

## Biological Sciences

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**Mauricio Rodriguez-Lanetty**, Associate Professor  
**Diego Salazar**, Assistant Professor  
**Helena Schmidtmayerova**, Senior Instructor  
**Laura Serbus**, Assistant Professor

**Paul R. Sharp**, Senior Instructor  
**Philip K. Stoddard**, Professor  
**Jamie Theobald**, Assistant Professor  
**Joel C. Trexler**, Professor and Marine Sciences Program  
 Director  
**Tiffany Troxler**, Director, SLSC  
**Maureen Walter**, University Instructor  
**Jeffrey D. Wells**, Associate Professor  
**Yuying Zhang**, Associate Professor

## Bachelor of Arts 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 2010, BSC 2010L	BSCX010/X010L or BSCX010C or BSCX040/X040L or PCBX011C
BSC 2011, BSC 2011L	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 MACX281 or MACX241
MAC 2311	MACX312 or MACX282 or MACX234
MAC 2312 or	STAX023 or STAX024 or STAX321**
STA 2122 and STA 3123	

Courses which form part of the statewide articulation between the State University System and the Florida 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: <https://www.flvc.org>. Search Program Listing by Alphabetic Order.

### Required Courses

**Courses Required for the Degree:**

BSC 1005	Essentials of Biology: The Big Picture	3
BCH 2020	Foundations of Biochemistry	3
BSC 2300	Biological Organization: The Size and Scale of Life	3

## OTHER DEGREE REQUIREMENTS: 60 credits

**Upper Division Core Requirements – 10 credits**

PCB 3043	Ecology	3
PCB 3063	Genetics	3
PCB 4674	Evolution	3
BSC 4931	Senior Seminar	1

**Upper Division Biology Electives – 21 credits**

Students must complete 7 lecture courses from the acceptable Upper Division Biology Electives maintained by the Biology Department. One lecture course must be chosen in each of the following areas:

- Ecology
- Organismal Diversity
- Physiology/Biochemistry
- Structure/Development

The remaining 4 lecture courses may be chosen at the student's discretion from courses in any of the distribution areas (the distribution area is designated by the letter in brackets after the course description). The following courses are not allowed as Biology Electives: Essentials of Biology: The Big Picture (BSC 1005), Foundations of Biochemistry (BCH 2020), Biological Organization: The Size and Scale of Life (BSC 2300), Student Research Labs (BSC 3915, 4914, and 6916); Workshop Biology Labs (BSC 5928, PCB 5238, BSC 6926, etc.); Cooperative Education credits (BSC 3949); Biology of Women (BSC 3027); Research Methods in Biological Sciences (BSC 3910); and courses for non-science majors (BOT 1010, PCB 2061, PCB 2099, MCB 2000, BSC 2023, EVR 3013, OCB 2003, and OCE 3014).

**Biology Laboratory Requirements – 3 credits**

- Upper Division Labs

**Track Specific Courses – 18 credits**

Six courses in the specified track must be completed.

**Allied Health Profession Track**

ANT 3462	Medical Anthropology	3
ANT4480	Anthropological Approaches to Global Health	3
APK 3110	Exercise Physiology	3
CLP 4146	Abnormal Psychology	3
DEP 2000	Human Growth and Development: Introductory Developmental Psychology	3
ECO 4504	Intro to Public Finance	3
HIS 4492	History of U.S. Health Policy	3
PAD 3034	Policy Development and Implementation	3
PCB 3703	Human Physiology I	3
PCB 3703L	Human Physiology I Lab	1
POS 3424	The Legislative Process	3
HSC 3537	Medical Terminology	3
HSC 3549	Clinical Physiology for Health Professionals	3
HSC 4553	Fundamentals of Pathology	3
HUN 2202	Principles of Nutrition	3
PET 3310	Kinesiology	3
PSY 2012	Introductory Psychology	3
ZOO 3731	Human Anatomy	3
ZOO 3731L	Human Anatomy Demonstration	1

**Health Policy, Environmental Policy and Pre-Law Track**

AMH 3630	Environmental History of the United States	3
CJL 3512	The Courts	3
CJL 4064	Criminal Justice and the Constitution	3
COM 4462	Conflict Management	3
ECP 3302	Introduction to Environmental Economics	3
ENC 3311	Advanced Writing and Research	3
ENC 3354	Writing as Social Action	3
ENC 3371	Rhetorical Theory and Practice	3
ENC 4331	Writing, Rhetoric, and Community	3
ENC 4930	Special Topics in Composition	3
GEO 4354	Geography of the Global Food System	3
INR 4350	International Environmental Politics (IP)	3
PAD 3034	Policy Development and Implementation - GL	3
PHI 2100	Introduction to Logic	3
PHI 2103	Critical Thinking	3
PHI 4130	Symbolic Logic	3
POS 3283	The Judicial Process	3
POS 3603	Constitutional Law: Powers	3
POS 3604	Constitutional Law: Limitations	3
POS 4784	Analytic Writing in Political Science	3
REL 3492	Earth Ethics	3
SPC 3230	Rhetorical Communication: A Theory of Civil Discourse	3
SPC 3540	Persuasion	3

