

Faculty

Chair

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YOU MIN ZHANG, PhD *Northwestern Polytechnical University*, PEng

Distinguished Professors Emeriti

RICHARD M.H. CHENG, PhD *University of Birmingham*
SUI LIN, Dring *University of Karlsruhe*

Professors Emeriti

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Associate Professors

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TSZ-HO KWOK, PhD *Chinese University of Hong Kong*
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BEHROOZ YOUSEFZADEH, PhD *University of British Columbia*

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ASHOK KAUSHAL, PhD *Concordia University*, PEng

Lecturers

CAROLE EL AYOUBI, PhD *Concordia University*, ing.
HANY GOMAA, PhD *Concordia University*, PEng
SORIN VOICULESCU, PhD *University of Angers*

Affiliate Professors

FARHAD AGHILI, PhD *McGill University*
ANIRBAN GHOSH, PhD *Jawaharlal Nehru University*
ROGERIO SOARES LIMA, PhD *State University of New York at Stony Brook*
PIERRE MARCOTTE, PhD *Virginia Polytechnic Institute and State University*
JOHN MARIS, PhD *Embry-Riddle Aeronautical University*, ing.

Affiliate Associate Professors

ALI BONAKDAR, PhD *Concordia University*
YONG CHEN, PhD *Nanjing University of Aeronautics and Astronautics*

Affiliate Assistant Professor

JAYAN OZHI KANDATHIL, PhD *Concordia University*

For the complete list of faculty members, please consult the Department website.

Location

Sir George Williams Campus

Engineering, Computer Science and Visual Arts Complex, Room: EV 004.139
514-848-2424, ext. 3125

Department Objectives

The Department of Mechanical, Industrial and Aerospace Engineering offers three distinct undergraduate programs: BEng in **Mechanical Engineering**, BEng in **Industrial Engineering** and BEng in **Aerospace Engineering**.

Mechanical Engineering is concerned with all forms of power generation (hydro-electric, steam, internal combustion, nuclear, jet rocket, and fuel cells), the design of mechanisms and machines, transportation systems, controls and automation, vibration analysis, environmental control (heating, ventilation, and refrigeration), materials handling, and precision measurement. The Mechanical Engineering curriculum consists of a combination of core courses with a series of technical electives that allow students to obtain some specialization in a particular area of the field depending on their interests and expected future professional activity. Current groups of electives include: Aerospace, Design and Manufacturing, Systems and Mechatronics, Thermo-Fluids and Propulsion, Vehicle Systems and Stress Analysis.

Industrial Engineering is concerned with the design, organization, analysis, and integration of people and industrial systems components in order to achieve or enhance effectiveness. These components include whole machines, transportation and conveyance elements, physical plant, organizational frameworks, schedules, and budgets. The Industrial Engineering curriculum is therefore designed to give students the background needed to define and solve problems related to the conception, improvement, integration, and implementation of industrial systems.

The Aerospace Engineering program is offered jointly with the Department of Electrical and Computer Engineering. The detailed description of this program can be found in §71.55.

71.40.1 Course Requirements (BEng in Mechanical Engineering)

The program in Mechanical Engineering consists of the Engineering Core, the Mechanical Engineering Core, and elective credits as shown below. The minimum length of the program is 120 credits.

Engineering Core (27 credits)

See §71.20.5.

Mechanical Engineering Core		<i>Credits</i>
ENGR 242	Statics	3.00
ENGR 243	Dynamics	3.00
ENGR 244	Mechanics of Materials	3.75
ENGR 251	Thermodynamics I	3.00
ENGR 311	Transform Calculus and Partial Differential Equations	3.00
ENGR 361	Fluid Mechanics I	3.00
MECH 321	Properties and Failure of Materials	3.50
MECH 343	Theory of Machines	3.50
MECH 344	Machine Element Design	3.00
MECH 351	Thermodynamics II	3.50
MECH 352	Heat Transfer I	3.50
MECH 361	Fluid Mechanics II	3.50
MECH 368	Electronics for Mechanical Engineers	3.50
MECH 370	Modelling and Analysis of Dynamic Systems	3.50
MECH 371	Analysis and Design of Control Systems	3.75
MECH 375	Mechanical Vibrations	3.50
MECH 390	Mechanical Engineering Design Project	3.50
MECH 490	Capstone Mechanical Engineering Design Project*	4.00
MIAE 211	Mechanical Engineering Drawing	3.50
MIAE 215	Programming for Mechanical and Industrial Engineers	3.50
MIAE 221	Materials Science	3.00
MIAE 311	Manufacturing Processes	3.00
MIAE 312	Engineering Design and Manufacturing Processes Lab	1.00
MIAE 313	Machine Drawing and Design	3.50
MIAE 380	Product Design and Development	3.00
		81.50

*Note: Students may replace MECH 490 with ENGR 490 if they are interested in a multidisciplinary project that requires collaboration with students from other engineering departments. In order for students to register in ENGR 490, their projects must be approved by the ENGR 490 Design Committee before the start of the fall term.

