

# BIOSCIENCES

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## Contact Information

### BioSciences

<https://biosciences.rice.edu/>

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### Edward P. Nikonowicz

Department Chair

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The BioSciences department unites faculty engaged in research and teaching in a wide range of disciplines within the life sciences, creating a vibrant and diverse community of scholars. The department offers a broad range of introductory and advanced courses that lead to undergraduate degrees (BA, BS) with a Major in Biosciences and a Major Concentration in Biochemistry, in Cell Biology and Genetics, in Ecology and Evolutionary Biology, or in Integrative Biology.

In addition, a Minor in Biochemistry and Cell Biology and a Minor in Ecology and Evolutionary Biology are offered. The BA degree offers a rigorous biological curriculum suitable for many career paths while allowing the flexibility for extended academic exploration in other areas. The BS degree offers greater depth in upper-level coursework. Most BioSciences students, regardless of major, participate in undergraduate research, availing themselves of the numerous research opportunities at Rice and in the Houston community.

All major degree paths will prepare students for graduate, medical, or other professional schools and a wide range of careers in the life sciences. In addition, qualified students may apply to the Biochemistry and Cell Biology BA-MS-PhD program track. Additional information on departmental programs, courses, and advising is available at the [BioSciences website](http://biosciences.rice.edu/) (<http://biosciences.rice.edu/>).

The BioSciences department also oversees academic programs that lead to undergraduate degrees in Environmental Science (BA, BS) and Neuroscience (BA), as well as a Minor in Neuroscience. At the graduate-level, the BioSciences department administers graduate programs in Biochemistry and Cell Biology (PhD, MS) and in Ecology and Evolutionary Biology (PhD, MS). In addition, some BioSciences faculty members participate in the Systems, Synthetic, and Physical Biology (SSPB) PhD program administered by the Institute of Biosciences and Bioengineering (<https://ibb.rice.edu/>). Graduate studies include a combination of advanced coursework and individual research with faculty mentors.

For additional information regarding BioSciences and its associated academic programs, please see the department's website: <https://biosciences.rice.edu/>.

## Bachelor's Programs

- Bachelor of Arts (BA) Degree with a Major in Biosciences
  - [and a Major Concentration in Biochemistry](https://ga.rice.edu/programs-study/departments-programs/natural-sciences/biosciences/biochemistry-ba/)

- [and a Major Concentration in Cell Biology and Genetics](https://ga.rice.edu/programs-study/departments-programs/natural-sciences/biosciences/cell-biology-and-genetics-ba/)
- [and a Major Concentration in Ecology and Evolutionary Biology](https://ga.rice.edu/programs-study/departments-programs/natural-sciences/biosciences/ecology-and-evolutionary-biology-ba/)
- [and a Major Concentration in Integrative Biology](https://ga.rice.edu/programs-study/departments-programs/natural-sciences/biosciences/integrative-biology-ba/)
- Bachelor of Science (BS) Degree with a Major in Biosciences
  - [and a Major Concentration in Biochemistry](https://ga.rice.edu/programs-study/departments-programs/natural-sciences/biosciences/biochemistry-bs/)
  - [and a Major Concentration in Cell Biology and Genetics](https://ga.rice.edu/programs-study/departments-programs/natural-sciences/biosciences/cell-biology-and-genetics-bs/)
  - [and a Major Concentration in Ecology and Evolutionary Biology](https://ga.rice.edu/programs-study/departments-programs/natural-sciences/biosciences/ecology-and-evolutionary-biology-bs/)
  - [and a Major Concentration in Integrative Biology](https://ga.rice.edu/programs-study/departments-programs/natural-sciences/biosciences/integrative-biology-bs/)

## Minors

- [Minor in Biochemistry and Cell Biology](https://ga.rice.edu/programs-study/departments-programs/natural-sciences/biosciences/biochemistry-cell-biology-minor/)
- [Minor in Ecology and Evolutionary Biology](https://ga.rice.edu/programs-study/departments-programs/natural-sciences/biosciences/ecology-evolutionary-biology-minor/)

## Accelerated Program

- [Bachelor of Arts \(BA\) Degree / Master of Science \(MS\) Degree / Doctor of Philosophy \(PhD\) Degree in the field of Biochemistry and Cell Biology](https://ga.rice.edu/programs-study/departments-programs/natural-sciences/biosciences/biochemistry-cell-biology-ba-ms-phd/)

## Master's Programs

- [Master of Science \(MS\) Degree in the field of Biochemistry and Cell Biology](https://ga.rice.edu/programs-study/departments-programs/natural-sciences/biosciences/biochemistry-cell-biology-ms/)
- [Master of Science \(MS\) Degree in the field of Ecology and Evolutionary Biology](https://ga.rice.edu/programs-study/departments-programs/natural-sciences/biosciences/ecology-evolutionary-biology-ms/)

## Doctoral Programs

- [Doctor of Philosophy \(PhD\) Degree in the field of Biochemistry and Cell Biology](https://ga.rice.edu/programs-study/departments-programs/natural-sciences/biosciences/biochemistry-cell-biology-phd/)
- [Doctor of Philosophy \(PhD\) Degree in the field of Ecology and Evolutionary Biology](https://ga.rice.edu/programs-study/departments-programs/natural-sciences/biosciences/ecology-evolutionary-biology-phd/)

[departments-programs/natural-sciences/biosciences/ecology-evolutionary-biology-phd/](https://www.biology.yale.edu/departments-programs/natural-sciences/biosciences/ecology-evolutionary-biology-phd/)

## Chair

Edward P. Nikonowicz

## Professors

Caroline Ajo-Franklin  
Bonnie Bartel  
Kathleen M. Beckingham  
George M. Bennett  
Janet Braam  
Daniel D. Carson  
Michael C. Gustin  
Oleg A. Igoshin  
Caroline A. Masiello  
Seiichi P.T. Matsuda  
Kathleen Shive Matthews  
James A. McNew  
Luay K. Nakhleh  
Edward P. Nikonowicz  
Jose Nelson Onuchic  
George Phillips  
Volker H.W. Rudolf  
Yousif Shamoo  
Evan Siemann  
Jonathan J. Silberg  
Michael Stern  
Charles R. Stewart  
Yizhi Jane Tao  
Peter C. Wolynes

## Associate Professors

Matthew Bennett  
Amy E. Dunham  
Scott Egan  
Michael H. Kohn  
Peter Y. Lwigale  
Thomas E.X. Miller  
Laura Segatori  
Jeffrey J. Tabor  
Daniel S. Wagner  
Aryeh Warmflash

## Assistant Professors

Caleb Bashor  
Lydia Beaudrot  
James Chappell  
Kory Evans  
Xue Gao  
Yang Gao  
Anna-Karin Gustavsson  
Isaac Hilton  
Natalia Kirienko  
George Lu  
Matthew McCary  
Julia Saltz  
Adrienne Simoes Correa  
Rosa Uribe

Han Xiao

## Professors Emeriti

Frank M. Fisher, Jr.  
Raymond M. Glantz  
Paul A. Harcombe  
Jordan Konisky  
John Steven Olson  
Graham A. Palmer  
David Queller  
Ronald L. Sass  
Joan Strassman  
Stephen Subtelny  
Calvin H. Ward

## Teaching Faculty

Beth Beason-Abmayr  
David R. Caprette  
Daniel J. Catanese  
Jonathan Flynn  
Scott Solomon

## Lecturers

Mary Susan Cates  
Elizabeth Eich  
Cassidy Johnson  
Nele Lefeldt  
Kirstin Matthews  
Joseph R. Novak  
Alma M. Novotny  
Dereth Phillips  
Collin E. Thomas

## Adjunct Faculty

Richard Behringer  
Sarah Bondos  
Nikki Delk  
J. David Dickman  
Cindy Farach-Carson  
Haichun Gao  
Jeffrey Glassberg  
Richard H. Gomer  
Nancy Greig  
Daniel Harrington  
Maria K. Hartley  
Kendal Hirschi  
Kresimir Josic  
Olivier Lichtarge  
Jianpeng Ma  
Kevin R. MacKenzie  
Jordan Orange  
Pamela Constantinou Papadopoulos  
Debananda Pati  
Neal R. Pellis  
Susan M. Rosenberg  
Clarence F. Sams  
Erica Ollmann Sapphire  
Kelly L. Weinersmith  
Theodore G. Wensel  
Peggy Whitson

Zheng Zhou  
Huda Zoghbi

## EEB Faculty Fellow

David Armitage

## Rice Academy Fellows

Durre Muhammad  
Amanda Shore

*For Rice University degree-granting programs:*

To view the list of official course offerings, please see [Rice's Course Catalog \(https://courses.rice.edu/admweb!/SWKSCAT.cat?p\\_action=cata\)](https://courses.rice.edu/admweb!/SWKSCAT.cat?p_action=cata)

To view the most recent semester's course schedule, please see [Rice's Course Schedule \(https://courses.rice.edu/admweb!/SWKSCAT.cat\)](https://courses.rice.edu/admweb!/SWKSCAT.cat)

## Biosciences (BIOS)

### BIOS 100 - TRANSFER CREDIT – INTRODUCTORY BIOLOGY LABORATORY

**Short Title:** TRANSFER CREDIT-INTRO BIOL LAB

**Department:** Biosciences

**Grade Mode:** Transfer Courses

**Course Type:** Transfer

**Credit Hours:** 1-2

**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.

**Course Level:** Undergraduate Lower-Level

**Description:** For transfer of an introductory biology laboratory course in the BioSciences that is designated for biology majors and/or pre-health professionals and that has no current equivalent in the Rice curriculum. Any student may receive a maximum of one BIOC 100 course for a maximum of 2 credit hours. This credit counts toward the total credit hours required for graduation, but does not fulfill any major or minor requirements for Biosciences. Students must contact the BioSciences transfer credit advisor to determine if their course will transfer. Instructor Permission Required.

### BIOS 110 - INTRODUCTION TO RESEARCH

**Short Title:** INTRODUCTION TO RESEARCH

**Department:** Biosciences

**Grade Mode:** Satisfactory/Unsatisfactory

**Course Type:** Research

**Credit Hours:** 5

**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.

**Course Level:** Undergraduate Lower-Level

**Description:** This 5-week course is for high school juniors and seniors to conduct scientific research in the laboratories of Rice faculty in Biosciences. Students will engage in full time research and will be mentored by experienced researchers under the supervision of Rice faculty. Participating students will also receive formal instruction on the basics of scientific research and receive 5 hours of Rice University course credit. Interested students must complete the visiting student application process at [https://biosciences.rice.edu/bioc\\_ebio110](https://biosciences.rice.edu/bioc_ebio110). Tuition and fees apply. Instructor Permission Required. Repeatable for Credit.

### BIOS 118 - FIRST-YEAR SEMINAR IN LOCAL BIOLOGY RESEARCH (BIOCHEMISTRY, CELL BIOLOGY, AND GENETICS FOCUS)

**Short Title:** FIRST-YEAR SEMINAR (BCBG)

**Department:** Biosciences

**Grade Mode:** Standard Letter

**Course Type:** Seminar

**Credit Hour:** 1

**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.

**Course Level:** Undergraduate Lower-Level

**Description:** A 7-week seminar course to introduce first-year prospective biologists to the excitement of research at Rice and the Medical Center and to provide context with which to think about facts presented in biosciences textbooks. Small groups will meet weekly with a graduate student or postdoctoral researcher to explore a published research article by a local lab, gaining background information about the subject and exposure to the research techniques. In the final session, the group will tour the lab that produced the featured article. Additional tours and activities TBA. All first-year non-transfer students are eligible to enroll in BIOC 118 regardless of AP credit. This course meets in the second half of the semester and features research in Biochemistry, Cell Biology, and Genetics.

