

Graduate Education in Medical Sciences (GEMS)

Courses

GEMS 500. Physiology. 3 hours.

Lectures in human physiology. Emphasis is on an integrated approach to systems physiology. Course Information: Previously listed as GCLS 500. 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.

GEMS 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: Previously listed as GCLS 501. 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. Recommended background: Coursework in organic and physical chemistry.

GEMS 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: Previously listed as GCLS 502. 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.

GEMS 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: Previously listed as GCLS 503. Credit is not given for GEMS 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.

GEMS 504. Research Methods I. 1 or 2 hour.

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. Previously listed as GCLS 504. 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.

GEMS 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 in more than one section per term. Previously listed as GCLS 505. 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.

GEMS 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. Previously listed as GCLS 506. Animals used in instruction. Prerequisite(s): Open only to Ph.D. degree students.

GEMS 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: Previously listed as GCLS 510. 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): GEMS 501 and GEMS 502 and GEMS 503; or demonstrated proficiency of the material covered in these courses.

GEMS 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: Previously listed as GCLS 511. Prerequisite(s): GEMS 501 and GEMS 502 and GEMS 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.

GEMS 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. Previously listed as GCLS 512. Prerequisite(s): Consent of the instructor. Recommended background: Basic knowledge of molecular and cell biology is highly recommended.

GEMS 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 GEMS 515 if the student has credit in PCOL 505 or PHYB 505. Previously listed as GCLS 515. Prerequisite(s): GEMS 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.

GEMS 521. Foundations of Biomedical Sciences I. 3 or 6 hours.

A general class to introduce students to advanced concepts in biochemistry and molecular biology. This course is aimed at training graduate students who wish to apply principles of biochemistry and molecular biology to answering biomedical questions. Course Information: Credit is not given for GEMS 521 if the student has credit in GEMS 501 or GEMS 502. Class Schedule Information: To be properly registered, students must enroll in one Lecture and one Discussion.

GEMS 522. Foundations of Biomedical Sciences II. 3 or 6 hours.

An introduction to advanced concepts in cell biology and physiology. This course is aimed at training graduate students who wish to apply principles of cell biology and physiology to answering biomedical questions. Course Information: Credit is not given for GEMS 522 if the student has credit in GEMS 500 or GEMS 503. Class Schedule Information: To be properly registered, students must enroll in one Lecture and one Discussion.

GEMS 551. Foundations of Cancer Biology. 3 hours.

A graduate level general cancer biology class that covers the basic molecular elements of the disease, establish the hallmarks of cancer and incorporate how they are targeted by therapies. Course Information: Previously listed as PATH 510. Prerequisite(s): Open only to Ph.D. degree students; or approval of the department. Recommended background: Basic molecular and cell biology is highly recommended.

GEMS 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. Previously listed as GCLS 594. Prerequisite(s): Consent of the instructor.

GEMS 599. Mentored Research. 0-16 hours.

Research under the mentorship of permanent thesis advisor. Course Information: Satisfactory/Unsatisfactory grading only. May be repeated.