

# BIOLOGY: EVOLUTIONARY BIOLOGY

## REQUIREMENTS

### REQUIREMENTS FOR THE NAMED OPTION

Students must complete a minimum of 31 credits of Biological Science courses within the Introductory Biology, Foundation Course, Upper-Level Breadth in the Major, Additional Lab or Field Research, 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:		5-10
MATH 221	Calculus and Analytic Geometry I	
MATH 171 & MATH 217	Calculus with Algebra and Trigonometry I and Calculus with Algebra and Trigonometry II	
Complete one of the following:		3-4
STAT 240	Data Science Modeling I	
STAT 301	Introduction to Statistical Methods	
STAT 371	Introductory Applied Statistics for the Life Sciences	

**Total Credits** 8-14

##### 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
- 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 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
AGRONOMY/ HORT 338	Plant Breeding and Biotechnology	3
AGRONOMY/ BOTANY/HORT 339	Plant Biotechnology: Principles and Techniques I <sup>1</sup>	4
AGRONOMY/ BOTANY/HORT 340	Plant Cell Culture and Genetic Engineering	3
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 550	Principles of Human Disease and Biotechnology	2
BIOCHEM 570	Computational Modeling of Biological Systems	3
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
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 650	Molecular and Cellular Organogenesis	3
CRB/B M E 670	Biology of Heart Disease and Regeneration	3
DERM 601	Skin Biology and Skin Diseases	3
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
MICROBIO 607	Advanced Microbial Genetics	3
MICROBIO 470	Microbial Genetics & Molecular Machines	3
MICROBIO/ SOIL SCI 523	Soil Microbiology and Biochemistry	3
M M & I 341	Immunology	3
M M & I/PATH- BIO 528	Immunology	3
NEURODPT/ ZOOLOGY 616	Lab Course in Neurobiology and Behavior <sup>1</sup>	4
NTP/ NEURODPT 610	Cellular and Molecular Neuroscience	4
NTP/ NEURODPT 629	Molecular and Cellular Mechanisms of Memory	3
NTP 675	Special Topics (Stem Cell in Neurobiology)	1-3
NTP 675	Special Topics (Reproductive Neuroendocrinology)	1-3
NTP 675	Special Topics (Molecular Mechanisms of Brain Damage)	1-3
ONCOLOGY/ PL PATH 640	General Virology-Multiplication of Viruses	3
PHM SCI 558	Laboratory Techniques in Pharmacology and Toxicology <sup>1</sup>	2
ZOOLOGY 470	Introduction to Animal Development	3
ZOOLOGY/ PSYCH 523	Neurobiology	3
ZOOLOGY 555	Laboratory in Developmental Biology <sup>1</sup>	3
ZOOLOGY 570	Cell Biology	3
ZOOLOGY 604	Computer-based Gene and Disease/Disorder Research Lab <sup>1</sup>	2
ZOOLOGY 625	Development of the Nervous System	2
ZOOLOGY 655	Modeling Neurodevelopmental Disease	3

**B. Organismal Biology**

Code	Title	Credits
AN SCI/DY SCI 373	Animal Physiology	3
AN SCI/DY SCI 434	Reproductive Physiology <sup>1</sup>	3
AN SCI/F&W ECOL/ ZOOLOGY 520	Ornithology	3
AN SCI/F&W ECOL/ ZOOLOGY 521	Birds of Southern Wisconsin <sup>1</sup>	3
ANAT&PHY 335	Physiology <sup>1</sup>	5
ANAT&PHY 337	Human Anatomy	3
ANAT&PHY 338	Human Anatomy Laboratory	2
ANAT&PHY 435	Fundamentals of Human Physiology <sup>1</sup>	5
ANTHRO/ NTP/PSYCH/ ZOOLOGY 619	Biology of Mind	3
BIOCORE 486	Principles of Physiology Laboratory <sup>1</sup>	2
BOTANY 300	Plant Anatomy <sup>1</sup>	4

