

College of the Environment, Forestry, and Natural Sciences 2020-2021

Department of Biological Sciences

Microbiology, Bachelor of Science

Ever since Van Leeuwenhoek described the “cavorting wee beasties” seen through his simple 1670s-style microscope, scientists have been fascinated by tiny life forms. This degree allows students to join those who explore the world of bacteria, viruses, mitochondria, neurons, and genetic material. A strong core of biology and chemistry anchors the program, which offers flexibility through a generous selection of approved electives.

Careers

What Can I Do with a Bachelor of Science in Microbiology?

Are you interested in infectious disease? Do you want to help conduct clinical trials for new drugs? Microbiology might be the career path for you. You can also use our program to prepare for graduate study, for admission to medical, dental, or veterinary school, or for other professional training.

You'll receive plenty of personal attention from faculty-in the classroom, in research laboratories, and in our Biology Advisement Center. You'll have numerous opportunities, even as an undergraduate, to do research-research that might get you a job in a lab or get you into medical school. Our graduates have exceptional placement rates in medical schools, government agencies, and graduate programs.

Career opportunities that might be pursued:

- Medical corporations
- Biological testing laboratories
- Pharmaceutical companies
- State or federal government agencies

With further education, one of these paths is possible:

- Physician
 - Researcher
 - Crime lab analyst
 - University professor
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University Requirements

- To receive a bachelor's degree at Northern Arizona University, you must complete at least 120 units of credit that minimally includes a major, the liberal studies requirements, and university requirements as listed below.
 - All of Northern Arizona University's [liberal studies](#), [diversity](#), [junior-level writing](#), and [capstone](#) requirements.
 - All requirements for your specific academic plan(s).
 - At least 30 units of upper-division courses, which may include transfer work.
 - At least 30 units of coursework taken through Northern Arizona University, of which at least 18 must be upper-division courses (300-level or above). This requirement is not met by credit-by-exam, retro-credits, transfer coursework, etc.
 - A cumulative grade point average of at least 2.0 on all work attempted at Northern Arizona University.

The full policy can be viewed [here](#).

Overview

In addition to University Requirements:

- At least 71 units of major requirements
- Up to 9 units of major prefix courses may be used to satisfy Liberal Studies requirements; these same courses may also be used to satisfy major requirements
- Elective courses, if needed, to reach an overall total of at least 120 units

Please note that you may be able to use some courses to meet more than one requirement. Contact your advisor for details.

Minimum Units for Completion	120
Major GPA	C
Highest Mathematics Required	MAT 125
Fieldwork Experience/Internship	Optional
Research	Optional
University Honors Program	Optional
AZ Transfer Students complete AGEC-A Recommended	
Progression Plan Link	View Progression Plan

Purpose Statement

The Bachelor of Science degree in Microbiology consists of a series of Life Science foundation courses followed by advanced courses that survey a range of microbiological sub-disciplines. These include courses focused on the interaction between microorganisms and human disease, such as infectious diseases, medical microbiology, and immunology but also courses that investigate the role of microbes in the environment including environmental microbiology, microbial ecology and industrial microbiology and biotechnology. From bioremediation to virology, students will develop an understanding of biological and chemical systems of microorganisms — and develop a foundation for a career in a range of professions that involve microbiology.

The Life Sciences Core is designed to provide the student with a strong grounding in biology, chemistry and mathematics. The student, in consultation with an academic advisor and using a basic course schedule as a guideline, may select from elective microbiology courses relevant to a range of disciplinary areas and career fields, such as Immunobiology, Medical Microbiology, Microbial Ecology, Bioinformatics, and Virology; or design his or her own set of electives approved by one of the program academic advisors.

Numerous undergraduate research opportunities involve you in the process and application of science in research areas at NAU's research centers and institutes, such as the [Center for Microbial Genetics & Genomics \(MGGen\)](#), and the Center for Ecosystem Science and Society (EcoSS). Due to the rigorous nature of our program, our graduates are well prepared for medical schools, careers in government agencies, or graduate programs.

Student Learning Outcomes

- Students will be able to communicate scientific information effectively, especially relating to microbiological organisms, and the roles of microbial organisms in ecosystem function and health-related issues
- Students will be able to collect, analyze and interpret scientific data, including developing a familiarity with microbiology laboratory techniques and safety procedures
- Students will develop proficiency in the quantitative skills necessary to analyze biological problems (e.g., arithmetic, algebra, dimensional analysis, and statistical analysis as applied to biology), with a knowledge of specialized techniques used in microbiology
- Students will be able to apply the scientific method as a demonstration that they understand its application furthering our knowledge of the microbial world
- Students will be able to describe fundamental principles of biology e.g., central dogma, diversity of life, inheritance and how these principles relate to microorganisms
- Students will be able to describe unique microbial genetic systems (i.e., prokaryotic and viral genomes, lateral gene transfer, plasmid structure and function, etc.)
- Students will appreciate the biological diversity of microbial forms, and appreciate that this diversity results from evolutionary processes
- Students will be able to access and interrogate the primary scientific literature and be aware of leading journals in the field of microbiology
- Students will be able to synthesize material from lower division courses across a biological sub-discipline and apply this to advanced course material (i.e., a Capstone

experience); specifically, students will draw from their learning experiences in the fields of microbial ecology & evolution, microbial physiology, bioremediation, immunology, etc., as related to the topic of their capstone course

