

BIOLOGY IN ENGINEERING FOR ENGINEERING MAJORS, CERTIFICATE

The biology in engineering certificate (BEC) is designed for engineering students who want to strengthen their biology backgrounds. It is offered especially to encourage engineering students in traditional disciplines to prepare themselves to understand the special engineering problems in biology and medicine. A student successfully fulfilling the requirements will have the notation "Biology in Engineering Certificate" added to the transcript.

HOW TO GET IN

The Biology in Engineering Certificate was designed and is administered by a Biology in Engineering Certificate Committee composed of faculty from multiple engineering disciplines. Students normally should begin the program during their sophomore or junior year, but seniors may also apply.

Prerequisites to enter the certificate program:

- Prior admission to an engineering B.S. degree program (<http://guide.wisc.edu/undergraduate/engineering/#degreesmajorscertificatestext>) or Biological Systems Engineering (<http://guide.wisc.edu/undergraduate/agricultural-life-sciences/biological-systems-engineering/biological-systems-engineering-bs/>) through the College of Agricultural and Life Sciences (<http://guide.wisc.edu/undergraduate/agricultural-life-sciences/>) at the UW-Madison.
- Students pursuing an undergraduate degree at UW-Madison need to have completed at least one intermediate-level (minimum 200-level) engineering course.

Click here (<https://go.wisc.edu/bme-bec-application/>) for certificate application.

REQUIREMENTS

The certificate requires a minimum of 15 credits:

GENERAL BIOLOGY: 5 CREDITS

| Code | Title | Credits |
|---|--|---------|
| Choose one combination: | | |
| BIOCORE 381 & BIOCORE 382 | Evolution, Ecology, and Genetics and Evolution, Ecology, and Genetics Laboratory | 5 |
| BIOCORE 383 & BIOCORE 384 | Cellular Biology and Cellular Biology Laboratory | 5 |
| ZOOLOGY/ BIOLOGY 101 & ZOOLOGY/ BIOLOGY 102 | Animal Biology and Animal Biology Laboratory | 5 |

| | | |
|---------------------------------------|--------------------------------|---|
| ZOOLOGY/ BIOLOGY/ BOTANY 151 | Introductory Biology | 5 |
| ZOOLOGY/ BIOLOGY/ BOTANY 152 | Introductory Biology | 5 |
| ZOOLOGY 153 | Introductory Biology (and) | 3 |
| BIOLOGY/ ZOOLOGY 102 | Animal Biology Laboratory (or) | |
| choose 2 more credits from list below | | |

ADVANCED BIOLOGY: 5-CREDIT MINIMUM

| Code | Title | Credits |
|--|--|---------|
| Advanced Biology (5 cr. minimum): Recommended to choose a lecture/lab combination as outlined below, but any combination of courses is acceptable | | |
| ANAT&PHY 335 | Physiology | 5 |
| ANAT&PHY 435 | Fundamentals of Human Physiology | 5 |
| BIOCORE 485 & BIOCORE 486 | Principles of Physiology and Principles of Physiology Laboratory | 5 |
| BIOCORE 587 | Biological Interactions | 3 |
| BIOCHEM 501 | Introduction to Biochemistry | 3 |
| BIOCHEM 507 | General Biochemistry I | 3 |
| BIOCHEM 508 | General Biochemistry II | 3-4 |
| GENETICS 466 & GENETICS 545 | Principles of Genetics and Genetics Laboratory | 5 |
| GENETICS/ MD GENET 662 | Cancer Genetics | 3 |
| MICROBIO 303 & MICROBIO 304 | Biology of Microorganisms and Biology of Microorganisms Laboratory | 5 |
| MICROBIO/ FOOD SCI 324 & MICROBIO/ FOOD SCI 325 | Food Microbiology Laboratory and Food Microbiology | 5 |
| MICROBIO 330 | Host-Parasite Interactions | 3 |
| M M & I 301 | Pathogenic Bacteriology | 2 |
| M M & I 341 | Immunology | 3 |
| M M & I/PATH-BIO 528 | Immunology | 3 |
| M M & I/ BIOCHEM 575 | Biology of Viruses | 2 |
| ZOOLOGY/ ENVIR ST 315 & ZOOLOGY 316 | Limnology-Conservation of Aquatic Resources and Laboratory for Limnology-Conservation of Aquatic Resources | 4-5 |
| ZOOLOGY/ENTOM/ M M & I/PATH-BIO 350 | Parasitology | 3 |
| ZOOLOGY/ ANTHRO/ BOTANY 410 | Evolutionary Biology | 3 |
| ZOOLOGY 430 | Comparative Anatomy of Vertebrates | 5 |

| | | |
|---|---|-----|
| ZOOLOGY 470 & ZOOLOGY 555 | Introduction to Animal Development and Laboratory in Developmental Biology | 6 |
| ZOOLOGY 504 | Modeling Animal Landscapes | 3-5 |
| ZOOLOGY/ ENVIR ST 510 & ZOOLOGY/ ENVIR ST 511 | Ecology of Fishes and Ecology of Fishes Lab | 5 |
| ZOOLOGY/ PSYCH 523 | Neurobiology | 3 |
| ZOOLOGY 525 | Tropical Herpetology | 1 |
| ZOOLOGY 570 | Cell Biology | 3 |
| ZOOLOGY 611 & ZOOLOGY 612 | Comparative and Evolutionary Physiology and Comparative Physiology Laboratory | 5 |

