Department of Ecology and Evolutionary Biology

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Overview
Ecology and evolutionary biology deals with the establishment of adaptations over evolutionary time and with the organismal function in ecological time. Faculty in the Department of Ecology and Evolutionary Biology study questions pertinent at a variety of levels of biological organization, from molecular aspects of evolution, to organismal structure and performance, to the ecology of ocean ecosystems. Research is conducted in both the laboratory and field and includes work on a variety of organisms from phages and bacteria, to higher plants and animals. Primary attention is given to evolutionary, ecological, and functional questions rather than to particular habitats or taxa. Faculty and graduate student research is often collaborative and interdisciplinary in approach. Departmental research activities include physiological ecology energetics, plant-herbivore and plant-pollinator interactions, microbial ecology and coevolution, quantitative genetics, life history evolution, population and reproductive ecology, community ecology and biogeography. These research endeavors provide a balance between empirical and theoretical approaches to evolutionary, organismal, and ecological problems.

Undergraduate Major in Ecology and Evolutionary Biology
In the 21st century, biologists in fields ranging from medicine to global change biology increasingly incorporate ecological and evolutionary ideas in their research. The major in Ecology and Evolutionary Biology encourages students to understand and appreciate important linkages between biological disciplines. The major is very broad, including components of evolutionary biology, ecology, and physiology. Faculty interests are also broad and include the evolution of aging, conservation biology, restoration ecology, biogeography, plant and animal population and community ecology, the evolution of infectious disease, evolutionary physiology, behavioral ecology, host-disease interactions, evolutionary genetics, genetics of invasive species, and plant population biology. Following graduation, students will be especially well prepared to enter graduate programs in either ecology or evolution for advanced study. The major also provides the foundation to pursue careers in governmental and non-governmental environmental organizations, as well as professional schools. The Department considers undergraduate experience in research an integral component of a scientific education, and majors are encouraged to participate in BIO SCI 199, in which they will be mentored by an individual faculty member within the Department.

Requirements for the B.S. in Ecology and Evolutionary Biology
All students must meet the University Requirements.
All students must meet the School Requirements.

Major Requirements
A. Required Major Courses:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
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<tbody>
<tr>
<td>BIO SCI E106</td>
<td>Processes in Ecology and Evolution</td>
</tr>
<tr>
<td>BIO SCI E107</td>
<td>Seminar in Ecology and Evolutionary Biology</td>
</tr>
<tr>
<td>STATS 8</td>
<td>Introduction to Biological Statistics</td>
</tr>
</tbody>
</table>

B. Upper-Division Laboratories:

<table>
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<tr>
<th>Course</th>
<th>Title</th>
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</thead>
<tbody>
<tr>
<td>BIO SCI E115L</td>
<td>Evolution Laboratory</td>
</tr>
<tr>
<td>BIO SCI E166L</td>
<td>Field Biology</td>
</tr>
</tbody>
</table>

and select one of the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
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<tbody>
<tr>
<td>BIO SCI D111L</td>
<td>Developmental and Cell Biology Laboratory</td>
</tr>
<tr>
<td>BIO SCI E106L</td>
<td>Habitats and Organisms</td>
</tr>
<tr>
<td>BIO SCI E112L</td>
<td>Physiology Laboratory</td>
</tr>
<tr>
<td>BIO SCI E131L</td>
<td>Image Analysis in Biological Research</td>
</tr>
<tr>
<td>BIO SCI E140L</td>
<td>Evolution and the Environment Laboratory</td>
</tr>
<tr>
<td>BIO SCI E160L</td>
<td>Biology of Birds Lab</td>
</tr>
<tr>
<td>BIO SCI E179L</td>
<td>Field Freshwater Ecology</td>
</tr>
<tr>
<td>BIO SCI M114L</td>
<td>Biochemistry Laboratory</td>
</tr>
<tr>
<td>BIO SCI M116L</td>
<td>Molecular Biology Laboratory</td>
</tr>
<tr>
<td>BIO SCI M118L</td>
<td>Experimental Microbiology Laboratory</td>
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</tbody>
</table>
BIO SCI M121L Advanced Immunology Laboratory
BIO SCI M127L Virology and Immunology Laboratory
BIO SCI M130L Advanced Molecular Lab Techniques
BIO SCI N113L Neurobiology Laboratory

One laboratory can be satisfied with completion of Excellence in Research in the Biological Sciences.

C. Upper-Division Biology Electives:
Select one of the following:

BIO SCI D103 Cell Biology
BIO SCI D104 Developmental Biology
BIO SCI D105 Cell, Developmental, and Molecular Biology of Plants
BIO SCI E109 Human Physiology
BIO SCI N110 Neurobiology and Behavior

and select three four-unit courses from the following:

BIO SCI E118–E190. BIO SCI 199 Research is strongly encouraged.

