All of the BS in Biology concentrations require 1 year of basic biology

BIO 105, 106 – Biological Principles I: Cellular Biology and Lab, and BIO 107 – Biological Principles II: Evolution, Biodiversity, Ecology, and Lab

### General Biology concentration
- Required major credits = 69
- Core Curriculum requirements

### Required biology courses:
- Biological Principles III: Functional Genetics
- Ecology
- Evolution

### combination from each of three areas:
- Nonsal Biology
- Comparative Vertebrate Anatomy
- Botany
- Ornithology
- Entomology
- Vertebrate Zoology
- Invertebrate Zoology
- Marine Ecology
- Plant Ecology
- 404 Comparative Animal Physiology
- 416 Microbial Ecology and Lab
- Limnology
- Lar and Functional Biology
- 306 Developmental Biology and Lab
- 282 Microbiology and Lab
- 322 Neurobiology and Lab
- Plant Physiology and Lab
- 402 Animal Physiology and Lab
- 410 Cell and Molecular Biology and Lab

Addition, take either two biology lecture/lab course, with at least 200 or above.

### Chemistry
- CHY 113, 114, 115, 116 Principles of Chemistry I and II, and Lab
- CHY 251, 252 Organic Chemistry I and Lab

### Physics
- PHY 111, 114, 112, 116 Elements of Physics I and II and Lab
- PHY 121, 114, 123, 116 General Physics I and II and Lab

### Mathematics
- MAT 152 Calculus
- MAT 220 Statistics

### Because of the interdisciplinary nature of biology, all concentrations also require basic courses in Chemistry, Physics and Mathematics

### BS, Human Biology concentration
- (Required major credits = 77
- + Core Curriculum requirements)

### Additional required biology courses:
- BIO 221, 112 Human Physiology I and Anatomy and Physiology I Lab
- BIO 223, 114 Human Physiology II and Anatomy and Physiology II Lab
- BIO 345 Pathophysiology

### Choose 15 credits from the following:
- BIO 201 Genetics
- BIO 205 Comparative Vertebrate Anatomy
- BIO 305, 306 Developmental Biology and Lab
- BIO 311, 282 Microbiology and Lab
- BIO 321, 322 Neurobiology and Lab
- BIO 361, 362 Parasitology and Lab
- BIO 401, 402 Animal Physiology and Lab
- BIO 407 Environmental Modulation of Developmental Mechanisms
- BIO 409, 410 Cell and Molecular Biology and Lab
- BIO 413 Biostatistics
- BIO 413, 432 Principles of Immunology and Lab

### Additional required courses:
- CHY 253, 254 Organic Chemistry II and Lab
- CHY 461, 462 Biochemistry I and Lab
- CHY 461, 463 Biochemistry I and II

### BS, Biotechnology concentration
- (Required major credits = 73
- + Core Curriculum requirements)

### Additional required biology courses:
- BIO 201 Genetics
- BIO 311, 282 Microbiology and Lab
- BIO 408 Experimental Genetics
- BIO 409, 410 Cell and Molecular Biology and Lab
- BIO 413 Biostatistics
- BIO 431, 432 Principles of Immunology and Lab

### Additional required courses:
- CHY 253, 254 Organic Chemistry II and Lab
- CHY 461, 462 Biochemistry I and Lab
- CHY 461, 463 Biochemistry I and II

### BS, Teacher Certification in Life Sciences concentration
- (total required credits = 116)

For this concentration, students follow the Human Biology concentration, but take the following courses to fulfill the Teacher Certification requirements. Please apply for this special program at http://usm.main.edu/educatorpreparation

### Other required courses:
- USM Core Curriculum (including pre-internship education courses):
  - EYE 108, Culture, Identity and Education (3 cr.)
  - EDU 100, Exploring Teaching as a Profession (3 cr.)
  - College Writing - ENG 100 (3 cr.)
  - Cultural Interpretation (3 cr.)
  - Quantitative Reasoning - MAT 152 (4 cr.)
  - Creative Expression (3 cr.) (THE 102 or 170)
  - Socio-Cultural Analysis - HRD 200 Multicultural (3 cr.)
  - Science Education (4 cr.)
  - Ethics - EDU 310 Purpose of Schooling, Democracy (3 cr.)
  - Thematic Cluster - EDU 305 Foundations of Cultural and Linguistic Diversity, SED 300 Developmental Psychology of Students with Exceptionalities in General Education, and SED 420 Multi-Tiered Educational Support (9 cr.)
  - Professional Education Internship Requirement (6 cr.)
  - Teaching methods in area of major: EDU 401 Teaching Methodology in Science (3 cr.)
  - EDU 402 Teaching Methodology in Health (3 cr.)
  - EDU 403 Teaching Methodology in Life Sciences (3 cr.)

Additional, take either two biology lecture/lab course, with at least 200 or above.

