FLORIDA STATE UNIVERSITY
DEPARTMENT OF
BIOLOGICAL SCIENCE

UNDERGRADUATE HANDBOOK
2016 – 2017
DEPARTMENT OF BIOLOGICAL SCIENCE

COLLEGE OF ARTS AND SCIENCES

Web Page: http://www.bio.fsu.edu/
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The Department of Biological Science offers an undergraduate major in biological science that includes programs of study in most contemporary areas of biology. Specific academic concentrations within the major include cell and molecular biology; ecology, evolution, and environmental biology; marine biology; physiology and neuroscience; invertebrate and vertebrate zoology; plant sciences; and pre-professional health sciences. The requirements for the baccalaureate degree in biological science include most prerequisite courses necessary for admission to medical, dental, optometry, veterinary, osteopathic, chiropractic, and other allied health professional schools.

The department also offers a major in computational biology in conjunction with the Computer Science Department. This interdisciplinary major provides a top-notch educational program for students interested in the areas of computational biology and bioinformatics. The program seeks to achieve two goals: (1) to develop an understanding of the issues associated with developing biologically meaningful computational models, and (2) to give students the broad-based education that is needed to create a set of models directed toward solving a practical biomedical problem.

In addition, students interested in marine science may complete the program in marine biology and living resource ecology.

COMPUTER SKILLS COMPETENCY

All undergraduates at Florida State University must demonstrate basic computer skills competency prior to graduation. As necessary computer competency skills vary from discipline to discipline, each major determines the courses needed to satisfy this requirement. Undergraduate majors in biological science and in biology/FSU-Teach satisfy this requirement by earning a grade of “C–” or higher in BSC 2010L.

STATE OF FLORIDA COMMON PROGRAM PREREQUISITES

The state of Florida has identified common program prerequisites for this University degree program. Specific prerequisites are required for admission into the upper-division program and must be completed by the student at either a community college or a state university prior to being admitted to this program. Students may be admitted into the University without completing the prerequisites, but may not be admitted into the program.

At the time this document was published, some common program prerequisites were being reviewed by the state of Florida and may have been revised. Please visit https://www.flvc.org/partner-portal/common-prerequisite-manual for a current list of state-approved prerequisites.

The following lists the common program prerequisites or their substitutions, necessary for admission into these upper-division degree programs:

BIOLOGY, GENERAL
1. BSC X010/X010L or BSC X010C or BSC X040/X040L
2. BSC X011/X011L or BSC X011C or BSC X041/X041L
3. CHM X045/X045L or CHM X045C, or CHM X040 and CHM X041
4. CHM X046/X046L or CHM X046C
5. CHM X210/X210L and CHM X211/X211L, or CHM X210C and CHM X211C, or PHY X053/X053L and PHY X054/X054L, or PHY X048/X048L and PHY X049/X049L
6. MAC X311 or MAC X233 or MAC X253 or MAC X281 or MAC X241
7. MAC X312 or MAC X282 or MAC X234 or STA X023 or STA X024 or STA X321

BIOLOGY, GENERAL FSU-TEACH
1. BSC X010/X010L or BSC X010C or BSC X040/X040L
2. BSC X011/X011L or BSC X011C or BSC X041/X041L
3. CHM X045/X045L or CHM X045C, or CHM X040 and CHM X041
4. CHM X046/X046L or CHM X046C
5. CHM X210/X210L and CHM X211/X211L, or CHM X210C and CHM X211C, or PHY X053/X053L and PHY X054/X054L, or PHY X048/X048L and PHY X049/X049L
6. MAC X311 or MAC X233 or MAC X253 or MAC X281 or MAC X241
7. MAC X312 or MAC X282 or MAC X234 or STA X023 or STA X024 or STA X321
8. SMT X043
9. SMT X053

Note: Transfer students will be able to take SMT X043 and SMT X053 while enrolled in upper division.

COMPUTATIONAL BIOLOGY, BIOLOGY
1. BSC X010 (3,) General Biology I or equivalent
2. BSC X011 (3) General Biology I or equivalent
3. CHM X045, X045L (3, 1) General Chemistry I & Lab or equivalent
4. CHM X046, X046L (3, 1) General Chemistry II & Lab
5. PHYX048/X048L (5) Physics A
6. MAC X311 (4) Calculus I
7. MAC X312 (4) Calculus II

REQUIREMENTS FOR A MAJOR IN BIOLOGICAL SCIENCE

Please review all college-wide degree requirements summarized in the “College of Arts and Sciences” chapter of this General Bulletin.

1. **Prerequisites for Upper-Division Biological Science Courses:**
   - Registration in all 3000- and 4000-level biological science courses is allowed only after meeting the following criteria:
     - Satisfactory completion (“C–” or better) of BSC 2010/L (Biological Science I with lab) and BSC 2011/L (Biological Science II with lab)
     - Satisfactory completion (“C–” or better) of CHM 1045/L and CHM 1046/L or CHM 1050/L and CHM 1051/L (General Chemistry I and II with labs)
   - A minimum combined 2.0 GPA in all biology, chemistry, physics, mathematics, and statistics courses, and their prerequisites, that are applicable to the major, from any institution attended.

