

- 401. Feminist Theory**
Spring. 4(4-0)
P: WS 201, WS 202. R: Not open to freshmen and sophomores.
Integrative and multidisciplinary approaches to theory in women's studies. Conceptualization of sex and gender and the subordination of women. Feminist critique of theories of knowledge. Comparison of evolving feminist theories.
QP: 9 WS CRS QA: WS 402
- 403. Women and Change in Developing Countries**
Spring. 3(3-0)
P: WS 201; WS 202 or WS 203. R: Not open to freshmen and sophomores.
Effects of economic, political, and social change on women in developing countries. Interrelationships of gender, class, race, and nationality.
QP: WS 201 QA: WS 401, SOC 490, ANP 490
- 404. Women and the Law in the United States**
Spring. 3(3-0)
P: WS 201; WS 202 or WS 203. R: Not open to freshmen and sophomores.
Law in the United States as a vehicle for structuring and maintaining women's social roles, and for social change.
QP: WS 201 QA: W S 300
- 405. Feminist Analyses of Education in the United States**
Fall. 3(3-0) Interdepartmental with Teacher Education.
P: WS 201; WS 202 or WS 203. R: Not open to freshmen and sophomores.
Feminist perspectives on the role of gender in structuring educational experiences in elementary and secondary school.
QP: WS 201 QA: W S 401
- 490. Independent Study**
Fall, Spring. 1 to 4 credits. A student may earn a maximum of 8 credits in all enrollments for this course.
P: WS 201; WS 202 or WS 203. R: Open only to juniors and seniors; approval of program.
Individual reading and research on women and gender.
QA: WS 409
- 491. Special Topics**
Spring. 3 to 4 credits. A student may earn a maximum of 8 credits in all enrollments for this course.
P: WS 201; WS 202 or 203. R: Not open to freshmen and sophomores.
In-depth study of special topic emphasizing women and gender.
QP: WS 201 QA: WS 300
- 492. Women's Studies Senior Seminar**
Spring. 4(4-0)
P: WS 201, WS 203; WS 301 or WS 302. R: Not open to freshmen and sophomores.
Synthesis and elaboration of ideas and perspectives central to Women's studies. Current areas of interest and research in feminist scholarship.
QP: WS 201 QA: WS 401
- 493. Internship**
Fall, Spring, Summer. 2 to 4 credits. A student may earn a maximum of 4 credits in all enrollments for this course.
P: WS 201; WS 202 or WS 203. R: Not open to freshmen and sophomores.
Integration of feminist knowledge through work experience related to women's concerns. Experience in legislative, community, or educational settings.
QA: WS 305
- 890. Individual Reading**
Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 12 credits in all enrollments for this course.
R: Approval of program.
Faculty supervised graduate level reading in special topics.
QA: WS 890

