

# ELECTRICAL AND COMPUTER ENGINEERING

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The Department of Electrical and Computer Engineering offers two fully accredited degree programs, one in Electrical Engineering and one in Computer Engineering. Both programs may include an industry internship (co-op). The programs are designed to give students knowledge of the basic principles of engineering and, in particular, an adequate training and education in the fundamentals and professional applications of Electrical and Computer Engineering. It is recommended that students entering Electrical or Computer Engineering acquire their own computer.

## Industry Internship Program (IIP)

The Price Faculty of Engineering offers cooperative education or industry internship opportunities as part of all degree programs. For information on these programs, please refer to Co-operative Education (<https://catalog.umanitoba.ca/undergraduate-studies/engineering/>) and Industrial Internship Programs (<https://catalog.umanitoba.ca/undergraduate-studies/engineering/#cooperativeeducationandindustrialinternshipprogramstext>).

## Computer Engineering Program

The program in Computer Engineering has a core-plus-elective structure. The core includes fundamental professional courses focused on digital hardware, digital systems design, software engineering, algorithms, electronics, and communications, as well as developing a necessary foundation in mathematics, computer programming, electric circuits, the physical sciences, and thermodynamics. At the conclusion of the program, a graduate will have acquired both the knowledge and experience necessary to design and engineer practical custom digital hardware and software systems to solve real-world problems. To support that outcome, the final year includes a significant, industrially relevant, capstone group design project as a core requirement, with the remaining program based on electives. A certain level of specialization is possible through the selection of elective courses offered in the final year. In addition, the Department offers recognized Focus Areas (<https://catalog.umanitoba.ca/undergraduate-studies/engineering/electrical-computer-engineering/computer-engineering-bsc/#concentrationstext>) in Computer Networks and Communications, Embedded Systems, Software Engineering, and Biomedical.

The student's program must include six credit hours of complementary studies electives. Courses in engineering economics, technical writing, and ecology, technology and society are compulsory.

Students are encouraged to consult with the department for model four-year ([https://umanitoba.ca/faculties/engineering/departments/ece/pdf/2020-2021\\_EE\\_Flowchart\\_\(4\\_year\\_plan\).pdf](https://umanitoba.ca/faculties/engineering/departments/ece/pdf/2020-2021_EE_Flowchart_(4_year_plan).pdf)) and five-year

([https://umanitoba.ca/faculties/engineering/departments/ece/pdf/2020-2021\\_EE\\_Flowchart\\_\(5\\_year\\_plan\).pdf](https://umanitoba.ca/faculties/engineering/departments/ece/pdf/2020-2021_EE_Flowchart_(5_year_plan).pdf)) programs. Students are strongly encouraged to follow the model programs when possible, as timetabling and course offerings are based on these.

## Electrical Engineering Program

The program in Electrical Engineering has a core-plus-elective structure. The core develops the necessary base in mathematics, the physical sciences, dynamics, thermodynamics, electric fields and circuits, and fundamental professional courses focused on energy conversion and transmission, electronics, materials and devices, communications, and control systems. At the conclusion of the program, a graduate will have acquired both the knowledge and experience necessary to design and engineer practical electrical and electronic systems to solve real-world problems. To support that outcome, the final year includes a significant, industrially relevant, capstone group design project, in addition to control systems, and communication systems as core requirements, with the remaining program based on electives. A certain level of specialization is possible through the selection of elective courses offered in the final year. In addition, the Department offers recognized Focus Areas (<https://catalog.umanitoba.ca/undergraduate-studies/engineering/electrical-computer-engineering/electrical-engineering-bsc/#concentrationstext>) in Power and Energy Systems, Communication Devices, Engineering Physics, and Biomedical.

The student's program must include six credit hours of complementary studies electives. Courses in engineering economics, technical writing, and ecology, technology and society are compulsory.

Students are encouraged to consult with the department for model four-year and five-year programs. Students are strongly encouraged to follow the model programs when possible, as timetabling and course offerings are based on these.

## Second Degree in Electrical or Computer Engineering

Students who have completed a first degree in Electrical Engineering or Computer Engineering may seek a second degree in the complementary program. The requirements for completion of the second degree include:

1. The completion of all deficient required (core) courses for the second degree. If a student has completed any of these courses as fourth year electives towards the first degree, then they will not have to repeat or replace the courses already taken.
2. The equivalent of a full fourth year program is required for the second degree, i.e., twelve half courses. This must include:
  - i) A second capstone group design project on a different topic relating to the field of the second degree;
  - ii) All the fourth year course requirements of the second degree. If a student has already taken one or more of the required fourth year courses during their first degree, then they must replace those courses by other appropriate fourth year courses as approved by the Department Head. For example, core courses common to both programs must be replaced by fourth year electives from the Department.

## Programs

<b>Degree/Diploma</b>	<b>Years to Completion</b>	<b>Total Credit Hours</b>	<b>Has Co-op Option</b>
Computer Engineering, B.Sc. ( <a href="https://catalog.umanitoba.ca/undergraduate-studies/engineering/electrical-computer-engineering/computer-engineering-bsc/">https://catalog.umanitoba.ca/undergraduate-studies/engineering/electrical-computer-engineering/computer-engineering-bsc/</a> )	4	152-157	Yes
Electrical Engineering, B.Sc. ( <a href="https://catalog.umanitoba.ca/undergraduate-studies/engineering/electrical-computer-engineering/electrical-engineering-bsc/">https://catalog.umanitoba.ca/undergraduate-studies/engineering/electrical-computer-engineering/electrical-engineering-bsc/</a> )	4	158-163	Yes