**Course URL:** [www.bioc.rice.edu/bioc115/](http://www.bioc.rice.edu/bioc115/) (<http://www.bioc.rice.edu/bioc115/>)

### BIOS 119 - FIRST-YEAR SEMINAR IN LOCAL BIOLOGY RESEARCH (ECOLOGY AND EVOLUTIONARY BIOLOGY FOCUS)

**Short Title:** FIRST-YEAR SEMINAR (EEB)

**Department:** Biosciences

**Grade Mode:** Standard Letter

**Course Type:** Seminar

**Credit Hour:** 1

**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.

**Course Level:** Undergraduate Lower-Level

**Description:** A 7-week seminar course to introduce first-year prospective biologists to the excitement of research at Rice and to provide context with which to think about facts presented in biosciences textbooks. Small groups will meet weekly with a graduate student or postdoctoral researcher to explore a published research article by a local lab, gaining background information about the subject and exposure to the research techniques. In the final session, the group will tour the lab that produced the featured article. Additional tours and activities TBA. All first-year, non-transfer students are eligible to enroll in BIOS 119 regardless of AP credit. This course meets in the first half of the semester and features research in Ecology and Evolutionary Biology.

**BIOS 122 - BIOLOGY FOR VOTERS****Short Title:** BIOLOGY FOR VOTERS**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Lecture**Distribution Group:** Distribution Group III**Credit Hours:** 3**Restrictions:** Students cannot enroll who have a major in Biochemistry and Cell Biology, Biological Sciences or Ecology & Evolutionary Biology. Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Lower-Level**Description:** Designer babies, climate change, the anti-vaccine movement, gender identity, evolution...exploring these and other socially relevant topics will provide a context for learning essential concepts in biology and ways to distinguish science truth from science fiction.**Course URL:** [www.ruf.rice.edu/~bioslabs/bioc122/](http://www.ruf.rice.edu/~bioslabs/bioc122/) (<http://www.ruf.rice.edu/~bioslabs/bioc122/>)**BIOS 124 - INTRODUCTION TO ECOLOGY AND EVOLUTIONARY BIOLOGY****Short Title:** INTRO TO EEB**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Lecture**Distribution Group:** Distribution Group III**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Lower-Level**Description:** This course provides a short introduction to the science of ecology and evolutionary biology. The topics covered include the mechanisms of evolution, the origin of species, the history of life on earth, biodiversity, animal behavior, population and community ecology, ecosystems, and conservation biology.**BIOS 128 - BRAINSTEM - TEACHING STEM THROUGH NEUROSCIENCE****Short Title:** BRAINSTEM**Department:** Biosciences**Grade Mode:** Satisfactory/Unsatisfactory**Course Type:** Internship/Practicum**Credit Hour:** 1**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Lower-Level**Description:** BrainSTEM is a service organization that teaches STEM subjects through the lens of neuroscience. We perform hands-on, small-group activities with ~45 students per week. This course will prepare you to communicate science in a both effective and entertaining manner, as well as build your skills in managing small groups. More information can be found at 'www.brainstem.club.' Graduate/Undergraduate Equivalency: BIOS 528. Mutually Exclusive: Cannot register for BIOS 128 if student has credit for BIOS 528. Repeatable for Credit.**BIOS 201 - INTRODUCTORY BIOLOGY I****Short Title:** INTRODUCTORY BIOLOGY I**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Lecture**Distribution Group:** Distribution Group III**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Lower-Level**Description:** The first in a series of two introductory biology courses (BIOS 201, BIOS 202). This course examines chemistry and energetics, cell physiology, cell biology, Mendelian genetics, molecular genetics, developmental biology, and plant physiology.**BIOS 202 - INTRODUCTORY BIOLOGY II****Short Title:** INTRODUCTORY BIOLOGY II**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Lecture**Distribution Group:** Distribution Group III**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Lower-Level**Prerequisite(s):** BIOC 201 or BIOS 201**Description:** The second in a series of two introductory biology courses (BIOS 201, BIOS 202). This course examines the diversity of life, comparative animal physiology, evolution, ecology, and conservation. An emphasis is placed on evolution as a central framework necessary for a complete understanding of modern biology. Group discussions allow students to explore topics in more detail and discover how they are relevant to our everyday lives.**BIOS 204 - ENVIRONMENTAL SUSTAINABILITY: THE DESIGN & PRACTICE OF COMMUNITY AGRICULTURE****Short Title:** COMMUNITY GARDEN**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Lecture/Laboratory**Credit Hour:** 1**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Lower-Level**Description:** The course introduces the fundamentals of community garden design and practice. Responsibilities will center on developing and improving the Rice Community Garden. A strong emphasis will be on learning and applying ecological principles to the practice of community agriculture. Class has required meetings outside of regular class time. Distribution Credit for EBIO/ENST 204 no longer eligible beginning Fall 2019. Repeatable for Credit.

**BIOS 205 - MICROBE HUNTERS REVISITED****Short Title:** MICROBE HUNTERS REVISITED**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Seminar**Credit Hours:** 2**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Lower-Level**Description:** This seminar will review important microbiologists and their discoveries of infectious agents. From Pasteur to Prusiner, we will review the infectious agents they described, as well as the methods used for their discovery. The classic text by Paul de Kruif entitled "Microbe Hunters" will be the basis for half of the course material.**BIOS 210 - INTRODUCTION TO RESEARCH****Short Title:** INTRODUCTION TO RESEARCH**Department:** Biosciences**Grade Mode:** Satisfactory/Unsatisfactory**Course Type:** Research**Credit Hours:** 1-5**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Lower-Level**Description:** This course is only for Rice students conducting research for the first time. The students will conduct scientific research in the laboratories of the Rice faculty in Biosciences. During the five-week course, students will engage in full time research and will be mentored by experienced researchers under the supervision of Rice faculty. Participating students will also receive formal instruction on the basics of scientific research and innovation. Instructor permission is required to register. Instructor Permission Required. Repeatable for Credit.**BIOS 211 - INTERMEDIATE EXPERIMENTAL BIOSCIENCES****Short Title:** EXPERIMENTAL BIOSCIENCES**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Laboratory**Credit Hours:** 2**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Lower-Level**Prerequisite(s):** (BIOC 201 or BIOS 201 (may be taken concurrently)) and**Description:** Introduction to scientific method, principles of experimental design, selected research strategies, record keeping, and technical communication as related to biological science. The prereq BIOS 201 may be taken concurrently with BIOS 211. Registration restricted to current BioSciences majors (BCB, BIOS, EEB) and new BioSciences majors (with concentrations of Biochemistry, Cell Biology & Genetics, Ecology & Evolutionary Biology, or Integrative Biology) for sections 001, 002, 003, 004, and 005. BCB minors can register for sections 007, 008, 009, 010, and 011. Mutually Exclusive: Cannot register for BIOS 211 if student has credit for BIOS/BIOC 212. Mutually Exclusive: Cannot register for BIOS 211 if student has credit for BIOC 212/BIOS 212.**BIOS 212 - INTERMEDIATE EXPERIMENTAL CELLULAR AND MOLECULAR NEUROSCIENCE****Short Title:** EXPERIMENTAL NEUROSCIENCE**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Laboratory**Credit Hours:** 2**Restrictions:** Enrollment is limited to students with a major in Neuroscience. Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Lower-Level**Prerequisite(s):** BIOC 201 or BIOS 201 (may be taken concurrently)**Description:** Introduction to the scientific method, principles of experimental design, selected research strategies, record keeping, and technical communication as related to neuroscience. This course is restricted to Neuroscience majors. Instructor permission is required if students have not yet declared. The pre-req BIOC 201 or BIOS 201 may be taken concurrently with BIOS 212. Mutually Exclusive: Cannot register for BIOS 212 if student has credit for BIOS 211.**BIOS 213 - INTRODUCTORY LAB IN ECOLOGY & EVOLUTION****Short Title:** INTRO LAB ECOL & EVOL**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Laboratory**Credit Hours:** 2**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Lower-Level**Prerequisite(s):** EBIO 202 or BIOS 202 (may be taken concurrently)**Description:** Experimental, laboratory, and field studies of natural history, ecology, evolution, and animal behavior. Class has required meetings outside of regular class time.**BIOS 215 - BIOS LAB TEACHING****Short Title:** BIOS LAB TEACHING**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Laboratory**Credit Hours:** 1-3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Lower-Level**Description:** Undergraduate teaching in a biosciences laboratory. Participate in meetings and selected seminars; supervise students in one or more laboratory sections. Provide group and individual instruction to undergraduates during and outside of laboratory classes. Instructor Permission Required. Repeatable for Credit.**BIOS 216 - DISCUSSION SECTION TEACHING****Short Title:** DISCUSSION SECTION TEACHING**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Independent Study**Credit Hour:** 1**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Lower-Level**Description:** In this course, undergraduates who have previously excelled in a BIOS course will develop teaching skills by leading discussion sections or serving as writing mentors under the guidance of the course instructor. Instructor Permission Required. Repeatable for Credit.

**BIOS 238 - SPECIAL TOPICS****Short Title:** SPECIAL TOPICS**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Lecture/Laboratory, Internship/Practicum, Seminar, Lecture, Laboratory**Credit Hours:** 1-4**Restrictions:** Enrollment is limited to Undergraduate level students.**Course Level:** Undergraduate Lower-Level**Description:** Topics and credit hours vary each semester. Contact department for current semester's topic(s). Repeatable for Credit.**BIOS 250 - INTERMEDIATE LABORATORY IN BIOSCIENCES****Short Title:** INTERMEDIATE LAB IN BIOSIENCES**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Laboratory**Credit Hours:** 2**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Lower-Level**Description:** In BIOS 250 students conduct investigative studies in the areas of biological science, neuroscience, natural history, ecology, evolution, and/or animal behavior. These studies may encompass original research, instructor-designed experiments, and/or online projects with curated data, depending on the availability of in-person laboratory and/or field experiences. This course is available to students who cannot reasonably be expected to complete BIOS 211, 212, or 213 and will substitute for that course requirement for any major concentration or minor in BioSciences, subject to approval by the instructors of the course to be replaced and the BioSciences Undergraduate Curriculum Committee. Instructor Permission Required.**BIOS 271 - ECOSYSTEM MANAGEMENT****Short Title:** ECOSYSTEM MANAGEMENT**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Lower-Level**Description:** This course will focus on applied ecosystem topics including relations with state and federal agencies, field studies, wetland delineations, permitting compliance, and environmental regulations. Graduate/Undergraduate Equivalency: BIOS 571.**BIOS 280 - SUSTAINABLE DEVELOPMENT AND REPORTING****Short Title:** SUSTAINABLE DEVELOPMENT**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Lecture**Distribution Group:** Distribution Group III**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Lower-Level**Description:** Sustainable development is an approach to development based on interacting social, economic, and environmental forces. It is intended as methodology for planning, and a guiding principle for Environmental Health and safety compliance (EHSs) and Corporate Sustainability (CSRs). Students will learn compliance guidelines, risk management, and assessment considerations. Graduate/Undergraduate Equivalency: BIOS 580. Mutually Exclusive: Cannot register for BIOS 280 if student has credit for BIOS 580.**BIOS 299 - EXPERIENTIAL EDUCATION IN BIOSCIENCES****Short Title:** EXPERIENTIAL EDUC IN BIOS**Department:** Biosciences**Grade Mode:** Satisfactory/Unsatisfactory**Course Type:** Internship/Practicum**Credit Hour:** 1**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Lower-Level**Description:** This experiential education course credits a student's experience in an approved internship/practicum with the goal of further developing their professional skills. Hour and activity requirements are flexible to accommodate a variety of experiential activities in biology-related professional contexts. There are no prerequisites. To receive approval to enroll, students must arrange their own internship, apply to the course instructor (<https://forms.gle/NGruMJZiYRRNN5CL8>), and produce an offer letter from their internship provider containing start and end dates and a description of their intended internship activities and expectations. Additional requirements are available on the course syllabus. Repeatable for credit. Instructor Permission Required. Repeatable for Credit.

