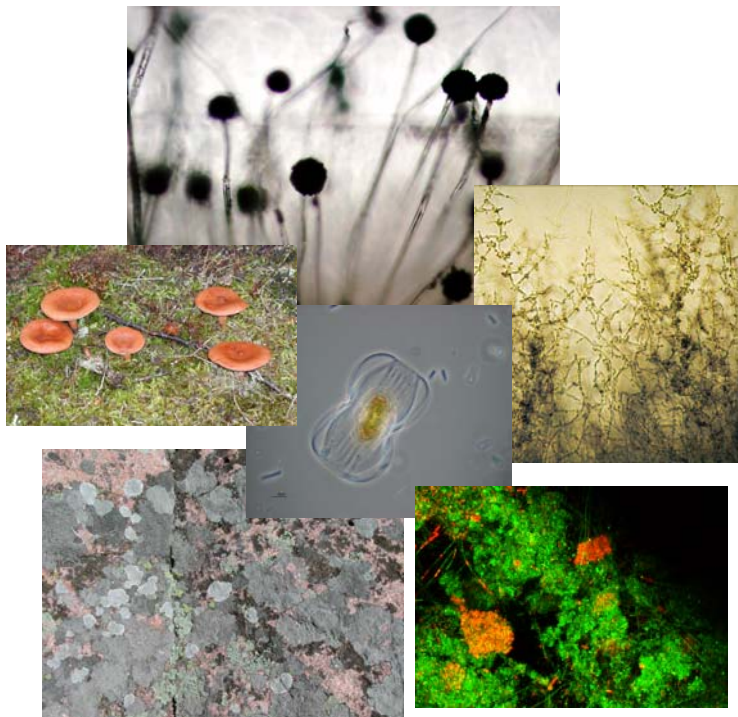




MICROBIOLOGY MAJOR—COOK

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A Student's Guide



The primary objectives of the program are to broadly educate students on the biology of microorganisms and prepare them for positions in the microbial industries and graduate/professional study in life sciences through extensive laboratory and course work and research experience

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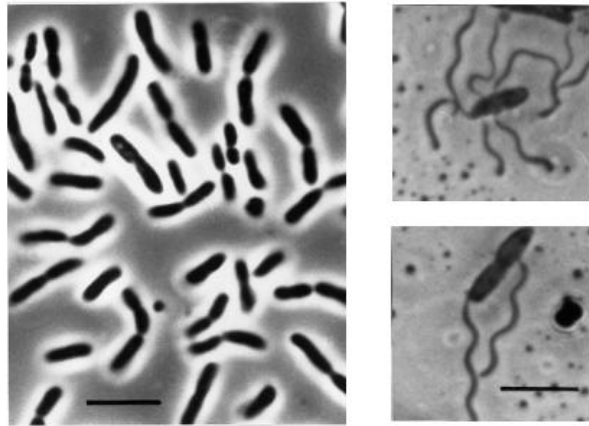
Cook College

Curriculum Description

Microorganisms are the smallest living things, the oldest form of life on earth, ubiquitous in the biosphere and central to many of the essential life processes on earth. The microbiology curriculum emphasizes the uniqueness of microbial biology, its enormous diversity, and the biochemical basis of microbial life.

The curriculum examines the diverse roles of microorganisms and covers the fundamentals of microbial diversity, physiology and genetics. The focus is on microorganisms, microbial processes in natural and managed environments and their effects on human, animal, plant and environmental health. The curriculum provides students with a fundamental understanding of the various applications of microbes in biotechnology, the food industry, agriculture, and medicine. The curriculum examines the nature and activity of microbial populations in aquatic and terrestrial ecosystems, the interactions within microbial communities, and biogeochemical cycles and energy flows. Recent advances in microbial molecular biology and biotechnology have led to an in-depth understanding of the physiology, genetics and taxonomy of microbes. The field of microbiology is a major contributor toward industrial development, human, animal and plant health, environmental integrity and agricultural productivity. Microbes are central to the food, biotechnology and pharmaceutical industries and are broadly utilized from food fermentations and biosynthesis to biodegradation of toxic chemicals.

