

BIOLOGY: EVOLUTIONARY BIOLOGY

REQUIREMENTS

REQUIREMENTS FOR THE NAMED OPTION

A minimum of 15 credits must be completed in the major that are not used elsewhere. Students must complete a minimum of 31 credits of Biological Science courses within the Introductory Biology, Foundation Course, Upper-Level Breadth in the Major, Capstone, and Evolutionary Biology Seminar requirements. Unless specifically stated otherwise, courses may not be used to meet multiple requirements of the major.

CORE REQUIREMENTS

Mathematics and Statistics

| Code | Title | Credits |
|--------------------------------|--|-------------|
| Complete one of the following: | | 4-10 |
| MATH 171 & MATH 217 | Calculus with Algebra and Trigonometry I and Calculus with Algebra and Trigonometry II | |
| MATH 221 | Calculus and Analytic Geometry I | |
| MATH 211 | Survey of Calculus I | |
| Complete one of the following: | | 3-4 |
| STAT 240 | Data Science Modeling I | |
| STAT 301 | Introduction to Statistical Methods | |
| STAT 324 | Introduction to Statistics for Science and Engineering | |
| STAT 371 | Introductory Applied Statistics for the Life Sciences | |
| Total Credits | | 7-14 |

Chemistry

| Code | Title | Credits |
|--|--|--------------|
| General Chemistry (Complete one of the following): | | 5-10 |
| CHEM 103 & CHEM 104 | General Chemistry I and General Chemistry II | |
| CHEM 109 | Advanced General Chemistry | |
| CHEM 115 & CHEM 116 | Chemical Principles I and Chemical Principles II | |
| Organic Chemistry | | |
| CHEM 343 | Organic Chemistry I | 3 |
| CHEM 344 | Introductory Organic Chemistry Laboratory | 2 |
| CHEM 345 | Organic Chemistry II | 3 |
| Total Credits | | 13-18 |

Physics

| Code | Title | Credits |
|--|-----------------|-------------|
| First Semester Physics (Complete one of the following): | | 4-5 |
| PHYSICS 103 | General Physics | |
| PHYSICS 201 | General Physics | |
| PHYSICS 207 | General Physics | |
| Second Semester Physics (complete one of the following): | | 4-5 |
| PHYSICS 104 | General Physics | |
| PHYSICS 202 | General Physics | |
| PHYSICS 208 | General Physics | |
| Total Credits | | 8-10 |

Introductory Biology

| Code | Title | Credits |
|------------------------------------|---|---------|
| Complete one sequence: | | 10-13 |
| Option A: | | 10 |
| BIOLOGY/ BOTANY/ ZOOLOGY 151 | Introductory Biology | |
| BIOLOGY/ BOTANY/ ZOOLOGY 152 | Introductory Biology | |
| Option B: | | 13 |
| BIOCORE 381 | Evolution, Ecology, and Genetics | |
| BIOCORE 382 | Evolution, Ecology, and Genetics Laboratory | |
| BIOCORE 383 | Cellular Biology | |
| BIOCORE 384 | Cellular Biology Laboratory | |
| BIOCORE 485 | Principles of Physiology | |
| Option C: | | 10 |
| ZOOLOGY/ BIOLOGY 101 | Animal Biology | |
| ZOOLOGY/ BIOLOGY 102 | Animal Biology Laboratory | |
| BOTANY/ BIOLOGY 130 | General Botany | |

Foundation Course (complete one of the following):

Students may use BIOCORE 381 and BIOCORE 383 toward both Introductory Biology and Foundation.

| Code | Title | Credits |
|---------------------------|---|---------|
| BIOCORE 381 & BIOCORE 383 | Evolution, Ecology, and Genetics and Cellular Biology | 6 |
| GENETICS 466 | Principles of Genetics | 3 |
| GENETICS 468 | General Genetics 2 | 3 |

UPPER-LEVEL BREADTH IN THE MAJOR

Minimum of 13 credits required as follows and must include **one approved lab course**. (Approved lab courses are indicated by footnote.) A course taken to meet the Foundation requirement may not also count as Upper-Level Breadth in the Major.