**Science Communication Track**

COM 3110	Business and Professional Communication	3
ENC 3213	Professional and Technical Writing	3
ENC 3311	Advanced Writing and Research	3
ENC 3363	Writing About the Environment	3
ENC 3416	Writing and New Media	3
ENC 4241	Scientific Writing	3
ENC 4260	Advanced Professional Writing	3
ENC 4357	How To Go Public	3
IDS 3309	How We Know What We Know – GL	3
MMC 3121	Writing Fundamentals for Communicators	3
MMC 3650	Media and Sustainability	3
MMC 4936	Special Topics	3
JOU 3314	Environmental Journalism: Communicating Environmental Issues in South Florida	3

**Bioentrepreneur Track**

ACG 3024	Accounting for Managers and Investors (AC)	3
FIN 3005	Introduction to Business Finance	3
ISM 3012	Introduction to Decision and Information Systems (IS)	3
MAN 3022	Introduction to Management	3
MAR 3024	Marketing Fundamentals (ME)	3
<b>Choose one of the following:</b>		
COM 3110	Business and Professional Communication	3
HAS 3111	Introduction to Health Services Systems	3

**General Electives – 8 credits**

Eight additional credits must be completed.

(Students transferring with 60 or more credits, including those who have completed an Associate of Arts degree,

will take BCH 2XXX and BSC 2300 as part of the elective credits, and will be exempt from the BSC 1005 requirement.)

## 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 2010, BSC 2010L	BSCX010/X010L or BSCX010C or BSCX040/X040L or PCBX011C
BSC 2011, BSC 2011L	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 MACX281 or MACX241
MAC 2311	MACX312 or MACX282 or MACX234
MAC 2312 or	STAX023 or STAX024 or STAX321**
STA 2122 and STA 3123	

Courses which form part of the statewide articulation between the State University System and the Florida 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: <https://www.flvc.org>. Search Program Listing by Alphabetic Order.

### Common Prerequisites

A grade of "C" or better required

<b>BSC 2010</b>	<b>General Biology I</b>
<b>BSC 2010L</b>	<b>General Biology I Lab</b>
<b>BSC 2011</b>	<b>General Biology II</b>
<b>BSC 2011L</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>
<b>MAC 2311</b>	<b>Calculus I<sup>3</sup></b>

<b>MAC 2312</b>	<b>Calculus II<sup>3</sup></b>
<b>OR</b>	
<b>STA 2122</b>	<b>Stats for Behav Scien I<sup>3</sup></b>
<b>STA 3123</b>	<b>Stats for Behav Scien 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.

\*FIU does not accept MAC 2233 (Calculus for Business) as a substitute for MAC 2311 (Calculus I).

\*\*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.

Students admitted to the university are admitted directly to their chosen major. Students are expected to make good progress based on critical indicators, such as GPA in specific courses or credits earned. In cases where students are not making good progress, a change of major may be required. Advisors work to redirect students to more appropriate majors when critical indicators are not met.

### 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> (Four Labs, regardless of credits per lab)	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: Essentials of Biology: The Big Picture (BSC 1005), Foundations of Biochemistry (BCH 2020), Biological Organization: The Size and Scale of Life (BSC

2300), Student Research Labs (BSC 3915, 4914, and 6916); Workshop Biology Labs (BSC 5928, PCB 5238, BSC 6926, etc.); Cooperative Education credits (BSC 3949); Biology of Women (BSC 3027); Research Methods in Biological Sciences (BSC 3910); 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 course or courses that meet the distribution or Biology elective requirements.

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

## Bachelor of Science in Biological Sciences: Quantifying Biology in the Classroom (QBIC) Track

**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 2010, BSC 2010L	BSCX010/X010L or BSCX010C or BSCX040/X040L or PCBX011C
BSC 2011, BSC 2011L	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
PHY 2048, PHY 2048L	PHYX048/X048L or PHY053/X053L
PHY 2049, PHY 2049L	PHYX049/X049L or PHY054/X054L
MAC 2311	MACX311 or MACX233 or MACX253 or MACX081 or MACX241
MAC 2312 or STA 2122 and STA 3123	MACX312 or MACX282 or MACX234 or STAX023 or STAX024 or STAX321

Courses which form part of the statewide articulation between the State University System and the Florida 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: <https://www.flvc.org>, Search Program Listing by Alphabetic Order.

