

engineering analysis, design, development or research. Opportunities to develop initiative, self-reliance, creative ability and engineering judgment. The results must be submitted in a comprehensive report with appropriate drawings, charts, bibliography, etc.

Prerequisite: Completion of or concurrent registration in MECH 4003, and fourth-year registration in the Mechanical program.

Mechanical and Aerospace Engineering (MAAE)

Department of Mechanical and Aerospace Engineering
Faculty of Engineering

MAAE 2001 [0.5 credit] (formerly 86.201*)

Engineering Graphical Design

Engineering drawing techniques; fits and tolerances; working drawings; fasteners. Elementary descriptive geometry; true length, true view, and intersection of geometric entities; developments. Assignments will make extensive use of Computer-Aided Design (CAD) and will include the production of detail and assembly drawings from actual physical models.

Precludes additional credit for ECOR 1001.

Prerequisite: ECOR 1010.

Lectures and tutorials two hours a week, laboratory four hours a week.

MAAE 2101 [0.5 credit] (formerly 86.211*)

Engineering Dynamics

Review of kinematics and kinetics of particles: rectilinear and curvilinear motions; Newton's second law; energy and momentum methods. Kinematics and kinetics of rigid bodies: plane motion of rigid bodies; forces and accelerations; energy and momentum methods.

Precludes additional credit for CIVE 2101 or ECOR 2101.

Prerequisites: ECOR 1101 and MATH 1005 and MATH 1104.

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

MAAE 2202 [0.5 credit] (formerly 86.222*)

Mechanics of Solids I

Review of Principles of Statics; friction problems; Concepts of stress and strain at a point; statically determinate and indeterminate stress systems; torsion of circular sections; bending moment and shear force diagrams; stresses and deflections in bending; stress and strain transformations; buckling instability.

Precludes additional credit for CIVE 2200.

Prerequisites: ECOR 1101, MATH 1005 and MATH 1104.

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

MAAE 2300 [0.5 credit] (formerly 86.230*)

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.

Prerequisites: 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] (formerly 86.240*)

Thermodynamics & 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.

Precludes additional credit for ECOR 2401.

Prerequisites: CHEM 1101 or CHEM 1000, MATH 1005 and MATH 1104.

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

MAAE 2700 [0.5 credit] (formerly 86.270*)

Engineering Materials

Materials (metals, alloys, polymers) in engineering service; relationship of interatomic bonding, crystal structure and defect structure (vacancies, dislocations) to material properties; polymers, thermoplastic, thermosetting; phase diagrams and alloys; microstructure control (heat treatment) and mechanical properties; material failure.

Precludes additional credit for MECH 2701 or CIVE 2700.

Prerequisites: CHEM 1101 or ECOR 1101.

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

MAAE 3004 [0.5 credit] (formerly 86.304*)

Dynamics of Machinery

Kinematic and dynamic analysis of mechanisms and machines. Instant Centres and complex algebra techniques. Synthesis of mechanisms. Kinematics and dynamics of Cams. Design and analysis considerations in reciprocating and rotating machinery. Vibrations in machinery. Vibration isolation. Experimental investigation of dynamic systems. Prerequisite: MAAE 2101.

Lectures three hours a week, problem analysis and laboratories one hour a week.

MAAE 3202 [0.5 credit] (formerly 86.322*)

Mechanics of Solids II

Torsion of non-circular sections; unsymmetric bending and shear centre; energy methods; complex stresses and criteria of yielding; elementary theory of elasticity; axisymmetric deformations; elementary plasticity analysis; plastic collapse.

Precludes additional credit for CIVE 3202.

Prerequisite: MAAE 2202.

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

MAAE 3300 [0.5 credit] (formerly 86.330*)

Fluid Mechanics II

Review of control volume analysis. Dimensional analysis and similitude. Compressible flow: isentropic flow relations, flow in ducts and nozzles, effects of friction and heat transfer, normal and oblique shocks, two-dimensional isentropic expansion. Viscous flow theory: hydrodynamic lubrication and introduction to boundary layers.

Precludes additional credit for MAAE 3303.

Prerequisites: MATH 2004 and MAAE 2300.

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

MAAE 3400 [0.5 credit] (formerly 86.340*)

Applied Thermodynamics

Gas and vapour power cycles: reheat, regeneration, combined gas/vapour cycles, cogeneration. Heat pump and refrigeration cycles: vapour compression cycles, absorption refrigeration and gas refrigeration. Mixtures of perfect gases and vapours: psychrometry and combustion. Principles of turbomachinery.

Prerequisite: MAAE 2400.

Lectures three hours a week, problem analysis and laboratories one hour a week.

MAAE 3901 [0.5 credit] (formerly 86.391*)

Mech & Aero Engineering Lab

Students perform a series of laboratory exercises dealing with a wide range of mechanical engineering topics. Included in this course is a group design project. Students relate theory and practice and develop experience with modern engineering equipment, measurement techniques and design methodology. Good reporting practice is emphasized.

Precludes additional credit for MAAE 4901.

Prerequisite: third-year registration.

Lectures and tutorials one hour a week, laboratory five hours a week.

MAAE 4102 [0.5 credit] (formerly 86.412*)

Materials: Strength & Fracture

Analysis and prevention of failures in metals and composite materials; micro-mechanisms of fracture, conditions

leading to crack growth. Mechanisms of fracture and transition temperature effects, fracture mechanics, fatigue, environmentally assisted cracking, non-destructive evaluation and testing. Mechanical properties of structural composites. Prerequisite: MAAE 2700.

Lectures three hours a week.

MAAE 4500 [0.5 credit] (formerly 86.450*)

Feedback Control Systems

Introduction to the linear feedback control. Analysis and design of classical control systems. Stability and the Routh-Hurwitz criteria. Time and frequency domain performance criteria, robustness and sensitivity. Root locus, Bode and Nyquist design techniques. Control system components and industrial process automation.

Precludes additional credit for MAAE 3502.

Prerequisites: MATH 3705 and SYSC 3600.

Lectures three hours a week.

MAAE 4905 [0.5 credit] (formerly 86.495*)

Professional Practice

Presentations by faculty and external lecturers on the Professional Engineers Act, professional ethics and responsibilities, practice within the discipline and its relationship with other disciplines and to society, health and safety, environmental stewardship, principles and practice of sustainable development. Communication skills are emphasized.

Precludes additional credit for CIVE 4905, SYSC 3905 or ELEC 3905.

Prerequisite: fourth-year registration.

Lectures three hours a week.

MAAE 4906 [0.5 credit] (formerly 86.496*)

Special Topics: Mech & Aero Eng.

At the discretion of the Faculty, a course may be offered that deals with selected advanced topics of interest to Aerospace and Mechanical Engineering students.

Prerequisite: permission of the Department.

MAAE 4917 [0.5 credit]

Undergraduate Directed Study

Student carries out a study, analysis, and solution of an engineering problem. Results presented in the form of a written report. Carried out under the close supervision of a faculty member. Intended for students interested in pursuing graduate studies. Requires supervising faculty member and proposal from student.

Prerequisite: permission of the Department and completion of, or concurrent registration in, AERO 4907 or MECH 4907.