



**ZOO 4603C**  
**Embryology/Development**  
Spring 2023



**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.

This is a **face-to-face** course with classroom lectures and exams, and online quizzes. There will be no recorded content on webcourses.

**Prerequisites:** both PCB 3063 and PCB 3023 with a C or better, or PCB 3522 with a C or better, or C.I.

**Instructor:** *Dr. Walter D. Sotero*

**Office:** Bio 202B

**Office hours:** TuTh 10:30AM-12:30PM

**Email:** [wsotero@ucf.edu](mailto:wsotero@ucf.edu)

Please indicate PCB 4723  
in your messages.

**Class Times**

**Lectures:** Bio 209

Section 0001 (16474): TuTh 9-10:15 AM

**Laboratory:** Bio 211

Section 0011 (16475): TuTh 1-2:50 PM

Section 0012 (16476): TuTh 3-4:50 PM

**Teaching Assistant:** *Daniel Gamarra*

**TA's Office hours:** 9:30-10:20AM, Bio 202B

Both the course 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.

**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.

### **Resources and References**

The online resources for this course are on **webcourses** (your ZOO4603C-23Spring 0001 course on <https://webcourses.ucf.edu/>). This course is organized in a series of **Modules** (find the “**Modules**” link on the menu on the left side of the home page of webcourses, and the **schedule of topics** table on page 3). Each module will contain **class notes** as downloadable PowerPoint files. Some modules may contain other resources such as **lab handouts** as downloadable PDF files. You may bring printouts of these files to class, or you may access them in the classroom or lab from a laptop, tablet, or phone. Some modules may also contain links to **online quizzes**. As the modules are published and the files are posted, you will be able to access their contents at any time.

**Laboratory manual:** *A Photographic Atlas of Developmental Biology*, by S. J. Wright. Morton, 2005. This lab manual is *required*. Available at the UCF Bookstore.

**Lecture textbook:** *Developmental Biology*, 12<sup>th</sup> ed, by Barresi & Gilbert. Sinauer, 2020. Recommended, but not required. Also available at the UCF Bookstore.

### **Exams and Grading**

**Exams.** *You will be taking all the exams in person.* (see “Guidelines for exam taking” on page 5). All scores will be posted on webcourses (the “Grades” link on webcourses). There will be four multiple-choice lecture exams, two written multiple-choice laboratory exams, and a comprehensive lecture & lab multiple-choice final exam, for a total of *seven* exams (all seven of them 100 points each). You will receive a score of 0 for any exam that you miss. 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.** You will also be offered two *online* bonus quizzes that will be worth a total of 12 bonus points (2% of the grade bonus). The dates, topics, and instructions for the quizzes will be announced at later dates. You will not see the score of the bonus quizzes added to your cumulative total until after the fourth lecture exam.

**Grading.** The following formula will be used to calculate your total score at the end of the semester: sum of your *six* highest exam scores plus your scores in the bonus quizzes/6. The following grading scheme will be applied to determine your final grade from your total score: 100-90%: A, <90-80%: B, <80-70%: C, <70-60%: D, <60-0%: F. No plus/minus (+/-) grades will be used in the scale. The score of the Practice Quiz (see

“Documenting” on this page) will *not* count toward your final grade. There will be no additional assignments or opportunities for credit after the final exam. Because of their formats, there can be no make-ups for laboratory exams or bonus quizzes, so be sure not to miss them.

**The “A+ challenge”**: The student who earns the highest total cumulative score at the end of the semester will receive the symbolic A+.

**Lecture Exams**

- Exam 1: February 7
- Exam 2: March 7
- Exam 3: March 30
- Exam 4: April 20

**Laboratory Exams**

- Exam 1: February 23
- Exam 2: April 13

**Comprehensive Lecture & Lab Final Exam**

Final Exam: April 27, 7-9AM

**Documenting Students’ Academic Activity**

All faculty members are required to document their students' academic activity at the beginning of each term. In order to comply, please take the **Practice Quiz**, which can be found in module #0 of webcourses, by 11:59 PM on the Friday of the first week of class. *Failure to do so may result in a delay in the disbursement of your financial aid.*

**Session Calendar and Schedule of Lecture Topics for the Spring 2023 Semester**

The following schedule of topics may be subject to modifications.

<b><u>Modules</u></b>	<b><u>Topics</u></b>	<b><u>Chapters*</u></b>
1	Questions and approaches	1
2	Stages of early development & Differentiation	1, 2
3	Gametes & Fertilization	7
4	Patterns & Early development in select invertebrates	1, 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	Axonal guidance & The vertebrate eye	15
11	The neural crest & Cranial ectodermal placodes	15, 16
12	The paraxial and intermediate mesoderm	17, 18
13	The lateral plate mesoderm & The endoderm	18, 20
14	Sex determination	6
15	Metamorphosis & Regeneration	21, 22
16	Early development in <i>Drosophila</i>	9
17	Early development in fish	11
18	Plant Development	1, 8

\*Gilbert & Barresi, 2019

### 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 quizzes 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 total 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.

