

2006-2007 PROGRAM GUIDE

SCHOOL OF ENGINEERING

University of Guelph

(Revised February 2007)

This program guide was revised to address changes to Program Electives and typos in the previous version.

Effective Summer 2007, the Bachelor of Science in Engineering [B.Sc.(Eng)] program name will be changed to Bachelor of Engineering (B.Eng.). All students with an active status in the Engineering Program after the Summer Convocation of 2007 will be switched from B.Sc.(Eng) to B.Eng., regardless of when they entered the program.

All students accepted into the B.Eng. Program for Fall 2006 or Winter 2007 must follow this program guide throughout their entire engineering program.

Helpful Hints:

The best way to plan ahead and keep track of your course requirements is to follow your Program Guide. Students are not permitted to mix and match courses with program guides from previous or subsequent calendar years.

Any curriculum changes and/or academic announcements will be sent to you via your uoguelph email account and will be posted on the School of Engineering (SOE) website, <http://www.soe.uoguelph.ca>.

The University of Guelph Calendar outlines important deadlines, rules and regulations, procedures for academic consideration and appeals, and continuation of study: (http://www.uoguelph.ca/undergrad_calendar/03.shtml).

It Is Your Responsibility:

- to maintain your uoguelph email account and to read all official university correspondence; and,
- to read and understand all academic rules, regulations, procedures and important deadlines as printed in the current academic calendar.

You should also verify with other departments and course instructors, as required, to ensure that courses listed herein continue to be offered and are not cancelled or rescheduled.

The University reserves the right to change without notice any information contained in this Program Guide, including regulations for admission, continuation of study, course offerings and provision of facilities.

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PART A: UNDERGRADUATE REGULATIONS, RESPONSIBILITIES

Accreditation and Becoming a Professional Engineer

In Canada, “Engineer” and “Professional Engineer” are titles restricted by law to those people who have demonstrated their competence and have been licensed in a provincial or territorial Association of Professional Engineers (in Quebec, Ordre des ingenieurs du Quebec). To practice engineering in Canada, it is mandatory to have earned the Professional Engineer (P.Eng.) designation by registering with your provincial or territorial association.

The Canadian Engineering Accreditation Board (CEAB) is a standing committee of the Canadian Council of Professional Engineers (CCPE) that is responsible for accrediting Canadian undergraduate engineering programs that meet or exceed educational standards for professional engineering registration in Canada. All B.Eng. degree programs at the University of Guelph are accredited by the CEAB. As a graduate from a Canadian accredited undergraduate engineering program, you will be eligible to register as a member of the Professional Engineering Association in the province where you live and work. Requirements for post-graduation experience may vary from province to province.

In Ontario, the Professional Engineers Ontario (PEO) requires four years of acceptable engineering experience upon graduation and successful completion of the Professional Practice Exam on engineering law and ethics. You may apply for your Professional Engineer (P.Eng.) license immediately after graduation or any time thereafter. Most students arrange to write the Professional Practice Exam soon after graduation while the material is still fresh in their minds.

Applicants can also earn up to 12 months work experience during the completion of their engineering degree through co-operative education or summer employment. The quality of the pre-graduation work experience will be measured against five quality-based criteria. Only pre-graduation work experience acquired after the mid-point of your undergraduate program is eligible for credit.

To facilitate a better understanding of the PEO, a Student Membership Program (SMP) for undergraduate students has been initiated by the School of Engineering at the University of Guelph. The School of Engineering encourages all students become SMP members. This membership is provided free of charge by the PEO. For more information about becoming a PEO student member, please contact the Engineering Society (EngSoc) at extension 58549, Dr. Richard G. Zytner, P.Eng. (rzytner@uoguelph.ca), or log onto: www.engineeringstudents.peo.on.ca.

For information on obtaining a P.Eng. license, writing the Professional Practice Exam, or pre-graduation work experience contact the PEO.

Professional Engineers Ontario

1000-25 Sheppard Ave. W.
North York, Ontario
M2N 6S9
Phone: (416) 224-1100
Fax: (416) 224-8168
Website: www.peo.on.ca

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School of Engineering Code of Ethics

The School of Engineering has adopted the Engineering Code of Ethics. Please refer to the School of Engineering Website for more information <http://www.soe.uoguelph.ca/academic/>.

Academic Misconduct

As per the definition in the University Calendar, (http://www.uoguelph.ca/undergrad_calendar/c08/c08-amisconduct.shtml), "Academic misconduct is behaviour that erodes the basis of mutual trust on which scholarly exchanges commonly rest, undermines the University's exercise of its responsibility to evaluate students' academic achievements, or restricts the University's ability to accomplish its learning objectives."

The University takes a serious view of academic misconduct and will severely penalize students, faculty and staff who are found guilty of offences associated with academic dishonesty, misrepresentation of personal performance, restrictions of equal opportunities for access to scholarly resources, and damage to the integrity of scholarly exchanges.

It is the responsibility of University of Guelph faculty, students, and staff to be aware of what constitutes academic misconduct and to do as much as possible to prevent such offences from occurring. Furthermore, all members of the community, students, faculty and staff have the specific responsibility of initiating appropriate action in all instances where academic misconduct is believed to have taken place."

Offences

Please refer to the University Calendar for definition of academic misconduct offences http://www.uoguelph.ca/undergrad_calendar/c08/sec_d0e6554.shtml

Penalties

In accordance with the University Calendar, (http://www.uoguelph.ca/undergrad_calendar/c08/sec_d0e6619.shtml), if a student is found guilty of academic misconduct, one or more of the following penalties may be assessed:

- Partial or total loss of marks for the course in which the offence occurred.
- The rescinding of University-funded scholarships or bursaries.
- Suspension from the University for a period of two to six consecutive semesters.
- A recommendation for expulsion from the University.
- A recommendation for revocation/rescinding of a degree.

For further information regarding Academic Misconduct refer to:

http://www.uoguelph.ca/undergrad_calendar/08-amisconduct.shtml

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Entrance Requirements

The following secondary school credits are required for application to the BSc(Eng) program:

English (ENG4U)

Calculus (MCB4U)

2 credits from: Biology (SBI4U), Chemistry (SCH4U) or Physics (SPH4U)

2 additional 4U or 4M credits

Physics and Chemistry are strongly recommended. Applicants who lack one of these credits will be required to take a replacement credit.

Although you may be admitted to the B.Eng. Program without Physics or Chemistry, you will need both credits to proceed into the first year Physics and Chemistry courses. If you are lacking Physics, Chemistry or any other required secondary school credit, you must complete the non-credit replacement courses during your first semester of the program. Please speak with the Engineering Program Counsellor as soon as possible if you are missing any of the entrance requirements.

Transfer (Advanced Standing) Students

Many students transfer into the B.Eng. Program from other universities, colleges or careers. Most students enter the program with advanced standing (credit transfers or exemptions). The time required to complete your Engineering degree will depend on your outstanding course requirements, course availability (i.e. fall, winter, spring course offerings) and potential time table conflicts.

You should consult the Engineering Program Counsellor for an explanation of your credit transfers and conditions of admission and for help in selecting courses. Requests for credit transfers in addition to those included in your offer of admission must be made by the end of your first semester. Forms to request additional credit transfers are available from the Engineering Program Counsellor.

Co-operative Education Program

The co-operative education program offers an excellent opportunity to develop your technical and personal skills in the professional world. Participants work four semesters (out of the five available work semesters) alternated with eight academic semesters as indicated in the schedule below.

Year	September-December	January-April	May-August
1	Semester 1	Semester 2	Off
2	Semester 3	Semester 4	Work Semester
3	Semester 5	Work Semester	Work Semester
4	Semester 6	Semester 7	Work Semester
5	Work Semester	Semester 8	Graduate!

Students can enter the co-op program directly from secondary school or can be admitted, depending on space availability, after completion of Semester 2. Please consult Dr. Bob Dony, P.Eng. or the Engineering Program Counsellor for more information about co-op programs or refer to the Co-operative Education website: <http://www.soe.uoguelph.ca/Prospective/coop.htm>

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Undergraduate Minor Degrees

Students majoring in the B.Eng. Program can add a minor from almost any degree program offered by the University of Guelph. Minors can be added at any time, however, if you plan to add one of the two Engineering Minors, you must do so before enrolling in ENGG*3100 in Semester 6. If you select a Minor degree program outside of Engineering, please contact the respective Program Counsellor for the program you have chosen. A list of program counsellors can be found at the following website:
http://www.uoguelph.ca/uaic/students_counsellors.shtml

The minor program you follow must correspond to the same calendar year you began your Engineering Major. For example, if you began your Engineering degree in Fall 2005 and you add a minor in 2007, the program of study for the minor must follow the 2005/06 academic calendar.

Please see the academic calendar for more details on Minor Degree Programs
http://www.uoguelph.ca/undergrad_calendar/c10/index.shtml

How To Apply For A Minor Degree

You can obtain an "Undergraduate Schedule of Studies Change Request" Form from the Registrar's Office on the 3rd floor. Both the B.Eng. Program Counsellor and the Program Counsellor of the Minor program must sign the form prior to you submitting the form to the Registrar's Office on the 3rd Floor.

Academic Requirements

To stay in the Engineering program, all students must follow the Continuation of Study model outlined in Section VIII -Undergraduate Degree Regulations and Procedures in the University of Guelph Calendar:
http://www.uoguelph.ca/undergrad_calendar/c08/index.shtml

To continue studying at the University of Guelph, you must satisfy the conditions set in Schedule 1 or Schedule 2. Most students who are admitted directly from secondary school follow Schedule 1, whereas students who transfer or are re-admitted generally follow Schedule 2. Please refer to the University Calendar for further explanation or consult the Engineering Program Counsellor if you are unsure of which Schedule of Studies you are to follow:
http://www.uoguelph.ca/undergrad_calendar/c08/c08-contstudy.shtml

To qualify for your B.Eng. degree you must complete all of the required courses and elective courses as listed in the curriculum of this Program Guide. To graduate, you must receive a minimum of 23.5 credits and achieve a minimum cumulative average of 60% in all ENGG courses. Refer to Section VIII - Undergraduate Degree Regulations and Procedures in the University of Guelph Calendar for an explanation of the conditions for graduation. It is your responsibility to know if you have met the graduation requirements. If you are unsure of the academic requirements or need clarification, please consult with the Engineering Program Counsellor.
http://www.uoguelph.ca/undergrad_calendar/c08/c08-gradn.shtml

3rd-Failure Rule

Students will be ineligible to continue in the Engineering Program and will not be readmitted to Engineering if the same course is failed three times. If you have failed a course three times and your continuation of study status is either eligible to continue or probationary, your enrolment status will be changed to non-degree. If you are eligible to continue, you may apply for admission to another degree offered by the University through the Admissions Department provided you meet the minimum admissions requirements. Students are advised to meet with the Program Counsellor for the degree program for which they wish to apply before making an application.

