

BIOSCIENCES

Contact Information

BioSciences

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

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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 in Biochemistry and Cell Biology (BA, BS), Ecology and Evolutionary Biology (BA, BS), and Biological Sciences (BA). In addition, a Minor in Biochemistry and Cell Biology and a Minor in Ecology and Evolutionary Biology are offered. The BA degrees offer a rigorous biological curriculum suitable for many career paths while allowing the flexibility for extended academic exploration other areas. The BS degrees offer 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-MA-PhD program track. Additional information on departmental programs, courses, and advising is available at the BioSciences website (<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, MA) and in Ecology and Evolutionary Biology (PhD, MA, 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 (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 Biochemistry and Cell Biology (ga.rice.edu/programs-study/departments-programs/natural-sciences/biosciences/biochemistry-cell-biology-ba)

- Bachelor of Arts (BA) Degree with a Major in Biological Sciences (ga.rice.edu/programs-study/departments-programs/natural-sciences/biosciences/biological-sciences-ba)
- Bachelor of Arts (BA) Degree with a Major in Ecology and Evolutionary Biology (ga.rice.edu/programs-study/departments-programs/natural-sciences/biosciences/ecology-evolutionary-biology-ba)
- Bachelor of Science (BS) Degree with a Major in Biochemistry and Cell Biology (ga.rice.edu/programs-study/departments-programs/natural-sciences/biosciences/biochemistry-cell-biology-bs)
- Bachelor of Science (BS) Degree with a Major in Ecology and Evolutionary Biology (ga.rice.edu/programs-study/departments-programs/natural-sciences/biosciences/ecology-evolutionary-biology-bs)

Minors

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

Accelerated Program

- Bachelor of Arts (BA) Degree / Master of Arts (MA) Degree / Doctor of Philosophy (PhD) Degree in the field of Biochemistry and Cell Biology (ga.rice.edu/programs-study/departments-programs/natural-sciences/biosciences/biochemistry-cell-biology-ba-ma-phd)

Master's Programs

- Master of Arts (MA) Degree in the field of Biochemistry and Cell Biology (ga.rice.edu/programs-study/departments-programs/natural-sciences/biosciences/biochemistry-cell-biology-ma)
- Master of Arts (MA) Degree in the field of Ecology and Evolutionary Biology (ga.rice.edu/programs-study/departments-programs/natural-sciences/biosciences/ecology-evolutionary-biology-ma)
- Master of Science (MS) Degree in the field of Ecology and Evolutionary Biology*

Doctoral Programs

- Doctor of Philosophy (PhD) Degree in the field of Biochemistry and Cell Biology (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 (ga.rice.edu/programs-study/departments-programs/natural-sciences/biosciences/ecology-evolutionary-biology-phd)

* *Although students are not normally admitted to a Master of Science (MS) degree program, graduate students may earn the MS as they work towards the PhD.*

Chair

Janet Braam

Professors

Bonnie Bartel

Kathleen Beckingham

George M. Bennett

Daniel D. Carson
Michael C. Gustin
Carrie A. Masiello
Seiichi P. T. Matsuda
Kathleen S. Matthews
James A. McNew
Luay Nakhleh
Edward P. Nikonowicz
Jose Onuchic
George N. Phillips
Volker Rudolf
Yousif Shamoo
Evan Siemann
Jonathan Silberg
Michael Stern
Charles R. Stewart
Yizhi Jane Tao
Peter Wolynes

Associate Professors

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Amy Dunham
Oleg Igoshin
Michael Kohn
Peter Lwigale
Tom Miller
Laura Segatori
Junghae Suh
Jeffrey J. Tabor
Daniel Wagner

Assistant Professors

Caleb Bashor
Lydia Beaudrot
James Chappell
Adrienne M.S. Correa
Scott Egan
Xue Gao
Isaac Hilton
Natalia Kirienko
Julia Saltz
Rosa Uribe
Aryeh Warmflash
Han Xiao

Professors Emeriti

Frank Fisher, Jr.
Raymon M. Glantz
Paul Harcombe
Jordan Konisky
John S. Olson
Graham Palmer
David Queller
Ronald Sass
Stephen Subtelny
Joan Strassman
Calvin Ward

Teaching Faculty

Beth Beason Abmayr

David R. Caprette
Daniel J. Catanese
Elizabeth Eich
Jonathan Flynn
Cassidy Johnson
Kristin Matthews
Joseph R. Novak
Alma Novotny
Dereth Phillips
Scott Solomon
Collin Thomas

Huxley Fellows

Benedicte Bachelot

Rice Academy Fellows

DurreShahwar Muhammad

Adjunct Faculty

Richard Behringer
Sarah Bondos
Andrea Burns
Nikki Delk
J. David Dickman
Cindy Farach-Carson
Robert O. Fox
Haichun Gao
Jeff Glassberg
Richard H. Gomer
Nancy Greig
Daniel Harrington
Maria Hartley
Kendal Hirschi
Kresimir Josic
Olivier Lichtarge
Jianpeng Ma
Kevin MacKenzie
Paolo Moretti
Jordan Orange
Timothy Palzkill
Dabananda Pati
Neal Pellis
Florante A. Quioco
Susan Rosenberg
Clarence Sams
Yigong Shi
Doris Taylor
Ah-Lim Tsai
Theodore G. Wensel
Peggy Whitson
Zheng Zhou
Huda Y. Zoghbi

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)

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

Biochemistry and Cell Biology (BIOC)

BIOC 112 - INTRODUCTORY BIOLOGICAL RESEARCH CHALLENGES

Short Title: INTRO BIOL RESEARCH CHALLENGES

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 Lower-Level

Description: Teams of students work on investigative, client-based projects with opportunities to design experiments, analyze data, and communicate their findings. This course is recommended for students interested in the Biosciences major who have very limited practical laboratory experience. Only first year students may enroll. Mutually Exclusive: Credit cannot be earned for BIOC 112 and BIOC 111/NSCI 120.

BIOC 115 - FRESHMAN SEMINAR IN LOCAL BIOLOGY RESEARCH (BCB)

Short Title: FRESHMAN BIOLOGY SEMINAR (BCB)

Department: Biosciences

Grade Mode: Standard Letter

Course Type: Seminar

Distribution Group: Distribution Group III

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 freshmen 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 115/FSEM 115 regardless of AP credit. This course meets in the second half of the semester and features research in the Program of Biochemistry and Cell Biology. Cross-list: FSEM 115.

Course URL: www.bioc.rice.edu/bioc115/

BIOC 122 - CURRENT TOPICS IN BIOLOGY

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/

BIOC 129 - 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.' Repeatable for Credit.

BIOC 201 - INTRODUCTORY BIOLOGY

Short Title: INTRODUCTORY 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 Lower-Level

Description: Chemistry and energetics, cell physiology, cell biology, Mendelian genetics, molecular genetics, developmental biology, and plant physiology.

BIOC 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.

BIOC 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 for high school juniors and seniors or Rice students conducting research for the first time. The students will conduct scientific research in the laboratories of the Rice faculty in the areas of Biochemistry & Cell Biology and Ecology & Evolutionary Biology. 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. Visiting high school students must complete visiting student application process for high school students. Instructions to do this can be found in the Application Checklist at summer.rice.edu. Rice students will need a special registration from or ask the faculty member for permission to register. Instructor Permission Required. Cross-list: EBIO 210. Repeatable for Credit.

