

BISC 480: Biology of Development (USC Spring Semester 2025)

Units 4

Meeting times

Lec 2:00-3:20pm Tu Th : RRI 221

Lab 3:30-6:20 Tu: ZHS 458

Instructor:

Rusty Lansford, Ph.D.

Office Hours: By appointment

E-mail: lansford@usc.edu

TA Maggie Struble (E: strublem@usc.edu)

Course Description

Basic mechanisms of animal and human development are considered at different levels of analysis. Emphasis is on molecular, genetic, and cellular processes underlying vertebrate and invertebrate development. General concepts and evolutionary mechanisms are emphasized.

This course uses Flipped Classroom Pedagogy to create a more active learning environment inside and outside the classroom that appeals to students' broad diversity of individual learning styles. The flipped class inverts the traditional sequence of presenting instructional material and application so that students come prepared to interact with a classroom of peers and an instructor as they share, test, apply, and integrate the material with their prior knowledge. The students will be challenged to exchange their ideas in the classroom.

Students design and conduct development experiments using quail/zebrafish/algae as a model system. Techniques covered include embryology, immunofluorescence, transfection of DNA/RNA for cell labeling and gain or loss of function studies, pharmacological analysis, GFP transgenics, and microscopy techniques. This laboratory is designed as a true research experience and likely requires time outside the normally scheduled lab period. Students will practice the scientific process and document their work in a lab notebook.

Learning Objectives

Students who complete the course will be able to:

- Describe the molecular and cellular mechanisms that affect organism development
- Evaluate scientific literature relevant to developmental biology
- Describe how complex, environmental factors can affect development
- Develop research skills that include hypothesis development, data collection, statistical analysis, and presentation of results.

Reading List and Supplementary Material

Text: *Developmental Biology* (13th ed) by Michael J.F. Barresi and Scott F. Gilbert

Text website: devbio.com

Web Site: Course materials, additional readings, multimedia content, assignments, and announcements will be posted to Brightspace. You are responsible for checking the website.

Prerequisite:

Biological Sciences 220/221

Recommended preparation:

Biological Sciences 311 or 320, Molecular Biology

Permission of instructor can be requested if you still need to meet the prerequisites. Familiarity with basic chemistry and physics is assumed.

Course E-mails will be sent only to your official USC email address.

Assessment

Assignments	Points	Percentage
Midterm Exam 1	150	15%
Lab Research	200	20%
Midterm Exam 2	150	15%
Final Exam	200	20%
Independent Proposal	150	15%
In class Case Studies/Qu	150	15%

In-Class Participation

Reading or watching the assigned materials before each class is expected. Students are expected to attend the entirety of the class, listen attentively to the instructor and each other, and engage in respectful debate and dialogue. We will use Case Studies for an in-depth, multi-faceted understanding of a complex issue in its real-life context.

Communication

Dr. Lansford will be available Monday-Friday via email. There are no set office hours, but he will make himself available to meet with you via Zoom at a mutually agreeable time.

Course Syllabus

Week	Date	Lecture-Discussion Topics	Pre-Class Assignments (On Brightspace)	Lab
1	Jan 14	Class Intro/ Intro to Dev Bio	Ch. 1 Dev Bio	
	Jan 16	Specifying Identity	Ch. 2 Dev Bio	
2	Jan 21	Differential Gene Expression	Ch. 3 Dev Bio	R1. Introduction
	Jan 23	Cell-cell Communication	Ch. 4 Dev Bio	
3	Jan 28	Stem Cells	Ch. 5 Dev Bio	R2. Algae
	Jan 30	Sex Determination and Gametogenesis	Ch. 6 Dev Bio	
4	Feb 04	Fertilization	Ch. 7 Dev Bio	R3. Algae

	Feb 06	Early Development	Ch. 8 Dev Bio	
5	Feb 11	Invertebrate model systems	Ch. 10 & 11 Dev Bio	Study period
	Feb 13	MIDTERM 1		
6	Feb 18	Vertebrate model systems	Ch. 12-14 Dev Bio	R4. Zebrafish
	Feb 20	NT Formation and Patterning	Ch. 15 Dev Bio	
7	Feb 25	Brain Growth	Ch. 16 Dev Bio	R5. Zebrafish
	Feb 27	Neural Crest Cells	Ch. 17 Dev Bio	
8	Mar 04	Axonal Specificity	Ch. 17 Dev Bio	R6. Zebrafish
	Mar 06	Ectodermal Placodes	Ch. 18 Dev Bio	
9	Mar 11	Paraxial Mesoderm	Ch. 19 Dev Bio	Field Trip
	Mar 13	Intermediate and Lateral Plate Mesoderm	Ch. 20 Dev Bio	
	Mar 18, 20	SPRING BREAK		
10	Mar 25	Tetrapod limb	Ch. 21 Dev Bio	R7. Quail Intro
	Mar 27	Endoderm	Ch. 22 Dev Bio	
11	Apr 01	Compilation		Study period
	Apr 03	MIDTERM 2		
12	Apr 08	Metamorphosis	Ch. 23 Dev Bio	R8. Feather bud
	Apr 10	Regeneration	Ch. 24 Dev Bio	
13	Apr 15	Regeneration	Ch. 24 Dev Bio	R9. Feather bud
	Apr 17	Environmental DB	Ch. 25 Dev Bio	
14	Apr 22	Environmental DB	Ch. 25 Dev Bio	Field Trip
	Apr 24	Development and Evolution	Ch. 26 Dev Bio	
15	Apr 29	IP Presentations		IP Presentations
	Apr 31	IP Presentations		
	May 8	FINAL EXAM 2-4p		

* The syllabus may change slightly during the semester. Assignment due dates are firm.