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Supplemental Privilege

Students are normally permitted only one supplemental privilege during their studies. A supplemental privilege may be granted for 3000 or 4000 level courses by the Academic Review Committee provided the course failure impacts the time line for graduation.

NOTE: Supplemental privileges are granted at the discretion of the Academic Review Committee, affording a student who has received a failing grade on the original course attempt, the opportunity to obtain credit for the course while retaining the original failing grade.

Academic Standing

Eligible to Continue (ETC)

A student who satisfies the program requirements for continuation of study will be eligible to continue. Students that are ETC may register for courses on-line (via Webadvisor), provided they meet the prerequisite requirements.

Probationary (P)

A student who does not satisfy the program requirements for continuation of study will be allowed to continue in their program if granted probationary status (see Continuation of Study in this section).

Required to Withdraw (RTW)

A student who does not satisfy the program requirements for continuation of study will be required to withdraw from the University for a minimum of two semesters (see Continuation of Study in this section). Students who do not satisfy the program requirements may appeal to the Academic Review Committee for probationary status to be granted based on medical, psychological or compassionate grounds.

Readmission to a program at the University of Guelph is not automatic. Students who are required to withdraw must apply for readmission to the University after completing the minimum two semesters of rustication (student is unable to register for courses at Guelph during the two semesters). A student who has been required to withdraw and who has made an appeal for probationary status to the Academic Review Committee will not be allowed to attend classes until such time that the appeal is granted.

Students who have been required to withdraw, and wish to reapply to Engineering must meet the conditions for substantial upgrading as outlined on the School of Engineering website:
http://www.soe.uoguelph.ca/academic/entrance_req_withdraw.htm

For further information regarding Academic Standing, please refer to the University Calendar:
http://www.uoguelph.ca/undergrad_calendar/08-astanding.shtml.

Course Prerequisites

The majority of courses offered by the School of Engineering have course prerequisites. As such, you need to obtain credit in the prerequisite course or courses before you are allowed to enrol in the subsequent course.

A student wishing to enrol in a course for which he/she does not have credit for the stated course prerequisite(s), may request permission from the Course Instructor to have the prerequisite(s) waived. The student seeking the waiver must obtain a "Course Requisite/Restriction Waiver" form, request it to be signed by the instructor and submit the completed form to Undergraduate Program Services for processing. Waiver forms are available from Undergraduate Program Services, Office of Registrarial Services, Level 3, University Centre.

The decision to sign a waiver rests with the individual Course Instructor. However, the School has

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recommended to all faculty that prerequisites be strictly enforced. One exception to this recommendation is for transfer students where extenuating circumstances exist. This does not mean that transfer students are guaranteed that the waiver form will be signed. The Course Instructor still makes a decision on an individual basis.

Dropping a Course

Courses must be dropped by the end of the fortieth (40th) class day. Students wishing to drop a course after the fortieth (40th) class day must appeal to the Academic Review Committee. Please note that there is NO guarantee that your request will be granted. Please refer to the section of the University Calendar, for a description on grounds for Academic Consideration. Forms for Academic Consideration may be picked up at the Registrar's office on the 3rd floor of the UC. Please note the deadlines for Academic Appeals are listed in Section III- Schedule of Dates in the University Calendar:
http://www.uoguelph.ca/undergrad_calendar/c03/index.shtml

It is important to remember that if you drop a course, you may not have the prerequisite for a subsequent course.

Engineering Academic Counselling

Academic counselling is available to you throughout your career at the University of Guelph. You are encouraged to take the initiative and seek advice from the Engineering Academic Program Counsellor and Faculty on many occasions, such as if...

- You are experiencing personal difficulties which are affecting your courses
- Your marks are low even though you have been working hard
- You feel that proper procedures aren't being followed in one of your classes
- You wish to appeal a grade or decision
- You wish to withdraw temporarily or permanently
- You are not sure which courses to select
- You wish to transfer programs or take courses at another institution
- You have been ill and missed assignments, labs or exams.

B.Eng. Academic Program Counsellor

Kim Thompson, P.Eng.

Room 202 Thornbrough (Engineering) Building

Phone: 519-824-4120 ext 56986, Fax: 519-836-0227

E-mail: engcouns@uoguelph.ca

Please make an appointment when possible to ensure that you are seen by the Program Counsellor.

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University Services

Counselling Services

The University also provides a broad range of on campus programs, services and resources to help students deal with any academic and personal issues. We want to provide you with all the necessary resources to ensure your success at Guelph!

Counsellors and therapists from a variety of backgrounds provide support to students who are experiencing problems of a personal nature. Counselling offers you the opportunity to talk to a counsellor to explore, understand and work through personal issues and meet your goals. Students may seek personal or group counselling to deal with issues such as adjusting to university life, interpersonal difficulties, relationships, stress management, depression, eating concerns or bereavement. Counselling Services is located on Level 3 in the University Centre or at ext. 53244.

Learning and Writing Services

The goal of Learning and Writing Services is to promote excellence in learning and writing across the university curriculum and into the world of work. A broad range of services is provided for undergraduate services including workshops, seminars, non-credit courses, individual consultations, printed resources and on-line services. Learning and writing seminars which may be of interest to engineering students include:

- Lab Report Writing,
- Essay Writing in the Sciences,
- Referencing in the Sciences,
- Learning in the Sciences,
- Preparing for Science Exams,
- Time Management, and
- Controlling Procrastination.

Learning and Writing Services is located in the Learning Commons on the first floor of the Library.

The Learning Commons

The Learning Commons is a consortium that links together the Library, Teaching Support Services and Learning & Writing Services, as well as other partners on campus. With student learning at its focus, Guelph's Learning Commons consolidates services related to teaching, learning, writing, research, and information and computer literacy into one area. The Learning Commons is located on the first floor of the McLaughlin Library, in the south-west corner behind the CCS computer pool.

The Tutor Connection

This service was developed for students to serve as a centralized information registry. The service connects students who wish to tutor with other students seeking academic assistance in specific subject areas. To participate in this service, students interested in tutoring or being tutored should go to the Connection Desk on Level 3 in the University Centre or log on using your central login at:

<http://www.slcs.uoguelph.ca/information/tutor/>

Stress Management and High Performance Clinic

Programs offered include Relaxation and Stress Management Skills, Preventing Repetitive Strain at Computer Tasks, Better Sleep Program, and examSMART. All classes are taught by Kathy Somers, BSc(HK) who is BCIA certified in Stress Management Education.

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Academic Consideration

The University of Guelph is committed to supporting students in their learning experiences and responding to their individual needs. To this end a broad network of advising, counselling, and support services is provided to assist students in meeting their personal and academic goals. The University is aware that a variety of situations or events beyond the student's control may affect academic performance. Support is provided to accommodate academic needs in the face of personal difficulties or unforeseen events. Procedures for academic appeals are designed to ensure that every effort is made at these times to provide appropriate accommodation and consideration, thus enabling students to complete course and program requirements as quickly as possible.

Knowledge of the procedures, early action on the student's part, timely consultation with the instructor(s) and/or program counsellor, and immediate provision of any required documentation will facilitate a prompt, coordinated institutional response.

The University will consider granting consideration for courses if there are sufficient extenuating medical, psychological or compassionate circumstances. Academic Consideration may take the form of an extended deadline, a deferred privilege, a late drop of a course(s) with or without failure, withdrawal from a semester with or without academic failure, or permission to continue on probationary status. A deferred privilege could take the form of approval to write a missed final examination or the completion of a course requirement after the end of the semester. Academic consideration is granted when acceptable medical, psychological or compassionate circumstances affect any portion of the semester work. Generally, work commitments will not constitute grounds for academic consideration. Depending upon the circumstances and whether the semester work is complete, consideration may be granted by the instructor, the Academic Counsellor or the Academic Review Sub-Committee of the program in which the student is registered (refer to the University Calendar for further details):

http://www.uoguelph.ca/undergrad_calendar/c08/c08-ac-ac.shtml

Grounds for Academic Consideration

Where possible, requests for academic consideration are to be accompanied by supporting documentation. Students unsure of documentation requirements are encouraged to contact their Program Counsellor.

1. Psychological Grounds

For academic consideration based on psychological grounds the student will be asked to provide documentation for the period affected. The necessity for documentation will depend in part upon the length of the problem and the amount of work missed during this time. During the semester, the student should submit this documentation to the Program Counsellor who will then advise the instructor of the need for consideration.

After the semester, the student must apply to the Academic Review Sub-committee for consideration. When the psychological difficulty affects final examinations or final assignments, Counselling Services, upon receipt of student authorization, will send documentation to the Program Counsellor. If the difficulty is of a duration that will affect a number of courses or completion of the semester's work, the student must contact the Program Counsellor for advice and consideration.

2. Compassionate Grounds

Unforeseen circumstances beyond the student's control in either their personal or family life may affect academic performance. The procedure to follow to request academic consideration based on compassionate grounds depends upon the severity of the circumstance and the amount of work missed. During the semester, students may wish to contact the instructor for consideration for missed semester work resulting from a compassionate circumstance. If the circumstance is more significant or if the semester is complete, the student should consult with the Program Counsellor for advice in making an application to the Academic Review Sub-committee. Generally, work commitments will not constitute grounds for academic consideration.

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3. Medical Grounds

For academic consideration based on medical grounds a student may be asked to provide medical documentation for the period of the illness. The necessity for documentation will depend in part upon the length of the illness and the amount of work missed during this time. If the medical situation results in missed semester work during the semester, the student should contact the instructor, presenting medical documentation where warranted. If the absence due to illness is of a duration that will affect a number of courses or completion of the semester's work, the student must contact the Program Counsellor for advice and consideration. When the absence affects final examinations or final assignments the student should go to Student Health Services or a personal physician for documentation. The student must present the medical documentation to the Program Counsellor.

