

PSIO 503 Course Syllabus

Fall 2023

MTWR 9:15-10:45am Medical Research Building (MRB) Rm. 102

Course Coordinator: Ron Lynch (phone: 626-2472 or 784-1563; rlynch@email.arizona.edu)

The Course website is on D2L (<http://d2l.arizona.edu>). Login with your UA NetID login. You will be able to download slides, notes, readings, and problem sets as they are made available.

Description: This is a graduate course in cellular and molecular physiology focused on selected fundamental cellular processes integrated across diverse cell types. In addition to covering the topics listed below, emphasis is placed on understanding and evaluating scientific research papers. Students learn about the scientific method and are exposed (through readings and discussions) to many of the most common methods used in cellular and molecular physiology. At the end of the course, students should have acquired a thorough knowledge of the basics of cell function in preparation for more specialized courses and research experiences.

Course Outline

<u>Section</u>	<u>Lecturer(s)</u>	<u>Topic (s)</u>	<u>% Total Grade</u>
I	Coletta, Langlais Lynch	Genes, Proteins and the Intracellular Environment	26%
II	Ronaldson Boitano, Pires	Cell Membrane and Transport Mechanisms, G-Protein Receptor Signaling	26%
III	Eggers	Ion Channels and Synaptic Function	23%
IV	Lynch Pires	Muscle Function, Cell Signaling and Immune Interactions	25%



PSIO 503 COURSE INFORMATION

A. Grading and Exams. For **Section I**, **20% of the grade** will be associated with **the Problem Set and Discussion while 80% of the grade** will be based on the **Exam Score**. For **Sections II and IV**, grades will be tabulated as **90% for exam results and 10% for problem sets/discussion papers**. For **Section III (Eggers)**, **95% of the grade** will be associated with **the Exam and 5%** from the **Discussion**.

The final grade is determined from the % of lectures/discussion associated within each section which is indicated in the course outline (above). The instructors will discuss specific exam question formats and relative grading schemes (Points related to Exams, Quizzes and Problem Sets) during their section of the course.

There will NOT be a cumulative final exam.

B. Discussion Sessions and Problem Sets: Discussion sessions typically involve reading research papers. Student participation in discussion sessions is essential. Guiding questions / problem sets will be distributed to students prior to the Discussion. All problem sets are due prior to the Discussion session.

C. Textbook: An optional textbook for the course is: **Molecular Biology of the Cell (Alberts et al. 5th Ed.)**. In the past, many students have found that the textbook was not necessary for the course. Reading assignments will be provided for some sections of the course. The medical bookstore has this textbook for purchase, several copies are available in the medical library, and the course coordinator has a copy available for short-term checkout. **Note:** The previous edition of the Alberts text (4th edition) is available online from the National Center for Biotechnology Information (NCBI) website (Bookshelf section): (<http://www.ncbi.nlm.nih.gov/books/>). Type in “Alberts” in the search field.

D. Overall Grading Policy: Students should use the following as a **guide** to their progress in the course: **90% of total points** (total of section grades) = A; 80% = B; 70% = C. At the completion of the course, the actual scores may be curved if deemed appropriate by the instructors. If a mean +/- SD curve is applied, it will be done in favor of the students.