**BIOS 300 - PARADIGMS IN BIOCHEMISTRY AND CELL BIOLOGY****Short Title:** PARADIGMS IN BIOCHM & CELL BIO**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Description:** This course examines paradigms in biochemistry and cell biology with a specific focus on the "central dogma" of molecular biology and is designed for BIOS majors and minors and recommended strongly for students with Advanced Placement in Biology who do not take BIOS 201 and for students wanting additional foundation before transitioning to other 300-level BIOS lecture courses. Using a "flipped" format, lectures are available online, and in-class activities address confusions/questions, examine both historic and contemporary research papers, explore cases and problems, and engage students in short writing assignments. Recommended Prerequisite(s): Recommended strongly for students with Advanced Placement in Biology and designed for prospective Biosciences majors. For students with AP credit for BIOS/BIOC 201, this course is strongly recommended as preparation for BIOS 341 (Cell Biology).**BIOS 301 - BIOCHEMISTRY I****Short Title:** BIOCHEMISTRY I**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** CHEM 211 and (BIOC 201 or BIOS 201)**Description:** The second in an integrated sequence of three courses (BIOS 201, 301, 302). Structure and function of proteins, enzymes, and nucleic acids; enzyme kinetics; glycolysis, aerobic metabolism, and energy coupling. Recommended Prerequisite(s): CHEM 212**BIOS 302 - BIOCHEMISTRY II****Short Title:** BIOCHEMISTRY II**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** BIOC 301 or BIOS 301**Description:** The final in an integrated sequence of three courses (BIOS 201, 301, 302). In depth study of carbohydrate, amino acid, and lipid metabolic pathways, hormone regulation of metabolic path ways, key cell signaling mechanisms, and the structural biology of DNA replication, transcription, and translation into proteins. Course also involves analysis of primary scientific literature. Recommended Prerequisite(s): CHEM 212 or CHEM 320**BIOS 310 - INDEPENDENT RESEARCH FOR BIOSCIENCES UNDERGRADUATES****Short Title:** IND RES FOR BIOS UNDERGRADS**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Research**Credit Hours:** 1-4**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** BIOC 111 or BIOC 112 or FWIS 115 or NSCI 120 or BIOC 211 or BIOS 211 or BIOC 212 or BIOS 212 or EBIO 306**Description:** Independent research in Rice BioSciences faculty laboratories (sections 2 and above) or other Texas Medical Center laboratories (section 1). Students must have secured a research position prior to applying for BIOS 310. Students spend at least 42 hours in the laboratory for each semester hour of credit (>9h/week for 3 credits). A minimum of 3 credit hours is needed to count toward the BS in Biosciences or to replace one required 300+ level elective lab course for the BA in Biosciences (cannot replace concentration core labs). Requires a proposal abstract, weekly reports, and a research paper (fall/spring/summer) or a poster presentation (spring/summer for advanced students). Students wishing to perform their research in an off-campus lab must apply online ([biosugresearch.rice.edu](http://biosugresearch.rice.edu)) at least 3 weeks prior to the start of classes and may not register for fewer than 3 credit hours. Students taking BIOS 310 in the full summer semester must be available to do full-time research for a minimum of 6 weeks or part-time equivalent which should equal to a total of 126 hours working in the lab. Recommended Prerequisite(s): Students are strongly advised to secure research advisors and register for the class well in advance of the start of classes. Repeatable for Credit. Instructor Permission Required. Students are strongly advised to secure research advisors and register for the class well in advance of the start of classes. Repeatable for Credit.  
**Course URL:** [www.bioc.rice.edu/bioc310/](http://www.bioc.rice.edu/bioc310/) (<http://www.bioc.rice.edu/bioc310/>)**BIOS 311 - ADVANCED EXPERIMENTAL BIOSCIENCES****Short Title:** ADV EXPERIMENTAL BIOSCIENCES**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Laboratory**Credit Hours:** 2**Restrictions:** Students with a class of Freshman may not enroll. Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** (BIOC 211 or BIOS 211 or BIOC 212 or BIOS 212) and (BIOC 301 or BIOS 301 (may be taken concurrently))**Description:** Advancement of biochemical laboratory methods, record keeping, technical communication skills, and research strategies. Students will maintain a research quality laboratory notebook and will submit a paper in the style of a journal article. Pre-req BIOS 301 may be taken concurrently with BIOS 311.

**BIOS 312 - ADVANCED COMMUNICATION IN THE BIOLOGICAL SCIENCES****Short Title:** ADV COMMUNICATION IN BIOL SCI**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Seminar**Credit Hours:** 2**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Description:** This course will focus on improving students' written and oral communication skills. Emphasis will be placed on communication of scientific topics for audiences ranging from experts to the general public through weekly assignments. Instructor Permission Required. Repeatable for Credit.**BIOS 313 - EXPERIMENTAL SYNTHETIC BIOLOGY****Short Title:** EXPERIMENTAL SYNTHETIC BIOLOGY**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Laboratory**Credit Hours:** 2**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** BIOC 211 or BIOS 211 or BIOC 212 or BIOS 212**Description:** Students learn molecular biological procedures commonly used to build and characterize synthetic genetic circuits. Teams of students work on a research project in the interdisciplinary field of synthetic biology. Students continue to develop technical communication skills.**BIOS 316 - LAB MODULE IN ECOLOGY****Short Title:** LAB MODULE IN ECOLOGY**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Laboratory**Credit Hour:** 1**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** EBIO 323 or BIOS 423 or EBIO 325 or BIOS 325**Description:** Field and lab experiments in ecology. Class has required meetings outside of regular class time.**BIOS 317 - LAB MODULE IN BEHAVIOR****Short Title:** LAB MODULE IN BEHAVIOR**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Laboratory**Credit Hour:** 1**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** (EBIO 321 or BIOS 321) and (EBIO 213 or BIOS 213)**Description:** Field experiments in behavior. Learn to formulate and test hypotheses on bird behavior using mockingbirds, grackles, and herons nesting on campus. Class has required meetings outside of regular class time.**BIOS 318 - MICROBIOLOGY LABORATORY****Short Title:** MICROBIOLOGY LABORATORY**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Laboratory**Credit Hour:** 1**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** BIOC 211 or BIOS 211 or BIOC 212 or BIOS 212**Description:** In teams, students will participate in ongoing faculty research by isolating and characterizing bacterial species from environmental samples. Offered in the second half of each semester.**Course URL:** [www.ruf.rice.edu/~bioslabs/bios318/](http://www.ruf.rice.edu/~bioslabs/bios318/) (<http://www.ruf.rice.edu/~bioslabs/bios318/>)**BIOS 319 - TROPICAL FIELD BIOLOGY****Short Title:** TROPICAL FIELD BIOLOGY**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Laboratory**Credit Hours:** 2**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Description:** Examine first-hand the two most diverse ecosystems on earth - the coral reef and the tropical rainforest in this 2-week summer course in the Central American country of Belize. Topics will include the diversity of tropical organisms and habitats, the formation of coral reefs, rainforest ecology, historical biogeography, symbiosis, and conservation of tropical biodiversity. While a background in biology is desirable, individuals lacking this background but having a special interest in the tropics are encouraged to enroll. Includes a course fee that covers all transportation, accommodation, and meals. Distribution Credit for BIOS 319 no longer eligible beginning Fall 2019. Instructor Permission Required.**BIOS 320 - ECOLOGY AND CONSERVATION OF BRAZILIAN WETLANDS LABORATORY****Short Title:** BRAZILIAN WETLANDS LAB**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Laboratory**Credit Hours:** 2**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Description:** This course consists of a 2-week trip to Brazil to examine first-hand the ecology of the largest wetland ecosystem on earth - the Pantanal. Days will be spent in the field making observations and collecting data; lectures in the evenings will cover topics including freshwater ecology, seasonal flooding dynamics, community ecology of wetland species, symbiosis, geology, environmental management, ecotourism, and conservation biology. Includes a course fee that covers all transportation, accommodations, and meals. Distribution Credit for BIOS 320 no longer eligible beginning Fall 2019. Recommended Prerequisite(s): EBIO 213 or BIOS 213



**BIOS 321 - ANIMAL BEHAVIOR****Short Title:** ANIMAL BEHAVIOR**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Lecture**Distribution Group:** Distribution Group III**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** (BIOC 201 or BIOS 201) and (EBIO 202 or BIOS 202)**Description:** Evolutionary theory is used to evaluate behavioral adaptations of organisms to their environment.**BIOS 322 - CONSERVATION BIOLOGY LAB****Short Title:** CONSERVATION BIOLOGY LAB**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Laboratory**Credit Hour:** 1**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** EBIO 213 or BIOS 213**Description:** This course will give students hands-on experiences in the practice of conservation biology through authentic projects related to prioritization and design of nature preserves, restoration of natural environments, and for monitoring threatened and endangered species in the Houston area. BIOS 423 may be taken concurrently with EBIO 322. Graduate/Undergraduate Equivalency: BIOS 522. Mutually Exclusive: Cannot register for BIOS 322 if student has credit for BIOS 522.**BIOS 326 - INSECT BIOLOGY****Short Title:** INSECT BIOLOGY**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Lecture**Distribution Group:** Distribution Group III**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** EBIO 202 or BIOS 202**Description:** This course addresses contemporary issues in ecology and evolution through the lens of insect diversity. Readings span a broad literature (popular to technical). Writing and oral reports develop proficiency in scientific communication.**BIOS 327 - BIOLOGICAL DIVERSITY****Short Title:** BIOLOGICAL DIVERSITY**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Laboratory**Credit Hour:** 1**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** (BIOC 201 or BIOS 201) and (EBIO 202 or BIOS 202) and (EBIO 213 or BIOS 213)**Description:** This laboratory course focuses on the theory and practice of estimating biodiversity. Students work in groups to design, execute, and communicate the results of a systematic survey of particular taxonomic groups in the Big Thicket National Preserve in east Texas. Class has required meetings outside of regular class time.**BIOS 329 - ANIMAL DIVERSITY****Short Title:** ANIMAL DIVERSITY**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Lecture**Distribution Group:** Distribution Group III**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** BIOC 201 or BIOS 201 or EBIO 202 or BIOS 202**Description:** The evolution and systematics of the animal kingdom with consideration of functional anatomy, comparative physiology, behavior, medical implications and resource management. Graduate/Undergraduate Equivalency: BIOS 529. Mutually Exclusive: Cannot register for BIOS 329 if student has credit for BIOS 529/EBIO 529.**BIOS 330 - INSECT BIOLOGY LAB****Short Title:** INSECT BIOLOGY LAB**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Laboratory**Credit Hour:** 1**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** (BIOC 201 or BIOS 201) and (EBIO 202 or BIOS 202) and (EBIO 213 or BIOS 213) and (EBIO 326 or BIOS 326 (may be taken concurrently))**Description:** Hands-on experiences with collection and curation of insects.