Medical Documentation

If you seek medical attention off-campus, the doctor must complete a School of Engineering Off Campus Medical Form which can be obtained from the SOE Website:
<http://www.soe.uoguelph.ca/academic/index.htm>.

Exclusions

Missing assignment due dates, Midterms and/or Final exams due to sleeping in, faulty alarm clocks, entertainment events, flight or travel plans, vacation and/or misreading course outlines or final exam schedules does not constitute grounds for consideration.

Submission Deadlines

Please refer to Section III-Schedule of Dates of the current University Calendar for Academic Consideration deadlines.

Deferred Final Exams and Deferred Conditions

Students who miss a final exam for an ENGG course or MATH*2270 in the FALL SEMESTER ONLY are granted a deferred condition if appropriate medical documentation is provided. The deferred condition for a missed final exam will be in the form of a two-hour exam to be written during the first week of classes of the subsequent winter semester. Exam schedules for deferred conditions are published on the School of Engineering website:

<http://www.soe.uoguelph.ca/academic/index.htm>. Medical documentation must be submitted to the Program Counsellor before the first week of classes.

Students who are granted deferred exams for courses other than ENGG*XXXX or MATH*2270 from the fall semester, or all courses in the winter or summer semesters will write the exam during the Scheduled Deferred Exam period as notified by the Registrar's office. Deferred exam schedules will be posted on Webadvisor, as required.

Appeals for a missed final exam based upon psychological or compassionate grounds must be submitted to the Registrar's Office on the 3rd floor of the UC by means of the Academic Consideration Process (please refer to the Academic Consideration Section of the University Calendar or Program Guide).

Medical documentation for a missed final exam should always be submitted to the Program Counsellor

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There is NO guarantee that your appeal will be approved

In the absence of sufficient medical documentation the Academic Consideration Committee and/or Engineering Program Counsellor has the right to deny the medical consideration. If you seek medical attention off-campus, the doctor must complete a School of Engineering Off Campus Medical Form which can be obtained from the SOE Website:

<http://www.soe.uoguelph.ca/academic/index.htm>.

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Undergraduate Engineering Scholarships and Awards

Scholarships and awards are available to students with high academic achievement, involved in extra-curricular activities, or who are in financial need. Section IX-Scholarships and Awards in the University Calendar describes every award offered and outlines the eligibility requirements. The awards described below are restricted to only Engineering students. Dr. Valerie Davidson is the Chair of the School of Engineering Awards Committee. Please contact her if you have any questions or wish to apply for any of the following Engineering awards.

Alma Mater B.Sc. Scholarships

Who: All CPES and CBS students finished Semester 6

Criteria: Academic achievement

Value: \$300 (8 available)

Deadline: N/A

CEO Award

Who: Students entering 4th year, one winner per school

Criteria: Academic achievement, extra-curricular activities, financial need

Value: \$500

Deadline: September 31

Helen Grace Tucker Design Awards

Who: Graduating student in each discipline

Criteria: Academic achievement in design courses

Value: \$500 (5 available)

Deadline: N/A

Knut Karl Grimstad Memorial Scholarships

Who: Water Resources engineering students in Semester 6

Criteria: Academic achievement and extra-curricular activities

Value: \$600

Deadline: September 31

Lindsey W. Christie Bursary

Who: Students participating in undergraduate conferences or congresses

Criteria: Financial need

Value: Up to \$1000 annually

Deadline: December 1

PEO Medal

Who: Graduating student

Criteria: Academic achievement

Value: \$100 and medal

Deadline: N/A

PEO Scholarships

Who: Students completing Semester 4 and Semester 6

Criteria: Academic achievement, academic achievement and extra-curricular activities

Value: \$600 (2 available)

Deadline: March 31

Taggart Scholarship in Biological Engineering

Who: Biological engineering students in Semester 6

Criteria: Academic achievement and extra-curricular activities

Value: \$600

Deadline: September 31

PART B: UNDERGRADUATE CURRICULUM REQUIREMENTS

Biological Engineering Program 2006-2007

Semester 1 (Fall) Regular or Co-op

CHEM*1040	[0.50]	General Chemistry I
CIS*1500	[0.50]	Introduction to Programming
ENGG*1100	[0.75]	Engineering and Design I
HIST*1250	[0.50]	Science & Society Since 1500
MATH*1200	[0.50]	Calculus I

Prerequisites

one of 4U Chemistry, OAC Chemistry (or equivalent), CHEM*1060
None
None
None
4U Advanced Functions and Calculus or OAC Calculus

Semester 2 (Winter) Regular or Co-op

CHEM*1050	[0.50]	General Chemistry II
ENGG*1210	[0.50]	Engineering Mechanics I
ENGG*1500	[0.50]	Engineering Analysis
MATH*1210	[0.50]	Calculus II

Prerequisites

CHEM*1040 or IPS*1100
None
Co-requisites ENGG*1210, MATH*1210
1 of MATH*1000, MATH*1080, MATH*1200, IPS*1110 (MATH*1200 or IPS*1110 preferred)
(MATH*1080 or MATH*1200), [1 of 4U Physics, OAC Physics (or equivalent), PHYS*1020]

PHYS*1130 [0.50] Physics With Applications

Semester 3 (Fall) Regular or Co-op

COOP*1100	[0.00]	Intro to Co-operative Education
ENGG*2100	[0.75]	Engineering and Design II
ENGG*2120	[0.50]	Material Science
ENGG*2160	[0.50]	Engineering Mechanics II
ENGG*2400	[0.50]	Engineering Systems Analysis
MATH*2270	[0.50]	Applied Differential Equations
MICR*1020	[0.50]	Fundamentals of Applied Microbiology

Prerequisites

Co-op students only as requirement for entry into the first work term
ENGG*1100, ENGG*1210, ENGG*1500, PHYS*1130, MATH*1200
CHEM*1040, PHYS*1130
ENGG*1210, ENGG*1500, [0.50] credits in Calculus
ENGG*1210, ENGG*1500, MATH*1210, MATH*1200, PHYS*1130,
Co-requisite MATH*2270
ENGG*1500, MATH*1210
4U Biology (or Grade 12 Biology) strongly recommended

Semester 4 (Winter) Regular or Co-op

BIOC*2580	[0.50]	Introductory Biochemistry
ENGG*2230	[0.50]	Fluid Mechanics
ENGG*2450	[0.50]	Network Theory
ENGG*2660	[0.50]	Biological Engineering Systems I
MATH*2130	[0.50]	Numerical Methods
STAT*2120	[0.50]	Probability and Statistics for Engineers

Prerequisites

CHEM*1050 or CHEM*2300
ENGG*1210, MATH*1210
PHYS*1130, ENGG*2400
MATH*2270, MICR*1020, ENGG*2400, Co-requisite BIOC*2580
1 of MATH*1010, MATH*1210, MATH*2080, IPS*1210
1 of MATH*1010, MATH*1210, MATH*2080, IPS*1210

Semester 5 (Fall) Regular or Co-op

ENGG*3240	[0.50]	Engineering Economics
ENGG*3260	[0.50]	Thermodynamics
ENGG*3450	[0.50]	Electrical Devices
ENGG*3160	[0.50]	Biological Engineering Systems II
ENGG*3170	[0.50]	Biomaterials
	[0.50]	Restricted Elective

Prerequisites

MATH*1210, MATH*2270, ENGG*2450, ENGG*2400
ENGG*2230, CHEM*1040, MATH*2270, ENGG*2400, ENGG*2450
ENGG*2450
ENGG*2660, ENGG*2230
ENGG*2120

Semester 6 (Winter) Reg or Semester 7 (Winter) Co-op

ENGG*3100	[0.75]	Engineering and Design III
ENGG*3410	[0.50]	Systems and Control Theory
ENGG*3430	[0.50]	Heat and Mass Transfer
	[1.00]	Restricted Electives

Prerequisites

ENGG*2100 (ENGG*2160 or ENGG*2150), ENGG*2230,
ENGG*2400, ENGG*2660, ENGG*3260, must be enrolled in B.Eng.
Program. Student must have a minimum cumulative average of
60% in ALL ENGG courses.
ENGG*2400, MATH*2270, Co-requisite ENGG*2450
ENGG*2230, ENGG*3260, MATH*2270

Semester 7 (Fall) Regular or Semester 6 (Fall) Co-op

ENGG*4390	[0.75]	Bio-Instrumentation Design
	[2.75]	Restricted Electives

Prerequisites

ENGG*3450

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Biological Engineering Program 2006-2007

Semester 8 (Winter) Regular or Co-op

ENGG*4110 [1.00] Biological Engineering Design IV

ENGG*4280 [0.75] Digital Process Control Design
[1.00] Restricted Electives

Prerequisites

All 1000 and 2000 level core credits plus ENGG*3100. Must be enrolled in the B.Eng. Program. This course must be taken in the final semester with a maximum of 3.25 credits. Admission to the course is by instructor's permission in the semester prior to the course offering. Student must have a minimum cumulative average of 60% in ALL ENGG courses.

ENGG*3410

Biological Engineering Electives

Biological engineering students must complete the following restricted electives. You can take these courses where Restricted Electives are indicated in the schedule of courses. **A maximum of three 1000 level electives is allowed.**

[1.00] credits in Biological Engineering Electives in List 1

[1.00] credits in Life Sciences Electives in List 2

[0.75] credits in required Biological Engineering Design Elective in List 3

[2.00] credits in Complementary Studies Electives in List 11

[0.50] credits in Free Elective*

* Free Elective

The following courses cannot be used as free electives. The material is redundant for Biological Engineering students.

MATH*2150 Applied Matrix Algebra

NOTE: The Biological Engineering Program offers two streams for further specialization. These two streams are: Bio-Process (P), Bio-Medical (M). If a student wishes to strengthen their knowledge in a particular specialization, the student is encouraged to take all 1.0 credits from one stream. Streams have been noted beside each elective course. For example, courses denoted (M) are Biomedical related courses are: ENGG*3150, ENGG*4660, HK*4070, HK*4240, HK*4670. Students are also free to mix and match between streams.