Technological Proficiency and Hardware/Software Required

This course requires use of Blackboard. Assignments, announcements, and the discussion board will be hosted on the Blackboard platform. You will be required to access articles, movies, videos, and podcasts as necessary via a web browser.

USC Technology Rental Program

If you need resources to successfully participate in your classes, such as a laptop or internet hotspot, you may be eligible for the university's equipment rental program. To apply, please submit an [USC Technology Rental Program Application](#).

USC Technology Support Links

[Zoom information for students](#)

[Software available to USC Campus](#)

Course Policies

- 1) Exam dates are firm. There are no makeup exams in the course with prior written approval from the course instructor. Performance on the final may be prorated to substitute for a missing midterm exam, if an excuse considered valid by faculty is presented in a timely fashion. An acceptable written excuse or documentation must be provided to the faculty. The final exam will be administered only on the date and time set by the University.
- 2) Midterm exams will be returned to students within a week of the exam date. The final examination will not be returned but will be retained for one semester by the faculty.
- 3) Regrades: If you think an answer that you have provided was graded incorrectly or if there is an arithmetic error, you may seek a regrade. You must provide a written explanation of why you think your answer was graded incorrectly. Regrade requests are to be submitted to your TA. If a regrade is agreed upon, then the ENTIRE EXAMINATION may be subject to a regrade. Your grade may therefore go up, go down, or remain the same. Regrade requests must be received within one week of when the exam key is posted for midterms, or by the second week of classes the following semester for the final exam.
- 4) No special assignments for extra credit are permitted.
- 5) Academic integrity policies of the University will be strictly followed. Infractions can result in severe penalties. There may be assigned seating for exams. No student may be admitted to an exam after the first student has left the exam.
- 6) Any student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered to one of the Professors as early in the semester as possible. DSP is in STU 301 and is open 8:30 AM – 5:00 PM, Monday thru Friday, Phone number: 213-740-0776.
- 7) It may be necessary to adjust the syllabus during the semester. Check the course web site or class announcements on Blackboard for updates. **Exam dates will not be changed.**
- 8) Any questions or concerns regarding these policies should be addressed to the faculty.

Statement on Academic Conduct and Support Systems

Academic Conduct:

Plagiarism – presenting someone else’s ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in SCampus in Part B, Section 11, “Behavior Violating University Standards” policy.usc.edu/scampus-part-b. Other forms of academic dishonesty are equally unacceptable. See additional information in SCampus and university policies on Research and Scholarship Misconduct.

Students and Disability Accommodations: USC welcomes students with disabilities into all of the University’s educational programs. The Office of Student Accessibility Services (OSAS) is responsible for the determination of appropriate accommodations for students who encounter disability-related barriers. Once a student has completed the OSAS process (registration, initial appointment, and submitted documentation) and accommodations are determined to be reasonable and appropriate, a Letter of Accommodation (LOA) will be available to generate for each course. The LOA must be given to each course instructor by the student and followed up with a discussion. This should be done as early in the semester as possible as accommodations are not retroactive. More information can be found at osas.usc.edu. You may contact OSAS at (213) 740-0776 or via email at osasfrontdesk@usc.edu.

Support Systems:

Counseling and Mental Health - (213) 740-9355 – 24/7 on call
studenthealth.usc.edu/counseling

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.

National Suicide Prevention Lifeline - 1 (800) 273-8255 – 24/7 on call
suicidepreventionlifeline.org

Free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week.

Relationship and Sexual Violence Prevention Services (RSVP) - (213) 740-9355(WELL), press “0” after hours – 24/7 on call
studenthealth.usc.edu/sexual-assault

Free and confidential therapy services, workshops, and training for situations related to gender-based harm.

Office for Equity, Equal Opportunity, and Title IX (EEO-TIX) - (213) 740-5086
eeotix.usc.edu

Information about how to get help or help someone affected by harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants.

Reporting Incidents of Bias or Harassment - (213) 740-5086 or (213) 821-8298
usc-advocate.symplicity.com/care_report

Avenue to report incidents of bias, hate crimes, and microaggressions to the Office for Equity, Equal Opportunity, and Title for appropriate investigation, supportive measures, and response.

The Office of Student Accessibility Services (OSAS) - (213) 740-0776

osas.usc.edu

OSAS ensures equal access for students with disabilities through providing academic accommodations and auxiliary aids in accordance with federal laws and university policy.

USC Campus Support and Intervention - (213) 821-4710

campussupport.usc.edu

Assists students and families in resolving complex personal, financial, and academic issues adversely affecting their success as a student.

Diversity, Equity and Inclusion - (213) 740-2101

diversity.usc.edu

Information on events, programs and training, the Provost's Diversity and Inclusion Council, Diversity Liaisons for each academic school, chronology, participation, and various resources for students.

USC Emergency - UPC: (213) 740-4321, HSC: (323) 442-1000 – 24/7 on call

dps.usc.edu, emergency.usc.edu

Emergency assistance and avenue to report a crime. Latest updates regarding safety, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible.

USC Department of Public Safety - UPC: (213) 740-6000, HSC: (323) 442-120 – 24/7 on call

dps.usc.edu

Non-emergency assistance or information.

Office of the Ombuds - (213) 821-9556 (UPC) / (323-442-0382 (HSC)

ombuds.usc.edu

A safe and confidential place to share your USC-related issues with a University Ombuds who will work with you to explore options or paths to manage your concern.

Occupational Therapy Faculty Practice - (323) 442-3340 or otfp@med.usc.edu chan.usc.edu/otfp

Confidential Lifestyle Redesign services for USC students to support health promoting habits and routines that enhance quality of life and academic performance.