

## Biological Sciences

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Scott Zona, *Curator, Wertheim Conservatory*

## Bachelor of Science in Biological Sciences

Degree Program Hours: 120

Courses Required for the Degree  
Lower Division Program

Common Prerequisite Courses and  
Equivalencies

<u>FIU Course(s)</u>	<u>Equivalent Course(s)</u>
BSC 1010, BSC 1010L	BSCX010/X010L or BSCX010C or BSCX040/X040L or PCBX011C
BSC 1011, BSC 1011L	BSCX011/X011L or BSCX011C or BSCX041/X041L or CHMX045/X045L or CHMX045C or CHMX040 and CHMX041
CHM 1045, CHM 1045L	CHMX046/X046L or CHMX046C
CHM 1046, CHM 1046L	CHMX210/X210L or CHMX210C
CHM 2210, CHM 2210L	CHMX211/X211L or CHMX211C
CHM 2211, CHM 2211L	PHYX048/X048L or PHY053/X053L
PHY 2048, PHY 2048L	PHYX049/X049L or PHY054/X054L
PHY 2049, PHY 2049L	MACX311 or MACX233 or MACX253 or MACX081 or MACX241
MAC 2311	MACX312 or MACX282 or MACX234 or STAX023 or STAX024 or STAX321
MAC 2312 or STA 2122 and STA 3123	

Courses which form part of the statewide articulation between the State University System and the Community College System will fulfill the Lower Division Common Prerequisites.

For generic course substitutions/equivalencies for Common Program Prerequisites offered at community colleges, state colleges, or state universities, visit: <http://facts.org>. See Common Prerequisite Manual.

### Common Prerequisites

A grade of "C" or better required

<b>BSC 1010</b>	<b>General Biology I</b>
<b>BSC 1010L</b>	<b>General Biology I Lab</b>
<b>BSC 1011</b>	<b>General Biology II</b>
<b>BSC 1011L</b>	<b>General Biology II Lab</b>
<b>CHM 1045</b>	<b>General Chemistry I</b>
<b>CHM 1045L</b>	<b>General Chemistry I Lab</b>
<b>CHM 1046</b>	<b>General Chemistry II</b>
<b>CHM 1046L</b>	<b>General Chemistry II Lab</b>
<b>CHM 2210</b>	<b>Organic Chemistry I<sup>1</sup></b>
<b>CHM 2210L</b>	<b>Organic Chemistry I Lab<sup>1</sup></b>
<b>CHM 2211</b>	<b>Organic Chemistry II<sup>1</sup></b>
<b>CHM 2211L</b>	<b>Organic Chemistry II Lab<sup>1</sup></b>
<b>PHY 2048</b>	<b>Physics with Calculus I<sup>1,2</sup></b>
<b>PHY 2048L</b>	<b>General Physics Lab I<sup>1,2</sup></b>
<b>PHY 2049</b>	<b>Physics with Calculus II<sup>1,2</sup></b>
<b>PHY 2049L</b>	<b>General Physics Lab II<sup>1,2</sup></b>

**MAC 2311      Calculus I<sup>3</sup>**

<b>MAC 2312</b>	<b>Calculus II<sup>3</sup></b>
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OR

<b>STA 2122</b>	<b>Intro to Statistics I<sup>3</sup></b>
<b>STA 3123</b>	<b>Intro to Statistics II<sup>3</sup></b>

<sup>1</sup>Organic chemistry sequence or physics sequence must be taken at the Lower Division.

<sup>2</sup>Physics without Calculus I and II and corresponding labs can be substituted (PHY 2053 and PHY 2054).

<sup>3</sup>Calculus I and Calculus II must be taken in the Lower Division. If Statistics I is taken, it must be taken in the Lower Division. Calculus I and Statistics I alone are not sufficient to meet the requirements for the degree. STA 3111 and STA 3112 may be substituted for STA 2122 and STA 3123.

To qualify for admission to the department, FIU undergraduates must have met all the lower division requirements including CLAS, completed 60 semester hours, and must be otherwise acceptable to the department.

**Upper Division Program****Required Courses**

1. PCB 3043	Ecology	3
2. PCB 3063	Genetics	3
3. PCB 4023	Cell Biology	3
4. PCB 4674	Evolution	3
5. BSC 4931	Senior Seminar	1
6. Distribution Requirement		12

One additional lecture course in each of the following areas:

- A. Ecology
  - B. Organismal Diversity
  - C. Physiology/Biochemistry
  - D. Structure/Development
- (If a course satisfies the distribution requirement, the letter of the area that it satisfies is in brackets after the course description).

7. Biology Electives <sup>1</sup> 2 lecture courses	6
8. Laboratory Requirement <sup>2</sup> (Labs)	4
9. Electives outside major	9
10. A minimum of 48 credits must be earned in Upper Division courses.	

<sup>1</sup>Two upper division lecture courses (3000-level and above) to be chosen in consultation with a faculty advisor. The following courses are not allowed as Biology Electives: Student Research Labs (BSC 3915, 4914, and 6916); Workshop Biology Labs (BSC 5928, PCB 5238, BSC 6926, etc.); Cooperative Education credits (BSC 3949); Physiology of Aging (PCB 3241); and courses for non-science majors (BOT 1010, PCB 2061, PCB 2099, MCB 2000, BSC 2023, EVR 3013, OCB 2003, and OCE 3014).

<sup>2</sup>Laboratory requirement is met with any four upper division Biology labs offered with the required courses, courses that meet the distribution or Biology elective requirements.

Students interested in teacher certification should contact the College of Education at (305) 348-2768.

**Special Programs****Bachelor of Science in Marine Biology****Admission to the Program**

Students wishing to pursue the BS in Marine Biology must meet the same entry requirements as identified for admission to the BS in Biological Sciences.

Marine Biology Program activities and upper-division coursework will be concentrated at the Biscayne Bay Campus, although course requirements may be met elsewhere at FIU.

Continuity in academic advisement is an objective in this specialized degree program. Students in the BS Marine Biology Program will be advised by a dedicated Marine Biology Advising Office. Faculty in Biological Sciences, including Marine Biology faculty, also are available to provide academic and career advice for students in the Marine Biology Program.

**Courses Required for the Degree  
Lower Division Program**

The lower Division component of the Marine Biology Bachelor of Science is identical to that of the BS in Biological Sciences, in which common prerequisites in Biological Sciences, Chemistry, Physics, Calculus, and Statistics must be met. All requirements for completion of the lower division in Biological Sciences apply to the BS in Marine Biology, including the grade of "C" or better in required courses, the lower division physics, calculus, and statistics requirements, options, and acceptable substitutions.

**Upper Division Program**

The upper-division requirements for the BS in Marine Biology include a selection of seven common requirements, one required laboratory, and a choice of four marine electives, including selections from among the physical sciences. The Biological Sciences Distribution Requirement does not apply to the BS in Marine Biology.

**Common Requirements**

PCB 3043	Ecology	3
PCB 3063	Genetics	3
PCB 4023	Cell Biology	3
PCB 4674	Evolution	3
OCB 3043	Marine Biology and Oceanography	3
OCB 3043L	Marine Biology and Oceanography Lab	1
OCP 3002	Physical Oceanography	3
BSC 4931	Senior Seminar	1

**Upper-Division Electives**

Students are required to choose five from among the following upper-division Marine electives:

BOT 4402C	Marine Botany	3-4
BOT 4404	Phycology	3
BOT 5647	Ecology of Marine Vascular Plants	3
GLY 4730	Marine Geology	3
OCB 3264	Biology of Coral Reefs	3
OCB 4004	Biological Oceanography at Sea I	3
OCB 4005C	Biological Oceanography at Sea II	4
OCB 4070	Coastal Marine Conservation	3
OCB 4303	Biology of Marine Mammals	3
OCB 4632	Marine Microbial Ecology	3
OCB 4633	Marine Community Ecology	3

PCB 4467C	Marine Protected Areas	3-4
PCB 4723	Animal Physiology	3
PCB 4724	Comparative Physiology	3
PCB 4805	Endocrinology	3
ZOO 3205C	Invertebrate Zoology	4
ZOO 4454	Fish Biology	3

Other courses as approved by the Marine Biology Advising Office may also be used.