2. **Academic Performance:**
   - All courses applicable to the major, including biological science, chemistry, physics, mathematics, and statistics must be completed with a grade of “C–” or better;
   - Designation, continuation, and graduation as a biological science major requires a minimum combined 2.0 GPA in all courses taken for the major from any institution, including biology, chemistry, physics, mathematics, and statistics, and their prerequisites;
   - A biological science major who applies for readmission to the college must meet the biological science degree requirements of the catalog in force on the date of readmission.

3. **D/F Policy:**
   - A student who has accumulated more than one grade below a “C–” (U, D, D-, D, D+) prior to completing the prerequisite courses required for upper-division status (CHM 1045 and lab, CHM 1046 and lab, BSC 2010 and lab, BSC 2011 and lab) in courses required for the major in biological science (biological science, chemistry, physics, mathematics, and statistics) and their prerequisites at Florida State University or elsewhere, whether or not repeated, will not be permitted to graduate from Florida State University with a degree in biological science;
   - A student who has completed the prerequisite courses required for upper-division status (CHM 1045 and lab, CHM 1046 and lab, BSC 2010 and lab, BSC 2011 and lab) and earned more than three unsatisfactory grades (U, F, D–, D, D+) in courses required for the major in biological science (biological science, chemistry, physics, mathematics, and statistics) and their prerequisites at Florida State University or elsewhere, whether or not repeated, will not be permitted to graduate from Florida State University with a degree in biological science.

4. **Co-op and Transient Study:**
   - Florida State University biological science majors who intend to take courses for the major (biological science, chemistry, physics, mathematics, statistics) at other institutions must receive approval from the Department of Biological Science Academic Advising Office prior to enrollment. This policy applies to courses taken as part of the FAMU–FSU and TCC–FSU co-op programs, as well as courses taken elsewhere.

5. **Required Courses in Biological Science:**
   - Thirty-eight semester hours of biological science coursework are required for the degree. At least twenty of the required semester hours must be taken in residence at Florida State University. The following shall be included in the thirty-eight semester hours:
     - PCB 3063 General Genetics (3)
     - PCB 3134 Cell Structure and Function OR BSC 3016 Eukaryotic Diversity (3)
     - BSC 3402L Experimental Biology Laboratory (3)
PCB 4674 Evolution (3)
At least one course from two of the three areas:

**Area I: Cell and Molecular Biology**
- MCB 4403 Prokaryotic Biology (3)
- PCB 3134 Cell Structure and Function (3)
- PCB 4024 Molecular Biology (3)
- PCB 4253 Animal Development (3)

**Area II: Physiology**
- PCB 4701 Human Physiology (3)
- PCB 4843 Fundamentals of Neuroscience (3)

**Area III: Ecology and Environmental Science**
- BSC 3052 Conservation Biology (3)
- PCB 3043 General Ecology (3)
- ZOO 4513 Animal Behavior (4)

Additional courses for major credit at the 3000 or 4000 level to complete the thirty-eight semester hour requirement. No more than six semester hours of honors work in biological science (BSC 4970r), six semester hours of directed individual study (BSC 4900r), four semester hours of internship (BSC 4941r), one semester hour of undergraduate supervised teaching (BSC 4945), and two semester hours of senior tutorial (BSC 4931r) can be used to meet the thirty-eight hour requirement.

Completion of at least five biology laboratory/field courses (the letter “C” listed after the course number indicates that the course is a lecture and a lab/field combined, and the letter “L” indicates the course is a laboratory or field course).

6. **Required Courses in Collateral Areas:**
   - **General Chemistry:** Two semesters of general chemistry with laboratory equivalent to CHM 1045/L plus CHM 1046/L or CHM 1050/L plus CHM 1051/L.
   - **Organic Chemistry and Physics:** Students are required to take either two semesters of organic chemistry (equivalent to CHM 2210 and 2211) and one semester of physics or two semesters of physics and one semester of organic chemistry (CHM 2210). The acceptable physics courses are general physics with laboratories equivalent to PHY 2048C and 2049C (prerequisite of MAC 2311) or PHY 2053C and 2054C (prerequisites are MAC 1114 and MAC 1140). Many health professions programs require two semesters of both organic chemistry and physics and also require CHM 2211L (Organic Chemistry II Laboratory), BCH 4053 (General Biochemistry I), and BCH 4054 (General Biochemistry II), which do not apply to the major.
   - **Mathematics/Statistics:** Either two semesters of calculus with analytical geometry equivalent to MAC 2311 and MAC 2312, or MAC 2311 and STA 2171 or MAC 2311 and COP 3014

7. **Exit Survey:**
   All seniors must complete the online exit survey in the semester in which they plan to graduate. For details, contact an advisor in the Biological Science Academic Advising Office.