For more information, visit: www.usm.main.edu/bio
In addition to the Bachelor of Science degree, we offer a BS in Biology with Teacher Certification in Life Sciences, a minor in Biology, a non-degree pre-Pharmacy program, and Post-Baccalaureate Certificate Programs for Pre-Medical and Pre-Veterinary studies. Together with Environmental Science & Policy, we offer a minor in Ecology.

<table>
<thead>
<tr>
<th>Minor in Biology (Required total credits = 16)</th>
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<tbody>
<tr>
<td>Core requirements:</td>
</tr>
<tr>
<td>• Either BIO 107 Biological Principles II: Evolution, Biodiversity, Ecology OR ESP 101, 102 Fundamentals of Environmental Science and Lab</td>
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<tr>
<td>• Either BIO 203 Ecology or ESP 125, 126 Introduction to Environmental Ecology and Lab</td>
</tr>
<tr>
<td>Electives: Complete 7–8 credits of the following, including at least one lab course or integrated lecture/lab, for a minimum of 16 credits for the minor. Elective courses for the Ecology minor cannot also be used for the ESP or BIO major (6+ credits). None of the following courses can be counted toward the major.</td>
</tr>
<tr>
<td>• ESP 250 Soils and Land Use</td>
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<td>• ESP 303 Wetlands Ecology</td>
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<td>• ESP 341 Limnology</td>
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<tr>
<td>• ESP 350 Environmental Entomology</td>
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<tr>
<td>• ESP 412 Field Ecosystem Ecology</td>
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<tr>
<td>• ESP 413 Forest Ecology</td>
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<tr>
<td>• BIO 231 Botany</td>
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<tr>
<td>• BIO 291 Ornithology</td>
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<tr>
<td>• BIO 335 Entomology</td>
</tr>
<tr>
<td>• BIO 337 Marine Ecology</td>
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<tr>
<td>• BIO 353 Vertebrate Zoology</td>
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<td>• BIO 383 Plant Ecology</td>
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<tr>
<td>• BIO 405, 406 Animal Behavior and Lab</td>
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<td>• BIO 415, 416 Microbial Ecology and Lab</td>
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<thead>
<tr>
<th>Pre-Pharmacy Concentration 2-yr, non-degree program (total required credits = 79)</th>
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</thead>
<tbody>
<tr>
<td>Required biology courses:</td>
</tr>
<tr>
<td>• BIO 105, 106 Biological Principles I: Cellular Biology I and Lab</td>
</tr>
<tr>
<td>• BIO 107 Biological Principles II: Evolution, Biodiversity, Ecology, and Lab</td>
</tr>
<tr>
<td>• BIO 111, 112 Human Anatomy and Physiology I and Lab</td>
</tr>
<tr>
<td>• BIO 113, 114 Human Anatomy and Physiology II and Lab</td>
</tr>
<tr>
<td>Other required STEM courses:</td>
</tr>
<tr>
<td>• CHY 113, 114, 115, 116 Principles of Chemistry I and II, and Lab</td>
</tr>
<tr>
<td>• CHY 251, 252 Organic Chemistry I and Lab</td>
</tr>
<tr>
<td>• CHY 253 Organic Chemistry II</td>
</tr>
<tr>
<td>• PHY 111, 114, 112, 116 Elements of Physics I and II and Lab</td>
</tr>
<tr>
<td>• MAT 152 Calculus A</td>
</tr>
<tr>
<td>• MAT 220 Statistics for the Biological Sciences</td>
</tr>
<tr>
<td>Other required courses:</td>
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<tr>
<td>• ENG 100 College Writing</td>
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<tr>
<td>• ENG 120 Introduction to Literature</td>
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<tr>
<td>• PSY 101 General Psychology I</td>
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<td>• SOC 100 Introduction to Sociology</td>
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<tr>
<td>• THE 170 Public Speaking</td>
</tr>
</tbody>
</table>

In addition, students must fulfill an additional 6-9 credits of general education electives, and some programs require 3 credits of economics.