### Laboratory Requirement

The student is required to take OCB 3043L Marine Biology and Oceanography Lab, plus 3 laboratories of upper division required or elective courses.

## Bachelor of Science with Honors in Biology

### Admission to the Program

- Permission of the department. Application should be made by letter to the Curriculum Committee from the applicant after completion of two semesters at the University and prior to two semesters before graduation. The letter should state the intended research problem and be countersigned by the Thesis Committee (advisor and mentor).
- A minimum GPA of 3.5 in biology, chemistry, physics, geology, and mathematics courses.

### Graduation Requirements

- A minimum GPA of 3.5 in biology, chemistry, physics, geology, and mathematics courses.
- Completion of the BS requirements in Biology and Honors Research Lab (BSC 4915L, 1 to 3 credits, and Honors Thesis (BSC 4970, 3 credits).
- Completion of Honors research in collaboration with a two-person Honors Committee, consisting of the honors advisor and one other member. The honors advisor must be a tenured or tenure-earning member of the department. The research results must be written in the form of an honors thesis and approved by the Honors Committee.
- Deposit two completed approved copies of the Honors Thesis with the Department's Office: one copy to be kept in the department and the other to be deposited in the Library.
- Presentation of the results of the Honors Research in a departmental seminar.

## Bachelor of Science in Biological Sciences Biomedical and Premedical Honors Track

### Admission to the Program

- Admission to the program will be limited to students who have a reasonable expectation of admission to medical school based on their performance in key lower division courses listed below.
- Students will receive orientation and group advisement through the College of Arts and Sciences Pre-Health Professions Advising Center and should avail themselves of the information posted on its website <http://www.fiu.edu/~preprofc>. In addition,

the Department has a Premedical/Pre-professional Advisement Committee composed of faculty who counsel individual students on a regular basis by appointment. The individual progress of students in the program will be tracked by the department's Undergraduate Advisement Center located in OE 246.

- Students will receive provisional admission and advisement as soon as possible during their freshman year. They are encouraged to enroll in the Premedical Honors FIG which encompasses both General Chemistry and General Biology among other courses.
- Students apply for admission to the Premedical Honors Program at the end of sophomore year as they apply for their major in Biological Sciences. This timetable also applies to transfer students.
- Admission to this limited-enrollment Premedical Honors Program will be based on a GPA of 3.5 in the following prerequisite lower division courses: General Biology 1&2, General Chemistry 1&2, Organic Chemistry 1&2, Calculus 1&2 and Physics 1&2. In addition, the student must receive the sponsorship of a faculty member who will agree to supervise his/her research. Applications for admission are made in the form of a letter to the department's Biomedical and Premedical Honors Committee by the applicant. Students who lack all but one (or one semester) of the required course sequences may be given a provisional admission to the program at the discretion of the BMPM Honors Committee. Students entering as transfer students who present these lower division courses taken elsewhere with the required GPA may also be provisionally admitted.
- The courses chosen to fulfill the requirements for the Biomedical and Premedical Honors Track will be the same as for the regular B.S. program except that (a) the mathematics requirement does not include Statistics as an option (although it is highly recommended), and (b) required courses taken outside the major must include at least one of the following: ANT 3462 Medical Anthropology, PHI 4633 Biomedical Ethics, REL 3180 Medical and Bioethics or SYO 3400 Medical Sociology.
- As in the Honors Program in Biological Sciences, the Biomedical and Premedical Honors Track will require placement in a research lab and registration for BSC 4915L Honors Research Laboratory. Students must enroll in this course prior to the spring term of their 3rd year and are therefore encouraged to contact potential research mentors as early as possible. In addition, the production of an honors thesis supervised by a thesis committee, and registration for BSC 4970 Honors Thesis is also required. A list of faculty and their research interests is available from the Biology Department office in OE 167 or from [www.fiu.edu/~biology](http://www.fiu.edu/~biology).
- Graduation requirements for the B.S. in Biological Sciences, Biomedical and Premedical Honors Track: GPA of 3.5 in all science and mathematics courses, satisfactory completion of an honors thesis and presentation of results in a departmental seminar.

## Minor in Biology

### Required Courses

BSC 1010 and BSC 1011 with labs, and one upper division course (3000-level or above) in three of the following areas: A. Ecology, B. Organismal Diversity, C. Physiology/Biochemistry, or D. Structure/Development.

One of these elective courses must be at the 4000-level or higher and one must include a lab. Total upper division biology credits must number 10 or more. Grades of 'C' or better are required for all courses and labs. The following courses do not count as electives: Student Research Labs (BSC 3915, 4914, and 6916), Workshop Biology Labs (BSC 5928, PCB 5238, BSC 6926, etc.); Cooperative Education credits (BSC 3949), Physiology of Aging (PCB 3241), and any course for non-science majors (e.g., BOT 1010, PCB 2061, PCB 2099, MCB 2000, BSC 2023, EVR 3013, OCB 2003, and OCE 3014).

## Minor in Marine Biology

### Required Courses

Students must complete, with a grade of "C" or better, BSC 1010 and BSC 1011 with labs, OCB 3043 Marine Biology and Oceanography and OCB 3043L, and at least two courses from among the selection of upper-division Marine Electives that meet the BS in Marine Biology requirement.

## Pre-Medical, Dental, Optometry, and Veterinary Curricula

Students who have fulfilled the requirements for the BS in Biology will also have satisfied the course requirements for admission to the above mentioned professional schools. Some professional schools may have additional course requirements. Interested students should consult the Pre-Medical Advisor for arranging a curriculum to enhance their potential to gain admission.

## Course Descriptions

Note: Laboratories should be taken concurrently with or subsequent to lectures. Students should register for each separately.

### Definition of Prefixes

BCH - Biochemistry; BOT - Botany; BSC - Biological Science; ENY - Entomology; MCB - Microbiology; OCB - Oceanography (Biological); PCB - Process Biology; ZOO - Zoology

**BCH 3033 General Biochemistry (3). BCH 3033L Biochemistry Lab (1).** Chemistry of proteins, lipids, carbohydrates, and nucleic acids; principles of enzymology, metabolism, and bioenergetics. Prerequisites: Organic Chemistry CHM 2211 and General Biology I BSC 1010. [C]

**BCH 5040 Introduction to Biochemical Research (3).** Analysis of biochemical data and experimental design. Prerequisite: Graduate standing.

**BCH 5134C Workshop in Chromatography Techniques (1).** Workshop covers the theory and practice of chromatographic techniques to separate complex mixtures of biomolecules, including absorption, ion exchange, size exclusion and affinity chromatography. Prerequisite: Graduate status.

**BCH 5411C Techniques in Molecular Evolution Research (5).** Ribosomal genes from related organisms are amplified by polymerase chain reaction (PCR) and sequenced. Phylogenetic maps are made by computer from sequence data. Students may use material from their own research. Prerequisites: General Biochemistry BCH 3033 and Lab BCH 3033L, Molecular Biology PCB 4524 and Lab PCB 4524L or graduate status.

