BIOCHEMISTRY AND MOLECULAR MEDICINE

GRADUATE

Master's program

- Master of Science in the field of bioinformatics and molecular biochemistry (http://bulletin.gwu.edu/arts-sciences/biochemistry-molecular-medicine/ms-bioinformatics-molecular-biochemistry)

FACULTY

**University Professor** F. Murad

**Professors** P. Berg, V. Hu, A. Kumar, R. Kumar (Chair), Z. Lu (Research), W. Nierman, M. Sharma (Research), J. Vanderhoek (Director of M.S. program), G. Walker, W. Weglicki

**Associate Professors** K. Bian (Research), G. Dimri, M. Elliott, Z. Han, J. Kramer (Research), I.T. Mak (Research), R. Mazumder

**Assistant Professors** J. Chmielinska (Research), M. Dimri (Research), J.-H. Kim, A. Kots (Research), K. Ohshiro (Research), M.-Y. Wu (Research), R.-C. Wu, J. Zhou (Research), W. Zhu

COURSES

**Explanation of Course Numbers**

- Courses in the 1000s are primarily introductory undergraduate courses
- Those in the 2000s to 4000s are upper-division undergraduate courses that can also be taken for graduate credit with permission and additional work
- Those in the 6000s and 8000s are for master’s, doctoral, and professional-level students
- The 6000s are open to advanced undergraduate students with approval of the instructor and the dean or advising office

**BIOC 3261. Introductory Medical Biochemistry. 4 Credits.**
Introduction to structures of biological macromolecules, enzyme catalysis, cellular bioenergetics, and metabolism. Same as BISC 3261. Prerequisite CHEM 2151–CHEM 2152. Credit toward the degree cannot be earned for this course and for CHEM 3165.

**BIOC 3262. Biochemistry Laboratory. 2 Credits.**
Study of common experimental techniques used in life science laboratories to separate and characterize biological macromolecules. Same as BISC 3262/ CHEM 3262. Prerequisite: BIOC 3261/ BISC 3261. Laboratory fee.

**BIOC 3263. Special Topics in Biochemistry. 2 Credits.**
In-depth discussion of current biochemically relevant topics, including cancer and HIV chemotherapy, immune response, photosynthesis, signal transduction, hormone regulation and nutrition. Same as BISC 3263. Prerequisite: BIOC 3261/BISC 3261. Credit toward the degree cannot be earned for this course and for CHEM 3166.

**BIOC 3263W. Special Topics in Biochemistry. 2 Credits.**

**BIOC 3560. Diet, Health, and Longevity. 3 Credits.**
Biochemical and molecular explanations of how calorie intake affects health; scientific principles of dieting. Prerequisites: BIOC 3261 or BISC 1005.

**BIOC 3564. Lipid Biotechnology. 0-2 Credits.**
Same as BISC 3564/ CHEM 3564. Prerequisite: BIOC 3261/ BISC 3261. Laboratory fee.

**BIOC 3820. Bioinformatics and Computational Biochemistry. 2 Credits.**
How biomedical researchers integrate information from molecular biology resources for analysis and testing of hypotheses. Prerequisites: BISC 1115 and BISC 1125; and STAT 1127.

**BIOC 3821. Projects in Biomed Informatics. 1-2 Credits.**

**BIOC 4195. Undergraduate Research. 1 Credit.**
Research conducted under a mentor who is a member of the department. May be repeated for credit (only 1 credit may count toward the minor). Prerequisites: permission of the faculty member concerned.

**BIOC 4701. Science and Medicine. 0-4 Credits.**
A broad overview of several biomedical discoveries made in the 20th century and the often profound influence they have had on medical technology and on new directions in science and medicine, science administration, politics, ethics, and philosophy.

**BIOC 6201. Medical Biochemistry. 7 Credits.**
Required for medical students. Lecture and laboratory; emphasis on basic principles and their relation to medicine.

**BIOC 6209. Research Elective in Medical Biochemistry. 1-12 Credits.**

**BIOC 6211. Biochemistry-Health Science Students. 3,4 Credits.**
Basic concepts of biochemistry and their relation to health sciences.

**BIOC 6221. Proteins, Pathways, and Human Health. 4 Credits.**
A comprehensive course in general biochemistry for graduate students in biomedical sciences. Prerequisite: CHEM 2152, CHEM 2154.

