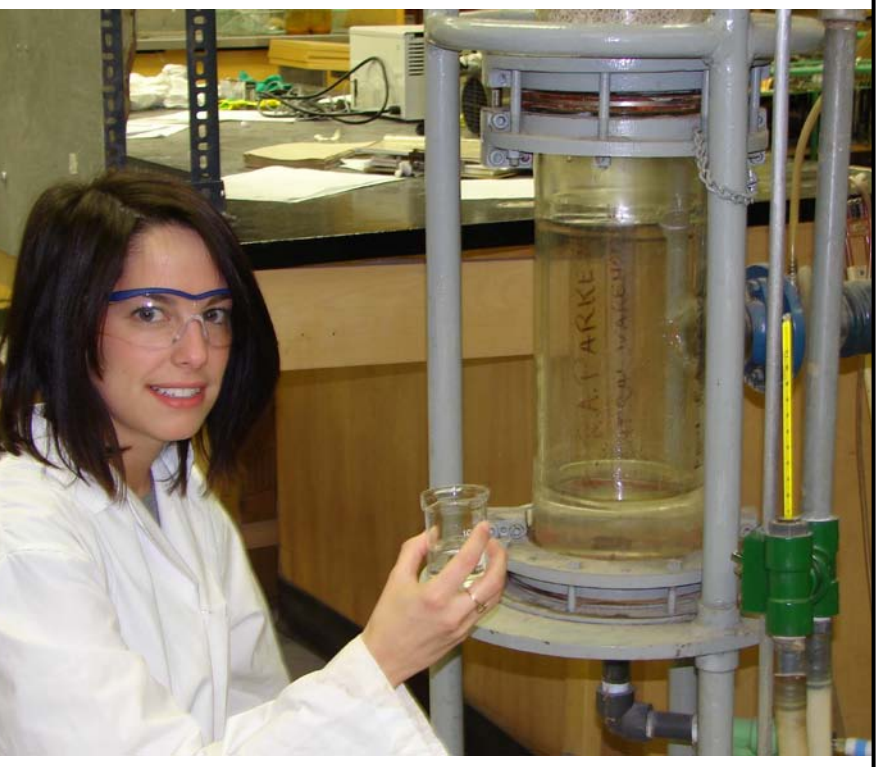
Chemical Engineering

2011/2012 Program Guide



Chemical Engineering provides the basic scientific engineering knowledge for the design, construction and operation of equipment and plants that process materials by chemical and physical operations into desired products. The curriculum is aimed at provision of a broad background in the underlying sciences of Chemistry, Physics and Mathematics, and detailed knowledge of Chemical Engineering principles, that will enable the graduate to proceed to further academic degrees by study and research at this University or elsewhere, or to carry on research, development or production operations in any process industry.

Students can choose the general program or specialize in an area by completing an option program: Energy Conversion Engineering or Biomedical Engineering Option.

The Department of Chemical Engineering considers practical training and close contact with Industry an important aspect of the engineering curriculum. The Industrial Practice Program includes both the two week Chemical Engineering Practice School and the work term or co-op components carried out in industry.

UNIVERSITY OF NEW BRUNSWICK

UNB

Revised: May 11, 2011

Important Program Changes and Notes

Course Renumbering

As most of you are aware, the chemical engineering program has undergone considerable changes over the past few years but we are now in a more-or-less stable state, at least for the time being. Since several courses were shuffled between years in the program, we have now renumbered them to be consistent with the year of program delivery, as outlined below.

Chemical Engineering Thermodynamics – **CHE 2123** is now **CHE 3123**

Numerical Methods in Chemical Engineering – **CHE 3418** is now **CHE 2418**

Process Dynamics and Control – **CHE 4601** is now **CHE 3601**

Technical Electives

Please see the list of technical electives for 2011/2012 in the following pages. The department remains committed to offering its students a breadth of technical elective courses, consistent with the faculty's expertise and our option programs. Although the technical elective list seems light this year as compared to others, please be aware that elective courses from other engineering departments are considered creditable courses with the permission of the Director of Undergraduate Studies.

