

MEMORIAL UNIVERSITY OF NEWFOUNDLAND  
SENATE

The special meeting of Senate was held on June 15, 2006, at 4:20 p.m. in Room E5004, Education Building.

109. PRESENT

The President, Dr. E. Campbell, Dr. C. Loomis, Dr. J. Ashton, Dr. S. Birnie-Lefcovitch, Mr. G. Blackwood, Dean A. Collins, Mr. G. Collins, Dean R. Gosine, Dr. N. Golfman (on behalf of Dean C. Jablonski), Dean R. Lucas, Dean J. Rourke, Dean L. Walker, Interim Dean S. Wolinetz, Mr. E. Andrews, Mr. K. Baker, Dr. E. Brown, Mr. E. Durnford, Dr. A. Gill, Dr. J. Harris, Dr. L. Hermanutz, Dr. O. Janzen, Professor V. Kuester, Dr. D. McKay, Dr. D. Moralejo, Dr. W. Okshevsky, Dr. D. Peters, Dr. D. Pike, Professor G. Riser, Dr. W. Schipper, Dr. C. Sharpe, Mr. R. Trenholm, Dr. D. Tulett, Professor D. Walsh, Dr. J. Whitehead, Ms. K. Hickey, Mr. S. Sullivan, Mr. R. Drinkall, Mr. J. Farrell, Ms. K. Giroux-Bougard, Ms. S. Magalios, Ms. E. Martin, Mr. I. Igho-Osagie, Mr. D. Singh.

The Chair noted that the following Senators have been reappointed by the Memorial University of Newfoundland Students' Union for the period June 1, 2006 to March 31, 2007:

James Farrell  
Emilie Martin

The Chair also noted the appointment of the following Marine Institute student Senator for the period June 1, 2006 to March 31, 2007:

Tim Williams

The Chair advised Senate that this is the last meeting of Senate which Dr. Wolinetz will attend in his capacity as Interim Dean, Faculty of Arts and he expressed appreciation to Dr. Wolinetz for his contributions to the Senate. Senators expressed their gratitude with a round of applause.

110. APOLOGIES FOR ABSENCE

Apologies were received from Dr. M. Bluechardt, Dr. T. Gordon, Dean G. Gorman, Dean C. Jablonski, Dr. R. Adamec, Dr. K. Aziz, Dr. G. Clark, Ms. B. Conran, Mr. C. Couturier, Dr. M. Daneshtalab, Dr. R. Helleur, Dr. F. King, Dr. M. Morrow, Dr. K. Popadiuk, Dr. J. Quaicoe, Dr. K. Szego, Dr. J. Wright, Ms. K. Greenfield.

111. TOWARDS A NEW STRATEGIC FRAMEWORK AND PLAN

Dr. Meisen introduced the topic for the special meeting by reminding Senators of the Strategic Planning process which has been underway for the past year and noted that in keeping with *Bill 39: An Act to Enhance the Transparency and Accountability of the Government and Government Entities to the People of the Province*, a new strategic plan and framework is needed for the University by March, 2007. Dr. Meisen then handed the floor over to Dr. Eddy Campbell, Vice-President (Academic) and Chair of the Strategic Planning Working Group, who gave a Powerpoint presentation entitled "*Towards a New Strategic Framework and Plan*".

Dr. Campbell began the presentation by reminding Senators that the purpose of the Strategic Plan is to:

- confirm the University's mission
- set directions for the next five to 10 years
- identify new goals, actions, and performance indicators
- determine priorities
- create a basis for resource allocations.

Dr. Campbell reported that internal consultations, including 23 unit level submissions, eight key strategic issue papers and several other initiatives, as well as external consultations, involving 12 sessions in 10 centres across the Province, have taken place. Dr. Campbell then provided a summary of the key messages emanating from the internal and external consultations which will be taken into consideration in drafting the new strategic plan. These messages are outlined in point form in the Powerpoint slides which are attached to the original of these minutes.

In concluding his presentation, Dr. Campbell noted that it is expected that the Strategic Plan will be approximately 20 pages in length and will consist of Part 1 which will contain the core values, mission, vision and broad goals and Part 2 which will contain strategies and actions with respect to five broad themes as outlined in his presentation.

Following the presentation Dr. Campbell invited Senators to forward their comments and suggestions to [strategic@mun.ca](mailto:strategic@mun.ca). He also noted that today's presentation would be available on the Strategic Planning website in the near future.

A brief discussion then ensued covering topics such as:

- the importance of placing more emphasis on the role that the University, as a crucial generator of ideas, plays in public discourse and debate
- the need to track not only the inputs of research but also the impact of research
- the inherent difficulties associated with writing a concise yet inclusive plan which will cover such broad and diverse themes and concepts.

Following the presentation, Dr. Meisen thanked Dr. Campbell, Mr. Paul Chancey, members of the Working Group and Steering Committee as well as members of Senate for today's useful discussion. He also noted that it is anticipated that a draft Strategic Plan will be presented to Senate in the early Fall.

112. ADJOURNMENT

The meeting adjourned at 5:05 p.m.

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CHAIRMAN

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SECRETARY

MEMORIAL UNIVERSITY OF NEWFOUNDLAND  
SENATE

The regular meeting of Senate was held on June 15, 2006, at 5:05 p.m. in Room E5004, Education Building.

113. PRESENT

The President, Dr. E. Campbell, Dr. C. Loomis, Dr. J. Ashton, Dr. S. Birnie-Lefcovitch, Mr. G. Blackwood, Dean A. Collins, Mr. G. Collins, Dean R. Gosine, Dr. N. Golfman (on behalf of Dean C. Jablonski), Dean R. Lucas, Dean J. Rourke, Dean L. Walker, Interim Dean S. Wolinetz, Mr. E. Andrews, Mr. K. Baker, Dr. E. Brown, Mr. E. Durnford, Dr. A. Gill, Dr. J. Harris, Dr. L. Hermanutz, Dr. O. Janzen, Professor V. Kuester, Dr. D. McKay, Dr. D. Moralejo, Dr. W. Okshevsky, Dr. D. Peters, Dr. D. Pike, Professor G. Riser, Dr. W. Schipper, Dr. C. Sharpe, Mr. R. Trenholm, Dr. D. Tulett, Professor D. Walsh, Dr. J. Whitehead, Ms. K. Hickey, Mr. S. Sullivan, Mr. R. Drinkall, Mr. J. Farrell, Ms. K. Giroux-Bougard, Ms. S. Magalios, Ms. E. Martin, Mr. I. Igho-Osagie, Mr. D. Singh.

114. APOLOGIES FOR ABSENCE

Apologies were received from Dr. M. Bluecharadt, Dr. T. Gordon, Dean G. Gorman, Dean C. Jablonski, Dr. R. Adamec, Dr. K. Aziz, Dr. G. Clark, Ms. B. Conran, Mr. C. Couturier, Dr. M. Daneshtalab, Dr. R. Helleur, Dr. F. King, Dr. M. Morrow, Dr. K. Popadiuk, Dr. J. Quaicoe, Dr. K. Szego, Dr. J. Wright, Ms. K. Greenfield.

115. MINUTES

The Minutes of the regular meeting held on May 9, 2006 were taken as read and confirmed.

REPORT OF THE EXECUTIVE COMMITTEE OF SENATE

It was agreed by separate motion where necessary, that the report of the Executive Committee be approved as follows:

CONSENT AGENDA

Consent Agenda Item 2.B.(ii) was moved from the Consent Agenda to the Regular Agenda at the request of Dr. McKay and Dr. Schipper.

It was moved by Professor Walsh, seconded by Dr. Lucas, and carried that the consent agenda, comprising Items 116 to 117, be approved as follows:

116. REPORT OF THE SENATE COMMITTEE ON UNDERGRADUATE STUDIES

116.1 Canadian Studies Major Program

Page 161, 2006-2007 Calendar, under the heading 6.4 Canadian Studies, clause 2.c., following the list of courses in History, amend to read:

“Law and Society 2000, 3011”

116.2 Department of Religious Studies

Page 208, 2006-2007 Calendar, under the heading 6.25.1 General Degree, subheading 6.25.1.1 Major in Religious Studies, amend clause 1.a. to read as follows:

“a. 2013, .... 2140, 2330, 2340, 3000, 3031, .. 3310, 3315, 3320, 3510, ... 3901.”

Page 208, 2006-2007 Calendar, under the heading 6.25.1 General Degree, subheading 6.25.1.1 Major in Religious Studies, amend clause 2. to read as follows:

“2. At least 18 credit hours of course work must be at the 3000 level or above.”

116.3 Department of Biochemistry

Page 254, 2006-2007 Calendar, under the heading 5.1.4 Nutrition Program, subheading 5.1.4.1 Major in Nutrition, clause 2.a., delete Biochemistry “3054”.

Page 254, 2006-2007 Calendar, under the heading 5.1.5 Professional Program in Dietetics, subheading 5.1.5.3 Major in Dietetics, clause 1.a., delete Biochemistry “3054”.

Page 254, 2006-2007 Calendar, under the heading 5.1.5 Professional Program in Dietetics, subheading 5.1.5.3 Major in Dietetics, add a new clause b. as follows and reletter existing clauses b. to g. as c. to h.:

“b. Either Biochemistry 3054 or Biology 3050.”

Page 254, 2006-2007 Calendar, under the heading 5.1.5 Professional Program in Dietetics, subheading 5.1.5.4 Honours Degree in Dietetics, delete the third paragraph and replace with the following:

“The 60 credit hours in courses from clause 6.a. of the Regulations for the Honours Degree of Bachelor of Science shall be chosen from the required Biochemistry courses in the program outlined above, the Nutrition and Foods courses at Acadia University, and Biology 3050.”

117. REPORT OF THE ACADEMIC COUNCIL OF THE SCHOOL OF GRADUATE STUDIES

117.1 Faculty of Education

Page 483, 2006-2007 Calendar, under the heading 8.8 Specific Programs, subheading 3. Counselling Psychology, clause b.v., add in numeric order “E6707 Assessment for Counsellors”.

Amend “E6709” as follows:

“(Prerequisite: E3600 r its graduate equivalent 6707. Normally, students ...”

117.2 Faculty of Engineering and Applied Science

Page 457, 2006-2007 Calendar, under the heading 2 Regulations Governing the Degree of Master of Applied Science, subheading 2.1.3 Degree Requirements, clause 1., change “33 credit hours” to “36 credit hours”.

In clause 1.a., add ENGR “9859”.

Amend clause 1.b. to read as follows:

“Three elective courses must be selected; each term the Board of Studies for the program will provide a selection of eligible courses, which may include Engr. 9821, Engr. 9822, Engr. 9868, Engr. 9869, Engr. 9872, Engr. 9875, Engr. 9877, Engr. 9878, Engr. 9879, Engr. 9880/83, Engr. 9888/91, CS 6752, CS 6756, PHYS 6102, and others designated by the Board of Studies for the program.”

Under the subheading 2.1.3 Degree Requirements, add the following:

“2. Normally students will take courses as shown in Table 1. Students wishing to take courses in another sequence must request approval from the Board of Studies for the program.

**Table 1: Program for the M.A.Sc. In Computer Engineering**

	<b>Preparation</b>	<b>Core</b>	<b>Elective</b>
Year 1 Spring	English		
Year 1 Fall		3	0
Year 1 Winter		2	1
Year 2 Spring		2	1
Year 2 Fall		ENGR 9801	1

Under subheading 2.1.4. Evaluation, Courses, add the following new course:

“9859 Computer Engineering Fundamentals”

Amend “Physics 6XXX” to read “Physics 6102”.

117.3 Computational Science Program

Page 513, 2006-2007 Calendar, under the heading 19.10 Computational Science Program, subheading 19.10.5 Co-operative Education Option, Courses, add the following two new courses:

“CMSC 6925 Tools of the Trade for Programming High Performance Computers  
CMSC 6940 Computer Based Research Tools and Applications”

## REGULAR AGENDA

### 118. REPORT OF THE SENATE COMMITTEE ON UNDERGRADUATE STUDIES

#### 118.1 Regulations for the Honours Degree of Bachelor of Science

A memo dated April 10, 2006 was received via the Committee on Undergraduate Studies for the Faculty of Science and the Senate Committee on Undergraduate Studies proposing an amendment to the Declaration of Intent statement of the Admission and Registration Regulations for the Bachelor of Science (Honours) Degree. The proposed amendment to the regulation was intended to provide clarification to ensure that students are aware of the requirement to complete those courses normally needed for entry into a department of subject of major before declaring his or her intent to pursue an Honours degree. However, it was suggested by Dr. McKay that the proposed amendment would be restrictive and students should have the flexibility to complete any deficiencies before graduation.

Following a brief discussion, it was moved by Dr. McKay, seconded by Dr. Schipper and carried that the proposed amendment be referred back to the Faculty of Science Undergraduate Studies Committee for further consideration taking the above into account.

#### 118.2 Section 3: Categories of Applicants, Admission Criteria and other Information of the Regulations Governing Admission/Readmission to the University (Undergraduate) - Office of the Registrar

Page 50, 2006-2007 Calendar, under the heading 2.3.4 Applicants Who Have Followed the Adult Basic Education Program (ABE), subheading 2.3.4.1 Admission Criteria, delete current entry and replace with the following:

“Applicants shall have completed the Level III Adult Basic Education Certificate (ABE) with the approved combination of thirty-six credits set down by the Department of Education and successfully completed, with an overall average of not less than 70%, the following courses as outlined below:

- **Communication Skills:** IC 3112 and IC 3321 **OR** English 3101A, 3101B, 3101C
- **Mathematics:** One of the following groups:
  - Mathematics: IM 3115, 3211, 3212, 3213 and 3216 **OR**
  - Mathematics: IM 3218, 3219 and 3221 **OR**
  - Mathematics: 2104A, 2104B, 2104C, 3104A, 3104B, 3104C
- **Science:** One of the following patterns:

Section 3: Categories of Applicants, Admission Criteria and other Information of the Regulations Governing Admission/Readmission to the University (Undergraduate) - Office of the Registrar (cont'd)

Biology: IB 3113, 3115, 3211, 3212A/B, 3214, 3316 **OR**  
Biology: 2101A, 2101B, 2101C, 3101A, 3101B, 3101C  
Chemistry: IH 3111, 3112, 3113, 3114, 3116, 3117, 3118, 3215 **OR**  
Chemistry: 2102A, 2102B, 2102C, 3102A, 3102B, 3102C  
Geology: IS 3212  
Physics: IP 3111, 3112, 3213, 3215, 3216 **OR**  
Physics: 2104A, 2104B, 2104C, 3104A, 3104B, 3104C”

118.3 Faculty of Engineering and Applied Science

Professor Walsh presented the proposed Faculty of Engineering and Applied Science calendar changes noting that the Faculty is proposing substantive changes to its undergraduate programs as a result of the recommendations and actions arising from the Faculty’s Academic Program Review in 2003. Professor Walsh provided an overview of some of the highlights of the revised program which included:

- while several modes of entry are possible, the normal mode of entry to the program will be direct entry from high school
- the normal duration of the program will be five academic years which includes eight academic semesters and four work terms compared to the 10 academic semesters and six work terms that are currently required for most students
- the creation of new courses as well as renumbering, redefining and reactivating of existing courses
- the provision of bridging programs.

Following discussion, the motion to approved the proposed amendments to the Faculty of Engineering and Applied Science program which was moved by Professor Walsh, seconded by Dr. Gosine, carried.

Page 384, 2006-2007 Calendar, starting with 1 Faculty of Engineering and Applied Science, up to and including page 406, delete and replace with the following:

“Program details for students in the Classes of 2012 and earlier are available in the 2006-07 Calendar (which can be viewed from the web site [www.mun.ca/regoff](http://www.mun.ca/regoff)).

## Faculty of Engineering and Applied Science (cont'd)

Students in the Classes of 2013 and beyond are governed by the following regulations.

### **1 FACULTY DESCRIPTION**

- 1.1 General Information
- 1.2 Bachelor of Engineering Program Majors
- 1.3 Continuing Engineering Education

#### **1.1 General Information**

Students must meet all regulations of the Faculty in addition to those stated in the general regulations. For information concerning fees and charges, admission/readmission to the University, and general academic regulations (undergraduate), refer to the University Regulations.

The Bachelor of Engineering Degree at Memorial University of Newfoundland is a Co-operative Program, in which regular full-time academic study is supplemented by 4-month periods of full-time work in positions related to the student's future career.

***“Engineering One”*** comprises the core program taken by all students in their first year engineering program. During Engineering One students take courses in mathematics and basic science (physics and chemistry), as well as courses covering engineering fundamentals which are common to each of the majors. The engineering courses in Engineering One introduce students to engineering problem-solving, analysis, design, communication, and teamwork. Students will develop an understanding of the different engineering specialities, as well as the interdisciplinary nature of engineering practice.

The specialized programs (majors) of Civil Engineering, Computer Engineering, Electrical Engineering, Mechanical Engineering and Ocean and Naval Architectural Engineering are offered in Academic Terms 3 through 8. Students in each major may also choose to pursue an Offshore Oil and Gas Engineering option in the last three terms of the program. For specific details on each major, refer to the appropriate Program Regulations. Courses of the Faculty are designated by the abbreviation ENGI.

Where electives are available in Complementary Studies, the selection must be approved by the Associate Dean (Undergraduate Studies).



Faculty of Engineering and Applied Science (cont'd)

**1.2 Bachelor of Engineering Program Majors**

1.2.1 Civil Engineering

In the nineteenth century, Civil Engineering was defined as, “The art of directing the great sources and powers of nature...for the use and convenience of man”. Still valid today, the definition indicates that civil engineers are involved in serving people by providing some of the essentials (e.g. water supplies, shelter and transportation) necessary for civilized life. The oldest of the engineering professions, Civil Engineering deals with the planning, design, and construction of such things as roads, railways, harbours, docks, tunnels, bridges, buildings, water supplies, hydroelectric power development, and sewage collection, treatment and disposal systems.

The major provides a broad introduction to the scientific principles and engineering techniques necessary for an understanding of the fundamental problems tackled by civil engineers.

1.2.2 Computer Engineering

Computer Engineering is the design and analysis of computer systems applied to the solution of practical problems. It encompasses both hardware and software design in applications ranging from telecommunications and information systems to process control and avionics. Computer Engineering students learn the mathematics of discrete as well as continuous systems, the design of digital machines such as processors and memories, the fundamentals of software design, and the principles used in communications systems such as telephone networks and the Internet.

