



**ZOO 4603**  
**Embryology/Development**  
Spring 2019



**Course Description**

We will study the mechanisms of morphological changes during embryonic development in several groups of animals through anatomical, experimental, and genetic approaches. The developmental processes in several key animal model systems will be examined in detail. The cellular, molecular, and genetic basis of animal development through the different stages, from gametogenesis to early development, organogenesis and metamorphosis, will be thoroughly examined. Plant development will also be introduced. The laboratory will focus on the anatomical examination of the early stages of embryonic development in frog and chick. We will also do experiments with living specimens representing model systems used in the study of developmental processes.

**Instructor:**

*Dr. Walter D. Sotero*

Office: Bio 202 B

Office hours: MoWe 12-1:30 PM

E-mail: [wsotero@ucf.edu](mailto:wsotero@ucf.edu) (please

indicate your section in your message)

**Class Times**

*Lectures:* Bio 209

Section 0001 (17341): TuTh 10:30-11:45 AM

*Laboratory:* Bio 206

Section 0011 (17342): TuTh 1-2:50 PM

Section 0012 (17343): TuTh 3-4:50 PM

**Lecture and Lab Teaching Assistant:** *Nirav Modha*

Office hours: Fr 12:30-2:30 PM, Bio 202 B

Both the class instructor and the teaching assistant will be available during their office hours to answer your questions, assist you with course topics, and to let you see your exams. There is no need to make appointments to meet during scheduled office hours. You may simply show up. Contact us if our office hours do not work for you.

**References**

***Lecture textbook:*** Developmental Biology, 11<sup>th</sup> ed, by Gilbert & Barresi. Sinauer, 2016.

Recommened, but not required. Available at the UCF Bookstore.

***Laboratory manual:*** A Photographic Atlas of Developmental Biology, by S. J. Wright.

Morton, 2005. This lab manual is *required*. Also available at the UCF Bookstore.

***Supplemental materials:*** all lecture notes with figures and laboratory handouts will be posted on Webcourses (the “Files” section of your ZOO4603C-19Spring 0001course at <https://webcourses.ucf.edu/>). You may bring printouts of these files to class, or you may access them in the classroom from your device.

**Course Objectives**

Students should demonstrate understanding of the basic concepts of Developmental Biology from studying developmental processes in invertebrates, vertebrates and plants, demonstrate an ability to use information in new situations to solve problems, and be able to draw connections and distinguish between concepts.

Learning outcomes include:

- Understand the general questions and scientific approaches to the study of Developmental Biology.
- Understand germline and fertilization related events in different animals.
- Understand the events that occur in the general stages of embryological development in animals.
- Understand the distinguishing features in the developmental processes in the groups of animals to be studied, and identify the similarities and differences in developmental processes between different groups of animals.
- Know the fates of the components of the three germ layers of the animal embryo.
- Understand how sex determination occurs and how the sexual phenotype develops.
- Compare developmental processes in plants and animals.
- Be able to track developmental stages and embryonic structures in prepared specimens of frog and chick embryos.

### **Grading**

**Exams.** There will be four multiple-choice lecture exams (100 points each), two laboratory exams (100 points each), and a comprehensive lecture & lab final exam (100 points), for a total of *seven* exams. You will receive a score of 0 for any exam that you miss. Make-ups for lecture exams may be given under special circumstances, but the instructor will ultimately decide the merit of each case. All exam scores will be posted on <https://webcourses.ucf.edu/>. The lowest of your seven exam scores will be dropped and will not count toward your final grade. For example, if you take the four lecture and two lab exams but not the final exam, you would receive a score of zero for the final exam, but then that score would be dropped and would not count toward your cumulative score.

**Bonus quizzes.** In addition to the regular exams, you will also be offered one or more online bonus quizzes that will add up to 12 points (2% of the grade bonus). The dates, topics, and instructions for the quiz(zes) will be announced at later dates.

**Final grading.** The following formula will be used to calculate your cumulative score and course grade: (sum of your *six* highest exam scores plus the scores of your bonus quizzes)/6. Results ending in .5 or a higher decimal round up to the next whole number (meaning an 89.5% would be a 90%). The following grading scale will be applied: 90-100: A, 80-89: B, 70-79: C, 60-69: D, 0-59: F. The score of the online Practice Quiz (see “Documenting” on page 3) will *not* count toward your final grade. There will be no additional assignments for extra credits. Because of their formats, there can be no make-ups for laboratory exams or bonus quizzes, so be sure not to miss them.