- Complete the Evolutionary Biology course listed below.
- Complete at least two credits from either category A or B.
- Complete at least two credits from category C.
- Complete at least two credits from category D.

- Additional courses needed to reach 13 credits of Upper-Level Breadth in the Major may be taken from any category (A, B, C, D, E).

Required Evolutionary Biology Course

| Code | Title | Credits |
|-----------------------------------|----------------------|---------|
| ZOOLOGY/ ANTHRO/ BOTANY 410 | Evolutionary Biology | 3 |

A. Cellular and Subcellular Biology

| Code | Title | Credits |
|---------------------------------------|--|---------|
| AN SCI 336 | Animal Growth and Development | 3 |
| AN SCI/DY SCI 362 | Veterinary Genetics | 2 |
| AN SCI 366 | Concepts in Genomics | 3 |
| BIOCHEM 501 | Introduction to Biochemistry | 3 |
| BIOCHEM 507 | General Biochemistry I | 3 |
| BIOCHEM 508 | General Biochemistry II | 3-4 |
| BIOCHEM/ NUTR SCI 510 | Nutritional Biochemistry and Metabolism | 3 |
| BIOCHEM/ NUTR SCI 560 | Principles of Human Disease and Biotechnology | 2 |
| BIOCHEM/ M M & I 575 | Biology of Viruses | 2 |
| BIOCHEM 601 | Protein and Enzyme Structure and Function | 2 |
| BIOCHEM/ GENETICS/ MICROBIO 612 | Prokaryotic Molecular Biology | 3 |
| BIOCHEM/ GENETICS/ MD GENET 620 | Eukaryotic Molecular Biology | 3 |
| BIOCHEM/ BOTANY 621 | Plant Biochemistry | 3 |
| BIOCHEM 625 | Mechanisms of Action of Vitamins and Minerals | 2 |
| BIOCHEM/ GENETICS 631 | Plant Genetics and Development | 3 |
| BMOLCHEM/ MICROBIO 668 | Microbiology at Atomic Resolution | 3 |
| BOTANY/ENTOM/ PL PATH 505 | Plant-Microbe Interactions: Molecular and Ecological Aspects | 3 |
| CRB 640 | Fundamentals of Stem Cell and Regenerative Biology | 3 |
| CRB/B M E 670 | Biology of Heart Disease and Regeneration | 3 |
| DERM 601 | Skin Biology and Skin Diseases | 3 |
| DERM 602 | Advances in Skin Biology and Skin Diseases | 2 |
| GENETICS 466 | Principles of Genetics | 3 |
| GENETICS 467 | General Genetics I | 3 |
| GENETICS 520 | Neurogenetics | 3 |
| GENETICS 527 | Developmental Genetics for Conservation and Regeneration | 3 |
| GENETICS 588 | Immunogenetics | 3 |
| GENETICS 605 | Clinical Cases in Medical Genetics | 3 |
| GENETICS 627 | Animal Developmental Genetics | 3 |