Computer Engineering shares many fundamentals with Electrical Engineering, and these are covered in a common curriculum up to and including Academic Term 3. Upon entering Academic Term 4, Computer Engineering students will begin taking courses specific to their major. In Academic Term 6, students may select the Offshore Oil and Gas Option. In recognition of the considerable diversity of careers available to computer engineers, students are given latitude in the final three academic terms to choose from a wide range of electives in various speciality areas. Electives can be tailored to meet the needs of those who plan to go straight into industry as well as those who wish to join the increasing number of our graduates who are pursuing advanced degrees.

## Faculty of Engineering and Applied Science (cont'd)

### 1.2.3 Electrical Engineering

Electrical Engineering is a broad field involving topics from the design of motors to the design of communication systems. Areas of study include control systems, electromagnetics and antennas, power systems, electronics, communications, and computer hardware and software.

Electrical Engineering shares many fundamentals with Computer Engineering, and these are covered in a common curriculum up to and including Academic Term 3. Upon entering Academic Term 4, Electrical Engineering students will begin taking courses specific to their major. In Academic Term 6, students may select the Offshore Oil and Gas Option. In recognition of the considerable diversity of careers available to electrical engineers, students are given latitude in the final three academic terms to choose from a wide range of electives in various speciality areas. Electives can be tailored to meet the needs of those who plan to go straight into industry as well as those who wish to join the increasing number of our graduates who are pursuing advanced degrees.

### 1.2.4 Mechanical Engineering

Mechanical engineering is one of the broadest engineering disciplines and is a highly diversified discipline encompassing the design, analysis, testing and manufacture of products that are used in every facet of modern society. Mechanical engineers analyze their design using the principles of motion, energy, and force to ensure that the product functions safely, efficiently, reliably, and can be manufactured at a competitive cost. This activity requires a thorough knowledge of materials, mathematics, and the physical sciences, and an ability to apply this knowledge to the synthesis of economical and socially acceptable solutions to engineering problems.

The Mechanical major in this Faculty is designed to provide students with a sufficiently general background in various areas, namely i) design and dynamics area, emphasizing solid mechanics, material science, dynamics, vibrations and machine component design; ii) thermo-fluids area, focusing on thermodynamics, heat transfer and fluid mechanics; iii) mechatronics area, dealing with electro-mechanical systems, control, robotics, and automation and iv) manufacturing/industrial area, which encompasses CAD/CAM, production and operation management. Recognizing differences in background technical knowledge, the students are given the choice from a wide range of electives in various speciality areas in Academic Terms 7 and 8. Beyond Academic Term 5 the students can opt for the Offshore Oil and Gas option in Mechanical Engineering to meet their career goals in oil exploration and process industry. Students can thereby tailor their programs to meet career goals in areas such as research and development, industry, design, resource utilization, offshore development and ocean engineering.

## Faculty of Engineering and Applied Science (cont'd)

### 1.2.5 Ocean and Naval Architectural Engineering

Ocean and Naval Architectural Engineering covers aspects of both Naval Architecture and Ocean Engineering. Naval Architecture is primarily concerned with the design and construction of ships, offshore structures and other floating equipment and facilities. A naval architect is an engineer with the working knowledge of many disciplines and particular expertise in one or more of the specialist areas such as structures, hydrodynamics, or marine systems. Ocean Engineering extends this focus to cover virtually all aspects of engineering related to the world's oceans. Our Ocean Engineering major content introduces students to this broad and truly international field. Topics including sub-sea systems and oceanographic science add core ocean engineering content to the program. Students will be able to further develop their particular interests by using the focus stream to study any of a wide variety of topics, reflecting the tremendous diversity of the field.

The Ocean and Naval Architectural Engineering major is the only accredited undergraduate program specifically in naval architecture / ocean engineering in Canada. The major is designed to provide highly qualified professionals who can work in various ocean industry sectors such as marine transport, ship and boat building, offshore engineering, submersibles design and many related marine areas. The undergraduate program is also a comprehensive preparation for graduate studies, research and consulting in ocean engineering.

### **1.3 Continuing Engineering Education**

The Faculty of Engineering and Applied Science has a firm commitment to Continuing Engineering Education. A variety of seminars and short courses is offered in St. John's and in other centres so that practising engineers may participate in Continuing Engineering programs aimed at maintaining and improving their competence.

## **2 ADMISSION/READMISSION REGULATIONS FOR THE FACULTY OF ENGINEERING AND APPLIED SCIENCE (for the Class of 2013 onwards)**

- 2.1 General Information
- 2.2 Deadlines and Application Forms
- 2.3 Admission Requirements of Faculty Programs
- 2.4 Other Information

Faculty of Engineering and Applied Science (cont'd)

In addition to meeting University Regulations, students must meet the admission/readmission regulations for the Faculty of Engineering and Applied Science.

**2.1 General Information**

- 2.1.1 Entry to Engineering One and to the majors offered by the Faculty is selective and competitive for a limited number of places. Meeting the minimum admission requirements does not guarantee acceptance into the Engineering program. The final decision on admission or readmission to Engineering One or to any major rests with the Admissions Committee of the Faculty.
- 2.1.2 Admission or readmission to the University does not necessarily constitute admission or readmission to Engineering One or to any major.
- 2.1.3 The primary criterion used in reaching decisions on applications for admission or readmission is the Admission Committee's judgement of the likelihood of an applicant succeeding in the program.

**2.2 Application Forms and Deadlines**

- 2.2.1 All programs of the Faculty commence in the Fall semester. The deadline for application for admission is March 1. Students are encouraged to submit their applications as early as possible, since the Faculty may begin to offer provisional admissions as early as February to students applying to begin their program in September.
- 2.2.2 The deadline for application for readmission, for students who were previously admitted to a Faculty program, is June 1 for the Fall semester, October 1 for Winter, and February 1 for Spring.
- 2.2.3 Applications received after the relevant deadline may be considered as time and space permit. Incomplete applications will not be considered.
- 2.2.4 Application forms are available in person from the Faculty's General Office and the Office of the Registrar or through the Faculty's website at [www.engr.mun.ca](http://www.engr.mun.ca). Application forms may also be obtained by writing to the Faculty of Engineering and Applied Science, Memorial University of Newfoundland, St. John's, NL, A1B 3X5 or to the Office of the Registrar, Admissions Office, Memorial University of Newfoundland, St. John's, NL, A1C 5S7.

## Faculty of Engineering and Applied Science (cont'd)

2.2.5 All applications for admission or readmission must be submitted to the Office of the Registrar. A complete application includes an application to the University (for those who have not attended Memorial University of Newfoundland in the two preceding semesters), an application to the Faculty and any other required supporting documentation. Application fees must be paid when the application forms are submitted.

### **2.3 Admission Requirements to the Faculty Program**

Applicants may apply for admission to the Faculty program under the CATEGORIES OF APPLICANTS, ADMISSION CRITERIA AND OTHER INFORMATION outlined under *UNIVERSITY REGULATIONS - ADMISSION/READMISSION TO THE UNIVERSITY (UNDERGRADUATE)*. In addition to meeting these regulations, applicants in the following categories must meet the requirements as indicated below.

#### 2.3.1 High School Applicants

The Faculty of Engineering and Applied Science encourages applications from high school students who have an interest in pursuing an engineering degree and who have achieved a good academic performance during high school.

High school applicants admitted to the program who are admissible to the required Engineering One courses Mathematics 1000, Physics 1050 and Chemistry 1050 are expected to be able to complete the Engineering One requirements during their first two semesters at Memorial.

High school applicants who are not admissible to these courses, but who are interested in pursuing an engineering degree, are encouraged to apply to the Faculty and to discuss an appropriate first-year program with the Associate Dean (Undergraduate Studies).

#### 2.3.2 Memorial University of Newfoundland Applicants

- To be eligible for consideration for admission to Engineering One, students who are attending or have previously attended this University must have a cumulative average of at least 60% or an average of at least 65% on their most recent 30 attempted credit hours and be admissible to (or have previously completed) the Engineering One courses Mathematics 1000, Physics 1050 and Chemistry 1050.

Faculty of Engineering and Applied Science (cont'd)

- To be eligible for consideration for admission to Academic Term 3, students who are attending or have previously attended this University must meet the requirements stated in the PROMOTION REGULATIONS, Promotion Status (Engineering One).

2.3.3 Transfer Applicants

- Applicants seeking admission through transfer from accredited post-secondary institutions must have achieved a minimum overall average of 60% to be considered for admission.
- A student's placement within a program, and requirements needed to complete the program, will be determined on an individual basis at the time of admission. Transfer applicants must complete a majority of the credit hours in their program at Memorial University.

**2.4 Other Information**

2.4.1 The Faculty will notify applicants in writing regarding an admission decision to a Faculty program.

2.4.2 Students admitted to the program in any term, without receiving credit for all courses required up to that level, must successfully complete those courses prior to graduation.

2.4.3 Students who have been admitted to one major offered by the Faculty and who wish to change to another major within the Faculty must submit a new application for admission to the program. This application must be submitted to the Office of the Registrar by the appropriate deadline date in (ADMISSION / READMISSION REGULATIONS - Application Forms and Deadlines) above and will be considered in competition with all other applications.

2.4.4 Students admitted full time to the program and who decline the offer of admission or who fail to register for the appropriate courses during the term of admission will be considered withdrawn from the program. Such students, if they subsequently wish to be considered for admission, must submit a new application for admission to the program. This application must be submitted to the Office of the Registrar by the appropriate deadline date in (ADMISSION / READMISSION REGULATIONS - Application Forms and Deadlines) above and will be considered in competition with other applications.

Faculty of Engineering and Applied Science (cont'd)

**3 PROGRAM REGULATIONS**

- 3.1 Program of Study
- 3.2 Work Terms
- 3.3 Complementary Studies
- 3.4 Civil Engineering
- 3.5 Computer Engineering
- 3.6 Electrical Engineering
- 3.7 Mechanical Engineering
- 3.8 Ocean and Naval Architectural Engineering
- 3.9 Transitional Program for Students Admitted to First Year in 2007

**3.1 Program of Study**

- 3.1.1 Courses in the engineering program are normally taken in blocks as shown in the appropriate program chart. Students must satisfy the criteria for promotion as described below (see PROMOTION REGULATIONS) to remain in the Engineering program.
- 3.1.2 The Engineering Program consists of eight academic terms and four work terms. The first year of the Engineering Program, known as “Engineering One”, forms a core that is common to all majors. All students must successfully complete the requirements of Engineering One prior to being promoted to Academic Term 3.
- 3.1.3 In 1000 level Engineering courses, registration priority is given to students who have been admitted to Engineering One. Other students will be admitted to these courses only with the approval of the Associate Dean (Undergraduate Studies).
- 3.1.4 In these program regulations, including the program charts, wherever reference is made to “English 1080” or “Chemistry 1050”, these courses may be replaced by courses deemed equivalent by the relevant academic unit.
- 3.1.5 Upon entering Academic Term 3, students begin to specialize in their academic program, in one of the following majors: (1) Civil Engineering, (2) Computer Engineering, (3) Electrical Engineering, (4) Mechanical Engineering, or (5) Ocean and Naval Architectural Engineering. All Engineering students who successfully complete the Engineering One requirements during their first year of Engineering will be guaranteed a place in Academic Term 3, although not necessarily in the preferred major, (see PROMOTION REGULATIONS, Promotion Status (Engineering One)).

Faculty of Engineering and Applied Science (cont'd)

- 3.1.6 Upon entering Academic Term 6, students in each major may choose to pursue the Offshore Oil and Gas Engineering (OUGE) option for that major.
- 3.1.7 Engineering courses in Academic Term 3 and beyond (i.e., those with numbers 3000 and greater) are restricted to students who have been admitted or promoted to the appropriate academic term and major (e.g., Academic Term 3 for 3000 level courses, restricted by major). Other students will be admitted to these courses only with the approval of the Associate Dean (Undergraduate Studies), in consultation with the appropriate Discipline Chair.

Some of the courses offered in Academic Terms 3 to 8 are taken by all Engineering students, others are offered for more than one major, but most technical courses in Academic Terms 3 to 8 are specific to the individual majors. Students should refer to the program descriptions for the detailed course requirements in each phase of their program.

- 3.1.8 Technical elective courses may be offered in terms other than those indicated in the program charts.
- 3.1.9 A student who has previously met a technical elective requirement in a given semester or wishes to defer it, may request an exemption or deferral by applying to the Associate Dean (Undergraduate Studies), who will consult the appropriate Discipline Chair. A minimum grade of 60% is required for credit to be given towards a student's engineering program for any technical elective taken outside the normal blocks as shown in the charts.
- 3.1.10 Students registered in Academic Term 7 of any Engineering major are eligible to apply for admission to a Master of Engineering fast-track option. The purpose of the option is to encourage students interested in pursuing graduate studies to begin their graduate program while still registered as an undergraduate student. While enrolled in the option, a student may complete some of the M.Eng. Degree requirements and, hence, potentially be able to graduate earlier from the M.Eng. Program. For further details and the regulations regarding the option, refer to the regulations governing the degree of Master of Engineering.



Faculty of Engineering and Applied Science (cont'd)

**3.2 Work Terms**

Students must successfully complete four work terms in order to graduate with a Bachelor of Engineering degree. Students who are expecting to complete the Engineering One requirements, or the requirements of Transition Term 1 and Transition Term 2, during the Fall and Winter Semesters may apply to the Committee on Undergraduate Studies to undertake a work term during the Spring Semester of Engineering One or following Transition Term 2. Students who have completed the requirement for four work terms may apply to the Committee on Undergraduate Studies to undertake additional work terms.

Students in the Engineering program are governed by the *Co-operative Student Handbook* (approved by the Committee on Undergraduate Studies and available from the web page "<http://www.mun.ca/coop/home/engineering.php>"). Prior to registering for the first work term, students must successfully complete the non-credit course ENGI 200W Professional Development Seminars.

**3.2.1 General Information**

- During work terms students are brought into direct contact with the engineering profession, exposed to the work place setting, expected to assume ever-increasing responsibility in employment situations as their education advances, and introduced to experiences beyond the scope of those which could be provided in the classroom.
- Students are responsible for finding suitable work placements. The Office of Co-operative Education of the Faculty provides resources to assist in this process.
- Students who cannot meet the demands of the job competition or the work place, may be required by the Faculty to withdraw from the work term until they can demonstrate an ability to continue in the program.
- Students are not permitted to drop work terms without prior approval of the Committee on Undergraduate Studies, on the recommendation of the Co-operative Education Office of the Faculty. Students who drop a work term without permission, or who fail to honour an agreement to work with an employer, will be assigned a grade of FAL (fail) for that work term.
- Students who conduct themselves in such a manner as to cause their termination from the job, will be assigned a grade of FAL (fail) for that work term.

## Faculty of Engineering and Applied Science (cont'd)

### 3.2.2 Evaluation of Work Terms

Two components are considered in work term evaluation: work performance and a communications component, as described in the *Co-operative Student Handbook* (approved by the Committee on Undergraduate Studies and available from the web page "<http://www.mun.ca/coop/home/engineering.php>"). Each component is evaluated separately and equally. Evaluation of the work performance will result in one of the following classifications: OUTSTANDING, ABOVE EXPECTATIONS, SATISFACTORY, MARGINAL PASS, FAIL. Evaluation of the communications component will result in one of the following classifications: OUTSTANDING, ABOVE EXPECTATIONS, SATISFACTORY, MARGINAL PASS, FAIL. Both the evaluation for work performance and the evaluation of the communications component are recorded on the transcript. Overall evaluation of the work term will result in the assignment of one of the following final grades:

- a. Pass with Distinction: To receive a PASS WITH DISTINCTION, a student must obtain an evaluation of OUTSTANDING in both the communications and work performance components of the work term.
- b. Pass: To receive a PASS, a student must achieve an evaluation of MARGINAL PASS or better in the communications component and in the performance component of the work term.
- c. Fail: A student receiving a FAIL in either the communications or performance component of the work term will receive a FAIL. For promotion from the work term, a student must obtain PASS WITH DISTINCTION or PASS.

### 3.3 Complementary Studies

3.3.1 The Complementary Studies component has been developed to make students aware of the function and responsibilities of the Professional Engineer in society and the impact that engineering in all its forms has on environmental, economic, social and cultural aspects of our society. This complements the technical expertise and communications skills developed and practised in all components of the program.

3.3.2 The Complementary Studies component is the same for all programs and consists of a minimum of 21 credit hours as follows:

1. **English 1080** or **English 1020** (3 credit hours)
2. **Engineering 3101** (3 credit hours)
3. **Engineering 4102** (3 credit hours)

Faculty of Engineering and Applied Science (cont'd)

4. **One course** that deals with the effect of technology on society and the environment. (3 credit hours). The course is to be chosen from  
Engineering 6101  
Sociology 2120  
Philosophy 2801  
Women's Studies 4107
  5. **Engineering 7102** (3 credit hours)
  6. **One Elective course** chosen from the arts, humanities, social sciences and management and approved by the Associate Dean (Undergraduate Studies) of the Faculty of Engineering and Applied Science. A list of approved courses ("List A") is maintained by the Office of the Associate Dean (Undergraduate Studies) of the Faculty of Engineering and Applied Science and is available at the web site [www.engr.mun.ca](http://www.engr.mun.ca). (3 credit hours)
  7. **One Elective course** chosen from the humanities and social sciences and approved by the Associate Dean (Undergraduate Studies) of the Faculty of Engineering and Applied Science. This course must be second year or higher and it is intended to provide experience with the central issues, methodologies and thought processes of the humanities and social sciences. A list of approved courses ("List B") is maintained by the Office of the Associate Dean (Undergraduate Studies) of the Faculty of Engineering and Applied Science and is available at the web site [www.engr.mun.ca](http://www.engr.mun.ca). (3 credit hours)
- 3.3.3 In order to graduate, the student must obtain an overall average of at least 60% in the 21 credit hours in Complementary Studies courses required in the program.

