

COLLEGE OF ENGINEERING

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Associate Member
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*Denotes non-members of faculty.

GENERAL INFORMATION

ADMISSION REQUIREMENTS

See General Information section of the *Calendar*.

TRANSFER CREDIT

The admission of applicants with Transfer Credits or transferring from other post-secondary institutions, including The University of Regina, is governed by the following criteria:

- (1) The applicant must have a sufficiently high academic standing to be eligible to continue in an engineering program at the last institution he or she attended. An applicant who has been advised or required to discontinue elsewhere, either temporarily or permanently, will not normally be accepted.
- (2) The applicant's past academic record will be assessed as if the equivalent academic grades had been obtained at the University of Saskatchewan and the current College of Engineering promotion regulations applied.
- (3) Credit for courses taken elsewhere may be granted on a course by course basis following an assessment of the transcripts by Admissions, Office of the Registrar, in consultation with the College of Engineering.

ADMISSION AND ENROLMENT LIMITS

Entry into the College of Engineering at the first year level is limited by an admission quota. There are also enrolment limits for all departments or branches of engineering beginning in second year and continuing into the upper years. Admission to, or continuation within, a program is based upon the applicant's academic performance in the preceding year.

Students entering second year are accepted on a priority basis due to the enrolment limits in each branch. Those having successfully completed one year in the College of Engineering are granted first priority. Transfer applicants must submit application forms by May 15.

FEES, PAYMENT OF FEES, CANCELLATIONS AND REFUNDS, AND COURSE CHANGES

See the General Information section of the *Calendar*.

ACCREDITATION

The programs offered by the College of Engineering have been reviewed by the Canadian Engineering Accreditation Board of the Canadian Council of Professional Engineers. All programs have received the Board's approval and have been granted accreditation.

PROGRAMS

The program prescribed for the Bachelor of Science in Engineering (B.E.) extends over four years. There are seven fields of specialization: Agricultural and Bioresource, Chemical, Civil, Electrical, Engineering Physics, Geological, and Mechanical Engineering. The work of the first year provides the theoretical and mathematical base necessary for specialization in the upper years, but at the same time shows how the basic fundamentals are applied to the solution of engineering problems.

Competence in writing is expected in all courses in the College of Engineering.

ENGINEERING PROFESSIONAL INTERNSHIP PROGRAM

The Engineering Professional Internship Program is a five-year program which includes a minimum of eight months of supervised work experience in industry. Normally, the work terms commence after the student has completed at least 84 credit units of an Engineering program. For a student to be admitted to the internship program he or she must have achieved and must maintain a 65% sessional weighted average. A student must have at least 18 credit units remaining in the B.E. program. Interested students are encouraged to contact either the Dean's Office, Engineering or the Student Employment and Career Centre (SECC).

Students are required to apply to SECC by early October for round one postings, late November for round two postings and an open third round beginning in February for an opportunity to compete for an internship starting in January, May or September. Students who do not meet the admission requirements should contact the SECC or the Dean's Office for alternative dates. For more information and specific dates, please check the web site: www.usask.ca/sas/secc/students.html

Students must complete a minimum of two of the following courses in addition to the regular requirements for the B.E. degree: EPIP 401, EPIP 402, EPIP 403, EPIP 404. Each EPIP course represents a four month professional internship work term.

The Engineering Internship work experience is for a minimum of eight continuous months and a maximum of sixteen months. Students are reminded that internship is *not* a summer work program. A student who does not successfully complete the internship program is deemed to have failed the EPIP program.

The work in each course is supervised by a Professional Engineer in the host company. Students are required to submit written reports to the Dean's Office at the end of each work term. The last report is a comprehensive technical report on the student's work experience. All reports must be approved by the student's industrial supervisor and are graded by a member of the faculty (pass/fail).

Students are referred to the Dean's Office or SECC for further details.

SECOND DEGREE PROGRAMS

It is possible to undertake programs which lead to a degree in both Engineering and Arts and Science. In particular, specific second degree programs have been developed for most engineering disciplines which lead to a B.E. and a B.Sc. with a major in computer science in five or five and one-half years. Students must complete all of the requirements of the four-year program in Engineering and 30 to 45 credit units in Arts and Science directly related to one Arts and Science major. Optimum sequences of courses for most disciplines have been developed.

For the completion of the B.Sc. degree as a second degree, students must meet all the requirements of Program C in Arts and Science with 90 credit units in Arts and Science, and may not consider any professional electives for this purpose. In some programs it may be possible to satisfy this regulation in one year with as few as 30 additional Arts and Science credit units not specifically included in the Engineering program.

Students interested in the humanities, social sciences or natural sciences may wish to consider a special arrangement of studies which will enable them to complete the work leading to the B.E. degree and the B.A. or B.Sc. degree in approximately five years.

Students wishing to take a second degree program should check with the Deans' offices of the College of Arts and Science and the College of Engineering as well as their Engineering discipline Department Head.

UNIVERSITY OF SASKATCHEWAN ENGINEERING SUMMER STUDY ABROAD PROGRAM

The University of Saskatchewan Engineering Summer Study Abroad is adjunct to the Texas A & M Study Abroad Program. Students are required to enroll in two, three-credit hour engineering science or complementary study courses while in Paris France. A variety of engineering courses for which University of Saskatchewan students may receive credit

is available. The six-week program is designed to provide a balance of formal instruction, field trips and social interaction with other students from the United States and Europe. Moreover, the program provides students with education in the history and architecture of Western Europe from Roman times to the Renaissance. Wherever possible the course work is presented in the context of the basic laws of nature as they were discovered (or rediscovered) by the scientific giants of the Renaissance, accompanied by the evolution of engineering science from that period of time to the present day.

In addition to the formal course work, consisting of approximately 39 lecture hours plus substantial assignments and/or projects, the students in one of the senior courses are required to undertake a detailed structural analysis of some aspect of an important structure or building that they have visited on one of several field trips.

Major field trips by chartered bus include one to the north of France and one to the south of France, or to Germany. In addition, the faculty leads several weekend field trips into Paris to various cathedrals, museums, art galleries and to bridges across the river Seine. As a result, the students experience not only technical training but also the arts, French cuisine and general western European culture.

