**Graduate College Life Sciences (GCLS)**

**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.