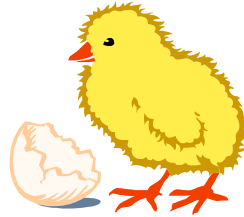


# Biology 302 ANIMAL EMBRYOLOGY Spring 2006



**COURSE WEBSITES:** <http://blackboard.vcu.edu>  
<http://www.people.vcu.edu/~cconway/embryology>

**COURSE MEETING TIMES and LOCATIONS:**

<i>Section Number</i>	<i>Lectures</i> (Life Sciences 253)	<i>Laboratory Sessions</i> (Life Sciences 227)	<i>Honors Session</i> (Life Sciences 227)
302-001	10:00 – 10:50 am MWF	11:00 am – 12:50 pm TR	
302-002		2:00 – 3:50 pm TR	
302-701 (Honors Students Only)		11:00 am – 12:50 pm TR	11:00 - 11:50 am F
302-702 (Honors Students Only)		2:00 – 3:50 pm TR	

**COURSE OBJECTIVES and GOALS:**

- To acquire a working knowledge and understanding of the events and processes which occur during animal reproduction and embryonic and fetal development.
- To observe and study developmental events and processes in selected animal models (both invertebrate and vertebrate) and to perform pertinent experimental work.
- To acquire a working knowledge and understanding of some of the techniques and experimental procedures which are used to investigate the mechanisms of animal reproduction and development.
- To gain experience in reading and evaluating scientific literature relevant to the topic of animal reproduction and development

The first three objectives will be met through an in-depth study of the events and processes that occur prior to, during, and after embryonic and fetal development in animals. A major, and very essential, component of this in-depth study will be the completion of the assigned laboratory work. The last objective will be met through various reading and writing assignments.

### **PREREQUISITE:**

As stated in the VCU Undergraduate Bulletin, the official prerequisite for Biology 302 is completion of Biology 218, Cell Biology (a required course for all biology majors), with a grade of C or better. Any student who has not satisfied this official prerequisite should drop the course during the add-drop period.

This prerequisite will be enforced for ALL degree-seeking students regardless of major. Students in post-baccalaureate certificate programs and special students/non-degree seeking students who completed cell biology at another institution will be asked to provide documentation (e.g., transcript) that they have satisfied the required prerequisite (or an acceptable equivalent). A prerequisite check will be conducted after the add-drop period is over and students without the required prerequisite will be asked to withdraw from the course.

**NOTE:** In addition to the official prerequisite, completion of BIOL 310, Genetics, (or an acceptable equivalent) prior to enrolling in BIOL 302 is highly recommended. Please see subsequent section on Miscellaneous Information and Policies for additional information concerning the relationship between the information to be covered in this course and the information covered in other courses in the Life Sciences.

The course objectives and goals can be achieved only if each student enrolled in the course has the appropriate knowledge base from his/her previous courses. Therefore, the instructor will assume that each student in Biology 302 has a working knowledge and basic understanding of topics that were covered in Biology 218: e.g., eucaryotic cell structure, macromolecular makeup and function of organelles found in eucaryotic cells, types of molecules and macromolecules found in/on eucaryotic cells and roles of these molecules and macromolecules in basic cell function, cell division (meiotic & mitotic), and gene function (DNA replication, transcription, translation). In addition, the instructor will assume that all students in Biology 302 have a working knowledge and basic understanding of topics that were covered in Biology 152 and 152 lab (courses that are among the prerequisites for BIOL 218): e.g., major animal phyla and their subdivisions, basic phylogenetic relationships of animals, basic morphology of animals (especially vertebrates). If necessary, students should consult the appropriate texts for a review of these and other topics.

## **REQUIRED/RECOMMENDED MATERIALS:**

- Carolyn M. Conway. 2006. LECTURE HANDOUTS FOR BIOLOGY 302, ANIMAL EMBRYOLOGY. Virginia Commonwealth University, Richmond.  
Will be available for printing (in installments) through VCU's Blackboard Website.

Each student will be responsible for printing the handout/handouts for each lecture topic prior to that topic's coverage in lecture.

- Carolyn M. Conway and Arthur F. Conway. 2006. LABORATORY EXERCISES AND STUDY GUIDE FOR BIOLOGY 302, ANIMAL EMBRYOLOGY. Virginia Commonwealth University, Richmond.  
Will be available for printing (in installments) through VCU's Blackboard Website.

Each student will be responsible for printing each exercise (and any other supplement materials) prior to each laboratory session.

- Shirley J. Wright. 2005. A PHOTOGRAPHIC ATLAS OF DEVELOPMENTAL BIOLOGY. Morton Publishing Company, Englewood, CO.  
Available in West Campus Bookstore (and possibly other area bookstores)

Each student will be responsible for bringing his/her Atlas to each laboratory session.