### 3.4 Civil Engineering Major - General Option (Class of 2013 and Later)

<b>Term</b>	<b>Required Courses</b>	<b>Elective courses</b>
Engineering One	Mathematics 1000 Calculus I Mathematics 1001 Calculus II Mathematics 2050 Linear Algebra I Physics 1050 General Physics I Mechanics Physics 1051 General Physics II Osc., Waves Chemistry 1050 General Chemistry I English 1080 Critical Reading and Writing I ENGI 1010 Engineering Statics ENGI 1020 Introduction to Programming ENGI 1030 Engineering Graphics & Design ENGI 1040 Mechanisms & Electric Circuits	Students who are expecting to complete the Engineering One requirements during the first two semesters may apply to undertake a work term during the Spring semester. In this case, the prerequisite course ENGI 200W must be completed during the Winter Semester.
Fall Academic Term 3	ENGI 3101 The Engineering Workplace ENGI 3425 Mathematics for Civil Engr. I ENGI 3610 Earth Sciences for Civil Engr. ENGI 3703 Surveying & Geomatics ENGI 3731 Materials for Construction ENGI 3934 Dynamics	ENGI 200W (if not completed during Engineering One).
Winter	Work Term	
Spring Academic Term 4	ENGI 4102 Engineering Economics ENGI 4312 Mechanics of Solids I ENGI 4421 Probability and Statistics ENGI 4425 Mathematics for Civil Engr. II ENGI 4717 Applied Envir. Sci. & Engr. ENGI 4723 Geotechnical Engineering I	
Fall	Work Term	
Winter Academic Term 5	ENGI 5312 Mechanics of Solids II ENGI 5434 Applied Mathematical Analysis ENGI 5706 Design of Concrete Structures ENGI 5713 Fluid Mechanics ENGI 5723 Geotechnical Engineering II	One Complementary Studies course
Spring	Work Term	
Fall Academic Term 6	ENGI 6322 Thermal Sciences ENGI 6705 Structural Analysis I ENGI 6707 Design of Concrete and Masonry ENGI 6713 Hydraulics	One Complementary Studies course One technical elective selected from: ENGI 6718 Envir. Geotech. ENGI 6749 Construction Plan.

**3.4 Civil Engineering Major - General Option (Class of 2013 and Later), (continued)**

<b>Term</b>	<b>Required Courses</b>	<b>Elective courses</b>
Winter	Work Term	
Spring Academic Term 7	ENGI 7102 The Engineering Profession ENGI 7704 Design of Steel Structures ENGI 7713 Hydrology & Water Resources ENGI 7745 Highway Engineering ENGI 7748 Project Planning & Control	One technical elective selected from: ENGI 7706 Finite Element Analysis ENGI 7707 Reliability & Env.Load. ENGI 7716 Hydrotech. Engr. ENGI 7723 Geotech. Engr. III
Fall	Work Term	
Winter Academic Term 8	ENGI 8700 Civil Engineering Project ENGI 8740 Contract Law and Labour Rel ENGI 8751 Coastal & Ocean Engr.	Complementary Studies elective. Two technical electives selected from: ENGI 8705 Struct. Building Sys. ENGI 8708 Offshore Struct. Design ENGI 8713 Municipal Engr. ENGI 8717 Envir. Assess., Monit.

**3.4 Civil Engineering Major - Offshore Oil and Gas Engineering Option  
(Class of 2013 and Later)**

<b>Term</b>	<b>Required Courses</b>	<b>Elective courses</b>
Engineering One	Mathematics 1000 Calculus I Mathematics 1001 Calculus II Mathematics 2050 Linear Algebra I Physics 1050 General Physics I Mechanics Physics 1051 General Physics II Osc., Waves Chemistry 1050 General Chemistry I English 1080 Critical Reading and Writing I ENGI 1010 Engineering Statics ENGI 1020 Introduction to Programming ENGI 1030 Engineering Graphics & Design ENGI 1040 Mechanisms & Electric Circuits	Students who are expecting to complete the Engineering One requirements during the first two semesters may apply to undertake a work term during the Spring semester. In this case, the prerequisite course ENGI 200W must be completed during the Winter Semester.
Fall Academic Term 3	ENGI 3101 The Engineering Workplace ENGI 3425 Mathematics for Civil Engr. I ENGI 3610 Earth Sciences for Civil Engr. ENGI 3703 Surveying & Geomatics ENGI 3731 Materials for Construction ENGI 3934 Dynamics	ENGI 200W (if not completed during Engineering One).
Winter	Work Term	
Spring Academic Term 4	ENGI 4102 Engineering Economics ENGI 4312 Mechanics of Solids I ENGI 4421 Probability and Statistics ENGI 4425 Mathematics for Civil Engr. II ENGI 4717 Applied Envir. Sci. & Eng. ENGI 4723 Geotechnical Engineering I	
Fall	Work Term	
Winter Academic Term 5	ENGI 5312 Mechanics of Solids II ENGI 5434 Applied Mathematical Analysis ENGI 5706 Design of Concrete Structures ENGI 5713 Fluid Mechanics ENGI 5723 Geotechnical Engineering II	One Complementary Studies course
Spring	Work Term	
Fall Academic Term 6	ENGI 6322 Thermal Sciences ENGI 6602 Offshore Petroleum Geology ENGI 6705 Structural Analysis I ENGI 6707 Design of Concrete and Masonry ENGI 6713 Hydraulics	One Complementary Studies course

**3.4 Civil Engineering Major - Offshore Oil and Gas Engineering Option  
(Class of 2013 and Later), (continued)**

<b>Term</b>	<b>Required Courses</b>	<b>Elective courses</b>
Winter	Work Term	
Spring Academic Term 7	ENGI 7650 OOG E Project I ENGI 7102 The Engineering Profession ENGI 7704 Design of Steel Structures ENGI 7713 Hydrology & Water Resources ENGI 8691 Petroleum Prod. Engr.	One technical elective selected from: ENGI 8671 Safety & Risk Engr. ENGI 8692 Drilling Engineering
Fall	Work Term	
Winter Academic Term 8	ENGI 8650 OOG E Project II ENGI 8740 Contract Law & Labour Rel. ENGI 8751 Coastal & Ocean Engineering	One Complementary Studies course Two technical electives selected from: ENGI 8670 Reliability Engineering ENGI 8676 Design Nat. Gas Equip. ENGI 8690 Reservoir Engineering

### 3.5 Computer Engineering Major - General Option (Class of 2013 and Later)

Term	Required Courses	Elective courses
Engineering One	Mathematics 1000 Calculus I Mathematics 1001 Calculus II Mathematics 2050 Linear Algebra I Physics 1050 General Physics I Mechanics Physics 1051 General Physics II Osc., Waves Chemistry 1050 General Chemistry I English 1080 Critical Reading and Writing I ENGI 1010 Engineering Statics ENGI 1020 Introduction to Programming ENGI 1030 Engineering Graphics & Design ENGI 1040 Mechanisms & Electric Circuits	Students who are expecting to complete the Engineering One requirements during the first two semesters may apply to undertake a work term during the Spring semester. In this case, the prerequisite course ENGI 200W must be completed during the Winter Semester.
Fall Academic Term 3	ENGI 3101 Engineering Workplace ENGI 3424 Engineering Mathematics ENGI 3821 Circuit Analysis ENGI 3861 Digital Logic ENGI 3891 Advanced Programming PHYS 3000 Physics of Device Materials	ENGI 200W (if not completed during Engineering One).
Winter	Work Term	
Spring Academic Term 4	ENGI 4102 Engineering Economics ENGI 4424 Discrete Math. for Comp. Engr. ENGI 4823 - Intro. to Systems and Signals ENGI 4854 Electronic Circuits I ENGI 4862 Microprocessors ENGI 4892 Data Structures	
Fall	Work Term	
Winter Academic Term 5	ENGI 5420 Probability and Random Proc. ENGI 5821 Control Systems I ENGI 5854 Electronic Circuits II ENGI 5865 Digital Systems ENGI 5895 Software Design	One Complementary Studies course
Spring	Work Term	
Fall Academic Term 6	ENGI 6861 Computer Architecture ENGI 6871 Communication Principles ENGI 6876 Communication Networks ENGI 6892 Algorithms, Complexity	One Complementary Studies course One technical elective selected from: ENGI 6855 Industrial Controls Computer Science courses as specified by Discipline Chair Other courses as specified by the Discipline Chair



**3.5 Computer Engineering Major - General Option (Class of 2013 and Later), (continued)**

<b>Term</b>	<b>Required Courses</b>	<b>Elective courses</b>
Winter Spring Academic Term 7	Work Term ENGI 7102 The Engineering Profession ENGI 7804 Comp.E. Design Project I ENGI 7824 Intro. to Digital Signal Pr. ENGI 7894 Concurrent Programming	Two technical electives selected from: ENGI 7814 Electromagnetics for Communications ENGI 7825 Control Systems II ENGI 7855 Communications Electronics ENGI 7952 Robotics and Automation ENGI 8680 Process Control and Instrumentation Other courses as specified by Discipline Chair
Fall Winter Academic Term 8	Work Term ENGI 8854 Comp.E. Design Project II ENGI 8894 Real-time Operating Sys.	Complementary Studies elective. One free elective. * Two technical electives selected from: ENGI 7680 Supervisory Control and Data Acquisition ENGI 8821 Design of Digital Signal Processing Systems ENGI 8826 Filter Synthesis ENGI 8863 Intro. LSI Design ENGI 8879 Digital Commun. ENGI 8801-8805 Special Topics in Computer Engineering Computer Science courses as specified by the ECE Discipline Chair Other courses as specified by the Discipline Chair

\* This course must be a 5000-level or higher Engineering course, or a 2000-level or higher course either from the Faculty of Arts or the Faculty of Science, or a 3000-level or higher course from the Faculty of Business. Selection of a course from outside the list of technical electives must be approved by the Discipline Chair.

**3.5 Computer Engineering - Offshore Oil and Gas Engineering Option  
(Class of 2013 and Later)**

<b>Term</b>	<b>Required Courses</b>	<b>Elective courses</b>
Engineering One	Mathematics 1000 Calculus I Mathematics 1001 Calculus II Mathematics 2050 Linear Algebra I Physics 1050 General Physics I Mechanics Physics 1051 General Physics II Osc., Waves Chemistry 1050 General Chemistry I English 1080 Critical Reading and Writing I ENGI 1010 Engineering Statics ENGI 1020 Introduction to Programming ENGI 1030 Engineering Graphics & Design ENGI 1040 Mechanisms & Electric Circuits	Students who are expecting to complete the Engineering One requirements during the first two semesters may apply to undertake a work term during the Spring semester. In this case, the prerequisite course ENGI 200W must be completed during the Winter Semester.
Fall Academic Term 3	ENGI 3101 Engineering Workplace ENGI 3424 Engineering Mathematics ENGI 3821 Circuit Analysis ENGI 3861 Digital Logic ENGI 3891 Advanced Programming PHYS 3000 Physics of Device Materials	ENGI 200W (if not completed during Engineering One).
Winter	Work Term	
Spring Academic Term 4	ENGI 4102 Engineering Economics ENGI 4424 Discrete Math. for Comp. Engr. ENGI 4823 Intro. to Systems and Signals ENGI 4854 Electronic Circuits I ENGI 4862 Microprocessors ENGI 4892 Data Structures	
Fall	Work Term	
Winter Academic Term 5	ENGI 5420 Probability and Random Proc. ENGI 5821 Control Systems I ENGI 5854 Electronic Circuits II ENGI 5865 Digital Systems ENGI 5895 Software Design	One Complementary Studies course
Spring	Work Term	
Fall Academic Term 6	ENGI 6602 Offshore Petroleum Geology ENGI 6861 Computer Architecture ENGI 6871 Communication Principles ENGI 6876 Communication Networks ENGI 6892 Algorithms, Complexity	One Complementary Studies course

**3.5 Computer Engineering - Offshore Oil and Gas Engineering Option  
(Class of 2013 and Later), (continued)**

<b>Term</b>	<b>Required Courses</b>	<b>Elective courses</b>
Winter	Work Term	
Spring Academic Term 7	ENGI 7650 OOG Project I ENGI 7102 The Engineering Profession ENGI 7824 Intro. to Digital Signal Pr. ENGI 7894 Concurrent Programming ENGI 8680 Process Control and Instrum.	One technical elective selected from: ENGI 7825 Control Systems II ENGI 8671 Safety and Risk Engr. ENGI 8692 Drilling Engineering
Fall	Work Term	
Winter Academic Term 8	ENGI 8650 OOG Project II ENGI 7680 Superv. Control & Data Acquis. ENGI 8894 Real-time Operating Sys.	Complementary Studies elective. One free elective. * One technical elective selected from: ENGI 8670 Reliability Engr. ENGI 8821 Design of Digital Signal Processing Systems ENGI 8826 Filter Synthesis ENGI 8863 Intro. LSI Design ENGI 8879 Digital Commun. ENGI 8801-8805 Special Topics in Computer Engineering Computer Science courses as specified by the Discipline Chair Other courses as specified by the Discipline Chair

\* This course must be a 5000-level or higher Engineering course, or a 2000-level or higher course either from the Faculty of Arts or the Faculty of Science, or a 3000-level or higher course from the Faculty of Business. Selection of a course from outside the list of technical electives must be approved by the Discipline Chair.

### 3.6 Electrical Engineering - General Option (Class of 2013 and Later)

Term	Required Courses	Elective courses
Engineering One	Mathematics 1000 Calculus I Mathematics 1001 Calculus II Mathematics 2050 Linear Algebra I Physics 1050 General Physics I Mechanics Physics 1051 General Physics II Osc., Waves Chemistry 1050 General Chemistry I English 1080 Critical Reading and Writing I ENGI 1010 Engineering Statics ENGI 1020 Introduction to Programming ENGI 1030 Engineering Graphics & Design ENGI 1040 Mechanisms & Electric Circuits	Students who are expecting to complete the Engineering One requirements during the first two semesters may apply to undertake a work term during the Spring semester. In this case, the prerequisite course ENGI 200W must be completed during the Winter Semester.
Fall Academic Term 3	ENGI 3101 Engineering Workplace ENGI 3424 Engineering Mathematics ENGI 3821 Circuit Analysis ENGI 3861 Digital Logic ENGI 3891 Advanced Programming PHYS 3000 Physics of Device Materials	ENGI 200W (if not completed during Engineering One).
Winter	Work Term	
Spring Academic Term 4	ENGI 4102 Engineering Economics ENGI 4430 Advanced Calculus for Engr. ENGI 4823 Intro. to Systems and Signals ENGI 4841 Electromechanical Devices ENGI 4854 Electronic Circuits I ENGI 4862 Microprocessors	
Fall	Work Term	
Winter Academic Term 5	ENGI 5420 Probability and Random Proc. ENGI 5800 Electrical Engineering Design ENGI 5812 Basic Electromagnetics ENGI 5821 Control Systems I ENGI 5854 Electronic Circuits II	One Complementary Studies course
Spring	Work Term	
Fall Academic Term 6	ENGI 6813 Electromagnetic Fields ENGI 6843 Rotating Machines ENGI 6855 Industrial Controls & Instrum. ENGI 6871 Communication Principles	One Complementary Studies course One technical elective selected from ENGI 6856 Power Electronics ENGI 6876 Comm. Networks Other courses as specified by the Discipline Chair
Winter	Work Term	

**3.6 Electrical Engineering - General Option (Class of 2013 and Later),  
(continued)**

<b>Term</b>	<b>Required Courses</b>	<b>Elective courses</b>
Spring Academic Term 7	ENGI 7102 The Engineering Profession ENGI 7803 EE Design Project I ENGI 7824 Introduction to Digital Signal Processing	Three technical electives selected from: ENGI 7811 Antennas ENGI 7825 Control Systems II ENGI 7844 Power System An. ENGI 7855 Commun. Electronics ENGI 7952 Robotics and Autom. ENGI 8680 Process Control & Ins. Other courses as specified by the Discipline Chair
Fall	Work Term	
Winter Academic Term 8	ENGI 8853 EE Design Project II ENGI 8826 Filter Synthesis	Complementary Studies elective. One free elective *. Two technical electives selected from: ENGI 5865 Digital Systems ENGI 7680 Supervisory Control ENGI 8821 Design of Digital Signal Processing Systems ENGI 8845 Power System Oper. ENGI 8879 Digital Commun. ENGI 8806-8809 Special Topics in Electrical Engineering Other courses as specified by the Discipline Chair

\* This course must be a 5000-level or higher Engineering course, or a 2000-level or higher course either from the Faculty of Arts or the Faculty of Science, or a 3000-level or higher course from the Faculty of Business. Selection of a course from outside the list of technical electives must be approved by the Discipline Chair.

**3.6 Electrical Engineering - Offshore Oil and Gas Engineering Option  
(Class of 2013 and Later)**

<b>Term</b>	<b>Required Courses</b>	<b>Elective courses</b>
Engineering One	Mathematics 1000 Calculus I Mathematics 1001 Calculus II Mathematics 2050 Linear Algebra I Physics 1050 General Physics I Mechanics Physics 1051 General Physics II Osc., Waves Chemistry 1050 General Chemistry I English 1080 Critical Reading and Writing I ENGI 1010 Engineering Statics ENGI 1020 Introduction to Programming ENGI 1030 Engineering Graphics & Design ENGI 1040 Mechanisms & Electric Circuits	Students who are expecting to complete the Engineering One requirements during the first two semesters may apply to undertake a work term during the Spring semester. In this case, the prerequisite course ENGI 200W must be completed during the Winter Semester.
Fall Academic Term 3	ENGI 3101 Engineering Workplace ENGI 3424 Engineering Mathematics ENGI 3821 Circuit Analysis ENGI 3861 Digital Logic ENGI 3891 Advanced Programming PHYS 3000 Physics of Device Materials	ENGI 200W (if not completed during Engineering One).
Winter	Work Term	
Spring Academic Term 4	ENGI 4102 Engineering Economics ENGI 4430 Advanced Calculus for Engr. ENGI 4823 Intro. to Systems and Signals ENGI 4841 Electromechanical Devices ENGI 4854 Electronic Circuits I ENGI 4862 Microprocessors	
Fall	Work Term	
Winter Academic Term 5	ENGI 5420 Probability and Random Proc. ENGI 5800 Electrical Design ENGI 5812 Basic Electromagnetics ENGI 5821 Control Systems I ENGI 5854 Electronic Circuits II	One Complementary Studies course
Spring	Work Term	
Fall Academic Term 6	ENGI 6602 Offshore Petroleum Geology ENGI 6813 Electromagnetic Fields ENGI 6843 Rotating Machines ENGI 6855 Industrial Controls & Instrum. ENGI 6871 Communication Principles	One Complementary Studies course

**3.6 Electrical Engineering - Offshore Oil and Gas Engineering Option  
(Class of 2013 and Later), (continued)**

<b>Term</b>	<b>Required Courses</b>	<b>Elective courses</b>
Winter	Work Term	
Spring Academic Term 7	ENGI 7650 OOGÉ Project I ENGI 7102 The Engineering Profession ENGI 7824 Introduction to Digital Signal Processing ENGI 8680 Process Control and Instrum.	One technical elective selected from: ENGI 8671 Safety and Risk Engr. ENGI 8692 Drilling Engineering One technical elective selected from: ENGI 7825 Control Systems II ENGI 7844 Power System An. ENGI 7952 Robotics and Autom. Other courses as specified by the Discipline Chair
Fall	Work Term	
Winter Academic Term 8	ENGI 8650 OOGÉ Project II ENGI 7680 Superv. Control & Data Acquis. ENGI 8826 Filter Synthesis	Complementary Studies elective. One free elective. * One technical elective selected from: ENGI 5865 Digital Systems ENGI 8670 Reliability Engr. ENGI 8821 Design of Digital Signal Processing Systems ENGI 8845 Power System Oper. ENGI 8879 Digital Communic. ENGI 8806-8809 Special Topics in Electrical Engineering Other courses as specified by the Discipline Chair

\* This course must be a 5000-level or higher Engineering course, or a 2000-level or higher course either from the Faculty of Arts or the Faculty of Science, or a 3000-level or higher course from the Faculty of Business. Selection of a course from outside the list of technical electives must be approved by the Discipline Chair.