In an age of increasing globalization this acquired background creates a wealth of new and varied experience that will assist students to function in multi-national companies, which are becoming the rule rather than exception, not to mention increased personal growth and self-confidence.

At present the cost of the program is approximately \$3600.00 (USD), plus University of Saskatchewan tuition for two courses, plus airfare, plus some spending money.

Texas A&M and University of Saskatchewan Course Equivalencies Paris, France (July – August, 2002)

U of S Course	A&M Equivalent
CE 212 Civil Engineering Materials	ENGR 213
CE 463 Advanced Structural Analysis	ENGR 489
CE 471 Finite Elements	MEMA 467
GE 213 Mechanics of Materials	CVEN 305
GE 449 Engineering in Society	ENGR 482

Students must register for 6 credit units only.

Students should contact the Dean's Office regarding fulfilling the course requirements on their program.

Students not registered in the Civil Engineering program *must* have the Department Head's permission to use these courses in their program.

GRADUATE STUDIES

Students who have done well in their undergraduate program are encouraged to continue their studies at the graduate level.

This will enable them to specialize or broaden their undergraduate training and earn a Postgraduate Diploma, a Master of Engineering Degree, a Master of Science degree or a Doctor of Philosophy degree. Students who are interested in these programs should consult the College of Graduate Studies and Research section of this *Calendar*.

OTHER PROGRAMS

Please contact the Dean's Office for information on other engineering programs not offered at the University of Saskatchewan.

B.E. PROGRAM (PRIOR TO 1999)

Please contact the Dean's office for information on the old program. Students returning after an absence from the college may need to follow the new program requirements if they cannot complete their program by October 2004.

B.E. PROGRAM

The B.E. program was changed effective September 1999. The following sections list the program requirements for students who have entered the college in September 1999 or later. Students who were in the college prior to September 1999 should contact the Dean's Office for the program requirements. These students have the option of moving to the new program, however, to receive the B.E. degree, they will be required to satisfy all the requirements of the new program.

To receive a B.E. degree, students must meet the requirements of the program listed below. Credit for equivalent courses taken previously, either from the University of Saskatchewan or another post-secondary institution, will only be given on a course by course basis. Approval for credit for equivalent courses must be obtained from the Dean's Office.

FIRST YEAR (30 CREDIT UNITS)

Term 1

CHEM 100-level (3 credit units)*
COMM 102.3 Introduction to Business Management
G E 110.3 Engineering I
G E 124.3 Engineering Mechanics I
MATH 110.3 Calculus I

Term 2

E P 155.3 Electric and Magnetic Circuits I
G E 120.3 Engineering II
G E 125.3 Engineering Mechanics II
MATH 124.3 Calculus II for Engineers
CHEM 115.3 General Chemistry II: Chemical Processes
or
GEOL 121.3 Physical Geology**

or
PHYS 128.3 Contemporary Physics

*Please consult the 2002-2003 Registration Guide.

**Students who select the Geological Engineering program must take GEOL 121 as an elective in second year if they did not take GEOL 121 in first year.

ENGINEERING

COMPLEMENTARY STUDIES

Each engineering program includes a certain portion of non-engineering non-science subject matter that complements the technical content of the program. To fulfill the Complementary Studies requirement of the degree, each student must complete a minimum of 18 credit units of courses acceptable in this category. Some of these courses are specified in the programs while others are electives but within certain subject categories. All programs contain the following complementary studies components.

- G E 300.3
- G E 348.3
- G E 449.3
- COMM 102.3 (subject to approval of the Dean's office, another business science course may be substituted)
- 6 credit units (minimum) in humanities or social sciences. At least 3 credit units must be at the 200- or higher level. Language courses in which the course content is to impart language skills (e.g. FR 103, GREEK 112) cannot be used to satisfy the humanities/social sciences requirement. The objectives of 100-level English courses are judged to be one-half humanities and social science (literature) and one-half to impart language skills (composition). Consequently, only one-half of the credit units of these courses may be used towards meeting the humanities/social sciences requirement. A list of acceptable humanities/social science courses is maintained on the College of Engineering web site (www.engr.usask.ca). Students wishing to select other courses must get approval from the Dean's Office.

UPPER YEARS

AGRICULTURAL AND BIORESOURCE ENGINEERING

Agricultural and Bioresource Engineering, often referred to as Biosystems Engineering, integrates engineering science and design with applied biological sciences for the solution of problems involving plants, animals and the natural environment. It deals with patterns of relationships among organisms and their environments, and engineering design to develop processes, machines, and systems that influence, control, or utilize biological materials and organisms for the benefit of society. Graduates are employed in the agricultural and food industries, as well as in other resource industries such as forestry and mining.

Second Year (36 credit units)

Term 1

AB E 211.3 Principles of Biological Systems
C E 212.3 Civil Engineering Materials
CMPT 116.3 Computing I
G E 210.3 Probability and Statistics
M E 227.3 Thermodynamics I
MATH 223.3 Intermediate Calculus

Term 2

AB E 212.3 Physical Principles of Plant Biosystems
AB E 295.3 Introduction to Biosystems Engineering
CH E 210.3 Fluid Mechanics I
G E 213.3 Strength of Materials
MATH 224.3 Differential Equations Technical, Science or Engineering elective (3 credit units)*

Third Year (36 credit units)

Term 1

AB E 311.3 Mathematical Methods
AB E 323.3 Properties of Materials in Biosystems
G E 348.3 Engineering Economics
Technical, science or engineering elective (3 credit units)*
Humanities or social science elective (3 credit units)

Term 2

AB E 313.3 Instrumentation
AB E 324.3 Mechanics of Materials in Biosystems
AB E 327.3 Transport Processes in Biosystems
AB E 395.3 Design Capstone I
Senior humanities or social science elective (3 credit units)

Term 1 or Term 2

AB E 312.3 Electrical Power (T1)
or
C E 319.3 Hydrology and Hydrogeology (T2)
G E 300.3 Oral and Written Communication

Fourth Year (36 credit units)

Term 1

AB E 422.3 Modeling of Biosystems
AB E 495.3 Design Capstone II

Term 1 or Term 2

G E 449.3 Engineering in Society
Agricultural or life science electives (6 credit units)*
Engineering electives (18 credit units, minimum 12 credit units from AB E course offerings)*
Complementary studies elective (3 credit units business science or humanities or social science)

* Requires approval of the Department Head. Students are strongly encouraged to fulfill the elective courses by selecting a "theme". A theme is a predetermined set of courses approved by the department. The set of courses will have a focus and serve an integrative purpose. Students may select courses from more than one theme. Completion of a theme will not be indicated on the university transcript but can be indicated on a resume or verified for an employer by the department. Consult with the department for further information on the following three themes:

Agricultural Systems Engineering, creating safer, more efficient, and environmentally sustainable production systems for plants and animals; machinery design for agriculture, horticulture, aquaculture and forestry; building systems for livestock, laboratory animals, horticulture, controlled-environment chambers, and storage of agricultural and food products; instrumentation, monitors and controls; standards and safety.