#### **Lecture Exams**

Exam 1: January 31  
Exam 2: February 26  
Exam 3: March 28  
Exam 4: April 18

#### **Laboratory Exams**

Exam 1: February 21  
Exam 2: April 11\_

#### **Comprehensive Lecture & Lab Final Exam**

Final Exam: April 30, 10-12

## Documenting Students' Academic Activity

All faculty members are required to document students' academic activity at the beginning of each semester. In order to comply, please take the **Practice Quiz** on <https://webcourses.ucf.edu/> by 5 PM of the Friday of the first week of class. *Failure to do so may result in a delay in the disbursement of your financial aid.*

### Attendance

Your instructor will not keep a record of your attendance to class, but attending all the lectures is strongly encouraged. The topics to be discussed in class may not be limited to those found in the textbook or class notes, and not all the sections from the textbook chapters will be covered in class. *Only topics covered in class will be included in the exams.* However, the bonus quiz may include topics not covered in class.

Please show respect for the instructor and your classmates by arriving on time to class and labs and by staying until the lecture is over. Do not walk across the classroom in front of the instructor while he is lecturing. As a courtesy to everyone in the classroom, please silence your phones or any other devices during lectures and exams. Do not talk on the phone in the classroom during lectures or exams. No smoking or vaping are allowed.

*Attendance to the four experimental laboratories and the lab checkout day is mandatory.* Each unjustified absence from these labs will result in the reduction of **2%** from your final cumulative score. You may only attend the lab section for which you are enrolled and only during the scheduled times, unless allowed by the instructor.

### Session Calendar and Schedule of Lecture Topics for the Spring 2019 Semester

The semester begins on January 7<sup>th</sup> and ends on April 22<sup>nd</sup>.

There will be no class or labs on March 12<sup>th</sup> and March 14<sup>th</sup>.

The following schedule of topics may be subject to modifications.

<u>Units</u>	<u>Topics</u>	<u>Chapters*</u>
1	Questions and approaches	1
2	Stages of early development & differentiation	2
3	Gametes and fertilization	7
4	Patterns and early development in invertebrates	10, 8
5	Early development in nematodes	8
6	Early development in amphibians	11
7	Early development in birds	12
8	Early mammalian development	12
9	The central nervous system	13, 14
10	The peripheral nervous system	15
11	The neural crest and cranial ectodermal placodes	15
12	The paraxial and intermediate mesoderms	17, 18
13	The lateral plate mesoderm and the endoderm	18, 20
14	Sex determination	6
15	Metamorphosis and regeneration	21, 22
16	Early development in <i>Drosophila</i>	9
17	Early development in fishes	11
18	Plant Development	

\*Gilbert & Barresi, 2016

### Laboratory Schedule for the Spring 2019 Semester

There will be a prepared handout with a guide for each lab topic that will be posted in advance on webcourses. Make sure you have these handouts with you for every lab session. The topics shown in *italics* are the required laboratory sessions (see “Attendance” on page 3).

The following schedule of lab topics may be subject to modification.

Week	Dates and Topics	References*
1	Jan 10: Introduction to the lab and distribution of equipment.	handout
2	Jan 15-17: Frog cleavage, gastrulation, and neurulation.	77-80 95-96 109-115
3	Jan 22-24: 4-mm frog.	143-150, 15
4	Jan 29-31: 7-mm frog.	156-161, 139
5	Feb 5-7: 10-mm frog.	162-169
6	Feb 12: <i>Experimental laboratory</i> : Sea urchin fertilization and early development. Feb 14: <i>Experimental laboratory</i> : Living frog embryos.	handout handout
7	Feb 19: Review for exam 1. Feb 21: <b>Lab Exam 1 (frog embryology)</b> .	
8	Feb 26-28: Chick cleavage, gastrulation, and neurulation.	80-83 96-101 116-123
9	Mar 5-7: 33-hr chick.	171-191
10	Spring break.	
11	Mar 19-21: 48-hr chick	194-199 138-139
12	Mar 26: <i>Experimental laboratory</i> : Set up planarian regeneration. Mar 28-29: <i>Experimental laboratory</i> : Living chick embryos.	handout handout
13	Apr 2-4: 72-hr chick.	201-209
14	Apr 9: Review for exam 2. Apr 11: <b>Lab Exam 2 (chick embryology)</b> .	
15	April 16: <i>Finish planarian regeneration. Checkout.</i>	