**3.7 Mechanical Engineering Major - General Option (Class of 2013 and Later)**

<b>Term</b>	<b>Required Courses</b>	<b>Elective courses</b>
Engineering One	Mathematics 1000 Calculus I Mathematics 1001 Calculus II Mathematics 2050 Linear Algebra I Physics 1050 General Physics I Mechanics Physics 1051 General Physics II Osc., Waves Chemistry 1050 General Chemistry I English 1080 Critical Reading and Writing I ENGI 1010 Engineering Statics ENGI 1020 Introduction to Programming ENGI 1030 Engineering Graphics & Design ENGI 1040 Mechanisms & Electric Circuits	Students who are expecting to complete the Engineering One requirements during the first two semesters may apply to undertake a work term during the Spring semester. In this case, the prerequisite course ENGI 200W must be completed during the Winter Semester.
Fall Academic Term 3	ENGI 3101 The Engineering Workplace ENGI 3424 Engineering Mathematics ENGI 3901 Thermodynamics I ENGI 3911 Chem. & Phys. Engr. Materials I ENGI 3934 Dynamics ENGI 3941 Production Technology	ENGI 200W (if not completed during Engineering One).
Winter	Work Term	
Spring Academic Term 4	ENGI 4102 Engineering Economics ENGI 4312 Mechanics of Solids I ENGI 4430 Advanced Calculus for Engr. ENGI 4901 Thermodynamics II ENGI 4932 Mechanisms and Machines ENGI 4951 Mechatronics I	
Fall	Work Term	
Winter Academic Term 5	ENGI 5911 Chem. & Phys. Engr. Materials II ENGI 5927 Mechanical Component Design I ENGI 5931 Adv. Mech. of Deformable Solids ENGI 5951 Mechatronics II ENGI 5961 Fluid Mechanics I	One Complementary Studies course
Spring	Work Term	
Fall Academic Term 6	ENGI 6901 Heat Transfer I ENGI 6927 Mechanical Component Design II ENGI 6933 Mechanical Vibration ENGI 6951 Automatic Control Engineering ENGI 6961 Fluid Mechanics II	One Complementary Studies course



**3.7 Mechanical Engineering Major - General Option (Class of 2013 and Later), (continued)**

<b>Term</b>	<b>Required Courses</b>	<b>Elective courses</b>
Winter	Work Term	
Spring Academic Term 7	ENGI 4421 Probability & Statistics ENGI 7102 The Engineering Profession ENGI 7926 Mechanical Design Project I ENGI 7928 Computer Aided Engineering	Two technical electives from ENGI 7901 Heat Transfer II ENGI 7903 Mechanical Equipment ENGI 7911 Industrial Materials ENGI 7934 Finite Element Analysis ENGI 7952 Robotics and Automation Other courses as specified by the Discipline Chair
Fall	Work Term	
Winter Academic Term 8	ENGI 8926 Mechanical Design Project II	One Complementary Studies course One free elective *. <b>Three technical electives from</b> ENGI 8903 Mechanical Systems ENGI 8911 Corrosion and Corrosion Control ENGI 8933 Fatigue and Fracture ENGI 8935 Pressure Component Design ENGI 8937 Machine Dynamics ENGI 8945 Production & Op. Man. ENGI 8964 Fluid Structure Interac. Other courses as specified by the Discipline Chair

\*This course must be a 5000-level or higher Engineering course, or a 2000-level or higher course either from the Faculty of Arts or the Faculty of Science, or a 3000-level or higher course from the Faculty of Business. Selection of a course from the outside the list of technical electives must be approved by the Discipline Chair

**3.7 Mechanical Engineering Major - Offshore Oil and Gas Engineering Option (Class of 2013 and Later)**

<b>Term</b>	<b>Required Courses</b>	<b>Elective courses</b>
Engineering One	Mathematics 1000 Calculus I Mathematics 1001 Calculus II Mathematics 2050 Linear Algebra I Physics 1050 General Physics I Mechanics Physics 1051 General Physics II Osc., Waves Chemistry 1050 General Chemistry I English 1080 Critical Reading and Writing I ENGI 1010 Engineering Statics ENGI 1020 Introduction to Programming ENGI 1030 Engineering Graphics & Design ENGI 1040 Mechanisms & Electric Circuits	Students who are expecting to complete the Engineering One requirements during the first two semesters may apply to undertake a work term during the Spring semester. In this case, the prerequisite course ENGI 200W must be completed during the Winter Semester.
Fall Academic Term 3	ENGI 3101 The Engineering Workplace ENGI 3424 Engineering Mathematics ENGI 3901 Thermodynamics I ENGI 3911 Chem. & Phys. Engr. Materials I ENGI 3934 Dynamics ENGI 3941 Production Technology	ENGI 200W (if not completed during Engineering One).
Winter	Work Term	
Spring Academic Term 4	ENGI 4102 Engineering Economics ENGI 4312 Mechanics of Solids I ENGI 4430 Advanced Calculus for Engr. ENGI 4901 Thermodynamics II ENGI 4932 Mechanisms and Machines ENGI 4951 Mechatronics I	
Fall	Work Term	
Winter Academic Term 5	ENGI 5911 Chem. & Phys. Engr. Materials II ENGI 5927 Mechanical Component Design I ENGI 5931 Adv. Mech. of Deformable Solids ENGI 5951 Mechatronics II ENGI 5961 Fluid Mechanics I	One Complementary Studies course
Spring	Work Term	
Fall Academic Term 6	ENGI 6602 Offshore Petroleum Geology ENGI 6901 Heat Transfer I ENGI 6927 Mechanical Component Design II ENGI 6933 Mechanical Vibration ENGI 6951 Automatic Control Engineering	One Complementary Studies course

**3.7 Mechanical Engineering Major - Offshore Oil and Gas Engineering Option (Class of 2013 and Later), (continued)**

<b>Term</b>	<b>Required Courses</b>	<b>Elective courses</b>
Winter	Work Term	
Spring Academic Term 7	ENGI 4421 Probability & Statistics ENGI 7650 OOGÉ Project I ENGI 7102 The Engineering Profession ENGI 8693 Petroleum Facilities Engr.  ENGI 8692 Drilling Engineering OR ENGI 8671 Safety and Risk Engineering	<b>One technical elective from</b> ENGI 7901 Heat Transfer II ENGI 7903 Mechanical Equipment ENGI 7934 Finite Element Analysis ENGI 7952 Robotics and Automation Other courses as specified by the Discipline Chair
Fall	Work Term	
Winter Academic Term 8	ENGI 8650 OOGÉ Project II ENGI 8690 Reservoir Engineering ENGI 8694 Down Stream Processing  ENGI 8676 Natural Gas Equipment OR ENGI 8670 Reliability Engineering	Complementary Studies elective. <b>One technical elective from</b> ENGI 8903 Mechanical Systems ENGI 8911 Corrosion and Corrosion Control ENGI 8935 Pressure Component Design ENGI 8945 Production & Operations Management ENGI 8964 Fluid Structure Interactions Other courses as specified by the Discipline Chair

### 3.8 Ocean and Naval Architectural Engineering Major (Class of 2013 and Later)

Term	Required Courses	Elective courses
Engineering One	Mathematics 1000 Calculus I Mathematics 1001 Calculus II Mathematics 2050 Linear Algebra I Physics 1050 General Physics I Mechanics Physics 1051 General Physics II Osc., Waves Chemistry 1050 General Chemistry I English 1080 Critical Reading and Writing I ENGI 1010 Engineering Statics ENGI 1020 Introduction to Programming ENGI 1030 Engineering Graphics & Design ENGI 1040 Mechanisms & Electric Circuits	Students who are expecting to complete the Engineering One requirements during the first two semesters may apply to undertake a work term during the Spring semester. In this case, the prerequisite course ENGI 200W must be completed during the Winter Semester.
Fall Academic Term 3	Math 2000 Multivariable Calculus ENGI 3001 Ocean/Naval Design ENGI 3054 Ocean Engr. Hydrostatics ENGI 3101 Engineering Workplace ENGI 3934 Dynamics	ENGI 200W (if not completed during Engineering One). One of: ENGI 3901 Thermodynamics I ENGI 3911 Chemistry and Physics of Engineering Materials I
Winter	Work Term	
Spring Academic Term 4	Math 3260 Differential Equations ENGI 4011 Resistance & Propulsion ENGI 4020 Marine Fluid Dynamics ENGI 4102 Engineering Economics ENGI 4312 Mechanics of Solids I	Focus Stream Elective *
Fall	Work Term	
Winter Academic Term 5	Math 3202 Vector Calculus ENGI 5003 Ship Structures I ENGI 5020 Marine Propulsion ENGI 5420 Probability & Random Proc.	One Complementary Studies course Focus Stream Elective *
Spring	Work Term	
Fall Academic Term 6	ENGI 6003 Ship Structures II ENGI 6005 Floating Ocean Structures ENGI 6030 Dynamics and Maneuvering Physics 4300 Advanced Phy. Oceanography	One Complementary Studies course Focus Stream Elective *

**3.8 Ocean and Naval Architectural Engineering Major (Class of 2013 and Later), (continued)**

Term	Required Courses	Elective courses
Winter	Work Term	
Spring Academic Term 7	ENGI 7000 Ocean Systems Design ENGI 7030 Vehicle Dynamics ENGI 7033 Marine Hydrodynamics ENGI 7102 The Engineering Profession	Focus Stream Elective * Technical Elective - ENGI 7045 Marine Engr. Systems
Fall	Work Term	
Winter Academic Term 8	ENGI 8000 ONAE Project ENGI 8003 Small Craft Design ENGI 8054 Advanced Marine Vehicles	One Complementary Studies course Focus Stream Elective * Ocean/Naval Elective - ENGI 8058 Submersible Design

**\* Note on the Focus Stream Electives:**

The courses in the Focus Stream allow a student to pursue a specialization in an area of interest. The area can be in Engineering, the sciences, the arts and humanities or business. Students will plan their own focus stream, with approval by the Committee on Undergraduate Studies (upon the recommendation of the Discipline Chair of Ocean and Naval Architectural Engineering).

For example, a student may wish to focus on Marine Engineering and would opt for courses in thermodynamics, vibrations and Marine Engineering (offered by ONAE). These example courses are available courses within the Mechanical Discipline. Similarly the flexibility of the above system allows students wishing to do the OUGE option to take the same stream of seven courses that Mechanical Engineering OUGE students take in Academic Terms 6, 7 and 8. Alternatively a student could take a series of business courses in what might be called a venture/entrepreneur stream. A student might take a series of language courses, in say German or Spanish, and seek work term experiences appropriately to strengthen the language training. Of the five courses, one must be an Engineering course (in order to meet Accreditation requirements), but otherwise any suitable course will be allowed.

In reviewing the plan for the stream, the Faculty will be looking for clear educational goals by each student, with increasingly advanced courses in the topic area. The stream is not meant to be a series of random free electives, and especially not a series of introductory courses. The stream will enable students to complete a significant part of a minor in almost any subject. Students are encouraged to take the required additional course to complete such a minor. Interdisciplinary experience and education is increasingly valuable and this focus stream opportunity will provide our graduates with unique and special knowledge.

Faculty of Engineering and Applied Science (cont'd)**3.9 Transition Program for Students Entering First Year in Fall 2007**

3.9.1 Students may apply for direct entry from high school into a transitional first year engineering program in the 2007-08 academic year. Such admission is on a competitive basis for a limited number of seats. The minimum requirements for direct admission from high school are general admission to the University and eligibility for registration in the following courses, by satisfying the prerequisites specified by the respective departments: Physics 1050, Chemistry 1050 and Math 1000. Meeting these minimum requirements does not, however, guarantee admission to the program.

Students who are admitted to the Faculty in Fall 2007 and who wish to seek entry to Academic Term 3 in the Fall semester of 2009 must follow the course of study in these charts during the 2007-08 and 2008-09 academic years.

<b>Transition Term A</b>	<b>Transition Term B</b>
MATH 1000	MATH 1001
CHEMISTRY 1050	MATH 2050
PHYSICS 1050	PHYSICS 1051
ENGLISH 1080	2420 STRUCTURED PROGRAMMING
1313 MECHANICS I	COMPLEMENTARY STUDIES

<b>Transition Term 1</b>	<b>Transition Term 2</b>
MATH 2000	MATH 3260
STATISTICS 2510	4102 ENGINEERING ECONOMICS
COMPLEMENTARY STUDIES (from List B)	3101 ENGINEERING WORKPLACE
COMPLEMENTARY STUDIES (one of 6101 ASSESSMENT OF TECHNOLOGY, PHILOSOPHY 2801, SOCIOLOGY 2120 OR WOMEN'S STUDIES 4107)	FREE ELECTIVE (a science course with a laboratory component is recommended)
1030 ENGINEERING GRAPHICS & DESIGN	1040 MECHANISMS & ELECTRIC CIRCUITS

3.9.2 Students must pass all ten courses listed in the chart for Transition Terms A and B during the 2007-08 academic year, with an average grade of at least 65%, and must achieve grades of at least 60% in each of Mathematics 1001, Mathematics 2050, Physics 1051 and Chemistry 1050, in order to remain in the engineering program.

3.9.3 Students must pass all ten courses listed in the chart for Transition Terms 1 and 2 during the 2008-09 academic year, with an average grade of at least 60%, in order to gain promotion to Academic Term 3 in the Fall semester of 2009.

### **3.10 Advanced Standing for Students Entering in Fall 2007**

Students are occasionally admitted to later terms in Engineering from other institutions. Such entry is normally based on a detailed analysis of the student's record and is handled on a case-by-case basis. Such students should contact the Office of the Associate Dean (Undergraduate Studies).

### **3.11 Bridging Programs**

The Faculty of Engineering and Applied Science has bridging programs which allow certain diploma graduates to enter the former Engineering program with advanced standing.

To be admitted to the bridging program in the Fall of 2007, students must have graduated from the diploma program with a cumulative average of at least 75%.

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The currently approved bridging programs are:

- (1) Civil Engineering Technology from the College of the North Atlantic to the Civil Engineering Program.
- (2) Electrical Engineering Technology or Electronics Engineering Technology from the College of the North Atlantic to the Electrical or Computer Engineering Program.
- (3) Mechanical Engineering Technology (Power) or Mechanical Engineering Technology (HVAC) from the College of the North Atlantic to the Mechanical Engineering Program.
- (4) Naval Architecture Program or Marine Systems Design Program at the Fisheries and Marine Institute of Memorial University of Newfoundland to the Ocean and Naval Architectural Engineering Program.
- (5) Techniques d'architecture navale at the Institut maritime du Québec, Rimouski, to the Ocean and Naval Architectural Engineering Program.

The programs of study for students admitted to the bridging program are described in the 2006-07 Calendar.

**4 PROMOTION REGULATIONS**

- 4.1 General Information
- 4.2 Promotion Status (Engineering One)
- 4.3 Promotion Status (Beyond Engineering One)
- 4.4 Other Information

**4.1 General Information**

- 4.1.1 In addition to meeting the promotion regulations for the Faculty of Engineering and Applied Science, all students must meet the general academic regulations (undergraduate). For further information refer to the *UNIVERSITY REGULATIONS - GENERAL ACADEMIC REGULATIONS (UNDERGRADUATE)*.
- 4.1.2 Success in the programs depends on meeting the requirements of both academic terms and work terms.

**4.2 Promotion Status (Engineering One)**

- 4.2.1 The requirements for promotion to Academic Term 3 are:  
A grade of at least 60% in each of Mathematics 1001, Mathematics 2050, Physics 1051 and Chemistry 1050  
and



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A grade of at least 50% in each of ENGI 1010, ENGI 1020, ENGI 1030 and ENGI 1040

and

An average of at least 65% over the above eight courses.

It is strongly recommended that students complete English 1080 during their first semester in Engineering.

- 4.2.2 In order to remain in the Engineering program, students admitted to Engineering One must complete the requirements for promotion to Academic Term 3 before the end of the academic year of admission.
- 4.2.3 Students who fail to meet the requirements for promotion to Academic Term 3 before the end of the academic year of admission will be deemed to have withdrawn from the Engineering program.
- 4.2.4 Promotion from Engineering One does not guarantee admission to a specific major (Civil Engineering, Computer Engineering, Electrical Engineering, Mechanical Engineering or Ocean and Naval Architectural Engineering). The Faculty reserves the right to limit the number of spaces available in each major. The Faculty also reserves the right to guarantee admission into a particular major at the time of admission into the Engineering program.
- 4.2.5 Students completing the requirements of Engineering One are required to apply for their major by March 1 of the academic year of admission, indicating their preferences for major in rank order. All Engineering students who successfully complete Engineering One in the academic year of admission will be guaranteed a place in Academic Term 3, although not necessarily in the preferred major.