Double majors within the School of Biological Sciences or with Public Health Sciences, Biomedical Engineering: Premedical, Nursing Science, or Pharmaceutical Sciences are not permitted.

Sample Program — Ecology and Evolutionary Biology

Freshman

Fall
BIO SCI 93
CHEM 1A
Lower-Division Writing¹
BIO SCI 2A

Winter
BIO SCI 94
CHEM 1B
Lower-Division Writing¹

Spring
BIO SCI 106²
CHEM 1C-1LC
Lower-Division Writing¹

Sophomore

Fall
BIO SCI 97
CHEM 51A
MATH 2A or 5A
CHEM 1LD
BIO SCI 194S

Winter
BIO SCI 98
CHEM 51B-51LB
MATH 2B or 5B

Spring
BIO SCI 99
CHEM 51C-51LC
STATS 8

Junior

Fall
BIO SCI E107
PHYSICS 3A
Bio. Sci. research
BIO SCI 100

Winter
U-D Bio. Sci. elective
PHYSICS 3B-3LB
Bio. Sci. research
General Education

Spring
BIO SCI E115L
PHYSICS 3C-3LC
U-D Bio. Sci. elective
Bio. Sci. research

Senior

Fall
BIO SCI E166L
U-D Lab
Bio. Sci. research
Elective

Winter
U-D Bio. Sci. elective
Bio. Sci. research
General Education

Spring
U-D Bio. Sci. elective
General Education
Bio. Sci. research

¹ Students have the option of taking HUMAN 1AS, HUMAN 1BS, HUMAN 1CS or WRITING 39A, WRITING 39B, WRITING 39C in order to fulfill the lower-division writing requirement.
² BIO SCI E106 is offered in all three quarters, is a prerequisite for many upper-division courses and may be taken at any time after completion of BIO SCI 94.

Graduate Program in Ecology and Evolutionary Biology

The graduate program offers both the Plan I M.S. and the Ph.D. in Biological Sciences.

Requirements

Students are required to complete a minimum of five core courses during their first six academic quarters. Two of those courses are required graduate-level courses that all students must take:

ECO EVO 204 Writing Grant Proposals (typically in the second year)
ECO EVO 207 Quantitative Methods in Ecology and Evolutionary Biology (typically in the first year)
In addition students must take one course each in the areas of Physiology (P), Ecology (EC), and Evolution (EV). Although all three courses can be taken at the graduate level (G), one of the three courses may be taken as an upper-division undergraduate course (U). The list of acceptable courses is currently limited to:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Level</th>
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<tbody>
<tr>
<td>ECO EVO 208</td>
<td>Ecological and Evolutionary Physiology (GP)</td>
<td>G</td>
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<tr>
<td>ECO EVO 227</td>
<td>Plant Physiological Ecology (GP)</td>
<td>G</td>
</tr>
<tr>
<td>PHYSIO 206A</td>
<td>Introduction to Medical Physiology (GP)</td>
<td>G</td>
</tr>
<tr>
<td>PHYSIO 206B</td>
<td>Introduction to Medical Physiology (GP)</td>
<td>G</td>
</tr>
<tr>
<td>ANATOMY 201</td>
<td>Human Gross Anatomy (GP)</td>
<td>G</td>
</tr>
<tr>
<td>BIO SCI E109</td>
<td>Human Physiology (UP)</td>
<td>U</td>
</tr>
<tr>
<td>BIO SCI E127</td>
<td>Physiological Plant Ecology (UP)</td>
<td>U</td>
</tr>
<tr>
<td>BIO SCI E138</td>
<td>Comparative Animal Physiology (UP)</td>
<td>U</td>
</tr>
<tr>
<td>BIO SCI E139</td>
<td>Animal Locomotion (UP)</td>
<td>U</td>
</tr>
<tr>
<td>BIO SCI E145</td>
<td>Animal Coloration and Vision (UP)</td>
<td>U</td>
</tr>
<tr>
<td>BIO SCI E170</td>
<td>Mechanical Physiology (UP)</td>
<td>U</td>
</tr>
<tr>
<td>BIO SCI E183</td>
<td>Exercise Physiology (UP)</td>
<td>U</td>
</tr>
<tr>
<td>BIO SCI E188</td>
<td>Introduction to Insect Physiology (UP)</td>
<td>U</td>
</tr>
<tr>
<td>ECO EVO 205</td>
<td>Special Topics in Ecology (GEC)</td>
<td>G</td>
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<tr>
<td>ECO EVO 251</td>
<td>Evolutionary and Ecological Principles in Medicine (GEC)</td>
<td>G</td>
</tr>
<tr>
<td>BIO SCI E118</td>
<td>Ecosystem Ecology (UEC)</td>
<td>U</td>
</tr>
<tr>
<td>BIO SCI E151</td>
<td>Evolutionary and Ecological Principles in Medicine (UEC)</td>
<td>U</td>
</tr>
<tr>
<td>BIO SCI E166L</td>
<td>Field Biology (UEC)</td>
<td>U</td>
</tr>
<tr>
<td>BIO SCI E186</td>
<td>Population and Community Ecology (UEC)</td>
<td>U</td>
</tr>
<tr>
<td>ECO EVO 206</td>
<td>Special Topics in Evolution (GEV)</td>
<td>G</td>
</tr>
<tr>
<td>BIO SCI E153</td>
<td>Functional and Structural Evolutionary Genomics (UEV)</td>
<td>G</td>
</tr>
<tr>
<td>BIO SCI E154</td>
<td>Genetics and Human History (UEV)</td>
<td>U</td>
</tr>
<tr>
<td>BIO SCI E168</td>
<td>Evolution (UEV)</td>
<td>U</td>
</tr>
</tbody>
</table>