Bioprocess Engineering, improving and converting biological materials; added value-processing (drying, binding, separation) of agricultural crops for use as food, feed, fibre, energy; nutraceuticals and pharmaceuticals; primary processing of waste materials for land application; quality control in processing operations; handling systems for granular and fibrous materials; energy conservation and utilization; computer image analysis; engineering in support of biotechnology.

Natural Resources Engineering, managing and protecting resources; soil and water conservation; water management for agricultural use, irrigation and drainage; soil remediation; utilization of waste materials in plant-soil systems; modeling environmental systems; decision support and simulation.

CHEMICAL ENGINEERING

Chemical Engineering deals chiefly with industrial processing to produce value-added products from raw materials. The processing of organic (crude oils, natural gas, lumber), inorganic (ores, air, salts) and biological (starches, cellulose, fats) materials into a wide range of useful commodity products, such as fuels, plastics, pharmaceuticals, fertilizers and foods is carried out within a framework of environmental sustainability and concern for worker/public safety. Emphasis is on the design, construction and economic operation of equipment in these areas, and on related research and development. Some emphasis on environmental studies and biotechnology is permitted through the choice of electives.

Second Year (36 credit units)

Term 1

AB E 312.3 Electric Power
or
E E 201.3 Electric and Magnetic Circuits II
CHEM 250.3 Introduction to Organic Chemistry
CMPT 116.3 Computing I
MATH 223.3 Intermediate Calculus
English 100-level (3 credit units)

Term 2

CH E 210.3 Fluid Mechanics I
CH E 220.3 Introduction to Process Engineering
CHEM 347.3 Chemical Thermodynamics
G E 213.3 Strength of Materials I
MATH 224.3 Differential Equations
Humanities or social science elective (3 credit units)

Term 1 and Term 2

CH E 332.0 Seminar

Term 1 or Term 2

Elective 1*: Group A Elective (3 credit units)**

*If a student does not have credit for CHEM 242, it must be taken in Term 1.

Third Year (35 credit units)

Term 1

CH E 311.3 Mathematical Modelling I
CH E 320.3 Fluid Mechanics II
CH E 323.3 Chemical Engineering Thermodynamics
G E 300.3 Oral and Written Communication
CHEM 231.3 Inorganic Chemistry I
or
Approved option science elective***

Term 2

CH E 315.3 Mass Transfer I
CH E 322.3 Mathematical Modelling II
CH E 324.3 Heat Transfer
CH E 325.3 Process Engineering & Design I
CH E 333.2 Chemical Engineering Laboratory I
CH E 470.0 Field Trip****
CHEM 221.3 Analytical Chemistry
or
BIOCH 212.3 Introductory Biochemical Techniques

Term 1 and Term 2

CH E 332.0 Seminar

Term 1 or Term 2

Elective 2: Group A or B Elective (3 credit units)**

Fourth Year (38 credit units)

Term 1

CH E 411.3 Chemical Reaction Engineering
CH E 413.3 Process Dynamics
CH E 414.2 Chemical Engineering Laboratory II
CH E 421.3 Mass Transfer II
G E 348.3 Engineering Economics

Term 2

CH E 423.3 Process Control
CH E 424.2 Chemical Engineering Laboratory III
CH E 470.0 Field Trip****
G E 449.3 Engineering in Society
Senior humanities or social science elective (3 credit units)

Term 1 and Term 2

CH E 431.1 Seminar
CH E 422.6 Process Engineering & Design II

Term 1 or Term 2

Elective 3: Group A or B****
(3 credit units)**
Elective 4: Group B Elective
(3 credit units)**

***Group A - AP MC 212; BIOCH 200, 230, 310; CHEM 243, 252, 322, 374, 375, 377; CMPT 117, 215; E E 311, 314; M E 214, 324 and (GEOL 121 or PHYS 128).

**Group B - CH E 453, 454, 460, 461, 464. Group B electives are offered in alternating years. Consult with faculty advisor to determine the availability of a specific elective.

*** Consult with faculty advisor.

**** Offered alternate years. Student must take the class in either third or fourth year.

***** If a Group A elective was taken as Elective 2 then a Group B elective must be taken as Elective 3. If a Group B Elective was taken as Elective 2 then a Group A Elective must be taken as Elective 3.

Options

An "Option" within the College of Engineering is a prescribed set of courses that provides a concentration of specialized training in one particular field of study. Options are approved at the College level but are unique to Departments within the College, consisting of at least 18 credit units, none of which are core courses taken by all students within the Department. Students may elect to have the "Option" appear on their transcripts at the time of graduation.