| | | |
|--------------------------------------|---|-----|
| GENETICS/ MD GENET 662 | Cancer Genetics | 3 |
| H ONCOL/ MED PHYS 410 | Radiobiology | 2-3 |
| MICROBIO 345 | Introduction to Disease Biology | 3 |
| MICROBIO 470 | Microbial Genetics & Molecular Machines | 3 |
| MICROBIO/ SOIL SCI 523 | Soil Microbiology and Biochemistry | 3 |
| MICROBIO 626 | Microbial and Cellular Metabolomics | 3 |
| M M & I 341 | Immunology | 3 |
| M M & I/PATH- BIO 528 | Immunology | 3 |
| NEURODPT 629 | Molecular and Cellular Mechanisms of Memory | 3 |
| NTP/ NEURODPT 610 | Cellular and Molecular Neuroscience | 4 |
| ONCOLOGY/ M M & I/ PL PATH 640 | General Virology-Multiplication of Viruses | 3 |
| PHM SCI 254 | Tiny Earth Genomics - Researching Uncultured Antibiotic-Producing Microbes ¹ | 3 |
| PHM SCI 558 | Laboratory Techniques in Pharmacology and Toxicology ¹ | 2 |
| PLANTSCI 340 | Plant Genome Engineering and Editing | 3 |
| ZOOLOGY 370 | General Molecular Biology | 3 |
| ZOOLOGY 444 | Neuronal Cell Biology in Health and Disease | 2 |
| ZOOLOGY 470 | Introduction to Animal Development | 3 |
| ZOOLOGY/ PSYCH 523 | Neurobiology | 3 |
| ZOOLOGY 555 | Laboratory in Developmental Biology ¹ | 3 |
| ZOOLOGY 570 | Cell Biology | 3 |
| ZOOLOGY 604 | Computer-based Gene and Disease/Disorder Research Lab ¹ | 2 |
| ZOOLOGY 655 | Modeling Neurodevelopmental Disease | 3 |

B. Organismal Biology

| Code | Title | Credits |
|---------------------------------|---|---------|
| AN SCI/DY SCI 373 | Animal Physiology | 3 |
| AN SCI 377 | Integrative Animal Physiology Laboratory ¹ | 1 |
| AN SCI/DY SCI 434 | Reproductive Physiology ¹ | 3 |
| AN SCI/F&W ECOL/ ZOOLOGY 520 | Ornithology | 3 |
| AN SCI/F&W ECOL/ ZOOLOGY 521 | Birds of Southern Wisconsin ¹ | 3 |
| ANAT&PHY 335 | Physiology ¹ | 5 |
| ANAT&PHY 337 | Human Anatomy | 3 |
| ANAT&PHY 338 | Human Anatomy Laboratory | 2 |
| ANAT&PHY 435 | Fundamentals of Human Physiology ¹ | 5 |

| | | |
|--|--|-----|
| ANTHRO/PSYCH/ ZOOLOGY 619 | Biology of Mind | 3 |
| BIOCORE 486 | Principles of Physiology Laboratory ¹ | 2 |
| BOTANY 300 | Plant Anatomy ¹ | 4 |
| BOTANY 330 | Algae ¹ | 3 |
| BOTANY/ PL PATH 332 | Fungi ¹ | 4 |
| BOTANY/ PL PATH 333 | Biology of the Fungi | 2 |
| BOTANY/ F&W ECOL 402 | Dendrology: Woody Plant Identification and Ecology ¹ | 3 |
| BOTANY 500 | Plant Physiology ¹ | 3-4 |
| CS&D 503 | Neural Mechanisms of Speech, Hearing and Language | 3 |
| DY SCI 378 | Lactation Physiology ¹ | 3 |
| ENTOM/ ZOOLOGY 302 | Introduction to Entomology ¹ | 4 |
| ENTOM 321 | Physiology of Insects | 3 |
| ENTOM 331 | Taxonomy of Mature Insects ¹ | 4 |
| F&W ECOL 401 | | 3 |
| GENETICS 545 | Genetics Laboratory ¹ | 2 |
| GENETICS/ MD GENET 565 | Human Genetics | 3 |
| GEOSCI/ ZOOLOGY 542 | Invertebrate Paleontology | 3 |
| KINES 314 | Physiology of Exercise ¹ | 4 |
| MICROBIO 303 | Biology of Microorganisms | 3 |
| MICROBIO 304 | Biology of Microorganisms Laboratory ¹ | 2 |
| MICROBIO 526 | Physiology of Microorganisms | 3 |
| M M & I 301 | Pathogenic Bacteriology | 2 |
| M M & I/ENTOM/ PATH-BIO/ ZOOLOGY 350 | Parasitology | 3 |
| NTP/NEURODPT/ PSYCH 611 | Systems Neuroscience | 4 |
| NUTR SCI 431 | Nutrition in the Life Span | 3 |
| NUTR SCI 631 | Clinical Nutrition I | 3 |
| ONCOLOGY 401 | Introduction to Experimental Oncology | 2 |
| PATH 404 | Pathophysiologic Principles of Human Diseases | 3 |
| PSYCH 406 | Psychology of Perception | 3-4 |
| PSYCH 414 | Cognitive Psychology | 3 |
| PSYCH 454 | Behavioral Neuroscience | 3 |
| PSYCH 513 | Hormones, Brain, and Behavior | 4 |
| ZOOLOGY 303 | Aquatic Invertebrate Biology | 3 |
| ZOOLOGY 430 | Comparative Anatomy of Vertebrates ¹ | 5 |
| ZOOLOGY 603 | Endocrinology | 3-4 |
| ZOOLOGY 611 | Comparative and Evolutionary Physiology | 3 |