### Laboratory Schedule for the Spring 2023 Semester

A 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”).

Week	Dates and Topics	References*
1	Jan 12: Introduction to the lab and distribution of equipment.	handout
2	Jan 17-19: Early frog development.	77-80, 95-96, 109-115
3	Jan 24-26: 4-mm frog.	143-150, 15
4	Jan 31-Feb 2: 7-mm frog.	156-161, 139
5	Feb 7-9: 10-mm frog.	162-169
6	Feb 14: <i>Experimental laboratory</i> : Sea urchin <i>in vitro</i> fertilization. Feb 16: <i>Experimental laboratory</i> : Live frog embryos.	handout handout
7	Feb 21: Review for exam 1. Feb 23: <b>Lab Exam 1 (frog embryology)</b> .	handout
8	Feb 28-Mar 2: Early chick development.	80-83, 96-101, 116-123
9	Mar 7-9: 33-hr chick.	171-191
10	Spring break.	
11	Mar 21-23: 48-hr chick	194-199, 138-139
12	Mar 28: <i>Experimental laboratory</i> : Set up planarian regeneration. Mar 30: <i>Experimental laboratory</i> : Live chick embryos.	handout handout
13	Apr 4-6: 72-hr chick.	201-209
14	Apr 11: Review for exam 2. Apr 13: <b>Lab Exam 2 (chick embryology)</b> .	handout
15	April 18: <i>Finish planarian regeneration. Checkout.</i>	*Wright, 2005

### **Laboratory Equipment**

You will be provided with a box containing glass slides with prepared specimens and a compound microscope for your use in the lab during the entire semester. You will also be provided additional supplies for the experimental laboratories. Please handle with care all slides, microscopes, and every piece of laboratory equipment that you use. You may be held financially responsible for any equipment that you break or damage because of your own negligence. The student seating in your lab station in the other lab section will also use your assigned equipment, so inspect your box at the beginning of every lab session for any possible damaged or missing slides. Notify the instructor or TA immediately if you find any damaged equipment or 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 guidelines (<https://ehs.ucf.edu/laboratory-safety>), no open shoes, foods, or drinks can be allowed in the lab.

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

- *If you will be taking the exams at the Student Accessibility Services (SAS) testing center, there are special additional guidelines that you will need to be aware of (see “Course Accessibility” on page 8).*
- *You will be taking all the exams in person. You will be taking the lecture exams and the final exam in the lecture classroom (Bio 209) unless you are granted special accommodations by SAS.*
- *The location of the lab exams may be different from the regular teaching lab. Any changes will be announced in advance. Because of their format, no special accommodations for taking the lab exams will be possible.*

- *You are responsible for knowing the dates and times for each exam.*
- All exams will be offered during regular class or lab times, with the exception of the final exam (see the exams schedule on page 3).
- You will only be allowed one attempt per exam and bonus quiz.
- 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.
- 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.*
- 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 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.
- Failure to fill out the I.D. number section on your scantron (and without errors) may result in a delay in receiving your exam score.
- It is particularly critical that you fill out the I.D. number section on your scantron without errors on your final exam. If you do not, the score of the final exam *may not count* because the instructor might not be able to receive your score before the grades due deadline.
- 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 or to leave the office with your exams.
- The deadline to review you first three lecture exams, the lab exams, and all the quizzes is April 21<sup>st</sup>. You are encouraged not to wait until the end of the term to see the exams because traffic through the office may be too high. You may review exam 4 and the final exam during final exams week.
- When you take an online quiz, you will see one question at a time, but you will be able to go back to previous questions.

- If the time allowed to finish your online quiz expires before you submit it, your quiz will automatically close, and your answers will be saved.
- 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 is your lowest).
- *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.
- If you take any exams or quizzes after the 60% of the term date, your status will be “finished the course” for the purpose of any inquiries from the school about your participation in the course at the end of the term.
- If you are unable to take all the exams and wish to be granted an incomplete grade, you must request it to the instructor and complete an agreement form. Otherwise, you will be given a grade according to your total score.
- You will be assigned a final grade based on the exams and quizzes that you took, even if you do not take all the assigned exams or finished the course. If you want to be assigned an “incomplete” grade, *you must request it to the instructor before the grades due date.* Keep in mind that an “incomplete” grade will allow you to take any exams that you missed for valid reasons and could not make up before the end of the term (see “Make-up exams” on page 7), but not to re-take exams that you already took.

### **Make-up exams**

Requests for rescheduling exams and make-up exams may be granted under special circumstances such as health issues, family emergencies, attendance to professional conferences, post-graduate school interviews, job interviews, military duties, jury duties, religious observances, or any other justified reasons approved by the school. You may be required to produce evidence to justify your case. A request for rescheduling an exam must be made by email prior to the exam date or on the exam date at the latest.

