Biochemistry, Biophysics, and Molecular Biology (BBMB)

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The program in biochemistry, biophysics, and molecular biology (BBMB) offers interdisciplinary courses and a major at the interface of the physical and biological sciences. The curriculum focuses on the understanding of biological processes at the molecular level and seeks to prepare students to enter the rapidly developing fields of biotechnology, biomedicine, and structural biology. The BBMB courses will serve as major requirements in BBMB, biology, chemistry, and physics. Courses in the BBMB major apply to the science and quantitative analysis (selected courses) distribution areas.

The BBMB major: Biology 111, 205; either Chemistry 125, 135, 126, 136, or Chemistry 140; 245, 246, 250; Physics 155, 156; Mathematics 125, 126, 225; BBMB 324, 325, 326, 334, 335, 336, 400, and three credits of 490 or 498; at least seven additional credits taken from biology, chemistry or physics courses numbered 200 and above and approved by the BBMB faculty.

In the senior year, all BBMB majors must take a senior comprehensive exam containing both an oral and written component. The written component consists of the GRE exam in Biochemistry, Cell and Molecular Biology. A score in the 20th percentile or higher is required to Pass. The oral exam consist of a one-hour comprehensive question exam with two or more participating faculty.

324 Biophysics
x, 3 **Juers**

This course presents the molecular side of the broad field of biophysics, in which physical concepts are applied to biological systems. Topics may include thermodynamics, equilibrium, quantum mechanics, statistical mechanics, classical mechanics and spectroscopy of biological systems such as membranes, proteins, and nucleic acids. *Prerequisites:* Physics 155, 156; Biology 111 or consent of instructor.

325 Biochemistry
x, 3 **J. Russo**

The first semester of a yearlong sequence on the biochemistry and molecular biology of the living cell. Topics include an introduction to the techniques used to study biological macromolecules; characterization, structure, and function of proteins; enzyme kinetics, mechanisms, and regulation; composition of biological membranes; bioenergetics; and catabolism of proteins, fats, and carbohydrates. Three lectures per week. *Prerequisites:* Biology 111, Chemistry 246.

326 Molecular Biology
3, x **Vernon**

The second semester of a yearlong sequence on the biochemistry and molecular biology of the living cell. Topics include a detailed examination of DNA and RNA, the mechanism of DNA replication, transcription and translation, the control of gene expression in procaryotes and eucaryotes, the molecular biology of viruses, oncogenes/cancer, mobile genetic elements, and genomics. Three lectures per week. *Prerequisites:* Biology 205 and BBMB 325.

334 Biophysics Laboratory
x, 1 **Juers**

Laboratory exercises on a range of biophysical topics. Physical characterization of macromolecules using techniques that may include absorption spectroscopy, fluorescence spectroscopy, nuclear magnetic resonance, circular dichroism, crystallization and x-ray diffraction. Mathematical modeling and simulation of small molecules, macromolecules, and fluctuations in biological systems. *Co-requisite:* BBMB 324. Required of BBMB majors. Open to other students only with consent of instructor.

335 Biochemistry Laboratory
x, 1 **J. Russo**

Laboratory exercises in protein biochemistry, which will include biochemical reagent preparation, enzyme isolation and purification, enzyme and protein assays, and gel electrophoresis. One three- to four-hour laboratory per week. *Prerequisites:* Biology 111 and Chemistry 136 or 140; *Co-requisite*: BBMB 325. Chemistry 240 is strongly recommended. *Required of* BBMB majors. *Open* to other students only with consent of instructor.

336 Molecular Biology Laboratory
1, x **Vernon**

Laboratory exercises in nucleic acid biochemistry, with emphasis on molecular cloning and PCR techniques. One three- to four-hour laboratory per week. *Prerequisite:* BBMB 335; *Co-requisite:* BBMB 326.

400 BBMB Senior Seminar
x, 2 **Juers, J. Russo, Vernon**

A team-taught seminar which will present recent developments in the molecular life sciences, such as bioinformatics, drug design, genomics, or self-assembly processes. In addition to participation in discussion, students will contribute oral presentations of recent research articles and of the senior research project. *Required of* BBMB seniors. *Open* to other

students with consent of instructors.

430 Current Topics in Biochemistry: Infectious Disease
3, x **J. Russo**

The role of infectious disease in human mortality and morbidity. Discussion topics include: epidemiology and etiology of disease, cellular targets of microbial infection, immune responses, design and mechanisms of action of antibiotic drugs, drug resistance, the development of vaccines for disease prevention, and the ethical dilemmas and social consequences of infectious disease. Case studies may include polio, influenza, malaria, tuberculosis, Hepatitis B, and HIV. *Prerequisite:* consent of instructor. Distribution area: science or alternative voices.

490 Senior Research
1-3, 1-3 **Staff**

Each student will collect data and write a thesis on his or her research in accepted scientific style. One or more initial drafts of the thesis will be required before the final version is due in the last week of classes. Each student will also give a short presentation of his/her results in a public forum. *Prerequisite:* consent of the research adviser.

498 Honors Thesis
3, 3 **Staff**

Required of senior honors candidates, who will conduct more extensive research than students who take only BBMB 490. Honors students will finish data collection and write a thesis on the research in accepted scientific style. One or more initial drafts of the thesis will be required before the final version is due in the library. Presentation of results in a public forum to the staff and other BBMB majors is required. Credit cannot be earned simultaneously for BBMB 498 and 490. *Prerequisites:* consent of the research adviser, and admission to honors candidacy.