List 1: Biological Engineering Electives (1.0 Credit)

ENGG*3180 [0.50] Air Quality	(ENGG*2560 or ENGG*2660), ENGG*2230, Co-requisite ENGG*3260
ENGG*3590 (0.50) Water Quality (P)	ENGG*2230, (BIOL*1040 or MICR*1020), STAT*2120, ENGG*2560
ENGG*3830 (0.50) Bio-Process Engineering (P)	ENGG*2230, ENGG*2660, Co-requisite ENGG*3260
ENGG*4340 [0.50] Solid & Hazardous Waste Management (P)	ENGG*2560 or ENGG*2660
ENGG*4380 [0.75] Bioreactor Design	ENGG*3160
FOOD*3160 [0.75] Food Processing I (P)	(FOOD*2620, MICR*2030) or ENGG*2660
FOOD*3170 [0.50] Food Processing II (P)	FOOD*3160
FOOD*4400 [0.50] Dairy Processing(P)	BIOC*2580, FOOD*2150, MICR2030

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List 1 (Continued): Biological Engineering Electives (1.0 Credit)

FOOD*4520 [0.50] Cereal Technology (P)	BIOC*2580
FOOD*4070 [0.50] Food Packaging (P)	8.00 credits in science or engineering or (FOOD*2010, FOOD*2410, FOOD*2420)
ENGG*3150 [0.50] Engineering Biomechanics (M)	ENGG*2160
ENGG*3390 (0.5) Signal Processing (M)	ENGG*2400
ENGG*4660 (0.50) Medical Imaging Processing (M)	ENGG*3390
ENGG*2410 Digital Systems Design Using Description Languages	(CIS*1650 or CIS*1500), CIS*1900, PHYS*1130
ENGG*3640 Microcomputer Interfacing	ENGG*2410, Co-requisite ENGG*3390
HK*4070 [0.50] Clinical Biomechanics (M)	ENGG*2660 or (HK*2270, HK*3600)
HK*4240 [0.75] Occupational Biomechanics and Ergonomics (M)	1 of ENGG*1210, HK*3270, (HK*2270, HK*3600)
HK*4610 [0.50] Health and Injury Biomechanics	ENGG*3150 or HK*2270

List 2: Life Science Electives (1.0 Credit)

BIOC*3560 (0.5) Structure and Function in Biochemistry	BIOC*2580
BIOM*2000 [0.50] Concepts of Physiology	None
BIOM*3100 [0.50] Mammalian Physiology I	BIOC*2580
BIOM*3090 (0.50) Principles of Pharmacology and Toxicology	BIOC*2580, (BIOM*3100 OR HK 3940), co-requisite if BIOM*3100 taken, BIOM*3110
BIOM*4090 (0.50) Pharmacology	BIOM*3090
CHEM*2700 (0.50) Organic Chemistry I	CHEM*1050
CHEM*3360 [0.50] Environmental Chemistry & Toxicology	CHEM*1050; Equates: TOX*3360
CHEM*3750 (0.50) Organic Chemistry II	CHEM*2700
FOOD*2150 [0.50] Introduction to Nutritional and Food Sciences	BIOL*1040, (CHEM*1040 or CHEM*1300); Equates: NUTR*2150
FOOD*2400 [0.50] Introduction to Food Chemistry	CHEM*1040
FOOD*3010 [0.5] Food Chemistry	BIOC *2580
FOOD*3230 [0.75] Food Microbiology	MICR*1020 or MICR*2030
FOOD*3260 [0.50] Industrial Microbiology	MICR*1020 or MICR*2030
HK*2270 [0.50] Principles of Human Biomechanics	PHYS*1000 or PHYS*1080
HK*3600 (0.5) Applied Human Biology	HK*2270, co-requisite HK*3940
HK*3940 [1.25] Human Physiology	BIOL*2210

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List 2 (Continued): Life Science Electives (1.0 Credit)

MBG*2000 [0.50] Introductory Genetics	4 credits including BIOL*1040
MBG*2020 [0.50] Introductory Molecular Biology	BIOC*2580, MBG*2000
MBG*4080 [0.50] Molecular Genetics	MBG*2020
MICR*4180 [0.50] Microbial Processes in Environmental Management	BIOC*2580, BIOL*1040

List 3: Biological Engineering Design Electives (0.75 Credits)

ENGG*4380 [0.75] Bioreactor Design	ENGG*3160
ENGG*4300 [0.75] Food Processing Engineering Design	ENGG*3260, ENGG*3830
ENGG*4400 [0.75] Biomechanical Engineering Design	ENGG*2120, ENGG*3170

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Semester 1 (Fall) Regular or Co-op

CHEM*1040	[0.50]	General Chemistry I
CIS*1500	[0.50]	Introduction to Programming
ENGG*1100	[0.75]	Engineering and Design I
HIST*1250	[0.50]	Science & Society Since 1500
MATH*1200	[0.50]	Calculus I

Prerequisites

one of 4U Chemistry, OAC Chemistry (or equivalent), CHEM*1060
None
None
None
4U Advanced Functions and Calculus or OAC Calculus

Semester 2 (Winter) Regular or Co-op

CIS*2500	[0.50]	Intermediate Programming
ENGG*1210	[0.50]	Engineering Mechanics I
ENGG*1500	[0.50]	Engineering Analysis
MATH*1210	[0.50]	Calculus II
PHYS*1010	[0.50]	Introductory Electricity and Magnetism
PHYS*1130	[0.50]	Physics With Applications

Prerequisites

CIS*1500; Equates: CIS*2650
None
Co-requisites ENGG*1210, MATH*1210
1 of MATH*1000, MATH*1080, MATH*1200, IPS*1110 (MATH*1200 or IPS*1110 preferred)
(MATH*1080 or MATH*1200), [1 of 4U Physics, OAC Physics, PHYS*1020]
(MATH*1080 or MATH*1200), [1 of 4U Physics, OAC Physics (or equivalent), PHYS*1020]

Semester 3 (Fall) Regular or Co-op

COOP*1100	[0.00]	Intro to Co-operative Education
CIS*2430	[0.50]	Object Oriented Programming
ENGG*2100	[0.75]	Engineering and Design II
ENGG*2120	[0.50]	Material Science
ENGG*2400	[0.50]	Engineering Systems Analysis
ENGG*2410	[0.50]	Digital Systems Design Using Description Languages
MATH*2270	[0.50]	Applied Differential Equations

Prerequisites

Co-op students only as requirement for entry into the first work term
CIS*2500
ENGG*1100, ENGG*1210, ENGG*1500, PHYS*1130, MATH*1200
CHEM*1040, PHYS*1130
ENGG*1210, ENGG*1500, MATH*1210, MATH*1200, PHYS*1130, Co-requisite MATH*2270
(CIS*1650 or CIS*1500), CIS*1900, PHYS*1130
ENGG*1500, MATH*1210

Semester 4 (Winter) Regular or Co-op

CIS*3110	[0.50]	Operating Systems
ENGG*2230	[0.50]	Fluid Mechanics
ENGG*2450	[0.50]	Network Theory
MATH*2130	[0.50]	Numerical Methods
STAT*2120	[0.50]	Probability and Statistics for Engineers
	[0.50]	Restricted Elective

Prerequisites

(CIS*2500 or CIS*2650), Recommended (CIS*2030 or ENGG*2410)
ENGG*1210, MATH*1210
PHYS*1130, ENGG*2400
1 of MATH*1010, MATH*1210, MATH*2080, IPS*1210
1 of MATH*1010, MATH*1210, MATH*2080, IPS*1210

Semester 5 (Fall) Regular or Co-op

CIS*2520	[0.50]	Data Structures
ENGG*3260	[0.50]	Thermodynamics
ENGG*3390	[0.50]	Signal Processing
ENGG*3450	[0.50]	Electrical Devices
ENGG*3640	[0.50]	Microcomputing Interfacing
	[0.50]	Restricted Elective [1]

Prerequisites

CIS*2500, (CIS*1900 or CIS*1910) co-requisite CIS*2910;
Equate: CIS*2420
ENGG*2230, CHEM*1040, MATH*2270, ENGG*2400, ENGG*2450
ENGG*2400
ENGG*2450
ENGG*2410, Co-requisite ENGG*3390

[1] Students following the Mechatronics Stream in List 4 are strongly encouraged to take ENGG*3380 in Semester 5 of their program due to the possibility of timetable conflicts between ENGG*3380 and core courses in Semester 7. The SOE will make every effort to avoid such conflicts but this cannot be guaranteed.

Semester 6 (Winter) Reg or Semester 7 (Winter) Co-op

ENGG*3100	[0.75]	Engineering and Design III
ENGG*3430	[0.50]	Heat and Mass Transfer
ENGG*3410	[0.50]	Systems and Control Theory
	[1.00] or [1.25]	Restricted Electives [2]

Prerequisites

ENGG*2100, ENGG*2230, ENGG*2400, ENGG*3260, ENGG*3390, must be enrolled in B.Eng. Program. Student must have a minimum cumulative average of 60% in ALL ENGG courses.
ENGG*2230, ENGG*3260, MATH*2270
ENGG*2400, MATH*2270, co-requisite ENGG*2450

[2] If ENGG*3490 [0.75] is selected from List 5 to meet the Engineering Design Elective Requirement, then the elective count will total 1.25 in Semester 6. Otherwise, the elective count for Semester 6 will be 1.0 credit. The Engineering Design Elective ENGG*4390 [0.75] can be taken in Semester 7 (or) ENGG*3490 in Semester 8.

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Semester 7 (Fall) Regular or Semester 6 (Fall) Co-op

ENGG*3240	[0.50]	Engineering Economics
ENGG*4420	[0.75]	Real-time Systems Design
ENGG*4450	[0.50]	Large-Scale Software Architecture Engineering
	[1.00] or [1.25]	Restricted Electives [3]

Prerequisites

MATH*1210, MATH*2270, ENGG*2450, ENGG*2400
 CIS*3110
 (CIS*2420 or CIS*2520), ENGG*2100

[3] If ENGG*4390 [0.75] is selected from List 5 to meet the Engineering Design Elective Requirement, then the elective count will total 1.25 in Semester 7. Otherwise, the elective count for Semester 7 will be 1.0 credits. The Engineering Design Elective, ENGG*3490 [0.75] can be taken in either Semester 6 or Semester 8.

