BIOCHEMISTRY AND MOLECULAR BIOLOGY

http://bm.med.miami.edu

Overview
Biochemistry and Molecular Biology are sciences at the epicenter of modern biomedical research. Understanding basic biochemical pathways is key to gaining new knowledge for the prevention and combating of disease, allowing for the expansion of current boundaries in medicine and science. In addition to medical applications, molecular biology is indispensable for the development of tools implemented for environmental and bionanotechnology problems. The Department of Biochemistry and Molecular Biology (BMB) at the University of Miami is committed to maintaining our discipline as a central science and strives for excellence by sustaining the current areas of strength, fostering interdisciplinary and clinical translational research, and expanding the research portfolio to evolving areas of inquiry and discovery. Our expertise in mRNA biology, understanding DNA stability and repair, studying the biophysical nature of biomolecules, and gaining insight into cellular signaling pathways has been recently expanded by the arrival of researchers specialized in the design of natural and semi-synthetic biomolecules, as well as molecular-based devices that can be employed in translational medicine and other bionanotechnology applications. The commitment of the Miller School to increase growth in the basic sciences will continue to provide our department with new and exciting opportunities to enhance our prominence in biomedical research.

A chief mission of our department is to educate future generations of investigators and medical students to become critical thinkers and the leaders in their fields. The diverse composition of our department in regards to research interests creates a unique and intellectually stimulating learning environment for students at the undergraduate, graduate, and postgraduate levels. We offer a host of courses to fulfill the curriculum to obtain a BS in Biochemistry, a MS and a PhD in Biochemistry, as well as the basic science requirements for MD and MD / PhD students. Our courses address the basic principles of biochemistry and molecular biology as well as the emerging science and future of the fields.

The department serves the worldwide scientific community through leadership roles and active participation in national and international conferences, serving in study sections and on federal agency panels. Additionally, our department’s faculty roster encompasses editors of journals and members of editorial boards, as well as board members of national and international governmental centers and members of advisory boards of companies in the private sector. Moreover, the Department is committed to serve the community by participating in a variety of outreach events to promote awareness of the importance of science and technology in relation to public health and the environment.

Our department is also unique for hosting the internationally recognized annual Miami Winter Symposium, created by Professor William Whelan, the first leader and Chair of the Department. The Miami Winter Symposium is currently managed by Nature Publishing and features world-renowned speakers in emerging areas of science and technology. This event cements our department’s goal of furthering education and discovery in biochemistry and molecular biology on an international level.

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Admission Requirements
Applicants to biomedical programs should have a bachelor degree in a biological or related discipline (e.g., psychology, chemistry, engineering, physics). Although there are no prerequisite requirements, courses in general biology, cell/molecular biology, calculus, general physics, organic chemistry, physical chemistry, and biochemistry are encouraged. Applications are generally accepted from September to December for fall entry only. Select applicants will be offered an interview.

Competitive Candidates Will Have the Following:
- Excellent academic record
- Competitive GRE exam scores
- Research experience in a laboratory setting
- Publications of abstract and / or papers
- Co-authorship in a peer-reviewed journal is recommended
- Strong letters of recommendation from research scientists who know the candidate well
- Motivation to pursue state-of-the-art biomedical research

Applicants Must Submit the Following:
- Online Application
- Application Fee
- Official Academic Transcripts
- GRE General Test
- English Proficiency Exam (non-native speakers)
- Statement of Purpose
- Resume / CV

Full application instructions can be found online (http://biomed.med.miami.edu/apply).

Doctoral Program
- Ph.D. in Biochemistry and Molecular Biology (http://bulletin.miami.edu/graduate-academic-programs/medicine/biochemistry-molecular-biology/biochemistry-and-molecular-biology-phd)

BMB 617. Readings in Molecular Biology. 1 Credit Hour.
Discussion of classical papers in molecular biology beginning with the concept of the gene and continuing into modern studies. Format consists of student presentations and group discussions.