### Common Prerequisites

A grade of "C" or better required

<b>BSC 2010</b>	<b>General Biology I</b>
<b>BSC 2010L</b>	<b>General Biology I Lab</b>
<b>BSC 2011</b>	<b>General Biology II</b>
<b>BSC 2011L</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</sup></b>
<b>PHY 2048L</b>	<b>General Physics Lab I<sup>1</sup></b>
<b>PHY 2049</b>	<b>Physics with Calculus II<sup>1</sup></b>
<b>PHY 2049L</b>	<b>General Physics Lab II<sup>1</sup></b>
<b>MAC 2311</b>	<b>Calculus I</b>
<b>MAC 2312</b>	<b>Calculus II</b>

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

### QBIC Prerequisites

<b>BSC 2921</b>	<b>QBIC Journal Club I</b>	<b>1</b>
<b>BSC 2922</b>	<b>QBIC Journal Club II</b>	<b>1</b>
<b>STA 3193</b>	<b>Statistics for Biology I<sup>2</sup></b>	<b>3</b>
<b>STA 3194</b>	<b>Statistics for Biology II<sup>2</sup></b>	<b>3</b>

<sup>2</sup>Statistics I and II are upper division but taken during the Sophomore Year and coordinated with Ecology and Genetics labs.

For consideration for QBIC track admission entering freshman must have >3.3 GPA (unweighted), >1750 SAT with MATH >600, have completed Precalculus Math (or Algebra and Trigonometry) and have an interest in pursuing graduate studies (MD, DVM, DDS, PhD, MD/PhD). Transfer and continuing FIU students can apply on a space available basis if they have maintained >3.3 GPA in college-level work and have completed Calculus I with a grade above 'B-'. QBIC students are required to maintain cumulative GPA above 3.0.

### Upper Division Program

#### Required Courses

<b>1.</b>	<b>PCB 3043</b>	<b>Ecology</b>	<b>3</b>
<b>2.</b>	<b>PCB 3063</b>	<b>Genetics</b>	<b>3</b>
<b>3.</b>	<b>PCB 4023</b>	<b>Cell Biology</b>	<b>3</b>
<b>4.</b>	<b>PCB 4674</b>	<b>Evolution</b>	<b>3</b>
<b>5.</b>	<b>BSC 4927</b>	<b>QBIC Science Café</b>	<b>1</b>
<b>6.</b>	<b>Distribution Requirement<sup>1</sup></b>		<b>12</b>

One additional lecture course in each of the following areas:

- Ecology
- Organismal Diversity
- Physiology/Biochemistry
- Structure/Development

(If a course satisfies the distribution requirement, the letter of the area that it satisfies is in brackets after the course description).

<b>7.</b>	<b>QBIC Required Corequisites</b>		
	<b>BSC 3923</b>	<b>QBIC Ecology Journal Club<sup>1</sup></b>	<b>1</b>
	<b>BSC 3924</b>	<b>QBIC Genetics Journal Club<sup>1</sup></b>	<b>1</b>
	<b>BSC 4925</b>	<b>QBIC Cell Biology Journal Club<sup>1</sup></b>	<b>1</b>
	<b>BSC 4926</b>	<b>QBIC Evolution Journal Club<sup>1</sup></b>	<b>1</b>
<b>8.</b>	<b>Biology Electives<sup>1</sup></b>	<b>1 lecture courses</b>	<b>3</b>

9. Laboratory Requirement<sup>2</sup>  
(QBIC sections of PCB 3043L, PCB 3063L, PCB 4023L,  
and another lab accompanying an upper division lecture  
elective of choice) 4
10. Electives outside major 9  
(Modeling+Simulation and Higher Math courses are  
recommended)
11. A minimum of 48 credits must be earned in Upper  
Division courses.

<sup>1</sup>Lecture courses (3000-level and above) to be chosen in consultation with a faculty advisor. Journal Club courses count as one elective and are corequisites to PCB 3043, PCB 3063, PCB 4023 and PCB 4674. The following courses are not allowed as Biology Electives: Essentials of Biology: The Big Picture (BSC 1005), Foundations of Biochemistry (BCH 2020), Biological Organization: The Size and Scale of Life (BSC 2300), Student Research Labs (BSC 3915, 4914, and 6916); Workshop Biology Labs (BSC 5928, PCB 5238, BSC 6926, etc.); Cooperative Education credits (BSC 3949); Biology of Women (BSC 3027); Research Methods in Biological Sciences (BSC 3910); and courses for non-science majors (BOT 1010, PCB 2061, PCB 2099, MCB 2000, 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.

## 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 some 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 similar to that of the BS in Biological Sciences, in which common prerequisites in Biological Sciences, Chemistry<sup>1</sup>, 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.

<sup>1</sup> Organic chemistry sequence may be fulfilled by taking CHM 2210, CHM 2210L (lecture **and** lab) **and**

CHM 2211, CHM 2211L (lecture **and** lab)  
**or**  
CHM 2200, CHM 2200L (Survey of Organic  
Chemistry lecture **and** lab) **and**  
CHM3120, CHM3120L (Introduction to Analytical  
Chemistry lecture **and** lab) **and**  
CHS 4600 Marine Chemistry

#### Upper Division Program

The upper-division requirements for the BS in Marine Biology include a selection of six common requirements, one required laboratory, and a choice of four marine electives, including selections from among the physical sciences. The Marine Biology Distribution Requirement provides for disciplinary breadth in Marine Biology electives.