Academic Advisors

The duties of the Director of Undergraduate Studies will be carried out by Dr. Guida Bendrich while I am on sabbatical for the 2011-2012 academic year. Please see Dr. Bendrich for information or advising outside of typical course-based scheduling. The academic advisors for the 2011-2012 academic year are:

1st year and transfer students	Guida Bendrich
2nd year	Frank Collins
3rd year	Kecheng Li
4th year	Laura Romero-Zeron
5th year +	Guida Bendrich

I wish you all well and best of luck in your studies in 2011-2012!

W. Cook – May 12, 2011

technical electives

Technical Electives are scheduled as follows for 2011-2012:

Fall 2011

CHE 5522 Nanotechnology 3 ch (3C)

Studies the science of nanotechnology and surveys current and emerging applications of nanomaterials and nanodevices in many engineering disciplines. The unique physical properties of materials at the nano-meter scale are discussed and explained. Fabrication methods and advanced instrumentation for the construction, manipulation and viewing of nanometer-sized materials are presented. Pre-requisite: CHEM1982/1987 or equivalent, plus 100ch of degree credit. Restricted to science and engineering students.

CHE 5913 Pulp Production 3 ch (3C)

Wood and chip requirements; overview of pulping processes; mechanism and variables in mechanical and chemimechanical pulping, general principles of chemical pulping, kraft cooking, sulphite cooking, extended and oxygen delignification, pulp washing, pulp bleaching, recovery of pulping chemicals. Prerequisites: CHEM 3801, MATH 1013, or instructor's permission.

ME 5933 Industrial Ecology (Tentative) 3 ch (3C)

Objective is to develop awareness and knowledge of a new way of thinking about economy-environment interactions. Of interest to those with an industrial or environmental background, or to those who have to interact with specialists in these disciplines. Topics include: humanity and environment; technology and industry; environmental concerns and risk assessment; relevant external factors; an introduction to life-cycle assessment; LCA inventory analysis stage; LCA impact assessment stage; industrial design of processes and products; designing for energy efficiency; choosing materials; design for recycling; and standards. Prerequisite: Available to students in all Faculties who have completed at least 100 credit hours of university level courses.

Winter 2012

CHE 5933 Biorefining: Principles, Processes and Products 3 ch (3C)

This course discusses various bio-refining processes, placing emphasis on fundamental process chemistry and biology in the conversion of biomass to engineered products. Pathways for the use of wood resources are described in detail; exemplary processes, such as gasification, pyrolysis, pre-extraction and bio-diesel production are discussed. Industrial fermentation, including sugar fermentation to produce ethanol, will be explored. The modeling concept for integrated pulp manufacturing and bio-refining will also be discussed. Pre-requisite: CHEM 1982/1987, CHEM 2401 and a minimum of 80 credit hours.

CHE 4423 Chemical Engineering Practice School 4 ch (W)

A two week industrial practice school in selected industrial process plants scheduled after spring examinations. Groups of students, with Faculty supervisors, are assigned to engineering projects to be carried out on industrial process units. Students are required to present an oral report to plant operating and technical personnel at the end of the practice session. A written report is also required. As there will be practical limitations to the number of students in any one practice school, application for positions in this course will be treated on a first-come, first-

served basis. This course is strongly recommended as a technical elective for students not planning to complete either the co-op or professional experience programs. Prerequisites: CHE 2004, CHE 2412.

CE 5421 Water Quality and Treatment 4 ch (3C 2L)

Applied water chemistry, epidemiological analysis, water analysis, water treatment processes and design, water treatment systems and plant design, public health issues and case studies. The content is tailored towards drinking water quality and treatment issues. This will be supplemented by detailed design of unit operations and processes involved in the treatment of drinking water. Prerequisites: Chem 1882 (or equivalent) and CE 3403 or CHE 2004, or permission of course instructor.

