



ZOO 4603C
Embryology/Development
Spring 2024



Course Description and Format

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 in-person lectures and exams, and online bonus 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

E-mail: wsotero@ucf.edu (please indicate your section in your message)

Class Times

Lectures: Bio 209

Section 0001 (13548): TuTh 9-10:15 AM

Laboratory: Bio 211

Section 0011 (13549): TuTh 1-2:50 PM

Section 0012 (13550): TuTh 3-4:50 PM

Teaching Assistant: *Charles Ferron.*

Office hours: M 11:30-1:30 & W 1:30-2:30, 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-24Spring 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). 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 **bonus 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*, 13th ed, by Barresi & Gilbert. Sinauer, 2023. Recommended, but not required.

Exams and Grading

Exams. *You will be taking all the exams in person.* (see “Guidelines for exam taking”). All scores will be posted on webcourses (the “Grades” link on webcourses). There will be four multiple-choice lecture exams, two laboratory exams, and a comprehensive lecture & lab multiple-choice final exam, for a total of *seven* exams (all seven of them 100 points each). The topics for each lecture exam will be announced at least a week before each exam date. 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 a series of optional online bonus quizzes for extra credit. The dates, topics, and instructions for the quizzes will be announced at later dates. You will not see the scores 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 standard 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”) 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 1
Exam 2: February 27
Exam 3: March 28
Exam 4: April 18

Laboratory Exams

Exam 1: February 15
Exam 2: April 11

Comprehensive Lecture & Lab Final Exam

Final Exam: April 25, 8AM

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.*

Schedule of Lecture Topics for the Spring 2024 Semester

The following schedule may be subject to modifications.

<u>Modules</u>	<u>Topics</u>	<u>Chapters*</u>
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

*From Barresi & Gilbert, 2023. The actual pages from the textbook will be indicated at the bottom of the first slide of each PowerPoint file.

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 a ***10-points deduction*** 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 2024 Semester

There will be a prepared handout with a guide for each lab topic that will be posted in advance in the “**Files**” link of webcourses. Make sure you have these handouts with you for every lab session. The experimental laboratories are the **required** laboratory sessions (see “Attendance”).

Week	Dates and Topics	References*
1	Jan 11: Introduction to the lab and distribution of equipment.	handout
2	Jan 16-18: Early frog development.	77-80, 95-96, 109-115
3	Jan 23-25: 4-mm frog.	143-150, 15
4	Jan 30-Feb 1: 7-mm frog.	156-161, 139
5	Feb 6-8: 10-mm frog.	162-169
6	Feb 13: Review for exam 1. Feb 15: Lab Exam 1 (frog embryology).	handout
7	Feb 20: <i>Experimental laboratory</i> : Sea urchin <i>in vitro</i> fertilization. Feb 22: <i>Experimental laboratory</i> : Nematodes.	handout handout
8	Feb 27-29: Early chick development.	80-83, 96-101, 116-123
9	Mar 5-7: 33-hr chick.	171-191
10	Mar 12-14: 48-hr chick	194-199, 138-139
11	Spring break.	
12	Mar 26: <i>Experimental laboratory</i> : Set up planarian regeneration. Mar 28: <i>Experimental laboratory</i> : Live chick embryos.	handout handout
13	Apr 2-4: 72-hr chick.	201-209
14	Apr 9: Review for exam 2. Apr 11: Lab Exam 2 (chick embryology).	handout
15	April 16: Finish planarian regeneration. <i>Checkout.</i>	

*From 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), 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

- The word “**assignment**” refers to any in-person or online exam or quiz.
- *You are responsible for knowing the dates and times for each exam.*
- You will be notified well in advance about any changes to the schedule or the format of any assignment.
- *If you will be taking the in-person 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”).*
- The four lecture exams and the final exam will be **in-person**. *You are responsible for knowing the dates and times for each exam.*