The primary objectives of the curriculum are to broadly educate students on the biology of microorganisms. The curriculum prepares students for positions in industry, government and graduate/professional study in life sciences through extensive course work combined with laboratory and research experience.



Curriculum Coordinator

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Cook College Graduation Requirements for the Microbiology Major

Degree: Bachelor of Science

The microbiology program is open to students who have completed 01:119:101 General Biology and 01:160:161 General Chemistry with grades of C or better.

I. College Mission: Interdisciplinary Critical Analysis (5 credits)

- 11:015:101 Perspectives on Agriculture and the Environment (2)
- 11:015:400 Junior/Senior Colloquium (3)
(11:015:405 Ethics in Science (3) satisfies both this requirement and the professional requirement below.)

II. Introductory Life and Physical Sciences

Specific courses to meet the introductory life and physical sciences requirements are listed under VIII A, required courses for competence in microbiology.

III. Humanities and Arts (6 credits)

See suggested courses for Cook Degree Requirements.

IV. Multicultural and International Studies (6 credits)

See suggested courses for Cook Degree Requirements.

V. Human Behavior, Economic Systems, and Political Processes (9 credits)

See suggested courses for Cook Degree Requirements.

VI. Oral and Written Communication (6 credits)

See suggested courses for Cook Degree Requirements. 01:355:302 Scientific and Technical Writing (3) is strongly recommended.

VII. Experience-Based Education (0-3 credits)

Research in Microbiology *or* equivalent independent research project in microbiology *or* appropriate cooperative education placement of at least 3 credits *or* appropriate non-credit bearing internship approved by the curriculum coordinator.

VIII. Proficiency in Microbiology (91-95 credits)

A. REQUIRED COURSES (74-78)

Quantitative Methods (8)

Calc1-2 (8) 01:640:151-152 Calculus for Mathematics and Physical Sciences (4,4) is preferred

Computer Competence (0-3)

11:126:483 Nucleotide Sequence Analysis (3) or equivalent
This requirement is also fulfilled by General Biochemistry and Experimental Biochemistry

Professional Ethics (3)

11:015:405 Ethics in Science (3), 11:015:433 Critical Thinking in Science, or 01:119:160 Biology, Society, and Ecological Issues (3) or 01:730:249 Medical Ethics (3)

Additional requirements (61-62)

- 11:115:403-404 General Biochemistry (4,3) or 01:694:407-408 Molecular Biology and Biochemistry (3,3)
- 11:115:413 Experimental Biochemistry (3)
- 01:119:101-102 General Biology (4,4)
- 11:126:481 Molecular Genetics (3) or 11:680:xxx Microbial Genetics (3)
- 01:160:161-162 General Chemistry (4,4)
- 01:160:171 Introduction to Experimentation (1)
- 01:160:307-308 Organic Chemistry (4,4) or 01:160:315-316 Principles of Organic Chemistry (4,4) *
- 01:447:380 Genetics (4)
- 01:447:498 Bacterial Physiology (3)
- 11:680:390 or 01:447:390 General Microbiology (4)
- 11:680:491 or 11:126:491 Microbial Ecology and Diversity (4)
- 11:680:xxx Seminar in Microbiology (1)
- 01:750:193-194 Physics for the Sciences (4,4) or equivalent *

*Students intending to apply to medical school should be aware that many schools require laboratories in organic chemistry and physics.

B. ELECTIVES (19)

A minimum of ten credits from the following, including at least one laboratory:

- 11:126:394 or 11:680:394 or 01:447:394 Applied Microbiology (4) (includes laboratory)
- 11:126:407 Comparative Virology (3)
- 01:146:474 Immunology (3)
- 01:146:475 Laboratory in Immunology (1)
- 11:375:411 Pollution Microbiology (3)
- 11:400:423 Food Microbiology (3)
- 11:400:424 Food Microbiology Laboratory (1)
- 01:447:392 Pathogenic Microbiology (3)
- 11:628:404 Fungi and Ecosystems (3) or 11:770:403 Fungi in the Environment (3)

