**Stem Cell Biology Syllabus**

**Course Identifiers**

**Course Number: BIOL 440**

**Department:** Biology

**Term:** Fall 2020

**Time:** 11:30 AM – 12:45 PM.

**Classroom:** ZOOM

**Professor:** Dr. Kacy Gordon

**Office:** Fordham 316

**Office hours:** By appointment

[**kacy.gordon@unc.edu**](mailto:kacy.gordon@unc.edu)

**Sakai site:**   
https://sakai.unc.edu/portal/site/stemcells

**Course Description:** Stem cells are important for a number of biological processes and have become topics of fascination in popular science and culture. This course will build from a solid foundation of genetics, cell, and developmental biology to give students a broad appreciation of stem cells in development, homeostasis, and disease. Students will understand key concepts in stem cell biology like potential and immortality as well as understand stem cells’ promise and limitations in therapeutic settings.

**Target Audience:** This course is for advanced biology majors and graduate students.

**Course Prerequisites:** The prerequisite for this course is BIOL202, Molecular Biology and Genetics. You may find having taken BIOL205 Cell and Dev Bio helpful, but it is not required.

**Course Goals and Key Learning Objectives:** This course will teach students to be broadly aware of what stem cells are and why they are important in biology and medicine. Goals:

* Compare and contrast stem cells and non-stem cells
* Give examples of stem cells in their biological contexts and medical potential
* Read and discuss primary literature about stem cells

**Course Requirements:** Reading and presenting scientific articles, discussing them on the course website and in class, and taking quizzes and exams.

**Grade breakdown:** Three exams (15% each), one quiz (5%), one presentation (20%) and weekly participation (30%, with 2% earned each week in live sessions and/or on Piazza).

Grading scale is traditional, with (-) and (+) at the bottom and top of ranges: A (90-100%), B (80-89%), C (70-79%), D (60-69%), F (below 60%).

**Course Policies:** There is no textbook for this course. Live class meetings are not mandatory, but the discussion will be helpful. Midterms will be open for 24 hours. The course final exam is given in compliance with UNC final exam regulations and according to the UNC Final Exam calendar.

**Course Resources:** This course has no textbook; pdfs/links to readings will be posted in “Resources” on Sakai. Please download these materials, as you are allowed to refer to them during midterms. Sakai will be used for exams and piazza will be used for discussion.

**Exams and Quiz:** There will be one quiz on the background/introductory lectures I will give asynchronously in weeks 1 and 2. There will be two noncumulative midterms and a noncumulative final exam. The quiz and three exams will be open note/open internet, but you are asked not to confer with one another. They will test your understanding of the intro lectures and the papers that you have read, presented, and discussed for class.

**Syllabus Changes:** The professor reserves the right to make changes to the syllabus. Changes to the syllabus will be announced as soon as possible via email and on the course website.

**Honor Code:** Students are expected to follow the Honor Code at all times, which means following directions given at exam time about what resources they are permitted to use.

