

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, medicine, public health, and environmental health. A student successfully fulfilling the requirements will have the notation "Certificate for Biology in Engineering for Engineering Majors" added to the transcript.

HOW TO GET IN

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The Certificate for Biology in Engineering for Engineering Majors 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 BS 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

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The certificate requires a minimum of 15 credits.

GENERAL BIOLOGY: 5 CREDITS

Choose one from one of the following options.

| Code | Title | Credits |
|---------------------------|--|---------|
| 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 |

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| MICROBIO 101 & MICROBIO 102 | General Microbiology and General Microbiology 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 & BIOLOGY/ ZOOLOGY 102 | Introductory Biology and Animal Biology Laboratory | 5 |
| ZOOLOGY 153 AND | choose 2 additional credits from the advanced biology course list below | 5 |

ADVANCED BIOLOGY: 5 CREDITS MINIMUM

Recommended to choose a lecture/lab combination as outlined below, but any combination of courses is acceptable.

| Code | Title | Credits |
|---|--|---------|
| 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 |
| BIOCHEM 501 | Introduction to Biochemistry | 3 |
| BIOCHEM 507 | General Biochemistry I | 3 |
| BIOCHEM 508 | General Biochemistry II | 3-4 |
| BIOCHEM 551 | Biochemical Methods | 4 |
| BIOCORE 587 | Biological Interactions | 3 |
| 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 |
| 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 |

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|--|--|---|--|--|---|
| ZOOLOGY/ENTOM/ M M & I/PATH- BIO 350 | Parasitology | 3 | CIV ENGR 320 | Environmental Engineering | 3 |
| ZOOLOGY/ ANTHRO/ BOTANY 410 | Evolutionary Biology | 3 | CIV ENGR 322 | Environmental Engineering Processes | 3 |
| ZOOLOGY 430 | Comparative Anatomy of Vertebrates | 5 | CIV ENGR/ M&ENVTOX/ SOIL SCI 631 | Toxicants in the Environment: Sources, Distribution, Fate, & Effects | 3 |
| ZOOLOGY 470 & ZOOLOGY 555 | Introduction to Animal Development and Laboratory in Developmental Biology | 6 | COMP SCI/ B M I 576 | Introduction to Bioinformatics | 3 |
| ZOOLOGY/ ENVR ST 510 & ZOOLOGY/ ENVR ST 511 | Ecology of Fishes and Ecology of Fishes Lab | 5 | E C E 542 | Introduction to Microelectromechanical Systems | 3 |
| ZOOLOGY/ PSYCH 523 | Neurobiology | 3 | I S Y E/B M E 564 | Occupational Ergonomics and Biomechanics | 3 |
| ZOOLOGY 570 | Cell Biology | 3 | M S & E 553 | Nanomaterials & Nanotechnology | 3 |
| ZOOLOGY 611 & ZOOLOGY 612 | Comparative and Evolutionary Physiology and Comparative Physiology Laboratory | 5 | | | |

BIOLOGY IN ENGINEERING: 3 CREDITS MINIMUM

Choose from the following courses:

| Code | Title | Credits |
|---|--|---------|
| 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/M E 516 | Finite Elements for Biological and Other Soft Materials | 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 |

SEMINAR: 1 CREDIT

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

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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.

ADVISING AND CAREERS

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

CHAIR AND CERTIFICATE ADMINISTRATION - BIOMEDICAL ENGINEERING

Professor John Puccinelli
2132 Engineering Centers Building
john.puccinelli@wisc.edu
(608) 890-3573

BIOLOGICAL SYSTEMS ENGINEERING

Professor Anita Thompson
232B Agricultural Engineering Building
amthompson2@wisc.edu
(608) 262-0604

CHEMICAL AND BIOLOGICAL ENGINEERING

Professor John Yin
3172 Wisconsin Institutes for Discovery
john.yin@wisc.edu

(608) 316-4323

CIVIL AND ENVIRONMENTAL ENGINEERING

Professor Katherine McMahon
5552 Microbial Sciences Building
tmcMahon@engr.wisc.edu (trina.mcmahon@wisc.edu)
(608) 890-2836

ELECTRICAL AND COMPUTER ENGINEERING

Professor Daniel van der Weide
1439 Engineering Hall
danvdw@engr.wisc.edu
(608) 265-6561

INDUSTRIAL AND SYSTEMS ENGINEERING

Professor Robert Radwin
2106 Engineering Centers Building
rradwin@wisc.edu
(608) 263-6596

MATERIALS SCIENCE AND ENGINEERING

Professor Padma Gopalan
1143 Engineering Research Building
pgopalan@wisc.edu
(608) 265-4258

MECHANICAL ENGINEERING

Professor Corinne Henak
3031 Mechanical Engineering
chenak@wisc.edu
(608) 263-1619

NUCLEAR ENGINEERING AND ENGINEERING PHYSICS

Professor and Chair Paul Wilson
paul.wilson@wisc.edu
(608) 262-8384