8. **Minor:**
   The required collateral courses in chemistry constitute a chemistry minor and fulfill the College of Arts and Sciences requirement for a minor if two semesters of organic chemistry are taken; however, the student may select other minors in consultation with an advisor.

**HONORS IN THE MAJOR IN MARINE BIOLOGY PROGRAM**

Biological Science majors who are interested in the Honors in the Major in Marine Biology Program may apply if they have completed at least sixty credit hours with at least a 3.2 cumulative GPA on all coursework and at least a 3.2 GPA in the required introductory biology courses, BSC 2010 and BSC 2011, and their labs. Students typically apply at the end of their sophomore year, choose a research topic by the end of their junior year, and complete an honors thesis by the end of their senior year. Those interested in the program should visit an academic advisor for more information or contact Dr. Janie Wulff, the program director.

**HONORS IN THE MAJOR**

The Department of Biological Science offers a program in honors in the major to encourage talented juniors and seniors to undertake independent and original research as part of the undergraduate experience. For requirements and other information, see the “University Honors Office and Honor Societies” chapter of this General Bulletin.

**FSU-TEACH PROGRAM IN SCIENCE TEACHING**

For those interested in teaching Biological Science, FSU-Teach is an innovative approach to teacher education that involves a collaboration between scientists, mathematicians, and education faculty at Florida State University. In this program, students develop deep science or mathematics knowledge and the skill and experience needed to be an effective science or math teacher. FSU-Teach pays for tuition for the first two courses (Step 1 and Step 2). Work study positions with scientists, mathematicians and local schools are available.
Prerequisites for admission to the Biological Science/FSU-Teach major are the same as the prerequisites for the Biological Science major. The program is a double-major only curriculum requiring students to complete a primary major in Biological Science in addition to a secondary major in Science and Mathematics Teaching. The discipline area has a special track for FSU-Teach majors enabling students to complete the double major in four years.

The program culminates with conferral of the baccalaureate degree with two majors and all coursework and state testing requirements for initial Florida teacher certification. Note that students seeking certification must be formally admitted to the School of Teacher Education and meet all of the requirements for pursuing a state-approved program. For information regarding the requirements for the second major in Science and Mathematics Teaching, please see the chapter in this General Bulletin for School of Teacher Education. For additional information, see our Web site: http://FSU-Teach.fsu.edu.

PROGRAM IN COMPUTATIONAL BIOLOGY, BIOLOGY

Computational biology is a new and promising field of study. The purpose of this interdisciplinary major is to provide a top-notch educational program for students interested in the areas of computational biology and bioinformatics. The program seeks to achieve two goals: 1) to develop an understanding of the issues associated with developing biologically meaningful computational models, and 2) to give students the broad-based education that is needed to create a set of models directed towards solving a practical biomedical problem. This major is offered through both the Biological Science and Computer Science departments. Students in the program should be sure to consult with the advisors in their home department to make sure they are taking the correct courses in the correct sequence.

REQUIREMENTS FOR A MAJOR IN COMPUTATIONAL BIOLOGY

Required Biological Science Courses (17 hours)
BSC 2010 and BSC2010L (3,1) Biological Science I and Lab
BSC 2011 and BSC2011L (3,1) Biological Science II and Lab
PCB 3063 (3) Genetics
PCB 4674 (3) Evolution
Three (3) additional hours of biological science courses selected from: BSC 4900, MCB 4403/L, PCB 3134, PCB 3743, PCB 4024, PCB 4233, PCB 4253, and PCB 4843.

Required Scientific Computing Courses (21 hours)
ISC3322 (3) Symbolic and Numerical Computation
ISC 3313 (3) Introduction to Scientific Computing
ISC4220 (4) Algorithms for Scientific Applications I
ISC 4221 (4) Algorithms for Scientific Applications II
ISC4304 (4) Programming for Scientific Applications
ISC4933 (3) Introduction To Bioinformatics

Required Research Experience ISC4943r or BSC4900r (8, 4 each in two semesters)

Additional Elective Courses (5 hours)
Five (5) additional hours chosen from Biology, Chemistry, Computer Science; Mathematics or Statistics, Physics and Scientific Computing selected from: CDA 3101, COP 4531, COP 4710, COT 4420, and CIS 4900, MAC 2313, MAP 4481, STA 4102, STA 4103, STA 4202, STA 4203, STA 4442, STA 4502, and STA 4702, CHM1045L, CHM1046L, PHY2054C, PHY2049C, ISC4223, ISC4232

Collateral Courses: 24 hours
All collateral courses must be completed with a grade of C- or better.
Mathematics/Statistics (14 hours)
MAC 2311 (4) Calculus with Analytical Geometry I
MAC 2312 (4) Calculus with Analytical Geometry II
MAD 2104 (3) Discrete Mathematics
STA 2171 (3) Statistics for Biology
Chemistry (6 hours)
CHM 1045 (3) General Chemistry I
CHM 1046 (3) General Chemistry II
Physics (4 hours)
PHY2053C (4)

Computer Skills Competency: 0 hours beyond major. ISC 3313 (3).
GRADUATE STUDY

The Department of Biological Science offers work leading to the Master of Science (MS) and Doctor of Philosophy (PhD) degrees; consult the Graduate Bulletin for details.