BOTANY 330	Algae <sup>1</sup>	3
BOTANY/ PL PATH 332	Fungi <sup>1</sup>	4
BOTANY/ PL PATH 333	Biology of the Fungi	2
BOTANY/ F&W ECOL 402	Dendrology: Woody Plant Identification and Ecology <sup>1</sup>	3
BOTANY 500	Plant Physiology <sup>1</sup>	3-4
CS&D 503	Neural Mechanisms of Speech, Hearing and Language	3
DY SCI 378	Lactation Physiology <sup>1</sup>	3
ENTOM/ ZOOLOGY 302	Introduction to Entomology <sup>1</sup>	4
ENTOM 321	Physiology of Insects	3
ENTOM 331	Taxonomy of Mature Insects <sup>1</sup>	4
F&W ECOL 401	Physiological Animal Ecology	3
GENETICS 545	Genetics Laboratory <sup>1</sup>	2
GENETICS/ MD GENET 565	Human Genetics	3
GEOSCI/ ZOOLOGY 542	Invertebrate Paleontology	3
KINES 314	Physiology of Exercise <sup>1</sup>	4
MICROBIO 303	Biology of Microorganisms	3
MICROBIO 304	Biology of Microorganisms Laboratory <sup>1</sup>	2
MICROBIO 330	Host-Parasite Interactions	3
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
NTP/ZOOLOGY 620	Neuroethology Seminar	2
NTP 675	Special Topics (Functional Brain Imaging of Cognitive Disorders)	1-3
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
PL PATH 558	Biology of Plant Pathogens <sup>1</sup>	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
PSYCH 606	Hormones and Behavior	3
ZOOLOGY 303	Aquatic Invertebrate Biology	3
ZOOLOGY 430	Comparative Anatomy of Vertebrates <sup>1</sup>	5
ZOOLOGY 603	Endocrinology	3-4
ZOOLOGY 611	Comparative and Evolutionary Physiology	3

ZOOLOGY 612	Comparative Physiology Laboratory <sup>1</sup>	2
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### C. Ecology

Code	Title	Credits
AGRONOMY/ BOTANY/ SOIL SCI 370	Grassland Ecology	3
AGRONOMY/ ENTOM/F&W ECOL/ M&ENVTOX 632	Ecotoxicology: The Chemical Players	1
AGRONOMY/ ENTOM/F&W ECOL/ M&ENVTOX 633	Ecotoxicology: Impacts on Individuals	1
AGRONOMY/ ENTOM/F&W ECOL/ M&ENVTOX 634	Ecotoxicology: Impacts on Populations, Communities and Ecosystems	1
BOTANY/ ZOOLOGY 450	Midwestern Ecological Issues: A Case Study Approach	2
BOTANY/ F&W ECOL 455	The Vegetation of Wisconsin <sup>1</sup>	4
BOTANY/ F&W ECOL/ ZOOLOGY 460	General Ecology <sup>1</sup>	4
BOTANY/ENTOM/ ZOOLOGY 473	Plant-Insect Interactions	3
BOTANY/ENVIR ST/ F&W ECOL/ ZOOLOGY 651	Conservation Biology	3
ENTOM 450	Basic and Applied Insect Ecology	3
ENTOM 451	Basic and Applied Insect Ecology Laboratory	1
ENVIR ST/ ZOOLOGY 315	Limnology-Conservation of Aquatic Resources	2
ENVIR ST/ LAND ARC 361	Wetlands Ecology	3
F&W ECOL 379	Principles of Wildlife Management	3
F&W ECOL 550	Forest Ecology	3
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 <sup>1</sup>	4
PL PATH 315	Plant Microbiomes <sup>1</sup>	4
ZOOLOGY 304	Marine Biology	2
ZOOLOGY 316	Laboratory for Limnology- Conservation of Aquatic Resources <sup>1</sup>	2-3
ZOOLOGY 320	Field Marine Biology <sup>1</sup>	3
ZOOLOGY 504	Modeling Animal Landscapes	3-5
ZOOLOGY/ ENVIR ST 510	Ecology of Fishes	3

ZOOLOGY/  
ENVIR ST 511 Ecology of Fishes Lab<sup>1</sup> 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
ANTHRO 458	Primate Behavioral Ecology	3
ANTHRO 603	Seminar in Evolutionary Theory	3
BOTANY 305	Plant Morphology and Evolution <sup>1</sup>	4
BOTANY 400	Plant Systematics <sup>1</sup>	4
BOTANY 401	Vascular Flora of Wisconsin <sup>1</sup>	4
BOTANY 422	Plant Geography	3
BOTANY/ PL PATH 563	Phylogenetic Analysis of Molecular Data	3
ENTOM 432	Taxonomy and Bionomics of Immature Insects <sup>1</sup>	4
ENTOM/GENETICS/ ZOOLOGY 624	Molecular Ecology	3
ENVIR ST/ F&W ECOL/ ZOOLOGY 360	Extinction of Species	3
GENETICS 468	General Genetics 2	3
GEOSCI/ ZOOLOGY 541	Paleobiology	3
MICROBIO 450	Diversity, Ecology and Evolution of Microorganisms	3
PSYCH 449	Animal Behavior	3-4
PSYCH 450	Primate Psychology: Insights into Human Behavior	3
ZOOLOGY 300	Invertebrate Biology and Evolution	3
ZOOLOGY 301	Invertebrate Biology and Evolution Lab <sup>1</sup>	2
ZOOLOGY 415	Genetics of Human History	3
ZOOLOGY 425	Behavioral Ecology	3