**BIOS 332 - ECOLOGY****Short Title:** ECOLOGY**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Lecture**Distribution Group:** Distribution Group III**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** (BIOC 201 or BIOS 201) and (EBIO 202 or BIOS 202)**Description:** Study of population dynamics, species interactions, plant and animal community organization, and ecosystem function. Graduate/Undergraduate Equivalency: BIOS 532. Mutually Exclusive: Cannot register for BIOS 332 if student has credit for BIOS 532.**BIOS 333 - BIONNOVATION STUDIO: FROM BASIC RESEARCH AND IDEATION TO TECHNOLOGY DEVELOPMENT****Short Title:** BIOINNOVATION STUDIO**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Laboratory**Credit Hour:** 1**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** BIOC 211 or BIOS 211 or BIOC 212 or BIOS 212**Description:** In this lab, students will explore the relationship between curiosity-driven science and the steps of biological ideation that lead to technology creation. While the course focuses centrally on a semester long lab project, there will be informal discussions of articles and books with technology translation experts, visiting biology entrepreneurs, and commercialization experts.**BIOS 334 - EVOLUTION****Short Title:** EVOLUTION**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Lecture**Distribution Group:** Distribution Group III**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** EBIO 202 or BIOS 202**Description:** Principles of biological evolution. Topics include natural selection, adaptation, molecular evolution, formation of new species, the fossil record, biogeography, and principles of classification. Graduate/Undergraduate Equivalency: BIOS 534. Mutually Exclusive: Cannot register for BIOS 334 if student has credit for BIOS 534.**BIOS 336 - PLANT DIVERSITY****Short Title:** PLANT DIVERSITY**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Lecture**Distribution Group:** Distribution Group III**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** EBIO 202 or BIOS 202**Description:** The evolution, systematics, and ecology of plants, with emphasis on flowering plants and biodiversity.**BIOS 337 - FIELD BIRD BIOLOGY LAB****Short Title:** FIELD BIRD BIOLOGY LAB**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Laboratory**Credit Hour:** 1**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** EBIO 213 or BIOS 213**Description:** This course centers on a series of five field trips to diverse habitats for observing birds both immigrants and residents. Each will be preceded by a lecture and students will do two projects. Class has required meetings outside of regular class time. Distribution Credit for BIOS 337 no longer eligible beginning Fall 2019.**BIOS 338 - ANALYSIS AND VISUALIZATION OF BIOLOGICAL DATA****Short Title:** BIO DATA ANALYSIS**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Lecture**Distribution Group:** Distribution Group III**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** EBIO 213 or BIOS 213 or BIOC 211 or BIOS 211 or BIOC 212 or BIOS 212**Description:** This course addresses how to analyze, visualize and draw conclusions from biological data. It introduces basic concepts in statistics interwoven with training in data analysis using the R computing environment. Students will learn to identify underlying data structures and wrangle data. Students will also learn to effectively convey results using statistical graphics. Topics include basic R programming, data exploration, statistical modeling, parameter estimation and interpretation, and model comparison. This class particularly focuses on biological data. Graduate/Undergraduate Equivalency: BIOS 538. Mutually Exclusive: Cannot register for BIOS 338 if student has credit for BIOS 538.

**BIOS 339 - PLANT DIVERSITY LAB****Short Title:** PLANT DIVERSITY LAB**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Laboratory**Credit Hour:** 1**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** (BIOS 201 or BIOC 201) and (BIOS 202 or EBIO 202)**Corequisite:** BIOS 336**Description:** This course will complement the BIOS 336 course by providing hands-on experience in the science of botany. Students will become familiar with the anatomy, physiology, evolution and biodiversity of plants through lab dissections, microscopy, and field observations.**BIOS 340 - INTEGRATIVE ANIMAL PHYSIOLOGY****Short Title:** INTEGRATIVE ANIMAL PHYSIOLOGY**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** (BIOC 201 or BIOS 201) and (EBIO 202 or BIOS 202)**Description:** This course takes a comparative approach to investigate animal physiology of vertebrates. Students learn how animals are adapted to their environments, including how they meet their energy needs, take up and transport oxygen, and maintain hydration and salt balance. Students read primary literature to explore survival in extreme environments. Mutually Exclusive: Cannot register for BIOS 340 if student has credit for BIOS 540, BIOC 335, BIOC 536. Graduate/Undergraduate Equivalency: BIOS 540.**BIOS 341 - CELL BIOLOGY****Short Title:** CELL BIOLOGY**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Lecture**Distribution Group:** Distribution Group III**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** BIOC 201 or BIOS 201**Description:** Molecular mechanisms of eukaryotic cell function. Structure, function, and biogenesis of all subcellular organelles. Cell-cell communication, cytoskeleton assembly and function, cell cycle control, and cell-cell adhesions. Emphasis will be on cytoplasmic events; molecular studies of transcription are taught in BIOS 302 and BIOS 344. RECOMMENDATION: BIOS 300 is recommended for students using advanced placement credit for BIOS 201 and students preferring additional foundational background prior to enrollment in BIOS 341.**BIOS 344 - MOLECULAR BIOLOGY AND GENETICS****Short Title:** MOLECULAR BIOLOGY & GENETICS**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Lecture**Distribution Group:** Distribution Group III**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Description:** Mendelian genetics, population genetics, mapping, gene expression and regulation, genetic engineering, DNA replication and recombination, human genetics, genetic disease and gene therapy. Recommended Prerequisite(s): BIOC 201 or BIOS 201**BIOS 350 - ADVANCED LABORATORY IN BIOSCIENCES****Short Title:** ADVANCED LAB IN BIOSCIENCES**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Laboratory**Credit Hours:** 1-2**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Description:** In BIOS 350 students conduct investigative studies in the areas of biological science, neuroscience, natural history, ecology, evolution, and/or animal behavior. These studies may encompass original research, instructor-designed experiments, and/or online projects with curated data, depending on the availability of in-person laboratory and/or field experiences. BIOS 350 further advances basic laboratory and/or field experiences, record keeping abilities, and technical communication skills that were introduced and/or reinforced in the intermediate lab course. This course is available to students who cannot reasonably be expected to complete an advanced lab requirement for any major concentration in Biosciences and will substitute for that course requirement, subject to approval by the instructors of the course to be replaced and the BioSciences Undergraduate Curriculum Committee. Registration for this course will be by "instructor permission only." This course will be either a half or full semester course, credit hours: 1-2. Instructor Permission Required.**BIOS 352 - PHYSICAL CHEMISTRY FOR THE BIOSCIENCES****Short Title:** PHYS CHEM FOR BIOSCIENCES**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** (PHYS 126 or PHYS 102 or PHYS 112 or PHYS 142) and (BIOC 301 or BIOS 301)**Description:** Study of selected aspects of physical chemistry as it relates to the biosciences. Includes thermodynamics, reaction rate theory, quantum mechanics, and atomic and molecular structure.

**BIOS 368 - CONCEIVING AND MISCONCEIVING THE MONSTROUS IN FICTION AND IN ART, IN MEDICINE AND IN BIOSCIENCE****Short Title:** MONSTER**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Seminar**Distribution Group:** Distribution Group III**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Description:** Across variations of life, we draw boundaries between normal, not normal, and monstrous. From the Biosciences to the Creative Arts, our conceptions of the "monstrous" illuminate our identity, perceptions, and fears. Discussion-based class accessible to people of all backgrounds and interests.**BIOS 371 - SEMINAR IN CONTEMPORARY BIOLOGICAL AND BIOMEDICAL RESEARCH****Short Title:** BIOMEDICAL RESEARCH SEMINAR**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Seminar**Credit Hour:** 1**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** BIOC 341 or BIOS 341 (may be taken concurrently) or BIOC 301 or BIOS 301 (may be taken concurrently)**Description:** This course will offer students a close-up look at an area of contemporary biological and biomedical research in a small-group seminar setting. Each seminar will focus on a different area of research through reading and discussion of recent research articles in that focus area. The faculty discussion leader for each seminar will be drawn from Baylor College of Medicine, UT Health Science Center, MD Anderson Cancer Center, Rice and others. Prereqs may be taken concurrently. Please consult the course website for a complete listing of seminars offered each semester. Please refer to the following link for additional information: <http://www.bioc.rice.edu/bioc371>. Instructor Permission Required. Recommended Prerequisite(s): Students should check the courses website for additional prerequisites, notes from the instructor, and other information specific to each section. Repeatable for Credit.**BIOS 372 - IMMUNOLOGY****Short Title:** IMMUNOLOGY**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Lecture**Distribution Group:** Distribution Group III**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** (BIOC 201 or BIOS 201) and (EBIO 202 or BIOS 202)**Description:** Cellular and molecular basis of innate and adaptive immune function in mammals. Graduate/Undergraduate Equivalency: BIOS 572. Recommended Prerequisite(s): (BIOC 301 or BIOS 301) and (BIOC 341 or BIOS 341). Mutually Exclusive: Cannot register for BIOS 372 if student has credit for BIOC 372/BIOC 573.**BIOS 373 - CORAL REEF ECOSYSTEMS****Short Title:** CORAL REEF ECOSYSTEMS**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Lecture**Distribution Group:** Distribution Group III**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** EBIO 202 or BIOS 202**Description:** This three credit lecture course introduces students to a complex, dynamic and sensitive ecosystem: coral reefs. We will explore the biotic and abiotic components of coral reefs; how reef organisms interact with each other and the environment, and the factors that contribute to reef construction and decline over time and space. Graduate/Undergraduate Equivalency: BIOS 573.**BIOS 385 - FUNDAMENTALS OF CELLULAR AND MOLECULAR NEUROSCIENCE****Short Title:** FUNDAMENTALS OF NEUROSCIENCE**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Lecture**Distribution Group:** Distribution Group III**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** BIOC 201 or BIOS 201**Description:** Cellular, molecular, and integrative mechanisms of neural function, including membrane and axon physiology, synaptic transmission and plasticity, sensory transduction and processing. Graduate/Undergraduate Equivalency: BIOS 585.**BIOS 390 - TRANSFER CREDIT IN BIOCHEMISTRY AND CELL BIOLOGY****Short Title:** TRAN CREDIT BIOCHEM&CELL BIO**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Description:** For transfer of courses which have no current equivalent in the Rice curriculum, but which can be counted as 300 level lecture courses in biochemistry, cell biology, and genetics. Repeatable for Credit.**BIOS 391 - TRANSFER CREDIT IN ECOLOGY AND EVOLUTIONARY BIOLOGY****Short Title:** TRAN CREDIT ECOL&EVOLUTION**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Description:** For transfer of courses which have no current equivalent in the Rice curriculum, but which can be counted as a 300-level lecture course in ecology and evolutionary biology. Repeatable for Credit.