#### Common Requirements

PCB 3043	Ecology	3
PCB 3063	Genetics	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 at least 15 credits spread among the following four areas. At least 1 class per area (A,B,C,D) needs to be taken plus one additional class from any of the four categories for a total of 15 credits. Requirement (A): Biology and Physiology of Marine Organisms; Requirement (B): Marine Ecology and Conservation Biology; Requirement (C): Field Marine Biology Experience; Requirement (D): Marine Molecular Biology:

- (A) Biology and Physiology of Marine Organisms
1. Invertebrate Zoology ZOO 3250C (4)
  2. Marine Botany BOT 4402C (4);  
Phycology BOT 4404 (3)
  3. Biology of Marine Mammals OCB 4303 (3)
  4. Marine Microbial Ecology OCB 4632 (3)
  5. Fish Biology ZOO 4454 (3)
  6. Animal Physiology PCB 4723 (3) or  
Comparative Physiology PCB 4724 (3)  
or Physiological and Behavioral Ecology  
of Marine Animals PCB 4776 (3)
- (B) Marine Ecology and Conservation Biology
1. Coastal Marine Conservation OCB 4070 (3)
  2. Coral Reef Biology OCB 3264
  3. Marine Community Ecology OCB 4633 (3)
  4. Fisheries Science OCB 4711 (3)
  5. Marine Protected Areas PCB 4467C (4)
- (C) Field Marine Biology Experience
1. Field Methods in Marine Ecology OCB 4104C (4)
  2. Biological Oceanography at Sea I or II OCB 4004 (3) or OCB 4005C (4)
  3. Scientific Diving BSC 4437C\* (3) (\*does not count as a lab).
  4. Student Research Lab I BSC 3915 (3)



- Independent study with a Marine Biology faculty member, requires permission of Marine Biology Director
- Honors Research Lab BSC 4970 (3), requires permission of Marine Biology Director

(A) Marine Molecular Biology

- Cell Biology PCB 4023 (3)
- Molecular Biology PCB 4524 (3)
- Bioinformatics for Biologists BSC 4434 (3)
- Immunology PCB 4233 (3)
- Population Genetics PCB 4553 (3)

### 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 or Marine Biology

### Admission to the Program

- Permission of the department. Application should be made by letter to the Honors 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 or Marine 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: Biology Education Major (FIUteach)

This program prepares students interested in biology careers and certification to teach biology. Additional science and/or mathematic certifications at the secondary level may be added (below). Students are encouraged to contact the FIUteach program ([FIUteach.fiu.edu](http://FIUteach.fiu.edu)) for

opportunities to try out teaching at no cost. Interested students are encouraged to contact the department, the FIUteach program, or the secondary science advisor for additional details and certification requirements.

Additional coursework in science and/or mathematics is required to prepare for certification in additional subject areas. Students must contact the FIUteach program or the secondary science advisor for details and requirements.

### Admission to the Program

To qualify for admission to the program, undergraduate candidates must have met all of the lower division requirements including: 60 credit hours of lower-division courses, all general education requirements, lower division GPA of 2.5 higher, and achieve the competencies of the FTCE General Knowledge Exam (GK). All students must pass the GK Exam by the time they reach 72 credit hours in their program of study. All stated admission requirements are to be considered minimum. A student who meets these minimum requirements is not automatically assured admission. Program admission requirements are subject to change. It is the responsibility of the student to assure that he/she has met the requirements.

### Lower Division Requirements

#### Common Prerequisites

A grade of "C" or better required

<b>BSC 2010</b>	<b>General Biology I</b>
<b>BSC 2010L</b>	<b>General Biology I Lab</b>
<b>BSC 2011</b>	<b>General Biology II</b>
<b>BSC 2011L</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>

<b>MAC 2311</b>	<b>Calculus I<sup>3</sup></b>
<b>MAC 2312</b>	<b>Calculus II<sup>3</sup></b>

OR

<b>STA 2122</b>	<b>Stats for Behav Scien I<sup>3</sup></b>
<b>STA 3123</b>	<b>Stats for Behav Scien 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 (PHY 2053 and PHY 2054) can be substituted Physics with Calculus I and II.

<sup>3</sup>Calculus I and II must be taken at the lower division. If Statistics I is taken it must be taken at the lower division. Both Statistics I and II are required to replace Calculus II only. STA 3111 and STA 3112 may be substituted for STA 2122 and STA 3123.

