

# BACHELOR OF ENGINEERING (SOFTWARE ENGINEERING) (BSA)

## About the Program

This Honours-level Bachelor of Engineering program will prepare you to design, build, implement and maintain complex computer and software solutions that are efficient, reliable and secure. The emphasis of this four-year honours degree program is on artificial intelligence (AI) in solving software engineering problems. Courses in this program focus on software engineering criteria in the areas of mathematics, natural sciences, engineering design and engineering science.

Your studies will include two mandatory, co-operative, four-month work-integrated learning experiences — one between semesters 6 and 7 and another between semesters 7 and 8. In your final year of the program, you will choose from Professional Option courses such as robotics, parallel programming and computer vision. You will also undertake a substantial industry-driven group project.

## Credential Awarded

Bachelor Degree

## Duration

8 Semesters (4 Years)

## Starts

January, September

## Program and Course Delivery

This program is offered in person. Students are required to come on campus to attend classes.

## Skills

Throughout this program you will develop the following skills:

- software engineering techniques
- artificial intelligence, data mining, machine learning
- engineering design, natural sciences and mathematics
- communication, teamwork and leadership skills

## Work Experience

### Mandatory Degree Co-op

A work experience that includes at least one term in a formal work environment. In most cases the work term(s) is a paid position that is completed between two academic semesters and requires a minimum of 420 hours of work. Students must be in good standing and meet all identified requirements prior to participating in the work experience. The successful completion of the co-op work term(s) is required for graduation. Eligibility for participation does not guarantee that a work position will be secured. Additional fees are required for those participating

in the mandatory co-op stream regardless of success in securing a work position.

## Your Career

Graduates of the program can explore the following career options:

- software engineer
- software developer
- software programmer
- artificial intelligence specialist
- artificial intelligence engineer
- artificial intelligence developer
- artificial intelligence programmer
- artificial intelligence designer
- artificial intelligence researcher
- machine learning engineer
- machine learning developer
- data scientist

## Accreditation and Licensing

### Canadian Engineering Accreditation Board (CEAB)

The Bachelor of Engineering – Software Engineering is designed to meet the accreditation requirements of the Canadian Engineering Accreditation Board (<https://engineerscanada.ca/accreditation/about-accreditation/>) (CEAB). Seneca will be eligible to apply for CEAB accreditation upon the graduation of the first cohort of students.

### Professional Engineers of Ontario (PEO)

Students are encouraged to obtain the specific requirements directly from the granting body before enrolling.

### Program of Study

Course Code	Course Name	Weekly Hours
<b>Semester 1</b>		
BSA100	Engineering Attributes I	1
ENG106	Writing Strategies	3
MEC110	Mechanics	4
MTH110	Mathematics	4
SEA100	Exploration of Artificial Intelligence	4
SEM305	Discrete Mathematics	4
SEP101	Programming Fundamentals	4
<b>Semester 2</b>		
BTC240	Interpersonal Communications in Organizations	3
MTH200	Mathematics II	4
SED200	Design and Analysis	3
SEP200	Object-Oriented Programming	4
SEP420	Web Programming and Scripting	4
SES250	Electromagnetics	6
<b>Semester 3</b>		
BTD210	Database Design Principles	4
SEH300	Digital and Analog Circuits	4

SEM105	Linear Algebra	4
SEP300	Software Development and Deployment	4
SES300	Optics	4
WTP200	Work Term Preparation	1
plus: Liberal Studies Course (1)		3
<b>Semester 4</b>		
BTC440	Business and Technical Writing	3
BTP500	Data Structures and Algorithms	4
CHM300	Chemistry	3
SEA400	Artificial Intelligence	4
SEM405	Statistics	4
SEP400	Operating Systems	4
<b>Semester 5</b>		
BSA200	Engineering Attributes II	1
BTH545	Principles of GUI Design and Programming	4
BTS535	Software Project Management	4
SEA500	Introduction to Data Mining	4
SED500	Introduction to Software Engineering	4
SEE500	Systems Requirements Engineering	4
SEH500	Microprocessors and Computer Architecture	4
<b>Semester 6</b>		
LSP240	Micro Economics - Theory and Practice	3
SEA600	Introduction to Machine Learning	4
SED505	Design Patterns	4
SED600	Topics in Software Design	4
SEE600	Software Testing and Quality Assurance	4
SEP600	Embedded Systems	4
<b>Work-Integrated Learning Term 1</b>		
BSA771	Software Engineering Degree, Co-op	35
<b>Semester 7</b>		
SED700	Capstone I	4
SEL700	Law, Ethics and Professional Practice	3
SEN700	Computer Networks	4
SEP700	Compiler Design	4
plus: Liberal Studies Course (1)		3
plus: Professional Options (2)		8
<b>Work-Integrated Learning Term 2</b>		
BSA772	Software Engineering Degree, Co-op II	35
<b>Semester 8</b>		
SED800	Capstone II	5
SEG800	Digital Signal and Image Processing	4
SEN800	Computer Security and Cryptography	4
plus: Liberal Studies Course (1)		3
plus: Professional Options (2)		8

