Biochemistry and Molecular Genetics

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Administration:
Head of the Department: Jack Kaplan
Co-Directors of Graduate Studies: Alisa Katzen, Michael Caffrey

Program Codes:
20FS1069MS (MS)
20FS4050PHD (PhD)

The department participates in an integrated interdepartmental program, Graduate Education in Medical Sciences (GEMS (http://chicago.medicine.uic.edu/gems)), which offers students flexibility in course work and laboratory rotations. Students entering the PhD program in the Department of Biochemistry and Molecular Genetics will take courses in the GEMS curriculum during the first year. This curriculum will provide students with a broad background in biochemistry, molecular genetics, and other biomedical sciences. In the second year and beyond, students will pursue their own specific scientific interests by taking a variety of advanced courses and by undertaking a research program under the mentorship of a departmental faculty member whom they have selected during their first-year research rotations.

The Department of Biochemistry and Molecular Genetics also participates in the Medical Scientist Training Program (see the Medical Scientist Training Program (http://catalog.uic.edu/gcat/colleges-schools/medicine/mstp) section for more information). The department has active, well-funded research programs in the molecular biology of growth and development, oncogenesis, metabolic regulation, macromolecular structure and function, signal transduction, and the biochemical basis of diseases. The Interdepartmental Concentration in Neuroscience is available to doctoral students.

Admission and Degree Requirements

- MS in Biochemistry and Molecular Genetics (See listing for PhD in Biochemistry and Molecular Genetics)
- PhD in Biochemistry and Molecular Genetics (http://catalog.uic.edu/gcat/colleges-schools/medicine/bcmg/phd)

Biochemistry and Molecular Genetics Courses

**Biochemistry and Molecular Genetics Courses**

**BCMG 411. Introduction to Biological Chemistry. 4 hours.**
Includes chemistry of cellular constituents: enzymology; metabolism of sugars, proteins, lipids, and nucleic acids; and regulation of metabolism. Course Information: Prerequisite(s): Organic chemistry. Lecture course designed primarily for students in the College of Dentistry. Class Schedule Information: To be properly registered, students must enroll in one Conference and one Lecture.

**BCMG 501. Faculty Research Seminars. 1 hour.**
Faculty presentation of research areas within molecular genetics. Course Information: Satisfactory/Unsatisfactory grading only. Should be taken in the first year in the Ph.D. in Biochemistry and Molecular Genetics program. Prerequisite(s): Graduate standing in the Ph.D. in Biochemistry and Molecular Genetics program or consent of the instructor.

**BCMG 502. Somatic Cell and Human Genetics. 4 hours.**
The genetics of somatic cells and advanced human genetics. Gene transfer, mutagenesis, drosophila genetics, genetic linkage and human disease, cancer genetics, and gene therapy. Course Information: Prerequisite(s): GCLS 501 or consent of the instructor.

**BCMG 503. Research Methods in Biochemistry and Molecular Genetics. 5 hours.**
Laboratory course in experimental methods in biochemistry and molecular genetics. Course Information: May be repeated to a maximum of 10 hours. Prerequisite(s): Consent of the instructor. Open only to students entering as Ph.D. students in Biochemistry and Molecular Genetics.

**BCMG 512. Experimental Design and Analysis in Molecular Genetics. 4 hours.**
Methods and logic in the analysis of gene function, gene cloning, analysis of genetic changes, studies of gene expression, design of experimental controls. Course Information: Prerequisite(s): GCLS 501 or consent of the instructor.

**BCMG 513. Principles of Structure Determination and Analysis. 3 hours.**
Explores the relationship between structural stability, kinetic properties and function of biopolymers, with particular emphasis on proteins and nucleic acids. Course Information: Same as MIM 513, and PMPG 513. Prerequisite(s): GCLS 501 and one year of physical chemistry, or consent of the instructor.

**BCMG 514. Structure and Function of Nucleic Acids. 4 hours.**
Describes the structure and function of nucleic acids. Unravels the basic molecular mechanisms underlying heredity, including replication, transcription and recombination. Course Information: Prerequisite(s): GCLS 501 or consent of the instructor.

**BCMG 515. Journal Club. 1 hour.**
Student presentation and critical analysis of recent journal articles and current topics in biochemistry and molecular genetics. Course Information: May be repeated. Prerequisite(s): Consent of the instructor.