ME 5713 Non-Destructive Testing 4 ch (3C 3L)

Principles of non-destructive evaluation, acoustic emission techniques, ultrasonics, microwave methods, electromagnetic probes, penetrating radiation. Prerequisite: A first year course in Physics or APSC 1023. Restricted to students with 100 hours.

Non-Technical Electives

Non-technical electives are an important element of engineering education. Regardless of engineering role, engineers require an appreciation of business concepts, good communication skills and a broad sense of the impact of technology on society. Most engineers end up in management roles, making decisions on time, people and money. It is wise therefore, for students with an interest in management to choose their complimentary studies courses carefully. In the chemical engineering program at UNB, three of the four non-technical elective courses required for the degree (12 ch total) are area specific:

Humanities (3 ch) – Sociology, Anthropology, History, Philosophy, Classics, Political Science

Business (3 ch) – Any TME or ADM course; or select ECON courses

Non-Language (3 ch) – Any Humanities or Business course; PSYC, RLS, ENVS, ENR, IDS, RCLP, ARTS, WLCS

Other (3 ch) – must be approved by the Director of Undergraduate Studies

The Department STRONGLY recommends that students to obtain business-related education through the complementary studies stream and to pursue a diploma in **Technology Management and Entrepreneurship** which is offered by the Faculty of Engineering. For more information on integrating this diploma with the undergraduate degree in chemical engineering, please contact the Director of Undergraduate Studies.

Transfer Credits

As per university regulations, current students who are seeking transfer credit for courses taken at other institutions must receive permission prior to taking the course. Courses that have been taken without the proper approvals will not be counted towards your degree. Please obtain the appropriate permission slip (Request Form for Off-Campus Study) from the UNB Registrar, and seek approval from the Director of UG Studies for any courses you wish to take.

Pre- and Co-Requisites

Pre- and co-requisites are important guideposts along the degree program path. You must not attempt a chemical engineering course without having its stated pre- and co-requisites. If you find yourself out of sequence in the program (for example, as a transfer student or because of a late withdraw), please seek advising from the Academic Advisor or Director of UG Studies, and obtain official permission from the course instructor before enrolling into a course: a record of this permission must be put into your personal file in the Department. There is enough flexibility in the program to allow minor deviations, but no student will be allowed to take courses out of sequence if they are in academic jeopardy (GPA $\leq$2.2).

Chemical Engineering Option Registration Form

- refer to Calendar or Program Guide for details on Option programs

- the Department of Chemical Engineering reserves the right to remove registration in a chosen Option program, where students do not register in Option courses or where their studies clearly diverge from that Option program.

- the Department of Chemical Engineering will ensure that all students registered in an Option have a reasonable opportunity to complete that Option over two academic years of study.

- withdrawing from or failing Option courses is normally not a problem, but either could potentially make subsequent completion of an Option impossible.

- admission to Options is automatic for students enrolled in the BScE (Chemical Engineering) program who have successfully completed both ChE 2004 (or 2014) and ChE 2012, **along with the completion of this form.**

Name: _____UNB email: _____

ID # _____ Expected Graduation Year: _____

OPTIONS (You may register in more than one Option)

☐ Biomedical Engineering Option

Fall 2011		Winter 2012	
APSC 3953	Basis of Biomedical Eng.	Biol 2043	Cell Biology
Biol 2033	Biochemistry	Biol 2053	Genetics
Chem 3003	Biocomputing in Drug Des.	Biol 2073	Fund. Of Microbiology
KIN 2062	Intro. To Biomechanics	Biol 2753	Intro. To Human Anatomy
Phys 5143	Magnetic Resonance Imag.	Biol 2792	Human Physiology-Systems
		KIN 3061	Advanced Biomechanics

☐ Energy Conversion Engineering Option

Fall 2011		Winter 2012	
Hist 3925	Technology and Society	ENVS 2023	Understanding Envir. Issues
ENR 1001	Resource Mgmt. Issues	ENVS 4002	Stakeholders Approaches En
ENR 2021	Nat. Res. Mgmt., Inst.	ChE 5933	Biorefining: Princ., Proc.
ME 5933	Industrial Ecology	CE 5421	Water Quality & Treatment
		ME 5713	Non-Destructive Testing

* Please note: the Environmental Option, Nuclear & Power Plant Engineering Option and Pulp & Paper Option are available only to students currently registered.