Additional 9 credits of elective courses from the list above or below:

- 11:115:412 Protein and Enzyme Chemistry (3)
- 11:115:428 Homology Modeling of Proteins (3)
- 11:126:405 Microbial Technology (3)
- 11:126:412 Process Biotechnology (3)
- 11:126:427 Methods in Recombinant DNA Technology (4)
- 11:126:482 Molecular Genetics Laboratory (3)
- 11:126:484 Biotechnology Robotics (3)
- 11:126:486 Analytical Methods in Microbiology (4)
- 11:127:414 Unit Processes in Bioenvironmental Engineering II (3)
- 01:146:328 Human Parasitology (3)
- 11:375:453 Soil Ecology (3)
- 01:447:398 Electron Microscopy (3)
- 01:447:480 Topics in Molecular Genetics (3)
- 11:628:418 Marine Microbiology (4)
- 11:704:422 Ecology of Soil Organisms (3)
- 11:770:301 General Plant Pathology (3)
- 11:680:xxx,yyy Research in Microbiology (BA): One to three credits of research may be substituted for an equal number of credits of elective courses, with the approval of the curriculum coordinator.

IX. Unspecified Electives (0-5 credits)

Suggested Course Sequence

First Year, Fall Term

11:015:101 Perspectives (2)
01:355:101 Expository Writing (3)
01:119:101 General Biology (4)
01:160:161 General Chemistry (4)
01:640:135 Calculus I (4)*
* Can be delayed to subsequent year

Total Semester Credits: 17 – Cumulative Total Credits: 17

First Year, Spring Term

01:119:102 General Biology (4)
01:160:162 General Chemistry (4)
01:160:171 Introduction to Experimentation (1)
01:640:138 Calculus II (4)*
* Can be delayed to subsequent year
Course fulfilling Areas III, IV or V (3)

Total Semester Credits: 16 – Cumulative Total Credits: 33

Second Year, Fall Term

11:680:390 General Microbiology (4)
01:160:307 Organic Chemistry (4)
01:750:193 Physics for the Sciences (4)
Courses fulfilling Areas III, IV or V (6)

Total Semester Credits: 18 – Cumulative Total Credits: 51

Second Year, Spring Term

01:160:308 Organic Chemistry (4) *
01:447:380 Genetics (4)
01:750:194 Physics for the Sciences (4)
Microbiology Elective with lab (4)

* 01:160:311 Organic Chemistry Laboratory (2)
recommended

Total Semester Credits: 16 – Cumulative Total Credits: 67

Third Year, Fall Term

11:680:491 Microbial Ecology and Diversity (4)
11:115:403 Biochemistry (4)
11:115:413 Experimental Biochemistry (3)
11:126:481 Molecular Genetics (3) or 11:680:xxx
Microbial Genetics (3)
Course fulfilling Areas III, IV or V (3)

Total Semester Credits: 17 – Cumulative Total Credits: 84

Third Year, Spring Term

11:115:404 Biochemistry (3)
01:447:498 Microbial Physiology (3)
01:350:302 Scientific and Technical Writing (3) or
equivalent
Microbiology elective (3)
Professional Ethics course (3)
Course fulfilling Areas III, IV or V (3)

Total Semester Credits: 18 – Cumulative Total Credits: 102

Fourth Year, Fall Term

11:680:xxx Seminar in Microbiology (1)
Microbiology Electives (6-9) and/or Research in
Microbiology (3)*
Free elective courses (0-3)
Courses fulfilling Areas III, IV or V (3)

Total Semester Credits: 13-16 – Cumulative Total Credits:
115-117

Fourth Year, Spring Term

Junior/Senior Colloquium (3)
Microbiology Electives (3-6) and/or Research in
Microbiology (3)*
Free elective courses (0-5)
Courses fulfilling Areas III, IV or V (3)

Total Semester Credits: 13-16 – Cumulative Total
Credits: 128

*An appropriate cooperative education placement,
approved by the Curriculum Coordinator, or a George
H. Cook Scholars project can substitute for Research
in Microbiology.