BIOLOGY IN ENGINEERING: 3-CREDIT MINIMUM

| Code | Title | Credits |
|---|--|---------|
| Biology in Engineering (3 cr. minimum): Choose one | | |
| B M E/M E 414 | Orthopaedic Biomechanics - Design of Orthopaedic Implants | 3 |
| B M E/M E 415 | Biomechanics of Human Movement | 3 |
| B M E/PHM SCI 430 | Biological Interactions with Materials | 3 |
| B M E/E C E 462 | Medical Instrumentation | 3 |
| B M E/E C E 463 | Computers in Medicine | 3 |
| B M E/M E 505 | Biofluidics | 3 |
| B M E 510 | Introduction to Tissue Engineering | 3 |
| B M E 520 | Stem Cell Bioengineering | 3 |
| B M E 545 | Engineering Extracellular Matrices | 3 |
| B M E 550 | Introduction to Biological and Medical Microsystems | 3 |
| B M E/M E 615 | Tissue Mechanics | 3 |
| B M E/MED PHYS/ PHM COL- M/PHYSICS/ RADIOL 619 | Microscopy of Life | 3 |
| BSE 249 | Engineering Principles for Biological Systems | 3 |
| BSE 349 | Quantitative Techniques for Biological Systems | 3 |
| BSE 364 | Engineering Properties of Food and Biological Materials | 3 |
| BSE 365 | Measurements and Instrumentation for Biological Systems | 3 |
| CBE/B M E 560 | Biochemical Engineering | 3 |
| CIV ENGR 320 | Environmental Engineering | 3 |
| CIV ENGR 322 | Environmental Engineering Processes | 3 |
| CIV ENGR/ SOIL SCI 623 | Microbiology of Waterborne Pathogens and Indicator Organisms | 3 |
| CIV ENGR/ M&ENVTOX/ SOIL SCI 631 | Toxicants in the Environment: Sources, Distribution, Fate, & Effects | 3 |

| | | |
|---------------------|--|---|
| COMP SCI/ B M I 576 | Introduction to Bioinformatics | 3 |
| E C E 542 | Introduction to Microelectromechanical Systems | 3 |
| I SY E/B M E 564 | Occupational Ergonomics and Biomechanics | 3 |
| INTEREGR 301 | | |
| M S & E 553 | Nanomaterials & Nanotechnology | 3 |

SEMINAR: 1 CREDIT

| Code | Title | Credits |
|----------------------|--------------------------------|----------|
| B M E 517 | Biology in Engineering Seminar | 1 |
| Total Credits | | 1 |

CERTIFICATE COMPLETION REQUIREMENT

This undergraduate certificate must be completed concurrently with the student's undergraduate degree. Students cannot delay degree completion to complete the certificate.

LEARNING OUTCOMES

1. Develop an understanding of basic biology and a selected area of advanced biology.
2. Develop an understanding of the challenges in biology, medicine, public health, and environmental health that are currently being addressed by engineering research and development.
3. Demonstrate proficiency in the application of engineering principles to solve problems in the field based on biological principles.

PEOPLE

ADVISORS FOR THE BIOLOGY IN ENGINEERING CERTIFICATE PROGRAM

(Contact the advisor from your home department or the Chair)

CHAIR AND CERTIFICATE ADMINISTRATION - BIOMEDICAL ENGINEERING

Dr. John Puccinelli
2132 Engineering Centers Bldg
john.puccinelli@wisc.edu
890-3573

BIOLOGICAL SYSTEMS ENGINEERING

Professor Anita Thompson
115 Agricultural Engineering Bldg
amthompson2@wisc.edu
262-0604

Professor Mark Etzel
B115 Babcock Hall
etzel@enr.wisc.edu
263-2083

CHEMICAL AND BIOLOGICAL ENGINEERING

Professor John Yin
3172 Wisconsin Institutes for Discovery
yin@enr.wisc.edu
316-4323

CIVIL AND ENVIRONMENTAL ENGINEERING

Professor Katherine McMahon
5552 Microbial Sciences Building
tcmahon@enr.wisc.edu
890-2836

ELECTRICAL AND COMPUTER ENGINEERING

Daniel van der Weide
1439 Engineering Hall
danvdw@enr.wisc.edu
265-6561

ENGINEERING PHYSICS

Associate Professor Christian Franck
cfranck@wisc.edu

INDUSTRIAL AND SYSTEMS ENGINEERING

Professor Robert Radwin
2106 Engineering Centers Bldg
rradwin@wisc.edu
263-6596

MATERIALS SCIENCE AND ENGINEERING

Professor Padma Gopalan
219 Materials Science and Eng Bldg
pgopalan@wisc.edu
265-4258

MECHANICAL ENGINEERING

Associate Professor Christian Franck
cfranck@wisc.edu