



**ZOOL 3130, VERTEBRATE EMBRYOLOGY  
SPRING 2018**

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Instructor:	Mark A. Grobner	Office Hours:	MW 10-11 & T 4-5
Office:	N268		Or by appointment
Phone:	(209) 667-3268	Term:	Spring, 2019
E-Mail:	<a href="mailto:mgrobner@csustan.edu">mgrobner@csustan.edu</a>	Lecture Meeting:	TR 12:30-1:45 – N221
Website:	<a href="http://www.csustan.edu/grobner">http://www.csustan.edu/grobner</a>	Laboratory Meeting:	R 2:00-4:50 – N229

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## COURSE INFORMATION

### University Course Catalog Description

Comparative study of embryological stages of various selected vertebrate forms and developmental microanatomy of their organ systems.

### Course Prerequisites/Requirements

Students must have completed BIOL 3310 and BIOL 3350 with grades of C- or higher

### Required Texts and Materials

*Developmental Biology* (11th ed. 2016) Scott Gilbert ISBN: 978-1605354705

*A Photographic Atlas of Developmental Biology* (2005) Shirley J. Wright ISBN: 978-0895826299

*iClicker* ISBN: 978-1498603041

### Course Introduction

Vertebrate Embryology will introduce you to classical descriptive embryology as well as developmental biology. We will spend time on the classical descriptions of the various stages of embryo development along with exploring the molecular and genetic control of vertebrate development.

Developmental Biology is an exciting and dynamic field. It encompasses the development of organisms through their life cycles from fertilization to embryonic and post embryonic development to the formation of gametes. We will start with gamete formation and study the vertebrate life cycle.

You will find that this course will incorporate material from many different areas of biology including:

Molecular Biology  
Physiology  
Immunobiology

Genetics  
Biochemistry  
Evolutionary Biology

Cell Biology  
Comparative Anatomy  
Medicine

## Course Learning Outcomes

It is my hope that the end of this course will meet the following goals:

- Gaining an appreciation for the events in biological development.
- Gaining a familiarity with technical terms used in developmental biology.
- Gaining familiarity with the stages of development and the differences between the classical model species.
- Gaining experience in experimental procedures such as formulating hypotheses, designing appropriate experiments and interpreting their results.

To this end, we will explore such questions as:

- How does the fertilized egg give rise to the adult body?
  - How are the body's specialized organs and tissues formed?
  - How do cells become committed to a particular fate?
  - How are patterns established in the early embryo?
  - What is the role of cell-cell signaling in development?
- What is the connection between evolution and development?

## COURSE ASSIGNMENTS AND GRADING

This course will consist of three lecture exams (350 points), iClicker response lecture questions (50 points), three laboratory practicums (75 points), five serial section quizzes (50 points), 6 laboratory write ups (100 points), and a service learning component (25 points).

### Academic Dishonesty and Misconduct

Exams, reports, and presentations are indicators of individual performance. Copying off another student's exam, plagiarized reports, presentations or papers constitutes cheating. There is zero tolerance for cheating. Cheating in any capacity in this class will result in penalties ranging from a minimum of a zero on the assignment or exam to a maximum of expulsion from California State University, Stanislaus as indicated by the official University Policy regarding dishonesty and misconduct.

### Class attendance is highly recommended

Missing classes may result in poor performance in the course. There is no make-up for missed iClicker points. You are responsible for any information or assignments you missed in your absence. I highly recommend reading the assigned chapters before coming to class. Students leaving lab before data has been collected and materials put away will have 15 points deducted from their overall grade in the course.

### Lecture Exams (350 pts.)

There will be three exams during the term, the first two worth 100 pts. and the final worth 150 pts. each. The final will be comprehensive. Exams may consist of any of the following: multiple choice, definitions, fill in the blank, matching, and short answer essay questions. **There will be no make-up exams.** Failure to appear at exam time without 24 hours prior notice to the instructor with an appropriate excuse, or an appropriately documented emergency, will result in zero points for that exam.

### iClicker Response Questions (50 pts.)

Each lecture, you will be asked to respond to a number of questions using the iClicker student response system. The questions will come from lecture material that was covered previously, so it is in your best

interest to keep up with the material. You will receive one point for answering all the questions asked each day (participation points) and an additional point for each correct answer. Your final iClicker grade will be based on the percentage of points you have earned out of the total possible, you will receive the equivalent percentage of the 50 available points based on your accumulated points. Any student found in possession of more than one iClicker during lecture will be given an automatic F in the course. Similarly, students not present, but responses being registered, will also receive an F in the course. You can earn up to 50 points for your responses. **There is no makeup for iClicker questions due to absence, dead batteries or forgotten iClicker.**

### **Laboratory Practicums (75 pts.)**

There will be three practical laboratory exams during the term covering the prepared slide sections. These will be taken using your iClicker. Each exam is worth 25 points for a total of 75 points.