**BIOS 393 - LABORATORY TRANSFER CREDIT IN BIOSCIENCES****Short Title:** LAB TRANSFER CREDIT**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Laboratory**Credit Hour:** 1**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Description:** For transfer of an advanced laboratory course in the biosciences that has no current equivalent in the Rice Biosciences curriculum. Any student may receive a maximum of one credit of BIOS 393.**BIOS 401 - UNDERGRADUATE HONORS RESEARCH****Short Title:** UNDERGRADUATE HONORS RESEARCH**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Research**Credit Hours:** 5**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Description:** The Biosciences Honors Research Program offers our seniors and advanced juniors the opportunity to perform a two-semester, individual research project in a research laboratory in Biosciences or an approved off-campus site. Students registering for BIOS 401 are expected to take BIOS 402 the following semester. Typical expectations include an average of approximately 15 hours of research per week and will also include written and oral presentations intended to develop important science communication skills such as a proposal, and progress reports, and culminate in a final product such as a final paper, poster, oral presentation, and/or thesis. Department Permission Required. Repeatable for Credit.**BIOS 402 - UNDERGRADUATE HONORS RESEARCH****Short Title:** UNDERGRADUATE HONORS RESEARCH**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Research**Credit Hours:** 5**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** BIOC 401 or BIOS 401**Corequisite:** BIOS 412**Description:** The Biosciences Honors Research Program offers our seniors and advanced juniors the opportunity to perform a two-semester, individual research project in a research laboratory in Biosciences or an approved off-campus site. Students registering for BIOS 401 are expected to take BIOS 402 the following semester. Typical expectations include an average of approximately 15 hours of research per week and will also include written and oral presentations intended to develop important science communication skills such as a proposal, and progress reports, and culminate in a final product such as a final paper, poster, oral presentation, and/or thesis. Repeatable for Credit.**BIOS 405 - PHYSICAL BIOLOGY****Short Title:** PHYSICAL BIOLOGY**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** (BIOC 352 or BIOS 352) and MATH 211**Description:** This course provides a biophysical view of living systems, from the subcellular to the multicellular scales. Topics include: biomolecular dynamics, cellular biomechanics, cell motility and cell division, calcium signaling, action potential propagation, and tissue organization. Graduate/Undergraduate Equivalency: BIOS 505.**BIOS 410 - STEM CELL BIOLOGY****Short Title:** STEM CELL BIOLOGY**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** BIOC 341 or BIOC 344**Description:** This course will introduce students to modern topics in stem cell biology, teach students to critically evaluate primary literature, and teach students to synthesize research ideas into review articles and grant proposals. This is a literature and discussion-based course and will require reading 2-3 articles from the primary literature per week. Graduate/Undergraduate Equivalency: BIOS 510.**BIOS 412 - UNDERGRADUATE RESEARCH SEMINAR****Short Title:** UNDERGRADUATE RESEARCH SEMINAR**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Seminar**Credit Hour:** 1**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** BIOC 401 or BIOS 401**Corequisite:** BIOS 402**Description:** This companion seminar requires attendance at course meetings and a formal scientific presentation of research performed while enrolled in the Biosciences Honors Research Program. Repeatable for Credit.

**BIOS 415 - EXPERIMENTAL PHYSIOLOGY****Short Title:** EXPERIMENTAL PHYSIOLOGY**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Laboratory**Credit Hour:** 1**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** (BIOS 311 or BIOC 311 or BIOS 385 (may be taken concurrently) or BIOC 385 or NEUR 385) and (BIOS 211 or BIOC 211 or BIOS 212 or BIOC 212)**Description:** Laboratory studies in membrane, nerve, and muscle physiology, with emphasis on experimental design, data analysis, and data interpretation. BIOC/NEUR 385 may be taken concurrently with BIOC 415.**Course URL:** [www.ruf.rice.edu/~bioslabs/bios415](http://www.ruf.rice.edu/~bioslabs/bios415) (<http://www.ruf.rice.edu/~bioslabs/bios415/>)**BIOS 417 - EXPERIMENTAL CELL AND MOLECULAR NEUROSCIENCE****Short Title:** ADV EXPERIMENTAL NEUROSCIENCE**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Laboratory**Credit Hour:** 1**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** (BIOS 212 or BIOC 212) and CAAM 210 and (STAT 305 or STAT 310 or ECON 307 or STAT 312) and (BIOS 385 or BIOC 385 or NEUR 385)**Description:** Students will explore the molecular properties of neurons and related cells using standard techniques in the field. Experiments will include manipulating exocytosis, examining protein expression levels in different brain regions of mice, and culturing primary neurons. Lessons will also include a brief lecture/discussion on fundamental principles within cellular and molecular neuroscience.**BIOS 420 - MOLECULAR BASIS OF DISEASES****Short Title:** MOLECULAR BASIS OF DISEASES**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Description:** The course intends to provide in-depth knowledge of the molecular basis of human diseases. We will discuss: 1) Different types of genetic variations that may lead to human diseases; 2) The various approaches to investigate the molecular basis of human diseases; 3) The molecular and cellular consequences of disease-associated genetic variations; 4) The physiological and environmental causes of genetic variations; 5) The molecular basis for disease diagnosis and treatments. We will mainly focus on molecular mechanisms of inherent genetic diseases, neurodegenerative diseases, cancer and environmentally induced diseases. This will be a combined lecture/discussion course. The class materials are mainly based on preliminary literatures and case studies. Students are expected to actively participate in discussion in class and to give presentations and lectures based on research paper. Graduate/Undergraduate Equivalency: BIOS 520. Recommended Prerequisite(s): (BIOS 301 or BIOC 301) and (BIOS 302 or BIOC 302)**BIOS 423 - CONSERVATION BIOLOGY****Short Title:** CONSERVATION BIOLOGY**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Lecture**Distribution Group:** Distribution Group III**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** (BIOC 201 or BIOS 201) and (EBIO 202 or BIOS 202) and (EBIO 325 or BIOS 332)**Description:** This course is designed to give students a broad overview of conservation biology. Lecture and discussions will focus on conservation issues such as biodiversity, extinction, management, sustained yield, invasive species and preserve design. Counts as a capstone course for the major concentration in Ecology and Evolutionary Biology. Graduate/Undergraduate Equivalency: BIOS 523.**BIOS 424 - MICROBIOLOGY AND BIOTECHNOLOGY****Short Title:** MICROBIOLOGY & BIOTECHNOLOGY**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** BIOS 201 or BIOC 201**Description:** Structure and functions of microorganisms with emphasis on their environmental, industrial and medical importance. Graduate/Undergraduate Equivalency: BIOS 524. Recommended Prerequisite(s): BIOS 301 or BIOC 301 Mutually Exclusive: Cannot register for BIOS 424 if student has credit for BIOS 524.**BIOS 425 - PLANT MOLECULAR GENETICS AND DEVELOPMENT****Short Title:** PLANT MOLECULAR GENETICS**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** BIOS 301 or BIOC 301 or BIOS 341 or BIOC 341**Description:** Novel aspects of plant biology and development with emphasis on molecular and genetic mechanisms. Plant responses to the environment and the use of bioengineering and other means to develop new plant products will also be covered. Graduate/Undergraduate Equivalency: BIOS 525. Mutually Exclusive: Cannot register for BIOS 425 if student has credit for BIOS 525.

**BIOS 431 - BIOLOGY OF INFECTIOUS DISEASES****Short Title:** BIOLOGY OF INFECTIOUS DISEASES**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Lecture**Distribution Group:** Distribution Group III**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** (EBIO 213 or BIOS 213) and (EBIO 325 or BIOS 332)**Description:** This course gives a broad overview of the biology of infectious diseases using examples from humans, plants, and animals. Topics include diversity of diseases, mechanisms of disease transmission, epidemiology, population regulation, evolution of virulence, disease dynamics in natural communities and disease invasion and conservation biology. Counts as a capstone course for the major concentration in Ecology and Evolutionary Biology.**BIOS 432 - RESEARCH SEMINAR IN TRANSLATIONAL NEUROSCIENCE****Short Title:** MEDICAL NEUROSCIENCE**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Seminar**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** (BIOS 385 or BIOC 385 or NEUR 380) and (BIOS 201 or BIOC 201) and (BIOS 212 or BIOC 212) and (MATH 102 or MATH 106) and (STAT 305 or STAT 312 or STAT 310)**Description:** Students will work with Dr. Flynn and Dr. Krishnan (a clinician at BCM) to study the literature on neuropathologies. Students will learn how neuroscience research is applied in the medical field for the first third of the class. The remainder of the time will be spent creating a literature review on a brain related pathologies of their choice, with the goal of publication. Instructor Permission Required.**BIOS 442 - MOLECULES, MEMORY AND MODEL ANIMALS: METHODS IN BEHAVIORAL NEUROSCIENCE****Short Title:** BEHAVIORAL NEUROSCIENCE**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** (PSYC 380 or NEUR 380 or BIOC 380 or NEUR 385) and (PSYC 203 or BIOS 321 or EBIO 321) and (STAT 305 or STAT 310 or ECON 307 or STAT 312)**Description:** This will be a combined lecture/discussion course on historical and current methods in behavioral neuroscience using primary literature. Topics will include the molecular basis of memory, genetic impacts on cognition, and possible epigenetic influences on behavior. Special emphasis will be placed on discussing different model organism and their benefits/drawbacks in neuroscience research.**BIOS 443 - DEVELOPMENTAL NEUROBIOLOGY****Short Title:** NEURODEVELOPMENT**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** BIOS 341 or BIOC 341 or BIOS 301 or BIOC 301 or BIOS 344 or BIOC 344**Description:** An advanced undergraduate and graduate level course, dedicated to analysis and evaluation of scientific inquiry into animal development and neurodevelopment. Textbook based lectures and discussions based on primary scientific literature are used to exemplify and evaluate concepts and methodology. Writing assignments, quizzes, midterm and final exam will be used to evaluate performance. Graduate/Undergraduate Equivalency: BIOS 543.**BIOS 447 - EXPERIMENTAL BIOLOGY AND THE FUTURE OF MEDICINE****Short Title:** BIOLOGY AND MEDICINE**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** BIOS 301 or BIOC 301 or BIOS 341 or BIOC 341 or BIOS 344 or BIOC 344**Description:** Current biological methods offer the potential to transform health care. We will examine the biology and methodology of emergent health care technologies such as stem cell therapy and personal genome sequencing to understand their potential to impact human health. Graduate/Undergraduate Equivalency: BIOS 547.**BIOS 449 - ADVANCED CELL AND MOLECULAR NEUROSCIENCE****Short Title:** ADV CELL AND MOLECULAR NEURO**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** (BIOC 385 or BIOS 385 or NEUR 385) and (BIOS 201 or BIOC 201) and (BIOS 211 or BIOC 211 or BIOS 212 or BIOC 212) and (MATH 102 or MATH 106) and (STAT 305 or STAT 310 or ECON 307 or STAT 312)**Description:** This course will be an overview of advanced principles and techniques in cell and molecular neuroscience; subjects will include bio-electricity, cellular signaling, and the molecular mechanics of neuronal plasticity. The class will primarily be lecture driven. However, there will be seminar component – students will review primary scientific literature, discuss it in small groups, and present their findings. Graduate/Undergraduate Equivalency: BIOS 549. Recommended Prerequisite(s): PSYC 380 or BIOC 380 or NEUR 380