| | | |
|-------------|--|---|
| ZOOLOGY 612 | Comparative Physiology Laboratory ¹ | 2 |
| ZOOLOGY 620 | Neuroethology Seminar | 2 |

C. Ecology

| Code | Title | Credits |
|--|---|---------|
| AGROECOL 370 | Grassland Ecology | 3 |
| AN SCI 420 | Microbiomes of Animal Systems | 3 |
| BOTANY/ ZOOLOGY 450 | Midwestern Ecological Issues: A Case Study Approach | 2 |
| BOTANY 455 | The Vegetation of Wisconsin ¹ | 4 |
| BOTANY/ F&W ECOL/ ZOOLOGY 460 | General Ecology ¹ | 4 |
| BOTANY/ENTOM/ ZOOLOGY 473 | Plant-Insect Interactions | 3 |
| BOTANY/ENVIR ST/ F&W ECOL/ ZOOLOGY 516 | Conservation Biology | 3 |
| ENTOM 344 | From Flowers to Food: Pollinator Ecology and Conservation | 3 |
| ENTOM 450 | Basic and Applied Insect Ecology | 3 |
| ENTOM 490 | Biodiversity and Global Change | 3 |
| ENVIR ST/ LAND ARC 361 | Wetlands Ecology | 3 |
| F&W ECOL 448 | Disturbance Ecology | 3 |
| F&W ECOL 550 | Forest Ecology | 3 |
| F&W ECOL 551 | Forest Ecology Lab ¹ | 1 |
| F&W ECOL/ LAND ARC/ ZOOLOGY 565 | Principles of Landscape Ecology | 2 |
| F&W ECOL/ ZOOLOGY 660 | Climate Change Ecology | 3 |
| GENETICS 528 | Banking Animal Biodiversity: International Field Study in Costa Rica | 1 |
| MICROBIO/AN SCI/ BOTANY 335 | The Microbiome of Plants, Animals, and Humans | 3 |
| PL PATH 300 | Introduction to Plant Pathology ¹ | 4 |
| PL PATH 315 | Plant Microbiomes ¹ | 4 |
| ZOOLOGY 304 | Marine Biology | 2 |
| ZOOLOGY/ ENVIR ST 315 | Limnology-Conservation of Aquatic Resources | 2 |
| ZOOLOGY 316 | Laboratory for Limnology- Conservation of Aquatic Resources ¹ | 2-3 |
| ZOOLOGY 320 | Field Marine Biology ¹ | 3 |
| ZOOLOGY/ ENVIR ST 510 | Ecology of Fishes | 3 |
| ZOOLOGY/ ENVIR ST 511 | Ecology of Fishes Lab ¹ | 2 |