### **Laboratory Quizzes (50 pts.)**

Throughout the term, you will be asked to identify structures on slides you will be studying. At the beginning of the lab, you will be given a list of structures to identify (5 structures worth 2 points each). You will, from slide sets available to you, locate a good, clear, and unambiguous example of each structure on the list provided. Place the tip of the pointer exactly on, but not obscuring, the item. Raise your hand when you are ready to have your answer scored. When I come to your station, point to the item on the list that you are identifying; you need not say anything. I will score your sheet in the following manner, V indicates a correct identification, an X indicates an incorrect identification. A correct identification the first time earns full credit. A correct identification the second time earns half credit. There are no third attempts.

### **Laboratory Write-up (100 pts.)**

For several of the wet labs you will be provided a form in Blackboard to record observations and answer a series of questions regarding the activity. This will be turned in one week after the exercise was completed in the lab.

**Service Learning (25 pts.):** We will be doing a service learning project with local elementary schools, specifically with second grade classes. In second grade students learn about life cycles. We will be providing tanks of tadpoles as a model of life cycles to each of a number of second grade classes. Students will be assigned a different classroom for the project including the setup and cleanup of the aquaria and provide support materials for the classrooms. By February 24, each student will need to prepare the following materials to be delivered to their respective second grade class:

- A brief (5-10) minute PowerPoint presentation on life cycles
- Tadpole care and feeding guide (I will provide)
- Life cycle activity

We will visit the schools at least once more to pick up the tadpoles at the end of the term. You will also be required to respond to questions from the teachers and the students. Your grade on this portion will include an evaluation by your classroom teacher.

### **Laboratory Work**

In lab, students work in groups of three. Each lab is three hours in length. You are expected to stay the entire length of the lab and not leave until all materials are put away and your area cleaned. Students leaving early and/or leaving their partners to collect data and clean-up will have 20 points deducted

from their total grade. Missing more than one laboratory will result in the deduction of 20 points for each missed lab beyond one unexcused absence.

### Course Grading

Your grades will be assigned as follows:

Assessment	Total Points
Lecture Exams	300
iClicker Response Questions	50
Laboratory Practicums	75
Laboratory Quizzes	50
Laboratory Writeup	100
Service Learning Project	25
Total	500

I will use plus/minus grading.

Grading Scale (%)	
94-100	A
90-93	A-
87-89	B+
84-86	B
80-83	B-
77-79	C+
74-76	C
70-73	C-
67-69	D+
64-66	D
60-63	D-
0 - 59	F

### Grades of "Incomplete"

*From the University Catalog –*

An Incomplete signifies (1) that a portion of required coursework has not been completed and evaluated in the prescribed time period due to unforeseen but fully justified reasons beyond the student's control, and (2) that there is still a possibility of earning credit. It is the responsibility of the student to bring pertinent information to the attention of the instructor and to determine from the instructor the remaining course requirements which must be satisfied to remove the Incomplete. The conditions for removal of the Incomplete shall be put in writing by the instructor and given to the student, with a copy placed on file with the department chair. A final grade will be assigned when the work agreed upon has been completed and evaluated.

Any Incomplete must be made up within the time limit set by the instructor; in any case, no more than one calendar year following the end of the term in which the Incomplete was assigned. An Incomplete should never be used to (1) give a failing student an opportunity to redo unsatisfactory work or complete additional work; or (2) give a student more time to complete his/her work when the reasons

for the delay have been within his/her control. This limitation prevails whether or not the student maintains continuous enrollment. Failure to complete the assigned work will result in an incomplete reverting to a grade of NC for grading options 1 and 2, and to a grade of IC for grading option 3. (See the Academic Standards section of this catalog and the Schedule of Classes Informational Guide for grading options.)

In cases of prolonged illness or any emergency which necessitates an extension of time to complete the course, the student may petition through the academic department where the course was offered. Students may not be permitted to graduate until all Incompletes are removed or evaluated as "IC" grades. Students are not to reregister in courses in which they have an Incomplete.

