Electrical Engineering

Advising Sheet 2025W

This document summarizes the courses required to obtain a Bachelor of Applied Science Degree in Electrical Engineering. Electrical engineering students can also graduate with a Concentration in a Biomedical or Mechatronics. The Concentrations have specific course requirements that must be taken. The courses for the electrical engineering program, as well as biomedical and mechatronics concentrations, are summarized in tables and notes below. Please review this document in its entirety, annually.

Some notes for 2025W:

- Most electrical engineering students who started in 2022W, and all second year electrical engineering students from 2023W onwards, will take the New Curriculum. As a guideline, if a student has completed APSC_O 260 Mechanics of Materials I, they will follow the old program path. However, **APSC_O 260, if taken after 2022W, will not be honoured for a degree in Electrical Engineering.** Students who are uncertain should contact Engineering Academic Services (soe.academicservices@ubc.ca).

- The transition to our new Electrical Engineering program is ongoing. As the Old Curriculum is being phased out, not all courses are being offered. If you are still following the old program, please review the notes about substitutions carefully. Students in the Old Curriculum are:
    - Required to complete APSC_O 260
    - May fulfill the ENGR_O 361 requirement by taking APSC_O 270
    - May fulfill the ENGR_O 365 requirement by taking APSC_O 278
    - May fulfill the ENGR_O 451 requirement by taking ENGR_O 352
    - Not required to take ENGR_O 378, although it may be taken as an alternative technical elective.

- New to 2025W, electrical engineering students will take CMPE_O 246 instead of APSC_O 258. **APSC_O 258, if taken after 2024W, will not be honoured for a degree in Electrical Engineering.**

- Students can complete the electrical engineering program in four years by taking six courses per term or in five years by taking a maximum of five courses per term. Both four- and five-year plans are summarized in program tables.

- Full course descriptions are here. The tables in this document include course vectors, course prerequisites (shown in red), and course co-requisites (shown in orange).

- Students should review the advising sheet annually to follow any updates to the program.

4-year plan

5-year plan

Electrical Engineering Curriculum

	Term 1	Term 2	
Year 1 of 4	**APSC_O 169** Fundamentals of Sustain. Eng. Design [3-2-0]	**APSC_O 173** Engineering Analysis II [3-0-1] *APSC_O 172*	Year 1 of 5
	APSC_O 172 Engineering Analysis I [3-0-1]	**APSC_O 177** Engineering Computation and Instrumentation [3-2*-0][1]	
	APSC_O 179 Linear Algebra for Engineers [3-0-0]	**APSC_O 178** Electricity, Magnetism, and Waves [3-0-1] *APSC_O 172, 173*	
	APSC_O 180 Statics [3-0-2] *APSC_O 179*	**APSC_O 181** Dynamics [3-0-2] *APSC_O 172, 180, 173*	
	APSC_O 182 Matter and Energy I [2-2*-2*]	**APSC_O 183** Matter and Energy II [2-2*-2*]	
	APSC_O 176 Engineering Communication [3-0-0]	**APSC_O 171** Engineering Drawing and CAD/CAM [3-0-2]	
Year 2 of 4	**APSC_O 246** System Dynamics [3-0-1] *APSC_O 173, 179, 181*	**APSC_O 201** Technical Communication [3-0-0] *APSC_O 176*	Year 2 of 5
	APSC_O 248 Engineering Analysis III [3-0-1] *APSC_O 173*	**APSC_O 255** Electric Circuits and Power [3-2*-1] *APSC_O 178*	
	APSC_O 252 Thermodynamics [3-0-1] *APSC_O 173, 182*	**APSC_O 270** Signals and Communication Systems [3-2*-0] *APSC_O 246*	
	APSC_O 254 Instrumentation and Data Analysis [3-2*-1] *APSC_O 172, 178*	**APSC_O 278** Electric and Magnetic Fields *[3-0-1] APSC_O 178, 248*	
	APSC_O 256 Numerical Methods for Analysis [3-1-0] *APSC_O 173, 177, 179*	**CMPE_O 246** Computer Engineering Design Studio[2] [3-2-0] *APSC_O 169 and 177, or COSC_O 111*[2]	
	APSC_O 259 Materials Science I [3-2*-0] *APSC_O 182, 183*	**APSC_O 262** Digital Logic Design [3-2*-0] *APSC_O 178*	
Year 3 of 4	**ENGR_O 350** Linear Circuit Theory [3-0-0] *APSC_O 246, 255*	**ENGR_O 320** Electromechanical Devices [3-2*-1] *APSC_O 255*	Year 3 of 5
	ENGR_O 351 Microelectronics I [3-2*-0] *APSC_O 255*	**ENGR_O 352** Microelectronics II [3-2*-0] *ENGR_O 351*	
	ENGR_O 359 Microcomputer Engineering [3-2*-0] *APSC_O 255*	**ENGR_O 305** Engineering Economic Analysis [3-0-0] *2nd yr. standing*	
	ENGR_O 303 Engineering Project Management [3-0-0] *APSC_O 169, 201*	**ENGR_O 315** Systems and Control [3-2*-1] *APSC_O 246*	
	ENGR_O 353 Semiconductor Devices [3-0-0] *APSC_O 255*	**ENGR_O 362** Digital Signal Processing I [3-0-1] *APSC_O 270*	
	ENGR_O 360 Engineering Probability and Statistics [3-0-1] *APSC_O 248*	**ENGR_O 378** Electromagnetics for Engineers *[3-0-1] APSC_O 278*	
Year 4 of 4	*Humanities Elective*	*Design / Technical Elective*	Year 4 of 5
	Design / Technical Elective	*Design / Technical Elective*	
	Design / Technical Elective	**ENGR_O 413** Law and Ethics for Engineers [3-0-0] *Third-year standing*	Year 5 of 5
	Design / Technical Elective	*Design / Technical Elective*	
	Design / Technical Elective	*Design / Technical Elective*	
	ENGR_O 499 Engineering Capstone Design Project [2-3-0; 0-6-0] *Fourth-year standing*		

