COURSE SYLLABUS

PHOL 401A & 401B: Physiology and Biophysics of Molecules and Cells

Monday and Wednesdays -- 2:30-3:50 PM
Fridays -- 3:40-5:00 PM
Rm E504 School Of Medicine

DATE	TOPIC	INSTRUCTOR
	PHOL401A (2 credit hrs)	
13-Jan	Protein purification and electrophoretic analysis	Surewicz
15-Jan	Basic tools for studying proteins: Optical Methods I	Surewicz
17-Jan	Basic tools for studying proteins: Optical Methods II	Surewicz
20-Jan	No Class	
22-Jan	Concepts in protein folding I	Surewicz
24-Jan	Concepts in protein folding II	Surewicz
27-Jan	Cell signaling proteins and their mode of action	Buck
29-Jan	Molecular modeling in protein research	Buck
31-Jan	Protein-small ligand interactions	Buck
3-Feb	Adaptor proteins and posttranslational modifications	Buck
5-Feb	Mechanoproteins	Buck
7-Feb	**Review**	Surewicz/Buck
10-Feb	**Exam 1**	
12-Feb	Physical properties of lipids and membranes	Ramachadran
14-Feb	Organization of lipids in membranes and protein-lipid interactions	Ramachadran
17-Feb	No CLASS	
19-Feb	NO CLASS	
21-Feb	Membrane remodeling	Ramachadran
24-Feb	Tools for studying biological membranes	Ramachadran
26-Feb	Membrane-dependent signaling	Ramachadran
28-Feb	Enzyme kinetics and thermodynamics	Chakrapani
2-Mar	The role of protein dynamics in enzyme action	Chakrapani
4-Mar	Structural tools: X-ray crystallography and NMR	Chakrapani/Buck
6-Mar	**Review**	Buck/Ramachadran/Chakrapani
9-Mar	**Exam 2**	
	PHOL401B (2 credit hrs)	
11-Mar	Introduction to Membrane Physiology	Schilling
13-Mar	Generation of transmembrane ionic gradients: P-type ATPases	Schilling
16-Mar	Structure and function of ion channels I: Ca^{2+} channels	Jones
18-Mar	Structure and function of ion channels II: Na^{+} and K^{+} channels	Jones
20-Mar	Gating and Single channel kinetics I	Chakrapani
23-Mar	Gating and Single channel kinetics II	Chakrapani
25-Mar	Membrane potentials and passive membrane electrical properties	Smith
27-Mar	Active membrane electrical properties	Smith
30-Mar	Excitability Computer Lab	Jones/Smith

1-Apr	Excitation-contraction Coupling	Schilling
3-Apr	**Exam 1**	
6-Apr	Synaptic transmission--Exocytosis/endocytosis I	Smith
8-Apr	Synaptic transmission--Exocytosis/endocytosis II	Smith
10-Apr	Synaptic transmission—Post-synaaptic mechanisms	Jones
13-Apr	Synaptic Transmission Computer Lab	Jones/Smith
15-Apr	Transmembrane Signaling via GPCRs and Enzyme-linked Receptors	Jones
17-Apr	Membrane protein biogenesis and ion channel misfolding diseases	Mu
20-Apr	Membrane protein biogenesis and ion channel misfolding diseases	Mu
22-Apr	Membrane protein biogenesis and ion channel misfolding diseases	Mu
24-Apr	Store-Operated Channels	Schilling
27-Apr	Review	
1-May	**Exam 2**	

COURSE DESCRIPTION AND GENERAL ORGANIZATION

PHOL401A/B--*Physiology and Biophysics of Molecules and Cells*--is a graduate-level introductory course designed to provide the fundamental principles of modern physiology, protein science and structural biology, and to prepare students for advanced courses in the biomedical sciences. The course is divided into 2 blocks that can be taken independently (PHOL401A and PHOL401B; 2 credit hrs each) or sequentially during the Spring semester of each year. The first block (401A) will cover the structure and function of proteins and lipids, and the organization of cellular membranes. Topics will include primary, secondary, tertiary and quarternary protein structure and analysis, enzyme kinetics, allostery and cooperativity, lipid membrane organization and domain structure, and protein-protein and protein-lipid interactions. The second block (401B) will cover molecular pathways and processes critical for cellular homeostasis, function, and signaling. Topics will include molecular mechanisms of transport across biological membranes and cellular compartments, ionic basis of the resting membrane potential, action potential generation and propagation, regulation of voltage-gated channels and electrogenic transporters, and membrane protein biogenesis and ion channel misfolding diseases.

EVALUATION AND GRADING

Meetings: Class will meet Mon & Weds from 2:30 to 3:50 PM (80 min) and on Fri from 3:40 to 5:00 PM

Format: Each session will predominantly involve student-led presentations/discussions of focus questions, problem sets, or original research/journal papers pre-assigned for that session. In addition, some sessions will be computer lab exercises and demonstrations that will reinforce basic concepts. Students will be expected to come prepared to lead and/or participate in the class discussion.

Class Participation: Each student will receive a cumulative evaluation grade (0-3; see below) for his/her preparation and presentations during the class discussion. The cumulative score for class participation will account for 20% of the final grade.

Class Presentation and Participation Scoring Guidelines:

3 = Very strong understanding of material; outstanding preparation; voluntarily generates relevant questions or comments during discussions.

2 = Generally correct answers; has clearly read material in detail; acceptable contribution to discussions.

1 = Inaccurate or incomplete answers; somewhat familiar with study material; participation in open discussion is limited.

0 = Unprepared or unable to contribute to discussion in a way that indicates familiarity or comprehension of the study material. Unexcused absence.

Exams: Two exams will be administered each block. Exams will consist of 5-7 essay type questions that will cover material presented over the previous 10 sessions. Each exam will account for 40% of the final grade.

Policy on Excused Absences: If a student misses a session for a valid reason (illness, family emergency, attendance at a scientific meeting) the course director must be informed by noontime on the missed day (at the latest) to provide an excused absence.

PARTICIPATING FACULTY

Course Directors

401A--Witold Surewicz (Physiology)	368-0139	witold.surewicz@case.edu
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Teaching Faculty

401A

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