ZOOLOGY ZOL

Department of Zoology College of Natural Science

- 141. Introductory Human Genetics**
Spring. 3(3-0)
R: Not open to students in Biochemistry, Botany, Entomology, Medical Technology, Clinical Laboratory Sciences, Physiology, Zoology, Microbiology or Interdepartmental Biological Science or to students in the corresponding Lyman Briggs School coordinate in Inheritance of human traits. Impact of genetic technology on society. Ethical and legal issues. Risks and benefits of genetic technology.
- 213. Animal Behavior**
Spring. 3(3-0)
P: BS 110, BS 111 or LBS 144, LBS 145. R: Not open to freshmen.
Mechanisms and evolution of behavior (ethology).
QP: BS 210, BS 211, BS 212 or LBS 140, LBS 141, LBS 242 QA: ZOL 313
- 220. Developmental Biology**
Fall. 4(3-3)
P: BS 110, BS 111 or LBS 144, LBS 145.
Principles of development, emphasizing vertebrates. Illustrations from morphological and experimental investigations.
QP: BS 211 or LBS 141 QA: ZOL 317, ZOL 318
- 221. Cells and Development**
Spring. 4(3-3)
P: BS 110, BS 111 or LBS 144, LBS 145.
The role of cells in growth, differentiation and development of animals from protozoa to mammals.
QP: BS 210, BS 211, BS 212 or LBS 140, LBS 141 QA: ZOL 409, ZOL 482
- 228. Comparative Anatomy and Biology of Vertebrates**
Spring. 4(3-3)
P: BS 110 or LBS 144.
Comparative morphology and natural history of vertebrates. Dissection of representatives of most vertebrate classes.
QP: BS 212 or LBS 140 QA: ZOL 428, ZOL 307
- 250. Ecology**
Fall. 4(3-3) Summer: 4 credits. Given at W.K. Kellogg Biological Station. Interdepartmental with Botany and Plant Pathology.
P: BS 110 or LBS 144.
Plant and animal ecology. Interrelationships of plants and animals with the environment. Principles of population, community, and ecosystem ecology. Application of ecological principles to global sustainability.
QP: BS 212 or LBS 141 QA: ZOL 389, BOT 450
- 306. Invertebrate Biology**
Spring. 4(3-3)
P: BS 110.
Systematics, morphology, and natural history of invertebrate animals. Identification of live and preserved specimens. Recognition of selected groups.
QP: BS 212 QA: ZOL 306
- 316. General Parasitology**
Spring. 2(2-0)
P: BS 110, BS 111 or LBS 145.
Identification, life history, host-parasite relationships, and epidemiology of protozoan, helminth, acanthocephalan, copepod, and arthropod parasites of animals and humans.
QP: BS 210, BS 211, BS 212, EQV-LBS QA: MPH 437, MPH 416
- 316L. General Parasitology Laboratory**
Spring. 1(0-2)
P: BS 110, BS 111 or LBS 145. C: ZOL 316
Laboratory diagnosis of protozoans, helminths, acanthocephalans, copepods, and arthropods that infect humans and animals. Animal necropsy.
QP: BS 210, BS 211, BS 212, EQV-LBS QA: MPH 437, MPH 418

- 341. Fundamental Genetics**
Fall, Spring, Summer. 4(4-0) Interdepartmental with Botany and Plant Pathology.
P: BS 110 or LBS 144.
Principles of heredity in animals, plants and microorganisms. Formal and molecular methods in the study of gene structure, transmission, expression and evolution.
QP: BS 210, BS 211 QA: ZOL 441, ZOL 442
- 342. Advanced Genetics**
Spring. 3(3-0)
P: ZOL 341.
Advanced topics in classical and molecular genetics including various forms of genetic mapping.
QP: ZOL 441, ZOL 317 QA: ZOL 442, ZOL 443
- 343. Genetics Laboratory**
Spring. 2(0-4)
P: ZOL 341 or concurrently.
Experiments involving genetics of Drosophila and other eucaryotic organisms.
QP: ZOL 441
- 344. Human Genetics**
Spring. 3(3-0)
P: ZOL 341. R: Not open to freshmen.
Inheritance of human traits. Medical, physiological and forensic applications. Biochemical and molecular genetics of human disease. Chromosomal disorders and their consequences. Prenatal and pre-symptomatic diagnosis. Legal and ethnical considerations.
QA: ZOL 341
- 345. Evolution**
Fall. 3(3-0) Interdepartmental with Botany and Plant Pathology.
P: ZOL 341. R: Not open to freshmen.
Processes of evolutionary change in animals, plants, Microbes. Population genetics, microevolution, speciation, adaptive radiation, macroevolution. Origin of Homo sapiens.
QP: BS 212 QA: ZOL 445
- 350. Histology**
Fall. 4(3-3)
P: BS 111 or LBS 145.
The structure of cells and their interactions to form tissues.
QP: BS 210 or LBS 141 QA: ZOL 450
- 353. Marine Biology**
Fall of even-numbered years. 4(4-0)
P: BS 110; BOT 250 or ZOL 250 or ZOL 306.
Analysis of marine and estuarine systems. Integration of biology, chemistry, and physics. Life histories of marine organisms. Biology of special marine habitats. Physiological problems of marine life.
QP: BS 212 QA: ZOL 453
- 360. Biology of Birds and Mammals**
Spring. 4(3-3) Summer: 4 credits. Given at W.K. Kellogg Biological Station.
P: BS 110 or LBS 144.
The behavior, ecology, evolution and systematics of birds and mammals with emphasis of biodiversity. Laboratories emphasize diversity of form and function, life history patterns and identification.
QP: BS 212 or LBS 140 QA: ZOL 461, ZOL 486
- 384. Biology of Amphibians and Reptiles**
Fall of odd-numbered years. 3(2-3) Summer of even-numbered years: 3 credits. Given at W.K. Kellogg Biological Station.
P: ZOL 228.
Biology of amphibians and reptiles. Laboratory emphasis on diversity and on Michigan species. Field trips required.
QP: ZOL 307, ZOL 428 QA: ZOL 484
- 400H. Honors Work**
Fall, Spring. 1 to 5 credits. A student may earn a maximum of 5 credits in all enrollments for this course.
R: Not open to freshmen and sophomores. Approval of department.
Honors work on a topic in zoology.
QA: ZOL 400H