[1] COSC_O 111 can be substituted for APSC_O 177, especially for students planning to pursue the Minor of Computer Science. If taken instead of APSC_O 177, COSC_O 111 will count towards the Minor requirements and the program requirements.
[2] APSC_O 258 can be substituted for CMPE_O 246 if taken in 2024W or earlier.

Fourth Year Guide 2025W

Electrical Engineering Fourth-Year Curriculum	
ENGR_O 413 Law and Ethics for Engineers (Term 2) *Third-year standing*	3 credits
ENGR_O 499 Engineering Capstone Design Project (Terms 1 & 2) *Fourth-year standing*	6 credits
Humanities elective	3 credits
Design Electives[3]	12 credits
Technical Electives[4]	12 credits

[3] Design electives are chosen from the list of Approved Electrical Design Electives below.

[4] Technical electives are chosen from the list of Approved Electrical Technical Electives below or are chosen in accordance with the requirements for Alternative Electrical Technical Electives below.

Humanities Elective

A list of accepted humanities elective topics can be found here: https://engineering.ok.ubc.ca/student-resources/engineering-academic-services-undergraduate-students/navigate-your-degree/humanities-electives/ .

Design and Technical Electives

- **Design Elective (DE):** A design elective has at least 50% design content that meets requirements established by the Canadian Engineering Accreditation Board (CEAB). Design electives are taught by specific faculty who are licensed as Professional Engineers (P.Eng) in Canada.
- **Technical Elective (TE):** A technical elective course has less than 50% design content and focuses on specialized knowledge related to engineering.
- Students must take at least four design electives (12 credits).
- Students must take a total 24 credits (eight courses) of design and technical electives. Design electives can also count towards technical electives but the converse is not true – technical electives cannot replace design electives.
- Tables are shown below that group design and technical electives into specific specializations in electrical engineering. The tables are provided to help guide students in selecting courses for each specialization.
- Courses are subject to minimum and maximum enrolments. The School of Engineering reserves the right to cancel a course if the minimum enrolment is not met. If a course is cancelled, you will be notified by email. Check the UBC course schedule to see the course availability.
- Depending on the level of engineering design and the assigned instructor, the classification of a course as either a design elective or technical elective may change.
- Course descriptions including required prerequisites are found in the UBC Academic Calendar: https://okanagan.calendar.ubc.ca/course-descriptions-0

The full list of all electives available to electrical engineering students in 2025W is below. See also details about Alternative Electives and courses for students in the Biomedical or Mechatronics Concentration. In addition, the Electrical Program Chair has provided information on Page 5 to help with elective selection by grouping them into common themes.

Approved Electrical Design Electives (DE)

Electrical engineering students must choose **at least 4 courses** from the list below.

