EMBRYOLOGY

BIOL-4301.001
Engineering Building (EN)-106
Tuesday and Thursday
9:30-10:45 AM

INSTRUCTOR: DR. DAVID MOURY (Ph.D.)
Offices: Engineering Building (EN)-319F or
Center for Instruction (CI)-370
Office Phones: (361) 825-3259 or (361) 825-2241
E-mail: david.moury@.tamucc.edu
Office Hours: (Most often, I will be found in the CI office):
Monday, Tuesday and Thursday 3:20-5:00 PM

A student may make an appointment to see me at times other than the scheduled office hours. I am available for consultation and extra help, but it is the student’s responsibility to request such help. If I am unavailable or need to relocate during office hours, I will post a note on my office door.


OPTIONAL BOOK(S): Any of the various “Embryology/Development” books or coloring books that are available in academic or popular bookstores. Good anatomy and cell/genetics textbooks are also helpful as references for this course.

PREREQUISITES: Biology I and II (BIOL 1406 and 1407), and Genetics (BIOL 2416).

COURSE OVERVIEW: Embryology (BIOL 4301) is an upper-division, lecture course that examines aspects of animal development from the “gamete to the grave,” placing particular emphasis on the period from gametogenesis through birth. Students—in consultation with their academic advisors—must determine whether this course is appropriate for their academic and/or career plans. This course will focus on two major themes:
• Changes in anatomy and physiology during development.
• The physical, genetic, and chemical controls underlying these changes.

Familiarity with adult anatomy and/or physiology provides an understanding of the “end product” of development. The anatomy/physiology covered in Biology II, plus additional information given during this course, should provide sufficient background. (Students who have had a college-level course in anatomy/physiology, however, will find that it helps them in this course.) Knowledge of genetics, cell biology, or molecular biology is also helpful—hence the Genetics prerequisite. (In other words, I hope you didn’t do a “data dump” after Genetics!)
The emphasis of this course is normal animal development (based on studies of selected model organisms). However, we will also examine teratology (conditions resulting from abnormal development). These abnormal conditions serve as “natural experiments” that help to elucidate normal development by perturbing it.

This course seeks to give students an understanding of animal development at several levels of organization (see the traditional hierarchical organization shown at the right) by examining three major areas:

A. **Descriptive Embryology in Model Animals** which introduces the student to basic embryological terminology, concepts and questions;

B. **Vertebrate Morphogenesis and Organogenesis and Their Regulation** in which cells and tissues take their proper place as members of recognizable organs, continue to develop and grow; and

C. **A Broader Picture of Developmental Biology** which introduces students to developmental concepts that extend beyond embryology.

**STUDENT LEARNING OUTCOMES:** The division of topics in the schedule (p. 3) is based on the three major areas listed above. For each topic in the schedule, the student will be expected to…

1. Use scientific and clinical terminology correctly.
2. Recognize and identify developmental stages, structures, and their components. Simple naming of stages and parts, and listing of the time spent in these stages, though necessary, is a minor component of this course.
3. Discuss physical, genetic, and chemical control mechanisms in terms of what regulates a particular developmental change, and what—in turn—the effects of that particular change will be.
4. Explain how the interactions of structures and chemical systems change during development.
5. Evaluate our current understanding of developmental mechanisms using evidence from experimental embryology (with non-human organisms) or teratology supports their arguments.

Each of these outcomes will be assessed in all examinations and in the group presentation. Two skills-related outcomes will be measured only in the group presentation. Students will be expected to:

6. Demonstrate creativity, scientific accuracy and professionalism in the preparation and oral presentation of an overview of a scientific topic.
7. Synthesize a brief, concise written summary of their topic using and citing appropriate sources.
### Tentative Schedule:

