

PHCO 701

Short title Molecular Pharmacology

Long title 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.

Block 1: Pharmacological Targets Block Leader: Dohlman			
1	8/21/2019	Kenakin	Introduction / Pharmacological Targets
2	8/23/2019	Sondek	History of Pharmacology
3	8/26/2019	Dohlman	Pharmacology I
4	8/28/2019	Dohlman	Pharmacology II
5	8/30/2019	Roth	GPCRs
	9/2/2019	Labor Day	
6	9/4/2019	Roth	GPCRs
7	9/6/2019	Arnold	Exam 1
Block 2: Signaling Pathways Block Leader: Kenakin			
8	9/9/2019	Graves	Kinase networks / Receptor kinases
9	9/11/2019	Graves	Second messengers
10	9/13/2019	Sondek	Calcium
11	9/16/2019	Sondek	Membrane Biology
13	9/18/2019	Cox	Ras family of small GTPases
14	9/20/2019	Kenakin	Biased signaling?
			Take Home Exam 2
Block 3: Technology and Systems Pharmacology Block Leader: Hahn			
15	9/23/2019	Roth	Technology
16	9/25/2019	Graves	The Application of Mass Spectrometry in Pharmacology
17	9/27/2019	Pinkin	Chemical Biology in Drug Discovery
18	9/30/2019	Legant	Modern Fluorescence Microscopy
19	10/2/2019	Hahn	Molecular Imaging Tools
	10/4/2019	Kenakin	EXAM 3
Block 4: Informatics and Modeling Block Leader: Elston			
20	10/7/2019	Brown	Protein Expression, Purification, Characterization, and Interactions
21	10/9/2019	Brown	Protein Structure Determination and Structural Bioinformatics
22	10/11/2019	Elston	Modeling of Signaling networks
23	10/14/2019	Gomez	Analysis of Signaling Networks
24	10/16/2019	Kenakin	Fitting data to models to predict activity
25	10/18/2019	Johnson	Precision Medicine
26	10/21/2019	Roth	Introduction to Systems Biology
27	10/23/2019	Kenakin	EXAM 4
Block 5: Emerging Therapies Block Leader: Graves			
28	10/25/2019	Emanuele	Cell Cycle Regulation
29	10/28/2019	Emanuele	Developing a Cell Cycle small Molecule
30	10/30/2019	Dohlman	Genetic therapy
31	11/1/2019	Bryant	Cancer Metabolism
32	11/4/2019	Song	Stem cell therapy
33	11/6/2019	Duncan	Principles of Biologic Therapy
34	11/8/2019	Der	Cancer Immunotherapy
35	11/11/2019	Der	Mechanisms of Resistance to targeted therapies
			TAKE HOME EXAM 5
Block 6: Genetics and Epigenetics Block Leader: Calabrese			
36	11/13/2019	Calabrese	Genome structure and Diversity
37	11/15/2019	Calabrese	Transcriptors
38	11/18/2019	Dominguez	Splicing
39	11/20/2019	Dominguez	siRNA / Antisense / CRISPR
40	11/22/2019	Calabrese	Non coding RNA
41	11/25/2019	Samulski	Gene Therapy
	11/27/2019	Thanksgiving Break	
	11/29/2019	Thanksgiving Break	
42	12/2/2019	Kenakin	EXAM 6