

BIOL 4350(6350): Developmental Biology
Fall Semester 2008, Section A (CRN# 81156, 4 Credit hours)
Department of Biology, College of Arts & Science, Valdosta State University

Lecture (BC 2022): M & W 12:00 p.m. – 1:15 p.m.

Laboratory (BC 2071): T – 2:00 - 4:50 p.m.

Instructor: Dr. Brian C. Ring
Office: BC 2092
Office hours: **M / W** 3:30 p.m. – 4:30 p.m.
Phone: 249-4841 (Dept. office 333-5759)
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Pre-Requisites: BIOL 2230 and BIOL 2270 with a grade of C or better or permission of instructor.

Course Description: A study of development from fertilization through embryological stages with an emphasis placed on experimental embryology and molecular genetic mechanisms in selected model organisms. Topics include classic developmental life cycles from the formation of gametes to fertilization, early to late embryological stages, organ formation, and post-embryonic fates. Also included are more modern topics within the field to include developmental genetics, germ cell formation, sex determination, and aging.

Course Objectives: Upon completion of this course the student should be able to:

- 1) Exhibit a broad perspective on basic history, concepts, and mechanisms in the field of developmental biology;
- 2) Comprehend basic principles involving the life cycle of vertebrates through major stages of development;
- 3) Compare and contrast differences in developmental patterning among different model organisms;
- 4) Interpret and analyze laboratory preparations within the field of developmental biology;
- 5) Develop and test a hypothesis using experimental embryology skills acquired in the laboratory.

These objectives support the Department of Biology Educational Outcomes # 1, 3, & 4 and the University General Educational Outcomes # 5 as listed in the VSU Undergraduate Catalogue for those enrolled in BIOL 4350 and the Department of Biology Selected Educational Outcomes for the Masters # 1 & 2 as listed in the VSU Graduate Catalogue for those enrolled in BIOL 6350.

Required Materials:

Text: Lewis Wolpert. *Principles of Development*, 3rd edition. 2007. Oxford University Press (ISBN #: 9780199275373)

Laboratory Manual: Composed of 2 sources:

- 1) Melissa S. Gibbs. *A Practical Guide to Developmental Biology*. 2003. Oxford University Press (ISBN# 0199249717)
- 2) Various materials posted on webCT as specified in your lab syllabus and by your instructor.

Graded Course Components: Your final grade will be based on your performance on examinations and the laboratory. **NOTE:** Graduate students enrolled in this course (BIOL 6350) will receive additional literature assignments and adjusted grading scale in a supplementary syllabus.

Lecture: (400 pts) There will be a total of four exams; three lecture exams and one final exam covering sequential material as outlined below. Students are responsible for learning the lecture material and the readings from the text in order to prepare for exams. Exams will be composed primarily of multiple choice and short answer. Each of the exams will be worth 100 points or 1/5 of your final grade. **There are NO MAKEUP EXAMS.** Missed exams are recorded as zero.

Laboratory: (100 pts) Students will be graded on their performance in laboratory based on four major criteria: **(1)** Laboratory Notebook, 10 pts **(2)** ~ 8 Quizzes, 40 pts **(3)** Experimental Proposal & Lab Report, 40 pts **(4)** Participation, 10 pts. **There are NO MAKEUP LABS.** Any student missing more than 20% of laboratories (3 total) will automatically fail this course as per University attendance policy.

Grade Calculation & Distribution: Final grades will be based on a percentage of your cumulative points relative to the total points possible (e.g. 400/500 = 80% = B). See below chart.

| Grade Calculation | | Grade Distribution | | |
|-------------------|-----------------|--------------------|------------|--------------|
| Category | Possible Points | Letter | Percentage | Point Range |
| Exam 1 | 100 | A | 90-100% | 450-500 |
| Exam 2 | 100 | B | 80-89% | 400-449 |
| Exam 3 | 100 | C | 70-79% | 350-399 |
| Final Exam | 100 | D | 60-69% | 300-349 |
| Laboratory | 100 | F | ≤ 59% | ≤ 299 points |
| Total | 500 | | | |

Notes on grading: Students should note that a grade of "A" in this course represents an exemplary command of the material covered. To obtain this grade of excellence, it is recommended that students study daily and clarify with their instructor any problems regarding course information, as they arise. Additionally, the instructor may implement an overall curve based on class performance at the end of the course.

