

Upper-Division Science Electives 7-9
 from any biology courses numbered 355-599. In addition, with consent of advisor may include [PSYC 461](#) (no BB credit) or one course from the following list which will count for BB and elective credit:

- [CS 305, 311](#)
- [CHEM 341, 351, 401, 402, 404](#)
- [PHYS 440](#)
- [MATH 362, 374, 441, 448, 464](#)

Other courses may be approved with faculty consent.

Physiology Concentration Requirements

Upper-Division (19 units)

Select three of the following courses
 (at least one must have a lab): Units
10-12

- | | |
|-------------------------------|--------------------------------|
| BIOL 365++ | BIOL 476 |
| BIOL 368/368L | BIOL 505+ |
| BIOL 370/370L | BIOL 512/512L+ |
| BIOL 374 | BIOL 514/514L+ |
| BIOL 375 | BIOL 515+ |
| BIOL 380/380L | BIOL 531++ |
| BIOL 401 | BIOL 532++ |
| BIOL 411/411L | BIOL 576+ |

**Please put BIOL
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 327 in the
 Physiology
 courses**

+ With consent of faculty advisor.

++Only one of these courses can count for upper-division Physiology Concentration Requirements.

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General Concentration Requirements

Select one course from each of the three following lists (at least one course must have a lab): 10-12

Molecular and Cellular Biology courses:

- | | |
|-------------------------------|----------------------------|
| BIOT 356 | BIOL 480 |
| BIOT 357 | BIOL 503 |
| BIOL 365++ | BIOL 504+ |
| BIOL 367 | BIOL 520+ |
| BIOL 368/368L | BIOL 531++ |
| BIOL 370/378L | BIOL 532++ |
| BIOL 452 | BIOL 537+ |
| BIOL 477/477L | BIOL 540+ |

Ecology courses:

- | | |
|-------------------------------|-------------------------------|
| BIOL 365++ | BIOL 400/400L |
| BIOL 379 | BIOL 420 |
| BIOL 380/380L | BIOL 463 |
| BIOL 381/381L | BIOL 502+ |
| BIOL 382 | BIOL 505+ |
| BIOL 383 | BIOL 513 |
| BIOL 384 | BIOL 531++ |
| BIOL 386/386L | BIOL 532++ |
| BIOL 387/387L | BIOL 533+ |
| BIOL 388 | BIOL 535+ |
| BIOL 389 | BIOL 536+ |
| BIOL 390/390L | BIOL 540 |

Physiology courses:

- | | |
|-------------------------------|--------------------------------|
| BIOL 365++ | BIOL 505+ |
| BIOL 368/368L | BIOL 512/512L+ |
| BIOL 370/370L | BIOL 514/514L+ |
| BIOL 374 | BIOL 515+ |
| BIOL 375 | BIOL 531++ |
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Other courses may be approved with faculty consent.

+ With consent of faculty advisor.

++Only one of these courses can count for upper-division General Concentration Requirements.

BIOL 396 (1-3)**Topics in Biology**

Seminar reviewing current literature in a subject area of importance in biology. *May be repeated for credit as topics change for a total of six (6) units. Students should check the Class Schedule for listing of actual topics. Prerequisites: BIOL 210 and 211.*

BIOL 397 (1)**Topics in Biology Lab**

Laboratory experience that explores phenomena and techniques in the biological sciences. *May be repeated for credit as topics change for a total of three (3) units. Students should check the Class Schedule for listing of actual topics. Prerequisites: BIOL 210 and 211.*

BIOL 400 (3)**Vertebrate Biology**

Introduction to vertebrate animals, including overview of their evolution, systematics, anatomy, physiology, ecology and behavior. Major subjects will include, water-to-land transition, origins of amniotic egg, flight and endothermy, patterns of social organization and mating systems, and general life-history strategies. Courses will emphasize terrestrial vertebrates of the San Diego area. *Field trip(s) during or outside of class (including weekends) may be required. Prerequisites: BIOL 210, 211, and 212, or enrollment in the Biological Sciences graduate program.*