## Professional Options

Course Code	Course Name	Weekly Hours
BTH745	Human-Computer Interaction	4
BTP610	Mobile Applications	4
DPS909	Topics in Open Source Development	4
DPS921	Parallel Algorithms And Programming Techniques	4
QUC955	Quantum Computing	4
SEA700	Robotics for Software Engineers	4
SEA710	Advanced Computer Vision	4

Seneca has been granted a consent by the Minister of Colleges and Universities to offer this degree for a seven-year term starting Apr. 22, 2021. In conformity with the Minister's criteria and requirements, Seneca will submit an application for the renewal of the consent for this program 12 months prior to the expiration of the consent. Seneca shall ensure that all students admitted to the above-named program during the period of consent will have the opportunity to complete the program within a reasonable time frame.

## Program Learning Outcomes

This Seneca program has been validated by the Credential Validation Service as an Ontario College Credential as required by the Ministry of Colleges and Universities.

As a graduate, you will be prepared to reliably demonstrate the ability to:

1. Apply mathematics, natural sciences, and engineering fundamentals to solve engineering problems.
2. Create software engineering solutions that satisfy technical and business requirements.
3. Design an optimal solution using artificial intelligence, data mining, and machine learning tools for complex and open-ended problems.
4. Employ interpersonal, teambuilding, and leadership skills to solve problems independently and in diverse teams.
5. Communicate complex engineering problems and solutions to fellow software engineers and designers as well as non-technical audiences.
6. Act ethically and responsibly with public welfare and environmental protection as a guiding professional practice.
7. Plan and manage the scope, cost, timing, and quality of the project for success as defined by the project stakeholders.
8. Utilize investigative practices and self-awareness techniques to identify and pursue lifelong learning opportunities within their field of study and more broadly.

## Admissions Requirements

Ontario Secondary School Diploma (OSSD) or equivalent, including six grade 12 U or M courses with a minimum overall average of 70%, or a mature applicant (<https://www.senecapolytechnic.ca/registrar/canadian-applicants/admission-requirements/mature-applicants.html>).

Required courses with minimum final grade of 70% in each:

- English: Grade 12 ENG4U
- Calculus and Vectors: Grade 12 MCV4U
- Functions: Grade 12 MHF4U

- Physics: Grade 12 SPH4U
- Chemistry: Grade 12 SCH4U

Learn about Seneca's free English upgrading course (<https://www.senecapolytechnic.ca/registrar/canadian-applicants/admission-requirements/upgrading-options/english-12u-equivalency.html>) and math upgrading course (<https://www.senecapolytechnic.ca/registrar/canadian-applicants/admission-requirements/upgrading-options/math-12u-equivalency.html>) for applicants who don't meet the high school requirements, as well as recommended upgrading for applicants who don't meet their academic subject requirements. (<https://www.senecapolytechnic.ca/registrar/canadian-applicants/admission-requirements/upgrading-options.html>)

## International Student Information

International admissions requirements vary by program and in addition to English requirements (<https://www.senecapolytechnic.ca/international/apply/how-to-apply/admission-requirements/english-requirements.html>),

programs may require credits in mathematics, biology, and chemistry at a level equivalent to Ontario's curriculum, or a postsecondary degree or diploma, equivalent to an Ontario university or college. Program-specific pre-requisite courses and credentials are listed with the admission requirements on each program page. To review the academic requirements please visit: Academic Requirements - Seneca, Toronto, Canada ([senecapolytechnic.ca](https://www.senecapolytechnic.ca)) (<https://www.senecapolytechnic.ca/international/apply/how-to-apply/admission-requirements/academic-requirements.html>).

## Pathways

As a leader in academic pathways, we offer a range of options that will allow you to take your credential further in another Seneca program or a program at a partner institution.

To learn more about your eligibility, visit the Academic Pathways (<https://www.senecapolytechnic.ca/pathways.html>) web page.

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