

## **BIOC/PHCO 744**

### **Short title**

Stem Cells

### **Long title**

Stem Cell Biology and Regenerative Medicine

**Effective term** Spring 2018

**Course units/hours** 2 credit hours

**Grading basis** (GRAD – H P L F)

**Course Component** Lecture and class discussion

### **Course Description**

This graduate-level course addresses key issues in stem cell biology and regenerative medicine while providing insights into important aspects of developmental biology, stem cell technology, and human disease. Experimental systems to be studied include human stem cells as well as the mouse, zebrafish, and *Drosophila* model systems. Cell types to be explored include iPS and ES cells, the nervous system, epidermis, intestine, and cardiovascular system. The role of stem cells in human oncogenesis and their therapeutic use in human disease will be discussed. The class format combines lectures and in-class discussion of assigned readings selected from both seminal works and recent articles. Students are expected to have taken courses in genetics, cell biology, and molecular biology or to have acquired knowledge in those fields.

### **Short Description**

This graduate-level course addresses key issues in stem cell biology and regenerative medicine with an emphasis on vertebrate embryonic development. The class emphasizes in-depth discussion of current literature and unanswered questions. This class is one of the “Contemporary Topics in Cell Signaling” modules (see BBSP courses page for details). Prerequisites include coursework in genetics, cell biology, and molecular biology.

### **Course objectives**

The objectives of this course are to provide graduate students in biomedical research programs familiarity with biological principles and modern approaches to the study of stem cells, regenerative medicine, and developmental biology. Students will increase critical thinking skills in the context of the topics discussed in the course. By the end of the course students should be familiar with the major paradigms in the field, with the research approaches and tools used to establish and extend those paradigms, and with the major unanswered questions under current investigation. Students should have working knowledge sufficient to apply those principles to emerging research topics, including their own graduate research, and to propose strategies to solve existing research questions.

### **Course Assignments**

Reading assignments will 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. At times, the instructor may ask the students to present in class their analysis of the reading assignment.

### **Assessments**

Achievement of course objectives and individual student grades will be determined from a combination of midterm and final written exams and class participation.

## Instructors

**Stephen Crews:** Professor, Biochemistry & Biophysics with expertise in *Drosophila* developmental neuroscience, cell signaling, and transcriptional control

**Adriana Beltran:** Director, Human Pluripotent Stem Cell Core Facility with expertise in cellular reprogramming, cellular differentiation and genome editing

**Jiandong Liu:** Assistant Professor: Pathology, Member of McAllister Heart Institute with expertise in zebrafish heart development and function

**Scott Magness:** Associate Professor, Medicine and Cell Biology & Physiology, and Biomedical Engineering, Member of Gastrointestinal Stem Cell Group with expertise in mammalian intestinal stem cells and tissue engineering

**Li Qian:** Assistant Professor, Pathology, Member of McAllister Heart Institute with expertise in mammalian heart regeneration and cardiac cell reprogramming

**Juan Song:** Assistant Professor, Pharmacology with expertise in mammalian adult neural stem cells

**Scott Williams:** Assistant Professor, Pathology with expertise in mammalian skin epithelium stem cell and cancer biology

## Class Schedule

9:30 am to 10:45 am (tbd)

GMB 3007 (tbd)

T	Feb 13	Williams	Concepts in stem cell biology
Th	Feb 15	Williams	Asymmetric division; cancer stem cells
T	Feb 20	Williams	Epidermal stem cells
Th	Feb 22	Williams	Epidermal stem cells - paper discussion
T	Feb 27	Crews	Transcriptional control of development
Th	Mar 1	Magness	Intestinal stem cells
T	Mar 6	Magness	Intestinal stem cells - paper discussion
Th	Mar 8	Magness/Qian	Organoids/single cell omics
T	Mar 20	Gracz	Liver stem cells
Th	Mar 22	Liu	Cardiac development
F	Mar 23	No class	Midterm take-home exam
T	Mar 27	Liu	Cardiac regeneration in a lower vertebrate
Th	Mar 29	Qian	Mammalian heart regeneration
T	Apr 3	Qian	Cellular reprogramming
Th	Apr 5	Beltran	Human embryonic and induced pluripotent stem cells
T	Apr 10	Beltran	Gene editing in human stem cells/CRISPR
Th	Apr 12	Crews	Neural stem cells
T	Apr 17	Crews	Neurodegeneration and neural stem cells
Th	Apr 19	Song	Adult neural stem cell neurogenesis
T	Apr 24	Song	Adult neural stem cells - paper discussion
Th	Apr 26	Tata	Lung stem cells
F	Apr 27	No class	Final take-home exam