- Students will gain familiarity with the unique role of microbes play in genetic modification technologies (i.e., creation of GMOs, industrial applications, gene therapy, etc.)
- Students will gain familiarity with the role of microbes in human disease, the role of microbes in issues of international health, and the human immune response to microbial infection
- Students will gain familiarity with the role of microbes in the context of ecosystem function (e.g., microbial ecology, microbiome, etc.)

Details

Major Requirements

- **Take at least 71 units including 40 units of Biology and Biology-related coursework with a Grade of "C" or better:**
 - [BIO 181](#), [BIO 181L](#), [BIO 182](#), [BIO 182L](#) (8 units)

Select one of the following which meets the junior-level writing requirement (3-5 units):

- [BIO 205](#), [BIO 205L](#), [BIO 305W](#), (5 units)
- [BIO 365W](#) (3 units)

(Note: The Department of Biological Sciences is phasing out the five unit [BIO 205](#) and [BIO 205L](#) and [BIO 305W](#) option, and transitioning to the [BIO 365W](#) option.

- Select additional coursework from:
 - [BIO 240](#), [BIO 344](#), [BIO 346](#), [BIO 349L](#), [BIO 350](#), [BIO 369](#), [BIO 375](#), [BIO 376](#), [BIO 401C](#), [BIO 409](#), [BIO 410](#), [BIO 411](#), [BIO 434](#), [BIO 475](#), [BIO 488C](#), [BIO 488L](#) (at least 9 units)
- Select additional coursework from the following (including up to six units of non-BIO prefix courses) (8-9 units):
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 - [BIO 201](#), [BIO 201L](#), [BIO 202](#), [BIO 202L](#), [BIO 240](#), [BIO 300](#), [BIO 320](#), [BIO 343](#), [BIO 344](#), [BIO 346](#), [BIO 349L](#), [BIO 350](#), [BIO 375](#), [BIO 376](#), [BIO 401C](#), [BIO 408](#), [BIO 409](#), [BIO 410](#), [BIO 411](#), [BIO 426C](#), [BIO 435C](#), [BIO 471C](#), [BIO 475](#), [BIO 479](#), [BIO 485](#), [BIO 488C](#), [BIO 488L](#), [BIO 497](#), [BIO 498](#), [BIO 499](#), [BIO 545](#)
 - [CENE 150](#), [CENE 280](#), [CENE 281L](#), [CENE 330](#), [CENE 332](#), [CENE 335](#)
 - [CHM 440](#)

- [ENV 360](#), [ENV 385W](#)
- [FOR 213](#), [FOR 340](#)
- [GLG 309](#), [GLG 451](#)
- [NTS 356](#)
- Select one of the following which meets the senior capstone requirement:
 - [BIO 401C](#), [BIO 471C](#), [BIO 482C](#), [BIO 488C](#) (3-4 units)
- Please note the many of the courses in the following major requirements also satisfy Liberal Studies requirements.

Select a basic chemistry sequence:

- Basic chemistry sequence: [CHM 151](#), [CHM 151L](#), [CHM 152](#), [CHM 152L](#) (9 units)
- Biochemistry course: [CHM 360](#) or [CHM 461](#) (3 units)

Select an organic chemistry sequence:

- [CHM 230](#), [CHM 230L](#), [CHM 320](#) (8 units)
- [CHM 235](#), [CHM 235L](#), [CHM 238](#) (8 units)

- Select a math combination:
 - [MAT 125](#) and ([STA 270](#) or [PSY 230](#)) (7-8 units)
 - [MAT 136](#) (4 units)

Select a physics sequence:

- [PHY 111](#), [PHY 112](#) (8 units)
- [PHY 161](#), [PHY 262](#), [PHY 262L](#), [PHY 263](#) (11 units)

Please note:

- All prerequisite coursework must be completed with grades of C or better.
- The Department of Biological Sciences does not allow dual majors within the department.

General Electives

- Additional coursework is required, if, after you have met the previously described requirements, you have not yet completed a total of 120 units of credit.

You may take these remaining courses from any academic areas, using these courses to pursue your specific interests and goals. We encourage you to consult with your advisor to select the courses that will be most advantageous to you. (Please note that you may also use prerequisites or transfer credits as electives if they weren't used to meet major, minor, or liberal studies requirements.)

Additional Information

- Be aware that some courses may have prerequisites that you must also take. For prerequisite information click on the course or see your advisor.

Campus Availability

- [Flagstaff](#)
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