Electives

Students in the Mechanical Engineering program must complete at least 11.50 elective credits from the list of courses below. Courses are listed in groups to facilitate the selection of courses in a particular area of the field.

Aerospace		<i>Credits</i>
AERO 417	Standards, Regulations and Certification	3.00
AERO 446	Aerospace Vehicle Performance	3.00
AERO 455	Computational Fluid Dynamics for Aerospace Applications	3.75
AERO 462	Turbomachinery and Propulsion	3.00
AERO 464	Aerodynamics	3.00
AERO 465	Gas Turbine Design	3.50
AERO 480	Flight Control Systems	3.50
AERO 482	Avionic Navigation Systems	3.00
AERO 485	Introduction to Space Systems	3.00
AERO 486	Aircraft Stress Analysis	3.00
AERO 487	Design of Aircraft Structures	3.00
ENGR 411	Special Technical Report	1.00
ENGR 412	Honours Research Project	3.00
MECH 498	Topics in Mechanical Engineering	3.00

Design and Manufacturing		<i>Credits</i>
ENGR 411	Special Technical Report	1.00
ENGR 412	Honours Research Project	3.00
INDU 372	Quality Control and Reliability	3.00
INDU 410	Safety Engineering	3.00
INDU 411	Computer Integrated Manufacturing	3.50
MECH 412	Computer-Aided Mechanical Design	3.50
MECH 414	Computer Numerically Controlled Machining	3.50
MECH 421	Mechanical Shaping of Metals and Plastics	3.50
MECH 422	Mechanical Behaviour of Polymer Composite Materials	3.00
MECH 423	Casting, Welding, Heat Treating, and Non-Destructive Testing	3.50
MECH 424	MEMS – Design and Fabrication	3.50
MECH 425	Manufacturing of Composites	3.50
MECH 468	Wind Turbine Engineering	3.00
MECH 476	Generative Design and Manufacturing in Engineering	3.00
MECH 498	Topics in Mechanical Engineering	3.00
Systems and Mechatronics		<i>Credits</i>
AERO 480	Flight Control Systems	3.50
AERO 482	Avionic Navigation Systems	3.00
ENGR 411	Special Technical Report	1.00
ENGR 412	Honours Research Project	3.00
MECH 411	Instrumentation and Measurements	3.50
MECH 415	Advanced Programming for Mechanical and Industrial Engineers	3.00
MECH 463	Fluid Power Control	3.50
MECH 471	Microcontrollers for Mechatronics	3.50
MECH 472	Mechatronics and Automation	3.50
MECH 473	Control System Design	3.50
MECH 474	Mechatronics	3.75
MECH 498	Topics in Mechanical Engineering	3.00
Thermo-Fluids and Propulsion		<i>Credits</i>
AERO 455	Computational Fluid Dynamics for Aerospace Applications	3.75
AERO 462	Turbomachinery and Propulsion	3.00
AERO 465	Gas Turbine Design	3.50
ENGR 411	Special Technical Report	1.00
ENGR 412	Honours Research Project	3.00
MECH 411	Instrumentation and Measurements	3.50
MECH 415	Advanced Programming for Mechanical and Industrial Engineers	3.00
MECH 452	Heat Transfer II	3.50
MECH 453	Heating, Ventilation and Air Conditioning Systems	3.00
MECH 461	Gas Dynamics	3.50
MECH 463	Fluid Power Control	3.50
MECH 468	Wind Turbine Engineering	3.00
MECH 498	Topics in Mechanical Engineering	3.00
Vehicle Systems		<i>Credits</i>
ENGR 411	Special Technical Report	1.00
ENGR 412	Honours Research Project	3.00
MECH 411	Instrumentation and Measurements	3.50
MECH 415	Advanced Programming for Mechanical and Industrial Engineers	3.00
MECH 444	Guided Vehicle Systems	3.00
MECH 447	Fundamentals of Vehicle System Design	3.00
MECH 454	Vehicular Internal Combustion Engines	3.00
MECH 473	Control System Design	3.50
MECH 498	Topics in Mechanical Engineering	3.00
Stress Analysis		<i>Credits</i>
AERO 431	Principles of Aeroelasticity	3.00
AERO 486	Aircraft Stress Analysis	3.00

ENGR 411	Special Technical Report	1.00
ENGR 412	Honours Research Project	3.00
MECH 411	Instrumentation and Measurements	3.50
MECH 412	Computer-Aided Mechanical Design	3.50
MECH 415	Advanced Programming for Mechanical and Industrial Engineers	3.00
MECH 422	Mechanical Behaviour of Polymer Composite Materials	3.00
MECH 426	Stress and Failure Analysis of Machinery	3.00
MECH 460	Finite Element Analysis	3.75
MECH 498	Topics in Mechanical Engineering	3.00

71.40.2 Course Requirements (BEng in Industrial Engineering)

The program in Industrial Engineering consists of the Engineering Core, the Industrial Engineering Core, and elective credits as shown below. Students must select one course from the list of Basic and Natural Science courses as part of the Industrial Engineering Core courses. The minimum length of the program is 120 credits.