PSIO 503 Fall 2023 Lecture Schedule: MTWR 9:15-10:45 am Medical Research Building (MRB) 102		
Date	Title	Instructor
Section I: Genes, Proteins and the Intracellular Environment		
M (8/21)	Gene Expression—transcription	Coletta
T (8/22)	Gene Expression— translation	Coletta
W (8/23)	Post-trans modification	Coletta
R (8/24)	Molecular Biological Techniques	Coletta
M (8/28)	Molecular Biological Techniques	Coletta
T (8/29)	Proteomics and –Omic Analyses	Langlais
W (8/30)	Proteomics and –Omic Analyses	Langlais
R (8/31)	Discussion: Problem Set	Langlais
M (9/4)	Labor Day No Class Today	
T (9/5)	No Class Today	
W (9/6)	Fluorescence Microscopy and the Analysis of Cell Function	Lynch
R (9/7)	The Cytoskeleton; Cell-Cell and Cell-Matrix Interactions	Lynch
M (9/11)	The Intracellular Milieu; DISCUSSION	Lynch
T (9/12)	Protein sorting	Lynch
W (9/13)	Endocytosis, receptor cycling and regulation of cell pH	Lynch
R (9/14)	DISCUSSION: Tompkins et al. Protein Sorting / Lynch Review	Lynch
M (9/18)	Exam Section I (8:00-11:00 AM) Coletta/Lynch MRB 102	
Section II: Transport Mechanisms & G-Protein Receptor Signaling		
T (9/19)	Cell Membranes and Electrochemical Gradients	Ronaldson
W (9/20)	Principles of Passive Transport: Diffusion, Channels, and Carriers	Ronaldson
R (9/21)	Primary Active Transport	Ronaldson
M (9/25)	Secondary Active Transport	Ronaldson
T (9/26)	Blood Brain Barrier and Ronaldson Review	Ronaldson
W (9/27)	Epithelial transport: Regulation of salt & water transport	Boitano
R (9/28)	Epithelial transport: Methods and Signaling	Boitano
M (10/2)	DISCUSSION SESSION and Review	Boitano
T (10/3)	Introduction to Receptor Pharmacology	Pires
W (10/4)	Signaling & G proteins (cAMP, PI Cascades)	Pires
R (10/5)	G-proteins; b-arrestin, Epac	Pires
M (10/9)	Discussion Paper: Biased Signaling	Pires
T (10/10)	Signaling—receptor tyrosine kinases	Pires
W (10/11)	Nuclear receptors + Discussion	Pires
R (10/12)	Pires Review	
M (10/16)	Exam II (8:00-11:00 AM) MRB 102	
Section IV: Ion Channels and Synaptic Function		
T (10/17)	Ion channels and membrane currents	Eggers
W (10/18)	The resting membrane potential	Eggers
R (10/19)	Action potentials and conduction of the impulse	Eggers
M (10/23)	Function and diversity of voltage-gated channels	Eggers
T (10/24)	DISCUSSION SESSION	Eggers
W (10/25)	Chemical synaptic transmission	Eggers
R (10/26)	Presynaptic function	Eggers

M (10/30)	DISCUSSION SESSION	Eggers
T (10/31)	Function and diversity of ligand-gated channels	Eggers
W (11/1)	Synaptic Integration and Optogenetics	Eggers
R (11/2)	Synaptic Plasticity	Eggers
M (11/6)	DISCUSSION SESSION	Eggers
T (11/7)	Section III / NEURO REVIEW	Eggers
W (11/8)	STUDY DAY	
R (11/9)	Exam III (8:00-11:00 AM) MRB 102	
	Section IV. Muscle Function, Cell Signaling & Immune Interactions	
M (11/13)	Regulation of Cell Calcium and Subcellular Organization of Signaling Pathways I	Lynch
T(11/14)	Striated Muscle and Smooth Muscle	Lynch
W (11/15)	Smooth Muscle; DISCUSSION; Fay et al.	Lynch
R (11/16)	Phosphatase(s) and their regulation.	Lynch
M (11/20)	Gap junctions, intercellular signaling and vascular coupling	Pires
T(11/21)	Intercellular Signaling and the Regulation of Smooth Muscle Function	Pires
W (11/22)	THANKSGIVING DAY BREAK- No Classes	
R (11/23)	THANKSGIVING DAY BREAK- No Classes	
M (11/27)	Subcellular Organization of Signaling Pathways II	Pires
T (11/28)	Redox Signaling and Ischemic Disorders / Discussion	Pires
W (11/29)	Cell Cycle, Apoptosis and Autophagy	Lynch
R (11/30)	Organization of the Immune System; Innate & Adaptive Immunity	Lynch
M (12/4)	Immune System and Exercise	Simpson
T (12/5)	Immune System Discussion	TBD
W(12/6)	Review Session Pires/Lynch	
R (12/7)	Dead Day	
M (12/11)	Exam Section IV (8:00-11:00 AM) LYNCH MRB 102	