Additional Lower Division Courses: (2 credits)

SMT 2661 Step 1: Inquiry Approaches to Teaching Mathematics and Science

SMT 2662	Step 2: Inquiry-Based Lesson Design in Mathematics and Science	1
	<b>or</b>	
SMT 2044	Combined STEP 1 & 2: Inquiry-Based Approaches and Lesson Design for Teaching Mathematics and Science	2

### Upper Division Biology Education Program

#### Required Courses

PCB 3043	Ecology	3
PCB 3063	Genetics	3
PCB 4023	Cell Biology	3
PCB 4674	Evolution	3
BSC 4931	Senior Seminar	1

#### Biology Education Upper Division Electives

Select one course each of the following areas:

A.	Ecology	3
B.	Organismal Diversity	3
C.	Physiology/Biochemistry	3
D.	Structure/Development	3

(If a course satisfies the distribution requirement, the letter of the area it satisfies is in brackets after the course description)

#### Biology Laboratory Requirement

One Upper Division Lab 1

#### Education Requirements

BSC 3910	Research Methods in Biological Sciences	3
SMT 3100	Knowing and Learning in Mathematics and Science	3
SMT 4301	Classroom Interactions in Mathematics and Science Teaching	3
SMT 4664	Problem-Based Instruction (PBI) in Mathematics and Science	3
SCE 4194	Perspectives in Science and Math Education – <i>GL</i>	3
SCE 4944	Student Teaching	6
RED 4325	Subject Area Reading	3
TSL 4324	ESOL Issues and Strategies for Content Area Teachers – <i>GL</i>	3

### Minor in Biology

#### Required Courses

BSC 2010 and BSC 2011 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), 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 2010 and BSC 2011 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; IDS-Interdisciplinary Studies; MCB - Microbiology; OCB - Oceanography (Biological); PCB - Process Biology; SCE - Science Education; ZOO - Zoology

Courses that meet the University's Global Learning requirement are identified as GL.

**BCH 2020 Foundations of Biochemistry (3).** An introduction to the fundamentals of biochemistry which explores the interactions of macromolecules in cells and their environment, and the metabolic pathways that govern life. Prerequisites: BSC 2010, CHM 1045

**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: CHM 2211 and BSC 2010. [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: BCH 3033 and BCH 3033L, PCB 4524 and 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. Prerequisite: BSC 2011. [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: BOT 1010 or BSC 2011. 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: BSC 2010, BSC 2011. [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: BSC 2011 or equivalent. [B]

**BOT 3810 Economic Botany (3).** The origins, domestication and uses of economically important plants. Prerequisites: BSC 2011 or BOT 1010. [B]

**BOT 4401 Plant Conservation Biology (3).** Overview of the causes and consequences of local and global-scale human disturbances on plant diversity, including evaluation of strategies to mitigate these impacts. Prerequisite: PCB 3043. [A]

**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 2011 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 2010, BSC 2011. [B]

**BOT 4503 Plant Physiology (3).** Plant growth and metabolism in relationship to environment. Photobiology, nutrient relations, transport, and hormones in relation to plant development and function. Prerequisites: BSC 2010, BSC 2010L, BSC 2011, CHM 2210. [C]

**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. Prerequisites: BSC 2010, BSC 2010L, BSC 2011, CHM 2210. Prerequisite or Corequisite: BOT 4503. [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. [A]

**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: BOT 3154 or 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 2011 or equivalent.

**BOT 5159C 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: PCB 3043 or permission of the instructor.

**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 or CHM 4304. [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: 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 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, Phycocode, and others. Prerequisites: BOT 5725C or 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: BSC 2010 and BSC 2011 and 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: BOT 3810, BOT 3663, 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. Prerequisite: 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: BOT 3810 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: BOT 3154, 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 1005 Essentials of Biology: The Big Picture (3).** The class will explore the connections between the core concepts of biology and how they intertwine with economics, culture, history, human health and conservation.

**BSC 2010 General Biology I (3). BSC 2010L General Biology I Lab (1).** Biomolecules, cells, energy flow, genetics, and physiology. Science background or Biology major recommended. Concurrent registration in both lecture and laboratory is required. Prerequisite or Corequisite: BSC 2010L. (Lab fees assessed)

**BSC 2011 General Biology II (3). BSC 2011L General Biology Lab II (1).** A survey of organismal biology with emphasis on botany and zoology. Science background or Biology major recommended. Concurrent registration in both lecture and laboratory is required. Prerequisite or Corequisite: BSC 2011L. (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 2300 Biological Organization: The Size and Scale of Life (3).** An introduction to the extraordinary range of size of cells and organisms, and the interactions of biomolecules that govern and constrain all life. Prerequisites :BSC2010 and CHM1045

**BSC 2917 (1). CAChe Discovery 1: Research in Aquatic Ecosystems.** Exploration of South Florida's aquatic ecosystems through hands-on research experiences and introduction to career opportunities in science.

**BSC 2921 QBIC Journal Club I (1).** Topics complement General Biology I Lecture (BSC 2010) and reinforce concepts QBIC students learn in that class through discussion of relevant scientific literature. Corequisite: BSC 2010.

**BSC 2922 QBIC Journal Club II (1).** Topics complement General Biology II Lecture (BSC 2011) and reinforces concepts QBIC students learn in that class through discussion of relevant scientific literature. Corequisite: BSC 2011.

**BSC 3027 Biology of Women (3).** Consideration of women's bodies: how they work, how they have been regarded over time, and how biology affects abilities, health, and self-esteem. Course does not count as a biology or marine biology major elective.