Term 1

ENGR_O 401 Bioinstrumentation
[3-2*-0] *APSC_O 254*
ENGR_O 458 Power Electronics
[3-2*-0] *ENGR_O 320*
ENGR_O 471 Radio Frequency Integrated Circuits[5]
[3-2*-0] *APSC_O 270 and ENGR_O 352*
ENGR_O 472 Fibre Optics and Photonics
[3-2*-0] *ENGR_O 378*
ENGR_O 473 Antennas and Propagation
[3-2*-0] *ENGR_O 378*
ENGR_O 480 Modern Control
[3-0-0] *ENGR_O 315*

Term 2

ENGR_O 406 Microelectromechanical Systems
[3-2*-0] *Fourth-year B.A.Sc. standing.*
ENGR_O 467 Real-Time and Embedded System Design
[3-2*-0] *ENGR_O 359*
ENGR_O 474 Analog Integrated Circuits
[3-0-0] *ENGR_O 352*
ENGR_O 481 Mechatronics
[3-2*-0] *ENGR 315, ENGR 320*
ENGR_O 482 Biomedical Engineering I
[3-0-0] *Fourth-year standing*
ENGR_O 498-Q Communications Laboratory[5]
[3-0-0] *Fourth-year standing*
MANF_O 465 Digital Enterprise
[3-2-0] *MANF_O 386*

ENGR_O 407 Inclusive Design [3-2-0] Third-year standing* ***Offered Summer 2025*** *as a* ***Design Elective***

Approved Electrical Technical Electives (TE)

- Electrical students may substitute up to 2 technical electives with approved alternate electives.
- All of the Approved Electrical Design Electives can be credited as technical electives.

Term 1

ENGR_O 402: Biotechnology: Fundamentals and Appl.
[3-0-0] *Third-year standing*
ENGR_O 408 Energy System Transition
[3-2*-0] *ENGR_O 320*
ENGR_O 418 Applied Machine Learning for Engineers
[3-0-0] *Fourth-year standing*
ENGR_O 466 Introduction to VLSI Systems
[3-2*-0] *APSC_O 262*
ENGR_O 489 Multicriteria Optimization & Design of Exp.
[3-2*-0] *Fourth-year standing*
CMPE_O 386 Industrial Automation[6]
[3-2-0] *APSC_O 177*
CMPE_O 410 Network Security and Encryption
[3-0-0] *Fourth-year standing*

Term 2

ENGR_O 400 Applied Machine Vision for Engineers
[3-0-0] *Fourth-year standing*
ENGR_O 453 Internet of Things
[3-2*-0] *APSC_O 254*
ENGR_O 454 Motor Drive Systems
[3-2*-0] *ENGR_O 320*
ENGR_O 486 Robot Modelling and Control
[3-0-0] *ENGR_O 315*
ENGR_O 487 Digital Control
[3-0-0] *ENGR_O 315*
ENGR_O 494 Autonomous Vehicle Technology
[3-1-0] *ENGR_O 480*
CMPE_O 401 Deep Learning for Engineers
[3-0-0] *Fourth-year standing*

ENGR_O 498A Global Seminar: China [3-0-0] ***Offered Summer 2025*** *as a* ***Technical Elective***

[5] *Registration into ENGR_O 498-Q or ENGR_O 471 may require emailing soe.academicservices@ubc.ca if you meet the prerequisite but are unable to register.*
[6] *Students cannot receive credit for both CMPE 386 and MANF 386.*

Biomedical Concentration students, please review pg. 7 of this document carefully.
Mechatronics Concentration students, please review pg. 8 of this document carefully.

If you are interested in…

Antennas, Radio Frequency Systems, and Photonics
take…

ENGR_O 470 Microwave Engineering
ENGR_O 471 Radio Frequency Integrated Circuits
ENGR_O 472 Fibre Optics and Photonics
ENGR_O 473 Antennas and Propagation
ENGR_O 498-P Biophotonic Engineering

Communication Networks and Systems
take…

ENGR_O 453 Internet of Things
ENGR_O 498-Q Communications Laboratory
CMPE_O 410 Network Security and Encryption

Power Electronics and Power Systems
take…

ENGR_O 408 Energy System Transition
ENGR_O 454 Motor Drive Systems
ENGR_O 458 Power Electronics

Control and Mechatronics (see Concentration)
take…

ENGR_O 480 Modern Control
ENGR_O 487 Digital Control
ENGR_O 494 Autonomous Vehicle Technology

Entrepreneurship
take…

ENGR_O 411 Technology Entrepreneurship for Engineers

Microelectronics
take…

ENGR_O 406 Microelectromechanical Systems
ENGR_O 466 Introduction to VLSI Systems
ENGR_O 474 Analog Integrated Circuits