**BCMG 522. Strategies for Effective Scientific Communication. 1 hour.**
Development of critical skills for evaluation, development, and execution of forms of scientific communication, including research and grant proposals, manuscripts describing original research, and review summaries. Course Information: Satisfactory/Unsatisfactory grading only. Prerequisite(s): Consent of the instructor.

**BCMG 526. Molecular and Genetic Analysis of Development. 3 hours.**
Examines developmental mechanisms used in animal model systems. Course Information: Same as BIOS 526. Prerequisite(s): Graduate standing or consent of the instructor.

**BCMG 531. Medical Biochemistry and Nutrition. 3 hours.**
Chemistry of Biopolymers; enzymology; metabolism of carbohydrates, Lipids, amino acids and proteins; molecular biology. Course Information: Intended for first year medical students. Prerequisite(s): Membership in the College of Medicine (COM) M1 medical school class. Intended/available only for first year medical students registered in the COM.
BCMG 533. Nutrition for Medical Students. 2 hours.
Biochemical and nutritional basis of disease including heart disease, hypertension, obesity, malnutrition, and cancer. Course Information: Prerequisite(s): BCMG 531 and BCMG 532 and membership in the medical school or consent of the instructor. Intended primarily for medical students.

BCMG 561. Biochemistry of Cellular Regulation. 3 hours.
Membrane structure and function, transport, receptor and signal transduction mechanisms and growth factors. Cytoskeleton and motility, cell-cell communication, enzyme cascades and cellular control mechanisms.

BCMG 563. Principles of Molecular Medicine. 3 hours.
A lecture/discussion/writing course which integrates biochemical and molecular biological concepts into a clinical context. Diseases will be described in terms of molecular mechanisms. Course Information: Prerequisite(s): Consent of the instructor.

BCMG 575. Topics in Biochemistry and Molecular Genetics. 3 hours.
Students will be exposed to, present, and discuss recent scientific literature in biochemistry and molecular genetics. Course Information: May be repeated. Prerequisite(s): Completion of the first year of the program and consent of the instructor. Class Schedule Information: To be properly registered, students must enroll in one Discussion and one Lecture.

BCMG 594. Special Topics in Biochemistry and Molecular Genetics. 1-3 hours.
Topics of current interest in the field of biochemistry and molecular genetics, and may include protein structure, membrane proteins and trafficking, development and gene regulation, signal transduction, and cancer biology. Course Information: May be repeated to a maximum of 6 hours. Students may register in more than one section per term. Prerequisite(s): Consent of the instructor.

BCMG 595. Student Research Seminars. 1 hour.
Research presentations by graduate students in the biochemistry and molecular genetics program. Course Information: Satisfactory/Unsatisfactory grading only. May be repeated. Prerequisite(s): Consent of the instructor.

BCMG 598. Masters Thesis Research. 0-16 hours.
Investigation carried out by M.S. candidate under the direction of a faculty member leading to the M.S. in Biochemistry and Molecular Genetics. Course Information: Satisfactory/Unsatisfactory grading only. May be repeated. Prerequisite(s): Consent of the instructor.

BCMG 599. Ph.D. Thesis Research. 0-16 hours.
Independent dissertation research by the student, under the guidance of the adviser. Course Information: Satisfactory/Unsatisfactory grading only. May be repeated. Prerequisite(s): Consent of the instructor.

Graduate College Life Sciences Courses

GCLS 500. Physiology. 3 hours.
Lectures in human physiology. Emphasis is on an integrated approach to systems physiology. Course Information: Restricted to students enrolled in a graduate program offered through the College of Medicine or Pharmacy or Applied Health Sciences or in the Departments of Bioengineering or Biological Sciences, or consent of the instructor. Prerequisite(s): Mathematics, undergraduate physics, organic chemistry, or consent of the instructor.

GCLS 501. Biochemistry. 3 hours.
Fundamental properties of biomacromolecules, the thermodynamics underlying basic biochemical processes and the properties of enzymes, including the kinetics of operation, and regulation, illustrated with important examples. Course Information: Restricted to students enrolled in a graduate program offered through the Colleges of Medicine or Pharmacy or the departments of Bioengineering or Biological Sciences or consent of the instructor. Prerequisite(s): Recommended background: Coursework in organic and physical chemistry.