BIOL 400L (1)**Vertebrate Biology Laboratory**

Provides hands-on experience in identifying terrestrial vertebrates of Southern California. Using preserved specimens and interactive computer programs, students will learn to use and develop dichotomous species keys and to identify vertebrates by sight and sound. Students will design and conduct independent field research projects. Course will possibly include visits to local museums, zoos and aquaria. *Three hours of laboratory. Field trip(s) during or outside of class (including weekends) may be required. Co/Prerequisite: BIOL 400.*

BIOL 401 (4)**Comparative Vertebrate Anatomy**

Comparison of similarities and differences among vertebrate groups on the basis of structure and function. Emphasis will be placed on the evolution and vertebrate structures, new roles for derived and ancestral characters, adaptation of new functions, relationship to life style, life history and evolutionary phylogeny. A major goal of this course is to generate a greater understanding of the evolutionary processes and concomitant structural changes that have occurred among vertebrates including humans. Laboratory study includes dissection, and analysis of organ systems, and evolutionary innovations among representative vertebrates. *Three hours lecture and three hours lab. Prerequisites: BIOL 210, 211, and 212, or enrollment in the Biological Sciences graduate program.*

BIOL 411 (3)**Animal Reproductive Physiology**

Overview of the comparative structure and function of reproductive systems in animals, with in depth coverage of the reproductive physiology of select model species representing diverse taxa. Major topics will include sexual development, male and female reproductive cycles, gametogenesis, fertilization, implantation, gestation, birth, and lactation. Minor topics include mechanisms of environmental regulation of reproduction and applications of assisted reproductive technology. Course will emphasize evolution of diverse physiologic adaptations of the reproductive system. *Field trip(s) during or outside of class (including weekends) may be required. Recommended Preparation: BIOL 375. Prerequisites: BIOL 212 and 353 or enrollment in the Biological Sciences graduate program.*

BIOL 411L (1)**Animal Reproductive Physiology Laboratory**

Provides hands-on exploration of the anatomy, histology and physiology of the male and female reproductive system in a wide variety of animal species, including laboratory animals, livestock and wildlife. Both preserved specimens and computer programs will be used in the course to explore the diversity of physiologic adaptations of the reproductive system in animals. *Field trip(s) during or outside of class (including weekends) may be required. Three hours of laboratory. Recommended Preparation: BIOL 375. Co/Prerequisite: BIOL 411.*

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BIOL 420 (4)**Ecological Monitoring**

An overview of the various approaches used to assess ecological condition (status) and change over time (trend) for ecosystems, vegetation types, populations, and biological communities. Lectures that provide conceptual understanding will be combined with hands-on practical exercises in the lab, so that students will be prepared to apply their knowledge to real-world conservation problems. *Three hours lecture and three hours laboratory. This course may be taught together with BIOL 620 by the same instructor. Prerequisites: BIOL 215 and BIOL 354.*

BIOL 452 (3)**Medical Genetics**

The study of genetic principles as it relates to the practice of medicine. Emphasis will be placed on the diagnosis, treatments, and inheritance of genetic diseases, mapping of disease genes to their chromosome locations, study of the molecular genetics and pathogenesis of inherited disorders, and investigations of methods for gene therapy. A major goal for this course is to provide a foundation in medical genetics with emphasis on critical thinking skills including primary literature reviews and problem based learning of genetic disorders. *Prerequisite: BIOL 212 and 352, or enrollment in the Biological Sciences graduate program.*

BIOL 560 (2)**Seminar in Molecular Cell Biology**

Readings from the original literature, discussions, and writing on selected current subjects in cell and molecular biology. *May be repeated with new content for a maximum of four (4) units toward the Master's degree. Prerequisite: BIOL 351, or enrollment in the Biological Sciences graduate program.*