- Jonathan M. W. Slack. 2006. ESSENTIAL DEVELOPMENTAL BIOLOGY. Second Edition. Blackwell Publishing, Malden, MA.  
Available in West Campus Bookstore (and possibly other area bookstores)
- Appropriate printer supplies - ink cartridges or toner cartridges and paper (to be used to print out lecture handouts, laboratory exercises, and other course-related information available through Blackboard Website)
- Standard size clip board (for use during Laboratory Exams)
- Standard size 3-ring loose-leaf binder (to hold Laboratory Exercises and Lecture Handouts)  
Strongly recommended but not required

## **LECTURE SCHEDULE AND READING ASSIGNMENTS:**

As previously stated, handouts for each lecture topic will be distributed via VCU's Blackboard Website (<http://blackboard.vcu.edu>). Each student will be expected to print out his/her own copies of these lecture handouts (and any other supplemental materials) prior to the lectures and to bring these handouts to the lecture sessions. The lecture handouts, additional notes taken during the lecture sessions, and the PowerPoint slide shows used during the lecture sessions should be used as guidelines for the general concepts and principles and specific concepts and details that the instructor expects each student to learn and master during the semester.

The chapters in Wright (A PHOTOGRAPHIC ATLAS OF DEVELOPMENTAL BIOLOGY) and Slack (ESSENTIAL DEVELOPMENTAL BIOLOGY) that correlate with the lecture topics are indicated in the Lecture Schedule below. Some of the information in these books will not be covered during the lectures. Some of the information that will be presented in the lectures is not covered in these books.

It is recommended that students read over the handouts and related reading assignments prior to that topic's consideration in lecture. After each lecture session, students can concentrate mainly on those parts of the reading assignments that correlate with the information contained in the handouts, presented in the lectures, or covered subsequently in the related laboratory exercise/exercises.

<b>Date</b>		<b>Lecture Topic</b>	<b>Reading Assignment</b>
January	18	Overview of Animal Reproduction and Development	Wright: Preface, Ch. 1 Slack: Preface, Chs. 1, 2, 5 (pp. 43-48), 6
	20	Gene Expression in Eucaryotes	Slack: Appendix (pp. 324-327), Chs. 3, 4 (pp. 40-43), 5 (pp. 48-57)
	23	Gene Expression in Eucaryotes	
	25	Gene Expression in Eucaryotes	
	25	Overview of Gametogenesis	Wright: Chs. 3 (pp. 17-19), 4 (pp. 39-40) Slack: Ch. 2 (pp. 8-11)
	27	Oogenesis	Wright: Ch. 4 Slack: Chs. 7 (pp. 67-68), 11 (p. 140)
	30	Oogenesis	
February	1	Oogenesis	Wright: Ch. 3  Wright: Ch. 5 (pp. 53-57, 59-61)  Wright: Ch. 5 (pp. 53-57, 66) Slack: Ch. 10 (pp. 112-115)  Wright: Ch. 5 (pp. 53-57, 59-61)  Wright: Ch. 6 (pp. 67-71) Slack: Appendix (pp. 333-334), Chs. 2 (pp. 11-14, 18-19), 5 (pp. 53-55)  Wright: Ch. 6 (pp. 67-83) Slack: Chs. 7 (pp. 68-70), 9 (pp. 96-99), 11 (pp. 140-141)
		Spermatogenesis	
	3	Spermatogenesis	
	6	Spermatogenesis	
		Overview of Fertilization	
	8	Fertilization Process - Sea Urchins	
	10	Fertilization Process - Sea Urchins	
		Fertilization Process - Mammals	
	13	Fertilization Process - Mammals	
	15	Response of "Egg" to Gamete Fusion - "Egg" Activation	
	17	Overview of Cleavage and Blastulation	
	20	Early Development of Animal Embryos	
	22	Early Development of Animal Embryos	
	24	<b>LECTURE EXAM 1</b> (~130 points) Covers lecture topics and reading assignments through "Egg" Activation	
27	Early Development of Animal Embryos	(same as above)	

