

## SECOND YEAR MECHANICAL ENGINEERING<sup>1</sup>

### Fall Session-Year 2

MIE230H1F Engineering Analysis	MIE231H1F Probability & Statistics for Engineers	MIE258H1F Engineering Economics and Accounting	MSE270H1F Materials Science	Complementary Studies Elective <sup>2</sup>
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### Winter Session-Year 2

MAT234H1S Differential Equations	MIE210H1S Thermodynamics	MIE222H1S Mechanics of Solids I	MIE221H1S Manufacturing Engineering	Complementary Studies Elective <sup>2</sup>
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<sup>1</sup>Practical Experience Requirement - As described in the beginning pages of this chapter, students are required to have completed a total of 600 hours of acceptable practical experience before graduation (normally during their summer vacation periods).

<sup>2</sup>At least two of the four (0.5 credit) Complementary Studies Electives to be taken between second and fourth year must be Humanities/Social Science courses (see pages 25-26). An equivalent 1.0 credit course is also acceptable. Students are responsible for ensuring that each elective taken is approved. Please consult the electives list available on the Engineering Office of the Registrar's website.

## SECOND YEAR INDUSTRIAL (SYSTEMS) ENGINEERING<sup>1</sup>

### Fall Session-Year 2

MIE231H1F Probability & Statistics for Engineers	MIE235H1F Algorithms & Numerical Methods	MIE240H1F Human Centred Systems Design	MIE258H1F Engineering Economics & Accounting	MIE265H1F Introduction to Systems Engineering
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### Winter Session-Year 2

MAT234H1S Differential Equations	MIE237H1S Statistics & Design of Experiment	MIE253H1S Data Modelling	MIE262H1S Operational Research I	Complementary Studies Elective <sup>2</sup>
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<sup>2</sup>At least two of the four (0.5 credit) Complementary Studies Electives to be taken between second and fourth year must be Humanities/Social Science courses (see pages 25-26). Students are responsible for ensuring that each elective taken is approved. Please consult the electives list available on the Engineering Office of the Registrar's website.

## 2006-2007 Mechanical & Industrial Course Descriptions

### MIE210H1 S

#### Thermodynamics

II-AEMEBCASC

3/1.5/1/0.50

This is a basic course in engineering thermodynamics. Topics covered include: properties and behaviour of pure substances; equation of states for ideal and real gases; compressibility factor; first and second laws of thermodynamics; control mass and control volume analyses; applications of first and second laws of thermodynamics to closed systems, open systems and simple thermal cycles. (Prerequisite: MAT186H1 F).

### MIE221H1 S

#### Manufacturing Engineering

II – AEMEBCASC, III-AEESCBASC

3/2/1/0.50

Production Fundamentals: Metal casting; metal forming - rolling, forging, extrusion and drawing, and sheet-metal forming; plastic/ceramic/glass forming; metal removal - turning, drilling/ boring/reaming, milling, and grinding; non-traditional machining - ECM, EDM and laser cutting; welding; surface treatment; metrology. Environmental issues in manufacturing processes, recycling of materials. Automation Fundamentals: Automation in material processing and handling - NC, robotics and automatically-guided vehicles; flexible manufacturing - group technology, cellular manufacturing and FMS; and computer-aided design - geometric modelling, computer graphics, concurrent engineering and rapid prototyping.

### MIE222H1 S

#### Mechanics of Solids I

II-AEMECCBASC

3/1.5/1.5/0.50

Design of mechanical joints. Elasto-plastic torsion of circular sections. Elasto-plastic bending of beams. Residual stresses, shearing stresses in beams, analysis of plane stress and plane strain problems. Pressure vessels, design of members of strength criteria, deflection of beams. Statistically indeterminate problems.

### MIE230H1 F

#### Engineering Analysis

II-AEMECCBASC

3/-/2/0.50

Multivariate integration with application to calculation of volumes, centroids and moments. Vector calculus. Divergence, curl and gradient operators. Green's theorem. Gauss' theorem. Stokes' theorem. Functions of a complex variable. Singularities. Calculus of residues. Integral transforms. Laplace and Fourier transforms. (Prerequisite: MAT186H1 F & MAT187H1 S).

### MIE231H1 F

#### Probability and Statistics for Engineers

II-AEINDBASC, AEMECCBASC

3/2/2/0.50

Treatment of data. Elements of probability theory. Discrete and continuous random variables. Standard distributions: binomial, Poisson, hypergeometric exponential, normal, etc. Expectation and variance. Joint and conditional distributions. Random sampling and parameter estimation. Confidence intervals. Hypothesis testing. Goodness-of-fit-tests. Regression and correlation. Quality assurance. Engineering applications.

### MIE235H1 F

#### Algorithms and Numerical Methods

II-AEINDBASC; III-AEESCBASC (elective)

3/1/1/0.50

This course is concerned with the design, analysis and execution of algorithms that are of practical use in solving industrial engineering problems. Emphasis is placed on the essential characteristics of algorithms; data organization and numerical methods, while at the same time preparing students to appreciate algorithmic methods to be encountered in advanced courses. Topics include: analysis of algorithms, data structures, abstract data types, algorithm design, searching and sorting, solutions of linear systems and stability, interpolation and numerical integration, adaptive quadrature, solution of nonlinear equations and nonlinear optimization. (Prerequisite: MAT186H1 F or equivalent. Recommended: APS105H1 F or equivalent).