REQUIREMENTS FOR A MINOR IN BIOLOGICAL SCIENCE

A minimum of twelve semester hours of biological science courses approved for major credit, including BSC 2010/L and BSC 2011/L plus at least 4 credit hours of additional upper division biological science course work. No more than 1 (one) credit hour of S/U graded course work can be counted toward the minor. A minimum of four semester hours of the twelve semester hours must be taken at Florida State University. Grades below “C–” will not be accepted for minor credit.

DEFINITION OF PREFIXES

BCH—Biochemistry (Biophysics)
BOT—Botany
BSC—Biological Sciences
IFS—Interdisciplinary Florida State University Courses
ISC—Interdisciplinary Sciences
MCB—Microbiology
PCB—Process Biology (Cell/Molecular/Ecology/Genetics/Physiology)
SCE—Science Education
ZOO—Zoology

UNDERGRADUATE COURSES

COURSES NOT FOR MAJOR OR MINOR CREDIT

BSC 1005. General Biology for Nonmajors (3). This course consists of four selected topics in contemporary biology.
BSC 1005L. General Biology Laboratory for Nonmajors (1). This course may be taken concurrently with lecture or subsequent to completion of lecture with passing grade.
BSC 1005C. General Biology for Nonmajors (4).
BSC 2085. Anatomy and Physiology I (3). This course is the first of a two-semester human anatomy/physiology sequence emphasizing the cell, stimulus-response concept, and the skeletal-muscular and first half of the nervous systems.
BSC 2085L. Anatomy and Physiology I Laboratory (1). Corequisite: BSC 2085. This course is the first of two-semester human anatomy/physiology sequence emphasizing the cell, stimulus-response concept, and the skeletal-muscular and first half of the nervous systems.
BSC 2086. Anatomy and Physiology II (3). Prerequisite: BSC 2085 or instructor permission. This course is a continuation of a two-semester human anatomy/physiology sequence beginning with the second half of the nervous system, then continuing with endocrine, cardiovascular, respiratory, digestive, excretory, and reproductive systems. Also included are fluid-electrolyte balance and immunity.
BSC 2086L. Anatomy and Physiology II Laboratory (1). Corequisite: BSC 2086. This lab focuses on sensory and organ systems found in the human body. Physiology of the sensory and organ systems are explored with lab activities and computer simulated experiments.
IFS 2081. Busting Common Biology Myths (3). This course explores areas of biology popularized in the media, politics and global health policies. Students determine strengths and weaknesses of opposing arguments of controversial current biological issues using information found in the scientific literature to support or critique positions. Popular biological issues such as pros and cons of vaccination, the use of stem cells, or the dangers of genetically modified organisms are studied.
IFS 2082. The Ecology of Food (3). This course explores the basic ecology of agriculture and fisheries and considers how conventional and alternative food-production practices generate and solve ecological problems. The course focuses on several major current issues (e.g. genetically modified organisms, pollinator declines, organic agriculture, and fisheries), and for each students learn the science behind the issue and the social forces shaping the problem. Students also learn through discussions of scientific and popular writings, lectures, hands-on and written projects, oral presentations, local speakers and field trips.
IFS 2105. Evolution, Medicine, Evidence (3). This course introduces the study of evolution as it applies to the practice of medicine. Students investigate what constitutes scientific evidence, how to use evidence, the evidence concerning biological evolution, and the implications of evolution for the practice of medicine.
IFS 2117. Genetics in Society (3). This course is intended to help students understand the science behind major issues that are likely to evolve into increasingly important moral, political, and public policy decisions in their lifetime. Topics are discussed such as: choosing the sex or genetic composition of children, human cloning, rebuilding defective organs and tissues from stem cells, and altering genetic constitution.
IFS 2119. Biotechnology: Impact of Life Sciences on Society (3). This course addresses the important impacts that new biotechnological innovations have on society. Using examples from genetically modified crops to advances in personalized medicine, students explore the scientific bases of emerging biotechnologies and compare the scientific data with societal perception and acceptance.
IFS 3044. Living Green, Theory to Action (3). This course examines environmental issues, the three “E”s of sustainability (ecology, equity, and equality), ways to integrate sustainability into infrastructures and social structures, and practical solutions and skills for making personal and professional decisions that support living a sustainable life.
IFS 3092. Broken Clocks and Disrupted Sleep: Impacts of Technology (3). This course explores the impact of changing technology on circadian rhythms and sleep patterns and the consequences to human health. The course is suitable for all majors.
COURSES FOR MAJOR CREDIT

Note: All 3000- and 4000-level biological science courses have the following minimum prerequisites: BSC 2010/L, 2011/L; CHM 1045/L and 1046/L. Additional prerequisites, if any, are included in the course listing.

