

PHOL/PHRM/NEUR/CLBY 466: CELL SIGNALING
Tuesdays and Thursdays: 3:30 – 5:00 PM
Remote Classes via Zoom
2021 SCHEDULE

DATE	TOPIC	FORMAT	INSTRUCTOR
Feb 2 (Tu)	G Proteins	Focus Questions	Dubyak
Feb 4 (Th)	G Proteins	Paper Critiques	Dubyak
Feb 9 (Tu)	G Protein-Coupled Receptors	Focus Questions	Dubyak
Feb 11 (Th)	G Protein-Coupled Receptors	Paper Critiques	Dubyak
Feb 16 (Tu)	2 nd Messengers: cAMP and cGMP	Focus Questions	Dubyak
Feb 18 (Th)	2 nd Messengers: cAMP and cGMP	Paper Critiques	Dubyak
Feb 23 (Tu)	2 nd Messengers: Phospholipids and Ca ²⁺	Focus Questions	Schilling
Feb 25 (Th)	2 nd Messengers: Phospholipids and Ca ²⁺	Paper Critiques	Schilling
Mar 2 (Tu)	Receptor Ion Channels	Focus Questions	Dubyak
Mar 4 (Th)	Receptor Ion Channels	Paper Critiques	Dubyak
Mar 9 (Tu)	Nuclear Receptors	Focus Questions	Mesiano
Mar 11 (Th)	Nuclear Receptors	Paper Critiques	Mesiano
Mar 16 (Tu)	University No Class Day	No Class	No Class
Mar 18 (Th)	R21 Proposal: Workshop- Goals & Process	Discussion	Dubyak
Mar 23 (Tu)	Exam 1: Midterm; Part A	Canvas Quiz	Faculty
Mar 25 (Th)	Exam 1: Midterm; Part B	Canvas Quiz	Faculty
Mar 30 (Tu)	MAP Kinase Signaling	Focus Questions	Qi
Apr 1 (Th)	MAP Kinase Signaling	Paper Critiques	Qi
Apr 6 (Tu)	Cytokine Receptors	Focus Questions	Levine
Apr 8 (Th)	Cytokine Receptors	Paper Critiques	Levine
Apr 13 (Tu)	Growth Factor Receptors	Focus Questions	Dubyak
Apr 15 (Th)	Growth Factor Receptors	Paper Critiques	Dubyak
Apr 20 (Tu)	Metabolic Signals: mTOR and AMPK	Focus Questions	Zhou
Apr 22 (Th)	Metabolic Signals: mTOR and AMPK	Paper Critiques	Zhou
Apr 27 (Tu)	Developmental Signaling	Focus Questions	Dubyak
Apr 29 (Th)	Developmental Signaling	Paper Critiques	Dubyak
May 4 (Tu)	Cell Death Signaling	Focus Questions	Dubyak
May 6 (Th)	Cell Death Signaling	Paper Critiques	Dubyak
May 11 (Tu)	Exam 2: Final; Part A	Canvas Quiz	Faculty
May 13 (Th)	Exam 2: Final; Part B	Canvas Quiz	Faculty
May 20 (Th)	R21 Grant Study Section	Discussion	Students/Faculty

COURSE DIRECTOR: George Dubyak, Dept. of Physiology and Biophysics, School of Medicine E520; phone: 368-5523; george.dubyak@case.edu

COURSE DESCRIPTION AND ORGANIZATION

This advanced-level course will focus on 12 major areas of signal transduction biology that are indicated on the accompanying schedule. **All classes will be held remotely via Zoom.** One topic will be covered per week. Each week will consist of:

- 1) 90 min presentation/discussion of 8-12 basic focus questions (on the Tuesday session)
- 2) 90 min presentation/discussion of two original research papers (on the Thursday session).

There are no lectures. Each session involves student-led presentations/ discussions of the focus questions or original research papers pre-assigned for that session. General format for these student-led paper discussion presentations: Students will be divided into 2 groups of 6-8 students/ group (depending on the final number of registered students). Each group will be responsible for presenting and leading discussions on one of the two original research papers at the Thursday session.

A midterm exam will cover the material presented in the initial 6 weeks while a final exam will cover the material presented in the final 6 weeks. **Each exam will be conducted as open-book Canvas Quizzes in two parts (A and B) on the Tuesday and Thursday session of each “exam week”; each exam part will cover 3 specific topics.** Exam questions will be administered in short-essay formats. The questions will emphasize the design or interpretation of experiments that will address problems or mechanisms posed in the question background.

Exam 1-Part A Topics: G proteins, G protein-coupled receptors; cAMP/cGMP 2nd messengers

Exam 1-Part B Topics: Phospholipid/Ca²⁺ 2nd messengers; Receptor ion channels; Nuclear receptors

Exam 2-Part A Topics: MAP kinases; Cytokine receptors; Growth factor receptors

Exam 2-Part B Topics: mTOR/AMPK; Developmental signals; Cell death signals

Because writing effective grant proposals to extend and amplify current areas of investigation is an important component of biomedical research, students will write a R21-style NIH grant proposal (5-6 pages) that will be based on a Cell Signaling research topic chosen by the student with approval by the course director. Key issues involved in organizing and writing a research proposal will be discussed in a workshop at the mid-point (March 18). The final version of the R21 grant proposal will be due on noon on Friday May 14 (after the second exam). Each student's R21 grant will be peer-reviewed by two other students and one faculty. The grants will be discussed and “scored” at a mock NIH study section (with students and faculty) on Thursday May 20.

EVALUATION AND GRADING

Exams: Each exam will consist of 6 essay type questions (1 question per major topic presented in the previous 6 weeks). Each exam will account for **42.5%** of the total grade.

R21-style Written Grant Proposal: 5-6 pages (single-spaced) with format described in the March 18 workshop. The final proposal will be graded by the course director on a 40 point scale with three major sections. The three scored sections are: 1) Development of Hypothesis and Specific Aims (0-10 pts); 2) Background and Innovation (0-10 pts); 3) Experimental Plan (0-20 pts). The grant proposal score will account for **15%** of the total grade.

Class Participation: Each student will receive a cumulative weekly evaluation grade (-1; 0; 1; see below) for his/her preparation/presentations in the Tuesday focus discussion sessions. The cumulative score for class participation will added (or subtracted) to the final numerical grade that is based on the exam scores (42.5% each) and R21 grant (15%).

Focus question presentation scoring metric:

+1: Student exhibits exceptionally strong understanding of the material and generates advanced-level insights during her/his presentation.

0: Student exhibits basic understanding of the material and provides an informative and well-organized presentation. (**This will be the usual score**)

-1: Student is absent (without excuse) or completely unprepared for in-class participation

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 missed day (at the latest) to provide an excused absence.

Final Grading:

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| 1) Midterm exam: | 45% of total grade |
| 2) Final exam: | 45% of total grade |
| 3) R21 Grant Proposal | 10% of total grade |
| 4) Modification of total numerical grade by class participation score: | -13 to +13 |

PARTICIPATING FACULTY

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