<i>Date</i>	<i>Lecture Topic</i>	<i>Reading Assignment</i>	
March	1	Early Development of Embryos of Eutherial Mammals	Wright: Ch. 6 (p. 83-85) Slack: Ch. 10 (pp. 115-116, 124, 129-130)
	3	Overview of Gastrulation	Wright: Ch. 7 (p. 87-88) Slack: Chs. 2 (pp. 14-17), 4 (pp. 33-35), Appendix (pp. 334-336)
	6	Gastrulation Patterns - Sea Urchin Embryos	Wright: Ch. 7 (p. 88-92)
	8	Gastrulation Patterns - Amphibian Embryos	Wright: Ch. 7 (p. 95-96) Slack: Ch. 7 (pp. 70-82)
	10	Gastrulation Patterns - Amphibian Embryos	
	10	Gastrulation Patterns - Avian Embryos	Wright: Ch. 7 (p. 96-101) Slack: Ch. 9 (pp. 99-100, 101-105)
	13	SPRING BREAK	
	15		
	17		
	20	Gastrulation Patterns - Avian Embryos	(same as above)
	22	Overview of Organogenesis	Wright: Ch. 9 (pp. 129-130)
		Primary Organogenesis in Vertebrates	Wright: Ch. 8
	24	Primary Organogenesis in Vertebrates	
		(NOTE: This is the last day to withdraw from classes for the 2006 Spring semester.)	
	27	Secondary Organogenesis in Vertebrates	Wright: Chs. 9, 10 (pp. 143-144), 11 (pp. 171-174), 12 (pp. 227-228), 13 (pp. 179-185), 15 (221-225), 16 (pp. 249-262), 18 (pp. 281-285), 20, Appendix (pp. 327-332) Slack: Chs. 9 (pp. 105-110), 13 (pp. 179-185), 15 (221-225), 16 (pp. 249-262), 18 (pp. 281-285), 20, Appendix (pp. 327-332)
	29	Secondary Organogenesis in Vertebrates	
31	<b>LECTURE EXAM 2</b> (~100 points) Covers lecture topics and reading assignments through Gastrulation Patterns – Avian Embryos		

<b>Date</b>		<b>Lecture Topic</b>	<b>Reading Assignment</b>
April	3	Secondary Organogenesis in Vertebrates	(same as above)
	5	Extraembryonic Structures in Oviparous Vertebrates	Wright: Ch. 11 (pp. 173-174) Slack: Ch. 19 (pp. 100-101)
	7	Development of the Nervous System	Wright: Chs. 9 (pp. 130-136), 10 (pp. 144-145), 11 (pp. 174-177), 12 (pp. 220-233) Slack: Chs. 7 (pp. 82-86), 14
	10	Development of the Nervous System	
	12	Development of the Nervous System	
	14	Development of the Nervous System	
		Development of the Cardiovascular System	Wright: Chs. 9 (pp. 139-141), 10 (p. 146), 11 (pp. 181-183), 12 (pp. 235-240) Slack: Chs. 13 (pp. 194-196), 15 (pp. 242-246)
	17	Development of the Cardiovascular System	
	19	Development of the Cardiovascular System	
	21	<b>LECTURE EXAM 3</b> (~100 points) Covers lecture topics and reading assignments through Development of Nervous System	
24	Development of the Reproductive System	Wright: Chs. 9 (pp. 141-142), 11 (pp. 180-181), 12 (p. 236) Slack: Ch. 15 (pp. 229-233)	
26	Development of Limbs	Wright: Ch. 9 (p. 142) Slack: Ch. 15 (pp. 225-226, 233-241), 18 (pp. 285-287)	
28	Internal Development in Eutherial Mammals	Wright: Chs. 12 (pp. 228-229), 13 Slack: Ch. 10 (pp. 116-122, 133-135)	
May	1	Internal Development in Eutherial Mammals	
	5	8 - 10:50 am <b>FINAL EXAM</b> (~275 points) Covers lecture topics, reading assignments, and laboratory work for the entire course	

## LABORATORY SCHEDULE:

Laboratory sessions are scheduled at the following times on Tuesdays and Thursdays in Room 227 of the Trani Center for Life Sciences:

- Section 001: 11:00 am - 12:50 pm
- Section 701: 11:00 am - 12:50 pm (Honors Students)
- Section 002: 2:00 - 3:50 pm
- Section 702: 2:00 - 3:50 pm (Honors Students)

**NOTE:** The expectation is that each student will attend the laboratory sessions for which he/she is officially registered. Exceptions to this policy will be determined on a case-by-case basis. During the first week of classes each student should check his/her schedule and with the instructor if there is any question about, or problem with, his/her registration status. Most changes in registration status can only be made during the Add-Drop period; such changes will only be made on a space available basis.

*This course is a challenging, laboratory-intensive course* and the work conducted in the laboratory is a major, and very essential, component of the course. Laboratory work will be "experiential" and "hands-on" and will involve direct observation/study of a variety of materials including models, prepared microscope slides, living specimens, staged embryonic materials, etc. The expectation is that by the completion of the course, each student will have observed/studied, and will be able to recognize and distinguish, all of the stages of development (and their structural/morphological features) of all of the animal model systems observed/studied in the course.