BIOC 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 (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 BIOC 201 may be taken concurrently with BIOC 211. Registration is excluded for Fall 2018 New Matrics. Mutually Exclusive: Credit cannot be earned for BIOC 211 and BIOC 212.

BIOC 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 Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Lower-Level**Prerequisite(s):** BIOC 201 (may be taken concurrently) and

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 primarily intended for prospective and declared NEUR majors. The pre-req BIOC 201 may be taken concurrently with BIOC 212. Instructor Permission Required. Mutually Exclusive: Credit cannot be earned for BIOC 212 and BIOC 211.

BIOC 215 - BIOSCIENCES LAB TEACHING**Short Title:** BIOC 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. Provide group and individual instruction and feedback to undergraduates during and outside of laboratory classes. Instructor Permission Required. Repeatable for Credit.

BIOC 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 BIOC course, as approved by the Department Chair for this activity, will develop teaching skills by leading discussion sections or serving as writing mentors. These activities are designed to benefit students presently taking the relevant BIOC course and will be performed under the guidance of the professor teaching the course. Instructor Permission Required. Repeatable for Credit.

BIOC 220 - FORENSIC BIOLOGY AND CRIMINALISTICS**Short Title:** FORENSIC BIOL & CRIMINALISTICS**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**Prerequisite(s):** BIOC 201

Description: This course will introduce students to certain areas of forensic science including - crime scene analysis, forensic serology, molecular genetics (DNA), forensic toxicology; drugs, and the identification of biological fluids such as blood, saliva, and semen, with case studies and a potential field trip. The course is designed for biology and chemistry students, for students interested in the application of biosciences in DNA and crime scene analysis.

BIOC 238 - SPECIAL TOPICS**Short Title:** SPECIAL TOPICS**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Internship/Practicum, Lecture, Seminar, Laboratory**Credit Hours:** 1-4**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting 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.

BIOC 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: Examination of paradigms in Biochemistry and Cell Biology with a focus on the "central dogma" of molecular biology. Recommended strongly for students with Advanced Placement in Biology and designed for prospective BIOC majors. This course is strongly recommended as preparation for BIOC 341 (Cell Biology). Enrollment is restricted to students who have not yet taken BIOC 301 or BIOC 341. Recommended Prerequisite(s): Recommended strongly for students with Advanced Placement in Biology and designed for prospective BIOC majors. For students with AP credit for BIOS/BIOC 201, this course is strongly recommended as preparation for BIOC 341 (Cell Biology).

BIOC 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

Description: The second in an integrated sequence of three courses (BIOC 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.

BIOC 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

Description: The final in an integrated sequence of three courses (BIOC 201, 301, 302). In depth study of carbohydrate, amino acid, and lipid metabolic pathways, hormone regulation of metabolic pathways, 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.

BIOC 310 - INDEPENDENT RESEARCH FOR BIOCHEMISTRY AND CELL BIOLOGY UNDERGRADUATES**Short Title:** IND RES FOR BIOC 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 211 or BIOC 212 or BIOC 112 or NSCI 120

Description: Independent research in Rice BCB faculty laboratories (sections 2 and above) or other Texas Medical Center laboratories (sections 1). Students spend at least 3 hours per week in the laboratory for each semester hour of credit. If taken for 3 or more hours, counts as one required 300+ level lab course (not BIOC 311). Requires a proposal abstract, weekly reports, and a research paper (fall semester) or a proposal abstract, weekly reports, and a poster presentation (spring semester). Students wishing to perform their research in an off-campus lab must apply online (<http://www.bioc.rice.edu/bioc310>) at least 3 weeks prior to the start of classes and may not register for fewer than 3 credit hours. Instructor Permission Required. 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.

Course URL: www.bioc.rice.edu/bioc310**BIOC 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 BIOC 212) and BIOC 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 BIOC 301 may be taken concurrently with BIOC 311.

BIOC 313 - INTRODUCTORY SYNTHETIC BIOLOGY**Short Title:** INTRODUCTORY SYNTHETIC BIO**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 BIOC 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.

BIOC 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 BIOC 212**Description:** Team projects focusing on water analysis and isolation, culture, observation, assay, and identification of bacteria. Offered in the second half of each semester, self-scheduled after the first formal meetings.**Course URL:** www.ruf.rice.edu/~bioslabs/bios318/**BIOC 320 - LABORATORY IN TISSUE CULTURE****Short Title:** LABORATORY IN TISSUE CULTURE**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 440 or STAT 440 or BIOC 311**Description:** Introduction to tissue culture techniques, including cell passage, cell viability, and cell attachment and proliferation assays. Students complete quantitative analysis of their data. Engineering design and applications are featured in graded work. Sections 1 and 2 are taught during the first half of the semester. Sections 3 and 4 are taught during the second half of the semester. Students may be required to attend lab on a university holiday. Instructor Permission Required. Cross-list: BIOC 342.**BIOC 329 - ANIMAL BIOLOGY AND PHYSIOLOGY****Short Title:** ANIMAL BIOLOGY AND PHYSIOLOGY**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 EBIO 202**Description:** The evolution and systematics of the animal kingdom with consideration of functional anatomy, comparative physiology, behavior, medical implications and resource management. Cross-list: EBIO 329. Mutually Exclusive: Credit cannot be earned for BIOC 329 and EBIO 529.**BIOC 331 - 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**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. Cross-list: EBIO 331.**BIOC 332 - SYSTEMS PHYSIOLOGY****Short Title:** SYSTEMS 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 and (PHYS 101 and PHYS 102) or (PHYS 125 and PHYS 126)**Description:** This course will teach the fundamentals of human physiology with a specific focus on the nervous, cardiovascular, respiratory, and urinary systems. Basic introductory engineering principles will be applied to the study of physiological systems. The course is aimed to be accessible to students with non-engineering backgrounds. Students may receive credit for only one of BIOC 302, BIOC 322, and BIOC 332. Cross-list: BIOC 302. Mutually Exclusive: Credit cannot be earned for BIOC 332 and BIOC 322.**BIOC 333 - BIONNOVATION STUDIO: FROM BASIC RESEARCH AND IDEATION TO TECHNOLOGY DEVELOPMENT****Short Title:** BIONNOVATION 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**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.

BIOC 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**Description:** Principles of biological evolution. Topics include natural selection, adaptation, molecular evolution, formation of new species, the fossil record, biogeography, and principles of classification. Cross-list: EBIO 334. Graduate/Undergraduate Equivalency: BIOC 534. Mutually Exclusive: Credit cannot be earned for BIOC 334 and BIOC 534.**Course URL:** www.ruf.rice.edu/~queller/Bios334/**BIOC 335 - CELLULAR AND MOLECULAR ANIMAL PHYSIOLOGY****Short Title:** CELL & MOL 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**Description:** This course takes a functional approach to investigate animal physiology from a cellular and molecular perspective. Using an integrated and comparative approach, students learn how animals maintain homeostasis, including how they meet their energy needs, take up and transport oxygen, and maintain hydration and salt balance. Students will read primary literature to explore physiological adaptations for survival in extreme environments. Graduate/Undergraduate Equivalency: BIOC 536. Mutually Exclusive: Credit cannot be earned for BIOC 335 and BIOC 536.**BIOC 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**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 BIOC 302 and BIOC 344. RECOMMENDATION: BIOC 300 is recommended for students using advanced placement credit for BIOC 201 and students preferring additional foundational background prior to enrollment in BIOC 341.**BIOC 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.**BIOC 350 - INTRODUCTION TO MATHEMATICAL BIOLOGY****Short Title:** INTRODUCTION TO MATH 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):** (PHYS 126 or PHYS 102 or PHYS 112) and MATH 211 and (BIOC 201 or EBIO 202)**Description:** This class provides an introduction to mathematical concepts in biology and medicine. Students will learn to derive and manipulate mathematical equations describing concepts at all levels of biological organization, from biochemical reactions to population dynamics and epidemiology.**BIOC 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**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.

