

For the courses listed below, the Department of Mechanical and Aerospace Engineering is seeking qualified contract instructors with excellent communication and presentation skills; strong teaching skills established through successful teaching of engineering courses in an accredited Canadian university engineering program; and a high level of up-to-date expertise in the subject of the course, established through industrial experience and/or research in academia or government labs. Candidates must have a degree in a relevant field of engineering. A P.Eng. license in Canada is required for the instruction of most undergraduate courses.

Applications will be accepted until July 1, 2017. Applications with a covering letter and curriculum vitae including educational background, employment history, and related work experience, should be sent via email to the hiring committee at Hiring.MAE@carleton.ca.

Carleton University is strongly committed to fostering diversity within its community as a source of excellence, cultural enrichment and social strength. We welcome those who would contribute to the further diversification of our University including but not limited to women, persons with disabilities, visible minorities, Aboriginal peoples, and persons of any sexual orientation or gender identity.

Fall 2017 (September – December)

AERO 4003 [0.5 credit]

Aerospace Systems Design

Stress and deflection analysis; fatigue, safe life, damage tolerant design. Propulsion systems integration; landing gear; control and other subsystems. Mechanical component design. Airworthiness regulations and certification procedures. Weight and cost estimation and control. System reliability. Design studies of aircraft or spacecraft components.

Prerequisite(s): **MAAE 2202** and **AERO 3002**.

Lectures three hours a week, problem analysis three hours a week.

AERO 4304 [0.5 credit]

Computational Fluid Dynamics

Differential equations of motion. Numerical integration of ordinary differential equations. Potential flows: panel methods; direct solution; vortex-lattice methods. Finite-difference formulations: explicit versus implicit methods; stability. Parabolized and full Navier-Stokes equations; conservation form. Transonic and supersonic flows: upwind differencing. Grid transformations. Computer-based assignments.

Prerequisite(s): **MAAE 3300** or **MECH 3310**.

Lectures three hours a week.

AERO 4402 [0.5 credit]

Aerospace Propulsion

Propulsion requirements, effects of Mach Number, altitude, and application; basic propeller theory; propeller, turboshaft, turbojet, turbofan and rocket; cycle analysis and optimization for gas turbine power plant; inter-relations between thermodynamic, aerodynamic and mechanical designs; rocket propulsion; selection of aeroengines.

Precludes additional credit for **MECH 4401**.

Prerequisite(s): **MAAE 2400** and **MAAE 3300**.

Lectures three hours a week.

BIOM 5311 [0.5 credit] (BMG 5311)

Design of Medical Devices and Implants

Solutions to clinical problems through the use of implants and medical devices. Pathology of organ failure and bioengineering and clinical aspects of artificial organs. Examples: blood substitutes, oxygenators, cardiac support, vascular substitutes, pacemakers, ventricular assist devices, artificial hearts and heart valves.

Prerequisite(s): permission of the instructor.

MAAE 2300 [0.5 credit]**Fluid Mechanics I**

Fluid properties. Units. Kinematics, dynamics of fluid motion: concepts of streamline, control volume, steady and one-dimensional flows; continuity, Euler, Bernoulli, steady flow energy, momentum, moment of momentum equations; applications. Fluid statics; pressure distribution in fluid at rest; hydrostatic forces on plane and curved surfaces; buoyancy.

Prerequisite(s): **MATH 1005, MATH 1104** and **ECOR 1101**.

Lectures three hours a week, laboratory and problem analysis three hours a week.

MAAE 2400 [0.5 credit]**Thermodynamics and Heat Transfer**

Basic concepts of thermodynamics: temperature, work, heat, internal energy and enthalpy. First law of thermodynamics for closed and steady-flow open systems. Thermodynamic properties of pure substances; changes of phase; equation of state. Second law of thermodynamics: concept of entropy. Simple power and refrigeration cycles. Introduction to heat transfer: conduction, convection and radiation.

Prerequisite(s): **CHEM 1101 or CHEM 1001** and **CHEM 1002, MATH 1005** and **MATH 1104**.

Lectures three hours a week, laboratory and problem analysis three hours a week.

