

Course BSR1800 (G301)

# SYSTEMS BIOMEDICINE

## *Molecules, Cells and Networks*

Core Course for the Systems Biology of Disease and Therapeutics (SBDT) Training Area



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### COURSE MODULES

INTRO | DIABETES | CANCER | RENAL | DRUG ABUSE

COURSE DIRECTOR:

**Jeanne P. Hirsch, PhD, Associate Professor**  
Department of Pharmacology and Systems Therapeutics  
Mount Sinai School of Medicine

### 6 CREDIT COURSE

#### Course Dates:

August 27, 2012 to December 14, 2012

#### Location:

Annenberg Building  
19<sup>th</sup> Floor, Room 19-50

Department of Pharmacology and Systems Therapeutics  
Mount Sinai School of Medicine  
New York, New York 10029

### COURSE CONTENT AND FEATURES

- Integrates molecular biology with physiology and systems biology
- Integrates computational methods with core molecular/cellular concepts
- Translational perspective
- Active-learning
- Problem set based
- Integrated journal club

#### LECTURE TOPICS

##### Module 1: Introduction

- Responsible Conduct of Research
- Protein Structure
- Membrane Transport
- Physiological Homeostasis
- Introduction to MatLab
- Enzyme Kinetics
- Receptor Binding
- MatLab Workshop: Simulation of Enzyme Kinetics
- Classical Genetics
- Transcription
- Protein Translation
- Advanced Genetic Techniques
- Epigenetics
- Analysis of Large Datasets

##### Module 2: Diabetes

- Overview of Metabolism
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- RTK Signaling
- Glucose Metabolism
- Organ Cross-talk in Pathogenesis of Diabetes
- Fatty Acid Metabolism
- Mitochondrial Energetics and Insulin Secretion
- Genetics of Diabetes
- Drug Strategies
- MatLab Workshop: Modeling Metabolism

##### Module 3: Cancer

- Growth Control: Cell Cycle and Apoptosis
- MatLab Workshop: Modeling the Cell Cycle
- Oncogenes and Tumor Suppressors
- Cancer Genetics
- Signaling Pathways in Cancer
- Metastasis
- Use of Model Organisms in Studying Cancer
- Cancer Pathology
- MatLab Workshop: Chemotherapeutics
- Chemotherapeutics
- Cancer Epidemiology
- Cancer Biology

##### Module 4: Renal

- Renal Physiology
- Cytoskeleton in Polarized Epithelium
- Disease of Renal Podocytes, Cytoskeleton Disorders, Cytoskeleton and Cell Shape
- Actin Regulation in Podocyte Disease
- Introduction to Channelopathies
- Channel Disorders: Barter and Liddle's Syndromes
- Modeling Signaling Pathways, Cytoskeleton and Cell Shape
- Implication of Network Analysis in Disease

##### Module 5: Drug Abuse

- Receptors, Transporters and Signaling
- Neurocircuitry in Addiction/Genetics of Addiction
- Channels and Transporters in Addiction
- Synaptic and Structural Plasticity
- Optogenetic and Virogenetic Techniques in Addiction Research
- Introduction to Animal Models of Addiction
- Neuroimaging of Receptors and Transporters
- Systems Biology Methods to Study Addiction
- Modeling in Addiction Signaling
- Clinical Perspectives on Drug Addiction Disorders



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