Digital and Embedded Systems
take…

ENGR_O 466 Introduction to VLSI Systems
ENGR_O 467 Real-time and Embedded System Design
ENGR_O 468 Advanced Digital System Design

Algorithms and Numerical Methods
take…

ENGR_O 418 Applied Machine Learning for Engineers
ENGR_O 489 Multicriteria Optimization & Design of Experiments
CMPE_O 401 Deep Learning for Engineers

Biomedical (see Concentration)
take…

ENGR_O 401 Bioinstrumentation
ENGR_O 402 Biotechnology: Fundamentals and Appl.
ENGR_O 407 Inclusive Design
ENGR_O 482 Biomedical Engineering I
ENGR_O 495 Tissue Engineering
ENGR_O 498-P Biophotonic Engineering

Note: Courses in grey are not offered in 2025W.

***Notes**

- **Graduation: In your final year, you are required to apply for graduation, even if you don't plan on attending the ceremony.** If you intend to graduate, you must apply to graduate by the deadline. Students are responsible for taking the correct courses to fulfill degree requirements and to apply for graduation before the deadline.
    - Once you are registered in the final courses for your degree, you are strongly encouraged to request an update to your Academic Progress Report by the Engineering Academic Services team so you can see whether you are fulfilling all requirements by filling out the APR Update Request.
- The 4th year advising sheet changes annually. Courses offered this year may not be offered in subsequent years. If a course switches between design and technical elective designations between years, the student should refer to the sheet from the year the course was taken to know how it will be used to fulfill their degree requirements.

Alternative Electives (AE)

All of the Approved Electrical Design Electives can be credited as technical electives. Any design electives taken over and above those required will count towards the requirement of technical electives. Technical electives cannot be used as design electives.

Up to **two** technical electives (6 credits) can be replaced with:

1. Graduate 500-level courses from within the School of Engineering. For courses cross-listed as undergraduate (400 level) and graduate (500 level) courses, you must register in the undergraduate version. To be considered, you must have completed at least half of required 300- and 400- level courses (at least 36 credits) with a minimum average of 80% in those courses, completed all prerequisites, and obtained permission from the course instructor. If you meet the criteria, you must complete the Registration Waiver Request to be registered in a graduate course. Graduate courses being offered are listed as APSC_O 5XX and ENGR_O 5XX courses on the course schedule.
2. Any other UBCO APSC_O, CMPE_O, ENGR_O, or MANF_O 300- or 400-level courses, although registration in such courses is subject to prerequisite requirements (or prerequisite waiver approval via the Registration Waiver Request if the prerequisite requirements are not met).
    a. ENGR 405 Engineering Leadership is Offered Summer 2025 as an Alternative Elective
3. External (non-APSC_O /CMPE_O/ENGR_O/MANF_O) courses. Some external courses are pre-approved as technical electives (see below). Note that not all of these courses are offered each academic year and you will need to check the course schedule to see availability. If you are missing the course's prerequisite(s), you need to complete the registration waiver process for the external course's instructor/department. The School of Engineering cannot register you in external courses. If you would like to request permission to take a course outside of SOE as an alternative elective that does not appear on this list, please contact soe.academicservices@ubc.ca and include a course syllabus. It will be reviewed by the Electrical Engineering Program Chair.

COSC_O 301 Intro. to Data Analytics
COSC_O 304 Introduction to Databases
COSC_O 310 Software Engineering
COSC_O 315 Intro. to Operating Systems
COSC_O 320 Analysis of Algorithms
COSC_O 322 Intro. to Artificial Intelligence
COSC_O 335 Intro. to Medical Imaging & Imaging Informatics
COSC_O 344 Image Processing & Applications
COSC_O 360 Web Programming
COSC_O 406 Numerical Optimization
COSC_O 407 Introduction to Parallel Computing
COSC_O 444 Computer Vision
DATA_O 311 Machine Learning
MATH_O 319 Intro. to Partial Differential Equations
MATH_O 340 Intro. to Linear Programming
MATH_O 350 Complex Variables and Applications
PHYS_O 304 Intro. to Quantum Mechanics
PHYS_O 305 Intro. to Biophysics
PHYS_O 310 Intro. to Medical Physics
PHYS_O 336 Intro. to Medical Imaging
PHYS_O 401 Electromagnetic Theory
PHYS_O 402 Advanced Quantum Mechanics
PHYS_O 418 Methods of Theoretical Physics
PHYS_O 420 Data and Image Processing
PHYS_O 425 Low-Temperature Physics

For inquiries regarding registration or academic advising, contact an Academic and Career Advisor

Computer Engineering Program Chair: Dr. Thomas Johnson: thomas.johnson@ubc.ca

Biomedical Concentration

The Biomedical Concentration is available for electrical engineering students interested in biomedical engineering and wearable technology. There is information on Concentrations on the Academic Calendar and the School of Engineering website. Concentrations do not have enrolment caps and students must declare their Concentration themselves in Workday before submitting their application for graduation.