**BOT 1010 Introductory Botany (3). BOT 1010L Introductory Botany Lab (1).** A history of mankind's study and use of plants, and a survey of plants of economic importance. Includes lab. No science prerequisite. (Lab fees assessed)

**BOT 3014 Plant Life Histories (3). BOT 3014L Plant Life Histories Laboratory (1).** Plant form, function, and reproduction: the lives of algae, fungi, bryophytes, ferns, gymnosperms, and flowering plants. This course is designed for majors and certificate students. Prerequisites: BSC 1011. Corequisite: Concurrent registration in lecture and lab. [B]

**BOT 3154 Local Flora (3). BOT 3154L Local Flora Lab (1).** Introduction to the taxonomy and ecology of common native, cultivated, and exotic plant species in southern Florida. Laboratory observation of the gross features of vascular plants and practice in the use of keys for identification. Basic ecology of principal plant communities of Southern Florida. Field trips. Prerequisites: Introductory Botany BOT 1010 or General Biology II BSC 1011. Corequisite: Concurrent registration in lecture and lab courses. [B]

**BOT 3353 Morphology of Vascular Plants (3). BOT 3353L Morphology of Vascular Plants Lab (1).** Origin and evolution of plants, especially vascular plants of tropical origin. Analysis of vascular plant anatomy and morphology, emphasizing the underlying principles of plant construction. Prerequisites: A course in General Biology or permission of the instructor. [D]

**BOT 3434 Mycology (3). BOT 3434L Mycology Lab (1).** An introduction to the taxonomy, genetics, and physiology of fungi with special emphasis on commercially important fungi and plant and animal pathogenic fungi. Prerequisites: General Biology I BSC 1010, General Biology II BSC 1011. [B]

**BOT 3663 Tropical Botany (3). BOT 3663L Tropical Botany Lab (1).** How environmental factors affect the distribution of vegetation, and the morphology and physiology of plants in the tropics. Emphasis on tropical plants of economic importance. Prerequisites: General Biology II BSC 1011 or equivalent. Corequisite: Concurrent registration in lecture and lab courses. [B]

**BOT 3810 Economic Botany (3).** The origins, domestication and uses of economically important plants. Prerequisites: BSC 1011 General Biology II, or BOT 1010 Introductory to Botany. [B]

**BOT 4402C Marine Botany (3-4).** Introduction to the taxonomy, biology of seaweeds, seagrass and mangroves, including species identification in the field and lab. Prerequisites: BSC 1011 or equivalent. [B]

**BOT 4404 Phycology (3). BOT 4404L Phycology Lab (1).** The biology of marine and freshwater algae, with an emphasis on structure, function, reproduction, classification, and ecology. Prerequisites: BSC 1010 General Biology I, BSC 1011 General Biology II. [B]

**BOT 4503 Plant Physiology (3). BOT 4503L Plant Physiology Lab (1).** Plant growth and metabolism in relationship to environment. Photobiology, nutrient relations, transport, and hormones in relation to plant development and function. Prerequisite: BSC 1010 General Biology I and BSC 1010L General Biology I Lab, BSC 1011 General Biology II, CHM 2210 Organic Chemistry I. [C]

**BOT 4601 General Plant Ecology (3). BOT 4601L General Plant Ecology Lab (1).** An examination of the ecology of plants at the individual, population, and community levels. Prerequisites: PCB 3043 or permission of the instructor.

**BOT 4684 Taxonomy of Tropical Plants (3). BOT 4684L Taxonomy of Tropical Plants Lab (1).** Introduction to higher plant taxonomy, including nomenclature, modern systems of angiosperm classification, and angiosperm evolution. Emphasis on identification of tropical plant families and plants of economic importance. Prerequisites: Local Flora BOT 3154 or Tropical Botany BOT 3663 or permission of the instructor. [B]

**BOT 5186C Advanced Marine Botany (3-4).** Study of the taxonomy, biology, and ecology of seaweeds, seagrasses, and mangroves including a student research project. Prerequisites: BSC 1011 or equivalent.

**BOT 5304C Workshop in Plant Morphology (2).** Techniques to analyze plant form and experience with the diversity plant morphology; field work using the collections at Fairchild Tropical Gardens. Prerequisites: 2 botany courses or permission of the instructor.

**BOT 5515 Biochemistry of Plant Natural Products (3).** Aspects of primary and secondary plant metabolism will be covered including biosynthesis and degradation of natural products as well as their biological/pharmacological activity. Prerequisites: BCH 3033 General Biochemistry or CHM 4304 Biological Chemistry I. [C]

**BOT 5575 Photobiology (3). BOT 5575L Photobiology Lab (1).** The study of basic photochemical mechanisms as they occur in molecular biological processes such as photosynthesis, plant growth, animal vision, bioluminescence, and radiation damage. Prerequisite: Permission of the instructor. [C]

**BOT 5602 The Functional Ecology of Tropical Plants (3). BOT 5602L The Functional Ecology of Tropical Plants Lab (1).** The relationship of climate and soils to the distribution and function of the major plant groups of the tropical regions. Prerequisites: Two courses in botany or permission of the instructor. [A]

**BOT 5605 Plant Ecology (3). BOT 5605L Plant Ecology Lab (1).** In-depth study of plant ecology at 3 levels: individual, population, and community. Laboratory and field exercises will examine lecture topics. Prerequisites: Ecology PCB 3043 or permission of the instructor. Corequisite: Concurrent registration in lecture and lab courses. [A]

**BOT 5615 Workshop: Seed Conservation (1).** Covers practical issues of seed conservation of tropical plants: longevity curves, seed germination protocols and seed conservation procedures. Prerequisites: Graduate students or permission of instructor.

**BOT 5647 Ecology of Marine Vascular Plants (3).** Biology and ecology of seagrasses and mangroves, with an emphasis on South Florida and Caribbean species. Physiological ecology, population and community ecology, and ecosystem processes. Prerequisite: Permission of the instructor. [A]

**BOT 5648 Workshop on Aquatic Plants (1).** Biology and identification of aquatic plants. Prerequisites: Graduate status or permission of the instructor.

**BOT 5682 Florida Plant Communities (3).** Two-week field trip to many diverse plant communities of the state. Ecological and environmental factors influencing plant distribution will be examined, contrasting vegetation among sites. Prerequisites: General Biology II BSC 1011 and Ecology PCB 3043 or permission of the instructor. [A]

**BOT 5704 Botanical Terminology, Latin and Nomenclature (2).** Course is divided into 3 parts: 1) Botanical Latin and its use; 2) Plant description terminology, and current descriptive standards; and 3) Botanical nomenclature, the ICBN, Phylocode, and others. Prerequisites: Plants Systematics (BOT 5725C) or Systematic Biology (BSC 5606), or approval of the Advisor.

**BOT 5725C Plant Systematics (3).** Theory and methods of classification of vascular plants using phylogenetic principles. Covers the integration of morphological and molecular characters. Prerequisites: Graduate students or permission of the instructor.

**BOT 5727 Plant Genetics (3).** Topics related to higher plants, including polyploid inheritance, self-incompatibility, cytoplasmic inheritance, mutable alleles, complex loci, genome analysis, recombination and mutagenesis. Prerequisites: General Biology I and II (BSC 1010 and 1011) and Genetics (PCB 3063).

**BOT 5728 Plant Molecular Systematics (2).** DNA markers for phylogenetic analysis of vascular plants, including description of laboratory methods, computerized analytical techniques and evolutionary interpretation. Prerequisites: Graduate status or permission of the instructor.

**BOT 5728L Plant Molecular Systematics Laboratory (2).** DNA markers for phylogenetic analysis of vascular plants, including description of laboratory methods, computerized analytical techniques and evolutionary interpretation. Prerequisites: Graduate status or permission of the instructor.

**BOT 5816 Ethnobotany (3).** Review the use and management of plants by indigenous people. Discuss emerging theories in ethnobotany, examine the role of ethnobotany in conservation and resource utilization. Prerequisites: Economic Botany BOT 3810, Tropical Botany BOT 3663, Cultural Ecology ANT 3403, or permission of the instructor.

**BOT 5816L Ethnobotany Workshop (1).** Field methods in the study of plant use by traditional and modern societies. Examines botanical documentation, ethnological description and experimental design. Prerequisites: Graduate status or permission of the instructor.