BOTANY

BSC 2010. Biological Science I (3). This is the first part of a two-semester introductory biology course designed for those interested in pursuing a career in life sciences. The course provides the building blocks necessary for a student to gain a strong foundation in general biology. Topics covered provide an overview of biological processes and function at the molecular, cellular and organismal level.

BSC 2010L. Biological Science I Laboratory (1). This course introduces basic chemistry, energetics, and cellular organization; molecular genetics and information flow; animal and plant function.

BSC 2011. Biological Science II (3). Prerequisite: BSC 2010. This is the second of a two-semester introductory biology course designed for those interested in pursuing a career in life sciences. The course provides an overview of the processes underlying the animal embryonic development, inheritance genetics, evolution and ecology.

BSC 2011L. Biological Science II Lab (1). Prerequisites: BSC 2010 and BSC 2010L. Corequisite: BSC 2011. This course focuses on reproduction and development, transmission (Mendelian) genetics, population biology, ecology, and evolution.

BSC 3015. Plant Biology (2). This course is an introduction to evolutionary relationships, natural history, ecological adaptations, and physiology of plants, fungi, autotrophic protista, and prokaryotes.

BSC 3015L. Plant Biology Laboratory (1). Corequisite: BOT 3015. This lab explores anatomy, development, and morphology and life cycles of autotrophs and fungi and other osmotrophs.

BSC 3143C. Field Botany (4). This course is an introduction to plant taxonomy with emphasis on laboratory and field study. Orientation to principles of identification, classification, and rules of botanical nomenclature.

BSC 3041. Plant Molecular Biology (3). Prerequisite: BOT 3015. Pre- or corequisite: PCB 3063. This course explores molecular biology and biotechnology of plant growth and development.

BSC 3041L. Plant Physiology Laboratory (1). Prerequisite: BOT 3015.

BIOLOGICAL SCIENCE

BSC 3015C. Biotechnology (3). Prerequisite: BSC 2010. This course covers microbiological techniques including the isolation, typing, and identification of bacteria, properties of pathogenic bacteria, and food microbiology.

BSC 2004. Microbiology for Health Services (3). Corequisite: MCB 2004L. This course covers microbiology for students planning careers in the health services, with emphasis on infectious disease, food microbiology, and public health.

BSC 2004L. Microbiology for the Health Services Laboratory (1). Corequisite: MCB 2004. This course covers microbiological techniques including the isolation, typing, and identification of bacteria, properties of pathogenic bacteria, and food microbiology.

PCB 2099. Human Physiology (3). This course surveys the major systems and their regulation in normal function and disease in the human body.

SCE 4939r. Seminar in Contemporary Science, Mathematics, and Science Education (1). This course includes presentations of contemporary and interesting issues in science, mathematics, or teaching methods. Content varies from semester to semester. May be repeated to a maximum of four semester hours.

SCE 4939r. Seminar in Contemporary Science, Mathematics, and Science Education (1). This course includes presentations of contemporary and interesting issues in science, mathematics, or teaching methods. Content varies from semester to semester. May be repeated to a maximum of four semester hours.

COURSES FOR MAJOR CREDIT

Note: All 3000- and 4000-level biological science courses have the following minimum prerequisites: BSC 2010/L, 2011/L; CHM 1045/L and 1046/L. Additional prerequisites, if any, are included in the course listing.

BOTANY

BSC 3015. Plant Biology (2). This course is an introduction to evolutionary relationships, natural history, ecological adaptations, and physiology of plants, fungi, autotrophic protista, and prokaryotes.

BSC 3015L. Plant Biology Laboratory (1). Corequisite: BOT 3015. This lab explores anatomy, development, and morphology and life cycles of autotrophs and fungi and other osmotrophs.

BSC 3143C. Field Botany (4). This course is an introduction to plant taxonomy with emphasis on laboratory and field study. Orientation to principles of identification, classification, and rules of botanical nomenclature.

BSC 3041. Plant Molecular Biology (3). Prerequisite: BOT 3015. Pre- or corequisite: PCB 3063. This course explores molecular biology and biotechnology of plant growth and development.

BSC 3041L. Plant Physiology Laboratory (1). Prerequisite: BOT 3015.

BIOLOGICAL SCIENCE

BSC 3015C. Biotechnology (3). Prerequisite: BSC 2010. This course covers microbiological techniques including the isolation, typing, and identification of bacteria, properties of pathogenic bacteria, and food microbiology.

BSC 2004. Microbiology for Health Services (3). Corequisite: MCB 2004L. This course covers microbiology for students planning careers in the health services, with emphasis on infectious disease, food microbiology, and public health.

BSC 2004L. Microbiology for the Health Services Laboratory (1). Corequisite: MCB 2004. This course covers microbiological techniques including the isolation, typing, and identification of bacteria, properties of pathogenic bacteria, and food microbiology.