**4.3 Promotion Status (Beyond Engineering One)**

A student's promotion status at the end of each term (beyond Engineering One) will be in one of the following three categories:

- 4.3.1 **Clear Promotion** allows a student to proceed to the next term without restrictions.
- Students completing or repeating an academic term will receive a Clear Promotion by obtaining an overall average (excluding complementary studies courses and free elective courses) of at least 60%, with a numeric grade of at least 50% in each course (excluding complementary studies courses and free elective courses) in that academic term.

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- Students completing a work term will receive a Clear Promotion by obtaining an overall grade of PAS (pass) or PWD (pass with distinction) in that work term.
- 4.3.2 **Probationary Promotion** designates less than a Clear Promotion from an academic term, but requires an overall average (excluding complementary studies courses and free elective courses) of at least 60% in that academic term.
- A student with Probationary Promotion from an academic term may continue to the subsequent work term under the condition that entry into the next academic term is not allowed until the student's status is changed to Clear Promotion.
  - A student with Probationary Promotion at the end of the final academic term will not be recommended for graduation until the student's status is changed to Clear Promotion.
  - To change Probationary Promotion to Clear Promotion the student must satisfy the Faculty that he or she is competent in the subject of the ENGI course(s) in which the student has failed to achieve 50%. This will normally entail re-examination(s), after which the student will be declared to have passed or failed a test of competency in the subject(s) concerned. No numerical grade will be assigned in the re-examination(s). Upon passing a re-examination, the original grade submitted for the course will be changed to PAS.
  - Re-examination will be at a time determined by the Faculty. A student with Probationary Promotion who fails to submit to the re-examination(s) or who fails in the re-examination(s) must repeat all the corresponding failed course(s) successfully in order to change the Probationary Promotion to Clear Promotion.
- 4.3.3 **Promotion Denied:** If neither Clear Promotion nor Probationary Promotion is achieved at the end of an academic term, then promotion is denied.
- A student with Promotion Denied status will be required to withdraw from the Faculty. Students with Promotion Denied status may apply for readmission to the program after two semesters. Subject to space being available, a student will be readmitted into the term from which promotion was denied. An academic term may be repeated only once, and not more than two academic terms may be repeated in the entire program.
  - A student who is denied promotion for failing a work term may be considered for readmission. A student readmitted under this clause must successfully complete four work terms prior to graduation.

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- A student who has been denied promotion as a result of having failed a work term and who, in the opinion of the Faculty, can benefit from a remedial program, may be permitted an extension of time not to exceed the end of the registration period of the subsequent semester to complete the requirements of the work term.
- A student who is denied promotion from an academic term will be required to repeat all required courses in which the student obtained a numeric grade of less than 60% in that term. A technical elective course in which the student obtained a numeric grade of less than 60% may be replaced by a course acceptable in the student's program.
- A student with Promotion Denied status at the end of the final academic term will not be recommended for graduation until the student's status is changed to Clear Promotion.

**4.4 Other Information**

- The appropriate discipline will make a recommendation to Faculty Council on each student's promotion status at the end of each of academic terms 3 to 8.
- To be recommended for graduation, a student must have clear promotion from Academic Term 8, must have successfully completed at least four work terms and must have an average of at least 60% in the 21 credit hours in complementary studies as described in PROGRAM REGULATIONS, Complementary Studies.
- The Office of Cooperative Education will make a recommendation to Faculty Council on each student's promotion status at the end of each work term.
- A student must have completed at least one work term successfully, in order to be promoted to Academic Term 5.
- A student must have completed at least two work terms successfully, in order to be promoted to Academic Term 6.
- A student must have completed at least three work terms successfully, in order to be promoted to Academic Term 7.
- A student must have completed four work terms successfully, in order to be promoted to Academic Term 8.
- A student denied promotion shall be permitted only one readmission to the same term and a total of no more than two readmissions to the Faculty.
- No course required in any of academic terms 3 to 8 of the program may be attempted more than twice.
- Students may be required to withdraw from their program at any time, if, in the opinion of the Faculty, they are unlikely to benefit from continued attendance.

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**5 WAIVER OF FACULTY REGULATIONS**

Every student has the right to request a waiver of Faculty regulations. Students seeking a waiver of University academic regulations should refer to the *UNIVERSITY REGULATIONS - GENERAL ACADEMIC REGULATIONS (UNDERGRADUATE) - Waiver of Regulations*.

- 5.1 The Faculty Council reserves the right in special circumstances to modify, alter, or waive any Faculty regulation in its application to individual students, where merit and equity so warrant in the judgment of the appropriate Committee of the Faculty Council.
- 5.2 All requests must be submitted to the Office of the Associate Dean (Undergraduate Studies) for submission to the appropriate Committee of the Faculty. Students must submit their request in writing. Medical and/or other documentation to substantiate the request must be provided.
- 5.3 Requests for waivers of admission requirements will be submitted to the Admissions Committee who will make a recommendation for action to the Committee on Undergraduate Studies of the Faculty.
- 5.4 Requests for a waiver of a course(s) required in Academic Terms 3 to 8 should be made prior to the commencement of the academic term and will be considered by the Committee on Undergraduate Studies, upon recommendation of the appropriate Discipline Chair.
- 5.5 Requests for a waiver of a work term will be considered by the Committee on Undergraduate Studies upon recommendation of the Office of Co-operative Education. Any waiver granted does not reduce the total number of work terms required for the degree below an absolute minimum of three.

**6 APPEAL OF FACULTY REGULATIONS**

**6.1 Faculty Appeal Committee**

Appeals against decisions of the Faculty Admissions Committee and appeals against promotion decisions of Faculty Council will be considered by the Faculty Appeal Committee. An appeal against promotion decisions of Faculty Council will normally only be considered upon presentation of evidence which has not been placed before Faculty Council. Any such appeal must be made within one month of the issue of the decision of the Admission Committee or

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within one month of the issue of results by the Registrar, as the case may be. When a student has requested a re-read of an examination paper which may affect an appeal that appeal must nevertheless be made within one month of the issue of the original results, and consideration of the appeal will be delayed until the result of the re-read is available. An appeal against a decision by the Faculty Appeal Committee or by the Committee on Undergraduate Studies of the Faculty should be directed to the Senate Committee on Undergraduate Studies.

### **6.2 Other Appeals**

Any student whose request for waiver of Faculty regulations has been denied has the right to appeal. For further information refer to the *UNIVERSITY REGULATIONS - GENERAL ACADEMIC REGULATIONS (UNDERGRADUATE) - Appeal of Regulations*.

## **7 COURSE DESCRIPTIONS**

### **COURSE LIST**

In accordance with Senate's Policy Regarding Inactive Courses, the course descriptions for courses which have not been offered in the previous three academic years and which are not scheduled to be offered in the current academic year have been removed from the following listing. For information about any of these inactive courses, please contact the Dean of the Faculty.

All courses of the Faculty are designated by ENGI.

AR = Attendance requirement; CH = Credit hours are 3 unless otherwise noted; CO = Co-requisite(s); CR = Credit can be retained for only one course from the set(s) consisting of the course being described and the course(s) listed; LC = Lecture hours per week are 3 unless otherwise noted; LH = Laboratory hours per week; OR = Other requirements of the course such as tutorials, practical sessions, or seminars; PR = Prerequisite(s); UL = Usage limitation(s).

### **7.1 Work Terms and Non-Credit Courses**

#### **001W – Engineering Work Term 1**

For most students Work Term 1 represents their first experience in an engineering or related work environment. Students are expected to learn, develop and practice the basic standards of behaviour, discipline and performance normally found in a professional work environment. Students

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are also expected to learn the basics of technical writing and to become familiar with the various communications tools used in a technical work environment.

Two documents must be submitted for evaluation for the communications component for Work Term 1. Additional communication requirements such as technical reports or manuals may be requested by the employer. The two documents to be submitted to the Engineering Cooperative Education Office are:

1. Personal Job Diary
2. Work Term Journal or Short Technical Report or Portfolio

Detailed guidelines for the preparation of these documents are provided in the Engineering Student Co-operative Handbook. These documents shall be submitted or postmarked no later than the last official day of the work term as shown in the University Calendar.

CH: 0  
PR: ENGI 200W

**002W – Engineering Work Term 2**

Students should have sufficient academic grounding and work experience to contribute in a positive manner to the engineering design and problem solving processes practised in the work environment. Students are expected to show greater independence and responsibility in their assigned work functions than in Work Term 1. An ability to deal, under supervision, with complex work-related concepts and problems should also be demonstrated. Students can become better acquainted with their chosen discipline, and can observe and appreciate the attitudes, responsibilities, and ethics normally expected of engineers.

The communications component for Work Term 2 consists of a formal, descriptive technical report describing a technical process, project, procedure or investigation chosen from the student's work environment. Students are also expected to keep a job diary, which will not be submitted but must be available for review during monitoring.

Guidelines for the preparation of a descriptive technical report are provided in the Co-operative Student Handbook. The report shall be submitted or postmarked no later than the last official day of the work term as shown in the University Calendar.

CH: 0  
PR: ENGI 001W, ENGI 3101

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**003W – Engineering Work Term 3**

Students should anticipate greater participation in their selected engineering discipline and become more experienced and proficient with the appropriate design procedures than the preceding work terms. Students are expected to acquire improved speed and accuracy in their work and at the same time accept greater responsibility and be able to function with less direct supervision. Self-confidence and initiative as well as improved analytical skills are expected to develop at this stage in the student's engineering education.

The communications component for Work Term 3 consists of a formal technical report on a topic related to a specific theme prescribed by the Faculty and the Co-operative Education Office. Examples of themes would be sustainable development and environmental stewardship. Ideally the report would relate to the student's work in the areas of process, project, procedure or investigation.

Guidelines for the preparation of a descriptive technical report are provided in the Co-operative Student Handbook. The report shall be submitted or postmarked no later than the last official day of the work term as shown in the University Calendar.

CH: 0  
PR: ENGI 002W

**004W – Engineering Work Term 4**

Students should be engaged in various facets of engineering, such as design, analysis, project management, specifications, plans, formal proposals, tender documents, etc. Participation in their selected engineering discipline is expected. Students should continue to gain an appreciation of the use and importance of acquired analytical skills in engineering analysis as well as the application of specifications and codes. Students should have a level of responsibility commensurate with their academic background and experience.

The communications component for Work Term 4 consists of an oral presentation on a technical subject taken from the student's work environment and preferably related specifically to the student's work. The presentation should be of 10 minutes duration and will be given on campus in a formal setting after students have returned to class. A written summary is also required.

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Guidelines for the preparation of this oral presentation are provided in the Co-operative Student Handbook.

CH: 0  
PR: ENGI 003W

**005W – Engineering Work Term 5**

Students should be engaged in various facets of engineering, such as design, analysis, project management, specifications, plans, formal proposals, tender documents, etc. Participation in their selected engineering discipline is expected. Students should continue to gain an appreciation of the use and importance of acquired analytical skills in engineering analysis as well as the application of specifications and codes. Students should have a level of responsibility commensurate with their academic background and experience. The promotion criteria for this work term will be determined by the Committee on Undergraduate Studies.

CH: 0  
PR: ENGI 004W

**006W – Engineering Work Term 6**

Students should be engaged in various facets of engineering, such as design, analysis, project management, specifications, plans, formal proposals, tender documents, etc. Participation in their selected engineering discipline is expected. Students should continue to gain an appreciation of the use and importance of acquired analytical skills in engineering analysis as well as the application of specifications and codes. Students should have a level of responsibility commensurate with their academic background and experience. The promotion criteria for this work term will be determined by the Committee on Undergraduate Studies.

CH: 0  
PR: ENGI 005W

**200W. Professional Development Seminars** are offered during the Winter semester prior to a student's first work term. These seminars introduce the co-operative education process and prepare the student for work terms. These seminars are graded PAS or FAL based on attendance, participation and assignments.

AR: attendance is required  
CH: 0  
LC: as scheduled



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**7.2 Engineering One Courses**

**1010 Engineering Statics** includes an introduction to vector algebra. Coplanar and non-coplanar force systems, equivalent force systems, moments and equilibrium are studied, emphasizing the use of free body diagrams. There is an analysis of trusses, frames and machines, followed by consideration of dry friction, centres of gravity, centroids and moments of inertia of areas.

PR: Level III Physics or Physics 1020  
and Math 1000 (which may be taken concurrently)

CR: ENGI 1313

OR: 1 tutorial hour per week

**1020 Introduction to Programming** is an introduction to algorithmic problem solving techniques and computer programming, including basic program control structures (sequence, call, branch, loop) and data representations, functional decomposition, and design by contract. Exercises and examples are drawn from a variety of engineering disciplines and are implemented using a standard modern programming language.

PR: Level III Advanced Math or Math 1090

CR: ENGI 2420

LH: At least four 2-hour sessions per semester

**1030 Engineering Graphics and Design** provides two complementary competencies. Firstly, it provides an introduction to the fundamentals of graphic communication, including orthographic projections, three dimensional pictorials, sectioning and dimensioning. Both sketching and CAD are utilized. Secondly, the course introduces students to standard design methodologies. The graphics and design competencies are reinforced through lab and project exercises.

PR: Level III Advanced Math or Math 1090

LH: 3

**1040 Mechanisms and Electric Circuits** is offered in two serial modules, including laboratory and workshop practice, and a team project to expose students to the concept of system integration involving electrical and mechanical systems. The electrical module provides an introduction to dc circuits, with an analysis of dc circuits used in control, measurement and instrumentation systems. The mechanism module provides an introduction to machine components such as belts, pulleys, gears, and simple linkages. The laboratory and workshop component introduces students to hands-on practice in basic laboratory instruments, tools and safety procedures. A team project involves the construction, assembly and testing of a simple mechanism.

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PR: Level III Physics or Physics 1051 (which may be taken concurrently) and Math 1000 (which may be taken concurrently).

LH: 3

### 7.3 Academic Term 3 Courses

**3001 Ocean/Naval Design** is an introductory course to design in naval architecture and ocean engineering. It introduces the design challenges in a marine setting. A series of modules will familiarize the students with the main design issues. The first module covers the basic economic question of why ships are built. This is followed by an examination of the materials of construction and the primary fabrication method – welding. The third module deals with manufacturing, including design for manufacturing and the workflow process itself. The final module examines methods of marine design and performance evaluation. This covers numerical and experimental simulation methods and design software. There are several relevant labs and a design project.

LH: At least six 3-hour laboratory sessions per semester

**3054 Ocean Engineering Hydrostatics** is an introductory course to naval architecture and marine engineering. It discusses the basic principles of the statics of rigid floating or submerged structures. These include: ships, offshore platforms and submersibles. Methods of analysis of the hydrostatics, stability and trim, damage stability and the statics of mooring systems are introduced. Applications are also discussed.

LH: At least nine 3-hour laboratory sessions per semester

PR: ENGI 1010

**3101 The Engineering Workplace** is a course that deals with issues associated with professional engineering practice. Topics will include workplace and professional ethics, public and workplace occupational health and safety including first-aid, equity, gender and diversity issues, and technical written, oral and visual communication.

AR: Attendance required

**3424 Engineering Mathematics** includes ordinary differential equations of first order and first degree; linear ordinary differential equations of higher order, methods of undetermined coefficients and variation of parameters; applications to electric circuits and mass-spring systems; Laplace transforms; partial differentiation; convergence of series; Taylor and binomial series; remainder term; and an introduction to Fourier series.

CH: 4

LC: 4

OR: 1 tutorial hour per week

PR: MATH 1001, MATH 2050

Faculty of Engineering and Applied Science (cont'd)

**3425 Mathematics for Civil Engineering I.** Sequences & series, functions of a single parameter, conic sections, polar coordinates, partial differentiation, multiple integration, introduction to first order ordinary differential equations.

CH: 4

LC: 4

OR: 1 tutorial hour per week

PR: MATH 1000, 1001 and 2050

**3610 Earth Sciences for Civil Engineering.** Introduction to basic concepts in Geology and Mining with emphasis on applications in Civil, Geological, Mining and Environmental Engineering through the use of case histories. Includes the study of rocks and minerals in selected field and laboratory exercises.

LH: 3

**3703 Surveying and Geomatics.** Plane surveying: distance, elevation, and angle measurements; horizontal and vertical curves; plane survey calculations; area and volume computations. Photogrammetry: sensors and platforms, mathematics of photogrammetry; instruments and equipment, photogrammetric products, digital photogrammetry, remote sensing, and introduction to global positioning and geographical information systems (GIS). A surveying field school to introduce students to the use of surveying equipment and mapping will be held in the first two weeks of the term.

LH: 3

OR: In addition to the academic course, a 36-hour long field school is also conducted during the first two weeks of the semester.

**3731 Materials for Construction.** Structure of metals and nonmetals; deformation of metals; strengthening mechanisms in metals; concrete and cementitious materials; admixtures; iron and steel; brick masonry; concrete masonry; mortar grout and plaster; reinforced masonry structures; wood and wood products. Relevant experiments.

LH: At least ten 3-hour sessions per semester.

OR: Up to ten 1-hour tutorial sessions per semester

**3821 Circuit Analysis** Review of elementary circuits, wye-delta transformation, bridge circuits; transient analysis of first- and second -order circuits; sinusoidal steady state analysis, phasor diagrams, maximum power transfer, frequency selective circuits (filters); Laplace transforms in circuit analysis (transients, steady state, transfer function).

LH: At least five 3-hour sessions per semester

OR: 1 hour tutorial per week

PR: MATH 1001, MATH 2050, ENGI 1040

CO: ENGI 3424

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**3861 Digital Logic.** Number systems and Boolean algebra; minimization techniques for Boolean functions; basic combinational logic circuit analysis and design; flip-flops, state machine design and implementation; decoders, multiplexors, registers, counters; simple arithmetic and logic unit (ALU) algorithms; introduction to hardware description languages (VHDL) for logic component and circuit modeling.

LH: At least six 3-hour sessions per semester.

OR: Up to eight tutorial sessions per semester.

PR: ENGI 1040

**3891 Advanced Programming.** Advanced procedural language programming; data structures, user defined types, pointers; modularization techniques, scope and data hiding; object-oriented programming; classes, objects and attributes; data encapsulation, member and non-member functions; overloading, methods and friend functions; inheritance, sub- and super-classes; templates.

LH: At least nine 2-hour sessions per semester.

PR: ENGI 1020.