1) *Biochemical Option* (cannot be taken with the Biotechnology Option). This option provides specialization in sciences/engineering courses that apply to traditional bioprocessing industries such as brewing, food, enzymes, gasohol and pharmaceutical. The following electives are required for this option:

BIOCH 200.3 Molecules of Life
AP MC 212.3 General Microbiology
BIOCH 212.3 Introductory Biochemical Techniques

BIOCH 310.3 Proteins and Enzymes
CH E 454.3 Design of Industrial Waste Treatment Systems
CH E 461.3 Biochemical Engineering

2) *Biotechnology Option* (cannot be taken with the Biochemical Option). This option provides more extensive training involving the science of genetic manipulation. This technology is necessary for developing process systems using genetically altered cells to produce biomass and biochemicals. Examples include pharmaceuticals, enhanced waste treatment, and the production of gasohol

from cellulose. The following electives are required for this option:

- BIOL 110.6 General Biology
- BIOCH 200.3 Molecules of Life
- AP MC 212.3 General Microbiology
- BIOCH 212.3 Introductory Biochemical Techniques
- BIOCH 230.3 Information Transfer - DNA to Proteins
- BIOCH 311.3 Introductory Molecular Biology
- CH E 454.3 Design of Industrial Waste Treatment Systems
- CH E 461.3 Biochemical Engineering

CIVIL AND GEOLOGICAL ENGINEERING

Civil Engineering

Civil Engineering covers the broad areas of environmental, geoenvironmental, hydrotechnical structures, materials, and transportation engineering. The program is designed in such a way that students are exposed to the basic civil engineering science during the second and third years of the program. During this time, the students are required to take courses that introduce the fundamental concepts in all of the areas listed above. In the final year, students have the opportunity to select electives that allow some degree of specialization. However, students are strongly encouraged to select electives that will provide them with a broad-based technical background. Project/design courses are provided in two of the three upper years. These courses are designed to give students experience in solving open-ended problems, in working in partnership with others and, where possible, in becoming involved in interdisciplinary activities.

Second Year (38 credit units)

Term 1

- C E 212.3 Civil Engineering Materials
- CMPT 116.3 Computing I
- G E 210.3 Probability and Statistics
- GEO E 218.3 Engineering Geology
- MATH 223.3 Intermediate Calculus
- English 100-level (3 credit units)

Term 2

- C E 225.3 Fluid Mechanics
- C E 295.3 Design Project
- G E 213.3 Mechanics of Materials
- G E 300.3 Oral and Written Communication
- MATH 224.3 Differential Equations
- Humanities or social science or fine arts elective (3 credit units)

Term 3

- C E 271.2 Surveying (Spring Camp)

Third Year (36 credit units)

Term 1

- C E 311.3 Continuum Mechanics
- C E 315.3 Fluid Mechanics and Hydraulics
- C E 316.3 Geomatics
- C E 317.3 Structural Analysis
- C E 318.3 Applied Engineering Mathematics
- C E 328.3 Introduction to Geotechnical Engineering

Term 2

- C E 319.3 Hydrology and Hydrogeology
- C E 321.3 Structural Systems and Materials
- C E 327.3 Sanitary/Environmental I
- C E 329.3 Transportation Engineering
- G E 348.3 Engineering Economics

Science or business elective or permission of the Department Head (3 credit units)

Fourth Year (36 credit units)

Term 1

- C E 420.3 Project Engineering
- C E elective courses (6 credit units)*

Term 2

- G E 449.3 Engineering in Society
- C E elective courses (9 credit units)*

Term 1 and Term 2

- C E 495.6 Capstone Design Project

Term 1 or Term 2

- Engineering or science elective (3 credit units)**

- Senior humanities or social science elective (3 credit units)

- Open elective (3 credit units)**

*AB E 481; C E 414, 415, 416, 417, 418, 463, 464, 466, 467, 468, 470

** May be taken from outside the Department and outside the College.

Geological Engineering

Geological Engineering is designed for those persons interested in the exploration, development, recovery and stewardship of subsurface resources. A broad background in aspects of geotechnical, mining and petroleum engineering is provided. Some degree of specialization in each of these areas is possible in the selection of upper year electives.

Second Year (38 credit units)

Term 1

- C E 212.3 Civil Engineering Materials
- CMPT 116.3 Computing I
- G E 210.3 Probability and Statistics
- GEO E 218.3 Engineering Geology
- MATH 223.3 Intermediate Calculus
- English 100-level (3 credit units)

Term 2

- C E 225.3 Fluid Mechanics
- C E 295.3 Design Project
- G E 213.3 Strength of Materials I
- G E 300.3 Oral and Written Communication
- MATH 224.3 Differential Equations
- Senior humanities or social science elective (3 credit units)*

Term 3

- C E 271.2 Surveying (Spring Camp)

Third Year (39 credit units)

Term 1

- C E 318.3 Applied Engineering Mathematics
- C E 328.3 Introduction to Geotechnical Engineering
- GEO 224.3 Mineralogy and Petrology
- GEO 243.3 Sedimentology
- GEO 258.3 Structural Geology I
- Open elective (3 credit units)

Term 2

- C E 319.3 Hydrology and Hydrogeology
- G E 348.3 Engineering Economics
- GEO E 315.3 Rock Mechanics
- GEO 246.3 Stratigraphy and Stratigraphic Palaeontology
- Group B elective (3 credit units) or
- GEO 463.3 Petroleum Geology**
- Group A elective (3 credit units)

Term 3

- GEO E 378.3 Engineering Geological Mapping (Fall Camp)

Fourth Year (36 credit units)

Term 1

- C E 316.3 Geomatics
- C E 420.3 Project Management
- GEO E 414.3 Rock Mechanics Design
- G E 449.3 Engineering and Society

Term 2

- GEO E 412.3 Reservoir Mechanics
- GEO E 466.3 Petroleum Geomechanics
- Group B elective (3 credit units)

or
GEO 463.3 Petroleum Geology**

Term 1 and Term 2

- GEO E 495.6 Design Project

Term 1 or Term 2

- Group A elective (3 credit units)*
- Group C electives (6 credit units)

Group A – GEOG 335; GEO 229, 282, 358, 411(P), 445, 465(P)

Group B – GEO 384 or 334(P) or 335(P)

Group C – AB E 481; C E 416, 466; CH E 464; GEO E 475 (P) Elective subject to prerequisite requirements not covered in the core program.

*If Geol 121 is not taken as the science elective in Year 1, it must be taken in Year 2 in place of the humanities or social science elective and the Group A elective in Year 4 must be replaced by a senior humanities or social science elective.

**If GEO 463 is taken in third year, then Elective B must be taken in fourth year and vice-versa.

ELECTRICAL ENGINEERING

Electrical Engineering is designed as a foundation for work in the fields of analog and digital electronics, microelectronics, signal processing, communications, power generation, transmission and distribution, electrical machines, computing systems, controls and general electrical engineering applications. In the second, third and fourth years emphasis is placed on theory and practice. Some specialization is possible by choosing appropriate electives in the third and fourth years.

