PHCO 701 Introduction to Molecular Pharmacology

Effective term: Fall
Course units/hours: 3 credit hours M/W/F 9:00am-9:50am in 4007 Genetic Medicine Bldg.
Grading basis: (GRAD – H,P,L, F)
Course Component: (lecture or lab) lecture

Course Description:
This is a graduate-level first year course outlining the basics of molecular pharmacology, including molecular biology, bioinformatics, drug/receptor interactions, receptor and ion channels, regulation of second messengers, drug metabolism and system pharmacology. Permission of the instructor required for registration. Three credit hours a week.

Course objectives (learning outcomes):

The objectives of this course are to provide graduate students in biomedical research programs familiarity with the molecular principles of pharmacology involved in the design and action of drugs. Students will increase critical thinking skills in the context of the specific topics listed in the syllabus, which includes molecular biology underlying drug development, key drugable pathways and the interactions between drugs and human body. By the end of this course students should be familiar with molecular principles of drug development including knowledge of gene expression pathways related to drugs, key drugable targets and the interaction between drugs and their receptors. Students should have working knowledge sufficient to apply those principles to new research topics and to propose appropriate strategies to solve relevant research questions.

Course Assignments:
Reading assignments may be posted by the individual instructors and will be a combination of review articles, research papers of seminal importance to the field, and recent research articles of significant impact. There may be written assignments, including quizzes/homework and short essay-style exams designed to test both the assimilation of the readings and the application of principles to new scientific scenarios posted by individual instructors.

Assessments:

Achievement of course objectives and individual student grades will be determined from one take home project and two in-class exams at the end of each of three modules. By the end of the course, the students should have a good understand the principles of drug development and able to use the tools and knowledge introduced in the course in a new scientific questions related to drug actions. The students should also demonstrate a working vocabulary in the field and have a working knowledge of the pharmacologic principles.

Course Director: **Zefeng Wang**
Monday/Wednesdays/Fridays 9:00 - 9:50 AM, 4007 Genetic Medicine

Syllabus

Topic	Lecture hours	Block Leader
I. Genes to Protein/Molecular Biology	13	Zefeng Wang
II. Drugable molecular pathways	10	Lee Graves
III. Principles of Drug/Receptor Interactions	10	Terry Kenakin
IV. System pharmacology	7	Tim Elston

Date	Description of Lecture	Instructor
I. Genes to Protein/Molecular Biology		
W Aug. 21	Introduction to Course / Molecular Biology and Bioinformatics I : Genes and Genomes	Zefeng Wang
F Aug 23	Molecular Biology and Bioinformatics II: Gene Expression and new sequencing technology	Zefeng Wang
M Aug 26	Basic statistics or algorithms in bioinformatics	Shawn Gomez
W Aug 28	Gene expression analysis	Shawn Gomez
F Aug 30	Protein expression, Purification and Structure Determination	Mischa Machius
W Sept 4	Structural Bioinformatics	B. Temple/ Mischa Machius
F Sept. 6	Bioinformatics III: Proteins structure database /PDB search and visualization	B. Temple
M Sept. 9	Transcriptional Regulation as a Therapeutic Target	Zefeng Wang
W Sep 11	Student Projects assigned.	
W Sept 11	Post-transcription of gene regulation	Zefeng Wang
F Sept. 13	Gene Manipulation techniques/Macromolecular Therapeutics	Zefeng Wang
M Sept. 16	Genetic screens-RNAi screens and phenotype analysis	Gary Johnson
W Sept. 18	Student Project Presentations (group 1 and 2)	
F Sept. 20	Student Project presentations (group 3 and 4)	
II. Drugable molecular pathways (Receptors/ Ion Channels and Regulation of Second Messengers)		
M Sept. 23	Overview of signal transduction	Lee Graves
W Sept. 25	Receptor Tyrosine Kinases	Lee Graves
F Sept. 27	Chemical genetics	Bryan Roth
M Sept. 30	Neuroreceptors and Neuropharmacology	Bryan Roth
W Oct. 2	Activation of PKA by cAMP and regulation of cAMP by cyclase and PDEs	Lee Graves
F Oct. 4	Cell cycle regulation	Jean Cook

M Oct. 7	Ion Channels	Tom Kash
W Oct. 9	Activation and inactivation of Ras-family GTP binding proteins	Channing Der
F Oct. 11	GPCRs	Henrik Dohlman
M Oct.14	Activation and inactivation of G proteins; Introduction to effectors and second messengers	Henrik Dohlman
W Oct.16	Calcium: its regulation and its targets	Ken McCarthy
F Oct 18	FALL BREAK (NO CLASS)	
M Oct. 21	EXAM II (In-class: 8:00AM – 9:50AM)	
III. Principles of Drug/Receptor Interactions and Drug Metabolism		
W Oct. 23	Drug receptor interactions	Terry Kenakin
F Oct 25	Drug receptor interactions	Terry Kenakin
M Oct 28	Drug receptor interactions	Terry Kenakin
W Oct 30	Drug receptor interactions	Terry Kenakin
F Nov 1	Pharmacokinetics I	Klaus Hahn
M Nov. 4	Pharmacokinetics II	Klaus Hahn
W Nov. 6	Pharmacokinetics III	Klaus Hahn
F Nov 8	Drug Metabolism I	John Sondek
M Nov. 11	Drug Metabolism II	John Sondek
W Nov. 13	EXAM III (In-class: 8:00AM – 9:50AM)	
IV. Systems Pharmacology		
F Nov 15	Introduction to systems biology and its implication on drug development	Bryan Roth/Tim Elston
M Nov. 18	Modeling of Cell Signaling/Systems Biology/ Polypharmacology I	Tim Elston/Terry Kenakin/Shawn Gomez/Denis Tsygankov
W Nov. 20	Modeling of Cell Signaling/Systems Biology/ Polypharmacology II	Tim Elston/Terry Kenakin/Shawn Gomez/Denis Tsygankov
F Nov. 22	Data acquisition by imaging analyses I	Denis Tsygankov
M Nov 25	Data acquisition by imaging analyses II	Denis Tsygankov
M Nov 25	Student project assigned	
W Nov 27	Thanksgiving BREAK (NO CLASS)	
F Nov 29	Thanksgiving BREAK (NO CLASS)	
M Dec 2	Student Project Presentations (Groups 1 and 2)	
W Dec. 4	Student Project Presentations (Groups 3 and 4)	