

# COMPUTER ENGINEERING (CENG)

## School of Engineering, College of Engineering and Physical Sciences

Computer Engineering – the application of computer science and electrical/electronics engineering to develop computer hardware and software. Graduates in Computer Engineering gain skills and use computer aided-design tools that enable them to design, implement, and develop processors, hardware accelerators and associated software. These skills lead to efficient hardware/software co-design and the ability to develop user/application-level software. This major provides students with a common base of knowledge essential to computer engineering and then allows them to select from a menu of electives to attain a broad technical background. Electives are available in the areas of Embedded Systems, Artificial Intelligence, Software Design, Computer Communications, Circuit Design and VLSI, Controls and Robotics.

## Major Requirements (Honours)

This is a major within the degree: Bachelor of Engineering ([calendar.uoguelph.ca/undergraduate-calendar/degree-programs/bachelor-engineering-beng/](http://calendar.uoguelph.ca/undergraduate-calendar/degree-programs/bachelor-engineering-beng/)).

Code	Title	Credits
<b>Semester 1</b>		
CHEM*1040	General Chemistry I	0.50
ENGG*1100	Engineering and Design I	0.75
ENGG*1410	Introductory Programming for Engineers	0.50
MATH*1200	Calculus I	0.50
PHYS*1130	Physics with Applications	0.50
<b>Semester 2</b>		
ENGG*1210	Engineering Mechanics I	0.50
ENGG*1420	Object-Oriented Programming for Engineers	0.50
ENGG*1500	Engineering Analysis	0.50
MATH*1210	Calculus II	0.50
PHYS*1010	Introductory Electricity and Magnetism	0.50
<b>Semester 3</b>		
CIS*2520	Data Structures	0.50
ENGG*2400	Engineering Systems Analysis	0.50
ENGG*2410	Digital Systems Design Using Descriptive Languages	0.50
MATH*2270	Applied Differential Equations	0.50
STAT*2120	Probability and Statistics for Engineers	0.50
0.50 restricted electives		0.50
<b>Semester 4</b>		
CIS*2910	Discrete Structures in Computing II	0.50
ENGG*2100	Engineering and Design II	0.75
ENGG*2450	Electric Circuits	0.50
ENGG*3380	Computer Organization and Design	0.50
MATH*2130	Numerical Methods	0.50
0.50 restricted electives <sup>1</sup>		0.50
<b>Semester 5</b>		
ENGG*3390	Signal Processing	0.50
ENGG*3450	Electronic Devices	0.50

ENGG*3640	Microcomputer Interfacing	0.50
ENGG*4450	Large-Scale Software Architecture Engineering	0.50
HIST*1250	Science and Technology in a Global Context	0.50

0.50 restricted electives 0.50

### Semester 6

CIS*3110	Operating Systems I	0.50
CIS*3490	The Analysis and Design of Computer Algorithms	0.50

ENGG\*3100 Engineering and Design III 0.75

ENGG\*3210 Communication Systems 0.50

ENGG\*3410 Systems and Control Theory 0.50

0.50 restricted electives 0.50

### Semester 7

ENGG*3050	Embedded Reconfigurable Computing Systems	0.50
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ENGG\*3240 Engineering Economics 0.50

ENGG\*4000 Proposal for Engineering Design IV 0.00

ENGG\*4420 Real-time Systems Design 0.75

1.00 restricted electives 1.00

### Semester 8

ENGG\*4170 Computer Engineering Design IV 1.00

ENGG\*4540 Advanced Computer Architecture 0.50

ENGG\*4550 VLSI Digital Design 0.50

1.00 restricted electives 1.00

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CIS\*2750 Software Systems Development and Integration recommended for students interested in the software area of interest.

## Restricted Electives

(see Program Guide for more information)

The Engineering Program requires Computer Engineering students to complete the following combination of elective credits to complete their program:

- 2.00 credits from the CENG-1 Computer Engineering electives
- 2.00 credits from Complementary Studies electives

Consult the Program Guide for further information on the prerequisite requirements specific to each elective. Students can take a maximum of 1.50 credits at the 1000 level from the above list of electives.

## Co-op Requirements (Honours)

This is a major within the degree: Bachelor of Engineering ([calendar.uoguelph.ca/undergraduate-calendar/degree-programs/bachelor-engineering-beng/](http://calendar.uoguelph.ca/undergraduate-calendar/degree-programs/bachelor-engineering-beng/)).

The Co-op program in Computer Engineering is a five year program, including five work terms. Students must follow the academic work schedule as outlined below (also found on the Co-operative Education website: <https://www.recruitguelph.ca/cecs/>).