MAAE 4906 E [0.5 credit]**Introduction to Nuclear Engineering**

This course provides an overview of nuclear engineering concepts and practices used to generate electricity and to make nuclear medicine possible. The course will include basic fundamentals, as well as lectures on specific topics such as nuclear medicine applications, xenon oscillations, radiation protection and hormesis.

MAAE 4907 [1.0 credit]**Engineering Design Project**

Team project in the design of an aerospace, biomedical, mechanical, or sustainable energy system. Opportunity to develop initiative, engineering judgement, self-reliance, and creativity in a team environment. Results submitted in a comprehensive report as well as through formal oral presentations.

Prerequisite(s): fourth-year status in Engineering and completion of, or concurrent registration

in, [AERO 4003](#) or [AERO 4842](#) or [MECH 4003](#) or [MECH 4013](#) or [SREE 4001](#). Certain projects may have additional prerequisites.

MECH 4407 [0.5 credit]**Heating and Air Conditioning**

Environmental demands for residential, commercial and industrial systems. Methods of altering and controlling environment. Air distribution. Refrigeration methods, equipment and controls. Integrated year-round air-conditioning and heating systems; heat pumps. Cooling load and air-conditioning calculations. Thermal radiation control. Component matching. System analysis and design.

Prerequisite(s): **MAAE 2400** and third- or fourth- year status in Engineering.

Lectures three hours a week.

MECH 5008 [0.5 credit] (MCG 5308)**Experimental Methods in Fluid Mechanics**

Fundamentals of techniques of simulation of fluid dynamic phenomena. Theoretical basis, principles of design, performance and instrumentation of ground test facilities. Applications to aerodynamic testing.

MECH 5407 [0.5 credit] (MCG 5347)**Conductive and Radiative Heat Transfer**

Analytical, numerical and analog solutions to steady-state and transient conduction heat transfer in multi-dimensional systems. Radiative heat exchange between black, grey, non-grey diffusive and specular surfaces, including effects of athermanous media.

MECH 5601 [0.5 credit] (MCG 5361)**Creative Problem Solving and Design**

Problem-solving processes and how they can be applied in engineering design. Emphasis on learning methodologies rather than accumulating information. Techniques can be successfully applied in any engineering specialty.

Also listed as IDES 5301

MECH 5801 [0.5 credit] (MCG 5489)**3D Machine Vision: From Robots to the Space Station**

This course provides an introductory overview to 3D imaging and scanning systems from basic opto-mechanical designs and tradeoffs through applications for robotics, automation, assembly, mapping and navigation. The course focuses on mechanical operations while touching on electronic and control issues, calibration and standards.

MECH 5802 Wind Engineering [0.5 credit]

This course is designed to cover all the theoretical and practical areas pertinent to the operation of wind turbines. After finishing the course, a student is expected to have gained the knowledge to (a) be considered as a wind engineer and (b) be prepared to work in any company engaged in designing, manufacturing or utilization of wind turbines and the associated components, or in utility companies

MECH 5804 [0.5 credit] (MCG 5384)**Economics of Engineering with Applications to Energy and Transportation**

The purpose of the course is to acquaint students with the economic tools used in the choice and assessment of science and engineering projects and policies. Examples will be drawn from energy and transportation issues. Energy-economic modelling and the economics of climate change will also be discussed.

Winter 2018 (January – April)**AERO 4009 [0.5 credit]****Aviation Management and Certification**

Product development, quality control. Strategic organizational analysis and design. Airworthiness, type certification and planning, delegation of authority, airplane flight manual. Aerospace system design and safety.

Prerequisite(s): fourth-year status in Engineering.

Lectures three hours per week.

MAAE 2300 [0.5 credit]**Fluid Mechanics I**

Fluid properties. Units. Kinematics, dynamics of fluid motion: concepts of streamline, control volume, steady and one-dimensional flows; continuity, Euler, Bernoulli, steady flow energy, momentum, moment of momentum equations; applications. Fluid statics; pressure distribution in fluid at rest; hydrostatic forces on plane and curved surfaces; buoyancy.

Prerequisite(s): **MATH 1005, MATH 1104** and **ECOR 1101**.

Lectures three hours a week, laboratory and problem analysis three hours a week.

MAAE 4906 C [0.5 credit]**Corrosion and Corrosion Control**

The purpose of this course is to introduce the underlying science of corrosion and the fundamentals of corrosion engineering. The deterioration of the metallic components of critical structures by corrosion is often life-limiting. This course will examine the general mechanisms of corrosion and relate these specific engineering issues and methods used to reduce the cost of corrosion.