D. Evolution and Systematics

| Code | Title | Credits |
|------------|--|---------|
| ANTHRO 302 | Hominoid Evolution | 3 |
| ANTHRO 304 | Heredity, Environment and Human Populations | 3 |

| | | | | | |
|---------------------------------------|---|-----|--|---|-----|
| ANTHRO 411 | The Evolution of the Genus, Homo | 3 | ENTOM/ ZOOLOGY 371 | Medical Entomology: Biology of Vector and Vector-borne Diseases (4th credit meets lab requirement) ¹ | 3-4 |
| ANTHRO 458 | Primate Behavioral Ecology | 3 | ENVIR ST/ POP HLTH 471 | Introduction to Environmental Health | 3 |
| ANTHRO 603 | Seminar in Evolutionary Theory | 3 | ENVIR ST/ POP HLTH 502 | Air Pollution and Human Health | 3 |
| BOTANY 305 | Plant Morphology and Evolution ¹ | 4 | ENVIR ST/ LAND ARC 581 | Prescribed Fire: Ecology and Implementation ¹ | 3 |
| BOTANY 400 | Plant Systematics ¹ | 4 | F&W ECOL 306 | Terrestrial Vertebrates: Life History and Ecology ¹ | 4 |
| BOTANY 401 | Vascular Flora of Wisconsin ¹ | 4 | F&W ECOL/ ZOOLOGY 335 | Human/Animal Relationships: Biological and Philosophical Issues | 3 |
| BOTANY 422 | Plant Geography | 3 | F&W ECOL 410 | Silviculture: Applied Forest Ecology | 3 |
| BOTANY/ PL PATH 563 | Phylogenetic Analysis of Molecular Data | 3 | F&W ECOL 458 | Environmental Data Science | 3 |
| ENTOM 432 | Taxonomy and Bionomics of Immature Insects ¹ | 4 | F&W ECOL/ SURG SCI 548 | Diseases of Wildlife | 3 |
| ENTOM/GENETICS/ ZOOLOGY 624 | Molecular Ecology | 3 | F&W ECOL 561 | Wildlife Management Techniques ¹ | 3 |
| ENVIR ST/ F&W ECOL/ ZOOLOGY 360 | Extinction of Species | 3 | FOOD SCI/ MICROBIO 324 | Food Microbiology Laboratory ¹ | 2 |
| GENETICS 468 | General Genetics 2 | 3 | FOOD SCI/ MICROBIO 325 | Food Microbiology | 3 |
| MICROBIO 450 | Diversity, Ecology and Evolution of Microorganisms | 3 | GENETICS 548 | The Genomic Revolution | 3 |
| MICROBIO 520 | Planetary Microbiology: What Life Here Tells Us About Life Out There | 3 | M M & I 554 | Emerging Infectious Diseases and Bioterrorism | 2 |
| MICROBIO 525 | Field Studies of Planetary Microbiology and Life in the Universe ¹ | 3 | MED PHYS/ PHYSICS 265 | Introduction to Medical Physics | 2 |
| PATH-BIO 307 | Superbugs, Sex, & Drugs: Why Modern Medicine Needs Evolutionary Biology | 2 | MED PHYS 651 | Methods for Neuroimaging Research | 3 |
| PSYCH 449 | Animal Behavior | 3-4 | MICROBIO 357 | General Bioinformatics for Microbiologists | 3 |
| PSYCH 450 | Primate Psychology: Insights into Human Behavior | 3 | MICROBIO/ SOIL SCI 425 | Environmental Microbiology | 3 |
| ZOOLOGY 300 | Invertebrate Biology and Evolution | 3 | NUTR SCI 332 | Human Nutritional Needs | 3 |
| ZOOLOGY 301 | Invertebrate Biology and Evolution Lab ¹ | 2 | PHM SCI/ M&ENVTOX/ ONCOLOGY/ PHM COL-M/ POP HLTH 625 | Toxicology I | 3 |
| ZOOLOGY 415 | Genetics of Human History | 3 | PLANTSCI/ LAND ARC 263 | Woody Landscape Plant Identification, Culture, and Use | 4 |
| ZOOLOGY 425 | Behavioral Ecology | 3 | PLANTSCI 300 | Cropping Systems | 3 |

