

# Mechanical Engineering Fourth Year Program, 2021-22

**Program Compulsory and Elective Course Advising**

## Mechanical Engineering Fourth Year Curriculum:

|  |  |
| --- | --- |
| ENGR 413 Law and Ethics for Engineers | 3 |
| ENGR 476 Mechanics of Materials II | 3 |
| ENGR 499 Engineering Capstone Design Project | 6 |
| Design Electives1,3 | 12 |
| Technical Electives2,3 | 12 |
| Total Credits | 36 |
| 1 Design electives are chosen from the list of Approved Mechanical Design Electives below. These design electives differ from technical electives in that they have 50% engineering design content, as defined by the Canadian Engineering Accreditation Board (CEAB). | |
| 2 Technical electives are chosen from the list of Approved Mechanical Technical Electives below or are chosen in accordance with the Alternative Mechanical Technical Electives below. | |
| 3 As part of the electives, students are required to select either ENGR 491 or ENGR 492. | |

**Approved Mechanical Design Electives\***

*Term 1*

ENGR 401 Bioinstrumentation

ENGR 406 Microelectromechanical Systems ENGR 458 Power Electronics

ENGR 475 Materials Selection and Design ENGR 482 Biomedical Engineering I ENGR 484 Heat and Mass Transfer

ENGR 491 Computational Fluid Dynamics

## Approved Mechanical Technical Electives\*

*Term 1*

ENGR 402 Biotechnology: Fundamentals and Applications ENGR 418 Machine Learning for Engineers

ENGR 480 Modern Control ENGR 481 Mechatronics\*\*

ENGR 486 Robot Modelling and Control

ENGR 489 Multicriteria Optimization and Design of Exper. ENGR 490 Fluid Machinery

MANF 450 Lifecycle Analysis and Sustainability MANF 460 Supply Chain Tactics and Strategies

*Term 2*

ENGR 450 Clinical Engineering ENGR 454 Motor Drive Systems ENGR 469 Polymer Engineering

ENGR 478 Alternative Energy Systems

ENGR 479 Measurement Principles in Thermal-Fluids ENGR 485 Heating, Ventilating, and Air Conditioning ENGR 492 Finite Element Methods

ENGR 497 Combustion Processes

*MANF 486 Mechatronic Systems Lab. (MECA Option only)*

*Term 2*

ENGR 416 Advanced Manufacturing CAD/CAM/CAE ENGR 417 Pipeline Integrity Management

ENGR 439 Manufacturing Processes II ENGR 494 Autonomous Vehicle Technology MANF 455 Factory Planning

MANF 475 Welding and Joining: Processes & Metallurgy

*Biomedical Option students, please review pg. 3 of this document carefully. Mechatronics Option students, please review pg. 3 of this document carefully.*

## \*Notes

* **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 this year, you must [**apply to graduate**](https://students.ok.ubc.ca/courses-money-enrolment/graduation/) by the deadline.
* Once you are fully registered in the final courses for your degree, you can request a [Grad Check](https://ubc.ca1.qualtrics.com/jfe/form/SV_2moFOr3d7JK1qgl) by the Engineering Academic Services team. Grad Check requests will be reviewed in August and January annually.
* 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.
* 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 via e-mail. Check the UBC Student Service Centre 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 a technical elective is subject to change.
* Course descriptions, with prerequisites, can be found on the Academic Calendar: <http://www.calendar.ubc.ca/okanagan/courses.cfm>

**\*\***Mechatronics Option students should take MANF 486 **NOT** ENGR 481. See Page 3.

## Alternative Electives

All of the Approved Mechanical 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.

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

1. The following professional or entrepreneurship courses: ENGR 405 Engineering Leadership

ENGR 411 Technology Entrepreneurship for Engineers

ENGR 498L Special Topics in Engineering STARTUP EXP ENG (offered Summer 2021)

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. You must have a minimum average of 76% in your completed 300 and 400 level courses to be eligible for registration in graduate courses. Graduate courses being offered are listed as APSC 5XX and ENGR 5XX courses on the Student Services Centre.
2. Other APSC, ENGR, or MANF 300- or 400-level courses, although registration in such courses is subject to prerequisite requirements (or prerequisite waiver approval if the prerequisite requirements are not met).
3. External (non-ENGR) courses. To have an external (non-ENGR) course be credited as a technical elective, you first require the permission of the Civil Engineering Program Chair. Then, if you are missing the course’s prerequisite(s), you need the permission of the external course’s instructor/department to waive the prerequisite(s). You may require assistance from the external program’s advisor to register you in the course, as the School of Engineering cannot register you in external (non-ENGR) courses. Some external (non-ENGR) courses are pre-approved as technical electives—and thus do not require permission from the Civil Engineering Program Chair. Pre-approved alternative technical electives are4:

COSC 301 Introduction to Data Analytics (or DATA 301) COSC 315 Introduction to Operating Systems

COSC 322 Introduction. to Artificial Intelligence COSC 406 Numerical Optimization

MATH 319 Introduction to Partial Differential Equations MATH 340 Introduction to Linear Programming

MATH 350 Complex Variables and Applications PHYS 305 Introduction to Biophysics

PHYS 310 Introduction to Medical Physics PHYS 328 Advanced Mechanics

PHYS 401 Electromagnetic Theory

PHYS 402 Advanced Quantum Mechanics PHYS 418 Methods of Theoretical Physics PHYS 420 Data and Image Processing PHYS 425 Low-Temperature Physics

4 Not all of these courses are offered each academic year. Check the UBC Student Service Centre to see the course availability.