Background information and step-by-step directions for the laboratory work are contained in the laboratory guide LABORATORY EXERCISES and STUDY GUIDE for BIOLOGY 302, ANIMAL EMBRYOLOGY. Installments of the laboratory guide will be distributed via VCU's Blackboard Website (<http://blackboard.vcu.edu>). Each student will be expected to print out his/her own copies of the exercises (and any other supplemental materials) and to look over the exercises PRIOR TO THE LAB SESSIONS and to bring the appropriate exercise/exercises to his/her lab sessions.

Laboratory work will be initiated according to the schedule below. Many of the lab exercises (indicated by an \* in the schedule) involve the observation/study of living specimens and/or staged embryonic material that will be available ONLY during the scheduled laboratory sessions. Therefore, most laboratory work involving living material CAN NOT be made up after the scheduled laboratory sessions. Other materials used during the laboratory sessions (i.e., models, diagrams, prepared microscope slides, preserved material, etc.) may be observed/studied and/or reviewed at times others than the scheduled laboratory periods provided that the laboratory is not in use for another purpose.

Because of the importance of laboratory work in this course, *ALL students are expected to attend ALL laboratory sessions and to spend a minimum of ~4 hours a week in the laboratory.* Some of the laboratory work will be conducted during the scheduled laboratory sessions. However, due to the nature of many of the exercises and the large

amount of material covered in the laboratory exercises, additional laboratory work will have to be conducted at times other than during the scheduled laboratory sessions. Therefore, *ALL students should anticipate/expect to spend many additional hours in the laboratory observing/studying the required laboratory materials and learning to recognize and distinguish all of the stages of development (and their structural/morphological features) of all of the animal model systems observed/studied in the course.*

<b>Date</b>		<b>Exercise Number and Topic</b>
January	17	Video - "Odyssey of Life" (Part I – The Ultimate Journey)
	19	Video - "How Babies Get Made"
	24	Ex. 1 - Introduction to Developing Systems
	26	Ex. 2 - Mammalian Reproduction Tract Anatomy *
	31	Ex. 3 - Avian Reproductive Tract Anatomy *
February	2	Ex. 4 - Ovary Morphology and Oogenesis
	7	Ex. 4 - Ovary Morphology and Oogenesis (continued) Ex. 5 - Testis Morphology and Spermatogenesis
	9	Ex. 5 - Testis Morphology and Spermatogenesis (continued)
	14	Ex. 6 - Oogenesis, Fertilization and Early Development in <i>Ascaris</i>
	16	Ex. 7 - Development of Starfish Embryos
	21	<b>LABORATORY EXAM 1</b> (~80 points) Covers Exercises 1 through 6
	23	Ex. 10 - Development of Mollusc Embryos *
	28	Ex. 8 - Development of Sea Urchin Embryos * Ex. 10 - Development of Mollusc Embryos * (continued)
March	2	Ex. 11 - Early Development of Frog Embryos - Cleavage through Blastulation Ex. 8 - Development of Sea Urchin Embryos * (continued) Ex. 10 - Development of Mollusc Embryos * (continued)
	7	Ex. 9 - Role of Gene Expression during Development of Sea Urchin Embryos *
	9	Ex. 15 - Early Development of Chick Embryos – Cleavage through Blastulation Ex. 9 - Role of Gene Expression during Development of Sea Urchin Embryos * (continued)

<b>Date</b>		<b>Exercise Number and Topic</b>
March	14 16	SPRING BREAK
	21	Ex. 9 - Role of Gene Expression during Development of Sea Urchin Embryos (continued) *
	23	Ex. 12 - Gastrulation, Neurulation, and Primary Organogenesis in Frog Embryos Ex. 9 - Role of Gene Expression during Development of Sea Urchin Embryos (continued) *
	28	Ex. 16 - Gastrulation, Neurulation and Primary Organogenesis in Chick Embryos Ex. 14 - Development of Embryos and Larvae of the South African Clawed Frog, <i>Xenopus laevis</i> *
	30	Ex. 13 - Secondary Organogenesis in Frog Embryos and Larvae Ex. 14 - Development of Embryos and Larvae of the South African Clawed Frog, <i>Xenopus laevis</i> * (continued)
April	4	Ex. 17 - Removal of the Chick Blastoderm * Ex. 18 - Secondary Organogenesis in Chick Embryos I: 1.5 Days of Incubation * Ex. 23 - Preparation of Stained Whole Mount Slides of Chick Embryos/ Blastoderms (Part I) * Ex. 14 - Development of Embryos and Larvae of the South African Clawed Frog, <i>Xenopus laevis</i> * (continued)
	6	<b>LABORATORY EXAM 2</b> (~120 points) Covers Exercises 7 through 14
	11	Ex. 19 - Secondary Organogenesis in Chick Embryos II: Two Days of Incubation * Ex. 23 - Preparation of Stained Whole Mount Slides of Chick Embryos/Blastoderms (Part I) *
	13	Ex. 20 - Secondary Organogenesis in Chick Embryos III: Three Days of Incubation * Ex. 23 - Preparation of Stained Whole Mount Slides of Chick Embryos/Blastoderms (Part II)
	18	Ex. 21 - Secondary Organogenesis in Chick Embryos IV: Four Days of Incubation * Ex. 23 - Preparation of Stained Whole Mount Slides of Chick Embryos/Blastoderms (Part III)

