MECHATRONICS ENGINEERING (MTE)

School of Engineering, College of Engineering and Physical Sciences

Mechatronics engineering integrates the disciplines of mechanical, electrical, and computer engineering. Our curriculum prepares engineers with specialized multidisciplinary expertise, including training in Artificial Intelligence, to solve technological problems in today's highly automated industrial settings.

Students in the Mechatronics program complete coursework in foundational subjects taken by other engineering students during their first three semesters. From semester four onwards, they enroll in courses specialized to their program.

In their final two years students may choose to pursue one of two optional Areas of Emphasis (AoE): Robotics-Control-AI or Manufacturing-Automation. Students will enroll in electives based on their chosen Area of Emphasis. Students who do not choose an Area of Emphasis may choose electives from the Technical Electives list.

Students are advised to review the courses in the Areas of Emphasis and on the Technical Electives list and ensure that they have the pre-requisite courses. Not all courses are offered in all semesters, and it is strongly recommended that students complete courses in the suggested semester. Priority access restrictions could apply in some semesters.

Major Requirements (Honours)

This is a major within the degree: Bachelor of Engineering.

This major allows for the completion of one of two Areas of Emphasis as listed. Students are encouraged to speak with a Program Counsellor when choosing an Area of Emphasis. If pursuing an Area of Emphasis, it must be declared prior to the commencement of Semester 5. Students who do not choose an Area of Emphasis must choose electives from the Technical Electives list.

Schedule of Studies

Code	Title	Credits
Semester 1		
CHEM*1140	General Chemistry I	0.50
ENGG*1100	Engineering and Design I	0.75
ENGG*1410	Introductory Programming for Engineers	0.50
MATH*1200	Calculus I	0.50
PHYS*1130	Physics with Applications	0.50
Semester 2		
ENGG*1210	Engineering Mechanics I	0.50
ENGG*1500	Engineering Analysis	0.50
ENGG*2120	Material Science	0.50
MATH*1210	Calculus II	0.50
PHYS*1010	Introductory Electricity and Magnetism	0.50
Semester 3		
ENGG*2160	Engineering Mechanics II	0.50
ENGG*2400	Engineering Systems Analysis	0.50
ENGG*2450	Electric Circuits	0.50
ENGG*2910	Mathematics for Artificial Intelligence	0.50
MATH*2270	Applied Differential Equations	0.50
STAT*2120	Probability and Statistics for Engineers	0.50
Semester 4		
ENGG*2100	Engineering and Design II	0.75
ENGG*2180	Introduction to Manufacturing Processes	0.50
ENGG*2340	Kinematics and Dynamics	0.50
ENGG*3450	Electronic Devices	0.50
MATH*2130	Numerical Methods	0.50
Semester 5		
ENGG*3090	Digital Systems and Microcontroller Interfacing	0.50
ENGG*3390	Signal Processing	0.50
ENGG*3410	Systems and Control Theory	0.50
ENGG*3510	Electromechanical Devices	0.50
ENGG*3600	Introduction to Thermal-Fluid Sciences	0.50
0.50 restricted elective		0.50
Semester 6		
ENGG*3040	Mechatronic Systems Design I	0.75
ENGG*3060	Machine Elements	0.50
ENGG*3100	Engineering and Design III	0.75
HIST*1250	Science and Technology in a Global Context	0.50
0.50 restricted elective		
Semester 7		
ENGG*3240	Engineering Economics	0.50
ENGG*4000	Proposal for Engineering Design IV	0.00
ENGG*4210	Machine Learning	0.50
ENGG*4590	Sensors Instrumentation and Measurements	0.50
1.50 restricted elective		
Semester 8		
ENGG*4190	Mechatronics Engineering Design IV	1.00
ENGG*4690	Mechatronic Systems Design II	0.75
1.00 restricted elective		

Credit Summary (22.75 Total Credits)

Code	Title	Credits
Required Core courses		19.25
Credits for Technical Electives or Area of Emphasis		1.50
Complementary Studies Electives		2.00
Total credits		22.75

Restricted Electives Summary

- Semester 5 (0.5), Semester 6 (0.5), Semester 7 (1.5), Semester 8 (1) = 3.5 Credits
- Complementary Studies – 2.0 Credits
- Technical Electives
  - For students who choose to complete an Area of Emphasis:
    - Choose 1.5 credits from your Area of Emphasis list
  - For students who choose not to complete an Area of Emphasis:
    - Choose any 1.5 credits from the Technical Electives list

Technical Elective Courses

Students may choose to select one Area of Emphasis (AoE) and complete 1.5 credits from that AoE; in this case their AoE will appear on their

transcript. Otherwise, students can choose any 1.5 credits from the Technical Electives list; in this case no AoE appears on their transcript.