## Academic and Co-op Work Term Schedule

Year	Fall	Winter	Summer
1	Academic Semester 1	Academic Semester 2	Off
2	Academic Semester 3 COOP*1100	Academic Semester 4	COOP*1000 Work Term I
3	Academic Semester 5	COOP*2000 Work Term II	COOP*3000 Work Term III
4	Academic Semester 6	Academic Semester 7	COOP*4000 Work Term IV
5	COOP*5000 Work Term V	Academic Semester 8	N/A

Please refer to the Co-operative Education program policy with respect to work term performance grading, work term report grading and program completion requirements.

For additional program information students should consult with their Co-op Co-ordinator and Co-op Faculty Advisor, listed on the Co-operative Education web site.

## Credit Summary

(26.00 Total Credits)

Code	Title	Credits
	Required Core Courses	19.50
CENG-1	Computer Engineering Electives	2.00
	Complementary Studies Electives	2.00
	Co-op Work Terms	2.50
<b>Total Credits</b>		<b>26</b>

## Recommended Program Sequence

Code	Title	Credits
<b>Semester 1 - Fall</b>		
CHEM*1040	General Chemistry I	0.50
ENGG*1100	Engineering and Design I	0.75
ENGG*1410	Introductory Programming for Engineers	0.50
MATH*1200	Calculus I	0.50
PHYS*1130	Physics with Applications	0.50
<b>Semester 2 - Winter</b>		
ENGG*1210	Engineering Mechanics I	0.50
ENGG*1420	Object-Oriented Programming for Engineers	0.50
ENGG*1500	Engineering Analysis	0.50
MATH*1210	Calculus II	0.50
PHYS*1010	Introductory Electricity and Magnetism	0.50
<b>Summer Semester</b>		
No academic semester or work term		
<b>Semester 3 - Fall</b>		
CIS*2520	Data Structures	0.50
COOP*1100	Introduction to Co-operative Education	0.00
ENGG*2400	Engineering Systems Analysis	0.50
ENGG*2410	Digital Systems Design Using Descriptive Languages	0.50
MATH*2270	Applied Differential Equations	0.50
STAT*2120	Probability and Statistics for Engineers	0.50

0.50 restricted electives 0.50

### Semester 4 - Winter

CIS*2910	Discrete Structures in Computing II	0.50
ENGG*2100	Engineering and Design II	0.75
ENGG*2450	Electric Circuits	0.50
ENGG*3380	Computer Organization and Design	0.50
MATH*2130	Numerical Methods	0.50
0.50 restricted electives <sup>1</sup>		0.50

### Summer Semester

COOP*1000	Co-op Work Term I	0.50
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### Semester 5 - Fall

ENGG*3390	Signal Processing	0.50
ENGG*3450	Electronic Devices	0.50
ENGG*3640	Microcomputer Interfacing	0.50
ENGG*4450	Large-Scale Software Architecture Engineering	0.50
HIST*1250	Science and Technology in a Global Context	0.50

0.50 restricted electives 0.50

### Winter Semester

COOP*2000	Co-op Work Term II	0.50
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### Summer Semester

COOP*3000	Co-op Work Term III	0.50
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### Semester 6 - Fall

ENGG*3050	Embedded Reconfigurable Computing Systems	0.50
ENGG*3240	Engineering Economics	0.50
ENGG*4420	Real-time Systems Design	0.75

1.00 restricted electives 1.00

### Semester 7 - Winter

CIS*3110	Operating Systems I	0.50
CIS*3490	The Analysis and Design of Computer Algorithms	0.50
ENGG*3100	Engineering and Design III	0.75
ENGG*3210	Communication Systems	0.50
ENGG*3410	Systems and Control Theory	0.50

0.50 restricted electives 0.50

### Summer Semester

COOP*4000	Co-op Work Term IV	0.50
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### Fall Semester

COOP*5000	Co-op Work Term V	0.50
ENGG*4000	Proposal for Engineering Design IV	0.00

### Semester 8 - Winter

ENGG*4170	Computer Engineering Design IV	1.00
ENGG*4540	Advanced Computer Architecture	0.50
ENGG*4550	VLSI Digital Design	0.50

1.00 restricted electives 1.00

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CIS\*2750 Software Systems Development and Integration recommended for students interested in the software area of interest.

## Restricted Electives

(see Program Guide for more information)

The Engineering Program requires Computer Engineering students to complete the following combination of elective credits to complete their program:

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Consult the Program Guide for further information on the prerequisite requirements specific to each elective. Students can take a maximum of 1.50 credits at the 1000 level from the above list of electives.