



# Bioengineering MENG Program Handbook 2021-2022



**Oregon State**  
University

# Oregon State University (OSU)

## Bioengineering, MEng Program

**NOTE:** Official program requirements are available in the OSU catalog. If there is a conflict between what is stated here and what is presented in the catalog, the catalog requirements take precedent.

### COURSEWORK REQUIREMENTS

#### RECOMMENDED PREREQUISITE COURSEWORK

The following is recommended prerequisite coursework to prepare you to be successful in the Bioengineering Graduate Program.

Students with a B.S. degree in a non-engineering field are strongly encouraged to take the following courses prior to enrolling in the BIOE core courses:

- Math through Differential Equations
- One year of Physics
- A course on computer programming (e.g., Matlab)

#### REQUIRED COURSEWORK

MEng students must take a total of 45 graduate credits. Thesis credits cannot be used, and blanket credits are limited to a maximum of 9. Thus, at least 36 credits of non-blanket coursework is required. At least half of the non-blanket courses must be graduate stand-alone courses. The remaining courses can be the 500 component of 400/500 slash courses. (*Note: blanket courses are courses with a zero as the second number, e.g., CBEE 507.*)

MEng students must take the BIOE core, professional development and portfolio courses, and electives, as detailed below.

#### *BIOE Core Courses (10 credits)*

All BioE MEng graduate students are **required** to take the following BIOE core courses:

<b>BIOE 511</b>	<b>(3)</b>	<b>Cellular and Molecular Bioengineering</b>
<b>BIOE 512</b>	<b>(4)</b>	<b>Modeling of Physiological Systems</b>
<b>BIOE 513</b>	<b>(3)</b>	<b>Drug and Medical Device Regulation in Technology Development</b>

#### *Professional Development & Portfolio Project (3 credits):*

During their first fall term, all newly enrolled MEng students are **required** to take:

**CBEE 507** (1) **Professional Development Seminar**  
**ENGR 520** (1) **MEng Introduction to Portfolio**

During their last term, all MEng students are **required** to take:

**ENGR 521** (1) **MEng Portfolio Completion**

The 1 credit professional development seminar serves as an extended orientation to CBEE and will provide mandatory training, an introduction to important OSU resources, and development of skills to aid in navigating graduate school. The 2 credit Portfolio series will support you in understanding and completing your MEng portfolio. The MEng portfolio demonstrates your mastery, synthesis, and communication of subject matter knowledge in the context of your professional goals. It serves as the culmination of the MEng program and is the final required project for the MEng degree.

*Elective Course Selection (remaining credits):*

When selecting elective courses, consideration should be given to your areas of interest, your background, and achieving a balance between breadth and depth. Typically, students choose a range of courses in each of the following categories: engineering fundamentals, mathematics and statistics, biomedical science, and bioengineering. Some representative OSU courses in each of these categories are provided below. (This is a non-exhaustive list.)

**Bioengineering:**

<i>Course number</i>	<i>Course title</i>	<i>Credit hours</i>
BIOE 545	Surface analysis	3
BIOE 557	Bioreactors	3
BIOE 562	Bioseparations	3
ECE 599	Bioelectronic Systems and Devices	3
ECE 599	Biosensors and Medical Devices	3
CS 546	Networks in Computational Biology	3
IE 545	Human Factors Engineering	4
ROB 567	Human-Robot Interaction	4
ROB 562	Human Control Systems	4
KIN 525	Biomechanics of Musculoskeletal Injury	3
H 594	Applied Ergonomics	3
ME 513	Bio-Inspired Design	4
NSE 583	Radiation Biology	3

**Biomedical Sciences:**

<i>Course number</i>	<i>Course title</i>	<i>Credit hours</i>
VMB 521	Animal Models	3
VMB 652	Cancer Systems Biology	3
VMB 670	Introduction to Systems Biology	2
VMB 671	Molecular Tools	3
VMB 672	Molecular Approach to Cancer	1
VMB 673	Comparative Immunology	3
VMB 674	Vaccines and New Therapies	3

BB 585	Applied Bioinformatics	3
BB 586	Advanced Molecular Genetics	3
BB 590	Biochem 1: Structure & Function	3
BB 591	Biochem 2: Metabolism	3
BB 592	Biochem 3: Genetic Biochem	3
PHAR 525	Foundations of Drug Action I	3
PHAR 537	Bioorganic Chemistry	3
PHAR 547	Antibiotics and Infectious Disease	3
PHAR 548	Drug Actions in Immunology	3
PHAR 563	Cancer and Chemoprevention	2
PHAR 572	Applied Biopharmaceutics & Pharma	3
PHAR 574	Nanomedicine	3
PHAR 591	Pharmacology I	5
PHAR 594	Advances in Manipulating the Human Genome	3

#### Mathematics and Statistics:

<i>Course number</i>	<i>Course title</i>	<i>Credit hours</i>
ST 515	Design and Analysis of Planned Experiments	3
ST 592	Statistical Methods for Genomics Research	3
MTH 528	Stochastic Elements in Mathematical Biology	3
ME 526	Numerical Methods for Engineering Analysis	3
VMB 631	Mathematical Modeling of Biological Systems	3

#### Engineering Fundamentals:

<i>Course number</i>	<i>Course title</i>	<i>Credit hours</i>
ECE 564	Digital Signal Processing	4
ME 546	Convection Heat Transfer	3
ME 565	Incompressible Fluid Mechanics	3
CHE 520	Mass Transfer	4
CHE 537	Chemical Engineering Thermodynamics	4

#### *Program of Study:*

A program of study form must be submitted and on file with the graduate school. The program of study defines the student's path to completion of coursework, and, once approved, it becomes the obligation of the student to complete the requirements as formulated. MEng students will complete their program of study as part of ENGR 520 and, thus, should have their program of study completed by the end of their first term in the program. Changes in the program may be made by submitting a [Petition for Change of Program form](#) available in the Graduate School.

