BEE

Ecology and Evolution

BEE 500: Directed Readings in Population Biology

Directed readings in topics of current interest, under supervision of a faculty sponsor, culminating in one or more critical review papers.

Prerequisites: Sponsor and approval of master's program executive committee
Fall and Spring, 1-3 credits, S/U grading
May be repeated for credit.

BEE 501: Directed Readings in the Biology of Organisms

Directed readings in topics of current interest, under supervision of a faculty sponsor, culminating in one or more critical review papers.

Prerequisite: Sponsor and approval of master's program executive committee
Fall and Spring, 1-3 credits, S/U grading
May be repeated for credit.

BEE 510: Biology Education Research: Teaching, Learning, and Assessment

Introduction to core policy documents, standards, concepts, and empirical methods in biology education research and their applications to undergraduate classroom settings. Appropriate for graduate students in the biological sciences and/or those enrolled in the Ph.D. Program in Science Education.

3 credits, Letter graded (A, A-, B+, etc.)

BEE 520: Advanced Human Genetics

An advanced course in human genetics. Topics include the genotype/phenotype association, genetic architecture of disease/phenotype, human population genetics, coalescent theory, methylation, and ancient DNA. The course will emphasize hands-on engagement with genetic data and critical reading of scientific papers. Computer laboratory analysis/ assignments will make up a major component of this class. Students will be evaluated based on computer assignments and a final individual research project.

Spring, 3 credits, Letter graded (A, A-, B+, etc.)

BEE 521: Genomics Lab

This course provides a computer lab-based introduction to comparative genomics, molecular evolutionary analysis, and next generation sequencing (NGS) data and analysis. Activities will include familiarization with both web-based and command-line tools for analyzing genomic data and summarizing/ visualizing results. Lectures and background reading will provide an introduction to basic principles of genomics to inform computer-based hands-on activities. A weekly recitation will promote discussion. Students will be evaluated based on computer lab assignments, as well as a final individual project that applies learned concepts and approaches to a novel research question.

Spring, 3 credits, Letter graded (A, A-, B+, etc.)

BEE 550: Principles of Ecology

Population dynamics, interactions of organisms, theoretical concepts of community structure and their biological and evolutionary implications.

Prerequisite: Permission of instructor
Fall, 4 credits, Letter graded (A, A-, B+, etc.)

BEE 551: Principles of Evolution

Biological evolution, including the genetics of populations, speciation, evolution of higher taxa, and the fossil record.

Fall, 4 credits, Letter graded (A, A-, B+, etc.)

BEE 552: Biometry

An intensive course in statistical theory and methodology. The analysis of real biological data is emphasized. Topics include analysis of variance, simple multiple and curvilinear regression analysis, correlation analysis, and goodness of fit tests.

Spring, 4 credits, Letter graded (A, A-, B+, etc.)

BEE 553: Multivariate Analysis in Biology

An introduction to multivariate statistical analysis for biologists. Topics include general least squares analysis, MANOVA, cluster analysis, and factor analysis.

Prerequisite: BEE 552 or equivalent
Fall, 3 credits, Letter graded (A, A-, B+, etc.)

BEE 554: Population Genetics and Evolution

A general introduction to mathematical population genetics and evolutionary theory. The effects of mutation, recombination, selection, and migration are studied. Modern concepts in both theoretical and experimental population genetics are covered.

Prerequisite: BEE 552 or equivalent, and a course in evolution
Spring, odd years, 0-3 credits, Letter graded (A, A-, B+, etc.)

BEE 555: Mathematical Methods in Population Biology

This course covers a variety of mathematical methods used in modern theoretical biology. Topics include linear algebra and applications, ordinary and partial differential equations, and stochastic processes. Examples from population biology, i.e., mathematical ecology and population genetics, are used throughout.

Fall, even years, 3 credits, Letter graded (A, A-, B+, etc.)

BEE 556: Research Areas of Ecology and Evolution

A description of the current research areas of ecology and evolution, broadly conceived. All first-year ecology and evolution students are expected to participate.

Fall and Spring, 1-2 credits, S/U grading
May be repeated for credit.