PCB 2099. Human Physiology (3). This course surveys the major systems and their regulation in normal function and disease in the human body.

SCE 4939r. Seminar in Contemporary Science, Mathematics, and Science Education (1). This course includes presentations of contemporary and interesting issues in science, mathematics, or teaching methods. Content varies from semester to semester. May be repeated to a maximum of four semester hours.
BSC 4921C. Biogeography (4). This course emphasizes ecological and evolutionary biogeography, the physical processes and organismal characteristics that determine distributions, and the analytical methods used to describe distributions and test processes. Geographic data sets are analyzed in lab sessions to search for patterns and test hypotheses with the scientific method.

BSC 4900r. Directed Individual Study (1–4). Prerequisites: A combined 3.0 GPA in biology, chemistry, physics, math, and statistics courses applied to the major; permission from a biological science instructor; and Department of Biological Science Advising Office permission. This course is a supervised study of a special topic or research participation in the area of the faculty member’s research. Graduate students may not register for this course. A maximum of six semester hours may be applied to biological science major credit. May be repeated to a maximum of twelve semester hours.

BSC 4910. Directed Independent Study (0). (S/U grade only.) Pre- or corequisite: BSC 4900. In this course, students communicate the results of their research in writing or through an oral presentation.

BSC 4931r. Senior Tutorial in Biological Science (1). (S/U grade only.) Prerequisite: Senior standing. This course focuses on selected topics in contemporary biological science; maximum enrollment of five students in each tutorial. May be repeated to a maximum of two hours.

BSC 4933r. Selected Topics in Biological Science (1–4). Prerequisites: Courses as specified and junior or senior standing. May be repeated to a maximum of eight semester hours.

BSC 4933lr. Selected Topics in Biological Science Lab (1–4). Prerequisites: Courses as specified and junior or senior standing. May be repeated to a maximum of eight semester hours.

BSC 4934r. Selected Topics in Applied Biology (1–4). (S/U grade only.) May be repeated to a maximum of eight semester hours. Some sections are not for major credit.

BSC 4937. Seminar in Living Marine Resource Ecology (1). Prerequisite: Instructor permission. This seminar course in marine resource ecology is designed to introduce students to a broad array of current research priorities and interests in marine ecology. Students have the opportunity to meet with resource managers and scientists from both the biological and social fields. Lecture topics range from life history studies of marine fish to the economic consequences of marine policy.

BSC 4940. Research Internship in Marine Biology (3–9). Prerequisites: PCB 3043, junior or senior standing, 3.0 GPA in biology, a course in the area of research, and associate chair written permission. This course is a special supervised study in marine biology at the National Marine Fisheries Services Laboratory in Panama City, the Mote Marine Laboratory, or other approved location. Students may receive up to nine semester hours of credit, of which four semester hours would apply to the biological science major. Offered during the Summer only.

BSC 4941r. Internship in Biological Science (1–4). (S/U grade only) Prerequisites: In addition to the required introductory courses in biology and chemistry, junior or senior standing, a 3.0 or greater GPA in biology, and permission of the Associate Chair of Undergraduate Studies. This course is intended for students who are working off campus in some activity related to the biological sciences and who wish this work to be reflected on their transcript. The course may be repeated to a maximum of twelve semester hours, but only four credit hours may count toward the major.

BSC 4945. Undergraduate Supervised Teaching (1). Prerequisites: Senior standing and instructor permission. In this course, students serve as Laboratory Assistants in BSC 1005L or as Tutors in BSC 2010 or BSC 2011, or BSC 1005. Students also receive training in interactive techniques and use this training to lead classroom discussions and interactive exam review sessions.

BSC 4970r. Honors Work in Biological Science (1–6). Prerequisite: Admission to the department’s honors-in-the-major program. This course involves participation in a supervised research problem. May be repeated to a maximum of nine semester hours, of which six semester hours may be applied to biological science major credit.

MICROBIOLOGY

MCB 4403. Prokaryotic Biology (3). Prerequisites: CHM 2210 and PCB 3063. Corequisite: MCB 4403L. This course covers structural and functional characteristics of microorganisms, with emphasis on prokaryotes (bacteria and archaea) and viruses. Topics include: prokaryotic cell structure and function, physiology and genetics of prokaryotes and viruses, physiological and molecular aspects of microorganisms and human disease, and biotechnological applications of microbial physiology (environmental, food, and industrial microbiology).

MCB 4403L. Prokaryotic Biology Laboratory (2). Prerequisites: CHM 2210 and PCB 3063. Corequisite: MCB 4403. This course covers laboratory methods for growth, handling, and study of prokaryotes and other types of microorganisms. Topics include: aseptic technique and isolation of pure cultures; microscopic methods; effects of environment on growth; viruses; physiological characterization methods; and methods related to medical, environmental, and food microbiology.