#### E. Applied Biology, Agriculture and Natural Resources

Code	Title	Credits
A A E/AGRONOMY/ NUTR SCI 350	World Hunger and Malnutrition	3
AGRONOMY 300	Cropping Systems	3
AGRONOMY 302	Forage Management and Utilization	3
AGRONOMY/ HORT 360	Genetically Modified Crops: Science, Regulation & Controversy	2
AGRONOMY 377	Global Food Production and Health	3
AGRONOMY/ DY SCI 471	Food Production Systems and Sustainability	3
AGRONOMY/ HORT 501	Principles of Plant Breeding	3
AGRONOMY/ ATM OCN/ SOIL SCI 532	Environmental Biophysics	3

AMER IND/  
ANTHRO/  
BOTANY 474 Ethnobotany 3-4

AN SCI/DY SCI/ NUTR SCI 311	Comparative Animal Nutrition	3
AN SCI/DY SCI 320	Animal Health and Disease	3
AN SCI/DY SCI 361	Introduction to Animal and Veterinary Genetics	2
AN SCI/DY SCI 363	Principles of Animal Breeding	2
AN SCI 503	Avian Physiology <sup>1</sup>	3
AN SCI 512	Management for Avian Health <sup>1</sup>	3
BIOCORE 587	Biological Interactions	3
BOTANY 403	Field Collections and Identification	1-4
ENTOM 351	Principles of Economic Entomology	3
ENTOM/ ZOOLOGY 371	Medical Entomology <sup>1</sup>	3
ENTOM/ F&W ECOL 500	Insects in Forest Ecosystem Function and Management	2
ENVIR ST/ POP HLTH 471	Introduction to Environmental Health	3
ENVIR ST/ POP HLTH 502	Air Pollution and Human Health	3
F&W ECOL 306	Terrestrial Vertebrates: Life History and Ecology <sup>1</sup>	4
F&W ECOL/ HORT/LAND ARC/ PL PATH 309	Diseases of Trees and Shrubs	3
F&W ECOL/ ZOOLOGY 335	Human/Animal Relationships: Biological and Philosophical Issues	3
F&W ECOL 410	Principles of Silviculture	3
F&W ECOL 415	Tree Physiology	3
F&W ECOL/ SURG SCI 548	Diseases of Wildlife	3
F&W ECOL 561	Wildlife Management Techniques <sup>1</sup>	3
FOOD SCI/ MICROBIO 324	Food Microbiology Laboratory <sup>1</sup>	2
FOOD SCI/ MICROBIO 325	Food Microbiology	3
FOOD SCI 532	Integrated Food Manufacturing <sup>1</sup>	4
GENETICS 548	The Genomic Revolution	3
GENETICS/ HORT 550	Molecular Approaches for Potential Crop Improvement	3
HORT/ LAND ARC 263	Landscape Plants I <sup>1</sup>	3
HORT 370	World Vegetable Crops	3
HORT 372	Seminar in Organic Agriculture	1
HORT/ AGRONOMY 376	Tropical Horticultural Systems	2
HORT 378	Tropical Horticultural Systems International Field Study	2
M M & I 554	Emerging Infectious Diseases and Bioterrorism	2
MED PHYS/ PHYSICS 265	Introduction to Medical Physics	2
MED PHYS/NTP 651	Methods for Neuroimaging Research	3

MICROBIO/ SOIL SCI 425	Environmental Microbiology	3
NUTR SCI 332	Human Nutritional Needs	3
PHM SCI/ M&ENVTOX/ ONCOLOGY/ PHMCOL-M/ POP HLTH 625	Toxicology I	3
PL PATH/ SOIL SCI 323	Soil Biology	3
PL PATH 517	Plant Disease Resistance	2-3
SOIL SCI 321	Soils and Environmental Chemistry	3

## ADDITIONAL LAB OR FIELD RESEARCH

In addition to the Lab requirement, complete one of the following requirements:

- Complete one *additional* lab course from categories A-E in the Upper-Level Breadth in the Major course lists, **or**
- Complete at least 2 credits of directed study in a biological science discipline, or
- Complete a two-semester thesis in biological science.

## Approved Directed Study Courses

To have Directed Study count for the Additional Lab/Field Research requirement students must first complete an Introductory Biology sequence.