BEE 558: Tutorial Readings

Individual tutorial study with an instructor in the Graduate Program in Ecology and Evolution for the purpose of background reading in an area of ecology and evolution.

Fall and Spring, 1-4 credits, S/U grading
May be repeated for credit.

BEE 559: Individual Studies in Organisms

A detailed study of the biology of a selected systematic group chosen by the graduate student and a faculty member. This is conducted as a tutorial course.

Fall and Spring, 1-4 credits, Letter graded (A, A-, B+, etc.)
May be repeated for credit.

BEE 560: Advanced Ecology

This course will provide students with an understanding of the theoretical basis and empirical tests of diverse advanced topics in the field of ecology. The format includes both lectures and student-led discussions of primary literature.

2 credits, Letter graded (A, A-, B+, etc.)
May be repeated for credit.

BEE 562: Concepts and Methods in Evolutionary Biology

The course aims at achieving two related objectives: first, to provide graduate students in Ecology & Evolution, other biology departments, as well as Philosophy, with a basic understanding of the varied methods (both experimental and statistical) that make up the body of evolutionary quantitative biology. The focus will be in particular on quantitative genetics and its interface with more modern approaches, including QTL mapping, bioinformatics and the various "omics" (genomics, proteomics, etc.).

Second, students will become familiar with the fundamental concepts of philosophy of science, in particular as they relate to the conceptual analysis of the ideas that shape modern evolutionary and ecological theory. In this respect, the focus will be both on philosophical concepts such as falsificationism, induction, deduction, hypothesis testing and the nature of evidence, as well as on the meaning of key ideas in evolutionary ecology, like natural selection, genetic drift, and constraints.

3 credits, Letter graded (A, A-, B+, etc.)

BEE 564: Geometric Morphometrics

An introduction to theory and methods used in geometric morphometrics. Image analysis, outline methods, landmark methods, and shape statistics are covered.

Prerequisite: BEE 552 or equivalent; BEE 553 recommended
Fall, even years, 3 credits, Letter graded (A, A-, B+, etc.)

BEE 566: Horizons in Ecology and Evolution

The course is designed to provide beginning graduate students in Ecology and Evolution with an extended perspective on current and developing trends in this field. It will be based on readings (empirical and review papers) and discussion on diverse topics. The hour-long class will meet on a weekly basis. Each class session will be led by the faculty member with expertise in the scheduled topic of study.

Offered:
Spring, 1 credit, S/U grading

BEE 567: Molecular Diversity Laboratory

This course will provide hands-on experience in established and recently developed methods of detecting and analyzing molecular variation (DNA, RNA, Proteins) in nature. Natural populations of Drosophila melanogaster will be the model material for this laboratory. The main theme of this course is that molecular variation is abundant in nature and is an important tool for understanding adaptive evolution and species relationships.

Prerequisite: permission of instructor
Fall, 3 credits, Letter graded (A, A-, B+, etc.)

BEE 569: Bayesian Data Analysis and Computation

An applied course in Bayesian analysis and hierarchical modeling for advanced graduate students in Ecology & Evolution or related sciences. Topics will include probability theory, Bayesian analysis, and MCMC methods such as Gibbs, sampling and Metropolis-Hastings sampling, as well as applied issues regarding the choice of prior distributions, posterior convergence, censored and missing data, and model checking and comparison. The course will be taught using WinBUGS and JAGS as accessed via the R packages R2WinBUGS and R2jags, respectively. Offered in the Fall.

3-4 credits, Letter graded (A, A-, B+, etc.)

BEE 571: Ecology Laboratory

This course stresses the collection, analysis, and interpretation of ecological data, mostly in terrestrial settings. Laboratory and field exercises demonstrate the operation of general ecological principles in specific populations and communities.

Fall, 3 credits, Letter graded (A, A-, B+, etc.)

BEE 572: Conservation Biology

Society and individual lives are increasingly affected by environmental degradation at different scales. From the decline of local fisheries to global climate change, multiple crises threaten the biodiversity and ecosystems that sustain us humans. This course introduces the scientific foundations of conservation biology, along with examples from real-world conservation. The course reviews the biological concepts that underlie conservation including habitat requirements, population dynamics, biogeography, and population genetics. Analysis of case studies on the effects of human activities on biological diversity and ecosystem services will be used to explore the interdisciplinary nature of the practice of conservation. This course will prepare students for careers in environmental sciences and ecology.

