-state stability and power system stabilizer. Electromagnetic transients in power systems, insulation coordination and equipment protection.

Prerequisite(s): enrolment in the M.Eng.- Engineering Practice program and an undergraduate degree in Electrical Engineering or permission of the Director.

EGEN 5306 [0.5 credit]
Telecommunications Systems
Communications fundamentals including decibel, intermodulation, 1dB compression, dynamic range, SNR, noise figure, noise temperature, antenna gain, EIRP, G/T. Links; transceiver architecture, diversity, fade margin, link calculations, multiple accessing.
Prerequisite(s): enrolment in the M.Eng.- Engineering Practice program.

EGEN 5307 [0.5 credit]
Control Systems and Robotics
Fundamental aspects of modeling and control of robot manipulators as devices that involve electronics and mechanics (kinematics and dynamics), electronic actuators, information theory, automation. Principles of proximity, tactile, and force sensing. Programming platforms and languages. Automation strategies.
Prerequisite(s): enrolment in the M.Eng.- Engineering Practice program.

EGEN 5308 [0.5 credit]
Integrated Circuit and Device Technology
Survey of technology used in silicon VLSI integrated circuit fabrication. Crystal growth and crystal defects, oxidation, diffusion, ion implantation and annealing, gettering, CVD, etching, materials for metallization and contacting, and photolithography. Structures and fabrication techniques required for submicron MOSFETs. Applications in advanced CMOS processes.
Prerequisite(s): enrolment in the M.Eng.- Engineering Practice program.

EGEN 5399 [0.5 credit]
Special Topics in Electrical Engineering
The course tackles specific issues within the field of electrical engineering that may not be covered by existing approved courses.
Prerequisite(s): enrolment in the M.Eng.- Engineering Practice program.

EGEN 5400 [0.5 credit]
Overview of Environmental Engineering Principles
Basic mechanisms of chemistry, biology, and physics relevant to environmental engineering. Principles of equilibrium, mass transfer, material balances, microbial growth, water, energy, and nutrient cycles. Applications to environmental systems as biological degradation, mass and energy movement, and design of water and wastewater treatment systems.
Prerequisite(s): enrolment in the M.Eng.- Engineering Practice program and an undergraduate degree in Environmental Engineering or permission of the Director.

EGEN 5401 [0.5 credit]
Physico-Chemical Processes in Water and Wastewater Treatment
Theory and design of chemical and physical unit processes utilized in the treatment of water and wastewater, sedimentation, flotation, coagulation, precipitation, filtration, disinfection, ion exchange, reverse osmosis, adsorption, and gas transfer.
Prerequisite(s): enrolment in the M.Eng.- Engineering Practice program.

EGEN 5402 [0.5 credit]
Biological Processes in Water and Wastewater Treatment
Study of the theoretical and applied aspects of wastewater treatment by activated sludge, fixed and moving biological films, conventional and aerated lagoons, sludge digestion, septic tanks, land treatment, and nutrient removal. Guidelines, regulations and economics. System analysis and design of facilities.
Prerequisite(s): enrolment in the M.Eng.- Engineering Practice program and an undergraduate degree in Environmental Engineering or permission of the Director.

EGEN 5403 [0.5 credit]
Groundwater and Soil Remediation
Principles of groundwater chemistry, the chemical evolution of natural groundwater flow systems, sources of contamination, and mass transport processes. Hydrogeologic aspects of waste disposal and groundwater remediation.
Prerequisite(s): enrolment in the M.Eng.- Engineering Practice program and an undergraduate degree in Environmental Engineering or permission of the Director.

EGEN 5404 [0.5 credit]
Solid Wastes and Landfill
Principles of solid waste management to protect public health. Study of solid waste components, refuse collection, storage, and handling. Design and operation of solid waste transfer and disposal facilities including transfer stations, resource recovery and composting facilities, incinerators, and landfills.
Prerequisite(s): enrolment in the M.Eng.- Engineering Practice program and an undergraduate degree in Environmental Engineering or permission of the Director.

EGEN 5405 [0.5 credit]
Air Pollution and Emission Control
Types of gaseous and particulate pollutants and their sources, effects of air pollution on man,vegetation, and materials, indoor air pollution, sampling and analysis of air pollutants, air pollution meteorology and dispersion, control techniques for gaseous and particulate pollutants, and air quality management aspects.
Prerequisite(s): enrolment in the M.Eng.- Engineering Practice program and an undergraduate degree in Environmental Engineering or permission of the Director.

EGEN 5406 [0.5 credit]
Climate Change and Engineering
Current and projected impacts of climate change on the circumpolar north, including the land, its biota, northern communities, drivers that shape these interactions, as well as how these impact engineered structures.
Prerequisite(s): enrolment in the M.Eng.- Engineering Practice program and an undergraduate degree in Environmental Engineering or permission of the Director.