[http://catalog.csustan.edu/content.php?catoid=12&navoid=541&returnto=search#indi\\_stud\\_cour](http://catalog.csustan.edu/content.php?catoid=12&navoid=541&returnto=search#indi_stud_cour)

## **COURSE POLICIES: TECHNOLOGY AND MEDIA**

### **Email**

Questions regarding course materials should be directed to me at [mgrobner@csustan.edu](mailto:mgrobner@csustan.edu). Please be sure to put ZOO 3130 in the subject line as I get a lot of emails everyday and I want to be sure to respond to yours quickly. For issues with Blackboard, please contact the helpdesk, linked from the Blackboard login page.

### **Cell Phones**

Cell phones should not be out or used during class, if I see you using your cell phone in class I will ask you to leave as your use of a cell phone during lecture is disruptive to other students. During exams, cell phones must be turned off and placed upside down on your desk in front of you or secured in a backpack or book bag. Any cell phone found not in this manner during a test will result in an automatic F for the exam.

### **University Academic Conduct Policy**

There will be zero-tolerance for plagiarism/cheating. Plagiarism and/or cheating will result in a 0.0 for the class. For further information, please see the CSU Stanislaus catalog for Student Code of Conduct [http://catalog.csustan.edu/content.php?catoid=3&navoid=115#stud\\_cond](http://catalog.csustan.edu/content.php?catoid=3&navoid=115#stud_cond)

## **RESOURCES**

### **Disability Resource Services**

CSU Stanislaus respects all forms of diversity. By university commitment and by law, students with disabilities are entitled to participate in academic activities and to be tested in a manner that accurately assesses their knowledge and skills. They also may qualify for reasonable accommodations that ensure equal access to lectures, labs, films, and other class-related activities. Please see the instructor if you need accommodations for a registered disability. Students can contact the Disability Resource Services office for additional information. The Disability Resource Services website can be accessed at <http://www.csustan.edu/DRS/>

Phone: (209) 667-3159

### **Recording Policy:**

Audio or video recording of classes (tape and digital format) or use of cameras/phones to photograph or record lectures is not permitted. You may not photograph slide section using any device. An exception

is made for students registered with Disability Resource Services, who are approved for this accommodation. In such exceptions, DRS students will be asked to sign a “Recording Agreement” which disallows them from sharing recordings with other individuals unless approved by the DRS program.

## COURSE SCHEDULE

### Tentative Lecture/Lab Schedule

Materials for lecture and laboratory will be found on Blackboard.

Date	Lecture Topic	Chapter	Laboratory Exercise
1/29	Intro/Life cycles	1	
1/31	Specifying Identity	2	Introduction/Microscopes
2/5	Developmental Genetics	3	
2/7	Cell-Cell communication	4	Gametogenesis – prep chicken cups
2/12	Chick in a cup		
2/14	Stem Cells	5	Early Frog Development* - chick in a cup
2/19	Sex determination and Gametogenesis	6	
2/21,26	Fertilization	7	Fertilization – Urchins
2/26	Fertilization		
2/28	Exam #1		Late Frog development*
3/5	Early development (amphibians and fish)	11	
3/7	Early development other vertebrates	12	Gamete-Frog Practicum Embryo Folding Exercise
3/12	Early development other vertebrates		
3/14	Neurulation	13	Early Chicken – prep chicken cups
3/19, 21	Spring Break		
3/26	Brain Growth	14	
3/28	Neural Crest Cells	15	33-72 hr Chicken* Sonic Hedgehog and development - chicken
4/2	Ectodermal Placodes	16	
4/4	Paraxial and Intermediate Mesoderm	17	96 hr Chicken*
4/9	Paraxial and Intermediate Mesoderm		
4/11	Exam #2		Vitamin A Limb development – axolotls prep chicken cups
4/16	Lateral Plate Mesoderm and Endoderm	18	

4/18	Lateral Plate Mesoderm and Endoderm		Second Lab Practicum (Chick) Ethyl Alcohol and Chick Development
4/23	Limb Development	19	
4/25	Endoderm	20	Early Pig (6 mm)
4/30	Metamorphosis	21	
5/2	Regeneration/ Aging	22/23	Late Pig (10 mm)*
5/7	Medical Implications of Development	24	
5/9	Ecological Development	25	Third Lab Practicum (Pig) Video - What Darwin Never Knew
5/14	Evo/Devo	26	
5/22	Final		11:15-1:15 in N229

\*Laboratory structure quiz days

We will also be looking at the induction of metamorphosis in tadpoles resulting from treatment with Thyroxine; this will be started when tadpoles are available, usually just after spring break. This will require some students coming in on weekends to care for the tadpoles. A signup sheet will be available in lab once the start date has been determined.

Please note, the laboratory schedule is subject to change depending on the availability of specimens for the various labs.