**Descriptions—Zoology
of
Courses**

402. Neurobiology
Fall. 3(3-0)

P: BS 110, BS 111 or LBS 144, LBS 145. R: Not open to freshmen and sophomores.
Structure and function of nerve cells and nervous systems.
QP: BS 210, BS 211, BS 212 or LBS 140, LBS 141, LBS 242 QA: ZOL 402

412. Invertebrate Ecology

Summer of odd-numbered years: 4 credits.
Given only at W.K. Kellogg Biological Station.
P: BS 110.
Ecology and systematics of selected invertebrate phyla with emphasis on the local fauna. Extensive field and laboratory work with living animals.
QP: BS 212 QA: ZOL 412

415. Ecological Aspects of Animal Behavior

Fall. 3(3-0)
P: ZOL 213. R: Not open to freshmen.
Advanced topics in the ecology and evolution of animal behavior.
QP: ZOL 313 QA: ZOL 415

417H. Advanced Developmental Biology

Spring. 3(3-0)
P: ZOL 220 or ZOL 221. R: Not open to freshmen and sophomores.
Multidisciplinary approaches to major current concepts. Historic perspectives, analyses from molecular to organismal level, and practical applications.
QP: ZOL 317, ZOL 318 QA: ZOL 417, ZOL 456

421. Hormones and Development

Spring. 3(3-0) Interdepartmental with Physiology.
P: ZOL 220.
Hormonal regulation of development, growth and cancer. Hormonal decline in aging.
QP: ZOL 317 QA: ZOL 421

431. Comparative Limnology

Summer: 4 credits. Given only at W.K. Kellogg Biological Station. Interdepartmental with Botany and Plant Pathology, and Fisheries and Wildlife.
P: CEM 141 or CEM 151; ZOL 250. R: Not open to students with credit in FW 472.
Physical, chemical, and biological aspects of lakes and streams. Introduction to freshwater biology, and population and community ecology.
QP: CEM 141 or CEM 151, ZOL 389 or BOT 450 QA: ZOL 431, ZOL 432

446. Environmental Issues and Public Policy

Spring. 3(3-0) Interdepartmental with Resource Development.
R: Not open to freshmen and sophomores.
The interrelationship of science and public policy in resolving environmental issues. Technical, social, economic, and legal influences. Case study approach.
QA: ZOL 301, RD 439

450. Cancer Biology

Spring. 3(3-0) Interdepartmental with Medicine.
P: BCH 200 or BCH 401; ZOL 221.
Cancer biology: cellular and molecular aspects. Applications of modern biotechnology to cancer research. Causes, treatment and prevention of cancer. World distribution and risk factors of cancer.
QP: ZOL 221, BCH 200 or BCH 401