Offered in Spring, 3 credits, Letter graded (A, A-, B+, etc.)

BEE 574: Landscape Ecology Laboratory

A computer lab course focusing on spatial concepts, methods, and tools for addressing environmental problems. The course will be based on fundamental concepts in ecology and environmental science and extend that knowledge, as well as teaching technical skills, including the use of geographic information systems (GIS) software, image processing, spatially explicit modeling, and spatial statistics. The lab exercises will introduce a variety of spatial approaches for addressing problems in environmental protection, ecotoxicology, natural resource management, conservation biology and wildlife management.

Offered
Fall, 3 credits, Letter graded (A, A-, B+, etc.)

BEE 575: Evolutionary Ecology

The approach is to understand the theoretical basis and review empirical tests of diverse topics. The format includes both lectures and student-led discussions of primary literature.

Prerequisite: BEE 550; BEE 551, or permission of instructor
Fall, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)

BEE 576: Principles and Applications of Ecology and Evolution

An overview of the principles of ecology and evolutionary biology, and the applications of these principles in conservation biology, environmental and health sciences, and resource management. The course will cover fundamental concepts and research questions in population, community, and ecosystem ecology; population genetics; and evolutionary ecology. These principles will be discussed in the context of contemporary issues, such as global climate change, biodiversity loss, environmental contaminants, infectious diseases, invasive species, and management of ecological resources. Offered

Fall, 4 credits, Letter graded (A, A-, B+, etc.)

BEE 577: Ecological Genetics

An introduction to the concepts, research questions, and methods involved in modern ecological genetics and genomics. The course will provide a strong foundation and broad conceptual framework for students planning to engage in empirical work in conservation, management, ecology, and evolutionary biology. The course will cover basic Mendelian genetics, meiosis, and mating systems, standard population genetics methods for describing variation within and between populations, basic quantitative genetics, methods for molecular marker genotyping, bioinformatic and genomic concepts, and organism-specific methods and case studies, including plant and animal ecological genetics.

3 credits, Letter graded (A, A-, B+, etc.)
May be repeated 1 times FOR credit.

BEE 585: Research Design and Analysis in Ecology and Evolution

This course covers topics relevant to statistical aspects of carrying out research in ecology and evolution as well as interpreting the results of one's own and others analyses, particularly in field data and for experimental data in the lab and field. The topics include quantification of spatial pattern and spatial heterogeneity, recognizing and accounting for indirect effects and artifacts, design and analysis of experiments, meta-analysis and quantitative research synthesis. This course

will also provide an introduction to ecological niche modeling and bioinformatics (focused on species and traits). We will review a synthetic set of tools useful for a broad range of questions in ecology and evolution. Offered

Fall, odd years, 3 credits, Letter graded (A, A-, B+, etc.)

BEE 586: Introduction to Ecological Modeling

This course will provide students with a familiarity of the major concepts, approaches, and underlying rationale for modeling in the ecological sciences. Topics will include reviews of theoretical and empirical models, the use of models in adaptive management, and how to confront models with data to evaluate alternative hypotheses. Roughly 1/3 of the course will be devoted to the use of models in management, focusing on the problems of fitting models to data and management pitfalls that follow. Course work will consist of readings, in class exercises, and group assignments that involve the construction, analysis, and interpretation of ecological models.

Prerequisite: BEE 550, BEE 552; MAT 131 or equivalent; any statistics course.
Spring, 3 credits, Letter graded (A, A-, B+, etc.)

BEE 587: Applied Ecology and Conservation Biology Laboratory

A computer laboratory course introducing students to ecological risk analysis and conservation biology. Laboratories are based on interactive software. Computer simulation techniques for addressing problems in applied ecology are emphasized. This course is co-scheduled with BEE 353 for Spring 2012. Prerequisites: A year of calculus; one-year undergraduate biology course for majors

Spring, even years, 3 credits, Letter graded (A, A-, B+, etc.)