**3901 Thermodynamics I** Macroscopic approach to heat, work, and energy; properties of pure substances; conservation of mass, energy for open and closed systems; thermal efficiency and coefficient of performance; second law of thermodynamics; and its corollaries; entropy; second law analysis of thermodynamic systems; second law efficiency.

PR: MATH 1001

**3911 Chemistry and Physics of Engineering Materials I** is an introduction to the structure and properties of engineering materials, in particular materials, semiconductors, ceramics, glasses and polymers. Topics include a review of atomic bonding, discussion of basic crystalline and amorphous structures, point and line defects, and the role these structural features play in elastic and plastic deformations, yield, fracture, glass transition, thermal conductivity, thermal expansion, specific heat and electrical conductivity.

LH: At least four 3-hour sessions per semester.

OR: 1 hour tutorial per week

PR: CHEM 1050

**3934 Dynamics.** Kinematics and kinetics of particles using rectangular, normal/tangential and polar coordinates. Relative motion using rotating axes. Two-dimensional kinematics and kinetics of rigid bodies. Force-acceleration, work-energy and impulse-momentum methods.

OR: 1 hour tutorial per week

PR: PHYS 1050, MATH 1000,1001, 2050

Faculty of Engineering and Applied Science (cont'd)

**3941 Production Technology** Overview of production: production strategies; dimensioning and tolerancing; basic material removal process; forming and shaping process; casting; molding, extrusion and joining processes; computer aided machining; new technologies.  
LH: At least eight 3-hour sessions per semester.

**7.4 Academic Term 4 Courses**

**4011 Resistance and Propulsion.** Phenomena resisting the motions of ships and some factors considered in the design of the marine screw propeller. The topics include the resistance due to friction, wave making, form appendage, wind and waves, squat, blockage, and shallow water effects, and also include the estimation of powering using methodical series and statistical methods. Topics considered in the design of the marine screw propeller include propeller theory, blade sections, blade strength, methodical series charts, efficiency elements, lifting line calculations, cavitation, and propellers in non-uniform flow.

LH: 3  
OR: 1 hour tutorial per week  
PR: ENGI 3054

**4020 Marine Fluid Dynamics.** Fluid statics; fluid flow phenomena, in general and in marine applications; control volume analysis of fluid motion; conservation of mass, momentum and energy; differential approach to flow analysis; head losses. Applications of conservation laws; external v.s. internal flow; dimensional analysis and scaling. Fluid-structure interaction concepts; potential flow theory, lift and Kutta-Joukowski theorem. Viscous flow, boundary layers and drag.

LH: At least one 3-hour session per semester  
OR: 1 hour tutorial per week  
PR: ENGI 3054

**4102 Engineering Economics.** Introduction to the concepts in the determination of the economic feasibility of engineering projects; time value of money – interest rates, depreciation, annual, present and future worth analysis; benefit-cost analysis, tangible and intangible benefits and costs; economic risk and sensitivity analysis, economic optimization.

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**4312 Mechanics of Solids I.** Force analysis of structures and structural components - Free body diagrams of structure, components and section of a components - definition of a stress at point, stress notation, complementary property of shear stress - definition of strain – normal strain, shear strain, thermal strain - Mechanical properties of materials - Analysis of prismatic members due to axial – bending and torsion loading - Analysis of beams, shear force and bending moment diagrams, Combined loads; transformation of stresses and strains.

LH At least four 1-hour sessions per semester

OR Up to ten 1-hour tutorial sessions per semester

PR: ENGI 1010

**4421 Probability and Statistics.** Probability; probability distributions; probability densities; sampling distribution; hypothesis testing; regression and correlation.

OR: 1 tutorial hour per week

PR: MATH 1001

CR: ENGI 3423

**4424 Discrete Mathematics for Computer Engineering.** An introduction to discrete mathematics including a selection of topics such as propositional logic, introductory predicate logic, mathematical reasoning, induction, sets, relations, functions, integers, graphs, trees, and models of computation.

OR: 1 tutorial hour per week

PR: MATH 2050.

**4425 Mathematics for Civil Engineering II.** Analytical solutions of ordinary differential equations of the first and higher orders. Numerical methods: Errors, round off and stability, solution to nonlinear equations, curve fitting and interpolation methods, numerical differentiation and integration.

CH: 4

LC: 4

PR: MATH 1000, 1001 and 2050, ENGI 3425

OR: 1 tutorial hour per week

**4430 Advanced Calculus for Engineering** includes parametric vector functions; polar curves; gradient, divergence and curl; multiple integration; vector calculus, theorems of Green, Stokes and Gauss; an introduction to partial differential equations; and application of advanced calculus to relevant engineering problems.

CH: 4

LC: 4

OR: 1 tutorial hour per week

PR: ENGI 3424

Faculty of Engineering and Applied Science (cont'd)

**4717 Applied Environmental Science and Engineering.** Nature and scope of environmental problems; concept of sustainable development; natural environmental hazards; introduction to ecology, microbiology and epidemiology; basic concepts of environmental quality parameters and standards; solid and hazardous wastes; atmospheric, noise, and water pollution, their measurements, and control.

LH: At least ten 3-hour sessions per semester.

PR: Completion of Term 3 of the Civil Engineering program

**4723 Geotechnical Engineering I.** Introduction to soil as a three-phase material; physical and mechanical properties; structure; classification of soils; soil compaction; hydraulic properties; permeability; flow of water in soil; flownets; effective stress concept in soils; stresses in soils beneath loaded areas; one-dimensional consolidation theory.

LH: 3

OR: 1 tutorial hour per week.

PR: Completion of Term 3 of the Civil Engineering program

**4823 Introduction to Systems and Signals.** Introduction to systems and signals; mechanical and electrical analogues; principles of linear superposition and time-invariance; definitions, properties, and use of the delta function; applications of complex variables and functions; impulse and step responses; input-output relations of continuous-time systems in terms of convolution and transfer functions; frequency response plots; the Fourier transform and applications; applications of Laplace transforms to filtering, communications, and controls.

OR: 1 tutorial hour per week.

PR: ENGI 3424, ENGI 3821

**4841 Electromechanical Devices.** Introduction to fundamental principles of energy conversion; review of three-phase systems; magnetic fields and circuits; transformer models, performance and applications; basic concepts of rotating machines; performance and control of dc machines.

LH: At least six 3-hour sessions per semester.

OR: Up to ten tutorial sessions per semester.

PR: ENGI 3424, ENGI 3821

Faculty of Engineering and Applied Science (cont'd)

**4854 Electronic Circuits I.** An introduction to semiconductor electronic devices and circuits using operational amplifiers, diodes, bipolar junction transistors and field effect transistors. Topics covered include operational amplifier configurations and analysis; basic principles, dc and small-signal models and analysis of p-n junction diodes, bipolar junction transistors and field effect transistors; differential and multistage amplifiers; practical applications of the devices to the design of power supplies, amplifiers and switching circuits. CAD tools are used to illustrate the analysis and design of electronic circuits.

LH: At least ten 3-hour sessions per semester.

OR: 1 tutorial hour per week.

PR: ENGI 3821, PHYS 3000

**4862 Microprocessors.** Microprocessor architecture. Assembly language programming: addressing modes, table look up. Memory mapped devices. Interfacing techniques: parallel, serial. Timing control. Analog input and output. Computer displays.

LH: At least eight 3-hour sessions per semester.

PR: ENGI 3861

**4892 Data Structures.** Fundamental data structures; recursive structures and programming techniques; modularity and reusability; time complexity and efficient data structures; procedural abstraction; data abstraction and precise documentation of data structures.

PR: ENGI 3891

CO: ENGI 4424

**4901 Thermodynamics II.** Thermodynamic cycles: power and refrigeration applications; human comfort and air conditioning: mixture of gases and vapours, humidity, psychrometrics; chemically reacting mixtures; combustion.

LH: At least two 2-hour sessions per semester.

PR: ENGI 3901

**4932 Mechanisms and Machines.** Overview of mechanisms within machines; graphical and analytical methods for position, velocity, and acceleration analysis of moving mechanisms; kinematics and kinetics of planar mechanisms; Static and dynamic loads on mechanisms. Introduction to mechanism synthesis. Analysis project.

OR: 1 tutorial hour per week.

PR: ENGI 3934



Faculty of Engineering and Applied Science (cont'd)

**4951 Mechatronics I** The focus of the course is on sensors and instrumentation. The topics covered in the course are: electric circuits; electronic sensors; signal conditioning; instrumentation. There is a sensors project and 4 laboratory exercises.

LH: At least four 1-hour sessions per semester

PR: ENGI 1040

**7.5 Academic Term 5 Courses**

**5003 Ship Structures I.** Longitudinal strength, still water and wave bending moment, shear and bending moment curves, Smith Correction, section modulus calculation, torsion and racking forces. Bulkhead and girder scantlings, portal frame analysis by moment distribution and energy method. Finite element analysis. Use of Classification Society rules for design of midship section.

PR: ENGI 4312

**5020 Marine Propulsion** is a second course in marine propellers and ship powering. The purpose of this course is to give students the principles of design and analysis of marine screw propellers and other propulsion devices. The course introduces various marine propulsion devices including conventional and unconventional propulsion systems. It covers methods of propeller design and propeller design philosophy. Emphasis is placed on the design of fixed-pitch propellers based on the lifting line theory and the design of ducted propellers. The student will also develop some insight into the design of other propulsion systems such as waterjets and sails.

LH: At least one 3-hour session per semester

PR: ENGI 4020

**5312 Mechanics of Solids II.** Introduction to earlier concepts; strain transformation; deflections of beams and shafts, energy methods; failure theories; buckling of columns, inelastic behaviour of beams.

LH: At least five 3-hour sessions per semester

PR: ENGI 4312

**5420 Probability and Random Processes.** Basic concepts in probability, random variables, multiple random variables, descriptive statistics, random processes, selected applications for engineering.

PR: MATH 1001

Faculty of Engineering and Applied Science (cont'd)

**5434 Applied Mathematical Analysis.** Numerical and analytical solution of applied mathematical problems in Civil Engineering. Problems with higher order ordinary differential equations, Stiff equations, systems of ODE, Runge-Kutta methods, boundary value problems, Applications of eigen value problems (numerical solutions), Fourier analysis, elliptic, parabolic and hyperbolic partial differential equations and their numerical solutions with engineering applications.

PR: ENGI 4425

**5706 Design of Concrete Structures.** Review of concrete mix design; design methods and requirements, strength of rectangular sections in bending, balanced condition at ultimate strength with tension reinforcement, bending with both tension and compression reinforcement; serviceability, deflections, flexural crack control for beams and one-way slabs; shear strength, inclined cracking, and shear reinforcement; bond stress and development of reinforcement; T-sections in bending; members in compression and bending; length effects, lateral ties, spiral reinforcement and longitudinal bar placement.

LH: At least five 3-hour sessions per semester.

PR: ENGI 4312

**5713 Fluid Mechanics.** Fluid characteristics; fluid statics; buoyancy and stability; kinematics; pressure measurement; continuity, energy and momentum principles; energy and hydraulic grade lines; free jets; laminar and turbulent flow; dimensional analysis; drag on immersed bodies; flow measurement.

CR: ENGI 4913

LH: At least five 1-hour sessions per semester

PR: ENGI 4425

**5723 Geotechnical Engineering II.** Shear strength of soil, types of laboratory and in-situ soil tests; Immediate and consolidation settlement of foundations; plastic equilibrium in soils; limit equilibrium method; earth retaining structures; introduction to bearing capacity theories; stability of slopes. Relevant laboratory exercises and projects.

PR: ENGI 4723

LH: 3

Faculty of Engineering and Applied Science (cont'd)

**5800 Electrical Engineering Design.** Students will work in pairs on small design projects that will require them to follow a hierarchy of design process which includes general product definition, specifications and requirements, functional block diagrams, definition of specification of functional blocks for circuit level synthesis and implementation, system integration, simulation or modeling, testing and verification. The small projects are designed to encourage and motivate students to learn and practice the process of design. The course will culminate in a large design project.

LC: At least 10 lecture hours per semester.

OR: Meetings with project supervisor as required.

PR: ENGI 4841, ENGI 4855, ENGI 4862.

CO: ENGI 5821, ENGI 5855.

**5812 Basic Electromagnetics.** Review of relevant vector calculus, including the divergence, gradient and curl operators in Cartesian, cylindrical and spherical coordinates, divergence theorem, Stokes' theorem, and Laplace's and Poisson's equations; electrostatics including Coulomb's law, potential and energy, conductors, dielectrics, capacitance, electric field boundary conditions; the steady magnetic field, including the Biot-Savart law, Ampère's law, magnetic force, potential and magnetic materials and boundary conditions.

PR: ENGI 3821, ENGI 4430

**5821 Control Systems I.** Introduction to control systems with a negative feedback; mathematical modeling and transfer functions of electromechanical systems; block diagram reduction and signal flow graphs; controller realization using op-amps; transient response analysis; Routh's stability criterion; basic control actions and response of control systems; root locus analysis and design; frequency response analysis; Bode diagram; gain and phase margins; compensator design in frequency domain; Nyquist stability criterion; A/D and D/A conversion, digital implementations of analog compensators; introduction to PID controller tuning methods.

LH: At least four 3-hour sessions per semester.

PR: ENGI 4823

**5854 Electronic Circuits II.** Introduction to digital electronics; transient and frequency response of amplifier circuits; feedback amplifier analysis and design, stability and compensation techniques; noise and distortion in electronic circuits; analysis and design of data converters; introduction to analog filter design. CAD tools are used to illustrate the analysis and design of electronic circuits.

LH: At least five 3-hour sessions per semester.

PR: ENGI 4823, ENGI 4854

Faculty of Engineering and Applied Science (cont'd)

**5865 Digital Systems.** Concepts, language, tools, and issues pertaining to specification, modeling, analysis, simulation, testing and synthesis of digital systems, including PLD, FPGA, and ASIC devices. Industry standard CAD tools will be used in this course to facilitate system design and testing.

LH: At least ten 3-hour sessions per semester.

PR: ENGI 3891, ENGI 4862

**5895 Software Design.** The development process: requirement analysis, design, iterative development, design documentation; an introduction to the Unified Modeling Language: use cases, class diagrams and sequence diagrams; an introduction to software design patterns: creational patterns, structural patterns and behavioural patterns; object-oriented, modular decomposition. The course includes a major design project.

LC: At least 15 lecture hours per semester.

OR: Meetings with project supervisor as required.

PR: ENGI 4892

**5911 Chemistry and Physics of Engineering Materials II** Aspects of chemical and physical processes and microscopic structure relevant to the production and use of engineering materials, focusing on metals, alloys, silicates, Portland cement, plastics and adhesives, composites, and wood. Topics include solid-state solutions and compounds, alloy structures, phase diagrams, reaction rates, solid-state transformations, polymerization, oxidation and corrosion, hardness, creep, fatigue, fracture toughness and visco-elastic deformation.

LH: At least four 3-hour sessions per semester.

OR: 1 tutorial hour per week.

PR: ENGI 3911

**5927 Mechanical Component Design I** Adequacy assessment and synthesis of machine elements with a focus on failure prevention, safety factors, and strength. Static failure of ductile and brittle materials, fatigue analysis of components. Topics include the design of power screws, bolted connections, welds, springs, and shafts.

LH: At least eight 3-hour sessions per semester

PR: ENGI 4312

Faculty of Engineering and Applied Science (cont'd)

**5931 Advanced Mechanics of Deformable Solids.** Stresses due to combined loads - Thin-walled pressure vessels - Transformation of stresses and strains - Principal stresses and strains (two and three dimensional stresses) - Mohr's circle - Theory failures – stress concentrations - Energy Methods - Buckling of columns - Thick-walled cylindrical Pressure vessels - Rotating Disks - Multi layered thick walled pressure vessels - Shrink fits - Contact stresses.

LH: At least four 2-hour sessions per semester

PR: ENGI 4312

**5951 Mechatronics II** The focus of the course is on drives and controllers. The topics covered in the course are: electric motors; actuators; control circuits. There is a motors project and 4 laboratory exercises.

LH: At least four 1-hour sessions per semester

PR: ENGI 4951

**5961 Fluid Mechanics I** Fluid Statics; fluid flow phenomena; control volume analysis; conservation of mass, momentum, and energy; Bernoulli equation; head losses. Applications of conservation laws: flow measurement devices; pipe networks; momentum devices. Dimensional analysis. Boundary layer phenomena. Lift and Drag.

LH: At least five 1-hour sessions per semester

## **7.6 Academic Term 6 Courses**

**6003 Ship Structures II.** Introduction to ship structural safety and rational design. Local strength analysis. Elastic, plastic and ultimate strength of plating, frames and grillages. Buckling of columns and plates. Fatigue and fracture in ships.

LH: At least one 4-hour session per semester

PR: ENGI 5003

**6005 Floating Ocean Structures Design.** Floating structures used in the offshore petroleum industry are introduced, along with functional requirements, such as drilling and production, of the platforms. Field development criteria are discussed in the context of platform concept selection and synthesis. Environmental loads are examined, focusing on wave loads and ice loads. Diffraction theory and its application on offshore structures is presented. Offshore safety is discussed in terms of major hazards, risk management, and case studies.

LH: 1

PR: ENGI 3054

Faculty of Engineering and Applied Science (cont'd)

**6030 Dynamics and Maneuvering of Ocean Vehicles.** Applications of the linearised equations of motion to ocean vehicle problems with single and multiple degrees of freedom. Dynamics and maneuvering of marine vehicles: motions in calm water and in waves; hydrodynamics effects such as added mass, radiation and viscous damping; strip theory; irregular motions; and systems for course keeping and motion control.

PR: ENGI 3054, ENGI 4030

**6322 Thermal Sciences.** Fundamental concepts associated with thermodynamics, fluid dynamics and heat transfer; first and second laws of thermodynamics; system and control volume analysis; classification of flows; introduction to boundary layers and drag; convection, conduction and radiation heat transfer; thermal insulation and calculation of R-values; cooling of electrical components.

PR: ENGI 5312

**6602 Offshore Petroleum Geology and Technology.** The course introduces basic concepts in geology and geophysics of the offshore environment; An outline of petroleum geology following a path from the origins of hydrocarbons through migration in the Earth's crust, accumulation in reservoirs and the strategies used to discover and to exploit liquids found in the subsurface. Introduction to the offshore oil and gas industry in harsh environment, type of platforms and structures, exploration phase of offshore oil development, Production drilling and completion processes and equipment, oil and gas transportation system. Case Studies and Project.