Components: LEC.
Grading: GRD.
Typically Offered: Fall.
BMB 645. Research Problems in Biochemistry, Cell and Molecular Biology. 2-3 Credit Hours.
Laboratory research problems in various areas of biochemistry, cell biology, and molecular biology, including literature search, experimental design, data gathering, and evaluation of results. This course is the mechanism by which graduate laboratory rotations are done in preparation for selection of Ph.D. mentor.
Components: LEC.
Grading: GRD.
Typically Offered: Fall, Spring, & Summer.

BMB 680. Research Ethics. 0 Credit Hours.
The NIH Guide for Grants and Contracts stipulates that Institutions receiving support for National Research Service Award Training Grants are required to develop a program in the principles of Scientific Integrity. This program should be an integral part of the proposed training effort. The University of Miami School of Medicine has chosen to respond to this requirement with this course. This course must be taken during the first semester in the Department or Program. This is a six-hour course and will be given in two sessions of three hours each.
Components: LEC.
Grading: GRD.
Typically Offered: Fall.

BMB 691. Research Journal Club. 1 Credit Hour.
All registered BMB students must participate in the Journal Club/Seminar. Students are required to critically review published paper(s) of their choice and describe in detail the findings described therein. Senior students will present their own research.
Components: LEC.
Grading: GRD.
Typically Offered: Fall & Spring.

BMB 702. Biochemical Science Seminar. 1 Credit Hour.
The Biochemistry and Molecular Biology (BMB) department has an active seminar program that meets on every Friday at noon. In this program seminars are presented by the BMB faculty (primary and secondary), invited speakers within the University of Miami and from other universities, government agencies, and industry. All BMB Graduate Students enrolled in this course will be required to attend this seminar and will have informal interactions with speaker, and exchange ideas at lunch on the seminar day.
Components: LEC.
Grading: GRD.
Typically Offered: Offered by Announcement Only.

BMB 705. Principles of Biochemistry and Molecular Biology. 1-6 Credit Hours.
The biochemical composition, structure, and cellular metabolism of proteins, carbohydrates, lipids, and nucleic acids are rigorously described, emphasizing problem solving strategies required of biomedical field applications.
Components: DIL.
Grading: GRD.
Typically Offered: Fall & Spring.

BMB 709. Advanced Biochemistry and Molecular Biology. 3 Credit Hours.
This course is a continuation course for BMB 616. It covers essentially the same topics as BMB 616 but at a more advanced level. It brings the student to the forefront of research in Molecular Biology. The course material is discussed exclusively in the form of original research papers. Based on this experience, students are required to propose experimental approaches to biological problems and defend them.
Components: LEC.
Grading: LEC.
Typically Offered: Fall.

BMB 710. Advanced Topics in Biochemistry & Molecular Biology. 1-5 Credit Hours.
This course is offered by various faculty members in the department on a rotating basis depending upon their expertise. For example, an advanced topic course in Nanomedicine offered by Dr. Deo and Dr. Dhar covers these topics through lectures.
Components: DIL.
Grading: GRD.
Typically Offered: Fall.

BMB 714. Molecular Genetics. 4 Credit Hours.
This course deals with mechanisms and fundamental concepts of genetic inheritance. The first part of the course is devoted to the genetics of bacteria and bacteriophages. Topics include genetic implementation, recombination, suppression, transposition, conjugation, transformation, transduction, and regulation of prokaryotic gene expression. The second part of the course covers selected topics in eukaryotic genetics (including molecular genetics of yeast, mitochondria, Drosophila, mice and humans). Problem solving is emphasized in homework and exam. The objective of the course is to provide students with an appreciation of the value of molecular genetics as a tool they can use to solve a wide variety of problems in bio-medical research.
Components: DIL.
Grading: GRD.
Typically Offered: Fall.