Signed: _____ Date: _____

Please return this completed form to the Chemical Engineering Office.

Biomedical Engineering Option in Chemical Engineering

The Biomedical Option is available to students in the Department of Chemical Engineering. In order to enter the option program students must meet approval by the Department of Chemical Engineering.

To complete the option program the student must complete four technical electives (12 ch minimum), consisting of one core course (which is normally offered every year),

APSC 3953	Basis of Biomedical Engineering	3ch

and three courses selected from the list below (most courses are offered every year):

BIOL 2033	Biochemistry	3ch
BIOL 2043	Cell Biology	3ch
BIOL 2053	Genetics	3ch
BIOL 2073	Fundamentals of Microbiology	5ch
BIOL 2753*	Introduction to Human Anatomy	3ch
BIOL 2792	Human Physiology - Systems	3ch
CHEM 3003**	Biocomputing in Drug Design I	5ch
CHEM 4523	Medicinal Chemistry	3ch
CHEM 4003**	Biocomputing in Drug Design II	4ch
KIN 2062*	Introductory Biomechanics	3ch
KIN 3061*	Advanced Biomechanics	4ch
KIN 4163*	Workplace Ergonomic Design And Analysis	3ch
ME 5913	Biomechanics	4ch
PHYS 5143	Magnetic Resonance Imaging	3ch

* some option courses require that Biol 2753 be taken as a pre-requisite.
** some option courses require that Biol 1001 be taken as a pre-requisite.

Students with a special interest in biology and biochemical engineering are encouraged to pursue a Minor in Biology through the Faculty of Science. Such students should seek advising from the Director of Undergraduate Studies to embark upon this path as soon as possible in the degree program.

Energy Conversion Engineering Option in Chemical Engineering

This option places emphasis on emerging technologies and societal issues in the energy and environment sector within chemical engineering. This directed path consists of 3 technical elective courses and 1 complementary studies course (minimum total of 15 ch) selected from the approved lists below. Students may elect to receive a further specialization within the ECE Option by focusing their technical electives in nuclear & power plant technology, oil & gas processing or environmental disciplines.

To participate in the option, students must seek approval of the department.

Core:

CHE 5313	Energy and the Environment

Complementary Studies Elective: (1 course from the following list):

ECON 3865	Energy Economics
ENVS 2023	Understanding Environmental Issues
ENVS 4002	Stakeholder Approaches to Environmental Problem Solving
ENR 1001	Resource Management Issues
ENR 2021	Natural Resource Management, Institutions, Policy, Governance
ENR 2541	Climate Change
HIST 3925	Technology and Society

Technical Elective: (3 courses from the following list):

Oil & Gas Processing

CHE 5234	Oil Refining and Natural Gas Processing
CHE 5244	Enhanced Oil Recovery
CHE 5264	Oil Sands Technology
CHE 5933	Biorefining: Principles, Processes and Products

Nuclear & Power Plant Technology

CHE 5344	Combustion
CHE 5744	Steam Supply Systems
CHE 5824	Corrosion Processes
CHE 5834	Nuclear Engineering
ME 5713	Non-Destructive Testing (potential substitute, approval required)

Environmental

CE 5432	Wastewater Treatment and Pollution Control
CHE 5314	Chemical Process Industries
CHE 5413	Air Pollution Control
ME 5933	Industrial Ecology

Students with special interest in environmental studies are also encouraged to pursue a minor or secondary major in this area through the university's *Environmental Studies Program*, administered by the Faculty of Forestry and Environmental Management. The Department also encourages interested students to pursue a Masters of Engineering degree in environmental studies after graduation.