<table>
<thead>
<tr>
<th>Post-Baccalaureate Pre-Medical Certificate Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>Required biology courses:</td>
</tr>
<tr>
<td>• BIO 105, 106 Biological Principles I: Cellular Biology I and Lab</td>
</tr>
<tr>
<td>• BIO 107 Biological Principles II: Evolution, Biodiversity, Ecology, and Lab</td>
</tr>
<tr>
<td>Choose 2 additional courses from the following:</td>
</tr>
<tr>
<td>• BIO 201 Genetics and BIO 408 Experimental Genetics</td>
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<tr>
<td>• BIO 205 Comparative Vertebrate Anatomy</td>
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<tr>
<td>• 300-level or 400-level BIO courses with labs</td>
</tr>
<tr>
<td>Additional required STEM courses:</td>
</tr>
<tr>
<td>• CHY 113, 114, 115, 116 Principles of Chemistry I and II, and Lab</td>
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<tr>
<td>• CHY 251, 252 Organic Chemistry I and Lab</td>
</tr>
<tr>
<td>• CHY 253, 254 Organic Chemistry II and Lab</td>
</tr>
<tr>
<td>• PHY 111, 114, 112, 116 Elements of Physics I and II and Lab</td>
</tr>
<tr>
<td>• MAT 152 Calculus A</td>
</tr>
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<thead>
<tr>
<th>Post-Baccalaureate Pre-Veterinary Certificate Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>Required biology courses:</td>
</tr>
<tr>
<td>• BIO 105, 106 Biological Principles I: Cellular Biology I and Lab</td>
</tr>
<tr>
<td>• BIO 107 Biological Principles II: Evolution, Biodiversity, Ecology, and Lab</td>
</tr>
<tr>
<td>Choose 1 additional course from the following:</td>
</tr>
<tr>
<td>• BIO 201 Genetics and BIO 408 Experimental Genetics</td>
</tr>
<tr>
<td>• BIO 205 Comparative Vertebrate Anatomy</td>
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<td>• CHY 113, 114, 115, 116 Principles of Chemistry I and II, and Lab</td>
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</tr>
<tr>
<td>• MAT 152 Calculus A</td>
</tr>
</tbody>
</table>
The Biology Department offers research opportunities to undergraduate, Masters, and high school students as coauthors, present at professional meetings, review proposals and manuscripts, and many students get enhanced practical experience through research positions (volunteer, work study, grant funded, and fellowships) in science research labs at USM and elsewhere. Alumni from the B.S. program have continued their education in professional schools and in graduate school, and have gone on to work as lab technicians, research biologists, and state biologists.

**Adjoint Faculty**
- **Curtis Bohlen**, Casco Bay Estuary Partnership, Estuarine ecology, restoration, and protection
- **David Evers**, Biodiversity Research Institute, Environmental toxicology
- **David E. Harris**, USM School of Nursing, Cardiovascular disease
- **Ira A. Levine**, USM Lewiston-Auburn College, Algal physiological ecology and aquaculture
- **Leif Oxburgh**, Maine Medical Center Research Institute, Kidney development and injury
- **Jim Paruk**, St. Joseph’s College, Loon mortality and reproduction
- **Iain Stenhouse**, Biodiversity Research Institute, Pelagic seabird ecology
- **Karen A. Wilson**, USM Dept of Environmental Science and Policy, Freshwater-marine linkages and salt-marsh restoration

Research Opportunities
(see [https://usm.maine.edu/bio/research](https://usm.maine.edu/bio/research) for more details)

*Department Faculty:
- **Champlin** studies the hormonal control of development, steroid control of insect visual system morphology, cell cycle control, and transcription regulation.
- **Stieger** is a neuroscientist who investigates development and toxicological effects on the fish brain.
- **Tapen** studies environmental microbiology.
- **Iaher** studies the evolution of social behavior in mammals with a current emphasis on bats.
- **Gupta** investigates the physiological ecology of marine microbial phytoplankton, focusing on environmental factors that control growth and influence population composition and dynamics.
- **Lemons** is an animal physiologist who has studied locomotion.
- **Theodore** studies plant community ecology and plant-nutrient interactions in stressful environments, with a current emphasis on salt marshes.
- **Kerber** investigates the mechanics of swimming and flying and the evolution of locomotor systems in order to model the constraints on phenotypic evolution.
- **Weber** studies evolutionary genetics, including the genetic control of organic shapes, and excels in experimental observation of the operation of natural selection.

**What have our students done after graduation?**

Students also get strong hands-on experience by taking at least 4-6 lab classes, and many students get enhanced practical experience through research positions at USM and elsewhere. Alumni from the B.S. program have continued their education in professional schools and in graduate school, and have gone on to work as lab technicians, research biologists, and state biologists.

Here are some of the institutions that our students graduating since 2003 have attended:
- University College of Dublin (medical school)
- University of New England College of Osteopathic Medicine
- Maine Medical Center – Tufts University School of Medicine
- University of Rhode Island College of Pharmacy
- Albany College of Pharmacy
- New York Chiropractic College
- Brandeis University (PhD)
- Colorado State University (PhD)
- Northeastern University (PhD)
- Oregon Health Sciences University (PhD)
- Pennsylvania State University (PhD)
- University of Maine (PhD)
- University of Massachusetts (PhD)
- University of Michigan (PhD)
- University of New Hampshire (PhD)
- University of Oregon (PhD)
- University of Rhode Island (MS)
- University of Southern Maine (MS)
- University of Washington (PhD)

Here are some of the employers that have hired our BS graduates since 2003:
- Idexx Laboratories
- Alere Scarborough
- Animal Emergency Clinic
- Standish Veterinary Hospital
- Always Green
- Dia Med, Inc.
- Immucell
- Nordx
- Katahdin Analytical Services
- Poland Spring
- Tom's of Maine
- Corning, Kennebunk
- Maine Dept of Inland Fisheries & Wildlife
- Biodiversity Research Institute
- Portland Water District
- Bates College
- Thornton Academy
- University of New England
- University of Rhode Island
- Dana Farber Cancer Center