**BOT 5817 Field Ethnobotany (1-4).** A 4-week field course that introduces students to tropical vegetation and its use by traditional cultures. Topics include tropical botany, diversity, ecology, and the relationship between plants and people. Course may be repeated. Prerequisites: BOT 5816 and BOT 5816L or permission of the instructor.

**BOT 5852 Medical Botany (3).** An examination of medicinal plants including the biology, chemistry, and pharmacology of botanical remedies, and their effects on human health. Prerequisites: Economic Botany or BOT 5816 or permission of the instructor.

**BOT 5924 Workshop in Tropical Plant Families (3).** An introduction to important spermatophyte families, including systematics, ecology, and conservation. Prerequisite: Permission of the instructor. [B]

**BOT 5925 Workshop in the Biology of Southern Florida's Native Trees (3).** Distribution, floristic relationships, morphology, reproductive biology, taxonomy, and conservation of trees native to southern Florida. Prerequisites: Local Flora BOT 3154, Tropical Botany BOT 3663, or permission of the instructor. [B]

**BOT 5928 Workshop on Grasses and Sedges of Southern Florida (1).** The systematics, ecology, and identification of South Florida grasses and sedges. Prerequisites: Graduate status or permission of the instructor.

**BSC 1010 General Biology I (3). BSC 1010L General Biology I Lab (1).** Biomolecules, cells, energy flow, genetics, and physiology. Science background or Biology major recommended. (Lab fees assessed)

**BSC 1011 General Biology II (3). BSC 1011L General Biology Lab II (1).** A survey of organismal biology with emphasis on botany and zoology. Science background or Biology major recommended. (Lab fees assessed)

**BSC 2023 Human Biology (3). BSC 2023L Human Biology Lab (1).** Biological and general scientific principles governing human structure, function, health, and relationship to the planetary environment. For non-science majors. (Lab fees assessed)

**BSC 3364 Research in Tropical Ecosystems (3).** Biology, Earth Sciences and Environmental Studies faculty describe research in marine and terrestrial ecosystems, geology, conservation and education. Students discuss scientific ideas. [A]

**BSC 3392 Science Concept Mapping: Biological Sciences (1).** An introduction to the process of concept mapping and its application to the Biological Sciences. Topics include those included in standardized exams such as the MCAT and DAT. Prerequisites: BSC 1010 and BSC 1011.

**BSC 3915, 4914 Student Research Lab I and II (1-12).** Independent laboratory study in a project or projects of the student's choice. Registration by consultation with instructor. May be repeated for additional credit.

**BSC 3949 Cooperative Education in Biology (1-3).** A student majoring in biological sciences may spend several terms employed in industry or government in a capacity relating to the major. Prerequisites: Permission of Co-op Education and major department.

**BSC 4303 Biogeography (3).** Current issues concerning geographic distribution of plants and animals. Prerequisites: Ecology PCB 3043 and Evolution PCB 4674. [A]

**BSC 4304 Environments of the Past (3).** The biogeography, diversity and ecology of ancient life is combined with the study of sediments and stable isotopes to interpret environmental changes of the past at the local to global scale. Prerequisite: Permission of the instructor. [A]

**BSC 4361 Biodiversity of Tropical Islands (3).** Current issues on evolution, diversification and conservation of flora and fauna on tropical islands. Prerequisites: Genetics PCB 3063, Ecology PCB 3043, and Evolution PCB 4674. [A]

**BSC 4363 Biodiversity in the Caribbean Basin (3).** Current issues on evolution, conservation, and diversification of biota of the Caribbean Basin. Prerequisites: BSC 1010, BSC 1011 General Biology I and II. [A]

**BSC 4422 Biotechnology: Applications in Industry, Agriculture and Medicine (3).** Biological, biochemical, ecological, engineering, entrepreneurial, and ethical aspects of biotechnology in industry, agriculture, and medicine. [D]

**BSC 4434 Bioinformatics for Biologists (3).** Introduction to bioinformatic resources/methods for biologists. Accessing, searching, retrieving, and analyzing data, including sequence alignment, phylogenetic analysis, and structure prediction. Prerequisites: BSC 1010, BSC 1011, PCB 3063. [B]

**BSC 4443 Functional Genomics and Proteomics (3).** Introduction to the importance of functional genomics and proteomics in biological research. Prerequisite: PCB 3063. [C]

**BSC 4915L Honors Research (1-3).** Laboratory and/or field study in consultation with an Honors Thesis advisor. Prerequisite: Admission into Honors in Biological Sciences Program.

**BSC 4931 Senior Seminar (1).** An exploration of various research works in biological sciences. Oral presentation by the students required. Prerequisite: Senior standing.

**BSC 4934 Topics in Biology (1-3).** An intensive study of a particular topic or limited number of topics not otherwise offered in the curriculum.

**BSC 4970 Honors Thesis (3).** Writing an Honors Thesis. Prerequisite: BSC 4915L.

**BSC 5302 Ecosystems of the Past (3).** Analysis of local to global change in environments through time using faunal distributions, biodiversity, biogeography, physical and chemical properties of sediments, and stable isotopes. Prerequisite: Permission of the instructor. [A]

**BSC 5405C Environmental Instrumentation (3).** Theory and techniques for measurement of environmental parameters of interest to field biologist. Prerequisite: Permission of the instructor. [C]

**BSC 5406 Forensic Biology (3).** Forensic applications of molecular biology including PCR, STR techniques and other laboratory methods and data interpretation. Prerequisite: Graduate status. [D]

**BSC 5446 Advanced Functional Genomics and Proteomics (3).** Analysis of Modern Strategies to understand fundamental biological aspects using advanced genomics and proteomic approaches. Prerequisites: PCB 3063 or equivalent.

**BSC 5459 Advanced Bioinformatics for Biologists (3).** Introduction to bioinformatic resources/methods for biology graduate students, accessing, searching, retrieving, and analyzing data, including an in-depth research project. Prerequisites: BSC 1010, BSC 1011, PCB 3063.

**BSC 5926 Graduate Bioresource Workshop (1).** This workshop is designed to introduce Biology graduate students to the various resources available for graduate teaching and research. Prerequisite: Graduate status.

**BSC 5928 Workshop: Vertebrate Animal Research (1).** Reviews the ethical, legal and practical guidelines for conducting research with live vertebrate animals. Required for students capturing, handling or collecting vertebrate animals in the course of research or teaching. Prerequisites: Graduate status or permission of the instructor.

**BSC 5929 Workshop: Paleoecology of South Florida (2).** Sampling, preparation, and identification of diatoms and foraminifera from a freshwater to marine transect, and application of ecology to interpreting past ecosystems. Prerequisite: Permission of the instructor.

**BSC 5933 Current Topics in Tropical Biology (3).** An intensive study of particular tropical biology topics not otherwise offered in the curriculum. Prerequisite: Permission of the instructor.

**BSC 5936 Glaser Seminar: The Biology of Tomorrow (1).** A series of lectures by an invited, internationally recognized authority in biological topics of current and future concern.

**ENY 1004 General Entomology (3).** **ENY 1004L Entomology Lab (1).** The morphology, systematics, physiology and ecology of the major insect orders, and introduction to basic field procedures. Prerequisite: General Biology II BSC 1011.