If a student wishes to request an exception (an exemption or a substitution), the student must submit a written request justifying the reason to the Graduate Advisor. The Graduate Advisor and the student’s Advisory Committee (or prior to the formation of the Advisory Committee, the Prescription Committee) will decide whether to grant the request.

Students who enter the program through the Gateway Program are required to take ECO EVO 204 and one additional course at either the undergraduate or graduate level in the dissertation topic area. The student and his/her thesis advisor should decide which particular course would be most appropriate.

Students are required to maintain a grade point average of B or greater in the five core courses required for that student. The grade of B- is not considered a passing grade for a graduate student. Students must pass the five core courses by the end of their second academic year. Students failing to meet this requirement may be asked to leave the program. In the event a student receives an Incomplete in any of the core courses, the deficiency must be cleared by the deadline specified by the Graduate Advisor. Any extensions of this deadline require approval by the Graduate Advisor.

**Teaching Requirement**

To ensure that all students gain teaching experience, all students are required to serve as Teaching Assistants for a minimum of one quarter for M.S. students and three quarters for Ph.D. students. These are minima, and students may teach additional quarters during their program.

**Research**

Each entering graduate student chooses a faculty advisor and a three-person advisory committee for guidance, with whom the student meets at least twice each year. All students are encouraged to submit a research proposal to their advisory committee during their first year of residency. A comprehensive proposal is required before the end of the first year for M.S. students and before advancement to candidacy for Ph.D. students. The progress of each student is reviewed by the student’s advisory committee, together with the Graduate Advisor, twice each academic year.

**Advancement to Candidacy and Normative Time for Completion**

Doctoral students who Advance to Candidacy meet the M.S. degree requirements, and can receive the M.S. degree by submitting the M.S. degree advancement to candidacy paperwork, and then submitting the M.S. degree completion paperwork in a subsequent quarter.

The normative time for completion of the Ph.D. is five years, and the maximum time permitted is seven years. All requirements for the M.S. degree should be completed within two years, with a maximum of three years allowed for completion of the program. Advancement to doctoral candidacy by an
oral examination is expected during the third year for students entering with a B.A. or B.S. or during the second year for those entering with an M.A. or M.S.

Admissions

Applicants for this program should have a solid undergraduate program in biology and ecology, emphasizing both research and fieldwork. In addition, course work in statistics, mathematics, and physical and chemical sciences is expected. All applicants are required to submit GRE scores. The deadline for application is December 1.

Master of Conservation and Restoration Science (MCRS)

The Master of Conservation and Restoration Science (MCRS) is designed for professionals or recent graduates who wish to further their education and gain skills that will help them obtain or advance in careers related to environmental management. The MCRS program integrates academic scholarship in ecology and evolutionary biology, training in natural resource management and stewardship, professional development (leadership training in agency, non-profit and for-profit conservation), and community engagement (translational partnerships in research and education).

Program Objectives

Upon completion of the program, graduates are able to lead and collaborate in the planning, design, implementation, and management of complex, large-scale environmental conservation and restoration activities, in agency, non-profit, and for-profit settings. MCRS graduates have the broad knowledge in applied ecosystem and community ecology, in addition to training in the use of Geographical Information Systems (GIS), remote sensing, and informatics (data analysis and management). Professional development training (e.g., project and personnel management) will position our graduates for leadership positions in environmental non-profits, agencies, and private consulting firms where managing teams of employees, volunteers, and stewards to conduct long-term and large-scale projects is often required.