<table>
<thead>
<tr>
<th>Day</th>
<th>Date</th>
<th>Topic</th>
<th>Chapters*</th>
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<tr>
<td>Thurs.</td>
<td>23 Aug.</td>
<td>Introduction and Overview</td>
<td>1</td>
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<tr>
<td>Tues.</td>
<td>28 Aug.</td>
<td>Themes, Questions and Tools</td>
<td>2-5</td>
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<tr>
<td>Thurs.</td>
<td>30 Aug.</td>
<td>continued</td>
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<tr>
<td>Tues.</td>
<td>4 Sept.</td>
<td>continued</td>
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<tr>
<td>Thurs.</td>
<td>6 Sept.</td>
<td>continued</td>
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<tr>
<td>Tues.</td>
<td>11 Sept.</td>
<td>continued</td>
<td></td>
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<tr>
<td>Thurs.</td>
<td>13 Sept.</td>
<td>continued</td>
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**End of Material for Lecture Examination I**

| Tues.     | 18 Sept.   | EXAMINATION I                              | 1-5       |
| Thurs.    | 20 Sept.   | Overview of Early Development              | 7-11 (selected parts) |
| Tues.     | 23 Sept.   | continued                                  |           |
| Thurs.    | 27 Sept.   | continued                                  |           |
| Tues.     | 2 Oct.     | continued                                  |           |
| Thurs.    | 4 Oct.     | continued                                  |           |
| Tues.     | 4 Oct.     | continued                                  |           |
| Thurs.    | 9 Oct.     | Tissues and Histogenesis                   | 13        |
| Thurs.    | 11 Oct.    | continued                                  |           |
| Tues.     | 16 Oct.    | continued                                  |           |

**End of Material for Lecture Examination II**

| Thurs.    | 18 Oct.    | Organogenesis: Ectoderm                    | 14        |
| Tues.     | 23 Oct.    | EXAMINATION II                             | 7-11, 13  |
| Thurs.    | 25 Oct.    | continued                                  |           |
| Tues.     | 30 Oct.    | Organogenesis: Mesoderm                    | 15        |
| Thurs.    | 1 Nov.     | continued                                  |           |
| Tues.     | 6 Nov.     | Organogenesis: Endoderm                    | 16        |
| Thurs.    | 8 Nov.     | continued                                  |           |
| Tues.     | 13 Nov.    | Beyond the Embryo                          | 18-20 (selected parts) |
| Thurs.    | 15 Nov.    | continued                                  |           |

**End of Material for Lecture Examination III**

| Tues.     | 20 Nov.    | EXAMINATION III                            | 14-16, 18-20 |
| Thurs.    | 22 Nov.    | Thanksgiving Holiday—No Classes           |            |
| Tues.     | 27 Nov.    | Student Presentations                      |            |
| Thurs.    | 29 Nov.    | Student Presentations                      |            |
| Tues.     | 4 Dec.     | Student Presentations                      |            |

**Final Examination (8:00-10:30 AM) (Comprehensive)**

*Chapters in Slack (2006); reading these chapters before class is always a good idea. However, I tend to “tell the story of development” in my own way, rather than adhering strictly to the order of topics in the textbook. As upper-division science students you should be able to synthesize the authors’ story and my story into a single coherent story that is logical and makes sense to you. Use the textbook as a reference source and consult other chapters to fill in gaps in your knowledge. (I do this when making lectures, and am likely to pull some material from chapters 6, 12, 17 and the Appendix if it helps me tell the story, even though these are not assigned readings.)*

### Major Course Requirements / Grading:

Your final letter grade will be based on your average in lecture. Statistical manipulations (e.g., curving) may be performed once—at the end of the semester—not for each examination. The final grading scale will also be determined at the end of the semester, but the cut-off for each grade will be no higher than the following:

\[ A \geq 90\% > B \geq 80\% > C \geq 70\% > D \geq 60\% > F \]
The distribution of points in this course is:

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<tr>
<td><strong>Examinations:</strong></td>
<td>900 points</td>
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<tr>
<td><strong>Group Presentation:</strong></td>
<td>100 points</td>
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<tr>
<td><strong>TOTAL POINTS POSSIBLE:</strong></td>
<td>1000 points</td>
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**Examinations:** I will give four examinations (100 percentage points each), taking questions for these tests primarily from material covered in the lectures, from handouts and other assignments, and from readings in Slack (2006). Examinations may consist of essay, short-answer, compare-contrast, fill-in-the-blank, multiple-choice, matching, making and/or labeling drawings, and/or various types of “flex” questions (i.e., anything is fair game). The first three examinations are sequential (i.e., each examination covers material from one specific section of the course). The final examination is comprehensive (i.e., covers material from the entire course), and redemptive (i.e., it can count as nothing; it can replace single examination; or it can be your *entire* examination grade). Thus, your examination grade can come from a percentage derived from…