PR: Completion of Academic Term 5

**6705 Structural Analysis I.** Structure classification and loads. Building code provisions. Analysis of statically determinate arches and frames. Shear and moment diagrams for frames. Influence lines for statically determinate structures. Approximate analysis of indeterminate trusses and frames. The force method of analyzing indeterminate beams and frames. Introduction to slope deflection method. Moment distribution method.

LH: At least five 3-hour sessions per semester.

PR: ENGI 5312

**6707 Design of Concrete and Masonry Structures.** Design methods for reinforced concrete two-way slabs. Two-way slabs supported on walls and stiff beams. Design of two-way slab systems, direct design method and equivalent frame method. Design of concrete retaining walls and basement walls, Engineered masonry, allowable masonry stresses, mortar stress, analysis and design of flexural members, axial load and bending in unreinforced and reinforced walls, columns and masonry shear walls.

PR: ENGI 5706

LH: 2

Faculty of Engineering and Applied Science (cont'd)

**6713 Hydraulics.** Flow in pipe systems and networks; uniform and non-uniform flow in open channels; hydraulic machinery and associated conduits; design and analysis of culverts; and pipeline/pump system optimization.

PR: ENGI 5713

LH: At least four 3-hour sessions per semester.

**6718 Environmental Geotechniques** Soil characteristics; soil mineralogy; soil water interaction; soil contaminant interactions; advection, adsorption and diffusion; non-aqueous phase liquids; geosynthetics; design of landfills; use of waste materials; relevant software programs.

PR: ENGI 5723

**6749 Construction Planning Equipment and Methods.** Construction equipment selection and utilization; earthmoving including use of explosives; case studies of major civil projects; principles of project planning and control; computer applications to the construction industry.

PR: Completion of Term 5 of the Civil Engineering program

**6813 Electromagnetic Fields.** A continuation of the topics started in Engineering 5812, including a review of electrostatics and magnetostatics, Maxwell's equations, Lorentz force, Poynting's theorem, plane waves, and applications including two-wire transmission lines.

LH: At least three 3-hour sessions per semester.

PR: ENGI 5812

**6843 Rotating Machines.** Fundamentals of rotating machines; design of machine windings; polyphase and single phase induction motor theory and applications; synchronous machine theory; stability and control of synchronous generators; control and protection of rotating machines. Introduction to A.C. motor drives. machines.

LH: At least six 3-hour sessions per semester.

PR: ENGI 4841.

**6855 Industrial Controls and Instrumentation.** Control and instrumentation system components; transducers and signal processing circuits, linear variable differential transformers, power oscillators; electromechanical actuators, solenoids, power drives; A/D and D/A conversion, standard PC interfaces; real-time operating systems; design of discrete-time feedback controllers on a PC platform; system integration, control system tweaking and troubleshooting; programming soft-PLC's using IEC61131.

LH: At least eight 3-hour sessions per semester.

PR: ENGI 5821

Faculty of Engineering and Applied Science (cont'd)

**6856 Power Electronics.** Overview of power semiconductor switches; introduction to energy conversion and control techniques; controlled rectifiers; phase-controlled converters; switch-mode dc/dc converters; variable frequency dc/ac inverters; ac/ac converters; design of thyristor commutation circuits, gate and base drive circuits, and snubber circuits; thermal models and heat sink design.

LH: At least ten 3-hour sessions per semester.

PR: ENGI 5854

**6861 Computer Architecture.** Review of microprocessors and computer organization. Fundamentals of computer design: performance metrics and cost. Instruction set architecture. Memory hierarchy design: cache, main memory and virtual memory. Pipelining: hazards, parallelism. Special purpose processors. Multiprocessors and thread-level parallelism.

PR: ENGI 4862

**6871 Communication Principles.** Review of signal representation and analysis, distortionless signal transmission, analog modulation (AM, FM and PM), super-heterodyne receiver, sampling theorem, pulse amplitude modulation (PAM), pulse code modulation (PCM), delta modulation, baseband digital transmission, digital modulation techniques (ASK, FSK and PSK).

LH: At least four 3-hour sessions per term.

PR: ENGI 4823, ENGI 5420

**6876 Communication Networks.** Introduction to communication networks such as the telephone network and the Internet; flow control and error control; circuit switching; packet switching; local area networks; internetworking; communication architectures and protocols.

PR: ENGI 5420

**6892 Algorithms, Complexity, and Correctness** presents fundamental theories and practices for the design of correct and efficient computing systems, including specification of computing systems and their components, correctness with respect to specifications; methods of verification; algorithmic problem solving strategies (such as divide and conquer, dynamic programming, etc.); tractability and intractability of computational problems.

PR: ENGI 4424, ENGI 4892



Faculty of Engineering and Applied Science (cont'd)

**6901 Heat Transfer I.** Modes of Heat Transfer; Conduction: steady 1-D conduction, thermal resistance, extended surfaces (fins), lumped capacitance analysis, 1-D transient conduction; Convection: Newton's law of cooling, convection heat transfer coefficient, external boundary layer flows, internal flows, natural convection; Radiation: principles, properties, exchange factors, black body radiation, enclosures, radiation shields.

LH: At least one 3-hour session per semester.

PR: ENGI 4901

**6927 Mechanical Component Design II.** A continuation of the ENGI 5927 course in analysis and synthesis of machinery, including advanced analysis of machine elements such as clutches, brakes, couplings, journal bearings and gears. Advanced machine design concepts such as reliability, optimization and techniques for stimulating innovative design. A synthesis project involving the machine elements studied is usually included.

LH: At least ten 3-hour sessions per semester.

PR: ENGI 5927

**6933 Mechanical Vibrations.** Single degree of freedom systems: Free vibration. Energy methods. Response to harmonic excitation. Response to arbitrary inputs. Two degree of freedom systems: natural frequencies and mode shapes, Dynamic vibration absorber.

LH: At least four 2-hour sessions per semester.

PR: ENGI 3934

**6951 Automatic Control Engineering.** The goal of feedback control is to make the response of a system track commands but reject disturbances. This course deals with the design of such systems. The topics covered in the course are: feedback control concept; control system performance; control system stability; nonlinear phenomena. There is a project which makes use of a peripheral interface controller or PIC. There are 3 laboratory exercises. Extensive use is made of MATLAB.

LH: At least three 1-hour sessions per semester

PR: ENGI 4951, ENGI 5951

**6961 Fluid Mechanics II.** Differential analysis of fluid motion; conservation of mass: continuity equation; conservation of momentum: Navier-Stokes equations; conservation of energy; inviscid incompressible flows; low Reynolds number flows; boundary layer flows; compressible flows.

LH: At least three 1-hour sessions per semester.

PR: ENGI 5961

Faculty of Engineering and Applied Science (cont'd)

**7.7 Academic Term 7 Courses**

**7000 Ocean Systems Design.** Preliminary design methods for the design of marine platforms and vehicles from mission statement to the selection of one or more acceptable solutions. Weight and cost estimating, power requirements estimating, and selection of principal design characteristics. Economic and operational evaluation of alternative solutions. Relevant design laboratory projects.

LH: 3

PR: ENGI 3001, ENGI 3054

**7030 Vehicle Dynamics** is a course in the dynamics of vehicles of all types. This includes space craft, aircraft, automobiles, rail vehicles, boats, and underwater vehicles. The course will focus on the basic mechanics of vehicles, equilibrium, lift, powering, stability and performance.

LH: At least one 3-hour session per semester.

PR: ENGI 3934

**7033 Marine Hydrodynamics.** Fundamental equations of hydrodynamics, boundary layers; potential flow, added mass, damping, circulation, and vorticity; numerical methods for hydrodynamic coefficients; water waves and loading for regular and irregular seas.

LH: At least one 3-hour session per semester.

PR: ENGI 4020

**7045 Marine Engineering Systems.** Shafting system design; shafting system vibration analysis, study of exciting forces and moments, and balancing of reciprocating and rotating machinery; heat transfer and marine heat exchangers; incompressible fluid flow and piping system design and selection of appropriate pumping devices.

CH: 4

LC: 4

LH: 1

PR: ENGI 5902, ENGI 6933

**7102 The Engineering Profession** examines the origins and development of Engineering as a profession and its values, the place of technology in society and the nature of technological decisions. Topics will include the role and responsibility of the professional engineer in society, code of ethics, sustainable development and environmental stewardship.

Faculty of Engineering and Applied Science (cont'd)

**7650 Offshore Oil and Gas Engineering Project I** is a multidisciplinary design project that illustrates the application of previous engineering science and design related courses. The project will be done by teams of students with individuals concentrating their participation in their own engineering discipline. The project topic will be from the offshore oil and gas engineering industry. Lectures will be scheduled as required. This is the Term 7 project and if the scope of the project is such that it needs to continue, then the student will have the option to continue the same project in term 8 (in ENGI 8650).

LC: 1

PR: Completion of Academic Term 6

**7680 Supervisory Control and Data Acquisition.** Data acquisition and intelligent field devices; distributed systems and fieldbus technology; programmable logic controllers and programming standards; operator control interface; supervisory control and data acquisition; enterprise organization.

LH: At least four 3-hour sessions per semester.

PR: ENGI 5821

**7704 Design of Steel Structures.** Review of Design Concepts, Standards and Products. Design of Members and Connections, Tension Members, Bolted Joints, Welded Joints, Compression Members, stability and effective length, Flexural Members – Beams & Beam-Columns, Plate Girders, Composite Construction, Introduction to Serviceability, Deflections, etc.

LH: At least four 2-hour sessions per semester.

PR: ENGI 5706 (or approval of the Discipline Chair)

**7706 Finite Element Structural Analysis.** Review of basic concepts required for FEA, Basics of Stiffness Formulation, Direct stiffness method, Displacement method, One dimensional elements, trusses and frames. 1-D Fluid and Heat transfer elements. Automated Analysis and modeling concepts, Higher Order Elements, Two dimensional elements - plane stress and plane strain, Introduction to 3D and other types. -intro. Introduction to advanced topics, Isoparametric formulation.

LH: At least eight 2-hour sessions per semester.

PR: ENGI 6705 (or approval of the Discipline Chair)

**7707 Reliability and Environmental Loading on Offshore Structures -** Introduction to natural phenomena that cause loading and influence the design of marine structures; interpretation and utilization of field data for the determination of design loads for wind, waves currents and ice; case studies of load analysis for the design of offshore structures in Atlantic Canada.

PR: ENGI 5312

Faculty of Engineering and Applied Science (cont'd)

**7713 Hydrology and Water Resources.** Precipitation, snowmelt, infiltration, runoff and streamflow; statistical treatment of hydrologic data; hydrograph analysis and synthesis; evaporation; structure design floods; reservoir storage and flood routing; urban run-off and drainage.

LH: At least six hours per semester.

PR: ENGI 5713, ENGI 6322

**7716 Hydrotechnical Engineering.** The theory and application of steady gradually-varied flow in artificial and natural open channels together with an introduction to appropriate software; erosion protection and mobile-boundary hydraulics; problems with ice in rivers. The design of spillways, energy dissipaters, and culverts; physical scale models. Introduction to water hammer and surge tanks.

LH: At least four 3-hour sessions per semester.

PR: ENGI 5713, ENGI 6713

**7723 Geotechnical Engineering III.** Soil investigation and site characterization; Pile foundations; Embankment dams; Elements of geotechnical earthquake engineering; Constitutive theories for soil materials; Numerical methods in geotechnical engineering. The students select two of the above topics on which they are interested in concentrating their efforts. Bi-weekly lectures are offered on the other topics at an informal level.

PR: ENGI 5723

**7745 Highway Engineering.** Design and construction of highways including driver, vehicle and road characteristics; highway location and geometric design; soil classification; subgrade and base materials; highway drainage; flexible and rigid pavement; highway economics.

PR: Completion of Term 6 of the Civil Engineering program

**7748 Project Planning and Control.** Introduction to types of contracts, project delivery approaches, and prevailing contractual relationships; basic project management techniques for network planning and scheduling (CPM and PERT); principles of resource productivity databases, preliminary estimating, and detailed bid preparation; quantitative approaches for effective control of time, cost, resource, quality, and value of constructed facilities; use of computer software for scheduling, estimating, and control.

PR: Completion of Term 6 of the Civil Engineering program

Faculty of Engineering and Applied Science (cont'd)

**7803 Electrical Engineering Design Project I** provides an opportunity for senior students to integrate the knowledge that they have acquired through the junior terms and apply it to solving an electrical engineering design problem. Students work in small teams with the assistance of a faculty mentor to define an appropriate design problem and propose a method of solution to the problem. The project is continued in 8853.

LC: At least 10 lecture hours per semester.

OR: Weekly meetings with project supervisor.

PR: Completion of Term 6 of the Electrical Engineering program.

**7804 Computer Engineering Design Project I** provides an opportunity for senior students to integrate the knowledge that they have acquired through the junior terms and apply it to solving a computer engineering design problem. Students work in small teams with the assistance of a faculty mentor to define an appropriate design problem and propose a method of solution to the problem. The project is continued in 8854.

LC: At least 10 lecture hours per semester.

OR: Weekly meetings with project supervisor.

PR: Completion of Term 6 of the Computer Engineering program.

**7811 Antennas.** Fundamentals of electromagnetic radiation; potentials; small antennas and antenna parameters; thin linear wire antennas and antenna arrays; antenna impedance and ground effects; Friis transmission formula; aperture antennas.

LH: At least three 3-hour sessions per semester.

PR: ENGI 6813

**7814 Electromagnetics for Communications.** Vector calculus; Green's, Stokes' and Gauss' theorems; Maxwell's differential and integral equations; steady-state and time-varying aspects of Maxwell's equations; uniform plane wave propagation in various media; applications of electromagnetics in communications.

PR: ENGI 3424, ENGI 3821

**7824 Introduction to Digital Signal Processing.** Sampling theory; the discrete Fourier transform; the efficient fast Fourier transform algorithm; elementary discrete-time signals; the discrete-time Fourier series; the discrete-time Fourier transform; discrete-time linear and time-invariant systems; linear constant-coefficient difference equations; the convolution sum; the z-transform and frequency response of discrete-time systems; introduction to digital filter design techniques; digital signal processing applications.

PR: ENGI 6871

Faculty of Engineering and Applied Science (cont'd)

**7825 Control Systems II.** State space models for multi-input/output systems; observability, controllability; state feedback without and with integral controller structure, state observers; quadratic optimal regulator and tracking control strategies; discrete-time state equations; introduction to optimal control.

PR: ENGI 5821

**7844 Power System Analysis.** Introduction to electric power systems; per unit quantities; transmission line parameters; modeling of power system components; single line diagrams; network equations formulation; bus impedance and admittance matrices; load flow analysis and control; design of reactive power compensation for power system performance enhancement; tap changing, auto and control transformers for power system application; economic dispatch and optimal power flow studies.

LH: At least six 3-hour sessions per semester.

PR: ENGI 6843

**7855 Communications Electronics.** Introduction to communications systems components; review of linear amplifiers; linear amplifier design and characteristics using s-parameters; power amplifiers; mixers; oscillators; modulator/demodulator circuits and subsystems; integration of subsystems into analog and digital communication systems.

LH: At least four 3-hour sessions per semester

PR: ENGI 5854, ENGI 6871

**7894 Concurrent Programming.** Survey of parallel and distributed architectures. Patterns of concurrent program design. Correctness of concurrent programs: safety and liveness properties, proof of properties. Synchronization using locks, semaphores, and monitors. Communication using message passing and remote procedures. Parallelization for high-performance computation. Advanced topics such as scientific applications, distributed systems, model checking, and transaction processing.

PR: ENGI 6861, ENGI 6892

**7901 Heat Transfer II** Advanced Topics in Heat Transfer; multi-dimensional conduction: shape factors, numerical methods, moving heat sources; heat transfer equipment: heat exchangers, heat exchanger design principles; phase change heat transfer: melting, solidification, condensation, boiling.

LH: At least one 3-hour session per semester.

PR: ENGI 6901

Faculty of Engineering and Applied Science (cont'd)

**7903 Mechanical Equipment.** Performance characteristics of mechanical equipment. Fluid power devices: pipes; valves; pumps; fans; blowers; compressors; storage tanks. Heat transfer devices: heat exchangers; boilers; cooling towers; pressure vessels.

LH: At least three 1.5-hour sessions per semester.

PR: ENGI 6904

**7911 Industrial Materials.** Physical and mechanical properties; industrial materials; metals and metal alloys, ceramics and polymer, composite materials, failure modes and mechanisms, non-destructive testing and evaluation; damage tolerant materials; material treatments; materials selection.

LH: At least twenty hours per semester.

PR: ENGI 3911 and ENGI 4911

**7926 Mechanical Design Project I** is the first of two capstone design courses in the Mechanical Discipline. In this course mechanical students are organized into small groups or teams, which must complete a common design challenge. The project is presented as an open-ended problem statement with specific performance objectives. The system must be designed, prototyped and tested during the course of the term. Each team act as a small consulting firm and is required to document its object planning as well as its design.

LC: scheduled as required

LH: scheduled as required

PR: Completion of Term 6 of Mechanical Engineering program

**7928 Computer Aided Engineering Applications** introduces a variety of Computer Aided Engineering (CAE) applications based on advanced 3D CAD modeling. The fundamentals of 3D modeling are covered including parametric and feature-based design. CAE applications include assembly modelling, mechanism animation and finite element analysis. Further applications include Computer Aided Manufacturing (CAM); model based inspection (i.e. Coordinate Measurement Machines); reverse engineering; document/drawing production; data exchange; and data management. The course has a significant lab component, which provides exposure to solid modeling and CAE applications based on an industrial CAD/CAM/CAE package.

LH: At least ten 3-hour sessions per semester

PR: ENGI 1030, ENGI 6927

**7934 Finite Element Analysis.** Basis of the finite element method. Continuum mechanics applications; beam problems, fluid mechanics problems, heat transfer problems. Relevant computer laboratory exercises.

LH: At least ten 2-hour sessions per semester.

PR: ENGI 4430, ENGI 5931

Faculty of Engineering and Applied Science (cont'd)

**7952 Robotics and Automation** will provide the fundamentals in robotic manipulators and arms. The course will provide basic understanding in coordinate transformations for spatial description, both kinematical and kinetic analysis, forces and dynamics and finally trajectory generations and path planning.

LH: At least three 3-hour sessions per semester.