Second Year (38 credit units)

Term 1

- CMPT 116.3 Computing I
- E E 201.3 Electric and Magnetic Circuits II
- E E 216.3 Probability, Statistics & Numerical Methods
- E E 221.3 Analog Electronics
- E E 271.3 Electrical Engineering Materials & Heat Conduction
- MATH 223.3 Intermediate Calculus

Term 2

- CMPT 117.3 Computing II
- E E 212.3 Passive AC Circuits
- E E 214.3 System Modeling and Network Analysis
- E E 232.3 Digital Electronics
- E E 292.2 Electrical Engineering Laboratory I
- G E 300.3 Oral and Written Communication
- MATH 224.3 Differential Equations

Third Year (42 credit units)

Term 1

- E E 301.3 Electricity, Magnetism and Fields
- E E 323.3 Electronic Instrumentation
- E E 331.3 Microprocessor Hardware and Software
- E E 342.3 Power Systems I
- E E 351.3 Spectrum Analysis and Discrete Time Systems
- E E 372.3 Electronic Devices
- E E 391.3 Electrical Engineering Laboratory II

Term 2

- E E 332.3 Real Time Computing

- E E 341.3 Electric Machines I or E E 362.3 Digital Signal Processing I*
- E E 352.3 Communication Systems
- E E 392.3 Electrical Engineering Laboratory III
- E E 395.3 Electrical Engineering Design
- Group B/C or D electives or
- Complementary Studies (6 credit units)**

Fourth Year (36 credit units)

Term 1

- E E 481.3 Control Systems
- G E 449.3 Engineering in Society
- Humanities or social science elective (3 credit units)
- Group A (6 credit units)

Term 2

- E E 362.3 Digital Signal Processing I or
- E E 341.3 Electric Machines I*
- G E 348.3 Engineering Economics
- Senior Humanities or social science elective (3 credit units)
- Group B/C, D or E electives or
- Complementary Studies (6 credit units)**

Term 1 and Term 2

- E E 495.6 Design Project

Group A: E E 441, 444, 456, 461

Group B: Offered odd University Calendar years - E E 344, 402, 432, 442

Group C: Offered even University Calendar years - E E 431, 445, 458, 472

Group D: M E 483

Group E: E E 480, CMPT 424 or a course from another branch of Science or Engineering approved by the Department Head

*Must take both E E 341 and E E 362.

**Of 12 credits in two years, 3 credit units must be from Complementary Studies (business science group or humanities or social sciences).

ENGINEERING PHYSICS

Engineering Physics is designed for students who wish to enter fields of research and development that require extra training in physics, mathematics, electronics and computers. The program emphasizes the application of scientific principles to the design of experiments and electronic systems for use in measurements, communications, and data acquisition. The program is recommended for students interested in newly developing areas of physics, high technology, instrumentation and communications. Graduates may proceed to a post-graduate degree in Physics and Engineering Physics or in other branches of engineering. There is also a double degree program in Engineering Physics/Computer Science that has proven to be very effective for the high technology job market and for graduate work.

Second Year (36 credit units)

Term 1

- CMPT 116.3 Computing I
- G E 210.3 Probability and Statistics
- MATH 223.3 Intermediate Calculus
- MATH 238.3 Introduction to Differential Equations and Series
- PHYS 251.3 Relativistic Mechanics and Quantum Physics
- Humanities or social science electives (3 credit units)

Term 2

- E P 225.3 Waves, Fields and Optics
- E P 228.3 Computer Tools for Engineering Physics
- E P 271.3 Heat, Kinetic Theory, and Thermodynamics

ENGINEERING

G E 226.3 Mechanics III
PHYS 227.3 Electricity and Magnetism I
Humanities or social science electives
(3 credit units)

Third Year (36 credit units)

Term 1

E P 311.3 Electronics I
E P 317.3 Applied Physics of Materials
G E 300.3 Oral and Written Communication
PHYS 371.3 Statistical and Thermal
Physics
PHYS 381.3 Quantum Mechanics I

Term 2

E P 320.3 Discrete Linear System and
Applied Information Theory
E P 321.3 Electronics II
E P 324.3 Engineering Mechanics IV
E P 356.3 Electricity and Magnetism II
G E 348.3 Engineering Economics

Term 1 and Term 2

MATH 338.6 Differential Equations II

Fourth Year (36 credit units)

Term 1

E E 481.3 Control Systems
E P 413.3 Instrumentation and Design
E P 414.3 Instrumentation Laboratory
E P 421.3 Optical Systems and Materials I
PHYS 463.3 Electricity and Magnetism III

Term 2

G E 449.3 Engineering in Society
PHYS 404.3 Techniques of Experimental
Physics

Engineering or science electives*
(6 credit units)

Senior humanities/social science elective
(3 credit units)

Term 1 and Term 2

E P 495.6 Capstone Design Project
PHYS 490.0 Physics Seminars

*Engineering or science electives: 3 credits from E E 432, 480; E P 431; PHYS 470.

The other 3 credit-unit elective also can be from the above list, or may be any science or engineering course (or other course with approval of the Head of the Department of Physics and Engineering Physics) at the 200 level or higher.

MECHANICAL ENGINEERING

Mechanical Engineering provides the student with a fundamental training in the areas of statics, dynamics and mechanics of materials thermodynamics and fluid dynamics; material properties and metallurgy; analysis and synthesis of mechanical systems; and mechatronic and controls. Practical applications and design are introduced.