Course List for Robotics-Control-AI Area of Emphasis

Code	Title	Credits
ENGG*4460	Robotic Systems	0.50
ENGG*4430	Neuro-Fuzzy and Soft Computing Systems	0.50
ENGG*4740	Computational Methods for Data Analysis	0.50
ENGG*4490	Sampled Data Control Design	0.75

Course List for Manufacturing-Automation Area of Emphasis

Code	Title	Credits
ENGG*3070	Integrated Manufacturing Systems	0.50
ENGG*3120	Computer Aided Design and Manufacturing	0.75
ENGG*4460	Robotic Systems	0.50
ENGG*4470	Finite Element Analysis	0.50
ENGG*3140	Mechanical Vibration	0.50

Technical Electives Course List

Code	Title	Credits
ENGG*4460	Robotic Systems	0.50
ENGG*4430	Neuro-Fuzzy and Soft Computing Systems	0.50
ENGG*4740	Computational Methods for Data Analysis	0.50
ENGG*4490	Sampled Data Control Design	0.75
ENGG*3070	Integrated Manufacturing Systems	0.50
ENGG*3120	Computer Aided Design and Manufacturing	0.75
ENGG*4470	Finite Element Analysis	0.50
ENGG*3140	Mechanical Vibration	0.50

Complementary Studies elective courses:

Students choose:

- 0.5 credit from CSE-1 (Humanities and Social Science)
- 0.5 credit from CSE-2 (Sustainable Development and Environmental Stewardship)
- 0.5 credit from CSE-5 (Indigeneity, Equity, Diversity, and Inclusion)
- Remaining 0.5 credit from CSE-1, CSE-2, CSE-3, CSE-4, or CSE-5

where CSE-1, CSE-2, CSE-3, and CSE-4 are as defined here: https://www.uoguelph.ca/engineering/complementary-studies-electives-cohorts-20192020-onward

and CSE-5 is a new list defined as follows:

LIST CSE-5: Indigeneity, Equity, Diversity, and Inclusion

Engineering

Code	Title	Credits
ENGG*2540	Water and Climate Justice	0.50
ENGG*3000	Engineering for Inclusion: Addressing Systemic Issues in Design and Engineering	0.50

Co-op Requirements (Honours)

This is a major within the degree: Bachelor of Engineering.

The Co-op program in Mechatronics Engineering is a five-year program, including five work terms. Students must follow the academic work schedule as outlined below (also found on the Co-operative Education website: https://www.recruitguelph.ca/cecs/).

Mechatronics Engineering Academic and Co-op Work Term Schedule

Year	Fall	Winter	Summer
1	Academic Semester 1	Academic Semester 2	off
2	Academic Semester 3, COOP*1100	Academic Semester 4	COOP*1000 Work Term 1
3	Academic Semester 5	COOP*2000 Work Term II	COOP*3000 Work Term III
4	Academic Semester 7	Academic Semester 6	COOP*4000 Work Term IV
5	COOP*5000 Work Term V	Academic Semester 8	N/A

Please refer to the Co-operative Education program policy with respect to work term performance grading, work term report grading and program completion requirements.

For additional program information students should consult with their Co-op Coordinator and Co-op Faculty Advisor, listed on the Co-operative Education web site.

Credit Summary (25.25 Total Credits)

Code	Title	Credits
Required Core courses		19.25
Credits for Technical Electives or Area of Emphasis		1.50
Complementary Studies Electives		2.00
Co-op Work Terms		2.50
Total credits		25.25

This major also allows for the completion of one of two Areas of Emphasis as listed. Students are encouraged to speak with a Program Counsellor when choosing an Area of Emphasis. If pursuing an Area of Emphasis, it must be declared prior to the commencement of Semester 5. Students who do not choose an Area of Emphasis must choose electives from the Technical Electives list.

Schedule of Studies

Code	Title	Credits
Semester 1 - Fall		
CHEM*1140	General Chemistry I	0.50
ENGG*1100	Engineering and Design I	0.75
ENGG*1410	Introductory Programming for Engineers	0.50
MATH*1200	Calculus I	0.50
PHYS*1130	Physics with Applications	0.50
Semester 2 - Winter		
ENGG*1210	Engineering Mechanics I	0.50
ENGG*1500	Engineering Analysis	0.50
ENGG*2120	Material Science	0.50
MATH*1210	Calculus II	0.50
PHYS*1010	Introductory Electricity and Magnetism	0.50