Engineering Core (27 credits)

See §71.20.5.

Industrial Engineering Core		<i>Credits</i>
ENGR 245	Mechanical Analysis	3.00
ENGR 251	Thermodynamics I	3.00
ENGR 311	Transform Calculus and Partial Differential Equations	3.00
INDU 211	Introduction to Production and Manufacturing Systems	3.00
INDU 311	Simulation of Industrial Systems	3.50
INDU 320	Production Engineering	3.00
INDU 321	Lean Manufacturing	3.00
INDU 323	Operations Research I	3.50
INDU 324	Operations Research II	3.50
INDU 330	Engineering Management	3.00
INDU 342	Logistics Network Models	3.00
INDU 371	Stochastic Models in Industrial Engineering	3.00
INDU 372	Quality Control and Reliability	3.00
INDU 411	Computer Integrated Manufacturing	3.50
INDU 412	Human Factors Engineering	3.50
INDU 421	Facilities Design and Material Handling Systems	3.50
INDU 423	Inventory Control	3.50
INDU 490	Capstone Industrial Engineering Design Project*	4.00
MIAE 211	Mechanical Engineering Drawing	3.50
MIAE 215	Programming for Mechanical and Industrial Engineers	3.50
MIAE 221	Materials Science	3.00
MIAE 311	Manufacturing Processes	3.00
MIAE 312	Engineering Design and Manufacturing Processes Lab	1.00
MIAE 313	Machine Drawing and Design	3.50
MIAE 380	Product Design and Development	3.00
	One Basic and Natural Science course from the list below.	3.00
		82.00

*Note: Students may replace INDU 490 with ENGR 490 if they are interested in a multidisciplinary project that requires collaboration with students from other engineering departments. In order for students to register in ENGR 490, their projects must be approved by the ENGR 490 Design Committee before the start of the fall term.

Basic and Natural Science Courses

Students must complete one course from the following list:		<i>Credits</i>
BIOL 206	Elementary Genetics	3.00
BIOL 261	Molecular and General Genetics	3.00
CHEM 217	Introductory Analytical Chemistry I	3.00
CHEM 221	Introductory Organic Chemistry I	3.00
CIVI 231	Geology for Civil Engineers	3.00
GEOL 206	Earthquakes, Volcanoes, and Plate Tectonics	3.00

GEOL 208	The Earth, Moon and the Planets	3.00
PHYS 252	Optics	3.00
PHYS 260	Introductory Biophysics	3.00
PHYS 273	Energy and Environment	3.00
PHYS 284	Introduction to Astronomy	3.00
PHYS 385	Astrophysics	3.00

Electives

Students must complete a minimum of 11 credits from the following courses, including at least three INDU courses. With permission of the Department, students may take one technical elective course from another program or Faculty.

INDU Courses

Students must take at least three INDU courses from the following list: *Credits*

INDU 410	Safety Engineering	3.00
INDU 431	Quantitative Methods in Health-care Systems	3.00
INDU 441	Introduction to Six Sigma	3.00
INDU 466	Decision Models in Service Sector	3.00
INDU 475	Advanced Concepts in Quality Improvement	3.00
INDU 480	Cases in Industrial Engineering	3.00
INDU 498	Topics in Industrial Engineering	3.00

Other Elective Courses

Students may take no more than one course from the following list: *Credits*

BSTA 478	Data Mining Techniques	3.00
BTM 430	Enterprise Resource Planning and Information Technology Integration	3.00
BTM 480	Project Management	3.00
ENGR 361	Fluid Mechanics I	3.00
ENGR 411	Special Technical Report	1.00
ENGR 412	Honours Research Project	3.00
MANA 300	Entrepreneurship: Launching Your Business	3.00
MECH 321	Properties and Failure of Materials	3.50
MECH 370	Modelling and Analysis of Dynamic Systems	3.50
MECH 412	Computer-Aided Mechanical Design	3.50
MECH 415	Advanced Programming for Mechanical and Industrial Engineers	3.00
MECH 421	Mechanical Shaping of Metals and Plastics	3.50
MECH 423	Casting, Welding, Heat Treating and Non-Destructive Testing	3.50
MECH 425	Manufacturing of Composites	3.50