#### *Transfer Credit:*

Eligible graduate coursework completed previously can be transferred for credit towards the MEng degree with the consent of the student's advisor. Completion of the [Transfer Credit Request Form](#) is required if these credits were obtained outside of OSU.

## **ADVISOR SELECTION**

MEng students will be assigned an advisor by the Graduate Program Coordinator during their first term in the program.

## **COMMITTEE**

The MEng committee consists of 3 members:

- the student's advisor;
- the College of Engineering MEng Coordinator; and
- the academic chair of CBEE (the Associate Head for Graduate Programs).

## **MENG PORTFOLIO**

The MEng portfolio demonstrates the student's mastery, synthesis, and communication of subject matter knowledge in the context of the student's professional goals. It serves as the culmination of the MEng program and final examination for the MEng degree. MEng students will assemble their portfolio in their last term of residence as part of the course ENGR 521. The final portfolio will be assessed by both the course instructor and the student's academic advisor according to the rubric that will be provided to you by College of Engineering MEng Coordinator, Anita Hughes. Briefly, the aim of the portfolio is to highlight the following three elements:

- A. A statement of the candidate's professional goals for obtaining the MEng degree;
- B. An overview of how the MEng coursework, including both major and minor areas, provided the preparation needed to achieve the candidate's professional goals;
- C. A highlight of examples from class projects, homework, job search efforts, etc., that illustrate and elaborate on item B.

Additionally, the portfolio should demonstrate attainment of the program's three graduate learning outcomes.

## **TIMELINE AND CHECKLIST**

On the following page is a brief list of the steps required to obtain the MEng degree. You should also become familiar with the specific and detailed information contained in the Graduate School Catalog as well as School requirements.

**PROCEDURES FOR MENG STUDENTS**

<b>Check Box</b>	<b>Item #</b>	<b>Step</b>	<b>Timing</b>
	1	Be assigned a major professor	By the end of your first term
	2	File a <a href="#">Program of Study form</a>	By the completion of first term
	3	Register for ENGR 521 Portfolio Completion	Final term in residence
	4	Compare Program of Study form and transcripts for consistency	Completed in ENGR 521: Portfolio Completion course
	5	File <a href="#">Petition for Change in Program form</a> , if needed	
	6	Review CBEE Graduate Learning Outcomes rubric used for evaluating final exams	
	7	Confirm submission of your approved Program of Study with Graduate School	
	8	File a <a href="#">Diploma Application</a>	
	9	Fill out <a href="#">Exam Scheduling Form</a>	As directed in ENGR 521 course
	10	Submit final draft of MEng Portfolio to MEng Coordinator, Anita Hughes	Using timeline within ENGR 521
	12	Graduate School Survey will be emailed to you. If you complete it a gift will be mailed to you.	A month after graduation

## CURRICULUM CHART FOR BIOENGINEERING MEng STUDENTS

Year 1		
Fall	Winter	Spring
CBEE 507 Grad Seminar Prof. Dev. <b>AND</b> ENGR 520 MENG Portfolio Prep 2 cr		ENGR 521 MENG Portfolio Completion 1 cr
BIOE 511 Cell & Molecular BioE 3 cr	BIOE 513 Drug & Medical Device Regulations in Tech Dev 3 cr	Grad Minor or Elective 3-4 cr
BIOE 512 Modeling of Physiological Systems 4 cr	Grad Minor or Elective 3-4 cr	Grad Minor or Elective 3-4 cr
Grad Minor or Elective 3-4 cr	Grad Minor or Elective 3-4 cr	Grad Minor or Elective 3-4 cr
Grad Minor or Elective 3-4 cr	Grad Minor or Elective 3-4 cr	Grad Minor or Elective 3-4 cr
<b>16</b>	<b>15</b>	<b>14</b>

TOTAL

**BIOE core (10 cr):** BIOE 511, BIOE 512, BIOE 513.

**Professional Development & Portfolio (3 cr):** CBEE 507 Professional Development is required in fall; ENGR 520/521 is required in first and last terms, respectively.

**Graduate Elective (14+ cr):** Any graduate-level course. These are the most flexible credits. If pursuing a minor, a graduate minor typically requires 15 credits of courses from the minor field.

**45 Total Credits required**

**Note:** The completion timeline can vary.

## Evaluated Graduate Learning Objectives/Outcomes for BIOE MEng Program

MEng Outcomes
<p><b>Outcome 1: Demonstration of Scholarship</b></p> <p>The student will be able to assemble a capstone portfolio synthesizing aspects of core knowledge in the fields spanned by Bioengineering and to effectively communicate this work to a technically literate audience.</p> <p>This will be assessed using the MEng Final Portfolio Exam.</p>
<p><b>Outcome 2: Mastery of Subject Material</b></p> <p>The student will be able to think critically, creatively and to address technical problems in Bioengineering.</p> <p>This will be assessed through satisfactory completion of the graduate program of study.</p>
<p><b>Outcome 3: Ethical Conduct</b></p> <p>Students will be educated in ethical and responsible conduct in professional activities.</p> <p>This will be assessed through satisfactory completion of the graduate seminar (CBEE507).</p>