PROCESS BIOLOGY

PCB 3043. General Ecology (3). This course focuses on topics such as: population biology; population growth; community processes, succession, nutrient cycling, and energy flow; species interactions; ecological biology; and biogeographical ecology.

PCB 3043L. Lab for Ecology (2). Corequisite: BSC 3052 or PCB 3043. In this course, topics covered include quantifying populations and population growth; species interactions such as competition, predation, and mutualisms; documenting community patterns against gradients; adaptation and traits of species; habitat use, movement and species ranges; natural history of local habitats.

PCB 3063. General Genetics (3). This course is an introduction to the principles of transmission and molecular genetics of prokaryotes and eukaryotes and significance of these principles to other aspects of biological science.

PCB 3134. Cell Structure and Function (3). This course focuses on topics such as: cellular chemistry and physiology, morphology, and function of cellular organelles; and cellular motility, growth, division, communication, and regulation.

PCB 3743. Vertebrate Physiology (3). This course studies physiological systems of vertebrates with emphasis on mammals. Mechanisms underlying physiological processes and the physico-chemical principles upon which they depend are also studied.

PCB 4024. Molecular Biology (3). Prerequisites: PCB 3063 and PCB 3134 recommended. This course studies the molecular basis of cellular function with emphasis on the activities of DNA, RNA, and the regulation of gene expression.

PCB 4024L. Molecular Biology Laboratory (1). Corequisite: PCB 4024.

PCB 4109 Cancer Biology (3). Prerequisites: PCB 3063. This course will expose you to a range of cancer related topics from the cancer related mutations and signaling pathways to the cutting-edge research that offers attractive development for new anti-cancer drugs and therapeutic strategies.

PCB 4233. Immunology (3). Prerequisites: CHM 2210, PCB 3063, PCB 3134, or instructor permission. This course analyzes the tissues, cells, and molecules of the immune system and their relationships to disease and transplantation.
PCB 4233L. Laboratory in Immunology (1). Corequisite: PCB 4233.

PCB 4244. Biology of Aging (3). Prerequisites: PCB 3063. This course provides an introduction to multi-disciplinary questions and approaches in the biology of aging. Both molecular and evolutionary mechanisms will be discussed.

PCB 4253. Animal Development (3). Prerequisite: PCB 3063. This course discusses a number of topics, including fertilization, early embryonic events, organogenesis, differentiation, morphogenesis, cytoplasmic localization, determination, and differential gene expression.

PCB 4255L. Developmental Biology Laboratory (3). Prerequisite: PCB 3063. Corequisite: PCB 4253. This lab combines lecture and laboratory experiments regarding sea urchin fertilization, frog and chick early development, gene expression, cell-cell interactions, and metamorphosis.

PCB 4402. Ecology of Infectious Disease (1). Prerequisite: MAC 2311. This course will explore how concepts and tools of basic ecology can and have been used to understand the dynamics of infectious disease, and contribute to our ability to predict, prevent, and control disease outbreaks.

PCB 4674. Evolution (3). Prerequisites: PCB 3063 and senior standing. This course places emphasis on the processes of evolution: origin of life, theories of evolution, sources of variation, natural selection, population systems, isolating mechanisms, evolution above the species level.

PCB 4701. Human Physiology (3). Pre-requisite: PCB 3063 and PCB 3134. This course covers the human nervous system, special sensory organ systems, the central nervous system, the muscle and skeletal systems, the heart and circulatory system, the respiratory system, the urinary and digestive systems, the endocrine system, and reproduction. Cellular mechanisms underlying the homeostatic regulation of each organ system are studied in the context of clinical impacts based upon diseases. For example, Muscular Dystrophy, diabetes mellitus, cardiac arrhythmias, cardiovascular disease, renal failure, pulmonary disease, Alzheimer's, Parkinson's, metabolic disorders, or infertility.

PCB 4723. General and Comparative Animal Physiology (3). Prerequisite: CHM 2210. This course studies the physiological and biochemical interactions of animals with their respective environments. Emphasis on non-mammalian vertebrate and invertebrate systems.

PCB 4843. Fundamentals of Neuroscience (3). Prerequisite: PCB 3134. This course emphasizes cellular and molecular approaches to neuroscience and brain function and emphasizes simple model systems including invertebrates.

ZOLOGY

ZOO 3205. Advanced Invertebrate Zoology (2). Prerequisite: PCB 3043 or PCB 3063 or ZOO 3713C or instructor permission. Corequisite: ZOO 3205L. This course focuses on the structure, function, behavior, and evolution of the invertebrate phyla, especially those taxa living in the sea.

ZOO 3205L. Advanced Invertebrate Zoology Laboratory (2). Prerequisite: PCB 3043 or PCB 3063 or ZOO 3713C or instructor permission. Corequisite: ZOO 3205. This laboratory deals with the structure, function, behavior and ecology of the invertebrate phyla, especially those taxa living in the sea.

ZOO 3713C. Comparative Vertebrate Anatomy (4). This course emphasizes form and function and origin and evolution of structure.

