



GEORGIA'S HEALTH SCIENCES UNIVERSITY

School of Graduate Studies  
www.mcg.edu/gradstudies

## Biomedical Sciences Program First Year Core Curriculum

### Overview

Molecular Biology has fueled the tremendous explosion of new information regarding the fundamental mechanisms of cellular function over the past 20-30 years. We are now at a crossroads where scientists will be challenged to apply this knowledge to the understanding of organ-system biology in order to advance our knowledge of human health and disease. In today's environment, a basic understanding at all levels is necessary for a successful career. The Medical College of Georgia instituted a common admissions and curriculum for graduate study in the biomedical sciences for the first-year students in the fall of 2000. This program provides the student with the broad-based knowledge and experience needed for a successful career as a biomedical scientist.

The core curriculum provides the student with the basic information needed to begin a career in the biomedical sciences. Teaching focuses on the student's understanding of basic biological principles and knowledge required for advanced elective courses provided by participating programs in later years. This program teaches students the principles of experimental design and hypothesis testing, how to survey and evaluate the biomedical literature, research communications, and fundamental methods of research. The students are introduced to the principles and practice of scientific method emphasizing contemporary research topics and innovative technologies.

In their first year, students will complete three-semester of core courses that integrate basic science principles at all levels. The courses include a combination of lectures and interactive seminars that focus on contemporary research topics by reference to the biomedical research literature. In addition, students learn about the wide variety of research activities being conducted by the graduate faculty that allows them to complete three, hands-on laboratory rotations. At the end of their first year, students then choose the specific program of study (major) in which they desire to earn the Ph.D. degree and complete additional requirements.

### Fall Semester

#### **SGSS 8021 Biochemistry & Gene Regulation (5 Credit Hours)**

**Prerequisite:** Acceptance into the School of Graduate Studies

**Description:** One semester course includes metabolism; enzyme structure, kinetics and mechanisms; RNA, DNA, and protein biogenesis; DNA repair and recombination; cell cycle control, cancer genetics. Classroom time includes lectures, discussions, and demonstrations using traditional and alternative teaching methods.

**Grading System:** ABCDF

### **SGSS 8022 Molecular Cell Biology (5 Credit Hours)**

**Prerequisite:** Acceptance into the School of Graduate Studies

**Description:** This course focuses on the study of the cell as the fundamental structural and functional unit of which all living organisms are constructed. Cell Biology serves as a bridge between molecular biology, basic biochemistry, physiology, and morphology at the gross anatomical level and is increasingly a principle area of focus for biomedical research. In this course, the properties of cells are analyzed initially by viewing the structural organization, functional interactions, and biogenesis of cellular components with particular emphasis on understanding of processes involved in regulating the specific composition and interactions of cellular organelles. This forms a basis for the subsequent consideration of cell-cell interactions at the cellular and the tissue level. One semester course classroom time includes, lecture discussions, and demonstration using traditional and alternative teaching methods.

**Grading System:** ABCDF

### **SGSS 8011 Responsible Conduct of Research (1 Credit Hour)**

**Prerequisite:** Acceptance into the School of Graduate Studies

**Description:** This course will provide an overview, via lecture and discussion, of critical issues related to the responsible conduct of research. In addition, it will fulfill the requirements established by the Office of Research Integrity and the Public Health Service for ensuring that PHS-supported researchers are provided adequate instruction in conducting responsible research and ensuring integrity of the research record.

**Grading System:** ABCDF

### **SGSS 8012 Scientific Communication (1 Credit Hour)**

**Prerequisite:** Acceptance into the School of Graduate Studies

**Description:** This course focuses on writing and presentation skills needed for a career in biomedical sciences. It provides basic instruction in writing abstracts, curriculum vitae, and grant applications as well as how to organize and give oral scientific presentations. Also covered are basic aspects related to teaching skills needed in the biomedical classroom and laboratory.

**Grading System:** Satisfactory/Unsatisfactory

### **SGSS 8040 Introduction to Faculty Research (2 Credit Hours)**

**Prerequisite:** Acceptance into the School of Graduate Studies

**Description:** An introduction to all of the research topics currently being conducted by biomedical sciences graduate faculty (first half of semester only.)

**Grading System:** Satisfactory/Unsatisfactory

### **SGSS 8050 Introduction to Research I (2 Credit Hours)**

**Prerequisite:** Acceptance into the School of Graduate Studies

**Description:** Individualized instruction in a research or core laboratory. Students should master at least one laboratory technique and become familiar with the various activities of the laboratory (second half of the semester only). Students complete three, 3-week long laboratory rotations by working 10-20 hr/week in the laboratory of a graduate faculty member.

