Course BSR1800 (G301)

SYSTEMS BIOMEDICINE
Molecules, Cells and Networks

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

FALL 2012

6 CREDIT COURSE
Course Dates: August 27, 2012 to December 14, 2012
Location: Annenberg Building 19th Floor, Room 19-50
Department of Pharmacology and Systems Therapeutics Mount Sinai School of Medicine

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
- Overview of Diabetes
- 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
- Neurocircuity in Addiction/Genetics of Addiction
- Channels and Transporters in Addiction
- Synaptic and Structural Plasticity
- Opiogenetic 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

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

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