E. Applied Biology, Agriculture and Natural Resources

| Code | Title | Credits | | | |
|------------------------------------|--|---------|--------------------------|---|-----|
| A A E/ NUTR SCI 350 | World Hunger and Malnutrition | 3 | PLANTSCI 302 | Forage Management and Utilization | 3 |
| AGROECOL 377 | Global Food Production and Health | 3 | PLANTSCI 338 | Plant Breeding and Biotechnology | 3 |
| AMER IND/ ANTHRO/ BOTANY 474 | Ethnobotany | 3-4 | PLANTSCI 360 | Genetically Modified Crops: Science, Regulation & Controversy | 2 |
| AN SCI/DY SCI/ NUTR SCI 311 | Comparative Animal Nutrition | 3 | PLANTSCI 370 | World Vegetable Crops | 3 |
| AN SCI/DY SCI 320 | Animal Health and Disease | 3 | PLANTSCI 376 | Tropical Horticultural Systems | 2 |
| AN SCI/DY SCI 361 | Introduction to Animal and Veterinary Genetics | 2 | PLANTSCI 378 | Tropical Horticultural Systems International Field Study | 2 |
| AN SCI/DY SCI 363 | Principles of Animal Breeding | 2 | PLANTSCI 501 | Principles of Plant Breeding | 3 |
| BIOCORE 587 | Biological Interactions | 3 | PLANTSCI/ ATM OCN 532 | Environmental Biophysics | 3 |
| BOTANY 403 | Field Collections and Identification | 1-4 | PLANTSCI 550 | Molecular Approaches for Crop Improvement | 3 |
| DY SCI 471 | Food Production Systems and Sustainability | 3 | PL PATH 517 | Plant Disease Resistance | 2-3 |
| ENTOM 351 | Principles of Economic Entomology | 3 | | | |

| | | |
|--------------|----------------------------------|---|
| SOIL SCI 323 | Soil Biology | 3 |
| SOIL SCI 621 | Soil and Environmental Chemistry | 3 |

EVOLUTIONARY BIOLOGY SEMINAR

| Code | Title | Credits |
|--------------------------|---------------------------------------|---------|
| BIOLOGY/ GENETICS 522 | Communicating Evolutionary Biology | 2-3 |

CAPSTONE REQUIREMENT

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

Two credits minimum required. With advisor approval, directed study or research-based senior thesis in a biological science discipline can also count. The experience must be completed after the first year of an introductory biology sequence above. The capstone experience will normally be completed during the student's final two or three semesters. Also, a subset of laboratory courses has been approved for capstone. The following courses, along with 682s and 692s in biological science departments (taken senior year), can be accepted as fulfilling the capstone experience.

| | | |
|-------------------------------------|--|-----|
| ANAT&PHY 435 | Fundamentals of Human Physiology | 5 |
| BIOCORE 486 | Principles of Physiology Laboratory 2 | 2 |
| BOTANY 455 | The Vegetation of Wisconsin | 4 |
| BOTANY/ F&W ECOL/ ZOOLOGY 460 | General Ecology | 4 |
| ENVIR ST/ ZOOLOGY 511 | Ecology of Fishes Lab | 2 |
| F&W ECOL 599 | Wildlife Research Capstone (limited access) | 3 |
| GENETICS 527 | Developmental Genetics for Conservation and Regeneration | 3 |
| PL PATH 315 | Plant Microbiomes | 4 |
| ZOOLOGY 316 | Laboratory for Limnology- Conservation of Aquatic Resources | 2-3 |
| ZOOLOGY 555 | Laboratory in Developmental Biology | 3 |
| ZOOLOGY 612 | Comparative Physiology Laboratory | 2 |

FOOTNOTES

¹ Course also approved for lab credit.

² To count BIOCORE 486 Principles of Physiology Laboratory for capstone, students must also complete BIOCORE 382 Evolution, Ecology, and Genetics Laboratory and BIOCORE 384 Cellular Biology Laboratory.