\*Wright, 2005

### Laboratory Equipment

You will be provided with a complete set of microscope slides with prepared specimens and a compound microscope for your use in lab during the entire semester. Please handle with care all slides, microscopes, and every piece of laboratory equipment that you use. Open the slides box only after laying it on your bench with the lid at the top, otherwise they may fall off and break. Always carry the microscopes using both hands: one hand holding the arm and the other holding the base. Ask the instructor for help if you need assistance with the proper use of the microscope. You may be held financially responsible for any equipment that you break or damage because of your own negligence. The student seating on your station in the other lab section will also use your assigned equipment. Notify the instructor immediately if you find any damaged supplies.

### **Studying for the Lab**

With the exception of the four experimental laboratories and the checkout day (see the “Attendance” section on page 3), attendance to labs will be optional. On regular weeks, the Tuesday lab session will begin with a lecture describing the objectives for the week. After that, students will proceed to examine prepared specimens for the remaining of the lab time for that week. Students may study individually or in small groups. The time spent at the lab is entirely up to the student’s discretion. However, be mindful of the fact that your results in the lab exams will correlate with time spent in lab. Do not overlook the importance of spending enough time in lab. Many students in the past have performed very well in the lecture exams but have missed out on earning a good grade because they did not put enough effort in their lab work. Remember that the lab will amount to up to one-third of your final grade.

You will be examining prepared specimens of sequential stages of frog and chick embryonic development. Most of these specimens will be two-dimensional sections. When studying, do not attempt to merely memorize the structures of individual sections. Instead, always keep track of the position of each structure within the three-dimensional embryo, their origins, and how each structure (and the entire embryo) changes over time.

### **Safety in the Lab**

We will be using a teaching lab that is also used for other lab courses where hazardous materials are used, so some hazardous chemicals are being stored. Therefore, in order to comply with UCF Environmental Health and Safety (<http://www.ehs.ucf.edu/home.html>) guidelines, no open shoes, foods or drinks can be allowed in the lab.

### **Guidelines and Policies for Exam Taking**

- All lecture exams will be offered during regular class times, with the exception of the final exam (see the exams schedule on page 2).
- From the beginning of the regularly scheduled time, you will have an hour and twenty minutes to finish each of the four regular lecture exams and two hours to finish the final exam.
- If you are taking the exams in the classroom, you will not need to bring your own scantrons. They will be provided.
- *If you are taking the exams at the Student Accessibility Services testing center (see “Course Accessibility” on page 6), you will need to bring your own scantrons with you to the testing center.*
- Please choose appropriately between right- and left-handed desks.
- If you arrive late on an exam day, you will be allowed to take the exam but you will be required to finish by the scheduled time. However, *once the first student has finished the exam and left the room, no other students will be allowed in to begin the exam.*
- *The location of the lab exams may be different from the regular teaching lab. Any changes will be announced in advance.*
- If you arrive late on a lab exam day, you will miss some of the questions and will not have an opportunity for a do-over. Be sure to arrive on time on lab exam days.

- You may not have any visible communication devices with you during exams. This includes phones, tablets, laptops, music players, or any similar devices.
- Know your *Student I.D. Number* for the exams (your PID, not your NID).
- Do not engage in, enable or promote cheating or any form of academic dishonesty.
- *Do not write the answer letters on the sides of the exam pages. This will be considered enabling cheating and will carry an automatic **2-points deduction** from your exam score.*
- Be sure you have finished filling all the bubbles for your answers and your I.D. number on your scantron before time expires. *You may not take any additional time to do this. Failure to follow this guideline may result in a **2-points deduction** from your exam score.* To avoid this, you are encouraged to complete the I.D. number section of your scantron before answering any exam questions.
- Once the exam scores become available on webcourses you may review them during the regular office hours. Be ready to show your UCF student identification. However, you may not take any notes when reviewing your old exams.
- There are no deadlines to review any specific exams, but you are encouraged not to wait until the end of the term to see your exams because traffic through the office may be too high. There will be no office hours after the final exam.
- If you decide not to take the final exam, you do *not* need to show up on the day of the final exam or write your name on a scantron. You will automatically get a score of zero (which will be dropped if it's the lowest).
- If you take all the exams except the final, you will have completed the minimum number of assignments required for calculating the final grade from exams taken, as detailed in the grading guidelines (see "Grading" on page 2). In that case you will be considered a "finished the course" student for the purpose of answering any inquiries from the school about your participation in the course after the end of the semester. That means you would not be eligible for an "incomplete" grade.
- *Note:* the scores of the bonus quizzes will not be added to your total cumulative score until the scores of the fourth lecture exam are received.

