MOLECULAR BIOLOGY
BIOLOGY/BIOMEDICAL SCIENCE 3403.001 (Labs .101/.102)

Department of Life Sciences
Spring 2016

A. COURSE INFORMATION

Course number/section: BIOL/BIMS 3403.001
Class meeting time: T, R 9:30-10:45; (Labs: T 2-4:50; 5:30-8:20)
Class location: CI 109/112 (Labs: EN 301)
Course Website: See BlackBoard (https://bb9.tamucc.edu/)

B. INSTRUCTOR INFORMATION

Instructor: Kirk Cammarata
Office location: EN 319 B (Research Lab: CS 127)
Office hours: M, W, F 10:05-11:45
Telephone: 361-825-2468
email: kirk.cammarata@tamucc.edu
Appointments: Email or call to check on my availability at other times or to make an appointment

Laboratory Instructors and Contact Info:
Section .101 Tues 2:00-4:50 K. Cammarata Office Hrs: See Above
Section .102 Tues 5:30-8:20 TBD islander.tamucc.edu

C. COURSE DESCRIPTION

Catalog Course Description
Principles of molecular biology including advanced concepts of gene structure, chromatin structure, gene expression and regulation, and current molecular biology techniques. Laboratory emphasis is on skills for recombinant DNA technology and DNA sequencing-based approaches. Prerequisites: Successful completion of BIOL 2416 and BIOL 2421. CHEM 3411 highly recommended. Safety training given during a laboratory meeting early in the semester is required for continued participation in this course.

Extended Course Description
This course examines the molecular mechanisms of biological information maintenance, expression and regulation. Experimental approaches are emphasized. The lecture portion of the course covers basic molecular genetics such as protein and nucleic acid structure, function and expression. Advanced concepts of chromatin structure, regulation of gene expression, Next Gen DNA sequencing, and genomics/bioinformatics will be considered. Laboratory will focus on the practice of techniques central to recombinant DNA and molecular identification. Topics include PCR, Q-rtPCR, DNA sequencing, and bioinformatics for molecular identifications and biodiversity analysis.
D. **PREREQUISITES AND COREQUISITES**

**Prerequisites**
Genetics (BIOL 2416) and Microbiology (BIOL 2421); Organic Chem I (CHEM 3411) HIGHLY RECOMMENDED.

**Corequisites**
None

E. **REQUIRED TEXTBOOK(S), READINGS, RESOURCES AND SUPPLIES**

**Required Textbook**
(Also available as E-Book)

**Other Resources**
* Companion Website: [www.whfreeman.com/cox](http://www.whfreeman.com/cox)  (many student resources and study-aids)

**BlackBoard:** Course-associated site for messaging, quizzes, posting PPT notes, supplementary materials and readings, video-recordings, links to resources, labs, data, announcements, etc. **You MUST use this resource and READ email sent to class ! Please get your access figured out ASAP !**  
Call the IT Help desk for assistance: (361) 825-2692 (local); (866) 353-2491 (toll free); email: computer.helpline@tamucc.edu; internet: [Submit a Ticket](mailto:computer.helpline@tamucc.edu)  
If you haven't already prepared your computer for Blackboard, access Blackboard Technical Requirements and follow the directions.

To subscribe, send an e-mail to “molbio-list-request@listserv.tamucc.edu”. Make sure that your e-mail address appears in the “From:” heading, and that the word “subscribe” is typed in the subject line. You will receive a subscription acknowledgement confirming that you have done everything correctly. **If you do not receive this acknowledgement message, LOOK in your junk folder and permit these messages for your inbox.** To post messages to the listserv, send to “molbio-list@listserv.tamucc.edu”. Because of security concerns, you should post messages from the official TAMUCC computer account (Islander) that is used to subscribe to the listserv. At the end of class, please send an e-mail to “molbio-list-request@listserv.tamucc.edu” with “unsubscribe” in the subject heading. Please use this service to ask questions about class materials, dates, assignments, etc.

You should also subscribe to the Opportunities Listserv using the same procedure: “opportunities-list-request@listserv.tamucc.edu” This service provides notification of scholarships, research and volunteer opportunities and science-related job opportunities.
List of Supplies
You will need use of a computer with internet access.
For laboratory: notebook, “sharpie”, calculator, laboratory coat, and safety glasses.
Students should come prepared each day with textbook, lab notebook, calculator, and personal lab equipment. Supplies REQUIRED for lab include:
   a. Lab coat, Closed-toe shoes and Safety glasses or goggles
   b. Lab Notebook: Binder to organize handouts and data printouts
   c. Calculator
   d. Sharpie for labeling
   e. A USB drive is recommended for capturing data files to be used in lab reports.