- For the online bonus quizzes, make sure you can distinguish between the day and time an assignment becomes available, and the “**due date**” on webcourses.
- ***Make sure you are using a reliable internet connection for the online assignments.*** If you know your Wi-Fi is not always reliable, consider connecting your computer directly to the internet source, having a hotspot ready, or finding a location where you can take the exam confidently. Your instructor’s ability to help you if an accessibility problem occurs during an online assignment is *very* limited, and you might not get a second chance to complete the assignment.
- ***Honor code:*** do not save or share copies in any form of the questions or answers of the online assignments. Do not disseminate the contents of the online assignments in any way.
- You will only be allowed one attempt per assignment.
- If you are taking the lecture exams in the classroom, you will not need to bring your own scantrons. They will be provided.
- You will need to bring your own pencil to take the in-person exams.
- Please choose appropriately between right- and left-handed desks.
- If you arrive late to the classroom on an exam day, you will be allowed to take the exam, but you will be required to finish by the scheduled time.
- 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 in-person exams. This includes phones, tablets, laptops, and music players. You may not have any open class notes or textbooks with you during the exams.
- You may not leave the classroom without authorization before turning in your exam. This will result in the disqualification of your exam.
- Know your *Student I.D. Number* for the exams (your PID, not your NID).
- *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.
- 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.
- When you take an online assignment, 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 assignment expires before you submit it, it will automatically close, and your answers will be saved.

- Once the exam scores become available on webcourses, you may review them during the regular office hours. Be ready to show a photo identification. However, you may not take any notes or photos when reviewing your old exams.
- 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”), but not to re-take exams that you already took.
- The scores of the bonus quizzes will not be added to your total cumulative score until the scores of the fifth exam become available.

Make-up Exams and Incomplete Grades

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. All make-up exams will be offered at the Biology testing center, which will run on Tuesdays and Fridays, 1:30-3:30.

A request for rescheduling an exam must be made by email prior to the day of the exam or on the day of the exam at the latest. The day and time to take a make-up exam must be agreed by the student and the instructor. You may not make that decision on your own. Failure to follow these instructions may disqualify you from being granted a make-up exam. You are expected to be diligent in communicating with the instructor.

Make-up exams will only be offered at the Biology testing center, or at the SAS testing center, at the specific times scheduled by the department. These are TBA (unless you will be taking them at the SAS testing center). Make-up exams for in-person exams need to be scheduled at least 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 recent situation due to the Covid-19 pandemic did 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 will be recorded and you will not be allowed to re-take it. Do not take an exam if you have an emergency that can be documented. It is important that if you become ill or have any emergency, 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 do 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 other than active duty*, you missed that bonus quiz. The university does not allow make-up final exams. However, you have the option to request an incomplete grade if you have a justifiable reason to miss the final exam.

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.

Incomplete grades. If you take any assignments 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. That means you will not be eligible for an “incomplete” grade *unless you request one before the grades due date*. If you are unable to take all the exams and wish to be granted an incomplete grade, you must request it to the instructor. You will be required to present evidence of justification and complete an agreement form before the end of the term. Otherwise, you will be given a grade according to your total score. ***Important:*** you will not be able to access any online course resources after the course ends, so be sure you have saved all the files to study.

Course Accessibility

If you believe you would benefit from special accommodations for taking exams and quizzes because of a disabling 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 to explore options about accommodations such as extended exam times or a special environment at the SAS testing center 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 SAS.

If you are approved by SAS and will be taking the in-person exams at the 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 exam dates specified in this syllabus).
- If you are allowed extra time, you have the option to begin your exams *before* the regularly scheduled times rather than to finish later, if possible. You will need to notify SAS in advance if you want to choose this option.
- 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.

- The SAS testing center also have special policies regarding students that arrive late for an exam that you should be aware of.

Because of their format, the SAS testing center can not accomodate the lab exams. You will be required to take them in the same room as the rest of your classmates. However, you may ask the instructor in advance for special accomodations within the classroom to take the exams.

Zoom Meetings

You may request to schedule private meetings with the instructor if necessary. You can use Zoom on your mobile device (phone or tablet) or computer. You may 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. 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.

Under exceptional situations, Zoom sessions may be used by the instructor to replace in-person office hours. Otherwise, Zoom meetings are not meant to be substitutes for in-person office discussions of course topics.

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 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.

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

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.