**BIOS 450 - VIRUSES AND INFECTIOUS DISEASES****Short Title:** VIRUSES & INFECTIOUS DISEASES**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** BIOS 301 or BIOC 301 or BIOS 341 or BIOC 341**Description:** Animal viruses, especially those relevant to human health, will be discussed. Topics primarily focus on virus structure and the molecular biology of the virus life cycle. Practical issues such as the history of viral diseases, clinical manifestations, laboratory diagnosis, management and prevention will also be discussed. Graduate/Undergraduate Equivalency: BIOS 550.**BIOS 460 - CANCER BIOLOGY****Short Title:** CANCER BIOLOGY**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** (BIOC 301 or BIOS 301) and (BIOC 341 or BIOS 341)**Description:** Provides an integrated lecture series summarizing current knowledge in cancer biology and integrating current literature with basic concepts. Topics include: statistics of incidence/survival, types of cancer, pathology, the process of carcinogenesis and sources of carcinogens, genetic and epigenetic mechanisms and consequences, cancer progression, metastasis and current treatment options. Students will learn to use online databases to develop independent strategies for analyzing datasets. There will be several writing assignments and in class oral presentations of research articles. Graduate/Undergraduate Equivalency: BIOS 560. Mutually Exclusive: Cannot register for BIOS 460 if student has credit for BIOS 560.**BIOS 470 - COMPUTATION WITH BIOLOGICAL DATA****Short Title:** COMPUTATION WITH BIOL DATA**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** (BIOC 301 or BIOS 301 or BIOC 341 or BIOS 341 or BIOC 344 or BIOS 344) and (MATH 102 or MATH 106)**Description:** This course will teach programming and analysis techniques essential for modern research in the biological sciences. Students will learn the basics of programming in the MATLAB or Python scripting languages and applications to analyzing biological data. There will be a particular focus on quantitative image and sequence analysis. Graduate/Undergraduate Equivalency: BIOS 570. Mutually Exclusive: Cannot register for BIOS 470 if student has credit for BIOS 570.**BIOS 477 - SPECIAL TOPICS****Short Title:** SPECIAL TOPICS**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Seminar, Internship/Practicum, Lecture/Laboratory, Laboratory, Lecture**Credit Hours:** 1-4**Restrictions:** Enrollment is limited to Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Description:** Topics and credit hours may vary each semester. Contact department for current semester's topic(s). Repeatable for Credit.**BIOS 481 - MOLECULAR BIOPHYSICS I****Short Title:** MOLECULAR BIOPHYSICS I**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** BIOC 301 or BIOS 301 or BIOC 352 or BIOS 352**Description:** Focus on principles of common biophysical methods used for study of conformations and dynamics of biological macromolecules and assemblies. Topics cover spectroscopic methods (absorption, fluorescence, circular dichroism, epr, NMR), transport processes, sedimentation, calorimetry, mass spectrometry, crystallography, cryo-electron microscopy, atomic force microscopy, ligand-protein interactions, protein folding, single molecule detection, computer simulations, functional genomics and laboratory evolution. Biological examples will be used to demonstrate merits and complementarity in each of the biophysical methods. Graduate/Undergraduate Equivalency: BIOS 551.**BIOS 482 - STRUCTURAL BIOLOGY****Short Title:** STRUCTURAL BIOLOGY**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** (BIOC 301 or BIOS 301) and (PHYS 101 or PHYS 125) and (PHYS 102 or PHYS 126)**Description:** Structural biology plays an important role in defining atomic structures of biomolecules and understanding relationships between structure, dynamics and function in living systems. This course will give an introduction to techniques of determining biomolecular structures, X-ray crystallography, NMR, and cryoelectron microscopy and discuss striking examples of the power of structural biology. Graduate/Undergraduate Equivalency: BIOS 552.



**BIOS 495 - SEMINAR: TOPICS IN ENVIRONMENTAL SCIENCE****Short Title:** TOPICS: ENVIRONMENTAL SCIENCE**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Seminar**Credit Hours:** 3**Restrictions:** Enrollment limited to students with a class of Senior. Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Description:** This course provides an integration of interdisciplinary topics that span environmental sciences. Topics will vary depending upon the interests and needs of both students and faculty. Only Seniors may register for this course without instructor permission. Cross-list: ESCI 495.**BIOS 505 - PHYSICAL BIOLOGY****Short Title:** PHYSICAL BIOLOGY**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate**Description:** Basic introduction to a biophysical view of living systems, from the subcellular to the multicellular scales. Topics include: biomolecular dynamics, cellular biomechanics, cell motility and cell division, calcium signaling, action potential propagation, and tissue organization. Cross-list: BIOE 502, SSPB 501. Graduate/Undergraduate Equivalency: BIOS 405.**BIOS 510 - STEM CELL BIOLOGY****Short Title:** STEM CELL BIOLOGY**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate**Description:** This course will introduce students to modern topics in stem cell biology, teach students to critically evaluate primary literature, and teach students to synthesize research ideas into review articles and grant proposals. This is a literature and discussion-based course and will require reading 2-3 articles from the primary literature per week. Graduate/Undergraduate Equivalency: BIOS 410.**BIOS 520 - MOLECULAR BASIS OF DISEASES****Short Title:** MOLECULAR BASIS OF DISEASES**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate**Description:** The course intends to provide in-depth knowledge of the molecular basis of human diseases. We will discuss: 1) Different types of genetic variations that may lead to human diseases; 2) The various approaches to investigate the molecular basis of human diseases; 3) The molecular and cellular consequences of disease-associated genetic variations; 4) The physiological and environmental causes of genetic variations; 5) The molecular basis for disease diagnosis and treatments. We will mainly focus on molecular mechanisms of inherent genetic diseases, neurodegenerative diseases, cancer and environmentally induced diseases. This will be a combined lecture/discussion course. The class materials are mainly based on preliminary literatures and case studies. Students are expected to actively participate in discussion in class and to give presentations and lectures based on research paper. Graduate/Undergraduate Equivalency: BIOS 420.**BIOS 521 - STUDENT SEMINAR IN ECOLOGY AND EVOLUTIONARY BIOLOGY****Short Title:** STUDENT SEMINAR IN EEB**Department:** Biosciences**Grade Mode:** Satisfactory/Unsatisfactory**Course Type:** Seminar**Credit Hour:** 1**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate**Description:** Student-led presentations of work in progress, research ideas, and topics of research interest. Designed to enhance oral presentation skills and facilitate discussion of research ideas. Open to upper-level undergraduates and graduate students. Repeatable for Credit.**BIOS 522 - CONSERVATION BIOLOGY LAB****Short Title:** CONSERVATION BIOLOGY LAB**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Laboratory**Credit Hours:** 3**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate**Description:** This course will give students hands-on experiences in the practice of conservation biology through authentic projects related to prioritization and design of nature preserves, restoration of natural environments, and for monitoring threatened and endangered species in the Houston area. Graduate/Undergraduate Equivalency: BIOS 322. Mutually Exclusive: Cannot register for BIOS 522 if student has credit for BIOS 322.

**BIOS 523 - CONSERVATION BIOLOGY****Short Title:** CONSERVATION BIOLOGY**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate

**Description:** The course is designed to give students a broad overview of conservation biology. Lecture and discussions will focus on conservation issues such as biodiversity, extinction, management, sustained yield, invasive species and preserve design. Graduate/Undergraduate Equivalency: BIOS 423. Mutually Exclusive: Cannot register for BIOS 523 if student has credit for BIOS 323.

**BIOS 524 - MICROBIOLOGY & BIOTECHNOLOGY****Short Title:** MICROBIOLOGY & BIOTECHNOLOGY**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate

**Description:** Structure and functions of microorganisms with emphasis on their environmental, industrial and medical importance. Graduate/Undergraduate Equivalency: BIOS 424. Mutually Exclusive: Cannot register for BIOS 524 if student has credit for BIOS 424.

**BIOS 525 - PLANT MOLECULAR GENETICS AND DEVELOPMENT****Short Title:** PLANT MOLECULAR GENETICS**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate

**Description:** Novel aspects of plant biology and development with emphasis on molecular and genetic mechanisms. Plant responses to the environment and the use of bioengineering and other means to develop new plant products will also be covered Graduate/Undergraduate Equivalency: BIOS 425. Mutually Exclusive: Cannot register for BIOS 525 if student has credit for BIOS 425.

**BIOS 528 - BRAINSTEM - TEACHING STEM THROUGH NEUROSCIENCE****Short Title:** BRAINSTEM**Department:** Biosciences**Grade Mode:** Satisfactory/Unsatisfactory**Course Type:** Internship/Practicum**Credit Hour:** 1**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate

**Description:** BrainSTEM is a service organization that teaches STEM subjects through the lens of neuroscience. We perform hands-on, small-group activities with ~45 students per week. This course will prepare you to communicate science in a both effective and entertaining manner, as well as build your skills in managing small groups. More information can be found at 'www.brainstem.club.' Graduate/Undergraduate Equivalency: BIOS 128. Mutually Exclusive: Cannot register for BIOS 528 if student has credit for BIOS 128. Repeatable for Credit.

**BIOS 529 - ANIMAL DIVERSITY****Short Title:** ANIMAL DIVERSITY**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate**Prerequisite(s):** BIOC 201 or BIOS 201 or EBIO 202 or BIOS 202

**Description:** The evolution and systematics of the animal kingdom with consideration of functional anatomy, comparative physiology, behavior, medical implications and resource management. Graduate/Undergraduate Equivalency: BIOS 329. Mutually Exclusive: Cannot register for BIOS 529 if student has credit for BIOC 329/BIOS 329.

**BIOS 530 - LAB MODULE IN NMR SPECTROSCOPY AND MOLECULAR MODELING****Short Title:** LAB MOD NMR SPECTROSCOPY&MOLEC**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Lecture/Laboratory**Credit Hour:** 1**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate

**Prerequisite(s):** BIOC 481 or BIOS 481 or BIOC 482 or BIOS 482 (may be taken concurrently) or BIOC 552 or BIOS 552 (may be taken concurrently) or BIOC 551 or BIOS 551

**Description:** The students will learn to set up, acquire, and process one-dimensional and basic two-dimensional NMR experiments. Spectral interpretation (3D molecular modeling of proteins and nucleic acids) for nucleic acids and proteins using homonuclear and heteronuclear data. Enrollment limited to 12, with priority to graduate students. Offered first half of the semester. BIOS 482/552 may be taken concurrently with BIOS 530.

**BIOS 532 - ECOLOGY****Short Title:** ECOLOGY**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate

**Description:** Study of population dynamics, species interactions, plant and animal community organization, and ecosystem function. Graduate/Undergraduate Equivalency: BIOS 332. Mutually Exclusive: Cannot register for BIOS 532 if student has credit for BIOS 332.

**BIOS 534 - EVOLUTION****Short Title:** EVOLUTION**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate

**Description:** Principles of biological evolution. Topics include natural selection, adaptation, molecular evolution, formation of new species, the fossil record, biogeography, and principles of classification. Instructor Permission Required. Graduate/Undergraduate Equivalency: BIOS 334. Mutually Exclusive: Cannot register for BIOS 534 if student has credit for BIOS 334.