***Make-up exams for in-person exams will only be offered at the Biology testing center at the specific times scheduled by the department.*** These are Mondays and Tuesdays, 9-11AM in Bio 104 (unless you will be taking the in-person exams at the SAS testing center). Make-up exams for in-person exams need to be scheduled two days in advance so be sure to coordinate with the instructor in a timely manner. Students that have been granted permission to take the in-person exams at the SAS testing center and request make-up exams for in-person exams need to coordinate with both the instructor and SAS in a timely manner.

***Conflicting exams schedules are not a valid reason for rescheduling exams.*** The only exception for this rule is if the conflict is due to an exam time extension approved by SAS, in which case you must notify the instructor to make appropriate arrangements. Do not enroll in overlapping courses if it will result in conflicts (see the schedule of exams).

***Your work schedule is not a valid reason to miss exams and will not be considered an excuse for granting make-up exams.*** You are expected to plan your work schedule around your obligations as a student, *not the other way around.* The current situation due to the COVID-19 pandemic does not change that. You are expected to take the exams at the scheduled dates and times along with all your classmates regardless of your work schedule. Plan your term accordingly.

***Once you take an exam, your score must be counted (unless it turns out to be your lowest score), even if you do not finish it, and you will not be allowed to re-take it.*** Do not open an exam if you have an emergency that can be documented. It is important that if you become ill or have any emergency situation, you contact the instructor immediately and *before* attempting to take an exam.

***The instructor will ultimately decide the merit of each case.*** It is preferable that, if justified, an exam be rescheduled for a date *before* the regularly scheduled day and time (see the schedule of exams), in which case they need to be scheduled at least one weekday in advance. A make-up exam can also be offered after the regularly scheduled exam day and time, but only if justified by properly documented reasons.

***There will be no make-up lab exams*** due to their format.

***There will be no make-up bonus quizzes or the final exam.*** You will have a twenty-four hour window of time to take each bonus quiz. If you miss a bonus quiz *for any reason*, you missed that bonus quiz. The university does not allow make-up final exams.

***Religious observances.*** According to UCF regulation 5.020, a student who desires to observe a religious holy day of their religious faith must notify all of the instructors teaching the class(es) from which the student desires to be excused *no later than the tenth business day of the term*. This includes requesting rescheduling of exams. For more information about this regulation, go to <https://regulations.ucf.edu/chapter5.asp> and click on UCF-5.020.

***Active duty.*** Students who are deployed active duty military and/or National Guard personnel and require special accommodations such as rescheduling of exams should contact the course instructor as soon as possible after the semester begins and/or after they receive notification of deployment to make appropriate arrangements.

### **Course Accessibility**

If you believe you would benefit from special accommodations for taking exams and quizzes because of a disabling chronic physical or mental condition, you are encouraged to contact **Student Accessibility Services (SAS)**, (<http://sas.sdes.ucf.edu>) at 407-823-2371 or at [sds@ucf.edu](mailto:sds@ucf.edu) to explore options about accommodations such as extended exam times or a special environment to take the exams. The SAS office and testing center is located at Ferrell Commons, room 185. Other services such as notetaking and video captioning are also available through the SAS office.

If you will be taking the exams at SAS testing center, you need to be aware of the following guidelines:

- You are responsible to make sure that you are approved by SAS for the right exam dates (the same dates specified in this syllabus).
- The SAS testing center does not provide scantrons, so you will need to have your own. The instructor may be able to provide some during office hours.
- If you are allowed extra time, you may choose (and are encouraged to do so if possible) to begin your exams before the regularly scheduled times rather than to finish later, whenever possible (you will need to notify SAS in advance if you choose this option).



### **Zoom Meetings**

You may request to schedule private meetings with the instructor if needed. Visit the UCF Zoom Guides at <https://cdl.ucf.edu/support/webcourses/Zoom/>, where you can also get support if you experience any technical issues. You may choose to use Zoom on your mobile device (phone or tablet) or computer. You may also use the “Zoom” link on webcourses. You may also use your UCF NID and password at <https://ucf.Zoom.us> to schedule your own meetings.

### **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 about the Family Educational Rights and Privacy Act, visit <https://registrar.ucf.edu/ferpa/>.

### **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, financial and housing challenges, and active duty military students support and accommodations. 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.

### **Academic Integrity**

As a UCF student, you are expected to follow the standards of conduct established in the Office of Student Conduct and Academic Integrity (<https://scai.sdes.ucf.edu>). 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. By remaining enrolled in this class, you accept the terms and conditions of the syllabus.

Portions of this course, including exams, may be moved to online format in case of unforeseen circumstances, in which case you will be notified promptly.

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

**Students are required to notify the university if they receive a positive COVID-19 test result or diagnosis by calling the UCF COVID Line at 407-823-2509.** This will ensure robust tracing of cases at UCF and will help the university identify and contain potentially impacted populations.

An extended version of this syllabus, which includes expanded sections on University services, resources, and policy statements can be found on webcourses.