**ENY 4060 Entomology (3).** **ENY 4060L Entomology Laboratory (1).** Explorations of the morphology, physiology, behavior and metabolism of insects in the context of their evolutionary, environmental and economic significance. Prerequisites: General Biology I BS 1010, General Biology II BSC 1011, or permission of the instructor. [B]

**MCB 2000 Introductory Microbiology (3).** **MCB 2000L Introductory Micro Lab (1).** Basic concepts of microbes as pathogens, food spoilage and fermentative organisms. Microbial relationships to immunology, sanitation, pollution and geochemical cycling. Not applicable for majors in Biological Sciences. (Lab fees assessed)

**MCB 3020 General Microbiology (3).** **MCB 3020L General Microbiology Lab (1).** Introduction to the principles and techniques of microbiology, genetics, taxonomy, biochemistry and ecology of microorganisms. Prerequisites: Organic Chemistry I CHM 2210 and Organic Chemistry II CHM 2211; and General Biology I BSC 1010 and General Biology II BSC 1011; or permission of the instructor. [B]

**MCB 4022 Diversity of Microbes (3).** An introduction to the diversity of microbes to include the structural and functions dynamics and interactions as assessed by traditional or genetic methods. Prerequisites: MCB 3020 or instructor's permission. [B]

**MCB 4203 Microbial Pathogenicity (3).** **MCB 4203L Microbial Path Lab (1).** Host-parasite relationships: physiology of bacterial, fungal and viral pathogens emphasizing mechanisms of pathogenicity and the host response. Prerequisite: General Microbiology MCB 3020. [C]

**MCB 4404 Microbial Physiology (3).** **MCB 4404L Microbial Physiology Lab (1).** Introduction to the study of physiological and metabolic activities of microorganisms and processes that affect them. Prerequisites: General Microbiology MCB 3020 and Lab MCB 3020L. [C]

**MCB 4503 Virology (3).** **MCB 4503L Virology Lab (1).** Principles and methods of study of bacterial, plant, and animal viruses. Molecular aspects of viral development, virus pathogens, and carcinogens. Prerequisites: CHM 2210 Organic Chemistry I. [C]

**MCB 4603 Microbial Ecology (3).** **MCB 4603L Microbial Ecology Lab (1).** Principles and applications of microbial interactions with the environment: physical, chemical, and biological. Prerequisites: General Microbiology MCB 3020 and Lab MCB 3020L. [A]

**MCB 4653 Food Microbiology (3).** **MCB 4653L Food Microbiology Lab (1).** Public Health microbiology of water and sewage, microbiology of food preparation and spoilage; industrial aspects of microbiology. Prerequisites: General Microbiology MCB 3020 and Lab MCB 3020L. [A]

**MCB 5114 Microbial Diversity (3).** **MCB 5114L Microbial Diversity Laboratory (1).** Analysis of metabolic and morpho-logical diversity in bacteria in the context of bacterial systematics. Prerequisites: General Microbiology MCB 3020 and Lab MCB 3020L; additional course in microbiology or biochemistry. Corequisite: Concurrent registration in lecture and lab courses. [B]

**MCB 5315C Workshop: Prokaryotic Cloning (2).** Description of molecular genetic methods for manipulation of prokaryotic DNA. Prerequisites: PCB 3063 Genetics; BCH 3033 General Biochemistry; or CHM 4304 Biological Chemistry I or permission of the instructor.

**MCB 5405 Biology of Photosynthetic Bacteria (3).** Study of the physiology and ecology of photosynthetic bacteria, including Blue-green algae (cyanobacteria), purple and green bacteria, and Halobacteria. [A]

**MCB 5412 Advanced Microbial Physiology (3).** Overview of microbial metabolic diversity, including prokaryotic metabolic pathways, stress responses, cell signaling, and metabolic regulation. Prerequisite: Permission of the instructor.

**MCB 5453L Workshop: Prokaryotic Cell Signaling (1).** Covers chemical signals used by prokaryotes for cell-to cell communications. Prerequisites: MCB 3020 or permission of the instructor.

**MCB 5605 Microbial Ecology (3).** Principles and applications of microbial interactions with the environment. Current research areas are emphasized. Prerequisite: Graduate Level Standing.

**OCB 2003 Introductory Marine Biology (3). OCB 2003L Introductory Marine Biology Lab (1).** A survey of marine biological environments and zones, including the relationship of the physical and chemical environment to the distribution of marine plants and animals. (Lab fees assessed)

**OCB 3043 Marine Biology and Oceanography (3). OCB 3043L Marine Biology and Oceanography Laboratory (1).** An ecological approach to the biology of organisms in the marine environment with an emphasis on zonation and adaptation to the physical environment. Intended for biology majors or other science majors. Prerequisites: General Biology I BSC 1010 and General Biology II BSC 1011. [A]

**OCB 3264 Biology of Coral Reefs (3).** Biology and ecological relationships of reef plants and animals with emphasis on their role in reef construction or bioerosion; reef constructional environments symbiotic relationships and biogeography. Prerequisites: General Biology II BSC 1011 or Zoology. Ecology recommended. [A]

**OCB 4004 Biological Oceanography at Sea I (3).** An overview of current methods applied in biological oceanography including design of and working on research vessels and planning of research cruises. Prerequisite: OCB 3043.

**OCB 4005C Biological Oceanography at Sea II (4).** Experience in research at sea involving cruise planning, participation in a research cruise, and sample data analysis. Methods oriented lectures/seminars and participation in lab and shipboard work. Prerequisites: OCB 4004 or permission of the instructor.

**OCB 4070 Coastal Marine Conservation (3).** An overview of the basic subdisciplines - including science, governance, and policy - required for a detailed understanding of the most pressing problems threatening our coastal ecosystems. Prerequisites: OCB 3043 or PCB 3043. [A]

**OCB 4303 Biology of Marine Mammals (3).** A survey of marine mammals including evolution, systematics, morphology, physiology, behavior, population dynamics, ecology, conservation and theory relevant to these areas of biology. Prerequisites: BSC 1010 and 1011 and PCB 3043 or OCB 3043. [B]

**OCB 4632 Marine Microbial Ecology (3).** Diversity, ecology and physiology of marine viruses, bacteria and protozoa, their role in marine food webs and the biogeochemical cycling of carbon and nutrients, and the significance of microbial food webs for marine productivity. Prerequisites: BSC 1010, BSC 1011, OCB 3043. [A]

**OCB 4633 Marine Community Ecology (3).** A survey of the ecological patterns, processes, and interactions in marine environments with an emphasis on the ecology of different ecosystems and interactions among organisms. Prerequisite: PCB 3043. [A]

**OCB 5006 Advanced Biological Oceanography at Sea I (3).** An in-depth overview and critical discussion of current methods employed in biological oceanography including design of and working on research ships and planning of research cruises. Prerequisite: Permission of the instructor.

**OCB 5007C Advanced Biological Oceanography at Sea II (4).** A hands-on experience in research at sea involving cruise planning, participation in an offshore cruise on a research vessel, and subsequent sample analysis, data evaluation and research report. Prerequisites: OCB 5006 or permission of the instructor.

**OCB 5575L Workshop: Aquatic Flow Cytometry (1).** A practical introduction to theories and applications of flow cytometry in the analyses of aquatic microorganisms (bacteria, phytoplankton) and their physiology. Prerequisite: Permission of the instructor.

**OCB 5634 Marine Ecology (3). OCB 5634L Marine Ecology Lab (1).** Review of processes determining species distribution and abundance in marine ecosystems. Energy flow and trophic relationships examined. Prerequisite: Ecology PCB 3043. Corequisite: Concurrent registration in lecture for lab courses. [A]

**OCB 5636 Advanced Marine Microbial Ecology (3).** Diversity, ecology and physiology of marine viruses, bacteria and protozoa, their role in marine food webs and the biogeochemical cycling of carbon and nutrients, and the significance of microbial food webs for marine productivity. Prerequisites: BSC 1010, BSC 1011, OCB 3043, or graduate standing.

**OCB 5670L Techniques in Biological Oceanography (1).** A laboratory course designed to acquaint the student with biological sampling techniques at sea. Shipboard experience will be required as part of the course. Prerequisites: Previous course in marine biology and permission of the instructor.

**PCB 2061 Introductory Genetics (3). PCB 2061L Introductory Genetics Lab (1).** Principles of Mendelian and molecular genetics with selected examples of applications such as genetic engineering and twin studies.