Code	Title	Credits
AGRONOMY 699	Special Problems	
ANATOMY 699	Independent Study	
ANESTHES 699	Independent Study	
AN SCI 699	Special Problems	
BIOCHEM 699	Special Problems	
BIOLOGY 699	Directed Studies	
BOTANY 699	Directed Study	
BMOLCHEM 699	Special Research Problems	
COMP BIO 699	Directed Study	
CRB 699	Independent Study	
DY SCI 699	Special Problems	
ENTOM 699	Special Problems	
FAM MED 699	Directed Study	
FOOD SCI 699	Special Problems	
F&W ECOL 699	Special Problems	
GENETICS 699	Special Problems	
HORT 699	Special Problems	
M&ENVTOX 699	Special Problems	
MEDICINE 699	Independent Study	
MED SC-V 699	Directed Study	
MICROBIO 699	Special Problems	
M M & I 699	Directed Study	
MOL BIOL 699	Directed Studies in Molecular Biology	
NEURODPT 699	Directed Study	
NEUROL 699	Directed Research in Neurology	

NEURSURG 699	Neurosurgery: Directed in Study in Research
NURSING 699	Directed Study in Nursing
NUTR SCI 699	Special Problems
OBS&GYN 699	Directed Study
ONCOLOGY 699	Special Research Problems
OPHTHALM 699	Directed Study
PATH 699	Independent Study
PATH-BIO 699	Directed Study
PEDIAT 699	Independent Study
PHM SCI 699	Advanced Independent Study
PHMCOL-M 699	Independent Study
PHYSIOL 699	Independent Work
PL PATH 699	Special Problems
RHAB MED 699	Independent Study
SOIL SCI 699	Special Problems
SURG SCI 699	Directed Study
SURGERY 699	Independent Study

## Approved Thesis Sequences

**Code** **Title** **Credits**

*Approved Thesis sequences:*

AGRONOMY 681 & AGRONOMY 682	Senior Honors Thesis and Senior Honors Thesis
AN SCI 681 & AN SCI 682	Senior Honor Thesis and Senior Honors Thesis
AN SCI 691 & AN SCI 692	Thesis and Thesis
BIOCHEM 681 & BIOCHEM 682	Senior Honors Thesis and Senior Honors Thesis
BIOCHEM 691 & BIOCHEM 692	Senior Thesis and Senior Thesis
BIOLOGY 681 & BIOLOGY 682	Senior Honors Thesis and Senior Honors Thesis
BIOLOGY 691 & BIOLOGY 692	Senior Thesis and Senior Thesis
BOTANY 681 & BOTANY 682	Senior Honors Thesis and Senior Honors Thesis
BOTANY 691 & BOTANY 692	Senior Thesis and Senior Thesis
DY SCI 681 & DY SCI 682	Senior Honors Thesis and Senior Honors Thesis
ENTOM 681 & ENTOM 682	Senior Honors Thesis and Senior Honors Thesis
FOOD SCI 681 & FOOD SCI 682	Senior Honors Thesis and Senior Honors Thesis
F&W ECOL 681 & F&W ECOL 682	Senior Honors Thesis and Senior Honors Thesis
F&W ECOL 691 & F&W ECOL 692	Senior Thesis and Senior Thesis
GENETICS 681 & GENETICS 682	Senior Honors Thesis and Senior Honors Thesis
H ONCOL 681 & H ONCOL 682	Senior Honors Thesis in Human Oncology 1 and Senior Honors Thesis in Human Oncology 2

H ONCOL 691 & H ONCOL 692	Senior Thesis in Human Oncology 1 and Senior Thesis in Human Oncology 2
HORT 681 & HORT 682	Senior Honors Thesis and Senior Honors Thesis
M M & I 691 & M M & I 692	First Semester Senior Thesis and Second Semester Senior Thesis
MICROBIO 681 & MICROBIO 682	Senior Honors Thesis and Senior Honors Thesis
MICROBIO 691 & MICROBIO 692	Senior Thesis and Senior Thesis
MOL BIOL 681 & MOL BIOL 682	Senior Honors Thesis and Senior Honors Thesis
MOL BIOL 691 & MOL BIOL 692	Senior Thesis and Senior Thesis
NUTR SCI 681 & NUTR SCI 682	Senior Honors Thesis and Senior Honors Thesis
NUTR SCI 691 & NUTR SCI 692	Senior Thesis-Nutrition and Senior Thesis
PATH-BIO 681 & PATH-BIO 682	Senior Honors Thesis I and Senior Honors Thesis II
PL PATH 681 & PL PATH 682	Senior Honors Thesis and Senior Honors Thesis
SOIL SCI 681 & SOIL SCI 682	Senior Honors Thesis and Senior Honors Thesis
ZOOLOGY 681 & ZOOLOGY 682	Senior Honors Thesis and Senior Honors Thesis
ZOOLOGY 691 & ZOOLOGY 692	Senior Thesis and Senior Thesis

## EVOLUTIONARY BIOLOGY SEMINAR

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

## RESIDENCE AND QUALITY OF WORK

- 2.000 GPA in all BIOLOGY and major courses
- 2.000 GPA on at least 15 credits of Upper-Level work in the major, in Residence<sup>2</sup>
- 15 credits in the major, taken on the UW–Madison campus

## FOOTNOTES

1

Course also approved for lab credit

2

Foundation and Upper-Level Breadth in the Major courses are considered Upper-Level for purposes of this requirement.