Mid-term and Attendance: Students will have at least one exam and a partial laboratory grade to determine their overall grade by the Mid-Term and decide whether to withdraw at the deadline date (**10/19/2008**). Attendance in this course is highly recommended. Attendance may be taken at any time during the lecture or laboratory and used as an indicator of class participation. If you are late, your attendance may not be acknowledged. The student is responsible for all material missed regardless of the reason for absences. **ABSOLUTELY NO LECTURES OR LABORATORIES CAN BE "MADE UP."** Laboratories in particular are important not to miss as stated above. In the event that a student will miss a lab, s/he should notify the instructor in writing by email. It is the instructor's prerogative to accept the excuse or not.

IMPORTANT EXAM SCHEDULE DATES:

Exam 1: Wednesday, September 24, 2008
Exam 2: Wednesday, October 29, 2008
Exam 3: Wednesday, December 3, 2008
Final Exam: Thursday, December 11, 2008; 12:30 p.m. – 2:30 p.m.

Procedure for exams:

- No books, electronic devices (including cell phones), or notebooks will be allowed during exams. Students using such items will be asked to leave and will receive a zero for the exam.
- No talking will be allowed during the exam, but students are permitted to ask the instructor questions.
- Each student will be given an exam to be completed and handed back to the instructor.
- Students will take the exam during the stated lecture time only.

Student identification: Students should have in their possession at all times their VSU student identification card. In order to verify the identification of students officially enrolled in the course, it is the instructor's prerogative to request official student photo identification cards at any time during lecture or during exams.

Academic Dishonesty (e.g. cheating or plagiarism): A student cheating or plagiarizing will be penalized by receiving a zero for the assignment and will be reported to the dean of students. Refer to the Student Code of Ethics in the VSU Student Handbook.

Privacy Act (FERPA): The Family Educational Rights and Privacy Act (FERPA) prohibit the public posting of grades by social security number or in any manner personally identifiable to the individual student. No grades can be given by email or over the telephone, as positive identification can not be made by this manner.

Students with Disabilities: Students requesting classroom accommodations or modifications because of a documented disability must contact the Access Office for Students with Disabilities located in room 1115 Nevins Hall. The phone numbers are 245-2498 (voice) and 219-1348 (tty).

TENTATIVE LECTURE OUTLINE:

| Lecture: | Date: | Topics: | Text Readings (pgs): |
|----------|---------------------|--|-------------------------------|
| 1 | Aug. 18 (M) | Course Introduction & Objectives | -- |
| 2 | Aug. 20 (W) | History & Basic Concepts | Chpt. 1 |
| 3 | Aug. 25 (M) | Continued | Cont. |
| 4 | Aug. 27 (W) | <i>Drosophila</i> Early Development | Chpt. 2 (32-59) |
| - | Sept. 01 (M) | Labor Day- No class | -- |
| 5 | Sept. 03 (W) | Continued | Cont. |
| 6 | Sept. 08 (M) | Vertebrate Development I: Life Cycles & Primary Body Axis | Chpt. 3 (90-124) |
| 7 | Sept. 10 (W) | Continued | Cont. |
| 8 | Sept. 15 (M) | Vertebrate Development I: Germ Layers | Chpt. 3 (125-143) |
| 9 | Sept. 27 (W) | Continued | Cont. |
| 10 | Sept. 22 (M) | Vertebrate Development II: Somites & Hox Genes | Chpt. 4 (149-165) |
| -- | Sept. 24 (W) | EXAM # 1 | Lecture material 1-9 |
| 11 | Sept. 29 (M) | Continued | Cont. |
| 12 | Oct. 01 (W) | Vertebrate Development II: Organizers & Neural Induction | Chpt. 4 (166-180) |
| 13 | Oct. 06 (M) | Continued | Cont. |
| 14 | Oct. 08 (W) | Morphogenesis I: Cleavage → Blastula | Chpt. 7 (257-268) |
| -- | Oct. 09 (R) | Midterm- last day to drop without penalty. | -- |
| -- | Oct. 13 (M) | Fall Break- NO CLASS Mon. & Tues. | -- |
| 15 | Oct. 15 (W) | Morphogenesis II: Gastrulation → Notochord | Chpt. 7 (269-290) |
| 16 | Oct. 20 (M) | Vertebrate Neurulation | Chpt. 10 (392-401) |
| 17 | Oct. 22 (W) | Vertebrate Organogenesis | Chpt. 9 (371-379) |
| 18 | Oct. 27 (M) | Continued | |
| -- | Oct. 29 (W) | EXAM # 2 | Lecture material 11-18 |
| 19 | Nov. 03 (M) | Reproduction I: Germ Cells & Gametogenesis | Chpt. 11 (421-431) |
| 20 | Nov. 05 (W) | Reproduction II: Fertilization | Chpt. 11 (432-436) |
| 21 | Nov. 10 (M) | Reproduction III: Sex Determination | Chpt. 11 (437-447) |
| 22 | Nov. 12 (W) | Continued | Cont. |
| 23 | Nov. 17 (M) | Growth | Chpt. 13 (451-461) |
| 24 | Nov. 19 (W) | Aging | Chpt. 13 (469-471) |
| 25 | Nov. 24 (M) | Continued | -- |
| | Nov. 26 (W) | Thanksgiving Break- NO CLASS Wed.-Fri. | -- |
| 26 | Dec. 01 (M) | Catch-up, review | -- |
| -- | Dec. 03 (W) | EXAM # 3 | Lecture material 19-25 |
| -- | Dec. 11 (R) | FINAL: 12:30 pm – 2:30 pm BC 2022 | Cumulative |