**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 2010 and BSC 2011.

**BSC 3812 Biology Teacher Examination Preparation (0).** A review of the main principles in Biology and the scientific process. Prerequisites: BSC 2010, BSC 2011.

**BSC 3905 Biological Sciences Research Internship (0-12).** Supervised, practical experience in a professional, laboratory or field setting in which biologists may work. Department permission is required. May be repeated. Prerequisites: Permission from FIU faculty advisor is required.

**BSC 3910 Research Methods in Biological Sciences (3).** Experimental development and design for future biology teachers. Independent biological sciences experiments are designed, conducted and analyzed. Includes statistical analysis techniques. Prerequisite: SMT 2662.

**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 3923 QBIC Ecology Journal Club (1).** A seminar styled course teaching QBIC students how to dissect and analyze complex analytically written scientific articles in Ecology (PCB 3043). Corequisite: PCB 3043.

**BSC 3924 QBIC Genetics Journal Club (1).** A seminar styled course teaching QBIC students how to dissect and analyze complex analytically written scientific articles in Genetics (PCB 3063). Corequisite: PCB 3063.

**BSC 3930 CAChe Discovery 2: Professional Pathways in Aquatic and Environmental Science (1).** Explores the options for students to pursue careers and graduate work in STEM fields, through professional development training in resume building and improved written and oral communication skills.

**BSC 3941 Biological Sciences Research Internship (0-12).** Supervised, practical experience in a professional, laboratory or field setting in which biologists may work. Department permission is required. May be repeated. Prerequisites: Permission from FIU faculty advisor is required.

**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 4205 Topics in Organismal Diversity (3).** An intensive study of a topic or topics in organismal diversity not otherwise offered in the curriculum. Prerequisites: BSC 2010, BSC 2010L and BSC 2011, BSC 2011L. [B]

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

**BSC 4361 Biodiversity of Tropical Islands (3).** Current issues on evolution, diversification and conservation of flora and fauna on tropical islands. Prerequisites: PCB 3063, PCB 3043, and 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 2010, BSC 2011. [A]

**BSC 4401 Principles of Forensic Biology (3).** Molecular techniques used in forensic biology and how they, along with genetics, are used to generate a DNA profile in order to aid the administration of justice. Prerequisite: BSC 2010. [D]

**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 2010, BSC 2011, 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 4473C Introduction to Scientific Diving (3).** Covers all aspects of conducting safe underwater research, including theoretical and practical aspects of diving, diving equipment, and scientific techniques. Prerequisites: OCB 3043+lab or PCB 3043+lab or CHS 4600 or OCE 3014, open water diving certification, permission of the instructor, FIU Diving Medical clearance, pass standardized swim test, at least 18 years old.

**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 4925 QBIC Cell Biology Journal Club (1).** A seminar styled course teaching QBIC students how to dissect and analyze complex analytically written scientific articles in Cell Biology (PCB 4023).

**BSC 4926 QBIC Evolution Journal Club (1).** A seminar styled course teaching QBIC students how to dissect and analyze complex analytically written scientific articles in Evolution (PCB 4674).

**BSC 4927 QBIC Science Café (1).** QBIC students will develop and host their own Science Café to transmit scientific subjects to and engage in a dialog with the general public. Prerequisites: BSC 3923, BSC 3924, BSC 4925, BSC 4926.

**BSC 4931 Senior Seminar (1).** An exploration of various research works in biological sciences. Oral presentation by the students required. Prerequisite: Senior standing. Prerequisites or Corequisites: PCB 3043, PCB 3063, PCB 4023, and PCB 4674.

**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. [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 2010, BSC 2011, 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 5927 Workshop: R Programming for Biologists (2).** Statistical methods and biological/ecological applications using R programming language. Prerequisites: (Graduate standing in Biology) or (STA 3111 and STA 3112).

**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.

**BSC 5931 Thesis Proposal Seminar (1).** Presentation of thesis proposal seminar. Permission of major professor required.

**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 5935 Topics in Biology (1-3).** An intensive study of a particular topic or limited number of topics not otherwise offered in the curriculum. May be repeated for credit with different subject content. Prerequisites: Senior or graduate status.

**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.

**BSC 5945 Supervised Teaching in Biology (1-2).** Teaching in a biological discipline, under the supervision of departmental faculty. Prerequisite: Graduate status.

**BSC 5975 Thesis Defense Seminar (1).** Presentation of thesis defense seminar. Permission of major professor required. Prerequisite: Thesis proposal seminar.

**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: BSC 2011.

**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: BS 1010, BSC 2011, or permission of the instructor. [B]

**IDS 3214 Our Coastal Environment from the Bay to the World – GL (3).** Natural science principles applied to the world's coastal and marine environments, with emphasis on human use of and interaction with those environments, using cases from Florida and around the globe.

**MCB 2000 Introductory Microbiology – GL (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 3007 Living with Microbes – GL (3).** Explore the intricate relationship between human and planetary well-being and the microbes that inhabit us, both inside and outside our bodies.