International Exchange

UNB recognizes that we live in an increasingly globalized world. This is why the university provides students with overseas opportunities. The Student Abroad Program involves exchanges, internship programs or courses at overseas institutions. Visit the Students Abroad section (http://www.unbf.ca/international/studentabroad.htm) at the International Relations website (http://www.unbf.ca/international/index.html) for more information on where you can go, how to get there, and other ways to get involved internationally!

Are you setting sails to new horizons? If yes, there are a few things that you should be aware of before departing. To help you get ready for an experience of a lifetime, detailed information on entry requirements, passports & visas information, study permit, travel warnings, immunization, fees, travel advice, etc, are necessary. The International Relations Office has several resources available to you. Please contact them for more information.

Chemical Engineering Enchange programs

Students should consult the Director of Undergraduate Studies for further information on the ChE exchange programs.

France

The Department of Chemical Engineering at UNB has exchange programs with the following ÉcoleSupérieure de ChimiePhysique Électronique de Lyon (http://www.cpe.fr/fr2/default.asp), EcoleNationaleSupérieure des Mines de Saint-Etienne (http://www.emse.fr/index.php) and EcoleNationaleSupérieure de Chimie de Montpellier (http://www.cpe.fr/fr2/default.asp) in France. Students who have completed 2 years of study at UNB can study for one term or one year at one of these French universities. Students take appropriate courses in Lyon, Saint-Etienne or Montpellier to obtain credits for some third and fourth year courses and complete the rest of their requirements upon returning to UNB. Students should consult with the Director of Undergraduate Studies for proper course selection prior to leaving for France.
Students who go to France pay full UNB tuition, and receive $500 towards travel costs. This arrangement ensures that the year in France is financially comparable to the one in Fredericton in addition to providing a unique experience.

Summer School at CPE Lyon

The CPE Lyon Summer school program runs for four weeks (usually during the last week of May and first three weeks of June). During these four weeks, CPE Lyon offers short courses in science, French, and undergraduate research (literature project). The courses and the project are adapted to correspond with the background of the students. There are about 45 hours of French courses and 45 of scientific courses including the project. Two industrial visits are organized, as well as a cultural guided tour of Lyon (Lyon is a Unesco World Heritage Site) and a gastronomic dinner. The students will also be able to take part in the end-of-year weekend with Frenchstudents.

It is not necessary to be fluent in French but a basic knowledge is required. This program is offered to first and second year students. In addition, there may be also a possibility of an internship in industry in France for the remainder of the summer.The application deadline is normally in early February.

Australia

Established in 1853, the University of Melbourne (http://www.unimelb.edu.au/) has a rich history. The Melbourne School of Engineering (http://www.eng.unimelb.edu.au/) has an international reputation for its research, teaching, academic staff and graduates. The program is recognized for its excellence and is ranked 21st in the world for Technology by The Times Higher Education World University Rankings 2007. A detailed course listing can be found at http://www.eng.unimelb.edu.au/courses/ugrad/courses/index.html