MAAE 4906A Nuclear Power Plant Design [0.5 credit]

The objective of the course is to describe the basic design and technology of nuclear reactors. The course will describe the major systems in a nuclear power plant as well as the important CANDU reactor safety principles and systems; describe the important systems and components of the Balance of Plant (BoP); describe how safety systems meet licensing requirements with particular reference to IAEA, CNSC and USNRC regulations on plant design and discuss some computer codes used in the safety assessments and design of nuclear power plants.

MAAE 4906B Reactor Thermal-Hydraulic Fundamentals [0.5 credit]

The objective of the course is to describe the basic concepts and engineering methods used in the formulation of the analyses of thermal processes taken place in a nuclear system during normal operation and under postulated accident conditions.

MAAE 4907 [1.0 credit]**Engineering Design Project**

Team project in the design of an aerospace, biomedical, mechanical, or sustainable energy system. Opportunity to develop initiative, engineering judgement, self-reliance, and creativity in a team environment. Results submitted in a comprehensive report as well as through formal oral presentations.

Prerequisite(s): fourth-year status in Engineering and completion of, or concurrent registration in, [AERO 4003](#) or [AERO 4842](#) or [MECH 4003](#) or [MECH 4013](#) or [SREE 4001](#). Certain projects may have additional prerequisites.

MECH 4805 [0.5 credit]**Measurement and Data Systems**

Experimental data, accuracy and uncertainty analysis. Analog systems. Sensors. Signal conditioning. Op-Amps, instrumentation amplifiers, charge amplifiers, filters. Digital techniques. Encoders, A/D D/A converters. Data acquisition using microcomputers. Hardware and software considerations. Interfacing. Applications to measurement of motion, strain, force/torque, pressure, fluid flow, temperature.

Precludes additional credit for Engineering ELEC 4805.

Prerequisite(s): **STAT 3502, SYSC 3600 or SYSC 3610, and ELEC 3605 or ELEC 2501 or SYSC 3203.**

Lectures three hours a week.

MECH 5105 [0.5 credit] (MCG 5315)**Orbital Mechanics and Space Control**

Orbital dynamics and perturbations due to the Earth's figure, the sun, and the moon with emphasis on mission planning and analysis. Rigid body dynamics applied to transfer orbit and on-orbit momentum management and control of spacecraft. Effects of flexible structures on a spacecraft control system.

MECH 5203 [0.5 credit] (MCG 5322)**Nuclear Engineering**

Reactor design and safety requirement overview; reactor physics, chemistry and engineering, CANDU reactor design and operation; CANDU reactor fuel channels, thermal-hydraulics and fuel; reactor safety design and analysis; IAEA and Canadian safety analysis requirements; reactor accidents; nuclear energy policy.

MECH 5304 [0.5 credit] (MCG 5334)**Computational Fluid Dynamics of Compressible Flows**

Solution techniques for parabolic, elliptic and hyperbolic equations developed for problems of interest to fluid dynamics with appropriate stability considerations. A staged approach to solution of full Euler and Navier-Stokes equations is used. Grid generation techniques appropriate for compressible flows are introduced.

MECH 5401 [0.5 credit] (MCG 5341)**Turbomachinery**

Types of machines. Similarity: performance parameters; characteristics; cavitation. Velocity triangles. Euler equation: impulse and reaction. Radial pumps and compressors: analysis, design and operation. Axial pumps and compressors: cascade and blade-element methods; staging; off-design performance; stall and surge. Axial turbines. Current design practice.

MECH 5500 [0.5 credit] (MCG 5350)**Advanced Vibration Analysis**

General theory of continuous and discrete multi-degree-of-freedom vibrating systems. Emphasis on numerical techniques of solving complex vibrating systems, with selected applications from aerospace, civil, and mechanical engineering.

SERG 5000 [0.5 credit]**Cross Disciplinary Course in Sustainable Energy**

This course integrates concepts and frameworks drawn from engineering and policy studies appropriate to sustainable energy, using case studies to introduce the challenges of interdisciplinary work in sustainable energy.

Prerequisite(s): **SERG 5001 or SERG 5002.**