### Course Accessibility

If you have any difficulties with course participation and/or test taking, please meet with your instructor to discuss reasonable options or adjustments. Do not wait too long before asking for help if you are not doing well or are having any difficulties. You are also encouraged to visit Student Accessibility Services (SAS) at Ferrell Commons 185, or contact them at 407-823-2371 or at [sds@ucf.edu](mailto:sds@ucf.edu) to explore options about special test-taking accommodations.

Because of their format, lab exams can not be taken at the SAS testing center, but you may ask the instructor to assign a front seat for you for the lab exams. Also, webcourses does not allow extra time for online quizzes for individual students.

### UCF Cares

UCF Cares is a resource available to help you with your academic success and your overall well-being. It is an umbrella of care-related programs and resources dedicated to fostering a caring community of Knights. Visit <http://cares.sdes.ucf.edu> if

you are seeking help for yourself or if you are worried about a friend or classmate. Free services and information are included for a variety of student concerns, including but not limited to substance abuse, sexual violence response, bias incidents, LGBTQ support, mental health concerns, and financial and housing challenges. You will find links to the Knights Helping Knights Pantry, the Just Knights Response Team, UCF Victims Services, Veterans Academic Resource Center, Housing, Health Care, Legal Services, Counseling Services, Group Counseling Resources, UCF Safe Zone, and much more. You can also e-mail [ucfcares@ucf.edu](mailto:ucfcares@ucf.edu) with questions or for additional assistance. You can reach a UCF Cares staff member between 8 a.m. and 5 p.m. by calling 407-823-5607.

If you are in immediate distress, please call Counseling and Psychological Services to speak directly with a counselor 24/7 at 407-823-2811.

### **Privacy of Student's Educational Records**

The Family Educational Rights and Privacy Act (FERPA) of 1974 is a Federal law that protects the privacy of student education records. In accordance to this law, instructors may not disclose any personally identifiable information or student's records to anyone (including parents) without the written and signed consent of the student (unless ordered by a court or in case of an emergency, if the information is necessary to protect the health or safety of the student). These include student ID number, social security number, residency status, race/ethnicity, email address, test scores, grades, GPA, academic standings, class schedule, and transcripts.

In order to comply with FERPA, instructors may not disclose information about exam scores, grades or any other personally identifiable information or records to students via email, telephone or text messages. This information can only be released to the student in person and with a valid identification.

FERPA also gives students the right to review their educational records, the right to request amendment to records they believe to be inaccurate, and the right to limit disclosure from those records. For more information visit <https://ed.gov/policy/gen/guid/fpco/ferpa/index.html>.

### **Academic Integrity**

As a UCF student, you are expected to follow the standards of conduct established in the *Golden Rule Student Handbook* (<http://goldenrule.sdes.ucf.edu>), a compilation of policies and procedures intended to define your rights and responsibilities as a student.

No disruptive behavior or disrespect to the instructor or to your classmates will be tolerated. Promoting or engaging in academic dishonesty in any form (*cheating* or *enabling cheating*) will be penalized. Any violations to the standards of conduct may result in judicial action, which could result in suspensions or expulsion from the University. At a minimum, violations of these rules may result in a permanent record of the infraction being placed in your degree audit.

You are responsible for knowing all course rules and policies. If any changes to the syllabus become necessary, the instructor will notify all the students about the changes in a timely manner before they are implemented.

The instructor has the ultimate authority to determine the correct interpretation of the contents of this syllabus.

