# BIOLOGICAL AND ECOLOGICAL ENGINEERING GRADUATE MAJOR (MENG, MS, PHD)

**This program is available at the following location:**

- **Corvallis**

The Department of Biological & Ecological Engineering offers graduate programs leading to the Master of Engineering, Master of Science, and Doctor of Philosophy degrees.

The Biological & Ecological Engineering program serves at the interface of life sciences and engineering. Biological & Ecological Engineering is the application of engineering and life science principles and problem-solving techniques to the optimum use and sustainability of biological resources. The curriculum is engineering-based with a strong emphasis on the life sciences. Courses focus on biological systems modeling, bioprocess engineering, thermophysical and molecular properties of biological materials, regional hydrologic analysis, groundwater systems, irrigation and water resource optimization. The department concentrates its research effort on two major thrusts: biological engineering and water resources engineering. Specific research topics include biosensors, molecular-level biosystems analysis, nanosensors, microbial fuel cells, biological hydrogen production, and bio-based products and fuels. Research topics in water resources engineering include constructed wetland treatment systems, crop growth modeling, optimum irrigation management, crop-water requirements, groundwater and subsurface contaminant transport, hydrologic modeling, agricultural and ecological systems analysis, geographical information systems, artificial intelligence technologies, livestock production odor control, livestock waste treatment, and non-point source water pollution control.

### Contact Information

For more information, contact Biological & Ecological Engineering Graduate Program, info-bee@oregonstate.edu, visit their website (https://bee.oregonstate.edu/) or call 1-541-737-2041.

**Major Code: 4500**

*Upon successful completion of the program, students will meet the following learning outcomes:*

## MEng

- Conduct research or produce some other form of creative work.
- Demonstrate mastery of subject material.
- Conduct scholarly or professional activities in an ethical manner.

## MS

- Conduct research or produce some other form of creative work.
- Demonstrate mastery of subject material.
- Conduct scholarly or professional activities in an ethical manner.

## PhD

- Produce and defend an original significant contribution to knowledge.
- Demonstrate mastery of subject material.
- Conduct scholarly activities in an ethical manner.

## MEng

| Code | Title | Credits |
|---|---|---|
| **Core Requirements** | | |
| BEE 507 | SEMINAR [1] | 2 |
| BEE 529 | BIOSYSTEMS MODELING TECHNIQUES | 3 |
| **Ethics** | | |
| BA 550 | LEADERSHIP AND TEAMS IN ORGANIZATIONS | 3 |
| or EMGT 554 | PROFESSIONAL RESPONSIBILITY AND ETHICS | |
| **Biological & Ecological Engineering Electives [3]** | | |
| Select at least 12 credits from the following courses, as approved by major professor and committee: | | 12 |
| BEE 511 | GLOBAL ENVIRONMENTAL CHANGE: USING SPATIAL DATA IN DECISION MAKING | |
| BEE 512 | PHYSICAL HYDROLOGY | |
| BEE 533 | IRRIGATION SYSTEM DESIGN | |
| BEE 542 | VADOSE ZONE TRANSPORT | |
| BEE 546 | RIVER ENGINEERING | |
| BEE 549 | REGIONAL HYDROLOGIC MODELING | |
| BEE 558 | NONPOINT SOURCE POLLUTION ASSESSMENT AND CONTROL | |
| BEE 568 | BIOREMEDIATION ENGINEERING | |
| **Technical Writing** | | |
| WR 545 | TECHNICAL WRITING FOR PROFESSIONAL ENGINEERS [2] | 3 |
| **Additional Science & Engineering Electives** | | |
| Select at least 19 credits as approved by major professor and committee | | 19 |
| **Human Dimensions Elective** | | |
| Select at least 3 credits as approved by major professor and committee | | 3 |
| **Total Credits** | | **45** |

**1**

Other professional seminars offered as XXX 507 courses may be substituted with permission from advisors; one credit of reading and conference (BEE 506) may be substituted for one credit of 507.

**2**

Before enrolling in the technical writing course, students are required to complete a total of 30 credits that includes: at least one of the required seminar (507) courses and the ethics requirement

**3**

Other 500-level BEE courses may be used to meet this requirement.

## MS

| Code | Title | Credits |
|---|---|---|
| **Required Core** | | |
| BEE 529 | BIOSYSTEMS MODELING TECHNIQUES | 3 |
| **Seminar** | | |
| BEE 507 | SEMINAR [1] | 3 |
| **Electives** | | |
| Select 9 credits of graduate-level biological science courses (or science alternative) as approved by major professor and committee | | 9 |
| Select 18 credits of graduate-level engineering courses with significant components of engineering science and/or design from the College of Engineering | | 18 |
| **Thesis** | | |
| BEE 503 | THESIS [2] | 12 |
| **Total Credits** | | **45** |

**1**

Students may substitute 3 credits of a 500-level professional seminar course for 3 credits of BEE 507

**2**

Students may substitute 3-6 credits of BEE 506 and 6-9 credits of engineering electives for BEE 503

# PhD

| Code | Title | Credits |
|---|---|---|
| **Required Core** | | |
| BEE 529 | BIOSYSTEMS MODELING TECHNIQUES | 3 |
| **Seminar** | | |
| BEE 607 | SEMINAR [1] | 3 |
| **Electives** | | |
| Select 12 credits of graduate-level biological science courses (or science alternative) as approved by major professor and committee | | 12 |
| Select 12 credits of graduate-level engineering courses with significant components of engineering science and/or design from the College of Engineering | | 12 |
| **Thesis** | | |
| BEE 603 | THESIS [2] | 78 |
| **Total Credits** | | **108** |

**1**

Students may substitute 3 credits of a 600-level professional seminar course for 3 credits of BEE 607

**2**

Students may substitute graduate-level engineering or science electives for 34 credits of BEE 603 in consultation with the major professor and committee

## Prerequisite and Requisite Coursework for all BEE graduate degrees

| Code | Title | Credits |
|---|---|---|
| *Calculus* | | |
| One year, equivalent to: | | |
| MTH 251Z | +*DIFFERENTIAL CALCULUS | 4 |
| MTH 252Z | INTEGRAL CALCULUS | 4 |
| MTH 254 | VECTOR CALCULUS I [1] | 4 |
| *Applied Differential Equations* | | |
| One course, equivalent to: | | |
| MTH 256 | | |
| *Calculus-based Physics* | | |
| One year, equivalent to: | | |
| PH 211 | +*GENERAL PHYSICS WITH CALCULUS | 4 |
| PH 212 | *GENERAL PHYSICS WITH CALCULUS | 4 |
| PH 213 | *GENERAL PHYSICS WITH CALCULUS | 4 |
| *Chemistry* | | |
| One year, equivalent to: | | |
| CH 201 | GENERAL CHEMISTRY FOR ENGINEERING APPLICATIONS | 3 |
| CH 202 | CHEMISTRY FOR ENGINEERING MAJORS | 3 |
| CH 205 | LABORATORY FOR CH 202 | 1 |

**1**

MTH 254 can be substituted with both MTH 264 and MTH 265

**Major Code: 4500**