

## Biology 596: Stem Cell and Regenerative Biology

Tuesdays and Thursdays  
12:30-13:45, NLS 132

### **Instructor:**

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**Office Hours:** Tues., Thurs. 14:00-15:00

**Course Objectives:** The course will provide students with knowledge of wide-ranging topics related to stem cell and regenerative biology, including: a brief history of the field, research on animal models of regeneration, tissue engineering, and the political and ethical issues surrounding the stem cell debate. As part of the learning objectives of this course students will be able to:

- 1) List the properties that define a stem cell;
- 2) Explain how stem cells are derived for scientific research;
- 3) Compare and contrast tissue-specific stem cell types (e.g., blood, skin), and the basic mechanisms that regulate them;
- 4) List common and extrapolate potential clinical use(s) of stem cells;
- 5) Compare and contrast invertebrate and vertebrate animal models of regeneration research; and,
- 6) Assess the ethical and political issues related to stem cell research.

**Prerequisites:** Bio 366 is required for this course.

**Organization:** The course will be composed of two lectures per week. Students are expected to complete assigned readings prior to class. We will discuss 7-9 primary literature papers. All students should be ready to participate in class discussions and to provide, when required, a short written assignment that will be due at the beginning of the paper discussion.

### **Required reading:**

**StemBook.** StemBook is an open-access (free) collection of original, peer-reviewed chapters covering topics related to stem cell biology. Chapters required for class will be specified in the course schedule. StemBook can be accessed at <http://www.stembook.org>.

**NIH Stem Cell Information Home Page.** In *Stem Cell Information* [World Wide Web site]. Bethesda, MD: National Institutes of Health, U.S. Department of Health and Human Services. Available at <http://stemcells.nih.gov/index>.

Other required reading materials will be posted on Blackboard.

### **Additional resources and recommended reading:**

Lodish et al. *Molecular Cell Biology*. 6th Ed., W.H. Freeman & Co. 2008. This book is not required but it will come in handy to review concepts that will be discussed throughout the course. If you have completed the course prerequisites you should have a copy of this book. I am also working on making a copy available on library reserve.

Christopher Thomas Scott. Stem Cell Now. This book is written for a lay audience but it is an excellent primer for all of the topics that we will discuss during the course and provides an excellent historical overview. The paperback version of this book is inexpensive (\$11.70). Used copies can be found for a few dollars at most on-line book retail stores.

<http://www.hhmi.org/biointeractive/stemcells/index.html>

<http://www.cirm.ca.gov/about/default.asp>

<http://www.isscr.org/>

**Primary literature discussions:** Please read the assigned research papers and be prepared to discuss them in class. When assigned, you will have to write a summary of the article (no longer than two double-spaced pages; worth a total of 10 points) that should include:

1. A description of the major question, problem or technical issue addressed in the paper (2 points)
2. Identification of the hypothesis or idea leading the authors to perform the experiments described (2 points)
3. Selection and explanation of the experiment you think is the most important or interesting (2 points)
4. Identify any future or unanswered questions (2 points)
5. A proposal of a hypothesis to explain this new question(s) or identification of experiments that could address unanswered questions presented in the article (2 points)

Examples of this type of summary will be posted on Blackboard.

**Grading:** There will be three exams during the course. The exams will each cover one-third of the material, including basic concepts learned from discussion of the primary literature. Graduate students enrolled in the course will be required to contribute to in class explanation of advanced techniques related to the research articles.

The final cumulative grade will be based on:

Quizzes	5%
Papers and class participation:	20%
Midterm exam 1:	25%
Midterm exam 2:	25%
Final exam (non-cumulative):	25%

Final grades will likely be assigned according to a straight percentage distribution: A = 90-100%; B = 80-89.9%; C = 70-79.9%; D = 60-69.9%; F = <60%. The instructor may alter the grading scheme at his discretion.

**Make-up policy:** There will be no make-up exams or assignments unless the student provides a valid written excuse (e.g., a note from the doctor, etc.). Prior notice must be given to the instructor if possible or the instructor must be notified (preferably by e-mail) as soon as possible.

**Cell phones:** Please turn off your cell phones prior to lecture.

**Academic dishonesty:**

**Plagiarism** in any form will not be tolerated. No credit will be awarded for plagiarized work and students who plagiarize will be reported to the Judicial Procedures Office. If you are unclear of the definition of plagiarism, please see an Instructor or the University Catalog.

**Cheating** will not be tolerated. Students who cheat will be reported to the Judicial Procedures Office.

<b>Day</b>	<b>Month</b>	<b>Date</b>	<b>Topic</b>
Tues.	Sep.	1	Introduction to stem cells; Embryonic stem cells
Thurs.	Sep.	3	Embryonic Stem Cells
Tues.	Sep.	8	<b>Paper presentation I</b>
Thurs.	Sep.	10	Inducing pluripotency
Tues.	Sep.	15	<b>Paper presentation II</b>
Thurs.	Sep.	17	Epigenetics
Tues.	Sep.	22	<b>Paper presentation III</b>
Thurs.	Sep.	24	Adult stem cells & stem cell niches
Tues.	Sep.	29	<b>Paper presentation IV</b>
<b>Thurs.</b>	<b>Oct.</b>	<b>1</b>	<b>NO CLASS</b>
<b>Tues.</b>	<b>Oct.</b>	<b>6</b>	<b>Exam I</b>
Thurs.	Oct.	8	Neural Stem Cells
Tues.	Oct.	13	<b>Paper presentation V</b>
Thurs.	Oct.	15	Hematopoietic Stem Cells
Tues.	Oct.	20	<b>Paper presentation VI</b>
Thurs.	Oct.	22	Muscle and Cardiac Stem Cells
Tues.	Oct.	27	<b>Paper presentation VII</b>
Thurs.	Oct.	29	<b>NO CLASS</b>
<b>Tues.</b>	<b>Nov.</b>	<b>3</b>	<b>Exam II</b>
Thurs.	Nov.	5	Cancer Stem Cells
Tues.	Nov.	10	<b>Paper presentation VIII</b>
Thurs.	Nov.	12	Therapeutic Prospects; Tissue Engineering
<b>Tues.</b>	<b>Nov.</b>	<b>17</b>	<b>Short presentations I</b>
<b>Thurs.</b>	<b>Nov.</b>	<b>19</b>	<b>Short presentations II</b>
<b>Tues.</b>	<b>Nov.</b>	<b>24</b>	<b>NO CLASS</b>
<b>Nov. 26-28 Thanksgiving Recess</b>			
Tues.	Dec.	1	Animal Models of Regeneration
Thurs.	Dec.	3	<b>Paper presentation IX</b>
Tues.	Dec.	8	The Stem Cell Debate: Politics and Ethics
<b>Thurs.</b>	<b>Dec.</b>	<b>10</b>	<b>Exam III</b>