**PCB 2099 Foundations of Human Physiology (3). PCB 2099L Foundations of Human Physiology Lab (1).** Functional survey of the organ systems of the human body. Intended primarily for non-science majors. (Lab fees assessed)

**PCB 3043 Ecology (3). PCB 3043L Ecology Lab (1).** The basic principles governing the interaction of organism and environment. Trophic structure and energetics, species diversity, evolution of populations, biogeochemical cycles. Prerequisites: General Biology I BSC 1010 and General Biology II BSC 1011. [A]

**PCB 3063 Genetics (3). PCB 3063L Genetics Lab (1).** Mendelian inheritance and introduction to molecular genetics. Prerequisites: BSC 1010 General Biology I. [D]

**PCB 3241 Physiology of Aging (3).** Introductory treatment of the physiology of organ systems with emphasis on the decline in organ function with aging and on the resultant limitations in physiological performance.

**PCB 3374 Tropical Ecology (3).** In-depth survey of tropical climatology, ecological processes characteristic of tropical habitats, and biodiversity and conservation of tropical regions. Prerequisite: PCB 3043. [A]

**PCB 3702 Intermediate Human Physiology (3). PCB 3702L Intermediate Human Physiology Lab (1).** Functions of the human body and the physio-chemical mechanisms responsible for each organ's function. Prerequisites: General Biology I BSC 1010 or General Biology II BSC 1011. [C]

**PCB 3703 Human Physiology I (3). PCB 3703L Human Physiology I Lab (1).** Basic facts and concepts relating to the physiology of cells and nervous, muscular, and cardiovascular systems, with emphasis on regulatory mechanisms and abnormal physiology. Prerequisite: BSC 1010 General Biology I. Prerequisite or Corequisite: PCB 3703. [C]

**PCB 3704 Human Physiology II (3). PCB 3704L Human Physiology II Lab (1).** Physiology of respiratory, gastrointestinal, excretory, endocrine and reproductive systems. Continuation of PCB 3703. Prerequisite: BSC 1010 General Biology I. Prerequisite or Corequisite: PCB 3704. [C]

**PCB 3711 Physiological Mechanisms (3).** Biophysical and biochemical perspective; Integrative aspects of physiology are de-emphasized to accomplish a detailed, but introductory coverage of mechanisms. [C]

**PCB 4023 Cell Biology (3).** A structural and molecular analysis of cell function. Prerequisite: BSC 1010 General Biology I, CHM 1046 General Chemistry II. [C]

**PCB 4023L Cell Biology Lab (1).** Fundamentals of cell/histological identification and current techniques used to study cells. Prerequisite: PCB 3063.

**PCB 4232 The Biology of Acquired Immune Deficiency Syndrome (AIDS) (3).** An overview of Acquired Immune Deficiency Syndrome (AIDS) from biomedical and psychosocial perspectives. Prerequisites: General Biology I BSC 1010, General Biology II BSC 1011, General Chemistry I CHM 1045, and General Chemistry II CHM 1046. [A]

**PCB 4233 Immunology (3). PCB 4233L Immunology Lab (1).** Fundamentals of immunology including antibody structure, immunopathology, molecular recognition at cell surfaces and immunological aspects of cancer biology. Prerequisites: BSC 1010 General Biology I. [C]

**PCB 4253 Developmental Biology (3).** Comprehensive survey of principles of development and critical analysis of methods used to study these problems. Prerequisites: PCB 3063 Genetics or BCH 3033 or General Biochemistry. [D]

**PCB 4301 Freshwater Ecology (3). PCB 4301L Freshwater Ecology Laboratory (2).** Community-level analysis of marshes, lakes and rivers from theoretical and practical viewpoints, emphasizing quantitative description of community structure and function. Prerequisite: Ecology PCB 3043. Prerequisite or Corequisite: PCB 4301. [A]

**PCB 4373 Amphibian Ecology (3).** In-depth survey of the ecology of members of the vertebrate class Amphibia (caecilians, salamanders, and frogs). Prerequisite: PCB 3043. [A]

**PCB 4414 Behavioral Ecology (3).** Investigation of the adaptive significance of behavior. Synthesis and discussion of literature and theory pertaining to the strategies and tactics organisms use to survive and reproduce. Prerequisite: PCB 3043.

**PCB 4442 Community Ecology (3).** Dynamic and descriptive community ecology: interactions among >2 species, patterns in species co-occurrences across space and time. Terrestrial, aquatic, and marine examples and applications. Prerequisites: PCB 3043, MAC 2311. [A]

**PCB 4452 Introduction to Wetland Ecology and Management (3).** Principles of wetland ecology and their application to management of freshwater and estuarine wetlands. Prerequisites: PCB 3043 or permission of the instructor. [A]

**PCB 4467C Marine Protected Areas (1-4).** Introduction to the theory and methods for the design and management of Marine Protected Areas. [A]

**PCB 4514 Advanced Genetics (3).** Advanced level treatment of topics such as meiotic disjunction-uniparental disomy, transcription & splicing -differential splicing, polymorphisms, chromatin organization, horizontal gene transfer, etc. Prerequisite: Genetics PCB 3063. [C]

**PCB 4524 Molecular Biology (3). PCB 4524L Molecular Biology Lab (1).** Advanced nucleic acid and protein biochemistry: biosynthesis of macro-molecules and molecular genetics. Prerequisites: PCB 3063 Genetics, BCH 3033 Biochemistry or CHM 4304 Biological Chemistry I. [C]

**PCB 4663 General Human Genetics (3).** Examination of genetics as it applies to the normal and abnormal human condition. Includes topics such as genetic engineering, cloning, and human evolution. Prerequisite: PCB 3063. [D]

**PCB 4673 Evolutionary Ecology (3). PCB 4673L Evolutionary Ecology Lab (1).** Adaptation and interaction of plants and animals in natural and disturbed habitats. Prerequisites: PCB 3043 and PCB 3063. [A]

**PCB 4674 Evolution (3).** A study of the synthetic theory of evolution, its historic and experimental justification and the mechanisms of natural selection. Prerequisites: PCB 3063 Genetics, PCB 3043 Ecology. [B]

**PCB 4723 Animal Physiology (3). PCB 4723L Animal Physiology Lab (1).** Advanced study of physiological mechanisms employed by animals to maintain function of the organ systems and to interact with the environment. Prerequisites: BSC 1010, BSC 1011, and CHM 2211. [C]

**PCB 4724 Comparative Physiology (3). PCB 4724L Comparative Physiology Lab I (1).** Regulation of the internal environment: osmotic gastrointestinal, metabolic, circulatory and respiratory physiology. Prerequisites: General Biology I BSC 1010 and II BSC 1011 and Organic Chemistry I CHM 2210. [C]

**PCB 4733 Human Systemic Physiology I (3). PCB 4733L Human Systemic Physiology Lab (1).** Selected topics in human physiology with emphasis on topics of clinical significance. Prerequisites: BSC 1010 General Biology I. [C]

**PCB 4734 Human Systemic Physiology II (3).** Selected topics in human physiology with emphasis on topics of clinical significance. Prerequisites: BSC 1010 General Biology I. [C]

**PCB 4805 Endocrinology (3).** Biochemistry, physiology and anatomy of the endocrine systems of vertebrates and invertebrates. Steroid, peptide, and terpenoid hormones which control reproduction, growth, and other parameters. Prerequisites: General Biology II BSC 1011, Organic Chemistry II CHM 2211, and one physiology course. [C]

**PCB 4805L Endocrinology Laboratory (1).** A series of lab exercises and experiments designed to supplement lecture material in PCB 4805, and coordinated with that content. Prerequisites: General Biology I and II, permission of the instructor. Corequisite: PCB 4805.

**PCB 5025L Molecular Biology Techniques Laboratory (3).** Covers DNA and RNA extraction, digestion, electrophoresis, Southern analysis, RFLP analysis, PCR amplification, cloning and automated sequencing. Prerequisites: Graduate status or permission of the instructor.

**PCB 5184 Workshop in Microtechnique (1).** Laboratory techniques required for preparation of tissues for light microscopy-histological study. Prerequisites: Graduate status or permission of the instructor.