**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: CHM 2210 and CHM 2211; and BSC 2010 and BSC 2011; 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: MCB 3020. [C]

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

**MCB 4404L Microbial Physiology Lab (1).** Introduction to the study of physiological and metabolic activities of microorganisms and processes that affect them. Prerequisites: MCB 3020, MCB 3020L. Prerequisite or Corequisite: MCB 4404. [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. [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: MCB 3020 and MCB 3020L. [A]

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

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

**MCB 5116 Microbial Diversity (3). MCB 5116L Microbial Diversity Laboratory (1).** Analysis of metabolic and morphological 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 5205 Advanced Microbial Pathogenicity (3).** Overview of microbial pathogenicity, including interactions with hosts, evolution of pathogens, virulence factors, toxins, antibiotics, and case studies of specific pathogens. Prerequisites: MCB 3020 or permission of the instructor.

**MCB 5315C Workshop: Prokaryotic Cloning (2).** Description of molecular genetic methods for manipulation of prokaryotic DNA. Prerequisites: PCB 3063; BCH 3033; or CHM 4304 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 – GL (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: BSC 2010 and BSC 2011. [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: BSC 2011 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. [A]

**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. [A]

**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 4104C Field Methods in Marine Ecology (4).** Introduction to field and analytical methods applied in marine ecology research focusing on integrating principles of the scientific method, experimental design, data collection and analysis. 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 2010 and 2011 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 2010, BSC 2011, 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 4711 Fisheries Science (3).** Fundamental theory and techniques of fisheries science, including population dynamics, recruitment, migration, growth, measurement techniques and modeling. Prerequisites: BSC 2010 and BSC 2011. [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: 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 2010, BSC 2011, 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.

**OCB 5715 Advanced Fisheries Science (3).** Theory and techniques of fisheries science comprising recruitment, growth, migration, population dynamics, modeling and measurement techniques. Prerequisite: Graduate standing.

**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: BSC 2010 and BSC 2011. [A]

**PCB 3063 Genetics (3).** **PCB 3063L Genetics Lab (1).** Mendelian inheritance and introduction to molecular genetics. Prerequisites: BSC 2010. [D]

**PCB 3241 Biology of Aging (3).** Biologic changes that occur in aging with emphasis on underlying regulatory mechanisms, including the aging genome and structural and functional changes in organ systems. Prerequisites: BSC 2010 and BSC 2011. [C]

**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).** Functions of the human body and the physio-chemical mechanisms responsible for each organ's function. Prerequisites: BSC 2010 or BSC 2011. [C]

**PCB 3702L Intermediate Human Physiology Lab (1).** Functions of the human body and the physio-chemical mechanisms responsible for each organ's function. Prerequisites: BSC 2010 or BSC 2011. Prerequisite or Corequisite: PCB 3702. [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 2010. 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 2010. 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. Prerequisites: PCB 3063 and CHM 1046. [C]

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

**PCB 4133 Topics in Structure/Development (3).** An intensive study of a particular topic or topics in Structure-Development not otherwise offered in the curriculum. Prerequisites: BSC 2010, BSC 2010L and BSC 2011, BSC 2011L. [D]

**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: BSC 2010, BSC 2011, CHM 1045, and 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. Prerequisite: PCB 3063. [C]

**PCB 4234 Biology of Cancer (3).** Explore fundamental biology of cancer as a dynamic system governed by evolutionary and ecological principles. Prerequisites: PCB 3063 and PCB 3043. [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 or BCH 3033. [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: 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. [A]

**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 – GL (4).** Introduction to the theory and methods for the design and management of Marine Protected Areas. Prerequisites: BSC 2010 and BSC 2011. [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: 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, BCH 3033 or CHM 4304. [C]

**PCB 4553 General Population Genetics – GL (3).** Analysis of gene and genotype frequencies in theoretical and real populations. Topics include genetic drift, mutation, and selection. Prerequisite: PCB 3063. [A]

**PCB 4561 Epigenetics (3).** An overview of the mechanisms involved in epigenetic inheritance and their role in reproduction, development, environmental responses and health. Prerequisites: BSC1011, PCB3063

**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, PCB 3043. [B]

**PCB 4676 Human Evolution (3).** The evolutionary processes and relationships that have led to the unique biocultural development of the human species. Hominin origins and taxonomy are examined through fossil evidence. Prerequisites: BSC 2011 and PCB 3063. [B]



**PCB 4717 Topics in Physiology/Biochemistry (3).** An intensive study of a particular topic or topics in Physiology/Biochemistry not otherwise offered in the curriculum. Prerequisites: BSC 2010, BSC 2010L and BSC 2011, BSC 2011L. [C]

**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 2010, BSC 2011, 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: BSC 2010 and BSC 2011 and 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 2010. [C]

**PCB 4734 Human Systemic Physiology II (3).** Selected topics in human physiology with emphasis on topics of clinical significance. Prerequisites: BSC 2010. [C]

**PCB 4776 Physiological and Behavioral Ecology of Marine Animals (3).** An overview of the physiological and behavioral adaptations of marine animals to their environments (C). Prerequisites: BSC2010, BSC2011, and PCB3043.