1) the final examination alone…

or 2) the average of the three examinations…

or 3) the average of the two highest examinations with the final used to replace the lowest examination…

… whichever method gives you the highest percentage. (Multiply your highest percentage by 3 to determine how many points you earned out of the 900 examination points.)

**Student Group Presentations:** Students will work in groups to present short (about 10-15 minute) PowerPoint presentations on selected topics. In addition to the oral presentation, each group should prepare a one-page description and summary of their topic that will be distributed to the entire class. Each group should also prepare an annotated reference list including at least three references (types listed below). (An annotated reference list means that each citation includes a brief description or summary of its contents.) Students will receive more information about the group presentations after the later in the semester. Points are distributed as follows:

**Oral PowerPoint Presentation (including graphics, appropriate dress, etc.):** 60 points

**Description and Summary (1 page only—no bleeding onto p. 2):** 30 points

**Annotated References (1 page only—no bleeding onto p. 2):** 10 points

1. Primary Research Article or Review (in a peer-reviewed journal)—at least 2
2. Secondary Reference (web site, textbook, government pamphlet, popular science magazine, newspaper, etc.)—at least one

**TOTAL POINTS POSSIBLE:** 100 points
Reminders: All paperwork for the presentations is due at the beginning of the class period on Tuesday 20 November. (Yes, that is also the date for Examination III; do not put this paperwork off until the last minute!)

- Check your presentation on the projection hardware before D-day!
- The primary research article and the review must be from peer-reviewed journals.
- Each group must provide me with a hard copy of all reference sources.
- The annotation is similar to an abstract, but do not just copy or paraphrase the abstract from the paper. You will get no credit if you do!

Tutoring and Other Services: To be successful in this course, and most others, you must cultivate good note-taking skills, organization skills, study habits, and test-taking strategies from the very beginning. Your instructors are always available for help, but don’t wait until it is too late! The Center for Academic Student Achievement (CASA) (825-5933) and STEM Outreach Access and Retention (SOAR) (825-2618) provide free tutoring, test-taking strategies, and extra help. Take advantage of these services! Should you have test anxiety, stress problems, or need help with study skills, the University Counseling Center (University Center, 825-2703) also provides a free service.

Dropping the Course (or Not): Always consult your instructor before dropping a class! If you drop the class before the “drop date,” Friday 2 November (see the online Fall 2012 schedule for more information about drop and withdrawal dates), you will receive a grade of “W” for that class. There are consequences for dropping a class, so read the drop policy in the University Catalog (better still, see your academic advisor and someone in the financial aid office) before you drop any class. IMPORTANT: Simply stopping attendance and participation in a class WILL NOT automatically result in a student being dropped from the class; the student must initiate the “drop” process by going to the Student Services Center and filling out a course drop form. In the middle of the semester, you are likely to receive mid-term grade reports (either on S.A.I.L. or through some other means). If you have a lower mid-term grade than you wish, it should concern you, but not frighten you. (Remember that there are more opportunities to earn points and boost your grades in the last half of most courses than in the first half.) Talk to your instructors (not just to other students) to explore your options. Also note that the mid-term grades posted on S.A.I.L. are not official, not a guarantee and are never updated; once they are posted they cannot be changed even if your grade in the class does change.

Attendance Policies: My attendance policy is the same as that stated in the University Catalog. Attendance is the student’s responsibility, and students are expected to attend, be on time for and remain the entire period in every class. Attendance is not used to determine grades. In lecture, even when I take roll, I do not give—per se—a bonus for attendance, nor a penalty for absence (except for missing an examination, bonus points, or an assignment). (Note that I may choose to have “pop” quizzes, and/or “attendance” quizzes as part of the bonus points.) Coming to lecture on a regular basis should result in a higher grade, and if you come to class often, it will help you do well in this course.