<b>Date</b>		<b>Exercise Number and Topic</b>
April	20	Ex. 22 - Secondary Organogenesis in Chick Embryos V: Five Days of Incubation to Hatching * Ex. 23 - Preparation of Stained Whole Mount Slides of Chick Embryos/Blastoderms (Part IV)
	25	Ex. 24 - <i>In Vitro</i> Culture of Chick Embryos * Ex. 25 - Development of Mammalian Embryos and Fetuses Ex. 23 - Preparation of Stained Whole Mount Slides of Chick Embryos/Blastoderms (Part IV) (continued)
	27	Ex. 25 - Development of Mammalian Embryos and Fetuses (continued) Ex. 26 - Development of Embryos and Fetuses of the Laboratory Mouse, <i>Mus musculus</i> * Ex. 24 - <i>In Vitro</i> Culture of Chick Embryos * (continued)
May	2	Ex. 27 - Insect Development and Metamorphosis * Ex. 28 - Larval Development and Metamorphosis in the South African Clawed Frog, <i>Xenopus laevis</i> * Ex. 24 - <i>In Vitro</i> Culture of Chick Embryos * (continued)
	9 & 11	1 – 3:50 pm <b>LABORATORY EXAM 3</b> (~140 points) Covers Exercises 15 through 28 (Specific details about the date and time for each section will be provided at end of the semester.)

### STUDENT EVALUATION:

Evaluation of students in Biology 302 will be based on the following:

#### 1. POINTS OBTAINED ON LECTURE EXAMS (~330 points)

As indicated in the Lecture Schedule, three Lecture Exams will be given during the semester. The topics to be covered on each Lecture Exam are indicated in the Lecture Schedule. The approximate point value for each Lecture Exam (as indicated in the schedule) is determined mainly by the amount of material covered in the corresponding handouts and lectures.

All Lecture Exams will be THOROUGH and OBJECTIVE, consisting of true-false, multiple choice, multiple choices, multiple matching, fill in the blank, short answer, and "other" type questions. Because of the large amount of material to be covered on the Lecture Exams and the types of questions on the Lecture Exams, students will be given 1 hour and 50 minutes in which to complete each Lecture Exam. More details will be provided later in the course.

## 2. POINTS OBTAINED ON LABORATORY EXAMS (~340 points)

As indicated in the Laboratory Schedule, two Laboratory Exams will be given during the semester. The third Laboratory Exam will be given during the Final Exam Period. The laboratory exercises to be covered on each Laboratory Exam are indicated in the schedule. The approximate point value for each Laboratory Exam (as indicated in the schedule) will be determined mainly by the amount of material covered in the corresponding laboratory exercises.

All Laboratory Exams will be THOROUGH and OBJECTIVE, consisting of short answer and "other" type questions. Most of the questions on the Laboratory Exams will be practical in nature (requiring observation of appropriate specimens, microscope slides, etc.)

## 3. POINTS OBTAINED ON FINAL EXAM (~275 points)

The Final Exam will be given at the appropriately scheduled time during the Final Exam Period. This exam will be COMPREHENSIVE and will cover the entire course.

The Final Exam will consist of true-false, multiple choice, multiple choices, multiple matching, fill in the blank, short answer, and "other" type questions. Because of the large amount of material covered during the course and the types of questions on the Final Exam, students will be given additional time to complete the Final Exam.

## 4. PREPARATION AND SUBMISSION OF A WRITTEN RESEARCH PAPER (~75 points)

The Research Paper will be based on the experiment in Exercise 9 of LABORATORY EXERCISES AND STUDY GUIDE FOR BIOLOGY 302, ANIMAL EMBRYOLOGY. The experiment will be conducted by groups of students and the preparation of the paper will be a joint effort for each group conducting the experiment.

The format required for the research paper is provided in Appendix D of the lab guide. The specific procedures and dates for submission of drafts of the research paper, as well as other pertinent information, will be provided after the experiment has been conducted in the laboratory.