Summer semester		
No academic semester or co-op term		
Semester 3 - Fall		
COOP*1100	Introduction to Co-operative Education	0.00
ENGG*2160	Engineering Mechanics II	0.50
ENGG*2400	Engineering Systems Analysis	0.50
ENGG*2450	Electric Circuits	0.50
ENGG*2910	Mathematics for Artificial Intelligence	0.50
MATH*2270	Applied Differential Equations	0.50
STAT*2120	Probability and Statistics for Engineers	0.50
Semester 4 - Winter		
ENGG*2100	Engineering and Design II	0.75
ENGG*2180	Introduction to Manufacturing Processes	0.50
ENGG*2340	Kinematics and Dynamics	0.50
ENGG*3450	Electronic Devices	0.50
MATH*2130	Numerical Methods	0.50
Summer Semester		
COOP*1000	Co-op Work Term I	0.50
Semester 5 - Fall		
ENGG*3090	Digital Systems and Microcontroller Interfacing	0.50
ENGG*3390	Signal Processing	0.50
ENGG*3410	Systems and Control Theory	0.50
ENGG*3510	Electromechanical Devices	0.50
ENGG*3600	Introduction to Thermal-Fluid Sciences	0.50
0.50 restricted elective		0.50
Winter Semester		
COOP*2000	Co-op Work Term II	0.50
Summer Semester		
COOP*3000	Co-op Work Term III	0.50
Semester 6 - Fall		
ENGG*3240	Engineering Economics	0.50
ENGG*4210	Machine Learning	0.50
ENGG*4590	Sensors Instrumentation and Measurements	0.50
HIST*1250	Science and Technology in a Global Context	0.50
1.50 restricted elective		
Semester 7 - Winter		
ENGG*3040	Mechatronic Systems Design I	0.75
ENGG*3060	Machine Elements	0.50
ENGG*3100	Engineering and Design III	0.75
0.50 restricted elective		
Summer Semester		
COOP*4000	Co-op Work Term IV	0.50
Fall Semester		
COOP*5000	Co-op Work Term V	0.50
ENGG*4000	Proposal for Engineering Design IV	0.00
Semester 8 - Winter		
ENGG*4190	Mechatronics Engineering Design IV [1]	1.00
ENGG*4690	Mechatronic Systems Design II	0.75
1.00 restricted elective		

Restricted Electives Summary

- Semester 5 (0.5), Semester 6 (0.5), Semester 7 (1.5), Semester 8 (1) = 3.5 Credits
- Complementary Studies – 2.0 Credits
- Technical Electives
  - For students who choose to complete an Area of Emphasis:
    - Choose 1.5 credits from your Area of Emphasis list
  - For students who choose not to complete an Area of Emphasis:
    - Choose any 1.5 credits from the Technical Electives list

Technical Elective Courses

Students may choose to select one Area of Emphasis (AoE) and complete 1.5 credits from that AoE; in this case their AoE will appear on their transcript. Otherwise, students can choose any 1.5 credits from the Technical Electives list; in this case no AoE appears on their transcript.

Course List for Robotics-Control-AI Area of Emphasis

Code	Title	Credits
ENGG*4460	Robotic Systems	0.50
ENGG*4430	Neuro-Fuzzy and Soft Computing Systems	0.50
ENGG*4740	Computational Methods for Data Analysis	0.50
ENGG*4490	Sampled Data Control Design	0.75

Course List for Manufacturing-Automation Area of Emphasis

Code	Title	Credits
ENGG*3070	Integrated Manufacturing Systems	0.50
ENGG*3120	Computer Aided Design and Manufacturing	0.75
ENGG*4460	Robotic Systems	0.50
ENGG*4470	Finite Element Analysis	0.50
ENGG*3140	Mechanical Vibration	0.50

Technical Electives Course List

Code	Title	Credits
ENGG*4460	Robotic Systems	0.50
ENGG*4430	Neuro-Fuzzy and Soft Computing Systems	0.50
ENGG*4740	Computational Methods for Data Analysis	0.50
ENGG*4490	Sampled Data Control Design	0.75
ENGG*3070	Integrated Manufacturing Systems	0.50
ENGG*3120	Computer Aided Design and Manufacturing	0.75
ENGG*4470	Finite Element Analysis	0.50
ENGG*3140	Mechanical Vibration	0.50

Complementary Studies elective courses:

Students choose:

- 0.5 credit from CSE-1 (Humanities and Social Science)
- 0.5 credit from CSE-2 (Sustainable Development and Environmental Stewardship)
- 0.5 credit from CSE-5 (Indigeneity, Equity, Diversity, and Inclusion)
- Remaining 0.5 credit from CSE-1, CSE-2, CSE-3, CSE-4, or CSE-5

where CSE-1, CSE-2, CSE-3, and CSE-4 are as defined here: https://www.uoguelph.ca/engineering/complementary-studies-electives-cohorts-20192020-onward

and CSE-5 is a new list defined as follows:

LIST CSE-5: Indigeneity, Equity, Diversity, and Inclusion

Engineering

Code	Title	Credits
ENGG*2540	Water and Climate Justice	0.50
ENGG*3000	Engineering for Inclusion: Addressing Systemic Issues in Design and Engineering	0.50