Absences: You are responsible for the material covered and assignments made in every lecture regardless of whether you attend it. “I came in late and didn’t hear about
the assignment,” is never an acceptable excuse. It is always your responsibility to determine what happened in class during your absence. If you are absent, tardy, or leave early, I will provide you with copies of assignments (including “bonus point” assignments) and handouts if—and only if—you ask for them. (In other words, I will not, “track down” absentees to make sure that they know about assignments.) You must obtain class notes from other students. Because developing note-taking skills is a necessary skill, I do not “share” my notes or PowerPoints (including posting them on the web).

Points missed because of an unexcused absence (including tardiness and leaving early) cannot be recovered. An excused absence allows us to make alternative arrangements for completing assignments. The documentation required for an absence to be excused must be...

• from an appropriate source (e.g., doctor, dentist, funeral director) who states the nature of the event that caused (or will cause) your absence.
• in writing, on official stationery, and signed. (I do not return excuses to you.) Telephone calls, FAXes, and e-mails are not acceptable.
• presented prior to the absence for a scheduled event (e.g., university-sponsored activity, recognized religious holiday, military service).
• presented no more than one week after the date of an unexpected absence.

There Are NO Individual Make-up Examinations: The grading formulas above give you three chances to earn points from lecture examinations: method 1 or 3 if you miss one lecture examination; method 1 if you miss more than one lecture examination; method 2 if you miss the final examination.

Miscellaneous Policies Regarding Attendance: Unacceptable Excuses: Only unavoidable absences are excused, so you should schedule routine personal events (e.g., vacations, weddings, reunions, non-emergency medical or dental visits, parent-teacher conferences, household or auto repairs) to avoid conflicts with your classes. Oversleeping is never an acceptable excuse. Employment conflicts are not acceptable excuses for absences, tardiness, or leaving class early. (Once enrolled in a class, it is the student’s responsibility to arrange his or her work schedule so that no regularly scheduled class or examination time is missed.) Texas waives jury duty for students, so jury duty is not an acceptable excuse.

“Pre-Tests”: For some scheduled events (athletics, military duty, etc.), you may arrange to take a lecture examination before (but not after) its scheduled date. (You should take a test as close to its originally scheduled time as possible, but you may not take a test more than one week before its originally scheduled time. You must obtain your instructor’s approval at least one week before you wish to take the pre-test.) If you arrange to take any test at an alternate time and do not show for that appointment, then you forfeit the opportunity to take the test except at its originally scheduled time. Students who do not arrange to take examinations in advance will not be eligible for this special consideration. A written excuse from the university department involved or from the Office of Student Affairs is required.

The instructor—in consultation with the Vice President for Student Engagement and Success—will determine if circumstances warrant giving an individual a make-up test
after the original test. A make-up test given after the original test will be all written (i.e., no multiple choice or matching), and it will be administered on the “Reading Day” for the semester.

**Late Assignments:** You may always turn in assignments early. Except for excused absences, late assignments will not be accepted. If you know in advance that you will have an excused absence when an assignment is due, you must turn in that assignment before its due date. You should turn in assignments that were missed because of an unexpected, excused absence as soon as possible.

Any situations for which you cannot provide an acceptable excuse as outlined above (e.g., “I have an excuse, but it is too personal to discuss with you”) will be referred to the Vice President for Student Engagement and Success.

**ACADEMIC ADVISING:** As soon as students are ready to declare a major, they should meet with an Academic Advisor. The Academic Advisor will guide the student through the requirements of the major, including developing and maintaining the student’s degree plan and directing the student to an appropriate Faculty Mentor. Academic Advisors for the College of Science & Technology are located in the Center for Instruction (CI), Suite 350, (361) 825-6094.