**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: BSC 2011, 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: BSC 2010, BSC 2011, permission of the instructor. Corequisite: PCB 4805.

**PCB 4932 Topics in Ecology (3).** An intensive study of a particular topic or topic in Ecology not otherwise offered in the curriculum. Prerequisites: BSC 2010, BSC 2010L and BSC 2011, BSC 2011L. [A]

**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 5046 Advanced Plant Conservation Biology (3).** Survey of the causes and consequences of anthropogenic disturbances on plant diversity at different spatial scales, including critical evaluation of strategies to mitigate these impacts. Prerequisites: PCB 3043 or graduate status.

**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 5215 Workshop in Histo- and Immunocyto-Chemistry (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: 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: PCB 3043 and 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. Corequisites: PCB 5443; MAC 2311.

**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, BCH 3033 or CHM 4304. [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 (4).** Study of theory and methods for the design and management of Marine Protected Areas including a research project. Prerequisites: BSC 2010 and BSC 2011.

**PCB 5423 Advanced Ecology: Populations and Communities (3).** Advanced analysis of population and community ecology. Prerequisites: 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: 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).** **PCB 5665L Human Genetics Lab (2).** Principles and techniques in the analysis of humans and primates. Prerequisites: PCB 3063 and PCB 3063L, or permission of the instructor. Corequisite: Concurrent registration of lecture with lab course. [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: 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: PCB 3063 and 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: 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 or CHM 4304. [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, PHY 2049, BCH 3033. [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: BCH 3033 and MAC 2311. [C]

**SCE 3813 Biology Education Seminar (1).** theoretical and practical introduction to pedagogical elements such as Cooperative, Inquiry and Problem-Based Learning. Students will learn how to teach biology effectively in the modern classroom. Prerequisite: Permission of the instructor.

**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: BSC 2010 and BSC 2011 with BSC 2010L and BSC 2011L. [B]

**ZOO 3205C Invertebrate Zoology (4).** Taxonomy, anatomy, development, physiology and ecology of major invertebrate groups, including terrestrial and aquatic phyla. Prerequisite: BSC 2011. [B]

**ZOO 3303 Vertebrate Zoology (3).** **ZOO 3303L Vertebrate Zoology Lab (1).** Systematics, anatomy, physiology, development and ecology of vertebrate animals. Prerequisites: BSC 2010 and BSC 2011 with BSC 2010L and BSC 2011L. [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: BSC 2010 and BSC 2011 with BSC 2010L and BSC 2011L. [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: BSC 2010 and BSC 2011. [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 2010 or PCB 2099 or BSC 2023 or MCB 2000 or HSC 3549. Corequisite: Concurrent enrollment in both lecture and laboratory required. [D]

**ZOO 3753 Histology (3). ZOO 3753L Histology Lab (1).** Microscopic anatomy of cells, tissues and organs. Prerequisites: BSC 2010 and CHM 2210 and 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 2011. [B]

**ZOO 4234 General Parasitology (3). ZOO 4234L General Parasitology Lab (1).** Modern concepts of biology, development, immunology and pathology of animal parasites. Prerequisite: BSC 2010. 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 2011 and BSC 2011L, or permission of the instructor. [D]

**ZOO 4454 Fish Biology (3).** Covers the systematics, anatomy, physiology, reproductive biology, and ecology of fish. Prerequisites: BSC 2010, BSC 2011, 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: BSC 2010 and BSC 2011 and 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: BSC 2010 and BSC 2011. 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: BSC 2010 and BSC 2011 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 2010, BSC 2011. [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: BSC 2011, BSC 2011L, CHM 1046, CHM 1046L, and 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 2010, BSC 2011, CHM 2211. [D]

**ZOO 4744 Neurobiology (3).** A comparative overview of the function of the nervous system covering neurons, sensory and motor systems, and the neural basis of behavior. Prerequisites: BSC 2010 and BSC 2011. [C]

**ZOO 4781 Sensory Systems in Neurobiology (3).** A comparative overview of sensory systems covering environmental stimuli, physical transduction, neural processing, and behavioral responses. Prerequisites: ZOO 4744 or permission of the instructor.

**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 kinesiology 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 or ZOO 4733. Corequisite: ZOO 5371L. [D]

**ZOO 5376 Animal Design and Movement (4).** Basic biomechanical and behavioral theories of how animals feed and move. Prerequisites: BSC 2010 and BSC 2011, PHY 2053 and 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: BSC 2010 and BSC 2011 and 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: BSC 2010, and BSC 2011, and 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 eight credits. Prerequisites: ZOO 3733 and ZOO 3733L 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: 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: BSC 2010 and BSC 2011, CHM 1045 and CHM 1046 and PHY 2048; graduate standing or permission of the instructor. [C]

**ZOO 5785 Advanced Neurobiology (3).** An in depth treatment of the nervous system covering molecular and cellular function, sensory and motor systems, and the neural basis of behavior. Prerequisite: Graduate standing.