Semester 8 (Winter) Regular or Co-op

ENGG*4120	[1.00]	Engineering Systems and Computing Design IV
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Prerequisites

All 1000 and 2000 level core credits plus ENGG*3100. Must be enrolled in the B.Eng. Program. This course must be taken in the final semester with a maximum of 3.25 credits. Admission to the course is by instructor's permission in the semester prior to the course offering. Student must have a minimum cumulative average of 60% in ALL ENGG courses.
 ENGG*3410

ENGG*4280	[0.75]	Digital Process Control Design
	[1.00] or [1.25]	Restricted Electives [see note

4]

[4] If ENGG*3490 [0.75] is selected from List 5 to meet the Engineering Design Elective Requirement, then the elective count will total 1.25 in Semester 8. Otherwise, the elective count for Semester 8 will be 1.0 credits. The Engineering Design Elective ENGG*3490 [0.75] can be taken in Semester 6 (or) ENGG*4390 in Semester 7.

Engineering Systems & Computing Restricted Electives

Engineering Systems & Computing students must complete the following restricted electives. You can take these courses where Restricted Electives are indicated in the schedule of courses. **A maximum of three 1000 level electives is allowed.**

[1.50] credits in ES&C Engineering Electives in List 4
 [0.75] credits in ES&C Engineering Design Electives in List 5
 [2.00] credits in Complementary Studies electives in List 11

NOTE: The ES&C Program offers three streams for further specialization. These three streams are: Mechatronics (M), Biomedical (B), and Computing (C). If a student wishes to strengthen their knowledge in a particular specialization, the student is encouraged to take all 2.25 credits from one stream. Streams have been noted beside each elective course. For example, Courses denoted (M) are Mechatronics related courses: ENGG*3380, ENGG*4430, ENGG*4460 and ENGG*3490. Students are also free to mix and match between streams.

List 4: ES&C Engineering Electives (1.50 Credits)

ENGG*3380 [0.50]	Computerized Organization and Design (M)	ENGG*2410
ENGG*4430 [0.50]	Neuro-Fuzzy and Soft Computing Systems (M)	ENGG*3410, Co-requisite ENGG*4280
ENGG*4460 [0.50]	Robotic Systems (M)	ENGG*1500, ENGG*2400
ENGG*4660 [0.50]	Medical Image Processing (B)	ENGG*3390
HK*2270 [0.50]	Principles of Human Biomechanics	PHYS*1000 or PHYS* 1080
BIOM*2000 [0.50]	Concepts of Physiology (B)	None

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List 4 (Continued): ES&C Engineering Electives (1.50 Credits)

BIOM*3000 Mammalian Neuroanatomy (B)	1 of BIOL*1040, PSYC*2410, equivalent
PSYC*2390 Principles of Sensation and Perception (B)	PSYC*1100
PSYC*2410 Behavioural Neuroscience (B)	PSYC*1100
CIS*2750 Software Systems Development and Integration (C)	CIS*2520, CIS*2430 Restriction(s): CIS*2450
CIS*3750 System Analysis and Design in Applications (C)	CIS*2750 Restriction(s): CIS*3430
CIS*3490 The Analysis and Design of Computer Algorithms (C)	(CIS*2520 or CIS*2420), (CIS*2910 or CIS*1900)
CIS*3530 Data Base Systems and Concepts (C)	(CIS*2520 or CIS*2420), (CIS*2450 or CIS*2750)
CIS*4760 Computer Vision and Pattern Recognition (C)	CIS*3110, (CIS*2450 or CIS*2750), STAT*2040
CIS*3210 Computer Networks (C)	CIS*3110 Restriction(s): CIS*4200
CIS*4210 Telecommunications (C)	CIS*3210 Restriction(s): CIS*4200
CIS*4300 Human Computer Interaction (C)	CIS*3110, (CIS*3750 or CIS*3430)
CIS*4800 Computer Graphics (C)	CIS*3110, (CIS*3750 or CIS*3430)

List 5: ES&C Engineering Design Electives (0.75 Credits)

ENGG*3490 [0.75] Introduction to Mechatronic Systems Design (M)	ENGG*3450, Co-requisite: ENGG*3410 Restriction: ENGG*3400
ENGG*4390 [0.75] Bio-Instrumentation Design (B)	ENGG*3450

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Semester 1 (Fall) Regular or Co-op

CHEM*1040	[0.50]	General Chemistry I
CIS*1500	[0.50]	Introduction to Programming
ENGG*1100	[0.75]	Engineering and Design I
HIST*1250	[0.50]	Science & Society Since 1500
MATH*1200	[0.50]	Calculus I

Prerequisites

one of 4U Chemistry, OAC Chemistry (or equivalent), CHEM*1060
None
None
None
4U Advanced Functions and Calculus or OAC Calculus

Semester 2 (Winter) Regular or Co-op

CHEM*1050	[0.50]	General Chemistry II
ENGG*1210	[0.50]	Engineering Mechanics I
ENGG*1500	[0.50]	Engineering Analysis
MATH*1210	[0.50]	Calculus II

Prerequisites

CHEM*1040 or IPS*1100
None
Co-requisites ENGG*1210, MATH*1210
1 of MATH*1000, MATH*1080, MATH*1200, IPS*1110 (MATH*1200 or IPS*1110 preferred)
(MATH*1080 or MATH*1200), [1 of 4U Physics, OAC Physics (or equivalent), PHYS*1020]

PHYS*1130 [0.50] Physics With Applications

Semester 3 (Fall) Regular or Co-op

COOP*1100	[0.00]	Intro to Co-operative Education
ENGG*2100	[0.75]	Engineering and Design II
ENGG*2120	[0.50]	Material Science
ENGG*2400	[0.50]	Engineering Systems Analysis
MATH*2270	[0.50]	Applied Differential Equations
	[0.50]	Restricted Elective

Prerequisites

Co-op students only as requirement for entry into the first work term
ENGG*1100, ENGG*1210, ENGG*1500, PHYS*1130, MATH*1200
CHEM*1040, PHYS*1130
ENGG*1210, ENGG*1500, MATH*1210, MATH*1200, PHYS*1130,
Co-requisite MATH*2270
ENGG*1500, MATH*1210

One of:

BIOL*1030	[0.50]	Biology I [1]
MICR*1020	[0.50]	Fundamentals of Applied Microbiology [1]

4U Biology (or Grade 12 Biology) strongly recommended
4U Biology (or Grade 12 Biology) strongly recommended

[1] If BIOL*1030 is chosen instead of MICR*1020 as the core requirement in Semester 3, then BIOL*1040 must be taken in Semester 4 as the Life Science Elective from List 6. Note that BIOL*1030 does NOT equate to MICR*1020. Therefore, BIOL*1030 alone will not be sufficient to graduate; students must take BIOL*1040.

If MICR*1020 is chosen instead of BIOL*1030 as the core requirement in Semester 3, then BIOL*1040 is not required in Semester 4. Students may select any Life Science Elective from List 6 except BIOL*1040.

NOTE: BIOL*1040 is a prerequisite for many courses in List 7 (Science and Engineering Electives). Therefore, choices from List 7 will be reduced if MICR*1020 is selected in place of the BIOL*1030/1040 sequence.

Semester 4 (Winter) Regular or Co-op

ENGG*2230	[0.50]	Fluid Mechanics
ENGG*2450	[0.50]	Network Theory
ENGG*2560	[0.50]	Environmental Engineering Systems
MATH*2130	[0.50]	Numerical Methods
STAT*2120	[0.50]	Probability and Statistics for Engineers

Prerequisites

ENGG*1210, MATH*1210
PHYS*1130, ENGG*2400
CHEM*1050, MATH*2270
1 of MATH*1010, MATH*1210, MATH*2080, IPS*1210
1 of MATH*1010, MATH*1210, MATH*2080, IPS*1210

One of:

BIOL*1040	[0.50]	Biology II
or,	[0.50]	Restricted Elective if MICR*1020 is selected in Semester 3

BIOL*1030

Semester 5 (Fall) Regular or Co-op

ENGG*3240	[0.50]	Engineering Economics
ENGG*3260	[0.50]	Thermodynamics
ENGG*3180	[0.50]	Air Quality
ENGG*3590	[0.50]	Water Quality
ENGG*3650	[0.50]	Hydrology
	[0.50]	Restricted Elective

Prerequisites

MATH*1210, MATH*2270, ENGG*2450, ENGG*2400
ENGG*2230, CHEM*1040, MATH*2270, ENGG*2400, ENGG*2450
(ENGG*2560 or ENGG*2660), ENGG*2230, Co-requisite ENGG*3260
ENGG*2230, (MICR*1020 or BIOL*1040), STAT*2120, ENGG*2560
(ENGG*2230 or MET*2030), (MATH*1210 or MATH*2080),
(STAT*2120 or STAT*2040) and competency in computing

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Environmental Engineering Program 2006-2007

Semester 6 (Winter) Reg or Semester 7 (Winter) Co-op

ENGG*3100 [0.75] Engineering and Design III

ENGG*3410 [0.50] Systems and Control Theory
 ENGG*3430 [0.50] Heat and Mass Transfer
 ENGG*3470 [0.50] Mass Transfer Operations
 [1.00] Restricted Electives

Prerequisites

ENGG*2100, ENGG*2230, ENGG*2400, ENGG*3260, (ENGG*3360 or ENGG*3180), ENGG*3590, ENGG*3650, must be enrolled in B.Eng. Program. Student must have a minimum cumulative average of 60% in all ENGG courses.
 ENGG*2400, MATH*2270, Co-requisite ENGG*2450
 ENGG*2230, ENGG*3260, MATH*2270
 ENGG*2230, ENGG*3260, MATH*2270, Co-requisite ENGG*3430

Semester 7 (Fall) Regular or Semester 6 (Fall) Co-op

ENGG*3670 [0.50] Soil Mechanics
 ENGG*4330 [0.75] Air Pollution Control
 ENGG*4340 [0.50] Solid & Hazardous Waste Management
 ENGG*4370 [0.75] Urban Water Systems Design
 [0.50] Restricted Elective

Prerequisites

ENGG*2120, ENGG*2230
 ENGG*3180, ENGG*3260
 ENGG*2560 or ENGG*2660
 ENGG*2230, ENGG*3650

Semester 8 (Winter) Regular or Co-op

ENGG*4130 [1.00] Biological Engineering Design IV

ENGG*4260 [0.75] Water & Wastewater Treatment Design
 GEOL*3060 [0.50] Groundwater
 [0.50] Restricted Elective

Prerequisites

All 1000 and 2000 level core credits plus ENGG*3100. Must be enrolled in the B.Eng. Program. This course must be taken in the final semester with a maximum of 3.25 credits. Admission to the course is by instructor's permission in the semester prior to the course offering. Student must have a minimum cumulative average of 60% in ALL ENGG courses.
 ENGG*3100, ENGG*3590
 1 of MATH*1000, MATH*1080, MATH*1200, IPS*1110

Environmental Engineering Electives

Environmental engineering students must complete the following restricted electives. You can take these courses where Restricted Electives are indicated in the schedule of courses. **A maximum of three 1000 level electives is allowed.**

[0.50] credits in Life Science Electives in List 6

Note: If BIOL*1030 is selected instead of MICR*1020 in Semester 3, then BIOL*1040 MUST be taken as the List 6 elective requirement.