Second Year (36 credit units)

Term 1

CMPT 116.3 Computers I
G E 201.3 Electric and Magnetic Circuits II
G E 213.3 Strength of Materials I
M E 214.3 Introduction to Materials and
Manufacturing

M E 227.3 Thermodynamics I
MATH 223.3 Intermediate Calculus

Term 2

G E 226.3 Mechanics III
G E 300.3 Oral and Written Communication
M E 215.3 Fluid Mechanics I
M E 229.3 Introduction to Engineering
Design
M E 251.3 Probability, Statistics and
Analysis

MATH 224.3 Differential Equations

Third Year (42 credit units)

Term 1

M E 313.3 Mechanics of Materials I
M E 316.3 Dynamics and Vibrations
M E 318.3 Mechanical Engineering
Laboratory I
M E 321.3 Engineering Analysis I
M E 324.3 Engineering Materials
M E 327.3 Heat Transfer

Term 2

M E 323.3 Mechanics of Materials II
M E 328.3 Mechanical Engineering
Laboratory II
M E 330.3 Manufacturing Processes
M E 335.3 Fluid Mechanics II
M E 352.3 Engineering Analysis II

Term 1 or Term 2

G E 348.3 Engineering Economics
Technical electives (3 credit units)*
Humanities or social science elective
(3 credit units)

Fourth Year (39 credit units)

Term 1

M E 413.3 Machine Design I
M E 417.3 Thermodynamics II
M E 418.3 Mechanical Engineering
Laboratory III
M E 431.3 Controls Systems I
M E 450.3 Finite Element Analysis

Term 2

G E 449.3 Engineering in Society
Term 1 and Term 2

M E 495.6 Industrial Design Project
Term 1 or Term 2

Technical* and Design Electives** (9 credit
units)
Senior humanities or social science elective
(3 credit units)

Complementary Studies Elective (3 credit
units from the business science group
or humanities or social sciences)

*Technical Electives – Term 1 - E E 311, 314, M E 476, 478 Term 2 - AB E 313; M E 460, 463, 469, 471, 472, 473, 475, 477; or Term 1 or Term 2 - 200-, 300- and 400-level courses from the Department of Computer Science or a course from another branch of science or engineering approved by the Department Head.

**Design Elective (students must take a minimum of 3 credit units) – Term 1 - M E 491 Term 2 – M E 490, 492, 493. Design electives are offered every calendar year, subject to minimum enrollment limits and staffing considerations. Consult with the Department to determine the availability of specific electives.

GRADUATION REQUIREMENTS

To be awarded the Bachelor of Science in Engineering Degree (B.E.), a student must have obtained a pass standing in all of the courses required by the specific program in accordance with the rules and regulations of the College of Engineering and the university. These requirements must be completed within a ten year period. Under exceptional circumstances, the college may grant an extension.

To obtain a B.E. degree from the University of Saskatchewan, students transferring from another university must fulfill the program requirements, of which 48 credit units must be from the University of Saskatchewan, and 36 credit units must be from the last two years of a program in the College of Engineering.

COURSE LOAD

The normal course loads for each program are defined in this section of the *Calendar* under "B.E. Program". Students are normally required to take a course load equal to that indicated for their particular year and program. A student may not take more than the normal course load except with permission of the Dean's Office.

PROGRESS IN A GIVEN PROGRAM

Students will not normally be admitted into the College of Engineering if they have any deficiencies in admission requirements. Students who are admitted with deficiencies must remove them during their first year of study.

ATTENDANCE AND EXAMINATIONS

Information regarding *Guidelines for Academic Conduct* can be found in the General Information section under *Student Rights, Discipline and Appeals* and on the web at www.usask.ca/university_council/reports.shtml. Regular and punctual attendance is expected of students in all courses in which they are registered. Students who are persistently tardy or absent from classes or who neglect academic work may be subject to disciplinary action and may be excluded from the final examinations.

There will be two final examination periods, one in December, the other in April. Under special circumstances, the college may authorize supplemental examinations which are written in August. The instructors in a class may hold other examinations, tests or exercises that they consider appropriate.

UNIVERSITY COUNCIL REGULATIONS ON EXAMINATIONS

For provisions governing examinations, refer to the *University Council Regulations on Examinations* section of the *Calendar* or www.usask.ca/university_council/reports.shtml. *College Regulations on Examinations*, are available from the college office.

EXPECTATIONS OF STUDENT BEHAVIOR

Students are expected to respect the rights of other students and faculty by refraining from disruptive behaviour in the classroom, laboratory or tutorials in accordance with the Guidelines for Academic Conduct.

Students should be aware that they are considered responsible adults and will be treated as such in regard to academic dishonesty and non-academic offences. The results in such cases can be serious, and may lead to suspension or expulsion from the University.

GRADING

See the General Information section of this *Calendar* for an explanation of the grading system and the literal descriptors associated with percentage grades.

REGISTRATION AND PROGRAM CHANGES

Although the College of Engineering may review and audit all engineering registrations, all students are responsible for ensuring that their registration is complete and consistent with the regulations of the College of Engineering as contained in this *Calendar*. It is the student's responsibility to determine whether they have the prerequisites for courses they wish to take. Failure to adhere to these regulations may result in a cancellation of registration.

Students may drop a course at any time, but should note carefully that first-term courses dropped after November 15, second-term courses dropped after March 15, and courses extending over both terms dropped after February 15 will be regarded as failed courses (withdraw fail), and that in the calculation of the student's weighted average, a grade of 30% will be used for the course dropped.

Non-attendance of a course does not constitute official withdrawal. Failure to officially withdraw will result in an ABF grade which will count as a 30% in calculation of the weighted average.

Students may be given approval by the Dean's Office, to replace one or more courses in the Engineering program by registering in equivalent courses in other colleges. This approval may also be obtained for courses which are to be repeated, but the minimum promotion requirements are transferred to the replacement course.

Students who have been required to repeat, or have been absent for one or more terms, must apply to Admissions, Office of the Registrar for re-admission to the college. Although the college makes every effort to respond to program needs of students returning after an absence of a year or more, the college has no responsibility to provide previous courses or their equivalent; rather, the student's program must be adjusted.

PROMOTION

The promotion of students in their Engineering program is determined on the basis of their performance during the Regular Session. Performance is judged on the basis of the Sessional Weighted Average (S.W.A.) and the number of credit units failed. Credit is given for courses satisfactorily completed during Spring and Summer Session but the grades obtained are not used to alter the ruling made on a student's performance during the previous Regular Session. For mixed programs the grades used in calculating the S.W.A. are at the discretion of the college.

Students with reduced course loads are required to maintain the same academic standards as students with normal course loads.

SESSIONAL WEIGHTED AVERAGE (S.W.A.)

To calculate the Sessional Weighted Average:

- (1) Multiply the grade in each course by the number of credit units in the course. The result is the "weighted grade" of the course.
- (2) Add together the weighted grades of all the courses taken.
- (3) Add together the number of credit units taken.
- (4) Divide the total weighted grades by the total number of credit units. The result is the Sessional Weighted Average.