**GRADE APPEALS:** As stated in the Texas A&M University-Corpus Christi University Rules and Procedures (Section B [Academic Program], Part 13 [Students]: 13.02.99.C2 [Student Grade Appeals] and 13.02.99C2.01 [Student Grade Appeal Procedures]), a student who believes that he or she has not been held to appropriate academic standards as outlined in the class syllabus, equitable evaluation procedures, or appropriate grading, may appeal the final grade given in the course. The burden of proof is on the student to demonstrate the appropriateness of the appeal. A student with a complaint about a grade is encouraged to first discuss the matter with the instructor. For complete details, including the responsibilities of the parties involved in the process and the number of days allowed for completing the steps in the process, consult the University Rules and Procedures specified above (accessible through the University Rules and Procedures website at http://www.tamucc.edu/provost/university_rules/index.html). For assistance and/or guidance in the grade appeal process, students may contact the office of Student Affairs.

**DISABILITY AND VETERANS’ SERVICES:** Texas A&M University-Corpus Christi is committed to providing persons with disabilities an equal opportunity to access campus facilities, resources and programs. The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. Support and accommodations are also available for returning veterans who experience cognitive and/or physical access issues in the classroom or on campus. Our Office of Disability Services arranges such support and academic accommodations. If you believe that you require accommodation for a disability, have cognitive and/or physical access issues, or for more information, call (361) 825-5816 or visit Driftwood 101. It is important to contact the Office of Disability Services in a timely fashion to allow them to review requests and prepare
accommodations and accommodation letters. Upon receipt of accommodation letters, students should take them to appropriate instructors as soon as possible. (Instructors are not required to make accommodations prior to receipt of an official accommodation letter.)

Religious Holy Days: Any student who will miss class and/or test days because of recognized religious holy days should notify me as soon as possible so we can make alternative arrangements. Prior notification is required for such absences to be excused.

Computer Access: Use of a computer is important to this course (and many others). Students will need a computer to access e-mail, listservs, the worldwide web, the Bell Library catalogs and databases, and to prepare written assignments and slide/poster presentations. Computers are available for student use in Computer Laboratories around campus—the main one being Corpus Christi Hall-Room 200. Computer Laboratories are staffed with helpful personnel, and have generous operating hours. The University sets up a computer account for each student, and it is available from the first day of classes. Call the Student Computer Helpline at (361) 825-5618 for more information.

An Important Listserv: The “Opportunities” listserv is sponsored and operated by the College of Science and Technology, but anyone on campus may subscribe. Periodically, useful information (e.g., scholarship or job opportunities) is posted here. To subscribe, go to http://www.sci.tamucc.edu/mailman/listinfo/opportunities-list and follow the directions. If you follow the subscription instructions, but fail to receive a confirmation e-mail, please try again. You must receive, and reply to, the confirmation e-mail to complete the subscription process. If you decide that the listserv has nothing to offer you, the website contains instructions for removing your name (“unsubscribing”).

Expectations: You are adult university students. I will treat you as such, and I will expect you to act as such.

You will act with courtesy and common sense. I will not tolerate disruptive, disrespectful, or abusive behavior/language (including comments made on class assignments) directed toward anyone in this class (i.e., student or instructor). Violations range from talking during class to outright insubordination, and will result in penalties that range from the student being asked to stop to the student being “escorted” from the class—permanently. Cellular phones, pagers, and other “beepers” must be silenced BEFORE you enter the classroom. Children are not allowed in the rooms during lecture periods, or when the child’s guardian is working or studying “after hours.” Use of tobacco products (of any kind) is forbidden in lecture.

You will act like a responsible adult. You are responsible for your own education. You should not expect an instructor to take you by the hand, show you everything you need to know, and then have you regurgitate this information on an examination. This is not an effective way for self-motivated adults to learn. Students are responsible for all class and lecture notes; required assignments in the textbook and any additional handouts or assignments given by an instructor. This includes (but is not limited to)…

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• Knowing and meeting university-imposed deadlines (e.g., withdrawal dates of various types). This information is found in the online University Catalog, Course Schedule or elsewhere on the University website.
• Knowing and meeting assignment dates and times—including any changes that may occur during the semester.
• Checking your answers against a key as soon as possible. By all means check for any clerical errors, but a test score is not the end of the learning process. Always review your tests to determine why you missed questions. Making—and correcting—mistakes is an effective, natural way to learn material. Educators have a fancy term, reflective learning, for this simple process.
• Keeping track of your progress (i.e., your grades, points you earn, and averages).
• Asking for help. Instructors are available for consultation and extra help, but it is the student’s responsibility to request help.