Admissions

A B.A. or B.S., preferably in Biology, Conservation Biology, Ecology, or Environmental Science (or comparable degree title) from a fully accredited academic institution, is required for admission. Applicants with undergraduate degrees in areas such as Social Ecology, Public Health, Environmental Policy, or other similar degree titles are considered, but must demonstrate proficiency in the natural sciences and/or practical experience working in the professional field as documented below:

- Undergraduate preparation should include a minimum of:
  - One full year of biological sciences
  - One full year of chemistry
  - One semester or quarter of calculus or statistics

Experience from professional activities will be evaluated by faculty and staff in the program, but extended practical experience in ecology, conservation, restoration, or environmental engineering may be an acceptable substitute for one or more of the requirements above, depending on the nature of the experience. The GRE is not required.

Applicants must demonstrate that they possess academic potential for graduate study and meet the general requirements of the UCI Graduate Division. In addition to the requirements above, selection for admission is based on the following criteria:

1. A minimum overall grade point average of 3.0 in undergraduate academic course work
2. Two confidential letters of recommendation
3. A statement of purpose (describing the applicant’s goals in seeking the Master’s degree)
4. A resume (noting relevant work/academic experience)

Applicants apply directly to the Graduate Division for the MCRS program beginning each fall. The program uses rolling admission deadlines. The priority deadline is February 1; applications received by this date are read first, and next fall’s class begins to fill from this group. April 1 is the normal deadline; the remainder of the class is filled from these applicants. If the class is not full after each review of the April 1 applicants, additional applications will be accepted until July 1.

Curriculum

This two-year program of study consists of a four-part curriculum: a first-year sequence of core topic and professional development courses, a summer research/policy internship, a second-year of elective courses, and a team-based capstone experience (that serves as the thesis project). The summer internship and capstone experience are focused on stakeholder-engaged scholarship with community partners, where students are embedded in real-world conservation and restoration settings.

The MCRS program provides curriculum that includes:

1. Experience in core ecological and evolutionary principles underlying conservation and restoration;
2. Interdisciplinary training in the earth and environmental sciences vital for a modern perspective on system-based conservation and restoration;
3. Training in professional skills required for effective practice and success in leadership positions in non-profit, institute, for-profit and agency settings;
4. research experiences in community-engaged research projects to build bridges between communities of research capacity (universities, institutes, agencies) and need (non-profits, land management agencies, private land-holders, and governments); and
5. exposure to social, political, and economic principles that guide the application of science to conservation and restoration.

**Required and Elective Course Work**

*NOTE: This degree’s requirements have not been finalized. Please check back prior to the start of the fall 2018 quarter for the finalized requirements.*

This program consists of 11 required classes, four required workshops, four electives (selected across three categories), a recommended summer internship, and a group capstone project. There is no teaching requirement for the MCRS.

A. Complete the following:

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<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>ECO EVO 203B</td>
<td>Graduate Tutorial in Ecology and Evolutionary Biology ((Intro to Conservation and Restoration Science - 2 units))</td>
</tr>
<tr>
<td>ECO EVO 205</td>
<td>Special Topics in Ecology</td>
</tr>
<tr>
<td>ECO EVO 264</td>
<td>Conservation Biology</td>
</tr>
<tr>
<td>ECO EVO 265</td>
<td>Restoration Ecology</td>
</tr>
<tr>
<td>EARTHSS 264</td>
<td>Ecosystem Ecology</td>
</tr>
<tr>
<td>ECO EVO 207</td>
<td>Quantitative Methods in Ecology and Evolutionary Biology</td>
</tr>
<tr>
<td>EARTHSS 134</td>
<td>Fundamentals of GIS for Environmental Science</td>
</tr>
<tr>
<td>ECO EVO 266L</td>
<td>Field Methods in Restoration</td>
</tr>
<tr>
<td>ECO EVO 268</td>
<td>Technical Writing</td>
</tr>
<tr>
<td>ECO EVO 267</td>
<td>Science Communication</td>
</tr>
<tr>
<td>ECO EVO 269</td>
<td>Project Management</td>
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</tbody>
</table>

B. Select four courses from the following categories: ¹

- Environmental Regulation and Policy
- Organismal Biology and Diversity
- Earth and Environmental Science

¹ View courses eligible for the elective requirements here (http://mcrs.bio.uci.edu/elective-courses). Courses offered in each category may change each year. Two electives may be taken at the undergraduate level.

**Capstone Project for Degree Completion**

In lieu of qualifying exams or a thesis requirement, students are required to complete 12 units of capstone course during their second year in the program. In the MCRS capstone course, groups of three to six students complete a project involving community-engaged scholarship in collaboration with a local partner/stakeholder to address a current management need and/or solve a real environmental problem.