Norway

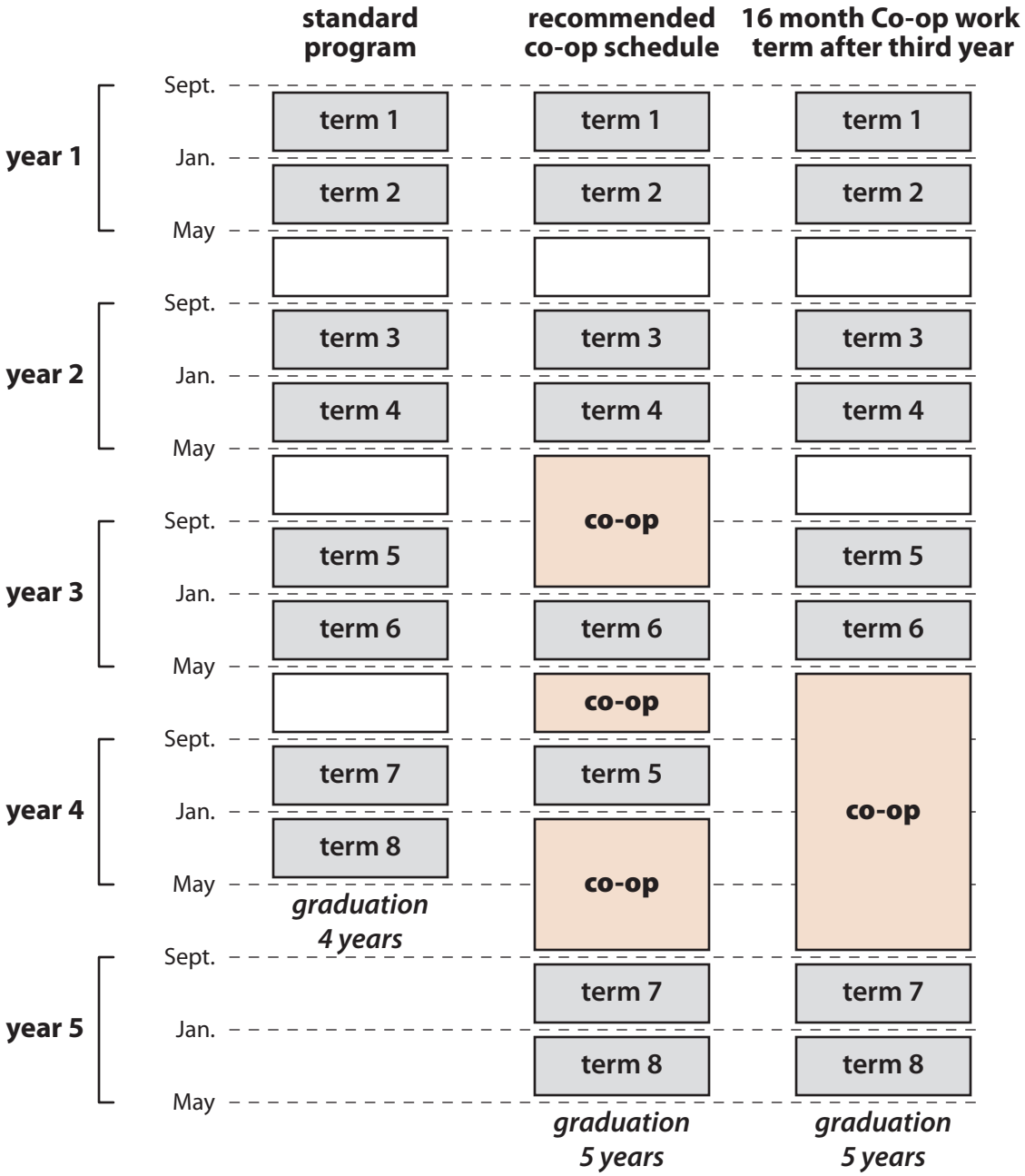
Bergen University College (http://www.hib.no/english/index.html)is a state institution of higher education, established in August 1994 by the merging of six former independent colleges in Bergen, Norway. The Faculty of Engineering offers degrees within various fields of engineering. Among one of them being chemical engineering (http://www.hib.no/english/AI/chemical/index.html). The language of instruction is Norwegian!

China

The Central South University (http://www.csu.edu.cn/index.htm) offers an opportunity for an academic exchange. The language of instruction in the department of chemical engineering is Chinese.

Chemical Engineering Co-op Scheduling

Students completing their BScE in Chemical Engineering may wish to gain work experience during their studies. The co-op program in Chemical Engineering is recommended for students who wish to maximize the reinforcement between academic and work experience. The schedule shown below is the recommended pattern of work terms for students in the co-op program who wish to add no more than one year to their time at UNB. By simply switching the order in which terms 5 and 6 are taken, it is possible to fit 20 months of co-op experience into a five-year degree program. An example of a 16 month Co-op term is also shown.