### MIE237H1 S

#### Statistics and Design of Experiment

II-AEINDBASC, III-AEMECCBASC; III-AEESCBASC (elective)

3/1/2/0.50

Tools of industrial statistics play an important role in helping engineers make their decisions more effectively. Experimental design methods have applications in many engineering disciplines. They play a major role in product and process design, in evaluation and comparison of design alternatives, selection of design parameters to achieve robust performance under a wide variety of operating and field conditions and in process improvement and optimization. The course focuses on the following topics: process modeling, important distributions and approximations, point and interval estimation of process parameters, hypothesis testing, correlation and regression analysis, design and analysis of experiments, sequential experimentation, off-line quality control and the Taguchi methods. (Prerequisite: MIE231H1 F or equivalent).

### MIE240H1 F

#### Human Centred Systems Design

II-AEINDBASC

3/-/2/0.50

This course deals with the engineering design of systems that effectively support humans in the tasks for which they are responsible. A systems approach is adopted in the course and the fundamentals of the human-centred design process are covered. A variety of generically useful tools will also be covered, including task analysis, basic human factors design principles, design reference sources, and techniques for predicting human reliability. Case studies will be used throughout to illustrate the concepts, showing the wide breadth of problems that can be addressed through the human centred systems design process. This process includes appropriate concerns for environmental requirements and issues.

### MIE253H1 S

#### Data Modelling

II-AEINDBASC; III-AEESCBASC (elective)

3/1/1/0.50

Provides an understanding of the theories and techniques of information modelling, including classical data models such as hierarchical, network and relational, newer models such as entity-relation, object, and conceptual. Secondly, the distributed information systems and query protocols, such as SQL will be covered. The laboratory will focus on the building of databases, using pc/workstation based tools such as dbase or Oracle. (Prerequisite: APS105H1 S or equivalent, MIE235H1 F)

### MIE258H1 F

Engineering Economics and Accounting

II-AEINDBASC, AEMECBASC, III-AEMMSBASC

3/-/1/0.50

This course focuses on the engineering economic and accounting concepts needed in the design of industrial engineering systems. They include time value of money, evaluation of cash flows, cost and managerial accounting concepts, defining alternatives, acceptance criteria, replacement analysis, depreciation and income tax, sensitivity and decision analysis, buy or lease, make or buy, production functions and relationship to cost functions. (Prerequisite: MIE231H1 F or equivalent)

### MIE262H1 S

Operational Research I

II-AEINDBASC, AELMEBASC, III-AEESCBASC (elective)

3/2/1/0.50

This course deals with the formulation of models for the design and operation of systems that produce goods and services. Linear programming; the simplex algorithm, sensitivity analysis and duality; the assignment problem; introduction to network design; probabilistic inventory models; Markov chains. (Prerequisite: MAT186 F, MAT188 F)

### MIE265H1 F

Introduction to Systems Engineering

II-AEINDBASC

3/-/2/0.50

This course provides an introduction to the modelling, analysis and control of integrated systems such as occur in manufacturing, logistics, process industries and health care. Well designed systems integrate many perspectives to satisfy customer needs. These perspectives include quality, reliability, ergonomics, human resources, management, information, productivity and environment. The design and analysis of an integrated system follows the basic engineering process of synthesis and analysis. Techniques, such as work measurement and design, project management, mathematical modelling and activity and information modelling will be studied as a basis of modelling integrated systems. A series of case studies will illustrate the design and analysis of integrated systems.

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## 2006-07 Registration Checklist for Students Entering Second Year

- ❑ Review the second-year curriculum. 2006-07 Calendars should be ready for pick-up from the Undergraduate Office in April.
- ❑ Complete the Course Selection information through the Office of the Registrars' website between the end of March and the end of April, 2006. An email will be sent to your ECF accounts once more details are available. You must indicate whether you want to remain in your program, or transfer to Mechanical or Industrial Engineering.
- ❑ Choose your Humanities Social Sciences (HSS)/Complementary Studies (CS) elective(s). Industrial students will take one elective in the 2W term; Mechanical students will take one elective in each of the 2F & 2W terms. Pick a few back-up courses in case your first choice is full when you try to enrol. **At least two** of the four (0.5 credit) HSS/CS electives taken between second and fourth year **must be HSS**.
- ❑ Remember that HSS courses can be used as CS courses, but the reverse is not necessarily true. Language courses may be used for CS but not HSS electives. Please refer to the Registrar's website for a list of approved HSS/CS courses: <http://www.engineering.utoronto.ca/English/page-1-2206-1.html>.
- ❑ Check the course descriptions in the Calendars (chapter 7 for Engineering) for prerequisites, corequisites or exclusions (read the fine print). ROSI does not check for these when you enrol in a course, and you can be removed from a course if you haven't met the requirements. Arts and Science course descriptions are available in their online Calendar: <http://www.artsci.utoronto.ca/current/undergraduate/course>.
- ❑ Make sure your HSS/CS elective does not conflict with your technical courses. The engineering timetable should be available on the Registrar's website by the end of July. Your personal timetable should be available on ROSI by mid-August.
- ❑ Enrol in your HSS/CS elective. You may begin adding courses offered through the Faculty of Arts and Science around the third week of August, 2006. Specific enrolment start dates will be sent by email to your ECF addresses in July. The Registrar's Office will enrol you in your technical courses for both terms.
- ❑ Submit your completed Practical Experience Hours Form(s) to the Undergraduate Office as soon as you've finished your summer job. The form is available from our office and online: <http://www.mie.utoronto.ca/undergrad/info/forms.htm>.