BIOC 361 - METABOLIC ENGINEERING FOR GLOBAL HEALTH ENVIRONMENTS**Short Title:** METAB ENG GLOBAL HEALTH ENVMNT**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):** (BIOE 362 or GLHT 362) and (PHYS 126 or PHYS 102 or PHYS 112 or PHYS 142) and MATH 102**Description:** Importance of nutritional and pharmaceutical compounds, impact of cost of compounds on global health; Overview of biochemical pathways; metabolite analysis; Genetic engineering and molecular biology tools for ME; Pharmaceuticals and drug discovery approaches (antibiotics, antivirals; anti-parasite compounds); anti-diarrhea treatments; vaccines. Cross-list: BIOE 361, GLHT 361.**Course URL:** www.btb.rice.edu**BIOC 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:** However various the forms of life, we draw boundaries between normal, not normal, and monstrous. From the Biosciences to the Arts, our conceptions of the "monstrous" illuminate our identity, perceptions, and fears. Priority for enrollment beyond the cap given to students also enrolled in ARTS 358. Cross-list: HUMA 368.**BIOC 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 (may be taken concurrently) or BIOC 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. 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.**Course URL:** www.bioc.rice.edu/bioc371**BIOC 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**Description:** Cellular and molecular basis of innate and adaptive immune function in mammals. Graduate/Undergraduate Equivalency: BIOC 573. Recommended Prerequisite(s): BIOC 301 and BIOC 341. Mutually Exclusive: Credit cannot be earned for BIOC 372 and BIOC 573/BIOS 372.**BIOC 380 - FUNDAMENTAL NEUROSCIENCE SYSTEMS****Short Title:** NEUROSYSTEMS**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 will provide a broad overview of the brain's neural systems that subserve perception, learning, and behavior. The course will be highly integrative with thematic content including functional organization of the nervous system, neural encoding and decoding, sensory systems, motor systems, and high-level concept processing. Cross-list: NEUR 380, PSYC 380. Recommended Prerequisite(s): PSYC 101.**BIOC 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**Description:** Cellular, molecular, and integrative mechanisms of neural function, including membrane and axon physiology, synaptic transmission and plasticity, sensory transduction and processing. Cross-list: NEUR 385. Graduate/Undergraduate Equivalency: BIOC 585. Recommended Prerequisite(s): BIOC 201. Mutually Exclusive: Credit cannot be earned for BIOC 385 and BIOC 585.**BIOC 390 - TRANSFER CREDIT IN BIOCHEMISTRY AND CELL BIOLOGY****Short Title:** TRAN CREDIT BIOCHEM&CELL BIO**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Transfer**Credit Hours:** 3**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 BIOC lecture courses, in satisfying requirements for majors in Biosciences. Repeatable for Credit.

BIOC 393 - LABORATORY TRANSFER CREDIT IN BIOCHEMISTRY AND CELL BIOLOGY**Short Title:** LAB TRANSFER CREDIT**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Transfer**Credit Hour:** 1**Course Level:** Undergraduate Upper-Level**Description:** For transfer of an advanced laboratory course in the Biochemistry and Cell Biology that has no current equivalent in the Rice curriculum. Any student may receive a maximum of one credit of BIOC 393.**BIOC 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 Biochemistry and Cell Biology Honors Research Program is a suite of courses offering our seniors and advanced juniors the opportunity to perform a two-semester, individual research project in a research laboratory in Biochemistry & Cell Biology. Students having performed BIOS/BIOC 310 research in an off-campus laboratory in the Texas Medical Center will also be eligible to apply to perform honors research in that laboratory. The Honors Research Program courses function as a set and must all be taken in the same academic year. Registration for any of the courses requires a commitment to register for all three. Requires at least 15 hours of laboratory research per week, a proposal (revised from application), monthly reports, and a formal progress report (abstract, aims, progress toward aims, discussion of results, plans for the spring semester). Prerequisites: strong performance in (BIOC 310, or HONS 470/471) and BIOC 211 and either BIOC 301 or BIOC 341. Research professor recommendation required. Application for admission required (BCB Honors Program OwlSpace Resources). Department Permission Required. Repeatable for Credit.**BIOC 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**Corequisite:** BIOC 412**Description:** The Biochemistry and Cell Biology Honors Research Program is a suite of courses offering our seniors and advanced juniors the opportunity to perform a two-semester, individual research project in a research laboratory in Biochemistry & Cell Biology. Students having performed BIOS/BIOC 310 research in an off-campus laboratory in the Texas Medical Center will also be eligible to apply to perform honors research in that laboratory. Registration for any of the courses requires a commitment to register for all three. Requires at least 15 hours of laboratory research per week, monthly reports, a thesis (substantial research paper) and a poster presentation at the Rice Undergraduate Research Symposium. Repeatable for Credit.**BIOC 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**Corequisite:** BIOC 402**Description:** This companion seminar requires attendance at course meetings and a formal scientific presentation of research performed while enrolled in the Honors Research Program. Repeatable for Credit.**BIOC 413 - EXPERIMENTAL MOLECULAR BIOLOGY****Short Title:** EXPERIMENTAL MOLECULAR BIO**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 311 or BIOC 313**Description:** Application of strategies in molecular biology to investigate gene expression and function with an emphasis on experimental design, data analysis, and data interpretation. Students will prepare a scientific poster. Offered second half of spring semester.**BIOC 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):** (BIOC 311 or BIOC 385 (may be taken concurrently) or NEUR 385 (may be taken concurrently)) and (BIOC 211 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

BIOC 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):** EBIO 202 and BIOC 212 and CAAM 210 and (STAT 305 or STAT 310 or STAT 312) and (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.**BIOC 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):** BIOC 201**Description:** Structure and functions of microorganisms with emphasis on their environmental, industrial and medical importance. Graduate/Undergraduate Equivalency: BIOC 524. Recommended Prerequisite(s): BIOC 301 or Instructor Permission. Mutually Exclusive: Credit cannot be earned for BIOC 424 and BIOC 524.**BIOC 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):** BIOC 301 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: BIOC 525. Mutually Exclusive: Credit cannot be earned for BIOC 425 and BIOC 525.**BIOC 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):** (BIOC 380 or NEUR 380 or PSYC 380 or BIOC 385 or NEUR 385) and (PSYC 203 or EBIO 321) and (STAT 305 or STAT 310 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.**BIOC 443 - ADVANCED CONCEPTS AND CRITICAL ANALYSIS IN MODERN DEVELOPMENTAL BIOLOGY****Short Title:** DEVELOPMENT**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 301 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: BIOC 544. Mutually Exclusive: Credit cannot be earned for BIOC 443 and BIOC 544.**BIOC 445 - ADVANCED MOLECULAR BIOLOGY AND GENETICS****Short Title:** ADV MOLECULAR BIOL & 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):** BIOC 301 or BIOC 344**Description:** Molecular and genetic aspects of the regulation of gene expression as seen in simple prokaryotic systems and the model eukaryotic systems used for studies of development. Graduate/Undergraduate Equivalency: BIOC 545. Mutually Exclusive: Credit cannot be earned for BIOC 445 and BIOC 545.