**NOTE:** In the unlikely event that Exercise 9 can not be conducted because of unavailability of, and/or problems with, the animal specimens, the instructor may assign a substitute writing assignment.

5. SUBMISSION OF SUMMARIES OF ONE OR MORE (as specified later) PRIMARY RESEARCH PAPERS THAT HAVE BEEN PUBLISHED RECENTLY IN SCIENTIFIC RESEARCH JOURNALS (15 - 45 points)

Specific details, the procedures to be followed, and the deadline for submission, will be specified in a detailed handout that will be distributed (via Blackboard) around the time of Lecture Exam 1.

6. ATTENDANCE AND PARTICIPATION (as specified below)

Each student is expected to attend ALL lecture sessions and ALL laboratory sessions (and for students enrolled in the Honors Sections – ALL honors sessions). This expectation includes arriving at all sessions on time and remaining for the entire session. Each student is expected to exhibit enthusiasm and interest in the subject matter and to be an active participant in all course activities.

Attendance will be taken during lecture and laboratory sessions and will be used, as specified below, in determining final grades.

**NOTE:** Honors students enrolled in Sections 701 and 702 will have additional requirements. Specific details will be provided in a handout that will be distributed at, or prior to, the 1<sup>st</sup> Honors Session.

At the end of the semester the points earned on all exams (Lecture Exams, Laboratory Exams, Final Exam), the Research Paper, and Research Articles Summaries will be totaled. The point total, along with the additional requirements indicated below (and the additional requirements for students enrolled in the Honors Sections), will then be used to determine the final letter grade.

D = Earned at least 60% of total possible points and satisfaction of the following:

- Missed no more than eight laboratory sessions

C = Earned at least 70% of total possible points and satisfaction of ALL of the following:

- Missed no more than six laboratory sessions
- Submission of at least one Research Article Summary

B = Earned at least 80% of total possible points and satisfaction of ALL of the following:

- Missed no more than four laboratory sessions
- Submission of at least one Research Article Summary

A = Earned at least 90% of total possible points and satisfaction of ALL of the following:

- Missed no more than two laboratory sessions
- Submission of at least one Research Article Summary

**NOTE:** The final letter grade for any student who did not attend lectures on a regular basis (i.e., unexcused absences from more than 4 - 5 lecture sessions) may, at the instructor's discretion, be lowered by at least one letter grade.

## MISCELLANEOUS INFORMATION AND POLICIES:

1. From the instructor's perspective, embryology is a subject where information from a number of other subject areas (e.g., cell biology, zoology, genetics, biochemistry, molecular biology, anatomy, physiology) can be integrated in order to really learn about, and understand, how different animal species reproduce and develop.

Therefore, this course is most appropriate for advanced biology majors (e.g., juniors/3<sup>rd</sup> year students, seniors/4<sup>th</sup> year students) who have completed a number of the previously mentioned courses and/or who may be concurrently enrolled in several of these courses.

As stated in the previous section on Course Prerequisites, in addition to completion of the official prerequisite (BIOL 218, Cell Biology), completion of BIOL 310, Genetics, (or an acceptable equivalent) prior to enrolling in BIOL 302 is highly recommended.

**NOTE:** Any student who is not familiar with the different animal phyla and/or the basic structure of the vertebrate body will find it necessary to obtain that information (on his/her own) in order to really learn, master, and appreciate, this subject.

2. This course will be *web-enhanced*. Throughout the semester, all course-related materials (i.e., lecture handouts, laboratory exercises, PowerPoint slide shows used in lectures, and other course documents) will be distributed via VCU's Blackboard Website (<http://blackboard.vcu.edu>). Most of the course information available via Blackboard will be in PDF format and can be read and printed using Adobe Acrobat Reader (if necessary, software can be downloaded free – <http://www.adobe.com>).

Each student will be expected to print out his/her own copies of the lecture handouts, laboratory exercises, and any other supplemental materials and to bring the appropriate handouts to the lecture sessions and the appropriate laboratory exercises to the laboratory sessions.

**NOTE:** Any student who does not have access to a computer and printer should consult with the instructor about this expectation ASAP.

3. Throughout the semester the instructor will notify students via email about the availability of items placed on the Blackboard Website and other pertinent course information. All emails sent out from Blackboard go to students' VCU email addresses. THEREFORE IT IS EACH STUDENT'S RESPONSIBILITY TO CHECK HIS/HER VCU EMAIL ON A REGULAR BASIS (on a daily basis at a minimum). Anyone with a VCU email address can check his/her VCU email using any web browser by accessing the VCU Website (<http://www.vcu.edu>) and clicking on Web Mail (located at upper right) and then selecting Student Email.