BEE 588: Current Topics in Ecology and Evolution

Subject matter varies from semester to semester, depending upon the interests of students and staff.

Fall and Spring, 2 credits, S/U grading
May be repeated for credit.

BEE 599: Research

Original investigation undertaken with the supervision of a member of the staff.

Fall and Spring, 1-12 credits, S/U grading
May be repeated for credit.

BEE 670: Informal Seminar

Presentation of preliminary research results and current research problems by students and faculty.

Fall and Spring, 0-2 credits, S/U grading
May be repeated for credit.

BEE 671: Ecology and Evolution Colloquium

A weekly series of research seminars presented by visiting scientists as well as by the faculty. Required every semester of all ecology and evolution graduate students.

Fall, 0-2 credits, S/U grading
May be repeated for credit.

BEE 672: Ecology and Evolution Colloquium

A weekly series of research seminars presented by visiting scientists as well as by the faculty. Required every semester of all ecology and evolution graduate students.

Spring, 0-2 credits, S/U grading
May be repeated for credit.

BEE 689: Seminar on Adaptations of Marine Organisms

Seminars on selected topics concerning ecological, genetical, and evolutionary problems in the marine environment.

Fall or Spring, alternate years, 0-2 credits, Letter graded (A, A-, B+, etc.)
May be repeated for credit.

BEE 690: Seminar on Evolutionary Processes

Seminars on selected topics concerning evolutionary processes.

Fall or Spring, alternate years, 0-2 credits, Letter graded (A, A-, B+, etc.)
May be repeated for credit.

BEE 691: Seminar on Systematics and Phylogeny

Seminars on selected topics in systematics. Topics will include the theory of classification and numerical taxonomy, both phenetic and cladistic.

Fall or Spring, alternate years, 0-2 credits, Letter graded (A, A-, B+, etc.)
May be repeated for credit.

BEE 692: Seminar on the Environment and Human Affairs

Student seminars on selected topics concerned with the effect of man on the environment. Application of ecological and evolutionary theory to the solution of human problems.

Fall or Spring, 0-2 credits, Letter graded (A, A-, B+, etc.)
May be repeated for credit.

BEE 693: Seminar on Population and Community Ecology

Student seminars on selected topics in population and community ecology.

Fall or Spring, 0-2 credits, Letter graded (A, A-, B+, etc.)
May be repeated for credit.

BEE 695: Seminar on Ecological Processes

Seminars on selected topics concerning ecological processes at the individual, population, community, ecosystem, and global levels.

Offered
Fall and Spring, 0-2 credits, Letter graded (A, A-, B+, etc.)
May be repeated for credit.

BEE 699: Dissertation Research on Campus

Prerequisite: Must be advanced to candidacy (G5). Major portion of research must take place on SBU campus, at Cold Spring Harbor, or at the Brookhaven National Lab.

Fall, Spring, and Summer, 1-9 credits, S/U grading
May be repeated for credit.

BEE 700: Dissertation Research off Campus - Domestic

Prerequisite: Must be advanced to candidacy (G5). Major portion of research will take place off-campus, but in the United States and/ or U.S. provinces. Please note, Brookhaven National Labs and the Cold Spring Harbor Lab are considered on-campus. All international students must enroll in one of the graduate student insurance plans and should be advised by an International Advisor.

Fall, Spring, 1-9 credits, S/U grading
May be repeated for credit.

BEE 701: Dissertation Research off Campus - International

Prerequisite: Must be advanced to candidacy (G5). Major portion of research will take place outside of the United States and/or U.S. provinces. Domestic students have the option of the health plan and may also enroll in MEDEX. International students who are in their home country are not covered by mandatory health plan and must contact the Insurance Office for the insurance charge to be removed. International students who are not in their home country are charged for the mandatory health insurance. If they are to be covered by another insurance plan they must file a waiver be second week of classes. The charge will only be removed if other plan is deemed comparable.

All international students must received clearance from an International Advisor.
Fall, Spring, 1-9 credits, S/U grading
May be repeated for credit.

BEE 800: Full-Time Summer Research

May be repeated for credit.