BIOC 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):** BIOC 301 or BIOC 341 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: BIOC 547.**BIOC 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 NEUR 385) and BIOC 201 and BIOC 212 and MATH 102 and (STAT 305 or STAT 310 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. Recommended Prerequisite(s): NEUR 380 or BIOC 380 or PSYC 380.**BIOC 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):** BIOC 201 and BIOC 301 and 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: BIOC 550. Mutually Exclusive: Credit cannot be earned for BIOC 450 and BIOC 550.**BIOC 455 - COMPUTATIONAL SYNTHETIC BIOLOGY****Short Title:** COMP SYNTHETIC 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):** MATH 211**Description:** Mathematical and computational techniques of cell biology and synthetic biology. Topics include deriving and implementing mathematical and computational models of cellular growth and division, evolution, gene regulation, synthetic gene circuits, enzymatic processing, and stochastic processes in biology. Graduate/Undergraduate Equivalency: BIOC 555. Recommended Prerequisite(s): CAAM 210**BIOC 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 and BIOC 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: BIOC 560. Mutually Exclusive: Credit cannot be earned for BIOC 460 and BIOC 560.**BIOC 464 - EXTRACELLULAR MATRIX****Short Title:** EXTRACELLULAR MATRIX**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**Description:** This course will address the biology, organization, mechanics, and turnover of extracellular matrix. There will be an emphasis on cells and cell-matrix interactions, matrix distribution within and design of connective tissues and organs techniques for quantitative analysis of matrix, techniques for measurement and modeling of connective tissue biomechanics, changes with growth and aging and tissue/matrix degradation. Cross-list: BIOE 464. Graduate/Undergraduate Equivalency: BIOC 523. Recommended Prerequisite(s): BIOE 372, BIOC 341. Mutually Exclusive: Credit cannot be earned for BIOC 464 and BIOC 523.

BIOC 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 BIOC 341 or BIOC 344) and MATH 102**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: BIOC 570. Mutually Exclusive: Credit cannot be earned for BIOC 470 and BIOC 570.**BIOC 477 - SPECIAL TOPICS****Short Title:** SPECIAL TOPICS**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Internship/Practicum, Lecture, Laboratory, Seminar**Credit Hours:** 1-4**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting 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.**BIOC 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 BIOC 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: BIOC 551.**BIOC 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 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: BIOC 552. Mutually Exclusive: Credit cannot be earned for BIOC 482 and BIOC 552.**BIOC 523 - EXTRACELLULAR MATRIX****Short Title:** EXTRACELLULAR MATRIC**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 address the biology, organization, mechanics, and turnover of extracellular matrix. There will be an emphasis on cells and cell-matrix interactions, matrix distribution within and design of connective tissues and organs techniques for quantitative analysis of matrix, techniques for measurement and modeling of connective tissue biomechanics, changes with growth and aging and tissue/matrix degradation. Additional projects will be required of graduate level students. Cross-list: BIOE 524. Graduate/Undergraduate Equivalency: BIOC 464. Recommended Prerequisite(s): BIOE 372, BIOC/ BIOE 341. Mutually Exclusive: Credit cannot be earned for BIOC 523 and BIOC 464.**BIOC 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: BIOC 424. Mutually Exclusive: Credit cannot be earned for BIOC 524 and BIOC 424.

BIOC 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: BIOC 425. Mutually Exclusive: Credit cannot be earned for BIOC 525 and BIOC 425.

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

Prerequisite(s): BIOC 481 or BIOC 482 (may be taken concurrently) or BIOC 552 (may be taken concurrently) or BIOC 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. BIOC 482/552 may be taken concurrently with BIOC 530.

BIOC 532 - LABORATORY MODULE IN OPTICAL SPECTROSCOPY AND KINETICS**Short Title:** LAB MOD OPTICAL SPECTROSCOPY**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Laboratory**Credit Hours:** 2**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate

Description: Students learn the principles behind fluorescence, circular dichroism, analytical ultracentrifugation, spectroscopy and rapid kinetics by carrying out experiments with genetically engineered proteins and state-of-the-art equipment. Data will be interpreted and manipulated using curve-fitting and graphics software. Offered second half of the semester. Recommended Prerequisite(s): BIOC 352 or equivalent. Concurrent or previous enrollment in BIOC 481 or BIOC 551.

BIOC 533 - BIOINFORMATICS & COMPUTATIONAL BIOLOGY**Short Title:** BIOINFORMATICS**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 2**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate

Description: An introduction to the emerging field of bioinformatics. A series of lectures, combined with hands-on exercises. The topics to be discussed include sequence comparison, structure analysis, phylogenetics, database searching, microarrays and proteomics. Recommended prerequisite(s): BIOC 301 or permission of instructor.

BIOC 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. Cross-list: EBIO 534. Graduate/Undergraduate Equivalency: BIOC 334. Mutually Exclusive: Credit cannot be earned for BIOC 534 and BIOC 334.

BIOC 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 (may be taken concurrently) or BIOC 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.

BIOC 536 - CELLULAR AND MOLECULAR ANIMAL PHYSIOLOGY**Short Title:** CELL & MOL 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 investigates animal physiology from a cellular and molecular perspective. Using an integrated and comparative approach, students learn how animals maintain homeostasis. Students will read primary literature to explore physiological adaptations for survival in extreme conditions. Graduate/Undergraduate Equivalency: BIOC 335. Mutually Exclusive: Credit cannot be earned for BIOC 536 and BIOC 335.

BIOC 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.

BIOC 540 - METABOLIC ENGINEERING**Short Title:** METABOLIC ENGINEERING**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 metabolic engineering: overview of biochemical pathways; kinetics and thermodynamics of metabolic networks; genetic engineering and molecular biology tools; metabolic flux analysis using stoichiometric and labeling techniques; metabolic control analysis. Metabolic engineering in the postgenomic era; functional genomics and systems biology. Emerging applications: chemicals from biorenewables; food ingredients; health and disease. Cross-list: CHBE 640.

BIOC 544 - ADVANCED CONCEPTS AND CRITICAL ANALYSIS IN MODERN DEVELOPMENTAL BIOLOGY**Short Title:** DEVELOPMENT**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 341 or BIOC 301 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: BIOC 443. Mutually Exclusive: Credit cannot be earned for BIOC 544 and BIOC 443.

BIOC 545 - ADVANCED MOLECULAR BIOLOGY AND GENETICS**Short Title:** ADV MOLECULAR BIOL & 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: Molecular and genetic aspects of the regulation of gene expression as seen in simple prokaryotic systems and the model eukaryotic systems used for studies of development. Graduate/Undergraduate Equivalency: BIOC 445. Mutually Exclusive: Credit cannot be earned for BIOC 545 and BIOC 445.