PROMOTION REGULATIONS

Grades of up to 29% and "INF", "ABF" and "WF" will be recorded on the transcript as such, but will be considered as 30% for calculating averages.

Sessional Weighted Average greater than or equal to 58%

Failures: none

Action: Promote to the next year

Sessional Weighted Average greater than or equal to 58%

Failures: 1 to 6 credit units of courses

Action: Promote to the next year but must pass supplemental examinations (if eligible) or repeat the failed courses

Sessional Weighted Average greater than or equal to 55% but less than 58%

Failures: 6 or fewer credit units of courses including no failures*

Action: Advised to Discontinue

Sessional Weighted Average greater than or equal to 55%

Failures: 7 to 12 credit units of courses

Action: Advised to Discontinue

Any Average

Failures: 13 or more credit units of courses

Action: Required to Discontinue

Sessional Weighted Average less than 55%

Failures: Any number of failures including no failures

Action: Required to Discontinue

* Students in this category who receive permission to write supplemental examinations and do well enough in **one** of these exams to raise their average to 58% or greater are promoted to their next year. The action Advised to Discontinue will remain on the student's record. Students in this category are required to repeat all failed courses.

Advised to Discontinue - Students in this category are advised to discontinue their studies for at least one year but are not required to do so. Students who return must repeat the year (see below). Students in this category must repeat all courses below 60% in their *first* year back.

Required to Discontinue - Students in this category are not eligible to register in the college for at least one academic year. Subsequently they must submit an application for readmission. If accepted, they must repeat the year (see below). If students transfer to another college or post-secondary institution during their "Required to Discontinue" year and subsequently

transfer back to the College of Engineering, they will only receive credit for courses taken during the "Required to Discontinue" year for which they receive a grade of 60% or greater. It will be at the discretion of the College, whether courses will be credited toward the B.E. degree.

Repeat the Year - Students in this category must repeat those courses taken during a previous academic session in which they received a grade of less than 60%. Students in this category must repeat all courses below 60% in their *first* year back. Students must receive a weighted average of 60% or greater on the repeated courses or they will be Required to Withdraw.

Required to Withdraw - Students are not normally permitted to repeat more than once in their program. The second time they are Advised to Discontinue and/or Required to Discontinue, they will be Required to Withdraw from the College of Engineering. Only under exceptional circumstances will subsequent readmission be considered.

Students who are Required to Discontinue or Required to Withdraw and could complete the requirements for the degree in one academic year may petition the Undergraduate Administration Committee for permission to return immediately. Permission to return will be at the discretion of the Undergraduate Administration Committee. Such a petition will only be considered once during the entire program of studies of a student.

Students may also be required to withdraw for non-academic reasons such as unethical conduct.

SUPPLEMENTAL EXAMINATIONS

At the discretion of the Undergraduate Administration Committee, supplemental examinations may be granted in courses in the Engineering program to students in the following categories who have met the criteria outlined: a) Students who did not fail any courses but had a sessional weighted average greater than or equal to 55% but less than 58% and who by writing a supplemental examination in one course may be able to raise their S.W.A. to 58% or greater; b) Students who failed only one course with a grade of less than 40% but received a S.W.A. of at least 65%; c) Students who failed one or two courses with grades of 40% or greater and received a S.W.A. of at least 55%.

Only the grade from **one** course can be used to raise a student's S.W.A. to 58% or greater.

Students must apply in writing to the Dean's Office by **June 1** for the privilege to write supplemental examinations. The examinations, if granted, are subject to the guidelines listed under the Attendance and Examinations section of the General Information section of the *Calendar*.

CRITERIA FOR SUPPLEMENTAL EXAMINATIONS

(1) In any one year, students may be granted a supplemental examination in a

course provided they a) fall in one of the categories outlined in the first paragraph under Supplemental Examinations; b) have only one or two or no failed courses in the year being considered and; c) will not have written more than a total of four supplemental examinations during their entire program of studies including the year under consideration.

(2) In any one course, the privilege of writing a supplemental examination will be granted only once without repeating the course.

(3) To receive credit for a course by means of a supplemental examination, a student must obtain a minimum grade of 58% in the course if the course is administered by the College of Engineering (including E P and GEO E courses). For a course administered by another college, credit for the course will be determined by the rules of that college. The supplemental examination will be accorded the same weight as the regular final examination when computing the student's final grade.

(4) To be promoted to the next year, or to graduate, students who have written supplemental examinations must satisfy the promotion regulations.

FOR STUDENTS IN THEIR GRADUATING YEAR

The Undergraduate Administration Committee, in consultation with the Department Head may grant a student a maximum of two supplemental examinations even if this brings the student's total supplemental exams (1 c above) to more than 4. Granting of such supplemental examinations will only be considered, if by receiving credit for the course(s), the student will be able to complete the requirements for the degree. To receive credit for a course, the student must satisfy criterion (3) listed in the Criteria for Supplemental Examination section. Special Supplementals will be written the last full week of May for students in their graduating year.

DEGREES WITH DISTINCTION

The Degree of Bachelor of Science in Engineering with Distinction or Great Distinction will be conferred on the basis of high academic standing in the courses of the second, third and fourth years. Students graduating with a three-year Cumulative Weighted Average (C.W.A.) of greater than or equal to 77% but less than 82% will be granted Distinction, and students graduating with a three-year C.W.A. of greater than or equal to 82% will be granted Great Distinction.

STUDENT RIGHTS, DISCIPLINE AND APPEALS

See the General Information section of the *Calendar*.