Note: The minimum cumulative GPA for participation in the Co-Op Program is 2.7

Plagiarism

The Department has a zero tolerance policy on plagiarism. Teaching Assistants and instructors will aggressively identify and severely penalize offenders, even for minor infractions.

The minimum penalty for plagiarism is a grade of zero on the work and a notation on your transcript.

Graduation Policy for Chemical Engineering (BScE)

The policy on graduation described in the UNB Calendar is that students must complete the degree as it is defined when they start a program. Unfortunately, this isn't really practical when courses are deleted or changed, so Chemical Engineering uses a modified version of this regulation: the policy is the lesser of the requirements when you start your degree and those when you complete it. If a course is dropped or changed in the program we will always make every attempt to ensure a reasonably fair transition. However, students who fail courses close to a change in requirements may sometimes be required to complete additional credit hours as a result. Following the recommended four-year program is generally the best way to avoid complications due to rule changes.

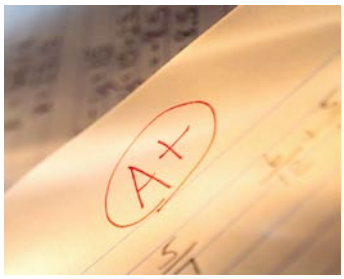
Deferred Exams

You are expected to follow the exam schedule set by the Registrar.

Students who by reason of illness or extenuating circumstances are unable to write final examinations at the specified times may apply to the Registrar for permission to write deferred exams written medical permission is required.

The Department of Chemical Engineering has set deferred examination dates of Thursday, January 5, 2012 and Thursday, May 3, 2012. Students who cannot write on these dates will normally be required to appeal for further deferral via the Registrar's Office.

For full Deferred Examination regulations please refer to University Regulations in the Undergraduate Calendar.



RECOMMENDED 4-YEAR PROGRAM FOR STUDENTS ENTERING IN 2011

Mondays, Wednesdays & Fridays

Time	Term 1	Term 2	Term 3	Term 4	Term 5	Term 6	Term 7	Term 8
8:30 AM 9:00 AM		CHEM 1982	CHE 2012	MATH 3503				
9:30 AM 10:00 AM	MATH 1503	CHE 1004	CHEM 2401		CHE 3601	CHE 3314		
10:30 AM 11:00 AM	PHYS 1081	EE 1813	BIOL 1001	CHE 2703	CHE 3324	CHE 3123	CHE 4101	
11:30 AM 12:00 PM	MATH 1003	MATH 1013	MATH 2513	NTE or TE	CHE 3304	CHE 3505	CHE 4341	CHE TE IV
12:30 PM 1:00 PM	CS 1003 (Mon)			CHE 2418	NTE or TE	NTE or TE	NTE or TE	NTE or TE
1:30 PM 2:00 PM	CS 1003	ENGG 1082	CHE 2004	CHE 2525	CHEM 3621	NTE or TE		
2:30 PM 3:00 PM 3:30 PM 4:00 PM 4:30 PM 5:00 PM	ENGG 1003 (Mon) PHYS 1081 (Wed)	ENGG 1082 (Mon) CHEM 1987 (Wed)		CHE 2412 (Wed or Fri)	CHEM 3886 (Monday)		CHE 4225 (Wed)	CHE 4225 (Wed)
5:30 PM 6:00 PM								
6:30 PM 7:00 PM		+NTE						