BIOC 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: BIOC 447. Recommended Prerequisite(s): BIOC 301 or BIOC 341 or BIOC 344.

BIOC 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 201 and BIOC 301 and 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: BIOC 450. Mutually Exclusive: Credit cannot be earned for BIOC 550 and BIOC 450.

BIOC 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 BIOC 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: BIOC 481.

BIOC 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: BIOC 482. Recommended prerequisite(s): BIOC 301. Mutually Exclusive: Credit cannot be earned for BIOC 552 and BIOC 482.

BIOC 555 - COMPUTATIONAL SYNTHETIC BIOLOGY**Short Title:** COMP SYNTH 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: Mathematical and computational techniques of cell biology and synthetic biology. Topics include deriving and implementing mathematical and computational models of cellular growth and division, evolution, gene regulation, synthetic gene circuits, enzymatic processing, and stochastic processes in biology. Graduate/Undergraduate Equivalency: BIOC 455.

BIOC 558 - ADVANCES IN NUCLEASE-MEDIATED GENOME ENGINEERING**Short Title:** ADV NUCLEASE-MEDIATED GEN ENG**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 provides a comprehensive understanding of advances in the nuclease-mediated genome engineering field. Past and current stages of genome-editing technologies, the fundamental mechanisms of different classes of genome-editing nucleases, and cutting-edge strategies for engineering novel genome-editing agents and their applications in synthetic biology and therapeutics. Cross-list: CHBE 558.

BIOC 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. All requests will be reviewed and you will be notified of an enrollment decision. Instructor Permission Required. Cross-list: BIOE 560. Graduate/Undergraduate Equivalency: BIOC 460. Mutually Exclusive: Credit cannot be earned for BIOC 560 and BIOC 460.

BIOC 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: BIOC 470. Mutually Exclusive: Credit cannot be earned for BIOC 570 and BIOC 470.

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

Description: Pairwise and multiple sequence alignment, Markov chains and HMMs, Phylogenetic reconstruction, Haplotype inference, Computational models of RNA structure, Gene finding, Genome rearrangements, and comparative genomics. Cross-list: COMP 571.

Course URL: www.cs.rice.edu/~nakhleh/COMP571/

BIOC 572 - BIOINFORMATICS: NETWORK ANALYSIS**Short Title:** BIOINFORMATICS: NETWORKS**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 covers computational aspects of biological network analysis, a major theme in the area of systems biology. The course addresses protein-protein interaction networks, signaling, and metabolic networks, and covers issues related to reconstructing, analyzing, and integrating various types of networks. Cross-list: BIOE 564, COMP 572.**Course URL:** www.cs.rice.edu/~nakhleh/COMP572/**BIOC 573 - 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**Prerequisite(s):** BIOC 201**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: BIOC 372. Recommended Prerequisite(s): BIOC 301 AND BIOC 341. Mutually Exclusive: Credit cannot be earned for BIOC 573 and BIOC 372/BIOS 372.**BIOC 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.**BIOC 578 - BIOTECHNOLOGY PRACTICUM****Short Title:** BIOTECHNOLOGY PRACTICUM**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Internship/Practicum**Credit Hour:** 1**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate**Description:** This course is part of the NIH Biotechnology Training Program and is limited to program participants. Students will receive exposure and training in cutting edge concepts and technologies. Cross-list: BIOE 578.**BIOC 580 - PROTEIN ENGINEERING****Short Title:** PROTEIN ENGINEERING**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate**Description:** Manipulation of gene expression in prokaryotic and eukaryotic cells. Rational design and directed solutions for cell and protein engineering. Selection and screening technologies and process optimization. Synthetic Biology: engineering and application of gene circuits. Molecular biotechnology applications: Diagnosis, Therapeutics and Vaccines. Cross-list: BIOE 580, CHBE 580. Recommended Prerequisite(s): CHBE 310/510 or equivalent is highly recommended.**BIOC 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.**BIOC 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.**BIOC 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.

BIOC 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: BIOC 385. Mutually Exclusive: Credit cannot be earned for BIOC 585 and BIOC 385.

BIOC 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.

BIOC 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.

BIOC 589 - COMPUTATIONAL MOLECULAR BIOENGINEERING/ BIOPHYSICS**Short Title:** COMP MOLECULAR BIOENG/BIOPHYS**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 is a course designed for students in computationally-oriented biomedical and bioengineering majors to introduce the principles and methods used for the simulations and modeling of macromolecules of biological interest. Protein conformation and dynamics are emphasized. Empirical energy function and molecular dynamics calculations, as well as other approaches, are described. Specific biological problems are discussed to illustrate the methodology. Cross-list: BIOE 589. Recommended Prerequisite(s): MATH 212, BIOC 301, BIOE 332.

BIOC 590 - SPECIAL TOPICS IN BIOCHEMISTRY AND CELL BIOLOGY**Short Title:** SPEC TOPCS BIOCHEM&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.

BIOC 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. Cross-list: KECK 592. Repeatable for Credit.

BIOC 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.

BIOC 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.

BIOC 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.

BIOC 643 - CELL MECHANICS, MECHANOTRANSDUCTION AND THE CELL MICROENVIRONMENT**Short Title:** MECHANOTRANSDUCTION**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate

Description: Mechanotransduction is a fundamental process essential for living systems and plays a fundamental role in cell signaling, cancer metastasis and stem cell differentiation. Additionally, fundamental biological processes such as endocytosis cell fusion and cell migration are driven by a coordinated interplay of molecular interactions that drive membrane deformation. This course will survey the current understanding of mechanotransduction and the mechanical properties of cells and their microenvironment, including membrane and cytoskeletal mechanics. Experimental approaches for measuring and manipulating the material properties of cells and their environment; including optical, electrical and magnetic techniques will be covered. A variety of application will be covered, including manipulation in engineering of mechanotransduction pathways to drive cell migration and stem cell differentiation. Instructor Permission Required. Cross-list: BIOE 643, PHYS 643.

BIOC 677 - SPECIAL TOPICS**Short Title:** SPECIAL TOPICS**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Internship/Practicum, Lecture, Seminar, Laboratory**Credit Hours:** 1-4**Restrictions:** Enrollment is limited to Graduate or Visiting Graduate level students.**Course Level:** Graduate**Description:** Topics and credit hours vary each semester. Contact department for current semester's topic(s). Repeatable for Credit.**BIOC 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. Recommended prerequisite(s): Graduate standing in Biochemistry and Cell Biology. Repeatable for Credit.

BIOC 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. Recommended prerequisite(s): Graduate standing in Biochemistry and Cell Biology. Repeatable for Credit.

BIOC 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:** Repeatable for Credit.