**PCB 5195 Histochemistry/Microtechnique (3). PCB 5195L Histochemistry/Microtechnique Lab (1).** Chemistry and use of fixatives and dyes; histochemistry emphasizes procedures used in research and pathology labs including techniques for enzymes, protein, carbohydrate, nucleic acids and lipids. Prerequisites: General Biochemistry BCH 3033.

**PCB 5215 Workshop in Histo- and Immunocytochemistry (1).** Laboratory techniques for preparation of paraffin-embedded and frozen sections; selected procedures to demonstrate the fundamentals of histochemical and immunocytochemical labeling methods. Prerequisites: Graduate status or permission of the instructor.

**PCB 5235 Current Topics in Comparative Immunology (1).** A weekly seminar/discussion course consisting of research presentations by students, faculty and visiting scientists in the area of comparative immunology. It is recommended for students with a research interest in the comparative study of mammalian and nonmammalian species or using alternative animal models. Prerequisite: Permission of the instructor.

**PCB 5236 Immune Assessment (3).** A review of the genetics and biochemistry of immune dysfunction with a focus on the methods used to evaluate adaptive and innate immunological function. Prerequisites: PCB 4233 or permission of the instructor.

**PCB 5238 Marine Comparative Immunology Workshop (1).** A workshop at the Keys Marine Lab to present general and unique research methodologies associated with the immunology of marine animals. Prerequisite: Permission of the instructor.

**PCB 5239 Immunophysiology (3).** Physiological and endocrine regulation of the vertebrate immune system. Prerequisite: Immunology PCB 4233.

**PCB 5259 Topics in Developmental Biology (3).** Molecular and cellular mechanisms in the development of plants and animals. Prerequisite: Permission of the instructor. [D]

**PCB 5307 Limnology (3). PCB 5307L Limnology Lab (1).** Chemical and physical properties of standing and flowing freshwater systems; ecophysiology and interactions of the fresh water flora and fauna in relation to abiotic factors; oligotrophic to eutrophic conditions. [A]

**PCB 5327 Coastal Ecosystems and Modeling (3).** Basics of ecology for coastal and wetland ecosystems. The theory and mechanisms of simulation modeling. Hands-on creation and application of computer models in ecological research. Prerequisites: Ecology PCB 3043 and Calculus I MAC 2311 or permission of the instructor. [A]

**PCB 5328 Spatial and Landscape Ecology (3).** Ecological processes with spatial components, including neighborhood interactions, foraging, metapopulations, infectious diseases, invasive species, and habitat associations. Prerequisites: PCB 5423 Advanced Ecology – Population and Community. Corequisites: PCB 5454 Advanced Ecology – Community Ecosystems; MAC 2311 Calculus.

**PCB 5356L Tropical Ecology Field Lab (3).** Field course in Costa Rica with fieldwork in two or more diverse habitats (rainforest, and dry forest). Emphasis on diversity and interactions between species. Visits to selected sites of deforestation, conservation and restoration. [A]

**PCB 5376 Animal Physiological Ecology (3). PCB 5376L Animal Physiological Ecology Laboratory (1).** Evolution-oriented approach to physiological adaptations of animals living in diverse environments. Considers the inter-relationship between behavior, energetics, and integrative regulation of metabolism. Prerequisites: PCB 3043 Ecology, BCH 3033 General Biochemistry or CHM 4304 Biological Chemistry I. [C]

**PCB 5405 Biochemical Ecology (3).** Principles of chemical communication between diverse organisms and the importance of a variety of allelo-chemicals in community structure. Prerequisite: Permission of the instructor.

**PCB 5407 Workshop: Microelectrodes in Microbial Ecology (1).** Use of microelectrodes to measure chemical micro-environments and biological processes in natural samples. Hands-on experience with O<sub>2</sub> and pH electrodes. Prerequisite: Permission of the instructor.

**PCB 5415 Advanced Behavioral Ecology (3).** In-depth investigation of the adaptive significance of behavior. Synthesis and discussion of literature and theory pertaining to the strategies and tactics organisms use to survive and reproduce. Prerequisites: Graduate status or permission of the instructor.

**PCB 5418C Advanced Marine Protected Areas (1-4).** Study of theory and methods for the design and management of Marine Protected Areas including a research project.

**PCB 5423 Advanced Ecology: Populations and Communities (3).** Advanced analysis of population and community ecology. Prerequisites: Ecology PCB 3043 or permission of the instructor or graduate status. [A]

**PCB 5443 Advanced Ecology: Communities and Ecosystems (3).** Advanced analysis of ecological principles pertaining to communities, ecosystems, and landscapes, with special emphasis on the South Florida and Caribbean region. Prerequisites: Ecology PCB 3043 or permission of the instructor or graduate status. [A]

**PCB 5596 Workshop: In Situ Hybridization (1).** Analysis of gene expression by in situ hybridization techniques using whole mount and cry sectioned tissues. Prerequisites: Graduate status or permission of the instructor.

**PCB 5615 Molecular and Organismal Evolution (3).** The evolutionary relationships among nucleotides and proteins as well as the processes which yield these relationships. The possible molecular events leading to speciation. Prerequisites: PCB 3063.

**PCB 5616 Applied Phylogenetics (3).** Methods of phylogenetic analysis with focus on pragmatic applications to ecological and evolutionary studies. Hands-on experience with current computer programs for phylogenetic analysis. Prerequisites: Graduate status or permission of the instructor. [B]

**PCB 5665 Human Genetics (3).** Principles and techniques in the analysis of the human race. Prerequisite: Genetics PCB 3063. [D]

**PCB 5677 Evolution and Development (3).** The models and evidence for the interaction of development and evolution, using both plant and animal systems. Prerequisite: Permission of the instructor.

**PCB 5685 Population Genetics (3).** Advanced analysis of gene and genotype frequencies in theoretical populations and analysis of real data. Linkage equilibrium, drift, migration and selection are a few of the topics covered. Prerequisite: Genetics (PCB 3063). [A]

**PCB 5686 Population Biology (3).** **PCB 5686L Population Biology Lab (1).** Intrinsic properties of natural and theoretical populations and their dynamics and interactions, and responses to disturbance. Includes field problems and computer exercises. Prerequisites: Genetics PCB 3063 and Evolution PCB 4674, or permission of the instructor. [A]

**PCB 5687 Evolutionary Ecology (3).** **PCB 5687L Evolutionary Ecology Lab (1).** Adaptations and interactions of plants and animals in natural and disturbed habitats. Prerequisite: Ecology PCB 3043. [A]

**PCB 5725 Membrane Signal Transduction (3).** Hormones and neurotransmitters as extracellular messengers. Membrane receptors and mechanisms of signal transduction: membrane channels and enzymes, direct linkage and G-protein linkage. Second messengers. Prerequisites: BCH 3033 General Biochemistry or CHM 4304 Biological Chemistry I. [C]

**PCB 5786 Membrane Physiology (3).** Chemical and physical properties of the plasma membrane, its biosynthesis and functions in transport and signal transduction. Prerequisites: PHY 2048 Physics with Calculus I, PHY 2049 Physics with Calculus II, BCH 3033 General Biochemistry. [C]

**PCB 5835 Neurophysiology (3).** **PCB 5835L Neurophysiology Lab (1).** Comparative neurophysiology; physico-chemical mechanisms of resting and action potentials; synaptic transmission; neural coding and integration; sensory-motor function and neurophysiological basis of behavior. Prerequisites: Biochemistry BCH 3033 and Calculus I MAC 2311. [C]

**ZOO 3021 Comparative Zoology (3).** **ZOO 3021 Comparative Zoology Lab (1).** Characteristics, evolutionary relationships and physiological adaptations of metazoan animal groups from porifera through the chordates. Prerequisites: General Biology I BSC 1010 and II BSC 1011 with Labs BSC 1010L and BSC 1011L. [B]