4. This is a *challenging laboratory-intensive course* that will require *much active participation and active learning by each student*.

A large amount of information will be covered in both the lecture sessions and in the laboratory sessions and each student must work to effectively integrate ALL of this information. In order to really LEARN and UNDERSTAND the course material, each student must spend adequate time in the laboratory and must keep up with the material on a daily and weekly basis. It is recommended that each student spend at least 14-21 hours per week reviewing and/or studying course-related materials. In other words, each week each student should plan to allocate 2-3 hours for each hour spent in class (including time spent in both lecture sessions and laboratory sessions) for the specific purpose of reviewing and/or studying course-related materials.

Because of the nature of the subject matter, the concepts, principles, and details continually build upon each other. In many animals, the events of early development influence the subsequent events of development. Therefore, it is essential that each student work very diligently to learn, understand, master, and retain ALL of the information covered in the early part of the course so that he/she will be prepared to deal effectively with the remaining course content.

5. Each student is expected to attend ALL lecture sessions and ALL laboratory sessions (including arriving at ALL sessions on time and remaining for the entire session) and will be held responsible for ALL lecture materials and ALL laboratory materials and/or assignments. Attendance and participation will be a factor in determining final grades (see previous section on Student Evaluation).

**NOTE:** In previous semesters students who were frequently absent from lecture and/or laboratory sessions did not perform well in the course.

In the event that a student must miss a lecture session for a legitimate reason (e.g., interview, court date, religious holiday, illness, etc.), he/she is encouraged to view the appropriate PowerPoint slides (via the course's Blackboard Website) associated with the missed lecture session.

In the event that a student must miss his/her scheduled laboratory session for a legitimate reason (e.g., interview, court date, religious holiday, etc.), the student should consult with the instructor about the possibility of attending a different laboratory session.

6. The Laboratory Exams and Lecture Exams in this course will be challenging learning experiences for all students.

Laboratory Exams will be practical in nature and will consist of short answer and “other” type questions. Lecture Exams will consist of a variety of question formats: true-false, multiple choice, multiple choices, multiple matching, fill in the blank, short answer, and “other” type questions. Study Guides will be available (1 - 1 weeks preceding each exam) to help students prepare for the exams.

Because of the nature of the Lecture Exams, students will be given 1 hour and 50 minutes in which to complete each of the three Lecture Exams given during the semester. Specific details will be provided later in the course.

7. In the event that a student can not take a Lecture Exam on the scheduled date, the instructor may allow the student to reschedule the Lecture Exam provided that the student has a VALID, VERIFIABLE reason (e.g., interview, serious illness, court date, religious holiday, etc.) and provided that the student contacted the instructor in writing (e.g., via email) PRIOR to the day of the Lecture Exam. The rescheduled Lecture Exam should be taken within one week of the originally scheduled Lecture Exam (unless there are extenuating circumstances). In cases in which a Lecture Exam is missed because of an invalid reason, a grade of 0 will be recorded.

**NOTE:** Lack of preparation for an exam is usually alone NOT an acceptable reason for rescheduling or missing an exam.

8. Laboratory Exams can not be rescheduled and there will be NO make-up Laboratory Exams. Therefore Laboratory Exams must be taken on the scheduled day. In cases in which a Laboratory Exam is missed, a grade of 0 will be recorded.

**NOTE:** In the unlikely event that a student misses a Laboratory Exam because of an event over which he/she has no control, the instructor will evaluate the situation and determine how the absence will affect the student’s final grade.

9. Each student is encouraged to make use of every opportunity to use the laboratory (LS 227) to review and study laboratory materials and other course materials. In compliance with departmental regulations, any student using the laboratory during any of the time periods indicated below must be especially careful and not conduct any activities that could affect his/her own safety or other students' safety.

In addition to the scheduled laboratory sessions, LS 227 will usually be available for review and study on Mondays, Wednesdays, and Fridays from ~8 am to ~5 pm and on Tuesdays and Thursdays before and after the scheduled laboratory sessions [i.e., ~8 - ~11 am, ~1 - ~2 pm, & ~4 - ~5 pm] (see schedule posted on lab door). LS 227 may also be available on Monday through Friday evenings from ~5 pm until ~9:30 pm and during weekends provided that appropriate arrangements have been made with the instructor (see schedule posted on lab door). Access to the laboratory at all times other than during the scheduled laboratory sessions will be via a proxy card. Specific details about obtaining proxy card access to LS 227 will be provided by the instructor.

**NOTE:** During those weeks that Laboratory Exams are scheduled, the laboratory will close at 6 pm on the day preceding the Laboratory Exam and will not reopen for student use until after all students have completed the Laboratory Exam and the instructor has put away all materials used for the Laboratory Exam.