453. Field Studies in Marine and Estuarine Biology

Summer. 2 to 3 credits. A student may earn a maximum of 5 credits in all enrollments for this course.
R: Approval of instructor.
Marine and estuarine communities emphasizing ecology, life histories, behavior, and resource ecology of the organisms present. Field trip to seacoast.
QA: ZOL 454

457. Foundations of Evolutionary Biology

Spring. 3(3-0)
P: BS 110.
Reading and discussion of original works in evolutionary biology which have shaped modern evolutionary thought.
QP: BS 212 QA: ZOL 457, ZOL 456

482. Cytochemistry

Spring. 4(3-3)
P: ZOL 350.
Principles of microscopy, microtomy. Cells and organelles. Localization of lipids, carbohydrates, proteins, nucleic acids and enzymes using cytochemical, immunological and autoradiographic methods.
QP: BS 212 QA: ZOL 450

483. Environmental Physiology

Spring. 4(4-0) Interdepartmental with Physiology.
P: ZOL 228 or ZOL 250.
Aspects of physiology important to the environmental relations of vertebrates and invertebrates: energetics, thermal relations, osmotic-ionic relations, and exercise physiology.
QP: BS 212 or LBS 140 QA: ZOL 483

485. Tropical Biology

Spring. 3(3-0) Interdepartmental with Botany and Plant Pathology, and Entomology.
P: ZOL 250. R: Open only to juniors and seniors.
Tropical biota emphasizing evolutionary and ecological principles compared across tropical ecosystems.
QP: ZOL 389, BOT 450

485L. Field Tropical Biology

Spring, Summer. 2 credits. Interdepartmental with Botany and Plant Pathology, and Entomology.
P: ZOL 485 or concurrently. R: Open only to juniors and seniors. Approval of department.
Intensive field experience to study tropical ecosystems. Individual project required. Given at various sites in Costa Rica by the Organization for Tropical Studies.

494. Capstone: Independent Study

Fall. 1 to 6 credits. A student may earn a maximum of 8 credits in all enrollments for this course.
R: Approval of department.
Supervised research on a topic not normally covered in the classroom.
QA: ZOL 391

495. Capstone: Undergraduate Seminar

Fall, Spring. 1(1-0) A student may earn a maximum of 3 credits in all enrollments for this course.
R: Open only to senior Zoology majors.
Economic, social and environmental impact of current developments in Zoology.
QA: ZOL 495

496. Capstone: Internship in Zoology

Fall, Spring, Summer. 1 to 6 credits.
Given at various off-campus sites. A student may earn a maximum of 8 credits in all enrollments for this course.
R: Open only to seniors. Approval of department.
Practical experience applying Zoology training in a setting outside the University.

499. Capstone: Undergraduate Thesis

Fall, Spring, Summer. 1 to 6 credits. A student may earn a maximum of 8 credits in all enrollments for this course.
R: Open only to seniors. Approval of department.
Laboratory research culminating in the preparation and defense of an undergraduate thesis.
QA: ZOL 499

817. Ecological and Evolutionary Mechanisms-Aquatics

Summer: 4 credits. Given only at W.K. Kellogg Biological Station. Interdepartmental with Botany and Plant Pathology, and Fisheries and Wildlife.
P: ZOL 250 or ZOL 431. Experimental field studies of population and community ecology of freshwater lakes and streams. Emphasis on interactions among species and between biotic and abiotic factors.
QP: ZOL 389, ZOL 432 QA: ZOL 817, ZOL 871

822. Topics in Ethology and Behavioral Ecology

Spring of even-numbered years. 3(3-0) A student may earn a maximum of 6 credits in all enrollments for this course.
P: ZOL 415. R: Open only to graduate students.
Critical analysis through seminar-discussions of the primary research literature.
QP: ZOL 313 QA: ZOL 822

827. Advanced Neurobiology

Fall. 4(4-0) Interdepartmental with Physiology, and Pharmacology and Toxicology.
R: Approval of department.
Nervous system function at the cellular level: membrane biophysics and potentials, synaptic transmission.
QA: ZOL 827