[0.50] credits in Science and Engineering Electives in List 7

[2.00] credits in Complementary Studies Electives in List 11

[0.50] credits in Free Elective*

*Free Elective

The following courses can not be used as free electives. The material is redundant for Environmental Engineering students.

CHEM*2820 Thermodynamics and Kinetics
 CHEM*2880 Physical Chemistry
 CHEM*3360 Environmental Chemistry and Toxicology
 GEOG*3620 Desert Environments
 GEOL*3190 Environmental Water Chemistry
 MATH*2150 Applied Matrix Algebra
 PHYS*1600 Contemporary Astronomy
 SOIL*3070 Environmental Soil Physics
 SOIL*3080 Soil and Water Conservation
 TOX*3360 Environmental Chemistry and Toxicology

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List 6: Life Science Electives (0.5 Credits)

BIOC*2580 [0.50] Introductory Biochemistry	CHEM*1050 or CHEM*2300
BIOL*1030 [0.50] Biology I	4U Biology (or Grade 12 Biology) strongly recommended
BIOL*1040 [0.50] Biology II [1]	BIOL*1030
ENVB*3040 [0.50] Natural Chemicals in the Environment	BIOL*1040
BIOM*2000 [0.50] Concepts of Physiology	None
CHEM*2060 [0.50] Structure and Bonding	CHEM*1050, MATH*1210, PHYS*1010
CHEM*2300 [0.50] Chemical Reactivity	CHEM*1050 or CHEM*1310
CHEM*2480 [0.50] Analytical Chemistry	1 of CHEM*1050, CHEM*1310, IPS*1200
CHEM*2700 [0.50] Organic Chemistry	CHEM*1050
GEOG*2000 [0.50] Geomorphology	1 of GEOG*1300, GEOG*1350, GEOL*1000, GEOL*1100
GEOG*2110 [0.50] Climate and the Biophysical Environment	GEOG*1300 or GEOG*1350
GEOG*2210 [0.50] Environment and Resources	GEOG*1220 is recommended
GEOG*2420 [0.50] Aerial-Photo Interpretation	0.50 credits in geography and/or earth science
MET*2030 [0.50] Meteorology and Climatology	1 of PHYS*1000, PHYS*1070, PHYS*1080, PHYS*1110, PHYS*1130, MET*2020
SOIL*2120 [0.50] Introduction to Environmental Stewardship	NONE
SOIL*3050 [0.50] Land Utilization	1 of AGR*2301/2, AGR*2320, GEOG*1300, GEOL*1000, SOIL*2010
SOIL*3080 [0.50] Soil and Water Conservation	1 of AGR*2301/2, AGR*2320, SOIL*2010
SOIL*3200 [0.50] Environmental Soil Biology	10.0 credits including AGR*2301/2 or SOIL*2010
SOIL*3600 [0.50] Remote Sensing	10.0 credits (recommend 1 of GEOG*2420, AGR*2320, AGR*2301/2, SOIL*2010)
SOIL*4090 [0.50] Soil Management	1 of AGR*2301/2, AGR*2320, SOIL*2010
STAT*3510 [0.50] Environmental Risk Assessment	1 of (IPS*1110, MATH*1000, MATH*1080, MATH*1200), (STAT*2050 or STAT*2250)
TOX*2000 [0.50] Principles of Toxicology	(CHEM*1050 or CHEM*2300), (MATH*1080 or equivalent), (BIOL*1040 or equivalent), (CHEM*2300 may be taken concurrently)

- [1] **BIOL*1040 must be taken as the Life Science Elective if BIOL*1030 is taken in Semester 3. Students who select MICR*1020 in Semester 3 can choose any course from List 6 exception BIOL*1040 as their Life Science Elective.**

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List 7: Science and Engineering Electives (0.5 Credits)

BIOC*2580 [0.50] Introductory Biochemistry	CHEM*1050 or CHEM*2300
BIOL*3450 [0.50] Introduction to Aquatic Environments	BIOL*1040, (CHEM*1050 or CHEM*1310), ZOO*2070 is strongly recommended
BIOL*2060 [0.50] Ecology	BIOL*1040
BIOL*2210 [0.50] Introductory Cell Biology	BIOL*1040
BIOL*3110 [0.50] Population Ecology	(MATH*1080 or MATH*1200), STAT*2040
BIOM*2000 [0.50] Concepts of Physiology	None
BOT*2000 [0.50] Plants, Biology and People	BIOL*1040
BOT*2050 [0.50] Plant Ecology	BIOL*1040 or BOT*1150
BOT*2100 [0.50] Life Strategies Of Plants	BIOL*1040
BOT*3310 [0.50] Plant Growth and Development	BIOL*1040
BOT*3410 [0.50] Plant Anatomy	BIOL*1040 or BOT*1150
CHEM*2060 [0.50] Structure and Bonding	CHEM*1050, MATH*1210, PHYS*1010
CHEM*2300 [0.50] Chemical Reactivity	CHEM*1050 OR CHEM*1310
CHEM*2480 [0.50] Analytical Chemistry	1 of CHEM*1050, CHEM*1310, IPS*1200
CHEM*2700 [0.50] Organic Chemistry	CHEM*1050
CIS*2500 [0.50] Programming II	CIS*1500; Equates: CIS*2650
CROP*2110 [0.50] Crop Ecology	BIOL*1040
CROP*2280 [0.50] Crops in Land Reclamation	NONE
ENGG*2160 [0.50] Engineering Mechanics II	ENGG*1210, ENGG*1500, [0.50] credits in Calculus
ENGG*3170 [0.50] Biomaterials	ENGG*2120
ENGG*3340 [0.50] Geographic Information Systems in Environmental Engineering	(CIS*1500 or CIS*1600), (1 of MATH*1000, MATH*1080, MATH*1200)
ENGG*3450 [0.50] Electrical Devices	ENGG*2450
ENGG*3830 [0.50] Bio-Process Engineering	ENGG*2230, ENGG*2660, Co-Requisite ENGG*3260
ENGG*4250 [0.50] Watershed Systems Design	ENGG*2230, ENGG*3650
ENGG*4280 [0.50] Digital Processing Control Design	ENGG*3410
ENGG*4360 [0.75] Soil-Water Conservation Systems Design	ENGG*2230, ENGG*3650, ENGG*3670
ENVB*2010 [0.50] Food Production and the Environment	2.50 credits
ENVB*2030 [0.50] Current Issues in Forest Science	BIOL*1040

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List 7 (Continued): Science and Engineering Electives (0.5 Credits)

ENVB*2040 [0.50] Plant Health and the Environment	BIOL*1040
ENVB*3030 [0.50] Pesticides and the Environment	BIOL*1040, (CHEM*1040 or CHEM*2300)
ENVB*3040 [0.50] Natural Chemicals in the Environment	BIOL*1040
FOOD*2010 [0.50] Principle of Food Science	NONE
FOOD*2150 [0.50] Introduction to Nutritional and Food Science	BIOL*1040, (CHEM*1040 OR CHEM*1300); Equates: NUTR*2150
FOOD*2400 [0.50] Introduction to Food Chemistry	CHEM*1040
FOOD*2410 [0.50] Introduction to Food Processing	CHEM*1040, (BIOL*1040 or MICR*1020)
FOOD*2420 [0.50] Introduction to Food Microbiology	MICR*1020 or BIOL*1040
GEOG*2000 [0.50] Geomorphology	1 of GEOG*1300, GEOG*1350, GEOL*1000, GEOL*1100
GEOG*2110 [0.50] Climate and the Biophysical Environment	GEOG*1300 or GEOG*1350
GEOG*2210 [0.50] Environment and Resources	GEOG*1220 is recommended
GEOG*2420 [0.50] Aerial-Photo Interpretation	0.50 credits in geography and/or earth science
GEOG*3480 [0.50] GIS and Spatial Analysis	10 credits, including GEOG*2480
MATH*4430 [0.50] Advanced Numerical Methods	MATH*2130 (MATH*2150 or MATH*2160), MATH*2200, (MATH*2170 or MATH*2270)
MET*2030 [0.50] Meteorology and Climatology	1 of PHYS*1000, PHYS*1070, PHYS*1080, PHYS*1110, PHYS*1130, MET*2020
MICR*2020 [0.50] Microbial Interactions and Associations	BIOL*1040 or equivalent
MICR*2030 [0.50] Microbial Growth	BIOL*1040
MICR*3220 [0.50] Plant Microbiology	BIOL*1040
MICR*4140 [0.50] Soil Microbiology and Biotechnology	BIOL*1040, BIOC*2580
MICR*4180 [0.50] Microbial Processes in Environmental Management	BIOL*1040, BIOC*2580
MBG*2000 [0.50] Introductory Genetics	4 credits including BIOL*1040
POPM*3240 [0.50] Epidemiology	BIOL*1040, STAT*2040
SOIL*2120 [0.50] Introduction to Environmental Stewardship	NONE
SOIL*3050 [0.50] Land Utilization	1 of AGR*2301/2, AGR*2320, GEOG*1300, GEOL*1000, OIL*2010
SOIL*3080 [0.50] Soil and Water Conservation	1 of AGR*2301/2, AGR*2320, SOIL*2010
SOIL*3200 [0.50] Environmental Soil Biology	10.0 credits including AGR*2301/2 or SOIL*2010

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Environmental Engineering Program 2006-2007

List 7 (Continued): Science and Engineering Electives (0.5 Credits)