10. From the instructor's perspective, grades are considered as confidential and private information between each student and the instructor. Therefore, individual student grades for Lecture Exams, Laboratory Exams, and Final Exam as well as the final course grade will not be posted publicly. Each student will be able to access his/her course grades via Blackboard. Each student is expected to adhere to a "don't ask and don't tell" policy (i.e., do not ask other students about their grades and do not tell other students what your grades are).

11. Each student must follow the General Safety Regulations for the Life Sciences Building.

Smoking is not allowed in the Life Sciences Building at any time. Eating in the lecture room and/or laboratory is routinely not allowed. Appropriate clothing and footwear must be worn in the laboratory.

**NOTE:** Flipflops and similar open-toed sandals are not considered to be appropriate footwear for the laboratory.

12. In compliance with Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990, reasonable accommodations will be made for any student with disabilities provided that the student presents the appropriate documentation from the Coordinator of Services for Students with Disabilities.

For further information, see the current edition of the VCU Resource Guide and VCU's WebSite ([www.vcu.edu/eeoaa/disability.html](http://www.vcu.edu/eeoaa/disability.html)).

13. Each student must be familiar with the official Rules and Procedures of VCU as described in the current edition of the VCU Resource Guide and also posted on VCU's WebSite ([www.students.vcu.edu/rg/pdf/ResourceGuide2005-Policies.pdf](http://www.students.vcu.edu/rg/pdf/ResourceGuide2005-Policies.pdf)).

14. Each student must be familiar with the official statement on Student Conduct in the Classroom as described in the current edition of the VCU Resource Guide and also posted on VCU's WebSite ([www.students.vcu.edu/rg/policies/conductguide.html](http://www.students.vcu.edu/rg/policies/conductguide.html)).

Each student is expected to conduct him/herself as a mature, responsible adult and to be considerate to other persons, regardless of gender, age, ethnic background, disabilities, etc.

ALL cell phones and beepers MUST BE TURNED COMPLETELY OFF while in the lecture room and in the laboratory. During all exams, students will be required to place cell phones and beepers in backpacks, bags, purses, etc. or leave them with the instructor.

Inappropriate and/or disruptive behavior during lecture and/or laboratory sessions will not be tolerated. Side conversations held during lecture sessions are totally inappropriate, show disrespect to both the instructor and fellow students, and have a detrimental effect on both the delivery, and receipt, of course-related information. Likewise, side conversations held during laboratory sessions on topics unrelated to the subject matter are totally inappropriate and have a detrimental effect on laboratory activities.

15. Each student must demonstrate academic integrity and act in accordance with the revised VCU Honor System as described in the current edition of the VCU Resource Guide and posted on VCU's WebSite ([www.students.vcu.edu/rg/policies/honor.html](http://www.students.vcu.edu/rg/policies/honor.html)).

ALL materials submitted to the instructor for a grade (i.e., Laboratory Exams, Lecture Exams, Research Paper, Research Article Summaries) must be each student's own work.

Microscopes, microscope slides, and/or any other course materials are NOT to be removed from the laboratory.

Other rules/regulations relating specifically to the laboratory are stated in LABORATORY EXERCISES and STUDY GUIDE for BIOLOGY 302, ANIMAL EMBRYOLOGY.

All cases of abuse of University materials, cheating and/or plagiarism will be dealt with according to the policies/procedures of the VCU Honor System.

**NOTE:** Obtaining copies of Lecture Exams and/or Laboratory Exams from students who took this course in previous years is a violation of the VCU Honor System.

16. Any student who does not understand course policies, departmental policies, and/or university policies should seek clarification of the policies from the instructor. Also, any student who does not understand the materials covered during the lecture sessions and/or laboratory sessions should consult with the instructor on a regular basis.

17. Any student who attempts to contact the course professor at VCU (by telephone or in person) and is unsuccessful in his/her attempt should leave a voice mail message or a message on the professor's office door (Room 228) or send an e-mail message. Otherwise the course professor will not be aware that a student attempted to contact her.

Course Professor: Dr. Carolyn M. Conway

Office Hours: ~11 am to ~noon on Mondays and Wednesdays  
~4 pm to ~5 pm on Tuesdays and Thursdays  
~noon to ~1 pm on Fridays

Other times BY APPOINTMENT

Office Location: Life Sciences Room 228

Office Phone: 804-827-0177

Office E-mail Address: cmconway@vcu.edu or cconway@mail1.vcu.edu

Personal Website: <http://www.people.vcu.edu/~cconway>

Home Phone: 804-746-2475 (leave message on answering machine)

Home E-mail Address: caconway@vcu.org

Embryology-Syllabus-S2006

1/13/2006

cmc