**Dates:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Week | Date | Class meeting | Topic | Assignment | Project Due |
| 1 | **Tu, Aug 11** | **11:30 ZOOM** | Syllabus, Intro to SCs | Tech quiz, form groups | none |
|  | Th, Aug 13 | Asynch, Dr. G | Embryogen, Signaling | choose topics |  |
| 2 | Tu, Aug 18 | Asynch, Dr. G | Gene expression and, differentiation | start readings, plan approach with groups | Group 1-ECs |
|  | **Th, Aug 20** | **11:30 ZOOM** | Review/breakout rooms | background quiz on Sakai | DUE THURS |
| 3 | Tu, Aug 25 | Recorded Presentation | Embryonic stem cells | Chung et al., 2006 | Group 2- |
|  | **Th, Aug 27** | **11:30 ZOOM** | Embryonic stem cells | Chung et al., 2006 | IPSCs |
| 4 | Tu, Sept 1 | Recorded Presentation | Induced pluripotent SCs | Takahashi Yamanaka 2006 | Group 3- |
|  | **Th, Sept 3** | **11:30 ZOOM** | Induced pluripotent SCs | Takahashi Yamanaka 2006 | Niche |
| 5 | Tu, Sept 8 | Recorded Presentation | The stem cell niche | Kimble and White 1981 | Group 4- |
|  | **Th, Sept 10** | **11:30 ZOOM** | The stem cell niche | Kimble and White 1981 | Breast Cancer |
| 6 | **Tu, Sept 15** | **11:30 ZOOM** | Midterm review |  | Group 4- |
|  | Th, Sept 17 | 24+ h window | **MIDTERM 1** | **Take midterm** | optional |
| 7 | Tu, Sept 22 | Recorded Presentation | Breast cancer SCs | Al-Hajj et al., 2003 | Group 5- |
|  | **Th, Sept 24** | **11:30 ZOOM** | Breast cancer SCs | Al-Hajj et al., 2003 | Melanoma |
| 8 | Tu, Sept 29 | Recorded Presentation | Melanocyte SCs and cancer | Moon et al., 2017 | Group 6- |
|  | **Th, Oct 1** | **11:30 ZOOM** | Melanocyte SCs and cancer | Moon et al., 2017 | Intestine |
| 9 | Tu, Oct 6 | Recorded Presentation | Mammalian intestine | Farin et al., 2016 | Group 7- |
|  | **Th, Oct 8** | **11:30 ZOOM** | Mammalian intestine | Farin et al., 2016 | Neural |
| 10 | Tu, Oct 13 | Stud. Pres. | Neural stem cells | Kalladka et al., 2016 | Group 8- |
|  | **Th, Oct 15** | **11:30 ZOOM** | Neural stem cells | Kalladka et al., 2016 | Blastema |
| 11 | **Tu, Oct 20** | **11:30 ZOOM** | Midterm review |  | Group 8- |
|  | Th, Oct 22 | 24+ h window | **MIDTERM 2** | **Take midterm** | optional |
| 12 | Tu, Oct 27 | Recorded Presentation | Regeneration: blastema | Sandoval-Guzmán, Wang, Khattak, et al., 2013 | Group 9- |
|  | **Th, Oct 29** | **11:30 ZOOM** | Regeneration: blastema | Sandoval-Guzmán, Wang, Khattak, et al., 2013 | Heart |
| 13 | Tu, Nov 3 | Recorded Presentation | Zebrafish heart regeneration | Jopling et al., 2010 | Group 10- |
|  | **Th, Nov 5** | **11:30 ZOOM** | Zebrafish heart regeneration | Jopling et al., 2010 | Planarian |
| 14 | Tu, Nov 10 | Recorded Presentation | Planarian stem cells | Wagner et al., 2011 | none |
|  | **Th, Nov 12** | **11:30 ZOOM** | Planarian stem cells | Wagner et al., 2011 |  |
| 15 | **Tu, Nov 17** | **11:30 ZOOM** | Final review |  |  |
| EXAMS | Tu Nov 24 | Noon | **Final exam noon 11/24** |  |  |

**Group projects:** You will have one group presentation. Your first assignment is to form groups of 3-4 students using the discussion forum to find people who want to work in a compatible way. Email me with your suggested group composition on Weds CCing all group members; groups will be finalized by class time Thurs. Next, with your groups prepare and send me a ranked list of your preferences for which topic/date to claim. I will assign papers for each group to present. Groups should split work equitably and presentations should integrate the work of all members (separate videos are ok, but they should be labeled clearly in order, reference one another, and flow). Each presentation will probably be 20-40 mins total. Shorter and you’re likely not covering the material thoroughly; longer and you’re probably covering too much. Group presentations will be posted for viewing on Tues with the class discussion of those papers to take place Thurs at class time and/or asynchronously on Piazza (see below).

**Group project due dates:** Projects are due Tues before (ESCs-Thurs before) the week your topic is on the calendar (with flexibility for the groups presenting the week after midterms). This protects the flow of the class from delays and gives me a chance to review the presentations for completeness/correctness before they are viewed by the class. Upload via Sakai dropbox.

**Grading rubric for projects:** Your group project will be worth 20% of your class grade, (15% my evaluation via “professor rubric” which will be the same for every group mate and 5% averaged from your group mates’ evaluations of your work via “peer rubric”, see last page of syllabus). Peer rubrics are part of your “quality” presentation grade, and they are due at the time that your presentation is due. **If you are going to score a group-mate “Unsatisfactory” in any category—or if you yourself realize you are on track to perform in an unsatisfactory manner—please reach out to me before the presentation due date.** This is bound to be a strange and difficult semester; we don’t want to be punitive with classmates who are struggling. Still, fulfilling our obligations to one another is an essential signal of respect and consideration.