**BIOS 535 - PRACTICAL X-RAY CRYSTALLOGRAPHY****Short Title:** PRACT X-RAY CRYSTALLOGRAPHY**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Laboratory**Credit Hours:** 2**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate**Prerequisite(s):** BIOC 552 or BIOS 552 (may be taken concurrently) or BIOC 482 or BIOS 482 (may be taken concurrently)**Description:** This is an introduction to macromolecular crystallography with emphasis on crystallization methods, data acquisition, processing and molecular model-building. Approaches to solving structures will be discussed, as well as refinement of molecular models. Offered second half of the semester. Prerequisites are concurrent and may be taken the same semester.**BIOS 537 - ADVANCED STRUCTURAL BIOLOGY SEMINAR****Short Title:** ADV STRUCTURAL BIOLOGY SEMINAR**Department:** Biosciences**Grade Mode:** Satisfactory/Unsatisfactory**Course Type:** Seminar**Credit Hour:** 1**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate**Description:** One hour seminar course in theoretical and practical aspects of crystallography, primarily as it applies to macromolecular crystallography. Presentations will be given by instructors and students on advanced topics based on published works or original research. Repeatable for Credit.**BIOS 538 - ANALYSIS AND VISUALIZATION OF BIOLOGICAL DATA****Short Title:** BIO DATA ANALYSIS**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate**Description:** This course addresses how to analyze, visualize and draw conclusions from biological data. It introduces basic concepts in statistics interwoven with training in data analysis using the R computing environment. Students will learn to identify underlying data structures and wrangle data. Students will also learn to effectively convey results using statistical graphics. Topics include basic R programming, data exploration, statistical modeling, parameter estimation and interpretation, and model comparison. This class particularly focuses on biological data. Graduate/Undergraduate Equivalency: BIOS 338. Mutually Exclusive: Cannot register for BIOS 538 if student has credit for BIOS 338.**BIOS 540 - INTEGRATIVE ANIMAL PHYSIOLOGY****Short Title:** INTEGRATIVE ANIMAL PHYSIOLOGY**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate**Description:** This course takes a comparative approach to investigate animal physiology of vertebrates. Students learn how animals are adapted to their environments, including how they meet their energy needs, take up and transport oxygen, and maintain hydration and salt balance. Students read primary literature to explore survival in extreme environments. Mutually Exclusive: Cannot register for BIOS 540 if student has credit for BIOS 340, BIOC 335, BIOC 536. Graduate/Undergraduate Equivalency: BIOS 340.**BIOS 541 - RESEARCH SEMINAR IN ECOLOGY AND EVOLUTIONARY BIOLOGY****Short Title:** RESEARCH SEMINAR**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Seminar**Credit Hour:** 1**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate**Description:** Discussion of individual research or current topics in particular areas. Intended for students conducting research projects with the instructor as advisor. Repeatable for Credit.**BIOS 542 - RESEARCH SEMINAR IN ECOLOGY AND EVOLUTIONARY BIOLOGY****Short Title:** RESEARCH SEMINAR**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Research**Credit Hour:** 1**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate**Description:** Discussion of individual research or current topics in particular areas. Intended for students conducting research projects with the instructor as advisor. Repeatable for Credit.**BIOS 543 - DEVELOPMENTAL NEUROBIOLOGY****Short Title:** NEURODEVELOPMENT**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate**Prerequisite(s):** BIOS 341 or BIOC 341 or BIOS 301 or BIOC 301 or BIOS 344 or BIOC 344**Description:** An advanced undergraduate and graduate level course, dedicated to analysis and evaluation of scientific inquiry into animal development. Textbook based lectures and discussions based on primary scientific literature are used to exemplify and evaluate concepts and methodology. Writing assignments, quizzes, midterm and final exam will be used to evaluate performance. Graduate/Undergraduate Equivalency: BIOS 443.

**BIOS 547 - EXPERIMENTAL BIOLOGY AND THE FUTURE OF MEDICINE****Short Title:** BIOLOGY AND MEDICINE**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate**Description:** Current biological methods offer the potential to transform health care. We will examine the biology and methodology of emergent health care technologies such as stem cell therapy and personal genome sequencing to understand their potential to impact human health. Graduate/Undergraduate Equivalency: BIOS 447. Recommended Prerequisite(s): BIOS 301 or BIOC 301 or BIOS 341 or BIOC 341 or BIOS 344 or BIOC 344**BIOS 549 - ADVANCED CELL AND MOLECULAR NEUROSCIENCE****Short Title:** ADV CELL AND MOLECULAR NEURO**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate**Prerequisite(s):** (BIOS 385 or NEUR 385) and (BIOS 201 or BIOC 201) and (BIOS 212 or BIOC 212) and (MATH 102 or MATH 106) and (STAT 305 or STAT 310 or ECON 307 or STAT 312)**Description:** This course will be an overview of advanced principles and techniques in cell and molecular neuroscience; subjects will include bio-electricity, cellular signaling, and the molecular mechanics of neuronal plasticity. The class will primarily be lecture driven. However, there will be seminar component – students will review primary scientific literature, discuss it in small groups, and present their findings. Graduate/Undergraduate Equivalency: BIOS 449. Recommended Prerequisite(s): PSYC 380 or NEUR 380 or BIOC 380**BIOS 550 - VIRUSES AND INFECTIOUS DISEASES****Short Title:** VIRUSES & INFECTIOUS DISEASES**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate**Prerequisite(s):** BIOC 301 or BIOS 301 or BIOC 341 or BIOS 341**Description:** Animal viruses, especially those relevant to human health, will be discussed. Topics primarily focus on virus structure and the molecular biology of the virus life cycle. Practical issues such as the history of viral diseases, clinical manifestations, laboratory diagnosis, management and prevention will also be discussed. Graduate/Undergraduate Equivalency: BIOS 450.**BIOS 551 - MOLECULAR BIOPHYSICS****Short Title:** MOLECULAR BIOPHYSICS I**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate**Prerequisite(s):** BIOC 301 or BIOS 301 or BIOC 352 or BIOS 352**Description:** Focus on principles of common biophysical methods used for study of conformations and dynamics of biological macromolecules and assemblies. Topics cover spectroscopic methods (absorption, fluorescence, circular dichroism, epr, NMR), transport processes, sedimentation, calorimetry, mass spectrometry, crystallography, cryo-electron microscopy, atomic force microscopy, ligand-protein interactions, protein folding, single molecule detection, computer simulations, functional genomics and laboratory evolution. Biological examples will be used to demonstrate merits and complementarity in each of the biophysical methods. Graduate/Undergraduate Equivalency: BIOS 481.**BIOS 552 - STRUCTURAL BIOLOGY****Short Title:** STRUCTURAL BIOLOGY**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate**Description:** Structural biology plays an important role in defining atomic structures of biomolecules and understanding relationships between structure, dynamics and function in living systems. This course will give an introduction to techniques of determining biomolecular structures, X-ray crystallography, NMR, and cryoelectron microscopy and discuss striking examples of the power of structural biology. Graduate/Undergraduate Equivalency: BIOS 482. Recommended Prerequisite(s): BIOC 301 or BIOS 301**BIOS 559 - SUSTAINABILITY IMPACT ASSESSMENTS****Short Title:** SUSTAINABILITY IMPACTS**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate**Description:** This course is an exciting review of the methodologies involved in conducting Environmental Impact Assessments according to epistemologies from Sustainable Development. EIAs have to be conducted, before permitting is secured, for large projects and programs; such as power plants, highways, pipelines, dams, mines, airports, incinerators and landfills. Most environmental consultancies and government environmental offices will routinely engage experts who are familiar with a comprehensive assessment of local ecosystems around a project or program.**Course URL:** [profms.rice.edu](http://profms.rice.edu) (<http://profms.rice.edu>)

**BIOS 560 - CANCER BIOLOGY****Short Title:** CANCER BIOLOGY**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate

**Description:** Provides an integrated lecture series summarizing current knowledge in cancer biology and integrating current literature with basic concepts. Topics include: statistics of incidence/survival, types of cancer, pathology, the process of carcinogenesis and sources of carcinogens, genetic and epigenetic mechanisms and consequences, cancer progression, metastasis and current treatment options. Students will learn to use online databases to develop independent strategies for analyzing datasets. There will be several writing assignments and in class oral presentations of research articles. This course requires instructor permission to enroll. Please fill out the special registration form from [https://registrar.rice.edu/student/special\\_registration](https://registrar.rice.edu/student/special_registration). All requests will be reviewed and you will be notified of an enrollment decision. Instructor Permission Required. Graduate/Undergraduate Equivalency: BIOS 460. Mutually Exclusive: Cannot register for BIOS 560 if student has credit for BIOS 460.

**BIOS 561 - TOPICS IN EVOLUTION****Short Title:** TOPICS IN EVOLUTION**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Seminar**Credit Hour:** 1**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate

**Description:** Review and discussion of the literature on current research in evolution. Repeatable for Credit.

**BIOS 562 - TOPICS IN EVOLUTION (SPRING)****Short Title:** TOPICS IN EVOLUTION (SPRING)**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Seminar**Credit Hour:** 1**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate

**Description:** Review and discussion of the literature on current research in evolution. Repeatable for Credit.

**BIOS 563 - TOPICS IN ECOLOGY****Short Title:** TOPICS IN ECOLOGY**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hour:** 1**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate

**Description:** Review and discussion of the literature on current research in ecology. Repeatable for Credit.

**BIOS 568 - TOPICS IN ECOLOGY (SPRING)****Short Title:** TOPICS IN ECOLOGY (SPRING)**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Seminar**Credit Hour:** 1**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate

**Description:** Review and discussion of the literature on current research in ecology. Repeatable for Credit.

**BIOS 569 - CORE COURSE IN ECOLOGY AND EVOLUTIONARY BIOLOGY****Short Title:** CORE COURSE IN ECOLOGY & EVOL**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate

**Description:** Survey of topics in ecology and evolution taught by all EEB faculty.

**BIOS 570 - COMPUTATION WITH BIOLOGICAL DATA****Short Title:** COMPUTATION WITH BIOL DATA**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate

**Description:** This course will teach programming and analysis techniques essential for modern research in the biological sciences. Students will learn the basics of programming in the MATLAB or Python scripting languages and applications to analyzing biological data. There will be a particular focus on quantitative image and sequence analysis. Instructor Permission Required. Graduate/Undergraduate Equivalency: BIOS 470. Mutually Exclusive: Cannot register for BIOS 570 if student has credit for BIOS 470.

**BIOS 571 - ECOSYSTEM MANAGEMENT****Short Title:** ECOSYSTEM MANAGEMENT**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate

**Description:** This course will focus on applied ecosystem topics including relations with state and federal agencies, field studies, wetland delineations, permitting compliance, and environmental regulations. Graduate/Undergraduate Equivalency: BIOS 271.

**BIOS 572 - IMMUNOLOGY****Short Title:** IMMUNOLOGY**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate

**Description:** Cellular and molecular basis of innate and adaptive immune function in mammals. Graduate students will be required to do all the usual assignments associated with the undergraduate section of the course but in addition will write a substantial paper on some aspects of the field that is relevant to their planned careers in biomedical research/biotechnology. Graduate/Undergraduate Equivalency: BIOS 372.

**BIOS 573 - CORAL REEF ECOSYSTEMS****Short Title:** CORAL REEF ECOSYSTEMS**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate**Prerequisite(s):** EBIO 202 or BIOS 202

**Description:** This three credit lecture course introduces students to a complex, dynamic and sensitive ecosystem: coral reefs. We will explore the biotic and abiotic components of coral reefs; how reef organisms interact with each other and the environment, and the factors that contribute to reef construction and decline over time and space. Graduate/Undergraduate Equivalency: BIOS 373.

**BIOS 575 - INTRODUCTION TO RESEARCH****Short Title:** INTRODUCTION TO RESEARCH**Department:** Biosciences**Grade Mode:** Satisfactory/Unsatisfactory**Course Type:** Seminar**Credit Hour:** 1**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate

**Description:** Introduction of first-year graduate students to the research programs and laboratories of individual faculty members. Open only to BCB graduate students.

**BIOS 580 - SUSTAINABLE DEVELOPMENT AND REPORTING****Short Title:** SUSTAINABLE DEVELOPMENT**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate

**Description:** Sustainable development is an approach to development based on interacting social, economic, and environmental forces. It is intended as methodology for planning, and a guiding principle for Environmental Health and safety compliance (EHSs) and Corporate Sustainability (CSRs). Students will learn compliance guidelines, risk management, and assessment considerations. Graduate/Undergraduate Equivalency: BIOS 280. Mutually Exclusive: Cannot register for BIOS 580 if student has credit for BIOS 280.