Tuesdays

8:30 AM 9:00 AM		EE 1813	CHE 2501	MATH 3503	CHE 3424	CHE 3434		
9:30 AM 10:00 AM				STAT 2593			CHE 4101	
10:30 AM 11:00 AM	ENGG 1003		CHE 2012		CHE3304	CHE3505	CHE 4341	
11:30 AM 12:00 PM			MATH 2513	CHE 2703	CHE 3601	NTE or TE		
12:30 PM 1:00 PM		NTE						
1:30 PM 2:00 PM				CHE 2412				
2:30 PM 3:00 PM 3:30 PM 4:00 PM 4:30 PM 5:00 PM	CS 1003	EE 1813			CHE 3424 or Mon or Wed or Thurs	CHE 3434 or Mon or Wed or Thurs		
5:30 PM 6:00 PM								
6:30 PM 7:00 PM								ENGG 4013

Thursdays

8:30 AM 9:00 AM	MATH 1003	MATH 1013	CHE 2501					
9:30 AM 10:00 AM				STAT 2593	CHE 3324		CHE 4404	CHE 4404
10:30 AM 11:00 AM	ENGG 1003							
11:30 AM 12:00 PM	ENGG 1015					NTE or TE		
12:30 PM 1:00 PM		NTE						
1:30 PM 2:00 PM			CHE1024*	CHE 2525				
2:30 PM 3:00 PM 3:30 PM 4:00 PM 4:30 PM 5:00 PM	ENGG 1015		CHE 2506			CHEM 3897	CHEM 4886	
5:30 PM 6:00 PM								
6:30 PM 7:00 PM								ENGG 4013

lecture	tutorial	lab

Degree Audit Form Chemical Eng.
Students Entering in 2011/2012

Name: _____ Date: _____

UNB ID: _____ email: _____

UNB Course	ch	Note(s)	Grade(s)	UNB course	ch	Notes	Grade(s)
ChE 1004	3			Phys 1081	5		
ChE 2004	3			Biol 1001	3		
ChE 2012	3			CS 1003	4		
ChE 2412	3			EE 1813	4		
ChE 2418	3			Engg 1082	4		
ChE 2501	3			Engg 1001	CR		
ChE 2506	1			Engg 1003	4		
ChE 2525	4			Engg 1015	2		
ChE 2703	3			Engg 4013	3		
ChE 3123	3						
ChE 3304	4			Math 1003	3		
ChE 3314	3			Math 1013	3		
ChE 3324	4			Math 1503	3		
ChE 3424	3			Math 2513	4		
ChE 3434	3			Math 3503	3		
ChE 3505	4						
ChE 3601	4			Stat 2593	3		
ChE 4101	3						
ChE 4225	8			NTE Humanities	3	Anth, Clas, Hist, Phil, Pols, Soci	
ChE 4341	4			NTE Business	3	ADM, TME, Econ	
ChE 4404	3			NTE Non-Lang	3	Hum, Bus, Psyc, RLS, ENVS, ENR, IDS, RCLP, ARTS, WLCS	
CHE TE							
CHE TE				NTE Other	3	With Approval of Dir. UG Studies	
CHE TE				Notes:			
CHE TE							
Chem 1982/1987	5						
Chem 2401	3						
Chem 3621	3						
Chem 3886	2						
Chem 3897	1						
Chem 4886	2						

CHEMICAL ENGINEERING FACULTY

Name	Office Phone	Room No.	Email
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Michel Couturier	453-4690	GD126	cout@unb.ca
Mladen Eić	453-4689	D32B	meic@unb.ca
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ChE OFFICE INFO

Phone: 453-4520 **Fax: 453-3591**
Location: D-39 (Head Hall)
Hours: winter - 8:15 - 4:30, summer 7:45 - 4:00 (closed for lunch: noon-1 pm)

FACULTY ADVISORS

Guida Bendrich	*1st Year and Transfer Students*
Frank Collins	*2nd Year*
Kecheng Li	*3rd Year*
Laura Romero-Zeron	*4th Year*
Guida Bendrich	*5th Year*

ACTING DIRECTOR OF UNDERGRADUATE STUDIES

(for 2011/2012)

Guida Bendrich
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447-3238

SECRETARY FOR UNDERGRADUATE STUDIES

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