**Grading System:** Satisfactory/Unsatisfactory

## **Spring Semester**

### **SGSS 8033 Integrative Systems Biology (6 Credit Hours)**

**Prerequisite:** Acceptance into the School of Graduate Studies

**Description:** One semester course includes basic anatomy, physiology, and pharmacology of all the organ systems. Special topics also covered include integrated biosystems and feedback, physiological genomics, modern drug discovery, and hot research topics. Classroom time includes lectures, discussions and demonstrations using traditional and alternative teaching methods.

**Grading System:** ABCDF

### **SGSS 8060 Introduction to Research II (4 Credit Hours)**

**Prerequisite:** SGSS 8050

**Description:** Individualized instruction in two research or core laboratories. For each laboratory, students should master at least one laboratory technique and become familiar with the various activities of the laboratory. Students will spend half of the semester in each laboratory. Two rotations divided evenly over the term; 10-20 hr/week working in the laboratory of a graduate faculty member.

**Grading System:** Satisfactory/Unsatisfactory

## **Selectives- Student must select one option from the following:**

### **SGSS 8210 Fundamentals of Oncology (4 Credit Hours)**

**Prerequisite:** Satisfactory completion of the first semester of the biomedical sciences core curriculum, or permission of the course director.

**Description:** As the first semester of a two-semester course sequence, this course covers fundamental aspects of cancer biology with emphasis on the etiology of cancer, natural history of neoplasia, epidemiology of human malignancies, host-tumor relationships, immunobiology and principles of chemotherapy and radiotherapy.

**Grading System:** ABCDF

### **SGSS 8080 Neuroscience I (4 Credit Hours)**

**Prerequisite:** SGSS 8022 Molecular Cell Biology is required.

**Description:** Presentations of clinical cases will illustrate the need to understand basic neuroscience principles. These presentations will be followed by a rigorous treatment of the basic neuroscience from the organization of neural systems, to synapses, to molecular mechanisms. Each section will include a discussion of classic papers in the field and relevant current neuroscience research. Neuroscience I will cover the cell and molecular biology of neurons and synapses, motor systems, somatosensory, vision, audition, chemical senses, taste and olfaction, glia and neuroimmunology, regulatory, autonomic and neuroendocrine systems.

**Grading System:** ABCDF

### **SGSS 8092 Fundamentals of Genomic Medicine (4 Credit Hours)**

**Pre-requisite:** SGSS 8021, SGSS 8022, or approval from course director

**Description:** This course will provide a theoretical framework for understanding the fundamental concepts of mammalian genetics, functional genomics and bioinformatics as well as advanced technical and biological tools used in today's biomedical research environment. The course will provide lectures on a wide range of classical and modern topics such as classical genetics, linkage analysis, genetic mapping, positional cloning, genomics, proteomics and bioinformatics. The focus of the course will be to understand the experimental identification of genes responsible for disease and modern applications of genomics and proteomics to understanding biological processes as well as their impact on modern medicine.

**Grading System:** ABCDF

### **SGSS 8065 Critical Analysis of the Mechanisms of Disease (4 Credit Hours)**

**Pre-requisite:** SGSS 8021, SGSS 8022, or approval from course director

**Description:** This interdisciplinary course is designed to teach students how to read and analyze literature in the context of introducing students to the pathophysiological basis of disease. Emphasis is placed in three major areas: immunology, microbiology, and the biology of proteins. Class time includes a mixture of traditional lectures to cover background material along with student discussion of the primary literature.

**Grading System:** ABCDF

## **Summer Semester**

### **STAT 7070 Biomedical Statistics (3 Credit Hours)**

**Pre-requisites:** Satisfactory completion of the first and second semesters of the biomedical sciences core curriculum, college algebra (calculus highly recommended) or prior approval of course director.

**Description:** This course offers an introduction to the majority of statistical techniques used to analyze and interpret data in the biomedical sciences and related fields. Emphasis is on applications of these methods, with the following topics covered: graphical methods, probability, discrete and continuous distributions, inferential statistics (estimation and hypothesis testing for the one and two-sample case) for numeric and categorical data, non-parametric methods, one-way ANOVA, simple linear regression, correlation, factorial ANOVA (fixed and random effects), multiple linear regression and correlation, ANCOVA, logistic regression, longitudinal data analysis, and survival analysis.

**Grading System:** ABCDF

### **SGSS 9210 Investigation of a Problem (9 Credit Hours)**

**Pre-requisite:** Satisfactory completion of the first and second semesters of the biomedical sciences core curriculum.

**Description:** Laboratory research in major advisor's lab. Please choose an additional lab rotation ONLY if you have not been able to reach a decision on a major advisor yet.

**Grading System:** Satisfactory/Unsatisfactory