Ecology and Evolutionary Biology (EBIO)

EBIO 113 - ENVIRONMENTAL CRISIS SEMINAR**Short Title:** ENVIRONMENTAL CRISIS SEMINAR**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Seminar**Distribution Group:** Distribution Group III**Credit Hour:** 1**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Lower-Level**Description:** Discussion of environmental crises. Topics vary annually. Cross-list: ENST 113, ESCI 113. Repeatable for Credit.**EBIO 116 - FRESHMAN SEMINAR ON LOCAL BIOLOGY RESEARCH (EEB)****Short Title:** FRESHMAN BIOLOGY SEMINAR (EEB)**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Seminar**Distribution Group:** Distribution Group III**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 freshmen 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 EBIO 116/FSEM 116 regardless of AP credit. This course meets in the first half of the semester and features research in the Program of Ecology and Environmental Biology. Cross-list: FSEM 116.

EBIO 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.

EBIO 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

Description: The second in a series of two introductory biology courses (BIOC 201, EBIO 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.

EBIO 204 - ENVIRONMENTAL SUSTAINABILITY: THE DESIGN & PRACTICE OF COMMUNITY AGRICULTURE

Short Title: COMMUNITY GARDEN

Department: Biosciences

Grade Mode: Standard Letter

Course Type: Lecture/Laboratory

Distribution Group: Distribution Group III

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. Cross-list: ENST 204. Repeatable for Credit.

EBIO 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 for high school juniors and seniors or Rice students conducting research for the first time. The students will conduct scientific research in the laboratories of the Rice faculty in the areas of Biochemistry & Cell Biology and Ecology & Evolutionary Biology. 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. Visiting high school students must complete visiting student application process for high school students. Instructions to do this can be found in the Application Checklist at summer.rice.edu. Rice students will need a special registration from or ask the faculty member for permission to register. Instructor Permission Required. Cross-list: BIOC 210. Repeatable for Credit.

EBIO 213 - INTRO EXPERIMENTAL ECOLOGY AND EVOLUTIONARY BIOLOGY

Short Title: INTRO EXP ECOL & EVOL BIOL

Department: Biosciences

Grade Mode: Standard Letter

Course Type: Laboratory

Distribution Group: Distribution Group III

Credit Hours: 2

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

Course Level: Undergraduate Lower-Level

Description: Experimental, laboratory, and field studies of natural history, ecology, evolution, and animal behavior. Class has required meetings outside of regular class time.

EBIO 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.

EBIO 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 EBIO courses will develop teaching skills by leading discussion sections for the benefit of students presently taking EBIO courses under the guidance of the professor teaching the course. Instructor Permission Required.**EBIO 238 - SPECIAL TOPICS****Short Title:** SPECIAL TOPICS**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Seminar, Lecture, Laboratory, Internship/Practicum**Credit Hours:** 1-4**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting 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.**EBIO 270 - 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: EBIO 570. Mutually Exclusive: Credit cannot be earned for EBIO 270 and EBIO 570.**EBIO 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: EBIO 580. Mutually Exclusive: Credit cannot be earned for EBIO 280 and EBIO 580.**EBIO 306 - INDEPENDENT RESEARCH FOR ECOLOGY & EVOLUTIONARY BIOLOGY UNDERGRADUATES****Short Title:** EEB UNDERGRADUATES IND RES**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Research**Credit Hours:** 1-3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** EBIO 213**Description:** Program of independent research for students with previous training in the biosciences. Includes a research paper. Students are expected to spend at least three hours per week in the laboratory for each semester hour of credit. If receiving two or more credits, students will be required to participate in the university annual undergraduate symposium in the spring semesters. Instructor Permission Required. Repeatable for Credit.**EBIO 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 EBIO 325**Description:** Field and lab experiments in ecology. Class has required meetings outside of regular class time.**EBIO 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 and EBIO 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.

EBIO 319 - TROPICAL FIELD BIOLOGY**Short Title:** TROPICAL FIELD BIOLOGY**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Laboratory**Distribution Group:** Distribution Group III**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. Students will be responsible for their own transportation and accommodation cost (exact price TBD). Instructor Permission Required.**EBIO 320 - ECOLOGY AND CONSERVATION OF BRAZILIAN WETLANDS LABORATORY****Short Title:** BRAZILIAN WETLANDS LAB**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Laboratory**Distribution Group:** Distribution Group III**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. Recommended Prerequisite(s): EBIO 213**EBIO 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 and EBIO 202**Description:** Evolutionary theory is used to evaluate behavioral adaptations of organisms to their environment.**EBIO 323 - 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 and EBIO 202**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. Cross-list: ENST 323. Graduate/Undergraduate Equivalency: EBIO 523. Mutually Exclusive: Credit cannot be earned for EBIO 323 and EBIO 523.**EBIO 324 - 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 and EBIO 323 (may be taken concurrently)**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. EBIO 323 may be taken concurrently with EBIO 324. Graduate/Undergraduate Equivalency: EBIO 524. Mutually Exclusive: Credit cannot be earned for EBIO 324 and EBIO 524.**EBIO 325 - 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 and EBIO 202**Description:** Study of population dynamics, species interactions, plant and animal community organization, and ecosystem function. Graduate/Undergraduate Equivalency: EBIO 525. Mutually Exclusive: Credit cannot be earned for EBIO 325 and EBIO 525.

EBIO 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**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.**EBIO 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 and EBIO 202 and EBIO 213**Description:** The lecture/laboratory course in field ecology focuses on the theory and practice of estimating biodiversity. The goals are to acquaint students with basic techniques for field sampling and quantifying biodiversity as well as some aspects of the natural history of south and east Texas. These will be accomplished through four field trips during the first half of the semester and an independent research project to be completed by the end of the semester. Class has required meetings outside of regular class time.**EBIO 328 - EVOLUTION OF GENES & GENOMES****Short Title:** EVOLUTION OF GENES & GENOMES**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 and EBIO 202**Description:** The course provides an overview of the evolution of genes and genomes. Using many examples, the course introduces databases and the Worldwide Web, and molecular and statistical methods used to study the evolution of genes and genomes. Broad-scale evolutionary patterns and medical applications based on genome analyses are presented.**EBIO 329 - ANIMAL BIOLOGY AND PHYSIOLOGY****Short Title:** ANIMAL BIOLOGY AND PHYSIOLOGY**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 EBIO 202**Description:** The evolution and systematics of the animal kingdom with consideration of functional anatomy, comparative physiology, behavior, medical implications and resource management. Cross-list: BIOC 329. Graduate/Undergraduate Equivalency: EBIO 529. Mutually Exclusive: Credit cannot be earned for EBIO 329 and EBIO 529.**EBIO 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 and EBIO 202 and EBIO 213**Description:** Lectures will address contemporary issues in ecology and evolution through the lens of insect diversity. Labs will provide hands-on experiences with collection and curation of insects.**EBIO 331 - 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**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. Cross-list: BIOC 331.