The Biomedical Concentration requires completion of 12 credits of the following electives. These electives will be counted towards the requirements of the Bachelor of Applied Science in Electrical Engineering AND the Biomedical Concentration if completed before graduation.

Choose 4 of the below:
ENGR_O 401 Bioinstrumentation **(DE)**
ENGR_O 402 Biotechnology: Fundamentals and Applications **(TE)**
ENGR_O 406 Microelectromechanical Systems **(DE)**
ENGR_O 407 Inclusive Design **(DE)** ***Offered Summer 2025***
ENGR_O 423 Wearable Devices **Not Offered in 25W**
ENGR_O 450 Clinical Engineering[7]
ENGR_O 482 Biomedical Engineering I **(DE)**
ENGR_O 495 Tissue Engineering[7]
ENGR_O 498-P Biophotonic Engineering **Not Offered in 25W**

[7] *ENGR_O 450, 495 (if selected) will count as an Alternative Electives (see Page 6).*

The student is responsible for ensuring that electives chosen meet the Electrical Engineering program requirements for design (12 credits) and technical courses (12 credits). Note also the restriction on no more than 6 credits of alternative electives. If the student opts into the concentration before submitting the application to graduate and successfully completes the concentration requirements, the notation "Biomedical Concentration" will be included on the student's transcript.

Mechatronics Concentration

The Mechatronics Concentration is available for electrical engineering students interested in electromechanical systems integrated with embedded electronics, sensors, actuators, and related systems. There is information on Concentrations on the Academic Calendar and the School of Engineering website. Concentrations do not have enrolment caps and students must declare their Concentration themselves in Workday before submitting their application for graduation.

The Mechatronics Concentration requires completion of 15 credits of the following credits. COSC_O 121, COSC_O 222 (required in addition to your degree requirements) must be taken and 9 credits from the electives below. The electives will be counted towards the requirements of the Bachelor of Applied Science in Electrical Engineering AND the Mechatronics Concentration if completed before graduation.

Take
COSC_O 121 Computer Programming II
COSC_O 222 Data Structures
AND
Choose 3 of the below:
ENGR_O 406 Microelectromechanical Systems **(DE)**
ENGR_O 418 Applied Machine Learning for Engineers **(TE)**
ENGR_O 453 Internet of Things **(TE)**
ENGR_O 454 Motor Drive Systems **(TE)**
ENGR_O 456 Electrochemical Energy Storage Systems[8]
ENGR_O 458 Power Electronics **(DE)**
ENGR_O 467 Real-Time and Embedded System Design **(DE)**
ENGR_O 480 Modern Control **(DE)**
ENGR_O 486 Robot Modelling and Control **(DE)**
ENGR_O 487 Digital Control **(TE)**
ENGR_O 494 Autonomous Vehicle Technology **(TE)**
CMPE_O 386 Industrial Automation[9] **(TE)**
MANF_O 465 Digital Enterprise **(DE)**
MANF_O 486 Mechatronic Systems Laboratory[10] **Not Offered in 25W**

[8] *ENGR_O 456 (if selected) will count as an Alternative Elective (see Page 6).*
[9] *Students who take MANF_O 386 in 2023W or later may count it as one of their Mechatronics Electives. If taken prior to that, it will count towards the ENGR_O 315 requirement and cannot be used towards the Mechatronics Concentration or towards the Technical Elective degree requirements. Students cannot receive credit for both CMPE 386 and MANF 386.*
[10] *Students who took ENGR_O 481 in 2020W or earlier may use this course to fulfill the MANF_O 486 requirement. It will be a Tech. Elective*

The student is responsible for ensuring that electives chosen meet the Electrical Engineering program requirements for design (12 credits) and technical courses (12 credits). Note also the restriction on no more than 6 credits of alternative electives. If the student opts into the concentration before submitting the application to graduate and successfully completes the concentration requirements, the notation "Mechatronics Concentration" will be included on the student's transcript.