**ZOO 3205C Invertebrate Zoology (4).** Taxonomy, anatomy, development, physiology and ecology of major invertebrate groups, including terrestrial and aquatic phyla. Prerequisite: General Biology II BSC 1011. [B]

**ZOO 3303 Vertebrate Zoology (3).** **ZOO 3303L Vertebrate Zoology Lab (1).** Systematics, anatomy, physiology, development and ecology of vertebrate animals. Prerequisites: General Biology I BSC 1010 and II BSC 1011 with Labs BSC 1010L and BSC 1011L. [B]

**ZOO 3327 Human Evolutionary Morphology (3).** The major evolutionary adaptations that have led to the unique biocultural characteristics of the human species. Prerequisites: ZOO 3731. [D]

**ZOO 3378C Forensic Osteology (4).** A detailed examination of the human skeleton revealing such individual traits as sex, age, height, and race in order to assist law enforcement investigation in forensic identifications. Prerequisite: Permission of the instructor. [D]

**ZOO 3603 Embryology (3). ZOO 3603L Embryology Lab (1).** Animal morphogenesis. Laboratory must be taken with lecture. Prerequisites: General Biology I BSC 1010 and II BSC 1011 with Labs BSC 1010L and BSC 1011L. [D]

**ZOO 3713C Comparative Vertebrate Anatomy (4).** Study of the structural diversity and classification of vertebrates and the evolution of various organ systems. Dissection of a variety of vertebrate specimens to reveal relationships of the various organ systems. Prerequisites: General Biology I BSC 1010 and General Biology II BSC 1011. [D]

**ZOO 3731 Human Anatomy (3). ZOO 3731L Human Anatomy Demonstration (1).** Survey of organ systems of the human body with major emphasis on the skeletal, muscular, and peripheral nervous system. Guided examination of prosected human cadavers. Prerequisites: BSC 1011 or PCB 2099 or BSC 2023 or MCB 2000 or HSC 3549. Prerequisite or Corequisite: ZOO 3731. [D]

**ZOO 3753 Histology (3). ZOO 3753L Histology Lab (1).** Microscopic anatomy of cells, tissues and organs. Prerequisites: General Biology I BSC 1010 and Organic Chemistry I CHM 2210 and Organic Chemistry II CHM 2211. [D]

**ZOO 4114 Principles of Paleobiology (3).** Concepts and methods of paleobiology. Covers the nature of fossils, adaptation, systematics, evolutionary trends through time, global origination and extinction, paleoecology and paleobiogeography. Prerequisite: BSC 1011. [B]

**ZOO 4234 General Parasitology (3). ZOO 4234L General Parasitology Lab (1).** Modern concepts of biology, development, immunology and pathology of animal parasites. Prerequisite: General Biology I BSC 1010. Corequisite: Concurrent registration of lecture and lab course. [B]

**ZOO 4377C Functional Vertebrate Morphology (4).** The study of the diversity of anatomical structure in vertebrates and the relationship between form and function. Prerequisites: BSC 1011 General Biology II and BSC 1011L General Biology II Lab, or permission of the instructor. [D]

**ZOO 4454 Fish Biology (3).** Covers the systematics, anatomy, physiology, reproductive biology, and ecology of fish. Prerequisites: BSC 1010, BSC 1011, PCB 3043. [B]

**ZOO 4462C Herpetology (4).** Study of the biology of reptiles and amphibians with emphasis on the natural history and ecology of local species. Prerequisites: General Biology I BSC 1010 and II BSC 1011 and Ecology PCB 3043 or permission of the instructor. [B]

**ZOO 4472 Ornithology (3). ZOO 4472L Ornithology Lab (2).** Avian systematics, anatomy, physiology, behavior, ecology, evolution, and conservation. Labs teach visual and auditory identification, census techniques, banding, and taping. Field trips alternate Saturdays and at least one overnight weekend field trip. Prerequisites: General Biology I BSC 1010 and II BSC 1011. Corequisite: Concurrent registration of lecture with lab course. [B]

**ZOO 4484 Primate Biology (3). ZOO 4484L Primate Biology Field Lab (1).** Survey of the natural history of the prosimians, monkeys, and apes with special emphasis on primate anatomy, evolution, ecology, and behavior. Prerequisites: General Biology I BSC 1010 and II BSC 1011 or permission of the instructor. [B]

**ZOO 4513 Animal Behavior (3). ZOO 4513L Animal Behavior Laboratory (2).** Evolutionary approach to understanding the diversity of behavioral strategies. Ecological and physiological mechanisms of behavior will be emphasized. Prerequisites: BSC 1010 General Biology I, BSC 1011 General Biology II. [A]

**ZOO 4733 Survey of Regional Anatomy (3). ZOO 4733L Survey of Regional Anatomy Lab (2).** The regional anatomy of the human body as revealed by dissections, radiographs, models and videos. Prerequisites: General Biology II BSC 1011 with lab BSC 1011L, General Chemistry II CHM 1046 with lab CHM 1046L, and Physics II PHY 2054. (Lab fees assessed) [D]

**ZOO 4743C Neuroscience (4).** Structure and function of the human nervous system. Dissection and demonstration of human nervous system and various neurophysiology labs. Prerequisites: BSC 1010 General Biology I, BSC 1011 General Biology II, CHM 2211 Organic Chemistry II. [D]

**ZOO 5265 Biology of Crustaceans (3). ZOO 5265L Biology of Crustaceans Laboratory (1).** Morphology, physiology, systematics and evolution in crustaceans. [B]

**ZOO 5371 Clinical Anatomy of the Trunk and Limbs (3). ZOO 5371L Clinical Anatomy of the Trunk and Limbs Lab (1).** A detailed analysis of the anatomical foundations of kinesology and physical rehabilitation. Special emphasis will be placed on the functional anatomy of the trunk, pectoral and pelvic limbs with clinical correlations to the major disorders commonly treated by physical and occupational therapists. Prerequisite: ZOO 3731 Human Anatomy or ZOO 4733 Survey of Regional Anatomy. Corequisite: ZOO 5371L Clinical Anatomy of the Trunk and Limbs Lab. [D]

**ZOO 5376 Animal Design and Movement (4).** Basic biomechanical and behavioral theories of how animals feed and move. Prerequisites: General Biology I BSC 1010 and II BSC 1011, Physics I PHY 2053 and II PHY 2054. [D]

**ZOO 5424 Herpetology (3). ZOO 5424L Herpetology Laboratory (1).** Biology of amphibians and reptiles from a systematic perspective. The three orders of living amphibians and the six living orders of reptiles are covered in detail. Prerequisites: General Biology I BSC 1010 and II BSC 1011 and Ecology PCB 3043, or permission of the instructor. [B]

**ZOO 5456 Ichthyology (3). ZOO 5456L Ichthyology Lab (1).** Systematics, structure, function, ecology, and evolution of fishes. Prerequisites: General Biology I BSC 1010, and II BSC 1011, and Ecology PCB 3043. Corequisite: Concurrent registration of lecture and lab course. [B]

**ZOO 5732 Advanced Anatomy Demonstration (1-4).**

Dissection and demonstration of the human body with the emphasis on structure and function. May be repeated to a maximum of 8 credits. Prerequisites: ZOO 4733 with Lab ZOO 4733L or permission of the instructor. [D]

**ZOO 5745 Advanced Neuroanatomy (3).**

In-depth knowledge of the embryonic development, structure, and function of the human nervous system with a great deal of clinical consideration. Prerequisites: Neuroscience ZOO 4743C or permission of the instructor. [D]

**ZOO 5746 Comparative Neurobiology (4).**

Structure and function of neural systems at many levels including biophysical and cellular mechanisms, molecular processes, neural circuits, development, and anatomy. Prerequisites: General Biology I BSC 1010 and II BSC 1011, General Chemistry I CHM 1045 and II CHM 1046 and Physics PHY 2048; graduate standing or permission of the instructor. [C]