**BIOS 581 - GRADUATE SEMINAR IN BIOCHEMISTRY AND CELL BIOLOGY****Short Title:** GRAD SEM BIOCHEM & CELL BIOL**Department:** Biosciences**Grade Mode:** Satisfactory/Unsatisfactory**Course Type:** Seminar**Credit Hour:** 1**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate

**Description:** A discussion of selected research topics. Required of all Biochemistry and Cell Biology graduate students. Open only to BCB graduate students. Repeatable for Credit.

**BIOS 582 - GRADUATE SEMINAR IN BIOCHEMISTRY AND CELL BIOLOGY****Short Title:** GRAD SEM BIOCHEM & CELL BIOL**Department:** Biosciences**Grade Mode:** Satisfactory/Unsatisfactory**Course Type:** Seminar**Credit Hour:** 1**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate

**Description:** A discussion of selected research topics. Required of all Biochemistry and Cell Biology graduate students. Open only to BCB graduate students. Repeatable for Credit.

**BIOS 583 - MOLECULAR INTERACTIONS****Short Title:** MOLECULAR INTERACTIONS**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Seminar**Credit Hours:** 4

**Restrictions:** Enrollment is limited to students with a major in Biochemistry and Cell Biology. Enrollment is limited to Graduate level students.

**Course Level:** Graduate

**Description:** First of two integrated classes taken by first-year graduate students in BCB (to be followed by BIOC 588, Cellular Interactions). Covers advanced topics in biochemistry, ranging from protein and nucleic acid synthesis, folding, function, and engineering to allostery, dynamics, and degradation with an emphasis on fundamental principles, research methodologies, problem solving, and critical analysis of primary literature. Enrollment limited to BCB graduate students.

**BIOS 584 - GRADUATE SEMINAR IN ECOLOGY AND EVOLUTIONARY BIOLOGY****Short Title:** GRAD SEM IN ECOL & EVOL BIOL**Department:** Biosciences**Grade Mode:** Satisfactory/Unsatisfactory**Course Type:** Seminar**Credit Hour:** 1**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate

**Description:** Faculty and student presentations on current research. Required of all Ecology & Evolutionary Biology graduate students. Repeatable for Credit.

**BIOS 585 - FUNDAMENTALS OF CELLULAR AND MOLECULAR NEUROSCIENCE****Short Title:** FUNDAMENTALS OF NEUROSCIENCE**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate**Description:** Cellular, molecular, and integrative mechanisms of neural function, including membrane and axon physiology, synaptic transmission and plasticity, sensory transduction and processing.

Graduate/Undergraduate Equivalency: BIOS 385.

**BIOS 586 - GRADUATE SEMINAR IN ECOLOGY AND EVOLUTIONARY BIOLOGY****Short Title:** GRAD SEM: ECOL & EVOL BIOLOGY**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Seminar**Credit Hour:** 1**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate**Description:** Continuation of BIOS 584 in spring semester. Repeatable for Credit.**BIOS 587 - RESEARCH DESIGN, PROPOSAL WRITING, AND PROFESSIONAL DEVELOPMENT****Short Title:** PROPOSAL WRITING**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Seminar**Credit Hours:** 3**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate**Description:** Preparation for professional scientific communication with an emphasis on writing research proposals, describing work in progress, and presenting data in context of research goals.**BIOS 588 - CELLULAR INTERACTIONS****Short Title:** CELLULAR INTERACTIONS**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Seminar**Credit Hours:** 4**Restrictions:** Enrollment is limited to students with a major in Biochemistry and Cell Biology. Enrollment is limited to Graduate level students.**Course Level:** Graduate**Description:** Second of two integrated classes taken by first-year graduate students in BCB (following BIOC 583, Molecular Interactions). Covers advanced topics in genetics, cell biology, and developmental biology, focusing on cellular, tissue, and organismal structure and function with an emphasis on fundamental principles, research methodologies, and critical analysis of primary literature.**BIOS 589 - EEB OUTREACH DEVELOPMENT****Short Title:** EEB OUTREACH DEVELOPMENT**Department:** Biosciences**Grade Mode:** Satisfactory/Unsatisfactory**Course Type:** Seminar**Credit Hour:** 1**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate**Description:** This course is for Rice students interested in developing life science outreach initiatives that target underserved K-12 students in the Houston area. Goals of the course include developing hands-on teaching modules related to Texas science education standards and expanding graduate student teaching experiences beyond the University setting.**BIOS 590 - SPECIAL TOPICS IN BIOCHEMISTRY AND CELL BIOLOGY****Short Title:** SPEC TOPICS BIOC & CELL BIO**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Seminar**Credit Hour:** 1**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate**Description:** Development of specific topic areas at the graduate level. Instructor Permission Required.**BIOS 591 - GRADUATE TEACHING IN ECOLOGY AND EVOLUTIONARY BIOLOGY****Short Title:** GRADUATE TEACHING IN EEB**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Internship/Practicum**Credit Hours:** 3**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate**Description:** Supervised instruction in teaching ecology and evolutionary biology. Repeatable for Credit. Repeatable for Credit.**BIOS 592 - TOPICS IN QUANTITATIVE BIOLOGY AND BIOMEDICAL INFORMATICS (KECK SEMINAR)****Short Title:** TOPICS QUANT BIO & BIOMED INFO**Department:** Biosciences**Grade Mode:** Satisfactory/Unsatisfactory**Course Type:** Seminar**Credit Hour:** 1**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate**Description:** A discussion of selected research topics in quantitative biology and biomedical informatics. Repeatable for Credit.**BIOS 593 - CURRENT TOPICS IN PLANT BIOLOGY****Short Title:** TOPICS IN PLANT BIOLOGY**Department:** Biosciences**Grade Mode:** Satisfactory/Unsatisfactory**Course Type:** Seminar**Credit Hour:** 1**Restrictions:** Enrollment is limited to students with a major in Biochemistry and Cell Biology. Enrollment is limited to Graduate level students.**Course Level:** Graduate**Description:** Discussion of selected research topics in current plant biology literature. Repeatable for Credit.

**BIOS 599 - GRADUATE TEACHING IN BIOCHEMISTRY AND CELL BIOLOGY****Short Title:** GRADUATE TEACHING IN BIOCHEM**Department:** Biosciences**Grade Mode:** Satisfactory/Unsatisfactory**Course Type:** Independent Study**Credit Hour:** 1**Restrictions:** Enrollment is limited to students with a major in Biochemistry and Cell Biology. Enrollment is limited to Graduate level students.**Course Level:** Graduate**Description:** Supervised instruction in teaching biochemistry and cell biology. Repeatable for Credit.**BIOS 611 - RESEARCH SEMINAR IN BIOCHEMISTRY AND CELL BIOLOGY****Short Title:** RESEARCH SEMINAR**Department:** Biosciences**Grade Mode:** Satisfactory/Unsatisfactory**Course Type:** Seminar**Credit Hour:** 1**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate**Description:** Discussion of individual research or current topics in particular areas. Intended for students conducting research projects in the lab of the instructor. Repeatable for Credit.**BIOS 677 - SPECIAL TOPICS****Short Title:** SPECIAL TOPICS**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Seminar, Internship/Practicum, Lecture/Laboratory, Laboratory, Lecture**Credit Hours:** 1-4**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate**Description:** Topics and credit hours may vary each semester. Contact department for current semester's topic(s). Repeatable for Credit.**BIOS 701 - GRADUATE LAB RESEARCH I****Short Title:** GRADUATE LAB RESEARCH I**Department:** Biosciences**Grade Mode:** Satisfactory/Unsatisfactory**Course Type:** Research**Credit Hours:** 2-4**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate**Description:** Graduate research in Biochemistry and Cell Biology. Designed for short term laboratory projects for first year graduate students. Repeatable for Credit.**BIOS 702 - GRADUATE LAB RESEARCH II****Short Title:** GRADUATE LAB RESEARCH II**Department:** Biosciences**Grade Mode:** Satisfactory/Unsatisfactory**Course Type:** Research**Credit Hours:** 2-4**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate**Description:** Graduate research in Biochemistry and Cell Biology. Designed for short term laboratory projects for first year graduate students. Repeatable for Credit.**BIOS 800 - BIOCHEMISTRY & CELL BIOLOGY GRADUATE RESEARCH****Short Title:** BCB GRADUATE RESEARCH**Department:** Biosciences**Grade Mode:** Satisfactory/Unsatisfactory**Course Type:** Research**Credit Hours:** 1-15**Restrictions:** Enrollment is limited to students with a major in Biochemistry and Cell Biology. Enrollment is limited to Graduate level students.**Course Level:** Graduate**Description:** Biochemistry & Cell Biology graduate research. Repeatable for Credit.**BIOS 801 - ECOLOGY & EVOLUTIONARY BIOLOGY GRADUATE RESEARCH****Short Title:** EEB GRADUATE RESEARCH**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Research**Credit Hours:** 1-15**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate**Description:** Ecology & Evolutionary Biology graduate research. Repeatable for Credit.

## Description and Code Legend

**Note:** Internally, the university uses the following descriptions, codes, and abbreviations for this academic program. The following is a quick reference:

### Course Catalog/Schedule

- Course offerings/subject code for Biosciences: BIOS

### Department Description and Code

- BioSciences: BIOS

### Undergraduate Degree Descriptions and Codes

- Bachelor of Arts degree: BA
- Bachelor of Science degree: BS

### Undergraduate Major Descriptions and Codes

- Major in Biosciences (for both the BA and BS degrees): BISC

### Undergraduate Major Concentration Descriptions and Codes

- Major Concentration in Biochemistry (for both the BA and BS degrees): BIBC
- Major Concentration in Cell Biology and Genetics (for both the BA and BS degrees): BICB
- Major Concentration in Ecology and Evolutionary Biology (for both the BA and BS degrees): BIEE
- Major Concentration in Integrative Biology (for both the BA and BS degrees): BIIB

### Undergraduate Minor Descriptions and Codes

- Minor in Biochemistry and Cell Biology: BCBM
- Minor in Ecology and Evolutionary Biology: EEBM



## Graduate Degree Descriptions and Codes

- Master of Science degree: MS
- Doctor of Philosophy degree: PhD

## Graduate Degree Program Descriptions and Codes

- Degree Program in Biochemistry and Cell Biology: BIOC
- Degree Program in Ecology and Evolutionary Biology: EBIO

## CIP Code and Description <sup>1</sup>

- **BIOC** Major/Program: CIP Code/Title: 26.0202 - *Biochemistry*
- **BISC** Major/Program: CIP Code/Title: 26.0101 - *Biology/Biological Sciences, General*
- **EBIO** Major/Program: CIP Code/Title: 26.1310 - *Ecology and Evolutionary Biology*
- **BIBC** Major Concentration: CIP Code/Title: 26.0202 - *Biochemistry*
- **BICB** Major Concentration: CIP Code/Title: 26.0406 - *Cell/Cellular and Molecular Biology*
- **BIEE** Major Concentration: CIP Code/Title: 26.1310 - *Ecology and Evolutionary Biology*
- **BIIB** Major Concentration: CIP Code/Title: 26.0101 - *Biology/Biological Sciences, General*
- **BCBM** Minor: CIP Code/Title: 26.0202 - *Biochemistry*
- **EEBM** Minor: CIP Code/Title: 26.1310 - *Ecology and Evolutionary Biology*

<sup>1</sup> Classification of Instructional Programs (CIP) 2020 Codes and Descriptions from the National Center for Education Statistics: <https://nces.ed.gov/ipeds/cipcode/>