EBIO 332 - EVOLUTION OF GENES & GENOMES LAB**Short Title:** EVOLUTION GENES & GENOMES 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 328**Description:** The laboratory course is designed to demonstrate concepts and approaches introduced in the lecture course EBIO 328. The text book remains the same, but the course will heavily rely on the computational exercises provided in the text (called Weblems). Students will be shown how to conduct analysis of sequence data, search databases, literature, and how to synthesize such data. Students will conduct their own projects, some suggested by the text, some by the instructor, some perhaps ideas of their own. Students present and defend their results in writing and in form of presentations and posters. The course would be useful for graduate student education, with added requirements for graduate students.**EBIO 333 - EVOLUTIONARY BIOINFORMATICS****Short Title:** EVOLUTIONARY BIOINFORMATICS**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:** Large accessible data sets have opened new frontiers in evolutionary biology, and many fields. Learn to write computer programs to test hypotheses and discover patterns in diverse data. Understand the most common strategies in evolutionary bioinformatics, including dynamic programming, hidden Markov models, and graphical algorithms. No previous programming experience required. Cross-list: COMP 370. Recommended Prerequisite(s): MATH 101 and MATH 102.**EBIO 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**Description:** Principles of biological evolution. Topics include natural selection, adaptation, molecular evolution, formation of new species, the fossil record, biogeography, and principles of classification. Cross-list: BIOC 334. Graduate/Undergraduate Equivalency: EBIO 534. Mutually Exclusive: Credit cannot be earned for EBIO 334 and EBIO 534.**EBIO 335 - EVOLUTIONARY BIOINFORMATICS LAB****Short Title:** EVOLUTION BIOINFORMATICS 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 333 (may be taken concurrently) or COMP 370 (may be taken concurrently)**Description:** Computer lab section for Evolutionary Bioinformatics. Students must enroll in EBIO 333.**EBIO 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**Description:** The evolution, systematics, and ecology of plants, with emphasis on flowering plants and biodiversity.**EBIO 337 - FIELD BIRD BIOLOGY LAB****Short Title:** FIELD BIRD BIOLOGY LAB**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Laboratory**Distribution Group:** Distribution Group III**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**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.

EBIO 338 - DESIGN AND ANALYSIS OF BIOLOGICAL EXPERIMENTS**Short Title:** DESIGN & ANALYSIS OF BIOL EXP**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**Description:** This course addresses how to set up and how to draw conclusions from biological experiments. It introduces basic theories in statistics, interwoven with data analysis using software packages. Students will learn to design statistically sound data collection in observational or experimental studies. To answer given research questions, students will choose among modern statistical tools and analyze data using software. Students will also learn to effectively present results using statistical graphics. This class particularly focuses on ecological and environmental data.**EBIO 340 - GLOBAL BIOGEOCHEMICAL CYCLES****Short Title:** GLOBAL BIOGEOCHEMICAL CYCLES**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Lecture/Laboratory**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:** This course introduces students to the coupled nature of the biosphere, atmosphere and hydrosphere using as focal points elemental cycles such as those of carbon and nitrogen. This is a writing-intensive class, and will include 3 required Saturday field trips. Cross-list: ENST 340, ESCI 340. Graduate/Undergraduate Equivalency: EBIO 540. Mutually Exclusive: Credit cannot be earned for EBIO 340 and EBIO 540.**EBIO 365 - INTRODUCTORY PHYCOLOGY****Short Title:** INTRODUCTORY PHYCOLOGY**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 and EBIO 202**Description:** This course provides an overview of the biology of algae including their physiology, taxonomy, biochemistry, and ecology. Students will study the role of algae in different environments, their importance as primary producers, and their economic value.**EBIO 366 - APPLIED PHYCOLOGY****Short Title:** APPLIED PHYCOLOGY**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 and EBIO 202**Description:** This course provides an overview of methods of algal strain selection and cultivation for food, fodder, fertilizers, biofuels, pharmaceuticals, and cosmetics. Graduate/Undergraduate Equivalency: EBIO 566. Mutually Exclusive: Credit cannot be earned for EBIO 366 and EBIO 566.**EBIO 367 - INTRODUCTION PHYCOLOGY LAB****Short Title:** INTRODUCTION PHYCOLOGY 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 and EBIO 202**Corequisite:** EBIO 365**Description:** This lab course provides an introduction to techniques of isolation, culturing, measuring of growth and identification of algae.**EBIO 368 - APPLIED PHYCOLOGY LAB****Short Title:** APPLIED PHYCOLOGY 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 and EBIO 202**Corequisite:** EBIO 366**Description:** In this course students will learn methods of algal strain selection and mass cultivation together with analyses of algal characteristics including their lipid composition, enzymes and pigments.

EBIO 372 - 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**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: EBIO 572. Mutually Exclusive: Credit cannot be earned for EBIO 372 and EBIO 572.**EBIO 379 - LAB MODULE IN AQUATIC ECOLOGY WITH SCUBA****Short Title:** LAB MOD AQU ECOLOGY WITH SCUBA**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Laboratory**Distribution Group:** Distribution Group III**Credit Hour:** 1**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Description:** Students will learn some fundamentals of aquatic ecosystems and conduct lab exercises that involve SCUB-based fieldwork in a nationally recognized freshwater dive site. Course has required meetings outside of regular class time. Prerequisites: LPAP 194 or proof of Open Water Scuba certification from a professional organization (e.g., PADI, NAUI). A course fee ranging from \$300 to \$535 is associated with the class. Please send all enrollment requests to Mariah McClarty, mam22@rice.edu and include the following information: major, year, scuba certification level and issuing professional organization, and a brief statement about why you want to take the course. You will be notified of enrollment decisions by December 5th. Department Permission Required. Cross-list: ENST 379. Graduate/Undergraduate Equivalency: EBIO 579. Recommended Prerequisite(s): EBIO 213 and LPAP 194. Mutually Exclusive: Credit cannot be earned for EBIO 379 and EBIO 579.**EBIO 391 - TRANSFER CREDIT IN ECOLOGY AND EVOLUTIONARY BIOLOGY****Short Title:** TRAN CREDIT ECOL&EVOLUTION**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Transfer**Credit Hours:** 3**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 Group B Biosciences courses in satisfying requirements for majors in the Biosciences. Repeatable for Credit.**EBIO 393 - LABORATORY TRANSFER CREDIT IN BIOSCIENCES****Short Title:** LAB TRANSFER CREDIT**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Transfer**Credit Hour:** 1**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 EBIO 393.**EBIO 403 - UNDERGRADUATE HONORS RESEARCH IN ECOLOGY AND EVOLUTIONARY BIOLOGY****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:** Open only to undergraduate majors who meet specific requirements and with permission of the research supervisor and chair. Registration for EBIO 403/404 implies a commitment to participate in research for at least 2 semesters. Department Permission Required.**EBIO 404 - UNDERGRADUATE HONORS RESEARCH IN ECOLOGY AND EVOLUTIONARY BIOLOGY****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:** Open only to undergraduate majors who meet specific requirements and with permission of the research supervisor and chair. Registration for EBIO 403/404 implies a commitment to participate in research for at least 2 semesters. Department Permission Required.**EBIO 412 - 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:** Intended primarily for seniors majoring in the biological sciences, 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.