ZOO 4204C. Biology of Higher Marine Invertebrates (5). Prerequisite: BSC 3312 or PCB 3043 or ZOO 3205 or ZOO 3205L. This course focuses on the biological specializations of crustaceans, mollusks, and echinoderms, including life history, behavior, ecology, biomechanics, and environmental adaptations.

ZOO 4343C. Biology of the Lower Vertebrates (4). This course explores the systematics, ecology, and evolution of fishes, amphibians, and reptiles.

ZOO 4353C. Biology of Higher Vertebrates (Ornithology) (4). This course covers the systematics, ecology, and evolution of birds.

ZOO 4454C. Biology of Fishes (4). This course focuses on the structure, function, behavior, and evolution of the invertebrate phyla, especially those taxa living in the sea.

ZOO 4513. Comparative Vertebrate Anatomy (4). This course emphasizes form and function and origin and evolution of structure.

ZOO 4753C. Histology (4). This course explores the microscopic anatomy and functions of the cells, tissues, and glands composing the organs and systems of humans.

ZOO 4823. Insect Biology (3). This course discusses the morphology, classification, natural history, physiology, and evolution of insects.

ZOO 4823L. Insect Diversity of North Florida (2). Prerequisite: MAC 2311. Pre- or corequisite: ZOO 4823. This course includes topics such as: collection, keying, and curation of local insects.

GRADUATE COURSES

BIOCHEMISTRY

BCH 5886r. Special Topics in Biochemistry and Cell Biology (1–3).

BCH 5887r. Special Topics in Biochemistry and Cell Biology (1–3).

BOTANY

BOT 5935r. Selected Topics in Botany (1–4).

BOT 6936r. Seminar in Botany (2). (S/U grade only.)

BIOLOGICAL SCIENCE

BSC 5409r. Biophysical Principles of Biological Techniques (3).

BSC 5476C. Introduction to Scientific Diving (3).

BSC 5900r. Directed Individual Study (1–12). (S/U grade only.)

BSC 5932r. Graduate Tutorial in Biological Science (1). (S/U grade only.)

BSC 5936r. Selected Topics in Biological Science (1–4).

BSC 5945r. Supervised Teaching (1–2). (S/U grade only.)

BSC 6921r. Colloquium in Biological Science (1). (S/U grade only.)

SECONDARY SCIENCE TEACHING

ISC 5098. Reflective Science Teaching (2).
ISC 5535. Research in the Content Area for Teachers (6).
ISC 5944. Ethics, School Law, and Management of Science Classrooms (3).
ISC 5945. Full-Time Teaching Internship (6). (S/U grade only.)
ISC 5946. Half-Time Teaching Internship (3). (S/U grade only.)
ISC 8939. Portfolio Review (0). (S/U grade only.)

MICROBIOLOGY
MCB 5408. Prokaryotic Biology (3).
MCB 5505. Virology (3).
MCB 5936r. Selected Topics in Microbiology (1–4).

PROCESS BIOLOGY
PCB 5137. Advanced Cell Biology (3).
PCB 5447. Community Ecology (3).
PCB 5525. Molecular Biology (3).
PCB 5595. Advanced Molecular Biology (3).
PCB 5672. Evolution (3).
PCB 5675. Advanced Evolutionary Biology (3).
PCB 5682. Macroevolution (3).
PCB 5785. Biology of Muscle (3).
PCB 5786. Membrane Biophysics (3).
PCB 5795. Sensory Physiology (3).
PCB 5845. Cell and Molecular Neuroscience (4).
PCB 5936r. Selected Topics in Genetics and Cell Biology (1–4).
PCB 5937r. Selected Topics in Physiology (1–4).
PCB 5938r. Selected Topics in Ecology and Evolutionary Biology (1–4).
PCB 6936r. Seminar in Genetics and Cell Biology (2). (S/U grade only.)
PCB 6938r. Seminar in Ecology and Evolutionary Biology (2). (S/U grade only.)

NEUROSCIENCE
PSB 5057. Neuroscience Methods: Molecules to Behavior (2). (S/U grade only.)
PSB 5077. Responsible Conduct of Research (2). (S/U grade only.)
PSB 5341. Systems and Behavioral Neuroscience (4).
PSB 5347. Neuropharmacology (3).
PSB 6070r. Current Problems in Neuroscience (2). (S/U grade only.)
PSB 6920r. Neuroscience Colloquium (1). (S/U grade only.)
PSB 6933r. Seminar in Neuroscience (1–2). (S/U grade only.)

ZOOLOGY
ZOO 5935r. Selected Topics in Zoology (1–4).
ZOO 6933r. Seminar in Marine Biology (2). (S/U grade only.)
ZOO 6934r. Seminar in Zoology (2). (S/U grade only.)

For listings relating to graduate coursework for thesis, dissertation, and master’s and doctoral examinations and defense, consult the Graduate Bulletin.