GCLS 502. Molecular Biology. 3 hours.
Core molecular biology course covering basic principles of gene expression, genome replication and molecular interactions important to biological processes in prokaryotes and eukaryotes. Course Information: Restricted to students enrolled in a graduate program offered through the Colleges of Medicine or Pharmacy or the departments of Bioengineering or Biological Sciences or consent of the instructor.

GCLS 503. Cell Biology. 3 hours.
Advanced course on fundamental aspects of cell biology; basic concepts will be integrated with key examples which span gene, protein, cell, and tissue function. Course Information: Credit is not given for GCLS 503 if the student has credit in BCHE 561 or ANAT 585 or MIM 585 or PHYB 585. Restricted to students enrolled in a graduate program offered through the Colleges of Medicine, Pharmacy, or Applied Health or the departments of Bioengineering or Biological Sciences or consent of the instructor.

GCLS 504. Research Methods I. 1-2 hours.
Lectures, demonstrations, and discussions concerned with principles and practical aspects of modern quantitative biochemical, molecular biological, physiological and biophysical methodology such as separation techniques and studies of biomembranes. Course Information: May be repeated. Students may register for more than one section per term. Restricted to students enrolled in a graduate program offered through the Colleges of Medicine or Pharmacy or the departments of Bioengineering or Biological Sciences or consent of the instructor.

GCLS 505. Research Methods II. 1-3 hours.
Lectures, demonstrations, and discussions concerned with principles and practical aspects of modern quantitative biochemical, molecular biological, physiological and biophysical methodology such as bioimaging and biochemical analysis. Course Information: May be repeated. Students may register for more than one section per term. Restricted to students enrolled in a graduate program offered through the Colleges of Medicine or Pharmacy or the departments of Bioengineering or Biological Sciences or consent of the instructor.

GCLS 506. GEMS Research Rotation. 2-5 hours.
Research rotation course in which first year students from the GEMS program will undertake research projects in laboratories affiliated with this program. Course Information: Satisfactory/Unsatisfactory grading only. May be repeated. Animals used in instruction. Prerequisite(s): Open only to Ph.D. degree students.

GCLS 510. Integrative Biology. 3 hours.
Advanced level, intensive course addressing fundamental topics of developmental biology, immunology, and cancer biology, with concentration on thematic issues that integrate these subjects. Course Information: Prerequisite(s): GCLS 501 and GCLS 502 and GCLS 503; or demonstrated proficiency of the material covered in these courses. Restricted to students enrolled in a graduate program offered through the Colleges of Medicine or Pharmacy or the departments of Bioengineering or Biological Sciences or consent of the instructor.
GCLS 511. Molecular Genetics. 3 hours.
Core molecular genetics course covering classical and molecular principles of microbial and Mendelian genetics. Systems covered include bacteria, bacteriophage, animal viruses, yeast, Drosophila, mouse, and human. Course Information: Prerequisite(s): GCLS 501 and GCLS 502 and GCLS 503; or demonstrated proficiency of the material covered in these courses. Restricted to students enrolled in a graduate program offered through the Colleges of Medicine or Pharmacy or the departments of Bioengineering or Biological Sciences or consent of the instructor.

GCLS 512. Pathobiology of Cancer. 3 hours.
Introduction to principles of carcinogenesis, tumor biology, and oncology, including cancer epidemiology, molecular-cellular basis of cancer, tumor progression, invasion and metastasis, and prevention, detection, diagnosis, and therapy of cancer. Course Information: Same as PATH 511. Prerequisite(s): Consent of the instructor. Recommended background: Basic knowledge of molecular and cell biology is highly recommended.

GCLS 515. Receptor Pharmacology and Cell Signaling. 3 hours.
Advanced course on cell-surface and nuclear receptors and mechanisms of signaling through receptors. Provides an overview of receptor theory, hands-on data analysis and lectures and discussions on various signaling mechanisms. Course Information: Credit is not given for GCLS 515 if the student has credit in PCOL 505 or PHYB 505. Prerequisite(s): GCLS 501 or approval of the department. Restricted to students enrolled in a graduate program offered through the Colleges of Medicine or Pharmacy or the departments of Bioengineering or Biological Sciences or consent of the instructor.

GCLS 594. Special Topics in Life Sciences. 1-4 hours.
Systematic study of advanced selected topics in life sciences from an interdisciplinary approach. Course Information: May be repeated. Students may register in more than one section per term. Prerequisite(s): Consent of the instructor.