SOIL*3600 [0.50] Remote Sensing	10.0 credits (recommend 1 of GEOG*2420, AGR*2301/2, AGR*2320, SOIL*2010)
SOIL*4090 [0.50] Soil Management	1 of AGR*2301/2, AGR*2320, SOIL*2010
STAT*3100 [0.50] Introductory Mathematical Statistics	(MATH*1210 or IPS*1210), (STAT*2040 or STAT*2100)
STAT*3510 [0.50] Environmental Risk Assessment	(1 of IPS*1110, MATH*1000, MATH*1080, MATH*1200) (STAT*2050 or STAT*2250)
TOX*2000 [0.50] Principles of Toxicology	(CHEM*1050 or CHEM*2300), (MATH*1080 or equivalent), (BIOL*1040 or equivalent), (CHEM*2300 may be taken concurrently)
ZOO*2050 [0.50] Natural History of Ontario	BIOL*1040 or equivalent
ZOO*2070 [0.50] Invertebrate Zoology	BIOL*1040
ZOO*2100 [0.50] Development Biology	BIOL*1040
ZOO*2090 [0.50] Vertebrate Structure and Function	BIOL*1040

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Semester 1 (Fall) Regular or Co-op

CHEM*1040	[0.50]	General Chemistry I
CIS*1500	[0.50]	Introduction to Programming
ENGG*1100	[0.75]	Engineering and Design I
HIST*1250	[0.50]	Science & Society Since 1500
MATH*1200	[0.50]	Calculus I

Prerequisites

one of 4U Chemistry, OAC Chemistry (or equivalent), CHEM*1060
None
None
None
4U Advanced Functions and Calculus or OAC Calculus

Semester 2 (Winter) Regular or Co-op

CHEM*1050	[0.50]	General Chemistry II
ENGG*1210	[0.50]	Engineering Mechanics I
ENGG*1500	[0.50]	Engineering Analysis
MATH*1210	[0.50]	Calculus II
PHYS*1130	[0.50]	Physics With Applications

Prerequisites

CHEM*1040 or IPS*1100
None
Co-requisites ENGG*1210, MATH*1210
1 of MATH*1000, MATH*1080, MATH*1200, IPS*1110
(MATH*1200 or IPS*1110 preferred)
(MATH*1080 or MATH*1200), [1 of 4U Physics, OAC Physics (or equivalent), PHYS*1020]

Semester 3 (Fall) Regular or Co-op

COOP*1100	[0.00]	Intro to Co-operative Education
ENGG*2100	[0.75]	Engineering and Design II
ENGG*2120	[0.50]	Material Science
ENGG*2400	[0.50]	Engineering Systems Analysis
GEOG*2000	[0.50]	Geomorphology [1]
MATH*2270	[0.50]	Applied Differential Equations
MICR*1020	[0.50]	Fundamentals of Applied Microbiology

Prerequisites

Co-op students only as requirement for entry into the first work term
ENGG*1100, ENGG*1210, ENGG*1500, PHYS*1130, MATH*1200
CHEM*1040, PHYS*1130
ENGG*1210, ENGG*1500, MATH*1210, MATH*1200,
PHYS*1130, Co-requisite MATH*2270
1 of GEOG*1300, GEOG*1350, GEOL*1000, GEOL*1100
ENGG*1500, MATH*1210
4U Biology (or Grade 12 Biology) strongly recommended

[1] Note that Webadvisor will not allow you to register for this course if you lack the GEOG prerequisite. Prerequisite waivers may be obtained from the Registrars Office on the 3rd floor of the UC and must be signed by the Course Instructor.

Semester 4 (Winter) Regular or Co-op

ENGG*2230	[0.50]	Fluid Mechanics
ENGG*2450	[0.50]	Network Theory
ENGG*2550	[0.50]	Water Management
ENGG*2560	[0.50]	Environmental Engineering Systems
MATH*2130	[0.50]	Numerical Methods
STAT*2120	[0.50]	Probability and Statistics for Engineers

Prerequisites

ENGG*1210, MATH*1210
PHYS*1130, ENGG*2400
GEOG*2000, (CHEM*1040 or CHEM*1310)
CHEM*1050, MATH*2270
1 of MATH*1010, MATH*1210, MATH*2080, IPS*1210
1 of MATH*1010, MATH*1210, MATH*2080, IPS*1210

Semester 5 (Fall) Regular or Co-op

ENGG*3240	[0.50]	Engineering Economics
ENGG*3260	[0.50]	Thermodynamics
ENGG*3590	[0.50]	Water Quality
ENGG*3650	[0.50]	Hydrology
ENGG*3670	[0.50]	Soil Mechanics
	[0.50]	Restricted Elective

Prerequisites

MATH*1210, MATH*2270, ENGG*2450, ENGG*2400
ENGG*2230, CHEM*1040, MATH*2270, ENGG*2400,
ENGG*2450
ENGG*2230, (MICR*1020 or BIOL*1040), STAT*2120,
ENGG*2560
(ENGG*2230 or MET*2030), (MATH*1210 or MATH*2080),
(STAT*2120 or STAT*2040) and competency in computing
ENGG*2120, ENGG*2230

Semester 6 (Winter) Reg or Semester 7 (Winter) Co-op

ENGG*3100	[0.75]	Engineering and Design III
ENGG*3430	[0.50]	Heat and Mass Transfer
GEOL*3060	[0.50]	Groundwater
	[1.50]	Restricted Electives

Prerequisites

ENGG*2100, ENGG*2230, ENGG*2400, ENGG*3260,
ENGG*3590, ENGG*3650, must be enrolled in B.Eng. Program.
Student must have a minimum cumulative average of 60% in ALL
ENGG courses.
ENGG*2230, ENGG*3260, MATH*2270
1 of MATH*1000, MATH*1080, MATH*1200, IPS*1110

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Semester 7 (Fall) Regular or Semester 6 (Fall) Co-op

ENGG*4250	[0.75]	Watershed Systems Design
ENGG*4360	[0.75]	Soil-Water Conservation Systems Design
ENGG*4370	[0.75]	Urban Water Systems Design
ENGG*3340	[0.50]	Geographic Information Systems in Environmental Engineering
	[0.50]	Restricted Elective

Prerequisites

ENGG*2230, ENGG*3650
ENGG*2230, ENGG*3650, ENGG*3670
ENGG*2230, ENGG*3650
(CIS*1500 or CIS*1600), (1 of MATH*1000, MATH*1080, MATH*1200)

Semester 8 (Winter) Regular or Co-op

ENGG*4130	[1.00]	Water Resources Engineering Design IV
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Prerequisites

All 1000 and 2000 level core credits plus ENGG*3100. Must be enrolled in the B.Eng. Program. This course must be taken in the final semester with a maximum of 3.25 credits. Admission to the course is by instructor's permission in the semester prior to the course offering. Student must have a minimum cumulative average of 60% in ALL ENGG courses.

[1.50] Restricted Electives

Water Resources Engineering Electives

Water resources engineering students must complete the following restricted electives. You can take these courses where Restricted Electives are indicated in the schedule of courses. **A maximum of three 1000 level electives is allowed.**

[1.00] credits in Water Resources Engineering Electives in List 8

[0.50] credits in Environmental Resources Elective in List 9

[0.50] credits in Water Resources Elective in List 10

[2.00] credits in Complementary Studies Electives in List 11

List 8: Water Resources Engineering Electives (1.0 Credit)

ENGG*3410 [0.50] Systems and Control Theory	ENGG*2400, MATH*2270, co-requisite ENGG*2450
ENGG*3450 [0.50] Electrical Devices	ENGG*2450
ENGG*4260 [0.75] Water and Wastewater Treatment	ENGG*3100, ENGG*3590
ENGG*4340 [0.50] Solid & Hazardous Waste Management	ENGG*2560 or ENGG*2660

List 9: Environmental Resources Electives (0.50 Credits)

BIOL*1020 [0.50] Introduction to Biology	None
BIOL*2060 [0.50] Ecology	BIOL*1040
BIOL*3450 [0.50] Introduction to Aquatic Environments	BIOL*1040, (CHEM*1050 or CHEM*1310), Z00*2070 is strongly recommended
CHEM*3360 [0.50] Environmental Chemistry and Toxicology	CHEM*1050; Equates: TOX*3360
GEOG*1300 [0.50] Introduction to the Biophysical Environment	None
GEOG*3210 [0.50] Management of the Biophysical Environment	7.50 credits including GEOG*2210
GEOG*4210 [0.50] Environmental Resource Analysis	GEOG*3210

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List 9 (Continued): Environmental Resources Electives (0.50 Credits)

MICR*4180 [0.50] Microbial Processes in Environmental Management	BIOC*2580, BIOL*1040
ZOO*4350 [0.50] Biology of Polluted Waters	BIOL*3450

List 10: Water Resources Elective (0.50 Credits)

GEOG*2420 [0.50] Aerial-photo Interpretation	0.50 credit in geography and/or earth science
GEOG*2480 [0.50] Cartographic Methods	5.00 credits
GEOG*3000 [0.50] Fluvial Processes	GEOG*2000, (GEOG*2460 or STAT*2040)
GEOG*4150 [0.50] Sedimentary Processes	GEOG*3000
MET*2020 [0.50] Agrometeorology	BIOL*1020 or BIOL*1030
MET*2030 [0.50] Meteorology and Climatology	1 of PHYS*1000, PHYS*1070, PHYS*1080, PHYS*1110, PHYS*1130, MET*2020
SOIL*2010 [0.50] Soil Science	None
SOIL*3050 [0.50] Land Utilization	1 of AGR*2301/2, AGR*2320, GEOG*1300, GEOL*1000, SOIL*2010
SOIL*3070 [0.50] Environmental Soil Physics	1 of MATH*1080, AGR*2301/2, SOIL*2010
SOIL*3100 [0.50] Resource Planning Techniques	SOIL*3050
SOIL*3600 [0.50] Remote Sensing	10.00 credits (recommend: 1 of GEOG*2420, AGR*2301/2, AGR*2320, SOIL*2010)

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Complementary Electives List

Professional engineers often face complex situations involving sociological, political and economic factors in addition to technical and technological problems. Recognition of the human aspects is so important that special attention should be paid to the humanities, social sciences and to areas of administrative studies. As an engineering student at the University of Guelph, you should strive to become aware of the role of professional engineers in society and the contribution engineering makes to the economic, social and cultural aspirations of society. In the Complementary Elective courses, along with ENGG*3240 Engineering Economics and HIST*1250 Science & Society Since 1500 in the core curriculum, you should gain an understanding of:

- The nature of the human and natural environment and the impact of technology on it;
- The function and roles of individuals, organizations, business and governments in shaping our society and its values;
- The ethical and legal responsibilities, guidelines and constraints within which the Engineering profession functions, and;
- Effective communication within the profession and society at large

You are strongly advised to carefully plan your Complementary Elective courses so as to ensure that some maturity is attained in the elective area of study. Advice may be obtained from Program Counsellors in each of the Departments and Schools of the University.

