MBS-Multidisciplinary Biomedical Science

MBS 601. Molecular and Cell Biology. 4 Hours.
This course will provide a broad but rigorous overview of molecular biology. Cell structure between prokaryotes and eukaryotes will be compared and contrasted. DNA structure/organization will be discussed with respect to replication and repair mechanisms. Mendelian, non-Mendelian and chromosomal bases of genetics will also be discussed. Transcription and translation will be discussed in detail, along with their respective regulatory mechanisms. Throughout this course there will be a focus on intracellular organelles that contribute to the generation and regulation of DNA, RNA and protein. Finally, when possible, relevance to human disease will be presented and discussed.

MBS 602. Biochemistry and Cell Biology. 4 Hours.
This course will cover the structure, function and metabolism of biological macromolecules including proteins, carbohydrates, lipids and nucleotides. A rigorous overview of pathways will be discussed that are important for the effective metabolism of macromolecules (e.g., glycolysis, citric acid cycle) and generation of energy for cells. The last part of this course will discuss membrane structure and function, and will provide an overview of eukaryotic cell signaling.

MBS 603. General Human Physiology. 4 Hours.
This course begins with the study of basic cell function, then proceeds to a rigorous overview of specific human organ systems.

MBS 611. Foundations of Pharmacology & Toxicology. 3 Hours.
This course will provide students with an overview of the discipline of Pharmacology or the science of the mechanism and regulation of drug action. Processes will be discussed that are affect most drugs and xenobiotics including absorption, distribution, metabolism and elimination. The course will provide students with concepts that will be applicable to understanding the activity and regulation of drugs discussed in the Systems Pharmacology courses. Concepts presented in the course will be advantageous to all students in understanding therapeutic drug use or in appreciating drug use and action in many different research settings.

MBS 612. Systems Pharmacology I. 3 Hours.
This course will introduce the student to the use, mechanism of action and physiological properties of major families of drugs that affect the cardiovascular system, autonomic nervous system (ANS) and central nervous system (CNS). Lectures will provide an overview of nervous/cardiovascular system physiology as well as pathophysiology that results from various diseases, disorders and injuries. Drugs used to treat these conditions and their mechanisms of action will be described in detail. Both classical drugs and newer classes of drugs will be discussed for both their therapeutic value and also their use in different research settings. This course will be taught using a combination of traditional didactic lectures and student participation through discussion of seminal research papers and presentations. This course is a companion course to BMS 613 (Systems Pharmacology II).

MBS 613. Systems Pharmacology II. 3 Hours.
This course will introduce drug use, mechanism of action and physiological properties of major drug families, with a focus on specific organ systems (endocrine, gastrointestinal and renal systems). In addition, this course will also cover specific classes of drugs for cancer treatment specifically related to the organ systems covered in the course. This course is divided into three “modules”. Each module has its own exam. In addition, there are graded student presentations at the end of the semester, topics of discussion to be determined. This course is a companion course to MBS 612 (Systems Pharmacology I).

MBS 614. Toxicology and Drug Development. 3 Hours.
This course is designed to provide students with an introduction to the field of toxicology and its association with pharmacology. This course will also provide an overview of the thought processes associated with defining drug targets and developing drug candidates. The course is separated into two modules: 1) introduction to toxicological issues associated with the drug and xenobiotic exposure; 2) introduction to the process of identifying a drug target, and developing and validating a drug that pharmacologically interacts with the target.

MBS 696. Special Topics. 1-3 Hour.
To be determined by the Program Director and prospective Course Directors.

MBS 697. Colloquium in Biomedical Science. 1 Hour.
This required colloquium course will be taught using a journal club format. Students will be taught to critically review scientific literature, while gaining effective written and oral scientific communication skills. Students working in small groups will be responsible for choosing a current biomedical research article and sharing their review of this article in a Power Point (PPT) presentation. Student audience members will be responsible for asking questions during the presentation and for submitting a review of each article in abstract form. The Course Director will provide initial instruction in the critical review, presentation and written summary of scientific literature. Topics to be covered include: critical review (background and rationale for study; identification of hypothesis; description of methods used; presentation of results and their interpretation; indicate significance of study and describe next step experiments), effective communication of research articles via Power Point presentations; and writing assignments based on articles discussed in class. When possible, scientific integrity in research will be a focus of in-class discussions.

MBS 698. Non-Thesis Research. 1-6 Hour.
Students may perform independent study in a research laboratory setting. This work may contribute toward concentration credits subject to Program Director approval.

MBS 699. Thesis Research. 1-6 Hour.
Supervised independent research.