EGEN 5407 [0.5 credit]
Environmental Impact Assessment
Principles and elements of environmental assessment with an interdisciplinary focus. Topics include types of environmental assessments, when to use them, data required, sampling strategies, how data should be collected and analyzed and ultimately communicated to pass legal and scientific scrutiny.
Prerequisite(s): enrolment in the M.Eng.- Engineering Practice program and an undergraduate degree in Environmental Engineering or permission of the Director.

EGEN 5499 [0.5 credit]
Special Topics in Environmental Engineering
The course tackles specific issues within the field of environmental engineering that may not be covered by existing approved courses.
Prerequisite(s): enrolment in the M.Eng.- Engineering Practice program.

EGEN 5500 [0.5 credit]
Applied Fluid Mechanics
Kinematics of fluid motion, fundamental fluid equations and concepts, laminar boundary layers, potential flow, stability and transition, introduction to turbulence, practical examples in mechanical engineering.
Prerequisite(s): enrolment in the M.Eng.- Engineering Practice program and an undergraduate degree in Mechanical Engineering or permission of the Director.

EGEN 5501 [0.5 credit]
Computational Fluid Mechanics
Solutions of the transport equations of momentum, mass, and energy. Transport processes are reviewed but emphasis is placed on the numerical solution of the governing differential equations. Different solution methodologies and software.
Prerequisite(s): enrolment in the M.Eng.- Engineering Practice program and an undergraduate degree in Mechanical Engineering or permission of the Director.

EGEN 5502 [0.5 credit]
Thermodynamics and Energy Systems
Principles of thermodynamics; properties of homogeneous fluid phases; phase and chemical equilibria; application to industrial and energy problems.
Prerequisite(s): enrolment in the M.Eng.- Engineering Practice program and an undergraduate degree in Mechanical Engineering or permission of the Director.

EGEN 5503 [0.5 credit]
Transport Phenomena (Heat and Mass)
Transport expressions for physical properties are combined with conservation laws to yield generalized equations used to solve a variety of engineering problems in fluid mechanics, and heat and mass transfer; steady-state and transient cases; special topics in non-Newtonian flow and forced diffusion.
Prerequisite(s): enrolment in the M.Eng.- Engineering Practice program and an undergraduate degree in Mechanical Engineering or permission of the Director.

EGEN 5504 [0.5 credit]
Kinematics and Dynamics of Human Movement
Kinematics and dynamics of rigid bodies moving in three dimensions. Spatial kinematics of rigid bodies, Euler angles, tensor of inertia and the Newton-Euler equations of motion for rigid bodies.
Prerequisite(s): enrolment in the M.Eng.- Engineering Practice program.

EGEN 5505 [0.5 credit]
Controls and Robotics
Introduction to advanced robotics including mobile robots, redundant manipulators, walking robots, aerial and marine autonomous vehicles. Kinematic and dynamic models for advanced robots. Linear and nonlinear control theory overview with applications to advanced robots.
Prerequisite(s): enrolment in the M.Eng.- Engineering Practice program and an undergraduate degree in Mechanical Engineering or permission of the Director.

EGEN 5506 [0.5 credit]
Mechanics and Fracture
Basic concepts of linear and nonlinear fracture mechanics: linear and nonlinear stationary crack-tip stress, strain and displacement fields; energy balance and energy release rates; fracture resistance concepts-static and dynamic fracture toughness; criteria for crack growth; fracture control methodology and applications.
Prerequisite(s): enrolment in the M.Eng.- Engineering Practice program and an undergraduate degree in Mechanical Engineering or permission of the Director.

EGEN 5507 [0.5 credit]
Surfaces and Interfacial Phenomena
Basics of colloid and interfacial phenomena with application to the energy sector, materials, processing, and biomedical industry.
Prerequisite(s): enrolment in the M.Eng.- Engineering Practice program and an undergraduate degree in Mechanical Engineering or permission of the Director.

EGEN 5508 [0.5 credit]
Introduction to Advanced Materials
Introduction to advanced materials focusing on emerging materials like fibre-reinforced composite materials. Manufacturing methods of lightweight, safe and environment-friendly structures and their use in the industry. Standard analytical techniques (Micro and Macro approach) for materials' mechanical characterization and strength theories. Failure analysis of composites.
Includes: Experiential Learning Activity

EGEN 5509 [0.5 credit]
Engineering Vibrations
Vibration analysis of free-response damped and undamped single-degree-of-freedom (SDOF) systems. Harmonic excitation and general forced response. The eigenvalue problem and modal analysis for multi-degree-of-freedom (MDOF) systems. Vibration isolation and suppression. Distributed parameter systems. Analytical and Numerical methods.
Prerequisite(s): enrolment in the M.Eng.- Engineering Practice program.

EGEN 5599 [0.5 credit]
Special Topics in Mechanical Engineering
The course tackles specific issues within the field of mechanical engineering that may not be covered by existing approved courses.
Prerequisite(s): enrolment in the M.Eng.- Engineering Practice program.