For fourth year course advising, contact the Mechanical Program Chair: Dr. Dimitry Sediako, [dimitry.sediako@ubc.ca](mailto:dimitry.sediako@ubc.ca) For technical inquiries regarding registration or academic advising, contact an Engineering Advisor: [soe.advising@ubc.ca](mailto:soe.advising@ubc.ca)

## Biomedical Option

The Biomedical Option is available for mechanical engineering students interested in biomedical engineering and wearable technology. Biomed option students should have completed APSC 193 Anatomy and Physiology for Engineers before Year 4 and should have taken ENGR 351 in Year 3 instead of ENGR 305 as indicated on earlier advising sheets. If you did not follow this, you should confirm with an advisor that your worklist will fulfill program and option requirements. The full academic calendar entry is here: [http://www.calendar.ubc.ca/okanagan/index.cfm?tree=18,317,989,1382](http://www.calendar.ubc.ca/okanagan/index.cfm?tree=18%2C317%2C989%2C1382)

Year 4 recommended schedule:

|  |  |
| --- | --- |
| *Term 1:*  ENGR 401 Bioinstrumentation (DE)  ENGR 402 Biotechnology: Fundamentals and Applications (TE) ENGR 406 Microelectromechanical Systems (DE)  ENGR 476 Mechanics of Materials II ENGR 482 Biomedical Engineering I (DE)  ENGR 499 Engineering Capstone Design Project – Biomedical | *Term 2:*  ENGR 305 Engineering Economic Analysis ENGR 413 Law and Ethics for Engineers ENGR 423 Wearables (TE)  ENGR 450 Clinical Engineering (DE) ENGR 492 Finite Element Methods (DE)\*  ENGR 499 (continued from previous term) |

\*Student can take ENGR 491 instead to fulfill this program requirement.

The student is responsible for ensuring that electives chosen meet the Mechanical Engineering program requirements for design and technical courses. Entry into and continuation in the option requires that the student remains in Good Standing. Upon successful completion of the option, the notation “Biomedical Option” will be added to the student’s transcript.

## Mechatronics Option

The Mechatronics Option is available for mechanical engineering students interested in electromechanical systems integrated with embedded electronics, sensors, actuators, and related systems. Mechatronics Option students should have completed COSC 121 and 222 before Year 4 and should have taken MANF 386 in Year 3 instead of ENGR 315, as indicated on earlier advising sheets. If you did not follow this, you should confirm with an advisor that your worklist will fulfill program and option requirements. The full academic calendar entry is here: [http://www.calendar.ubc.ca/okanagan/index.cfm?tree=18,317,989,1382](http://www.calendar.ubc.ca/okanagan/index.cfm?tree=18%2C317%2C989%2C1382)

The Mechatronics Option requires the mandatory 4th-year courses (ENGR 413, 476, 499) and the correct number of design and technical electives specified on pages 1 & 2 (including ENGR 491 or 492). Within those electives, Mechatronics **requires** the following courses:

* + ENGR 359 Microcomputer Engineering (Term 1, Technical Elective)
  + ENGR 480 Modern Control (Term 1, Design Elective)
  + MANF 486 Mechatronic Systems Laboratory (Term 2, Design Elective)\*
  + **12** credits of Approved Mechatronics Electives (below)

\*Students who took ENGR 481 in 2020W or earlier may use this course to fulfill the MANF 486 requirement. It will be a Tech. Elective

## Approved Mechatronics Design Electives

|  |  |
| --- | --- |
| *Term 1:*  ENGR 406 Microelectromechanical Systems (DE)  ENGR 458 Power Electronics (DE) | *Term 2:*  ENGR 454 Motor Drive Systems (DE)  ENGR 467 Real-Time and Embedded System Design (DE) |

**Approved Mechatronics Technical Electives**

|  |  |
| --- | --- |
| *Term 1:*  ENGR 418 Applied Machine Learning for Engineers (TE) ENGR 486 Robot Modelling and Control (TE)  *ENGR 456 (Not offered 2021W)* | *Term 2:*  ENGR 453 Internet of Things (TE) ENGR 487 Digital Control (TE)  ENGR 494 Autonomous Vehicle Technology (TE) |

The student is responsible for ensuring that electives chosen meet the Electrical Engineering program requirements for design and technical courses. Entry into and continuation in the option requires that the student remains in Good Standing. Upon successful completion of the option, the notation “Mechatronics Option” will be added to the student’s transcript.