



**ZOOL 3130, VERTEBRATE EMBRYOLOGY
SPRING 2018**

Instructor:	Mark A. Grobner	Office Hours:	T 2-3, W 1-2, F 9-10
Office:	N268		Or by appointment
Phone:	(209) 667-3268	Term:	Spring, 2018
E-Mail:	mgrobner@csustan.edu	Lecture Meeting:	TR 12:30-1:45
Website:	http://www.csustan.edu/grobner	Laboratory Meeting:	R 2:00-4:50
Co-requisite:	ZOOL 3130.002	Class Location:	N229

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 (250 points), three laboratory practicums (75 points), laboratory notebook (100 points), a library research paper/presentation (50 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. 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 points deducted from their overall grade in the course.

Lecture Exams (250 pts)

There will be three exams during the term, the first two worth 75 pts. and the final worth 100 pts. each. Exams may consist of any of the following: multiple choice, definitions, and 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.

Laboratory Practicums (75 pts)

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

Laboratory Notebooks (100 pts)

You will keep a laboratory notebook associated with the wet laboratories conducted throughout the term. Your notebook is a place to record observations and data and to also answer questions about the exercise performed. These will be turned in four times during the term for a grade equal to 25 points each. More on the notebook will be presented in lab.

Library Research Paper/PowerPoint presentation (50 pts)

Each student will research an anomaly in development. This can be in any vertebrate species and be either genetically or environmentally caused. Your research should define the cause of the anomaly and any consequences resulting from this defect. Your discussion should also discuss any treatments to compensate for the anomaly. The result of this research will be a short paper. You must submit your topic by **March 15th, 2018**.

The paper should be 5 pages double spaced using a 12 pt. font and include a bibliography. The references in the bibliography should be predominantly from scientific journals. Wikipedia is not an acceptable source and although you can use it to get background information, should not be used in your paper or cited. A minimum of 5 peer reviewed papers must be included in the bibliography and cited within the final paper. All papers must be submitted electronically using the assignment link on the Blackboard course site and will be checked using Turnitin.com. Any papers showing signs of plagiarism will result in the student getting an F in this course and the work submitted for appropriate disciplinary action. The final paper is due **April 20, 2018 by midnight**. All papers will be turned in using the Turnitin link in Blackboard.

The final paper and PowerPoint is worth 50 points scored as follows:

Paper		PowerPoint	
Criteria	Points	Criteria	Points
Introduction	5	Content	4
Discussion	15	Organization	4
Grammar	5	Subject knowledge	4
References	5	Visual	4
		Presentation	4
Total	30	Total	20

You will also present an overview of your paper in a PowerPoint presentation to the class, this will happen during laboratory time. A sign-up sheet will be provided in lab for you to pick a date to present.

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)
- Frog Life cycle handout/poster
- 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 10 points for each missed lab beyond one unexcused absence.

Course Grading

Your grades will be assigned as follows:

Assessment	Total Points
Lecture Exams	250
Laboratory Practicums	75
Laboratory Notebook	100
Library Research/PowerPoint	50
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

COURSE POLICIES: TECHNOLOGY AND MEDIA

Email

Questions regarding course materials should be directed to me at 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. Any cell phones out during lecture or laboratory will be confiscated and returned at the end of the period. If your cell phone is out during an exam, this 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

RESOURCES

University Library

For help with researching materials for your developmental anomaly paper and presentation, please go to the following for tutorials on the various resources the library has to offer:

<http://libguides.csustan.edu/biology>

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
1/25	Intro/Life cycles	1	Introduction/Microscopes
1/30	Specifying Identity	2	
2/1	Developmental Genetics	3	Gametogenesis – prep chicken cups
2/6	Chick in a cup		
2/8	Cell-Cell communication	4	Early Frog Development – Chick in a cup
2/13	Stem Cells	5	
2/15	Sex determination and Gametogenesis	6	Late Frog development
2/20	Fertilization	7	
2/22	Early development (amphibians and fish)	11	Fertilization – Urchins
2/27	Early development other vertebrates	12	
3/1	Early development other vertebrates		Late Frog development Embryo Folding exercise
3/6	Lecture Exam #1		
3/8	Neurulation	13	Gamete-Frog Practicum Axolotl Fate mapping
3/12	Brain Growth	14	

3/15	Neural Crest Cells	15	33-72 hr Chicken Sonic Hedgehog and development
3/20	Ectodermal Placodes	16	
3/22	Paraxial and Intermediate Mesoderm	17	96 hr Chicken
3/27	Paraxial and Intermediate Mesoderm		
3/29	Lateral Plate Mesoderm and Endoderm	18	Vitamin A Limb development
	Spring Break		
4/10	Lateral Plate Mesoderm and Endoderm		
4/12	Limb Development	19	Second Lab Practicum (Chick) Ethyl Alcohol and Chick Development
4/17	Lecture Exam #2		
4/19	Endoderm	20	Early Pig (6 mm) Library research presentations
4/24	Metamorphosis	21	
4/26	Regeneration	22	Library research presentations
5/1	Aging	23	
5/3	Medical Implications of Development	24	Late Pig (10 mm)
5/8	Ecological Development	25	
5/10	Evo/Devo		Third Lab Practicum (Pig) What Darwin Never Knew
5/15	Evo/Devo	26	
5/22	Final		8:30-10:30 in N229

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 around spring break. This will require some students coming in on weekends and possibly during spring break 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.