TENTATIVE LABORATORY EXERCISES:

| Lab | Day: | Topic: | Text / -Notes |
|-----|--------------------|--|---|
| 1 | August 19 | Laboratory Introduction, Safety, Web Resources, Microscopes, & Experimental Objectives | Tyler Chpt. 1: getting started, Lab Notebook |
| 2 | August 26 | Introduction to model organisms | Gibbs Chpt. 1 |
| -- | September 2 | NO LAB: Labor Day Week | -- |
| 3 | September 9 | Embryo Origami | Handout |
| 4 | September 16 | Axial Patterning & Embryo Preservation of Frogs | Gibbs Chpt. 2, Tyler Chpt. 14 (11-15) & Preservation Protocol |
| 5 | September 23 | Chicken Early Development (24 hour) | Gibbs Chpt. 8 Tyler Chpt. 9 -Observe frog embryos |
| 6 | September 30 | Chicken Development Cont. (33 hour) | Gibbs Chpt. 8 Tyler Chpt. 10 -Observe frog embryos -Notebook Check 1 |
| 7 | October 7 | Cell Adhesion & Frog Blastula Stages (from Lab 4, see Gibbs pg. 10-14) | Gibbs Chpt. 7 -Experimental Proposal Due See Gibbs Chpt. 13 |
| -- | October 14 | NO LAB: FALL BREAK— October 13-14 | -- |
| 8 | October 21 | Frog Neurula slides | Gibbs Chpt. 1 (pg. 10-14) -Proposal Approval |
| 9 | October 28 | Experiment Set-up | Based on Proposal (Gibbs Chpt. 13) |
| 10 | November 4 | Gametogenesis: Animals vs plants | Gibbs Chpt. 10 -Observe Experiment |
| 11 | November 11 | Gametogenesis: Mammals | Tyler Chpt. 5 -Observe Experiment |
| 12 | November 18 | Sea Urchin Fertilization | Gibbs Chpt. 4 |
| -- | November 25 | NO LAB: Thanksgiving Week | -- |
| 13 | December 2 | Catch-up, clean-up, review | Notebook Check 2 -Paper Due |
| | | | |

Note: Labs denoted by “Tyler Chpt. X” are provided on WebCT and will be discussed on the first lab session. Additional Ancillary materials are also listed on WebCT for this course. Above schedule subject to change or rearrangement based on availability of live specimens. Additional “unsupervised laboratory times” will be determined in class for outside student study time. It is strongly recommended you print out diagrams or pictures available for comparison during laboratory time and specify with instructor what structures you are responsible for identifying on practical exams. Keep track of your lab grade below:

| Type | Q1 | Q2 | Q3 | Q4 | Q5 | Q6 | Q7 | Q8 | NB1 | NB2 | P1 | P2 | P3 | Total |
|----------|----|----|----|----|----|----|----|----|-----|-----|----|----|----|-------|
| Possible | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 10 | 30 | 10 | 100 |
| Achieved | | | | | | | | | | | | | | |

Q= Quiz, **NB**= Notebook Check, **P1**= proposal, **P2**= paper, **P3**= participation.