PR: ENGI 1040, ENGI 4430

**7.8 Academic Term 8 Courses**

**8000 Ocean and Naval Architectural Engineering Project.** Execution of design project selected and approved in Term 7. The project must illustrate the application of previous design related courses, i.e., decision methods, impact assessments and application of technology. The subject may be ship design, marine system, directed research or a unique design solution. Lectures will be scheduled as required.

LH: 3

PR: ENGI 7000

**8003 Small Craft Design.** The fundamentals of naval architecture as practiced in small craft design are presented and a methodology developed for a variety of craft: tenders, lifeboats, planning vessels, dinghies, coastal cruisers and large, state of the art racing yachts. The emphasis is on recreational craft of all sizes, with special emphasis on sailing vessels. Special topics, such as choice of material of construction, scantlings, performance prediction, seaworthiness, tank testing, modern construction materials and techniques are covered. Specific design problems unique to small craft will be covered such as; mast design and sail area determination, and the state of the art in performance prediction. Students will do a design of their choice over duration of the course. Small weekly design studies will be required.

LH: At least twelve hours per semester.

PR: ENGI 6030

**8054 Advanced Marine Vehicles.** Concepts used in the design of advanced marine vehicles. Emphasis will be given to: structural design of craft constructed from fibre reinforced plastics; high speed marine vehicles (powering, structures, seakeeping and model testing); small craft.

LH: At least nine hours per semester.

PR: ENGI 5003



Faculty of Engineering and Applied Science (cont'd)

**8058 Submersible Design.** Formulation of mission statement, understanding various design constraints and reviewing the historical developments of submersibles design. Study of the hydrostatics principles of floatation, stability and control of submersibles. Performing resistance and propulsion calculations. Study of maneuvering and control equations. Survey of different materials and their selection criteria. Design of pressure hulls. Structural design of submersibles. Study of various support systems.

LH: At least twelve hours per semester.

PR: ENGI 3054

**8650 Offshore Oil and Gas Engineering Project II** is a multidisciplinary design project that illustrates the application of previous engineering science and design related courses. The project will be done by teams of students with individuals concentrating their participation in their own engineering discipline. The project topic will be from the offshore oil and gas engineering industry. Lectures will be scheduled as required.

LC: 1

PR: ENGI 7650

**8670 Reliability Engineering** is an introduction to reliability engineering; Physics of failure and failure mechanism, Reliability measures and assessment; Reliability of components and parts; Complex system Reliability and Availability analysis; Field Reliability Assessment; Case Studies and Project.

PR: Completion of Academic Term 6

**8671 Safety and Risk Engineering.** Overview of safety and risk issues in the offshore oil and gas industry; Regulatory requirements; Hazards and structured analysis tools; Risk terminology and Quantified risk analysis (QRA) techniques; and Safety assessment studies; project and case studies.

PR: Completion of Academic Term 6

**8676 Design of Natural Gas Handling Equipment.** The course covers process description, design methods, operating procedures, and troubleshooting aspect of gas production facilities including inlet separation operations, hydrate prevention and control, gas dehydration, NGL recovery and dew point control, gas transmission and pipeline design and transportation systems.

PR: Completion of Academic Term 6

Faculty of Engineering and Applied Science (cont'd)

**8680 Process Control and Instrumentation.** Introduction to feedback and feedforward control systems, regulatory and servo control; modeling thermal, gas, liquid and chemical processes; sensors and transmitters, control valve sizing for liquids and gases, industrial feedback controllers; design of feedback control loops, tuning of feedback controllers; cascade, ratio, override and selective control; feedforward control; multivariable process control; piping and instrumentation diagrams, control system documentation.  
LH: At least four 3-hour sessions per semester.  
PR: ENGI 5821

**8690 Reservoir Engineering.** Fluid pressure regimes, oil recovery factors, calculation of hydrocarbon volumes, reservoir rock characteristics, reservoir fluid properties, porosity and permeability, material balance, well test analysis.  
PR: Completion of Academic Term 6

**8691 Petroleum Production Engineering.** Procedures and equipment necessary for preparing a well to produce hydrocarbons and maximizing flow rate during the life of the well. Well completion configuration tubulars, packers and subsurface flow control devices, completion and work over fluids, perforating oil and gas wells, formation damage, surfactants for well treatment, hydraulic fracturing, acidizing, scale deposition, removal, prevention, work over and completion rigs, and artificial lift.  
PR: Completion of Academic Term 6

**8692 Drilling Engineering for Petroleum Exploration & Production.** The course covers both offshore and onshore drilling operations and includes, rotary drilling rig operations, well construction sequence, drill string, drill bits, well bore hydraulics, casing and well heads, cementing, well control, directional and horizontal drilling, well planning and fishing operations, and extended reach, horizontal and multilateral well drilling techniques.  
PR: Completion of Academic Term 6

**8693 Petroleum Facilities Engineering.** The course covers process description, design methods, operating procedures, and troubleshooting aspects of surface production facilities including separation systems, oil treating, water treating systems, custody transfer operations, transport and storage systems.  
PR: Completion of Academic Term 6

**8694 Downstream Processing.** The course content includes: oil and natural gas processing, oil and gas storage facilities and their design, oil and gas separation processes, petroleum refining processes, and de-bottle necking.  
PR: Completion of Academic Term 6

Faculty of Engineering and Applied Science (cont'd)

**8700 Civil Engineering Project.** A practically oriented design project integrated over the five areas in which Civil programs are offered. Students will operate in consultant groups and will complete a design for a typical Civil Engineering undertaking.

LC: Lectures will be scheduled as required.

OR: 1 client meeting per week, 1 tutorial per week

PR: Completion of Term 7 of the Civil Engineering program

**8705 Structural Building Systems.** Geometries, loads, safety and serviceability, procedure of using the national building code for evaluating the governing loads on structural members. Design of low rise concrete, timber and steel buildings. Lateral load-resisting elements and bracing systems. Design of foundation systems, footing design, pile cap design, pile group analysis using elastic centre method and inclined pile analysis. Prestressed concrete concepts: strength of flexural members, shear reinforcement for prestressed concrete beams.

LH: At least nine 3-hour sessions per semester

PR: ENGI 6707

**8708 Offshore Structural Design.** Guidelines and international codes and standards for offshore structural design. Understanding design constraints and concepts of offshore fixed and floating structures. Design consideration for fixed offshore concrete platform. Design consideration for offshore platform and Floating production system design. Analysis of various support systems of the offshore structure.

PR: ENGI 7707

**8713 Municipal Engineering** Water supply system overview; water consumption estimation; groundwater and surface water sources; oxygen demand and transfer; water treatment processes; water distribution systems and design software; sewer systems and design software; wastewater treatment processes; sludge handling; decentralized and on-site wastewater treatment.

PR: ENGI 7716

**8717 Environmental Assessment, Monitoring and Control** Statistical analysis; pollution monitoring, and sampling network design; water quality and air quality modeling; environmental risk assessment; environmental impact assessment; site remediation and hazardous waste management; relevant field trips and case studies.

LH: At least ten 3-hour lab sessions per semester.

PR: ENGI 4717

Faculty of Engineering and Applied Science (cont'd)

**8740 Contract Law and Labour Relations.** Introduction to law as it applies to engineering activity; the nature of law and legal processes, including standard forms; liens, bonds and insurances. The labour movement in North America; examination of union philosophies and managerial attitudes; labour law and collective bargaining; disputes and settlements.  
PR: Completion of Term 7 of the Civil Engineering program

**8751 Coastal and Ocean Engineering.** The coastal and ocean environment; ocean circulation and properties; waves and tides; instrumentation and measurement. Additional topics will be drawn from the areas of hydraulic, geotechnical and structural engineering. Relevant field exercises.  
PR: ENGI 5713, ENGI 6713

**8821 Design of Digital Signal Processing Systems.** Review of introductory digital signal processing (DSP) principles, including sampling theory and discrete-time systems and signals; transform analysis of DSP systems; issues in the implementation of DSP systems; design of IIR and FIR digital filters; computable transforms and their use in the frequency analysis of digital signals; design of DSP systems for current and emerging applications of digital signal processing.  
PR: ENGI 7824

**8826 Filter Synthesis.** Introduction to analog filters; descriptive terminology, transfer functions and frequency response of filters; design of first order passive and active filters; design and analysis of biquad circuit, Sallen key circuit, multiple feedback circuit and state variable filter; RC-CR transformation; inductance simulation circuit; cascade design principle; design of filters with maximally flat magnitude response; design of filters with equal ripple magnitude response; design of Bessel-Thomson filters; analysis and design of switched capacitor filters; use of Matlab for design of analog filters.  
LH: At least four 3-hour sessions per semester.  
PR: ENGI 5854

**8845 Power System Operation.** Symmetrical components; power system fault analysis; power system stability; power system protection.  
LH: At least four 3-hour sessions per semester.  
PR: ENGI 7844

Faculty of Engineering and Applied Science (cont'd)

**8853 Electrical Engineering Design Project II** continues 7803 and provides an opportunity for senior students to integrate the knowledge that they have acquired through the junior terms and apply it to solving an electrical engineering design problem. Students work in small teams with the assistance of a faculty mentor to complete detailed design, implementation and testing of an electrical engineering system to solve the problem as defined in 7803.

LC: 0

OR: Weekly meetings with project supervisor.

PR: 7803

**8854 Computer Engineering Design Project II** continues 7804 and provides an opportunity for senior students to integrate the knowledge that they have acquired through the junior terms and apply it to solving a computer engineering design problem. Students work in small teams with the assistance of a faculty mentor to complete detailed design, implementation and testing of an computer engineering system to solve the problem as defined in 7804.

LC: 0

OR: Weekly meetings with project supervisor.

PR: 7804

**8863 Introduction to LSI Design.** Introduction to ASICs and ASIC design methodology; basic concepts of digital logic design tools and ASIC technology libraries; partitioning for logic synthesis and VHDL coding; constraining designs, synthesizing, simulation and optimization; design for testability; layout and post-layout optimization and SDF generation; static timing analysis.

LH: At least eight 3-hour sessions per semester.

PR: ENGI 5865

**8879 Digital Communications.** Review of baseband transmission and basic digital modulation schemes, detection (optimum receiver, matched filter, correlator), error performance, intersymbol interference (ISI), equalization, the concept of information and entropy, source coding including Huffman coding and linear predictive coding, channel coding including block and convolutional error correcting codes, modulation and coding trade-offs, bandwidth and power efficiency.

PR: ENGI 6871

**8894 Real-time Operating Systems.** Real-time process scheduling; memory and device management; I/O communications; real-time systems; operating system and hardware concurrency issues; kernel architectures; device drivers; and a survey of available real-time operating systems and embedded platforms.

PR: ENGI 7894

Faculty of Engineering and Applied Science (cont'd)

**8903 Mechanical Systems.** Mechanical systems design. System simulation, control, and optimization. Design optimization and system performance evaluation. Design case studies. Equipment for overall system design.  
PR: ENGI 4901, ENGI 6901

**8911 Corrosion and Corrosion Control Forms of Corrosion** The electrochemical nature of the corrosion process. The mixed potential theory – Pourbaix Diagrams and Evans diagrams. Corrosion testing, control use by use of materials, selection, cathodic protection, inhibitors, and coatings. Case studies of selected corrosion problems.  
LH: At least five 3-hour sessions per semester  
PR: ENGI 7911

**8926 Mechanical Design Project II** is the second of two capstone design courses in the Mechanical Discipline. Building on skills acquired in the first, student teams each choose a unique design challenge and then proceed to generate a solution. The problem statements are often drawn from industry and, where possible, interdisciplinary interaction is encouraged (for example, with business, computer science, or other engineering disciplines). In most cases, the problem proponent will act as the “client” and the team is expected to manage the client interaction process as well. Significant emphasis is placed on both oral and written communication of both the process and results. Wherever possible, each system or a critical component of it, will be prototyped and tested.  
LC: scheduled as required  
LH: scheduled as required  
PR: ENGI 7926

**8933 Fatigue and Fracture Mechanics** is an introduction to Fatigue and fracture analysis of metallic components, Failure mechanisms, fracture mechanisms, effects of cracks, notches, collapse; linear elastic fracture mechanic analysis; design of components to avoid fracture; fatigue crack propagation, fracture initiation, crack arrest; fracture toughness measurements.  
PR: ENGI 5931

**8935 Pressure Component Design.** Traditional design methods; load types; sustained, cyclic, impact; failure modes and mechanisms; incremental collapse; plastic shakedown; upper bound and lower bound approximations; low cycle fatigue; rational design procedures; case studies: cylinders; plates; shells.  
PR: ENGI 5931

Faculty of Engineering and Applied Science (cont'd)

**8937 Machine Dynamics.** Review of Newton's Law, planar rigid body kinematics and kinetics. Three-dimensional kinematics and kinetics: orientation angles, rotation matrices, Euler's Equations. Lagrange's and Hamilton's Equations, constraints. Dynamic simulation of linkages, mechanism loads, balancing, engine dynamics. Three lecture hours / week. Student analysis project.

LH: At least eight 1-hour sessions per semester

PR: ENGI 3934, 4932, 6933

**8945 Production & Operations Management.** Overview of production and operations management; decision making and operations strategy; Process design and improvement, process flow analysis/simulation, capacity planning; Design of value chains, lean systems, plant layout and process planning; Operating value chains, MIS systems, inventory and resource management; Relevant computer laboratory exercises.

PR: ENGI 6904

**8964 Fluid Structure Interactions Fluids** can interact with structures and cause them to vibrate. These vibrations can be transient or they can take the form of instability or resonance. The course deals with the following fluid structure interactions: (1) Flow Induced Vibration of Structures (2) Unsteady Flow in Pipe Networks (3) Water Wave Interactions with Structures.

LH: At least three 3-hour sessions per semester

PR: ENGI 5961, ENGI 6961, ENGI 6933"

118.4 Policy on Academic Accommodations for Students with Disabilities

A memo dated 10 May 2006 was received from the Senate Committee on Undergraduate Studies regarding the proposed Policy on Academic Accommodations for Students with Disabilities. Following a careful review, that Committee forwarded the proposed Policy to Senate for consideration with several reservations which were outlined in the above-noted memorandum.

In a memo dated May 31, 2006, to the Executive Committee of Senate, Dr. Lilly Walker, Dean of Student Affairs and Services, responded to the reservations of the Senate Committee on Undergraduate Studies. Following a question and answer period, the motion that the proposed Policy on Academic Accommodations for Students with Disabilities be forwarded to the Board of Regents for consideration, which was moved by Dr. Walker, seconded by Professor Kuester, carried.

119. REPORT OF THE COMMITTEE ON COMMITTEES

On behalf of the Committee on Committees, Mr. Collins presented the Report of the Committee. The motion that the following appointments be approved to standing committees of Senate which was moved by Mr. Collins, seconded by Dr. Wolinetz, carried.

<b>Committee on Course Evaluations</b>	<b>Member until August 31</b>
Bruce Mann (Education)	2009
<b>Committee on Educational Technology</b>	<b>Member until August 31</b>
Vernon Curran (Medicine)	2009
Janet Goosney (Library)	2009
<b>Committee on Research</b>	<b>Member until August 31</b>
Karem Azmy (Earth Sciences)	2009
George Rose (Marine Institute)	2009
<b>Committee on Undergraduate Studies</b>	<b>Member until April 31</b>
*Danine Farquharson (English)	2009

\*Senate concurred with a recommendation from the Committee on Committees and agreed to waive the regulation which states that candidates must be "...beyond their first year in the University..." in respect to Dr. Danine Farquharson, who will meet that requirement on September 1, 2006, as per Clause II.C.1.(a) and Clause VI.C.2.(a) of the Senate Handbook of By-Laws and Procedures.

120. REMARKS FROM THE CHAIR - QUESTIONS/COMMENTS FROM SENATORS

- Dr. Meisen noted that since Senate last met on May 9, 2006, ten outstanding convocations/graduation sessions have been held. These include one session of Convocation held on May 12, 2006 at Sir Wilfred Grenfell College, eight sessions held on May 24, 25 and 26, 2006 at the St. John's campus and one graduation exercise held on June 9, 2006 at the Marine Institute.
- On May 30 and 31, 2006, the University conducted its first academic leadership development program.
- A group of Icelandic educators are visiting the University to learn more about our educational system while at the same time enabling educators at Memorial to learn more about the Icelandic system.
- On June 8, 2006, the Elaine Dobbin Centre for Autism held its grand opening. The facility is available to those afflicted by autism in order for them to find respite and to interact with clinicians and researchers who are in close proximity at the Health Sciences Centre.



Remarks from the Chair (cont'd)

- Since July 1, 2006 will commemorate the 90<sup>th</sup> anniversary of the battle of Beaumont Hamel, the President reported that, on behalf of the University, he and the Chancellor, Dr. John Crosbie, will attend the functions associated with the commemoration. Dr. Meisen noted that members of the Newfoundland Regiment, as it currently exists, will also be attending the ceremonies.

In response to a question from Shannon Sullivan regarding the Campus Plan Update, Dr. Meisen noted that the two plans, one for the St. John's campus and one for the Sir Wilfred Grenfell College, are expected to be ready in the early Fall.

With respect to Dr. Harris' question regarding the status of a feasibility study commissioned by the Provincial Department of Education to examine the governance structure for Sir Wilfred Grenfell College, Dr. Meisen reported that a release date for the report has not been issued.

Dr. Rourke remarked that having attended many convocations at different universities, he observed that convocation ceremonies at Memorial were well done and he offered his congratulations to the organizing officials.

Dr. Ashton reminded Senators that at a meeting held on March 14, 2006, when Dr. Holly Pike gave a presentation to Senate on Sir Wilfred Grenfell College, she noted that the College was in the process of preparing a newsletter. Today, Dr. Ashton announced that the newsletter *Grenfell Connects*, is now available and that Senators would be receiving a copy.

121. ITEM FOR INFORMATION

121.1 The Executive Committee of Senate upheld the following appeal:

ECS 2005-06: #5 - Appeal against the decision of the Senate Committee on Undergraduate Studies to deny a request to have a late Work Report for Work Term 1 of the Bachelor of Commerce (Co-operative) degree program accepted and graded.

122. ADJOURNMENT

The President wished Senators a very happy, prosperous, restful and productive summer.

The meeting adjourned at 6:05 p.m.

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CHAIRMAN

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SECRETARY