Students demonstrate how the knowledge and skills learned in this program can be applied in a practical professional setting while gaining skills necessary to succeed in the professional arena upon degree completion.

Capstone projects require a written product. The format of this product is not specified, but it must demonstrate that the student can effectively integrate the skills that they have learned in the MCRS program. Programs may include habitat conservation, restoration, or species management plans; detailed reports to partners or stakeholders; or scholarly research papers. All written products must show originality and thoroughness in the conception and implementation of the project and effective integration of their project with the broader field of conservation and restoration science.

**Faculty**

Nancy M. Aguilar-Roca, Ph.D. University of California, San Diego, *Lecturer with Potential Security of Employment of Ecology and Evolutionary Biology*

Steven D. Allison, Ph.D. Stanford University, *Associate Professor of Ecology and Evolutionary Biology; Earth System Science*

Peter R. Atsatt, Ph.D. University of California, Los Angeles, *Professor Emeritus of Ecology and Evolutionary Biology*

John C. Avise, Ph.D. University of California, Davis, *UCI Distinguished Professor of Ecology and Evolutionary Biology*

Manny Azizi, Ph.D. University of Massachusetts, *Assistant Professor of Ecology and Evolutionary Biology*

Alan G. Barbour, M.D. Tufts University, *Professor of Microbiology and Molecular Genetics; Ecology and Evolutionary Biology; Medicine*

Albert F. Bennett, Ph.D. University of Michigan, *Professor Emeritus of Ecology and Evolutionary Biology*

Rudi C. Berkelhamer, Ph.D. University of California, Berkeley, *Senior Lecturer Emerita of Ecology and Evolutionary Biology*
Peter A. Bowler, Ph.D. University of California, Irvine, Senior Lecturer of Ecology and Evolutionary Biology

Matthew E. Bracken, Ph.D. Oregon State University, Associate Professor of Ecology and Evolutionary Biology

Timothy J. Bradley, Ph.D. University of British Columbia, Professor of Ecology and Evolutionary Biology

Adriana D. Briscoe, Ph.D. Harvard University, Professor of Ecology and Evolutionary Biology

Nancy T. Burley, Ph.D. University of Texas at Austin, Professor of Ecology and Evolutionary Biology

Robin M. Bush, Ph.D. University of Michigan, Associate Professor of Ecology and Evolutionary Biology

Diane R. Campbell, Ph.D. Duke University, Professor of Ecology and Evolutionary Biology

F. Lynn Carpenter, Ph.D. University of California, Berkeley, Professor Emerita of Ecology and Evolutionary Biology

Michael T. Clegg, Ph.D. University of California, Davis, Donald Bren Professor and Professor Emeritus of Ecology and Evolutionary Biology

James J. Emerson, Ph.D. University of Chicago, Assistant Professor of Ecology and Evolutionary Biology

Celia Faia, Ph.D. Washington State University, Assistant Professor of Ecology and Evolutionary Biology

Steven A. Frank, Ph.D. University of Michigan, Donald Bren Professor of Ecology and Evolutionary Biology; Logic and Philosophy of Science

Brandon S. Gaut, Ph.D. University of California, Riverside, Professor of Ecology and Evolutionary Biology

Donovan German, Ph.D. University of Florida, Assistant Professor of Ecology and Evolutionary Biology

Michael L. Goulden, Ph.D. Stanford University, Professor of Earth System Science; Ecology and Evolutionary Biology

Bradford A. Hawkins, Ph.D. University of California, Riverside, Professor of Ecology and Evolutionary Biology

James W. Hicks, Ph.D. University of New Mexico, Professor of Ecology and Evolutionary Biology

Bradley S. Hughes, Ph.D. University of California, Irvine, Lecturer with Security of Employment of Ecology and Evolutionary Biology; Education

George L. Hunt, Jr., Ph.D. Harvard University, Professor Emeritus of Ecology and Evolutionary Biology

Travis E. Huxman, Ph.D. University of Nevada, Professor of Ecology and Evolutionary Biology

Mahtab F. Jafari, Pharm.D. University of California, San Francisco, Vice Chair and Director of the Center for Healthspan Pharmacology and Professor of Pharmaceutical Sciences; Ecology and Evolutionary Biology; Pharmacology (anti-aging pharmacology and preventive medicine)

Natalia Komarova, Ph.D. University of Arizona, UCI Chancellor's Professor of Mathematics; Ecology and Evolutionary Biology (applied and computational mathematics, mathematical and computational biology, mathematics of complex and social phenomena)

Harold Koopowitz, Ph.D. University of California, Los Angeles, Professor Emeritus of Ecology and Evolutionary Biology

Anthony D. Long, Ph.D. McMaster University, Professor of Ecology and Evolutionary Biology; Pharmaceutical Sciences