You must select [2.00] credits from the Complementary Electives in List 11. You must select two courses from one of the three sub-lists (11a, 11b or 11c) and one course from each of the remaining sub-lists. Refer to the University Calendar for prerequisites, class hours and the semester(s) courses are offered. It is your responsibility to contact the relevant department to check the flexibility of the prerequisites and course availability. Prerequisite waivers are at the discretion of the course instructor only.

List 11a: Central Issues

GEOG*1200 [0.50] Society and Space
GEOG*1220 [0.50] Human Impact on the Environment
GEOG*2210 [0.50] Environment and Resources
GEOG*3020 [0.50] Global Environmental Change
GEOG*3050 [0.50] Development and the City
GEOG*3210 [0.50] Management of the Biophysical Environment
IDEV*2010 [0.50] International Development Studies
ISS*2500 [0.50] Management in Organizations
POLS*1500 [0.50] World Politics
POLS*2080 [0.50] Development and Underdevelopment
POLS*2200 [0.50] International Relations
POLS*2250 [0.50] Public Administration
POLS*2300 [0.50] Canadian Government
POLS*3080 [0.50] Politics of Latin America
POLS*3110 [0.50] Politics of Ontario
POLS*3250 [0.50] Public Policy: Challenges and Prospects
POLS*3270 [0.50] Local Government in Ontario
REXT*3080 [0.50] Technology in Extension
REXT*4020 [0.50] Rural Extension in Change and Development

List 11b: Methodologies

AGEC*2220 [0.50] Financial Accounting*
AGEC*2230 [0.50] Management Accounting*
AGEC*2700 [0.50] Survey of Natural Resource Economics
AGEC*4360 [0.50] Marketing Research

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* NOTE: Course may be restricted by the AGECE Department. A waiver form may be required by the instructor for registration.

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List 11b: Methodologies (Continued)

AGEC*4410 [0.50] Sales and Sales Management
MCS*1000 [0.50] Introductory Marketing
MCS*2600 [0.50] Fundamentals of Consumer Behaviour
MCS*3010 [0.50] Quality Management
MCS*3040 [0.50] Business and Consumer Law
ECON*1050 [0.50] Introductory Microeconomics
ECON*1100 [0.50] Introductory Macroeconomics
ECON*2000 [0.50] Contemporary Economic Problems in Canada
ECON*2100 [0.50] Economic Growth and Environmental Quality
ECON*2200 [0.50] Industrial Relations
ECON*2310 [0.50] Intermediate Microeconomics
ECON*2410 [0.50] Intermediate Macroeconomics
EDRD*3550 [0.50] Economic Development for Rural and Smaller Communities
HTM*2150 [0.50] Introduction to Canadian Business Management
POLS*1400 [0.50] Public Management and Administration
POLS*3370 [0.50] Environmental Policy Formation and Administration
REXT*2000 [0.50] Intro to Rural Extension
REXT*3000 [0.50] Program Development and Evaluation
REXT*3040 [0.50] Communication Process and Administration
REXT*3060 [0.50] International Communication
REXT*4100 [0.50] Leadership Development in Rural Organization
SOIL*2120 [0.50] Introduction to Environmental Stewardship
ZOO*4050 [0.50] Natural Resources Policy

List 11c: Social Sciences

ANTH*1150 [0.50] Introduction to Anthropology
ANTH*2160 [0.50] Social Anthropology
ANTH*3400 [0.50] The Anthropology of Gender
ARTH*xxxx All Art History courses
ENGL*1200 [0.50] Reading the Contemporary World
ENGL*1410 [0.50] Major English Writers
ENGL*2200 [0.50] Postcolonial Literatures
FREN*2020 [0.50] France: Literature and Society
FREN*2060 [0.50] Québec: Literature and Society
GERM*2240 [0.50] Germany Through the Ages
GERM*2590 [0.50] Classics of German Literature
FRHD*1010 [0.50] Human Development
HIST*xxxx All History courses
ISS*3420 [0.50] Women Social and Political Theorists
MUSC*2620 [0.50] Music History: Classical and Romantic Eras
NUTR*1010 [0.50] Nutrition and Society
PHIL*1000 [0.50] Introductory Philosophy: Major Texts
PHIL*1010 [0.50] Social and Political Issues
PHIL*1050 [0.50] Introductory Philosophy: Basic Problems
PHIL*2030 [0.50] Philosophy of Medicine
PHIL*2060 [0.50] Philosophy of Feminism
PHIL*2070 [0.50] Philosophy of the Environment
PHIL*2100 [0.50] Critical Thinking
PHIL*2120 [0.50] Ethics
PHIL*2130 [0.50] Philosophy of Religion
PHIL*2180 [0.50] Philosophy of Science
PHIL*3230 [0.50] Issues in Social and Political Philosophy
PSYC*1100 [0.50] Principles of Behaviour
PSYC*1200 [0.50] Dynamics of Behaviour
PSYC*2310 [0.50] Intro to Social Psychology
PSYC*2330 [0.50] Principles of Learning
SOC*1100 [0.50] Sociology
SOC*2010 [0.50] Canadian Society
SOC*2070 [0.50] Social Deviance

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List 11c: Social Sciences (Continued)

SOC*2080 [0.50] Rural Sociology
SOC*2090 [0.50] Urban Sociology
SOC*2280 [0.50] Society and Environment
SOC*3380 [0.50] Society and Nature
SOC*3410 [0.50] Individual and Society
WMST*xxxx [0.50] All Women's Studies courses
UNIV*3250 [0.50] Environmental Perspectives and Human Choices II

International Exchange Programs

Students are encouraged to consult their program counsellor and the Centre for International Students to investigate exchange program opportunities. Course Approval prior to departing on an exchange is required. Courses such as HUMM*3150 The Theory of the Seventh Art and UNIV*3150 Architecture and Art of Paris have been approved by the SOE Curriculum Committee as complementary elective for the Paris Semester program.

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Engineering Minors

You must be registered in the BSc(Eng) program to take either of these minor programs. Declaration of these minors must be done prior to entering Semester 6 because ENGG*3100 and your final design project (ENGG*41XX) will require the application of both your minor and major programs. In addition, you must notify the course instructor of ENGG*3100 and your final design (41XX) advisor within the first week of class, that you are enrolled in an Engineering minor. Courses that you take for the minors will be counted towards the appropriate elective areas in your major program.

Environmental Engineering Minor

A minor in Environmental Engineering may be obtained by taking additional courses:		Prerequisites
ENGG*2560	[0.50] Environmental Engineering Systems	CHEM*1050, MATH*2270
OR		
ENGG*2660	[0.50] Biological Engineering Systems	MATH*2270, MICR*1020, ENGG*2400, Co-requisite BIOC*2580
ENGG*3180	[0.50] Air Quality	ENGG*2230, (ENGG*2560 or ENGG*2660), Co-requisite ENGG*3260
ENGG*3590	[0.50] Water Quality	ENGG*2230, ENGG*2560, (BIOL*1040 or MICR*1020), STAT*2120
ENGG*4260	[0.75] Water and Wastewater Treatment Design	ENGG*3100, ENGG*3590
BIOC*2580	[0.50] Introductory Biochemistry	CHEM*1050 or CHEM*2300
CHEM*3360	[0.50] Environmental Chemistry and Toxicology	CHEM*1050; Equates: TOX*3360
GEOG*1300	[0.50] Intro to the Biophysical Environment	None
MICR*1020	[0.50] Fundamentals of Applied Microbiology	4U Biology (or Grade 12 Biology) strongly recommended
MICR*4180	[0.50] Microbial Processes in Environmental Management	BIOC*2580, BIOL*1040
One of:		ENGG*2230, ENGG*3260, MATH*2270, Co-requisite ENGG*3430
ENGG*3470	[0.50] Mass Transfer Operations	ENGG*3180, ENGG*3260
ENGG*4330	[0.75] Air Pollution Control	ENGG*2560 or ENGG*2660
ENGG*4340	[0.50] Solid & Hazardous Waste Management	

You must select an environmental application for your final design project in your major program.

Food Engineering Minor

A minor in Food Engineering may be obtained by taking additional courses:		Prerequisites
AGEC*2220	[0.50] Financial Accounting	1 of ENGG*3240, ECON*1050, ECON*1100, ECON*1210
BIOC*2580	[0.50] Introductory Biochemistry	CHEM*1050 or CHEM*2300
ENGG*2660	[0.50] Biological Engineering Systems I	MATH*2270, MICR*1020, ENGG*2400, Co-requisite BIOC*2580
ENGG*3830	[0.50] Bio-Process Engineering	ENGG*2230, ENGG*2660, Co-requisite ENGG*3260
FOOD*2150	[0.50] Intro to Nutritional and Food Sciences	BIOL*1040, (CHEM*1040 or CHEM*1300); Equates: NUTR*2150
MICR*1020	[0.50] Fundamentals of Applied Microbiology	4U Biology (or Grade 12 Biology) strongly recommended
One Of:		
ENGG*4380	[0.75] Bio Reactor Design	ENGG*3160
ENGG*4300	[0.75] Food Processing Engineering Design	ENGG*3260, ENGG*3830
Two of:		
MCS*3010	[0.50] Quality Management	10.00 credits including [0.50] credits in statistics; Equates: COST*3010
FOOD*4070	[0.50] Food Packaging	8.00 credits in science or engineering or (FOOD*2010, FOOD*2410, FOOD*2420)
FOOD*4110	[0.50] Meat and Poultry Processing	1 of ANSC*2340, FOOD*3070, FOOD*3160
One of:		
FOOD*3160	[0.75] Food Processing I	(FOOD*2620, MICR*2030) or ENGG*2660
FOOD*4520	[0.50] Cereal Technology	BIOC*2580
One of:		
FOOD*3230	[0.75] Food Microbiology	MICR*1020 or MICR*2030
FOOD*2400	[0.50] Introduction to Food Chemistry	CHEM*1040
FOOD*3010	[0.50] Food Chemistry I	BIOC*2580
FOOD*3260	[0.50] Industrial Microbiology	MICR*1020 or MICR*2030

You must select a food application project for your final design project in your major program.