EBIO 433 - ADVANCED ECOLOGY**Short Title:** ADVANCED ECOLOGY**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 and EBIO 202 and EBIO 325**Description:** Students will develop a critical understanding of the discipline of ecology through a combination of lectures and discussion that span a range of topics. With the instructor's help, students will use current papers to stimulate debate on the theories, philosophies and methods of the study of populations, communities, and ecosystems. Instructor Permission Required.**EBIO 477 - SPECIAL TOPICS****Short Title:** SPECIAL TOPICS**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Seminar, Lecture, Laboratory, Internship/Practicum**Credit Hours:** 1-4**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Description:** Topics and credit hours vary each semester. Contact department for current semester's topic(s). Repeatable for Credit.**EBIO 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.**EBIO 520 - STUDENT SEMINAR IN ECOLOGY AND EVOLUTIONARY BIOLOGY****Short Title:** STUDENT SEMINAR IN EEB**Department:** Biosciences**Grade Mode:** Standard Letter**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. Recommended Prerequisite(s): Graduate Status or current enrollment in EBIO 403. Repeatable for Credit.**EBIO 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**Prerequisite(s):** (BIOC 201 and EBIO 202)**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: EBIO 323. Mutually Exclusive: Credit cannot be earned for EBIO 523 and EBIO 323.**EBIO 524 - 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**Prerequisite(s):** (EBIO 213 and EBIO 323 (may be taken concurrently))**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: EBIO 324. Mutually Exclusive: Credit cannot be earned for EBIO 524 and EBIO 324.**EBIO 525 - 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**Prerequisite(s):** BIOC 201 and EBIO 202**Description:** Study of population dynamics, species interactions, plant and animal community organization, and ecosystem function. Graduate/Undergraduate Equivalency: EBIO 325. Mutually Exclusive: Credit cannot be earned for EBIO 525 and EBIO 325.**EBIO 529 - ANIMAL BIOLOGY AND PHYSIOLOGY****Short Title:** ANIMAL BIOLOGY AND PHYSIOLOGY**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 EBIO 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: EBIO 329. Mutually Exclusive: Credit cannot be earned for EBIO 529 and BIOC 329/EBIO 329.

EBIO 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. Cross-list: BIOC 534. Graduate/Undergraduate Equivalency: EBIO 334. Mutually Exclusive: Credit cannot be earned for EBIO 534 and EBIO 334.

EBIO 540 - GLOBAL BIOGEOCHEMICAL CYCLES**Short Title:** GLOBAL BIOGEOCHEMICAL CYCLES**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 introduces students to the coupled nature of the biosphere, atmosphere and hydrosphere using as focal points elemental cycles such as those of carbon and nitrogen. This is a writing-intensive class, and will include 3 required Saturday field trips. Graduate/Undergraduate Equivalency: EBIO 340. Mutually Exclusive: Credit cannot be earned for EBIO 540 and EBIO 340.

EBIO 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:** Repeatable for Credit.**EBIO 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:** Repeatable for Credit.**EBIO 555 - CURRENT TOPICS IN WOLF CONSERVATION****Short Title:** WOLF CONSERVATION**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 will provide an overview of the biology of wolves, their effects on ecosystems, the history of their management, and the current state of their conservation in the United States. Instructor Permission Required.

EBIO 560 - ENVIRONMENTAL IMPACT STATEMENTS AND PERMITTING**Short Title:** EIS AND PERMITTING**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 Statements for project Permitting under the National Environmental Policy Act (NEPA). EISs have to be conducted before permitting is secured for large infrastructure projects, such as power plants, highways, pipelines, dams, mines, airports, incinerators and landfills.

Course URL: profms.rice.edu**EBIO 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.

EBIO 562 - TOPICS IN BEHAVIORAL BIOLOGY**Short Title:** TOPICS IN BEHAVIORAL 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: Review and discussion of the literature on current research in animal behavior and evolution. Recommended prerequisite(s): Graduate standing or permission of chair or instructor. Repeatable for Credit.

EBIO 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.

EBIO 566 - APPLIED PHYCOLOGY**Short Title:** APPLIED PHYCOLOGY**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 provides an overview of methods of algal strain selection and cultivation for food, fodder, fertilizers, biofuels, pharmaceuticals, and cosmetics. Graduate/Undergraduate Equivalency: EBIO 366. Mutually Exclusive: Credit cannot be earned for EBIO 566 and EBIO 366.

EBIO 568 - TOPICS IN BIOLOGICAL DIVERSITY**Short Title:** TOPICS IN BIOLOGICAL DIVERSITY**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 literature on current research in biological diversity. Repeatable for Credit.**EBIO 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.**EBIO 570 - 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: EBIO 270. Mutually Exclusive: Credit cannot be earned for EBIO 570 and EBIO 270.**EBIO 572 - 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**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: EBIO 372. Mutually Exclusive: Credit cannot be earned for EBIO 572 and EBIO 372.**EBIO 579 - LAB MODULE IN AQUATIC ECOLOGY WITH SCUBA****Short Title:** LAB MOD AQU ECOLOGY WITH SCUBA**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Laboratory**Credit Hour:** 1**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate**Description:** Students will learn some fundamentals of aquatic ecosystems and conduct lab exercises that involve SCUB-based fieldwork in a nationally recognized freshwater dive site. Course has required meetings outside of regular class time. Prerequisites: LPAP 194 or proof of Open Water Scuba certification from a professional organization (e.g., PADI, NAUI). A course fee ranging from \$300 to \$535 is associated with the class. Please send all enrollment requests to Mariah McClarty, mam22@rice.edu. You will be notified of enrollment decisions by December 5th. Department Permission Required. Graduate/Undergraduate Equivalency: EBIO 379. Recommended Prerequisite(s): EBIO 213 and LPAP 194. Mutually Exclusive: Credit cannot be earned for EBIO 579 and EBIO 379.**EBIO 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: EBIO 280. Mutually Exclusive: Credit cannot be earned for EBIO 580 and EBIO 280/EBIO 480.**EBIO 581 - EEB OUTREACH DEVELOPMENT****Short Title:** EEB OUTREACH DEVELOPMENT**Department:** Biosciences**Grade Mode:** Standard Letter**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.

EBIO 585 - 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.**EBIO 586 - GRADUATE SEMINAR/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 EBIO 585. Repeatable for Credit.**EBIO 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:** Repeatable for Credit.**EBIO 677 - SPECIAL TOPICS****Short Title:** SPECIAL TOPICS**Department:** Biosciences**Grade Mode:** Standard Letter**Course Type:** Internship/Practicum, Lecture, Seminar, Laboratory**Credit Hours:** 1-4**Restrictions:** Enrollment is limited to Graduate or Visiting Graduate level students.**Course Level:** Graduate**Description:** Topics and credit hours vary each semester. Contact department for current semester's topic(s). Repeatable for Credit.**EBIO 801 - EEB 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:** 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 Biochemistry and Cell Biology: BIOC
- Course offerings/subject code for Ecology and Evolutionary Biology: EBIO

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 Biochemistry and Cell Biology (for both the BA and BS degrees): BIOC
- Major in Ecology and Evolutionary Biology (for both the BA and BS degrees): EBIO
- Major in Biological Sciences (BA degree only): BIOS

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 Arts degree: MA
- 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 ¹

- **BIOC** Major/Program: CIP Code/Title: 26.0202 - *Biochemistry*
- **BIOS** Major/Program: CIP Code/Title: 26.0101 - *Biology/Biological Sciences, General*
- **EBIO** Major/Program: CIP Code/Title: 26.1310 - *Ecology and Evolutionary Biology*
- **BCBM** Minor: CIP Code/Title: 26.0202 - *Biochemistry*
- **EEBM** Minor: CIP Code/Title: 26.1310 - *Ecology and Evolutionary Biology*

¹ Classification of Instructional Programs (CIP) 2010 Codes and Descriptions from the National Center for Education Statistics: <https://nces.ed.gov/ipeds/cipcode/>