Catherine Loudon, Ph.D. Duke University, Senior Lecturer of Ecology and Evolutionary Biology

Richard E. MacMillen, Ph.D. University of California, Los Angeles, Professor Emeritus of Ecology and Evolutionary Biology

Adam Martiny, Ph.D. Technical University of Denmark, Associate Professor of Earth System Science; Ecology and Evolutionary Biology

Jennifer Martiny, Ph.D. Stanford University, UCI Chancellors’ Fellow and Professor of Ecology and Evolutionary Biology

Matthew J. McHenry, Ph.D. University of California, Berkeley, Associate Professor of Ecology and Evolutionary Biology

Kailen Mooney, Ph.D. University of Colorado Boulder, Associate Professor of Ecology and Evolutionary Biology

Laurence D. Mueller, Ph.D. University of California, Davis, Professor of Ecology and Evolutionary Biology

R. Michael Mulligan, Ph.D. Michigan State University, Biological Sciences Associate Dean of Graduate Studies and Professor of Developmental and Cell Biology; Ecology and Evolutionary Biology (RNA editing in plant mitochondria and chloroplasts)

Jessica Pratt, Ph.D. University of California, Irvine, Lecturer with Potential Security of Employment of Ecology and Evolutionary Biology

James T. Randerson, Ph.D. Stanford University, UCI Chancellor's Professor of Earth System Science; Ecology and Evolutionary Biology
Courses

ECO EVO 200A. Research in Ecology and Evolutionary Biology. 2-12 Units.
Individual research with Ecology and Evolutionary Biological faculty.

Repeatability: Unlimited as topics vary.
Restriction: Graduate students only.

ECO EVO 200B. Research in Ecology and Evolutionary Biology. 2-12 Units.
Individual research with Ecology and Evolutionary Biological faculty.

Repeatability: Unlimited as topics vary.
Restriction: Graduate students only.

ECO EVO 200C. Research in Ecology and Evolutionary Biology. 2-12 Units.
Individual research with Ecology and Evolutionary Biological faculty.

Repeatability: Unlimited as topics vary.
Restriction: Graduate students only.

ECO EVO 201. Seminar in Ecology and Evolutionary Biology. 2 Units.
Invited speakers, graduate students, and faculty present current research in ecology and evolutionary biology.

Grading Option: Satisfactory/unsatisfactory only.
Repeatability: May be repeated for credit unlimited times.
Restriction: Graduate students only.

Concurrent with BIO SCI E107.

ECO EVO 203A. Graduate Tutorial in Ecology and Evolutionary Biology. 2-12 Units.
Advanced study in areas not represented by formal courses. May involve individual or small group study through reading, discussion, and composition.

Repeatability: Unlimited as topics vary.
Restriction: Graduate students only.

ECO EVO 203B. Graduate Tutorial in Ecology and Evolutionary Biology. 2-12 Units.
Advanced study in areas not represented by formal courses. May involve individual or small group study through reading, discussion, and composition.

Repeatability: Unlimited as topics vary.
Restriction: Graduate students only.
ECO EVO 203C. Graduate Tutorial in Ecology and Evolutionary Biology. 2-12 Units.
Advanced study in areas not represented by formal courses. May involve individual or small group study through reading, discussion, and composition.

Repeatability: Unlimited as topics vary.
Restriction: Graduate students only.

ECO EVO 204. Writing Grant Proposals. 4 Units.
Provides students with hands-on experience writing proposals in the research areas of ecology, evolution, or physiology.

Restriction: Graduate students only.

ECO EVO 205. Special Topics in Ecology. 4 Units.
Survey of special topics in Ecology.

Restriction: Graduate students only.

ECO EVO 206. Special Topics in Evolution. 4 Units.
Extensive introduction to the primary literature of evolutionary biology. Topics include population genetics, quantitative genetics, neutralism, molecular evolution, evolution of genetic systems, genetic architecture of fitness, speciation, and macroevolution.

Restriction: Graduate students only.

ECO EVO 207. Quantitative Methods in Ecology and Evolutionary Biology. 4 Units.
Statistics for ecologists and evolutionary biologists. Emphasis on specific applications and underlying assumptions rather than on methods of calculation. Topics include experimental design, parametric and nonparametric methods, analysis of variance and covariance, and multiple regression.

Prerequisite: Completion of at least one quarter of statistics including regression and analysis of variance.

Restriction: Graduate students only.

ECO EVO 208. Ecological and Evolutionary Physiology. 4 Units.
A summary of information in organismal biology, comparative and ecological physiology, and the biophysical basis of organismal function. Course offered every other fall.

Restriction: Graduate students only.