BMB 715. Structural Biology and Applications to Drug Discovery. 2 Credit Hours.
This course focuses on the relationships between structure and function in biological macromolecules, and how this knowledge has led to the discoveries of new drugs.
Components: LEC.
Grading: GRD.
Typically Offered: Spring.
BMB 716. Bioinformatics of Gene Regulation and Protein Function. 3 Credit Hours.
Among the skills required to become a successful interdisciplinary life scientist is the ability to navigate biological databases to better understand gene and protein function. Genome sequences contain the signals that guide differential gene expression and encode structural RNAs, regulatory RNAs and proteins. This course will introduce the tools, databases and evolutionary considerations that help us understand the regulation of gene expression and predict protein function. The biochemical and regulatory functions encoded in genomic DNA sequences will be explored using bioinformatics techniques including gene finding, BLAST searches, PubMed searches, high-throughput dataset mining, multiple alignments, phylogenetic analysis, identification of conserved functional domains and motifs, assessment of protein-protein and protein-ligand interactions, gene context and co-occurrence analysis. Secondary and tertiary structural analysis, metabolic and cellular modeling, and phenotypic analysis. The databases, tools and tutorials available at websites developed by the National Center for Biotechnology Information, EMBL-EBI, the Protein Data Bank, and others will be used as supporting course materials. Each week will have a set of online videos and instructions to complete before the weekly live lecture. The live lecture consist of a one hour slide presentation and one half-hour of Q&A discussions. Competency in bioinformatics will be assessed by a midterm and a final exam.

Components: DIL.
Grading: GRD.
Typically Offered: Fall.

BMB 719. Fundamentals of Epigenetics. 3 Credit Hours.
The influence of nutrition on gene expression through modification of DNA and proteins in chromatin is described (i.e., epigenetics). Also, genetic variations, as well as the influence of bacterial flora of the digestive tract, are considered with respect to abilities to metabolize various dietary components. Students learn how to gather information about course topics and present their findings.

Components: LEC.
Grading: GRD.
Typically Offered: Fall & Spring.

BMB 720. Research in Residence. 0 Credit Hours.
Used to establish research in residence for the thesis for the master’s degree after the student has enrolled for the permissible cumulative total in BMB 710 (usually six credits). Credit not granted. May be regarded as full time residence.

Components: LEC.
Grading: GRD.
Typically Offered: Fall, Spring, & Summer.

BMB 731. Special Work. 1-3 Credit Hours.
Special work, lecture, or laboratory or a combination of these, as determined by advisor in accord with student’s individual interest.

Components: LEC.
Grading: GRD.
Typically Offered: Fall, Spring, & Summer.

BMB 810. Master’s Thesis. 1-6 Credit Hours.
The student working on his/her master’s thesis enrolls for this credit. In most departments not to exceed six credits, as determined by his/her advisor.

Components: THI.
Grading: SUS.
Typically Offered: Fall & Spring.

BMB 830. Doctoral Dissertation. 1-12 Credit Hours.
Required of all candidates for the Ph.D. The student will enroll for credit as determined by his/her advisor but not for less than a total of 24. Not more than 12 hours of BMB 730 may be taken in a regular semester, nor more than six in a summer session. Where a student has passed his/her (a) qualifying examinations, and (b) is engaged in an assistantship, he/she may still take the maximum allowable credit stated above.

Components: THI.
Grading: SUS.
Typically Offered: Fall, Spring, & Summer.

BMB 840. Doctoral Dissertation- Post Candidacy. 1-12 Credit Hours.
Required for all PhD candidates. The student will enroll for credits as determined by the Office of Graduate and Postdoctoral Studies.

Components: DIL.
Grading: SUS.
Typically Offered: Fall & Summer.

BMB 850. Research In Residence. 0 Credit Hours.
Used to establish research in residence for the Ph.D., after the student has been enrolled for the permissible cumulative total in appropriate doctoral research. Credit not granted. May be regarded as full-time residence as determined by the Dean of the Graduate School.

Components: DIL.
Grading: SUS.
Typically Offered: Fall, Spring, & Summer.