**BIOC 6222. Biochemical Genetics and Medicine. 3 Credits.**
Continuation of BIOC 6221. A comprehensive course in general biochemistry for graduate students in biomedical sciences. Prerequisite: CHEM 2152, CHEM 2154.
BIOC 6223. Bioinformatics. 2 Credits.
The application of bioinformatics concepts and methods through the use of molecular biology databases and tools, covering molecular evolution, and protein sequence, structural, functional analysis. Recommended background: One undergraduate biochemistry course.

BIOC 6224. Molecular Biology and Protein Methods. 3 Credits.
Common laboratory techniques used in life science laboratories to separate and characterize proteins, including chromatography, gel electrophoresis, immunoassays, spectroscopy, and centrifugation. Corequisite: BIOC 6221. Laboratory fee.

BIOC 6227. Biochemistry Seminar. 1 Credit.
Current literature in biochemistry. Limited to graduate students in the department. May be repeated for credit.

BIOC 6234. Biochemical and Bioinformatic Approaches to Protein Structure and Function. 3 Credits.
Molecular biological, biophysical, chemical, and bioinformatic approaches to understanding protein structure and function. Protein folding, interactions, and ligand binding.

BIOC 6235. Seminar in Genomics, Proteomics, and Bioinformatics. 1 Credit.

BIOC 6236. Medical Genomics. 2 Credits.
The structure and function of genes and genomes. Genomic theories, methods, and data analysis including bioinformatics and database mining. Prerequisite or corequisite: BIOC 6221-BIOC 6222.

BIOC 6237. Proteomics and biomarkers. 2 Credits.
Experimental proteomics, protein/proteome analysis, bioinformatics of proteomics, systems biology and structural genomics. Prerequisite: BIOC 6236.

BIOC 6238. Experimental Genomics Lab. 3 Credits.
Research applications of knowledge in genomics and proteomics. Prerequisite: BIOC 6236. Laboratory fee.

BIOC 6240. Next Generation Sequencing. 2 Credits.

BIOC 6250. Molecular Biology. 3 Credits.
Content includes the organization and replication of genetic material, transcriptional and translational machinery, regulation of eukaryotic gene expression, and other special topics. Prerequisite: BIOC 6221-BIOC 6222.

BIOC 6252. Current Laboratory Methods in Molecular Biology. 3 Credits.
Corequisite: BIOC 6221. Laboratory fee.

BIOC 6254. Fundamentals of Molecular Biology. 3 Credits.
An intermediate-level molecular biology survey course. Prerequisite: BIOC 6221.

BIOC 6260. Analytic Methods for Lipids and Carbohydrates. 3 Credits.
Basic techniques in the biotechnology of lipids and carbohydrates. Prerequisite: BIOC 6221.

BIOC 6262. Genes, Diets and Aging. 3 Credits.

BIOC 6264. Membrane-Associated Complex Lipids. 1 Credit.

BIOC 6281. Topics. 1,2 Credit.
Directed readings in biochemistry, molecular biology, and genetics. May be repeated for credit. Enrollment limited to graduate students in the department.

BIOC 6290. Extramural Biochemistry Elective. 1-12 Credits.

BIOC 6291. Extramural Biochemistry Elective. 1-12 Credits.

BIOC 6295. Research. 1-12 Credits.
Participation in a project under investigation or in a field suggested by the student and approved by the staff. May be repeated for credit. Laboratory fee.

BIOC 6298. Advanced Reading. 1-6 Credits.
Limited to master’s degree candidates. May be repeated for credit to a maximum of 6 hours.

BIOC 6998. Thesis Research. 3 Credits.

BIOC 6999. Thesis Research. 3 Credits.

BIOC 8225. Metabolism. 4 Credits.
Metabolic pathways and integration of metabolic processes. Limited to Ph.D. students in the Institute for Biomedical Sciences.

BIOC 8231. Biochemical Basis of Human Diseases. 3 Credits.
Biochemical perspectives on disorders involving metabolic alterations, immunological dysregulation, problems of environmental/toxicological etiology, genetic/epigenetic dysfunction, neglected tropical diseases. Prerequisites: BmSc 8210, 8212.

BIOC 8232. Molecular and Cellular Signaling. 3 Credits.

BIOC 8501. Issues in Clinical Nutrition. 3 Credits.

BIOC 8502. Molecular Biology of Oncogenes. 1-12 Credits.

BIOC 8503. Readings in Immunology. 3 Credits.

BIOC 8800. Summer Remedial Biochemistry. 8 Credits.