AWARDS

AGRA Memorial Scholarship in Honour of Lawrence H. Lashyn
Akzo Nobel Chemicals Ltd. Scholarship
Karl Allcock Bursary

AMEL Scholarship
American Society of Heating, Refrigerating & Air Conditioning Engineers (ASHRAE) - Saskatoon Chapter Design Award
BP Canada Energy Company Scholarships
Janet Anderson-Thomson Scholarship
John Anderson-Thomson Scholarship
Dr. Joseph Angel & Family Scholarship in Electrical Engineering
Clinton L. Armstrong Memorial Award
Association of Professional Engineers and Geoscientists of Saskatchewan Prizes
Harold Balmforth Memorial Prize
Charles Edward Bell Scholarship
Gerard Belle Design Prize
Kenneth Bimmann Scholarship
Canadian Institute of Steel Construction Central Region Scholarship
Canadian Society for Chemical Engineers Prize
Cement Association of Canada Scholarship
Chemical Institute of Canada, Andre Boily EBM Scholarship
Chemical Institute of Canada, North Saskatchewan Section Award
First Year Chemistry Award
Chevron Canada Resources Limited Scholarship
Janet S. Clark Prize
Col. E. Churchill Memorial Scholarship
Civil Engineering Alumni Medal
Cominco Limited Scholarship in Engineering and Geology
Balfour Currie Memorial Scholarship
Harry T. Danyluk Scholarship
Dr. Edsel Darby Memorial Scholarship
Paul Del Frari Memorial Book Prize
Dow Chemical of Canada Limited Scholarship
William R. Ducie Scholarships
Electrical Engineering Achievement Award
Robert J. and Joyann M. Genereux Scholarship
Geological Engineering Distinguished Award
Evan Hardy Memorial Scholarship
Sylvia Fedoruk Scholarship
Bernard/Freda Frankenburg Scholarship
Fredeen Scholarship in Engineering
Gem Centennial Bursary
Joyann Marguerite Genereux Scholarship
Philip William Graham Scholarship
Grieg-Lovell Scholarships
Gunnar Hagblom Scholarship
E. J. Harrington Prize
Harvey Undergraduate Award Scholarship
Howard Douglas Scholarship
Wilfred Augustine Hinz Memorial Award in Electrical Engineering
Husky Oil Scholarship
Mechanical Engineering Distinguished Award
Neil Hutcheon Prize
IEEE Saskatchewan Section Award
John Deere Limited Scholarship
Kevin Keayes Memorial Scholarship
Kilborn Engineering Ltd. Bursaries
George N. Listwin Scholarships
Virgil Loehr Memorial Award
Luscar Ltd. Scholarship
Mawdsley Memorial Book Prize
Mawdsley-Edmunds Memorial Scholarship
MESA Scholarship
Moore Memorial Award Scholarship
Joe Morgan Bursary in Mechanical Engineering
Helen Mary Morris Bursary
Teruo Natori Scholarship
Peter N. Nikiforuk Scholarship
O'Connor Associates Environmental Inc. Scholarship
PanCanadian Petroleum Ltd. Scholarship
Pirie Foundation Bursaries
Positive Feedback Scholarship
Ramsay-MacDonald Memorial Scholarship
Andrew Alexander Rutherford Memorial Scholarship
Ethel Raymond Prize
Sarnia Chemical Engineering Community Scholarship
SaskTel Scholarships
Saskatchewan Wheat Pool Agricultural Scholarships
Saskatoon Engineering Society Book Prize
Saskatoon Geotechnical Group Prize
Schlumberger Collegiate Award Scholarship
SED Systems Inc. Scholarship
Separator Engineering Prize
S.E.S.S. Peter Nikiforuk Scholarship
J. M. Sharpe Memorial Prize
Shell Canada Scholarship in Geology and Geophysics
Society of Chemical Industry Merit Award
Society of Petroleum Engineers Award
Spectrum Scholarship
W. R. Staples Scholarship
John L. Stoik Bursaries
Suncor Energy Foundation Engineering Scholarship
Oliver L. Symes Memorial Award
Talisman Bursary
Ethel Thompson Prize
Dr. L. A. Thornton Prize
Thorvaldson Undergraduate Scholarship
Trapp Memorial Scholarship
Jennette Gertrude Traynor Bursary
I. W. Tweddell Memorial Award
UMA Group Ltd. Scholarship
J. E. Underwood and R. A. McLellan Memorial Scholarship
University Undergraduate Scholarships
Kevin Van Cleave Memorial Scholarship
Wong-Fredlund Scholarship

For details, consult the *Awards Guides*.

ENGINEERING

ENGINEERING SOCIETIES

The practice of Engineering throughout Canada is regulated by Professional Associations in each province. The right to practice and accept professional responsibility is limited to those who are registered with the professional organization in the particular province concerned. In Saskatchewan, this organization is the Association of Professional Engineers of Saskatchewan. Graduates are encouraged to join the Association as Engineers in Training. Several years of acceptable experience following graduation are necessary for registration as a Professional Engineer.

The practicing engineer keeps abreast of technological developments through membership in one of several technical societies. Students in Engineering may become student members of such technical societies as the Engineering Institute of Canada, the Canadian Society

for Chemical Engineers, the Canadian Society of Civil Engineers, the Canadian Institute of Mining and Metallurgy, the Canadian Society of Agricultural Engineering, the Institute of Electrical and Electronic Engineering or the Society of Automotive Engineers. Engineering students are encouraged to join the society closest to their specialty.

The Engineering Student Society of the university is a voluntary organization of students within the college. Its object is to promote academic, social and athletic interests of the student body.

COURSES

College of Engineering courses are listed in the Courses section of the *Calendar* under the following subject headings:

Agricultural and Bioresource Engineering (AB E)

Chemical Engineering (CH E)

Civil Engineering (C E)

Electrical Engineering (E E)

Engineering Physics (E P)

Engineering Professional Internship Program (EPIP)

General Engineering (G E)

Geological Engineering (GEO E)

Mechanical Engineering (M E)

Note: The term prerequisite, as applied to a course offered by the College of Engineering, without further qualification, means that a pass standing has been attained in the prerequisite course. Where a first-term course is a prerequisite for a second-term course that is taken in the same academic year a minimum grade of 40% is required in the prerequisite course.

If the prerequisite course is qualified by the term "taken", a minimum grade of 40% is required in the prerequisite course.

In exceptional cases the Dean's Office, on the recommendation of the Department Head, may grant permission for a student to register in a course without having the prerequisite course(s). This permission will normally be granted only to students who have demonstrated superior performance in the program, students with a lighter than normal load, or students whose previous experience has involved sufficient exposure to the subject matter. Students receiving such permission will be responsible for obtaining sufficient knowledge of the prerequisite material to successfully complete the course for which they are registering. If a prerequisite course is a required course in the program, it must be successfully completed before graduation.