**Synchronous discussion:** We are not having live student presentations because too much can go wrong. However, we will have live discussions of the papers on during our scheduled class meeting time, Thurs **11:30-12:45**. **Attendance is optional** at the live discussions and the live review sessions (TUES of exam weeks) but counts for 1% participation credit if you attend. Having video on is also optional

**Asynchronous discussion:** This term we will be using Piazza for class discussion. The system is highly catered to getting you help fast and efficiently from classmates and me. Rather than emailing questions, I encourage you to post your questions on Piazza. You can choose to post anonymously to your classmates, but I will always be able to see who posted.

Find our class signup link at: [**https://piazza.com/unc/fall2020/biol440**](https://piazza.com/unc/fall2020/biol440)

Piazza will give you a chance to earn asynchronous participation points. Two substantive questions/answers/links per week will earn full participation credit (2% per week for a total of 30% of your final grade, with the option to drop the lowest two). One post/question per week plus participation in the synchronous discussion also earns complete participation credit.

**Statement of inclusivity:** Science is a group endeavor, and respectfully discussing ideas with others—including offering and receiving criticism in conversation with people who disagree—is a cornerstone of the scientific method. Key to these discussions is mutual respect. While all scientific ideas will be tolerated, statements that undermine the dignity of our classmates are antithetical to the spirit of open inquiry that is required for success in this class and in science more broadly. Please email me immediately if anything happens in a group session or breakout room that violates this ethos. You can leave a breakout room at any time.

**Counseling and Psychological Services**: CAPS is strongly committed to addressing the mental health needs of a diverse student body through timely access to consultation and connection to clinically appropriate services, whether for short or long-term needs. Go to their website: https://caps.unc.edu or visit their facilities on the third floor of the Campus Health Services building for a walk-in evaluation to learn more.

**Accessibility Resources & Services**: UNC-Chapel Hill facilitates the implementation of reasonable accommodations for students with learning disabilities, physical disabilities, mental health struggles, chronic medical conditions, temporary disability, or pregnancy complications, all of which can impair student success. See the ARS website for contact and registration information: https://ars.unc.edu/about-ars/contact-us

**Professor Grading Rubric**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Date:** | **Topic:** | **Review by Dr. Gordon** | **Review OF:** |  |
|  |  | **Average across 4 criteria:** |  |  |
| **Criteria** | **15 points** | **12 points** | **9 points** | **Unsatisfactory, 0 pts** |
| **Content** | Presentation included relevant material including background info not provided by assigned paper and excluded ancillary points appropriately | Presentation either included too many ancillary details or else not enough of background information for context | Presentation was missing at least one important aspect of the assigned paper but otherwise was complete | Presentation was missing multiple important aspects of the assigned paper |
| **Comprehension** | Group members demonstrated their understanding by raising new questions | Group members clearly communicated main points but faltered on some of the experimental details | Group members made an effort but explained incorrectly | Group members did not try to explain the assigned material |
| **Organization** | Presentation had a logical flow from inciting question to hypothesis to result | Presentation jumped around a bit, presenting some conclusions before results or presenting results without explaining | Presentation  failed to identify main question driving study | Presentation lacked organization and was a collection of figures only |
| **Quality** | Presentation was neat and turned in on time with all required elements | Presentation was not harmonized between its parts but was complete and on time | Presentation was turned in late but complete | Elements of the presentation were missing |

**Peer Grading Rubric**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Date:** | **Topic:** | **Review BY:** | **Review OF:** |  |
|  |  | **Average across 4 criteria:** |  |  |
| **Criteria** | **5 points** | **4 points** | **3 points** | **Unsatisfactory, 0 pts** |
| **Responsiveness** | Teammate responded to all messages within 24 h | Teammate responded to all messages, but was sometimes late | Teammate occasionally failed to respond | Teammate repeatedly failed to respond |
| **Responsibility** | Teammate completed agreed upon work in set time frame | Teammate made substantial progress on work but missed intermediate deadlines | Teammate completed work but not in time to integrate | Teammate failed to complete agreed upon work |
| **Comprehension** | Teammate mastered the material in the assigned paper and can clearly explain it to others | Teammate had some gaps in understanding that were identified within the group and ameliorated in time for presentation | Teammate did not clarify their understanding of material before the presentation deadline | Teammate did not understand their assigned task and did not find resources online, from Dr. G, or from classmates |
| **Quality** | Teammate's work was complete, neat, and clear | Teammate's work was complete but formatting had to be redone by group | Teammate's work was incomplete or sloppy, requiring substantial work by group | Teammate's work had to be redone by group |