ECO EVO 210. Foundations of Physiology. 4 Units.
Physical and functional principles common to many living forms. Course forms a basis for subsequent specialization in any of the subdisciplines of physiology. Course offered in even years.

Grading Option: Satisfactory/unsatisfactory only.
Repeatability: May be repeated for credit unlimited times.
Restriction: Graduate students only.

ECO EVO 218. Advanced Topics in Evolutionary Biology. 4 Units.
Content and instructor will vary from quarter to quarter. Possible topics include quantitative genetics, experimental methods of evolutionary studies, mathematical modeling in evolutionary studies, and the evolution of genetic systems.

Repeatability: May be repeated for credit unlimited times.

ECO EVO 219. Advanced Topics in Ecological Genetics. 4 Units.
Content and instructor will vary from year to year. Possible topics include coevolution, sex-ratio evolution, evolution senescence, plant population biology, and density-dependent selection.

Repeatability: May be repeated for credit unlimited times.
Restriction: Graduate students only.

ECO EVO 221. Advanced Topics in Ecology. 2-4 Units.
Weekly discussion of current topics in ecology at the graduate level.

Grading Option: Satisfactory/unsatisfactory only.
Repeatability: Unlimited as topics vary.
ECO EVO 222. Statistical Learning in Ecology and Evolution. 4 Units.
Reviews basic principals of variance/bias trade-offs. Topics include models for prediction and classification, variable selection methods, cross-validation, tree based methods, unsupervised learning. Applications in ecology and evolution using R.

Prerequisite: ECO EVO 207. ECO EVO 207 with a grade of B or better

Restriction: Graduate students only.

ECO EVO 227. Plant Physiological Ecology. 4 Units.
Provides a summary of information on plant organismal biology, comparative and ecological physiology, and functional ecology. Offered every other fall.

Repeatability: May be repeated for credit unlimited times.

Restriction: Graduate students only.

ECO EVO 228. Seminar in Conservation Biology. 2 Units.
Devoted to the application of basic ecological principles to the understanding and resolution of environmental problems of both local and global natures. Current problems approached through a combination of readings, group discussions, and visiting speakers.

Repeatability: May be repeated for credit unlimited times.

Restriction: Graduate students only.

ECO EVO 230. Topics in Microbial Ecology. 2-4 Units.
Weekly discussion of current topics in ecology, biogeochemistry, evolution, and physiology of microbial organisms.

Grading Option: Satisfactory/unsatisfactory only.

Repeatability: May be repeated for credit unlimited times.

ECO EVO 235. Experimental Evolution. 2 Units.
Explores experimental evolution, which is now a well-established part of evolutionary biology. With the advent of genomics, it is now one of the most powerful tools for studying the genetic foundations of biology.

Prerequisite: BIO SCI E106

Repeatability: May be repeated for credit unlimited times.

Restriction: Graduate students only. School of Biological Sciences students only.

ECO EVO 246. Seminar in Ecology and Evolution Education. 2 Units.
Weekly discussion of teaching techniques and challenges that are specific to courses in ecology and evolutionary biology. Emphasis will be on using evidence-based pedagogy techniques. There will be a combination of readings, group discussions and speakers.

Grading Option: Satisfactory/unsatisfactory only.

Repeatability: May be repeated for credit unlimited times.

Restriction: Graduate students only.

ECO EVO 251. Evolutionary and Ecological Principles in Medicine. 4 Units.
Explore the dynamics of populations on an ecological, epidemiological, and medical level. Considers the dynamics of competition, predation, and parasitism; the spread and control of infectious diseases; and the in vivo dynamics of viral infections and the immune system.

Restriction: Graduate students only.

 Concurrent with BIO SCI E151.

ECO EVO 253. Functional and Structural Evolutionary Genomics. 4 Units.
Function and organization of genomes analyzed from an evolutionary perspective. Review of some of the most recent experimental approaches in genome analysis and comparative genomics. Relevant software to analyze DNA and expression data is used.

Concurrent with BIO SCI E153.
ECO EVO 262. Professional Workshop. 2 Units.
Identify and attend professional or technical skill workshops to gain professional knowledge and certifications related to conservation and restoration science.

Repeatability: May be taken for credit 4 times.

Restriction: Graduate students only.

ECO EVO 264. Conservation Biology. 4 Units.
Explores concepts in ecology with potential for conserving biological diversity. Identifies creative applications of ecological research that mitigate impacts of rapid human population growth and habitat destruction on biodiversity.

Restriction: Graduate students only.

ECO EVO 265. Restoration Ecology. 4 Units.
Study of principles and practices that help recover degraded ecosystems including restoration in different ecological systems, restoration motives and intensities, implementation and monitoring, and scope and success of case studies.

Restriction: Graduate students only.