BIOL 561 (2)**Seminar in Genetics**

Readings from the original literature, discussions, and writing on selected current subjects in genetics. *May be repeated with new content for a maximum of four (4) units toward the Master's degree. Prerequisites: BIOL 352 for undergraduates, or enrollment in the Biological Sciences graduate program.*

BIOL 563 (2)**Seminar in Physiology**

Readings from the original literature, discussions, and writing on selected current subjects in physiology. *May be repeated with new content for a maximum of four (4) units toward the Master's degree. Prerequisites: BIOL 353 for undergraduates, or enrollment in the Biological Sciences graduate program.*

BIOL 564 (2)**Seminar in Evolution**

Readings from the original literature, discussions, and writing on selected current subjects in evolution. *May be repeated with new content for a maximum of four (4) units toward the Master's degree. Prerequisites: BIOL 212 for undergraduates, or enrollment in the Biological Sciences graduate program.*

BIOL 565 (2)**Seminar in Ecology**

Readings from the original literature, discussions, and writing on selected current subjects in ecology. *May be repeated with new content for a maximum of four (4) units toward the Master's degree. Prerequisites: BIOL 354 for undergraduates, or enrollment in the Biological Sciences graduate program.*

BIOL 566 (2)**Seminar in Aquatic Biology**

Readings from the original literature, discussions, and writing on selected current subjects in aquatic biology. *May be repeated with new content for a maximum of four (4) units toward the Master's degree. Prerequisites: BIOL 354 for undergraduates, or enrollment in the Biological Sciences graduate program.*

BIOL 576 (1)**Laboratory Experience in Neurobiology**

Provides hands-on experience using the latest techniques in neurophysiology. Students will record intracellular signals in neurons using an invertebrate model nervous system. Students will gain experience in physiological and anatomical techniques. *Three hours of laboratory. Co/Prerequisite: BIOL 476, or enrollment in the Biological Sciences graduate program.*

BIOL 596 (1-3)**Advanced Topics in Biology**

Advanced study of selected biological topics based on current problems or advances, and as demand warrants. *Students should check the Class Schedule for listing of actual topics and course prerequisites.*

BIOL 597 (1)**Advanced Topics in Biology Lab**

Laboratory in selected advanced topics in biology. Topics based on current problems or advances, and as demand warrants. *Three hours laboratory. Students should check the Class Schedule for listing of actual topics and prerequisites.*

BIOL 600 (3)**Scientific Communication**

Practical experience in the preparation of written, oral, and poster presentations in the biological sciences. Students will also actively take part in the peer review process commonly used to evaluate the scientific and technical merits of research proposals. Final products may include formal grant (NSF or NIH) and thesis proposals. *Enrollment restricted to students in the Biological Sciences graduate program. May not be taken for credit by students who have received credit for BIOL 610 or 611.*

BIOL 620 (4)**Advanced Ecological Monitoring**

An overview of the various approaches used to assess ecological condition (status) and change over time (trend) for ecosystems, vegetation types, populations, and biological communities. Lectures that provide conceptual understanding will be combined with hands-on practical exercises in the lab, so that students will be prepared to apply their knowledge to real-world conservation problems. Readings from the primary literature will explore the challenges and controversies involved in ecological monitoring. *Three hours lecture and three hours laboratory. This course will be taught together with BIOL 420 by the same instructor. Enrollment restricted to students in the Biological Sciences graduate program. May not be taken for credit by students who have received credit for BIOL 420.*

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BIOL 663 (3)**Advanced Principles of Conservation Biology**

An in-depth focus on the principles and practices of conservation and restoration ecology. Factors that affect the creation, destruction, and distribution of biological diversity are examined. Class discussions and assignments will focus on human destruction and degradation of habitats, invasive species introductions, accelerated species extinctions, pollution, global climate change, and species over-exploitation. The selection of maintenance of conservation areas will be explored, as well as the theory and methodology for restoring degraded habitats. *May not be taken for credit by students who have received credit for BIOL 363 or BIOL 463. This course will be taught together with BIOL 463 by the same instructor. Enrollment restricted to students in the Biological Sciences graduate program.*