Learning is more than just reading, taking notes, and memorizing. Reading and taking notes puts information in short-term memory where it is forgotten quickly unless you do something with it. Memorizing, though important, is but the first step in the learning process. As university students, you should be able to link, combine, and synthesize the bits of data that you memorize into useful concepts.

Scholastic dishonesty will not be tolerated. It will be prosecuted to the full extent of university regulations. All students are expected to be familiar with the Academic Honesty Statement found in the University Catalog. In addition, the following procedures will be enforced:
• You must be prepared to present a photo ID at all examinations.
• Different test forms may be prepared for a single examination. To ensure that the appropriate key will be used to grade your answer sheet, always follow instructions on the test or answer sheet, or given orally by the instructor.
• If you leave an examination room—for any reason—you must hand in your answer sheet and you will not be allowed to resume the examination. Attend to personal matters (e.g., rest room visits) before the examination.
• Be on time! Anyone arriving after the first test-taker has completed an examination and left the room will not be allowed to take that examination.
• Cheating and plagiarism are unacceptable behaviors.
  • Students are not to give or receive help during testing
  • Students are not to submit any work that is not their own product

Important Miscellaneous Notes:
• Follow instructions! The most common mistakes that cost students points result from failure to follow instructions.
• Bring two #2 pencils to each lecture examination (including the final examination); I neither provide nor sell pencils. (I will provide Scantron sheets for you.)
• Bring paper and a writing implement to each class period. Handwritten assignments will be accepted only if they are written in pencil, blue ink, or black ink. (You will get a permanent “zero” on the assignment if you write with anything else.)
• Grammar counts—period! Poor grammar will cost you points—especially on assignments and presentations.
• Spelling counts! To even be considered for partial credit, your answer must phonetically sound like the word that you are trying to spell. Examples of answers that are incorrect:
  • Grossly misspelled words (e.g., “crevurfian pleat” for “cribriform plate”).
  • Ambiguous answers (e.g., “tibula”—could be “tibia,” could be “fibula”).
  • Illegible answers (e.g., “ep-squiggle-squiggle-squiggle” for “epididymis”).
• After an assignment is returned, you have one (1) week to notify me of clerical, mathematical, and/or other errors. I will rectify any such errors, but I will not change a legitimate grade just because you “need” it.
• I will not change a legitimate course grade just because you “need” it either (for financial aid, to get into professional school, etc.). The grading section of this syllabus describes how I assign grades. Please be sure you earn enough points to get the grade you want. There will always be someone who just missed a D, or a C, or a B, or an A. Although I reserve the right to curve, doing so is usually not necessary. (Curves are based on statistical analysis of the entire class’s performance, not on the needs of individual students.) I have to draw lines between grades, and no matter where I draw them, someone is on the wrong side. Don’t let that someone be you. You have plenty of help in my class. Take advantage of the resources I offer. The reasons for receiving a grade of “I” (incomplete) are clearly defined in the University Catalog; this “grade” cannot be used simply to prevent a student from receiving an unwanted grade in a class.
• I only discuss grades in person (i.e., I do not discuss grades or matters relating to grades over the telephone or by e-mail). If you wish to know your final grade before the official grade report is mailed to you, please see me in person or provide me with a self-addressed, stamped envelope.

In choosing to take this course, you agree to abide by the course rules, regulations, and standards. Should you have concerns or questions, you should discuss them with the instructor as soon as possible. However, you are bound by these rules, regulations, and standards from the first day of class throughout the duration of the course.

GENERAL DISCLAIMER: I reserve the right to modify the information, schedules, assignments, deadlines, and policies in this syllabus if and when necessary. Whenever possible, I will announce such changes in a timely manner during regularly scheduled lecture periods. I will not attempt to contact students who were absent when an announcement was made. Nevertheless, all students are responsible for abiding by all announced changes, and it is a student’s responsibility to obtain this information. In rare cases, some modifications may be implemented without prior warning.