ECO EVO 266L. Field Methods in Restoration. 4 Units.
Laboratory experience performing field methods that help recover degraded ecosystems in different ecological systems. Emphasis on the plant community composition, soil, irrigation, maintenance, and monitoring of a project.

ECO EVO 267. Science Communication. 2 Units.
Develops students' abilities to convey information related to conservation and restoration in a way that has broad appeal and/or effective messaging for non-scientific audiences by assessing the audience, developing effective storytelling, and deploying a persuasive information campaign.

Repeatability: May be taken for credit 2 times.

ECO EVO 268. Technical Writing. 2 Units.
Practice developing key documents for restoration projects including a response to a request for proposal (RFP), a restoration project plan, and a monitoring and maintenance plan.

ECO EVO 269. Project Management. 2 Units.
Discover the planning, design, implementation, and aftercare phases of managing a conservation or restoration project. Students will project cost, manage risk, analyze sites, evaluate and review projects, and become familiar with common permitting and consultation requirements.

ECO EVO 272. Plant Diversity in a Changing World. 4 Units.
Investigation of plant diversity in California and throughout the world, including basic systematic concepts, introduction to major groups of flowering plants, and the effects of global biological change on plant diversity. Students carry out a phylogenetic analysis using appropriate software.

Concurrent with BIO SCI E172.

ECO EVO 282. Fundamentals of Informatics for Biologists. 4 Units.
Students learn the fundamentals of bioinformatics and the unix operating system (including the shell and Sun Grid Engine) in order to assemble a eukaryotic genome.

Restriction: Graduate students only.

ECO EVO 283. Advanced Informatics for Biologists. 4 Units.
Students learn advanced informatics including the analysis of: Poolseq, RNAseq, ATACseq, and ChiPseq datasets using programs such as bwa, tophat, cufflinks, DEseq, Trinity, Agustus, etc., in a unix high-performance computing environment. Statistical tests carried out and publication quality.

Prerequisite: ECO EVO 282

Restriction: Graduate students only.

ECO EVO 285. Topics in Evolutionary Genetics. 2 Units.
Weekly discussion of recent research on evolutionary genetics.

Repeatability: May be repeated for credit unlimited times.

Restriction: Graduate students only.
ECO EVO 286. MCRS Capstone. 4 Units.
Apply knowledge and skills in a practical professional setting, working with practitioners to identify a conservation or management problem and then to plan, implement, and evaluate a solution.

Repeatability: May be taken for credit for 12 units.

Restriction: Graduate students only.

ECO EVO 287. Communicating Research Through Video. 4 Units.
Students explore videography to develop basic production skills through practice with high interest special topics, such as laboratory experimental evolution and educational interdisciplinary field events, and then develop media to communicate their own research or other topics of interest.

Repeatability: May be repeated for credit unlimited times.

Restriction: Graduate students only.

ECO EVO 288. Documenting Research Through Cinematic Production. 4 Units.
Students gain advanced media expertise by conceptualizing investigative research into publicly engaging video projects. Popularly accessible research topics will be adapted into documentary, television, or cinematic pieces that provide opportunities for developing professionally marketable skills in educationally effective media production.

Prerequisite: ECO EVO 287

Repeatability: May be repeated for credit unlimited times.

Restriction: Graduate students only.

ECO EVO 289. Independent Study. 1-4 Units.
Individual research or investigation under the direction of an individual faculty.

Grading Option: Satisfactory/unsatisfactory only.

ECO EVO 323. Curriculum and Methods for Elementary School Science. 4 Units.
Prospective elementary teachers learn how to teach science in grades K-8. Covers States science requirements, a variety of teaching methods, criteria for selecting science curriculum materials, and how to plan science lessons, units, projects, and demonstrations.

Same as EDUC 323.

ECO EVO 341. Teaching Science in Secondary School. 4 Units.
Prospective secondary science teachers learn how to teach science in grades 7-12. Covers State science requirements, a variety of teaching methods, criteria for selecting science curricular materials, and how to plan science lessons, units, projects, and demonstrations.

Same as EDUC 341.

Restriction: Master of Arts in Teaching Degree students only.

ECO EVO 398. Teaching Assistant Seminar. 2 Units.
Readings, lectures, workshops, and student presentations designed to help develop teaching skills of graduate students teaching university-level biology classes. Topics vary and may include: course organization, presentation styles, exam design, grading, motivating students, and commonly encountered problems.

Repeatability: May be repeated for credit unlimited times.

ECO EVO 399. University Teaching. 4 Units.
Mandatory course for Ecology and Evolutionary Biology Teaching Assistants, required in each quarter in which student has a Teaching Assistant position. Limited to Teaching Assistants.

Repeatability: May be repeated for credit unlimited times.