830. Neuroendocrine Aspects of Behavior

Spring of odd-numbered years. 3(3-0)
P: ZOL 402.
Neural mechanisms by which hormones influence the reproductive, parental, and aggressive behavior of vertebrates. Plasticity.
QP: ZOL 313

841. Chromosome Structure and Genetics

Spring of odd-numbered years. 3(3-0)
Interdepartmental with Genetics.
R: Approval of department.
Classical and molecular genetics of chromosome structure and behavior in mitosis and meiosis. Synapsis and disjunction, exchange, centromeres, euchromatin, heterochromatin and transposable elements.
QP: ZOL 441 QA: ZOL 842, GEN 842

843. Selected Topics in Human Genetics

Fall. 3(3-0)
P: ZOL 344. R: Open only to seniors and graduate students.
Inheritance of human traits including medical, physiologic, forensic, biochemical, molecular and chromosomal areas.
QP: ZOL 441, ZOL 341 QA: ZOL 844

845. Ecology and Evolution: the Interface

Fall. 3(3-0) Interdepartmental with Botany and Plant Pathology, and Entomology.
Conceptual and methodological issues common to both ecology and evolutionary biology.
QA: ZOL 845

851. Quantitative Methods in Ecology and Evolution

Fall. 3(3-0) Interdepartmental with Botany and Plant Pathology.
P: STT 465.
Interpretation and analysis of ecological and evolutionary biology data. Statistical computer software.
QP: STT 423 QA: BOT 851

881. Soil Zoology

Spring of odd-numbered years. 4(2-6)
P: ENT 404 or ZOL 306. R: Open only to seniors and graduate students in College of Natural Science or College of Agriculture and Natural Resources.
Soil fauna and their ecology, biology, and systematics.
QP: ZOL 306 QA: ZOL 881

888. Molecular and Cellular Aspects of Development

Spring. 4(4-0)
R: Approval of department.
Current research topics in developmental biology. Cell interactions. Molecular regulation of cellular function in fertilization, morphogenesis, differentiation, oncogenesis, terato-genesis and regeneration.

890. Special Problems

Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 10 credits in all enrollments for this course.
R: Approval of department.
Current problems in Zoology.
QA: ZOL 890

891. Current Topics in Ecology and Evolution

Summer. 1 credit. Given only at W.K. Kellogg Biological Station. A student may earn a maximum of 8 credits in all enrollments for this course. Interdepartmental with Botany and Plant Pathology, and Crop and Soil Sciences. Presentation and critical evaluation of theoretical and empirical developments by visiting scientists.
QA: ZOL 891

892. Biodiversity

Spring. 2(2-0) A student may earn a maximum of 4 credits in all enrollments for this course. Interdepartmental with Fisheries and Wildlife.
P: ZOL 250.
Status of world biota and factors in the decline and extinction of major groups of plants and animals. Theory and design of natural reserves. Assessment and ecological meaning of diversity. Management for global and local diversity.
QP: ZOL 250

895. Seminar

Fall, Spring. 1(1-0) A student may earn a maximum of 6 credits in all enrollments for this course.
Graduate seminar on current research topics in Zoology.
QA: ZOL 895

896. Population and Community Ecology

Fall. 4(4-0)
Population dynamics of animals and plants utilizing life tables and projection matrices. Species interactions. Life history theory. Structure and dynamics of communities. Succession.
QA: ZOL 892

897. Community and Ecosystem Ecology

Spring. 4(4-0) Interdepartmental with Botany and Plant Pathology, and Fisheries and Wildlife.
R: Open only to students in Interdepartmental Graduate Specializations in Ecology and Evolutionary Biology.
Structure and function of natural communities and ecosystems. Community analysis along environmental gradients. Succession, food web analysis, energy flow, nutrient cycling, and effects of human activities on ecosystems.
QP: ZOL 389, BOT 450 QA: ZOL 897

899. Master's Thesis Research

Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 24 credits in all enrollments for this course.

999. Doctoral Dissertation Research

Fall, Spring, Summer. 1 to 24 credits. A student may earn a maximum of 99 credits in all enrollments for this course.