F. STUDENT LEARNING OUTCOMES AND ASSESSMENT
Assessment is a process used by instructors to help improve learning. Assessment is essential for effective learning because it provides feedback to both students and instructors. A critical step in this process is making clear the course’s student learning outcomes that describe what students are expected to learn to be successful in the course. The student learning outcomes for this course are listed below. By collecting data and sharing it with students on how well they are accomplishing these learning outcomes students can more efficiently and effectively focus their learning efforts. This information can also help instructors identify challenging areas for students and adjust their teaching approach to facilitate learning.

Upon successful completion of this course, students should be able to:
1. Describe and differentiate nucleic acid structures and functions at a molecular level
2. Describe the hierarchy of chromatin structure and the importance of DNA topology
3. Describe and differentiate the genome organization, gene structure, and basic gene expression and regulation mechanisms characteristic of prokaryotes and eukaryotes
4. Explain recombinant DNA technologies, their molecular bases and their application
5. Describe whole-genome approaches, including the application of Next Gen DNA sequencing and bioinformatics to “molecular identifications”

G. INSTRUCTIONAL METHODS AND ACTIVITIES
This course will utilize traditional lecture, in-class demonstrations/animations, homeworks, question and answer sessions, reflective learning, application readings and coordinated laboratory learning experiences to: 1) integrate conceptual learning and skills development; 2) explore the relationships between molecular structure and function; and 3) experience how molecular biologists apply recombinant DNA and whole-genome techniques to study biology.
H. MAJOR COURSE REQUIREMENTS AND GRADING

The Student Learning Outcomes will be assessed through exams, homeworks, and laboratory activities.

<table>
<thead>
<tr>
<th>ACTIVITY</th>
<th>% of FINAL GRADE</th>
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<tbody>
<tr>
<td>LECTURE</td>
<td>75%</td>
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<tr>
<td>3 Exams</td>
<td>85</td>
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<tr>
<td>Assignments, Participation</td>
<td>15</td>
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<tr>
<td>LABORATORY</td>
<td>25%</td>
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<tr>
<td>Lab Reports/Assignments</td>
<td>60</td>
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<tr>
<td>Lab Quizzes</td>
<td>30</td>
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<tr>
<td>Participation</td>
<td>10</td>
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Tentative Evaluation: Your final grade will be based on the percentage you earn out of the total possible points, with lecture and laboratory weighted as specified. Individual extra credit is not possible, but bonus points may be built into exams or other assignments. Statistical manipulations, if used (at the Instructor’s discretion), will be performed only once, at the end of the semester. A 10-point grading scale will be used:

- **A** = 90 - 100 %
- **B** = 80 - 89.9 %
- **C** = 70 - 79.9 %
- **D** = 60 - 69.9 %
- **F** = 0 - 59.9 %

**Components of Course Grade (Tentative)**

I. Lecture (75 %)
   - 4 Exams @ 100 pts = 400
   - Assignments & Participation (Tentative) = 100

II. Laboratory (25 %)
   - Lab Reports/Assignments = 120
   - Lab Quizzes = 60
   - Participation = 20

The time and grading schedule may require adjustment. Should this be the case, the assignments and weighting may change slightly. Additional assignments may or may not be provided at the Instructor’s discretion. Such assignments might include homeworks, group projects, reading assignments,
quizzes, seminar attendance, etc. Regardless of any such changes, the lecture and laboratory weighting of your grade shall remain at 75% and 25%, respectively. For example, if you make 90% of total points available for the lecture and 80% of total points available for the laboratory portion, then your grade would be calculated as:

\[(0.9 \times 75) + (0.8 \times 25) = (67.5) + (20) = 87.5/100 \text{ possible} = B\]

An assignment will likely be due during the last week of class.

Every attempt will be made to follow the time and evaluation schedules shown here. It is the student’s duty to attend each class session, read messages from the Listserv and to be aware of all assignments, deadlines, and changes.

NOTE: All Exams are the property of the Instructor as they must be saved for course records. Students may use the exams for study/reflection purposes during specified lab periods, but they must be saved and returned to the Instructor at the specified time in order for the final grade to be submitted. DO NOT LEAVE THE ROOM WITH OR COPY THE EXAMS IN ANY MANNER (photocopying, photographing, scanning, typing, etc are all strictly forbidden)! Violation of this policy will result in a “zero” score for the exam!

Exams will be a mixture of multiple choice, matching, fill-in the blank, short answer, labeling, calculations and essay questions. Questions are often relatively long and detailed compared to what you may have seen in some introductory courses. Some will require analysis and interpretation of data or experimental design to assess critical thinking skills. Some questions will be derived from laboratory activities. The Final Exam 4 (Thursday, May 5 from 8:00 - 10:30 AM) will contain new material from the end of the semester.

Quizzes may be given at any time in class. There will be no makeups. Homeworks and other assignments may be given in class. The other assignments may include data interpretation, experimental design, calculations, opinion papers, research article summaries, etc. They will generally be due at the start of lecture class the following week, but some assignments will be in-class only and makeups are not possible. You are encouraged to get together and work on them as a group. However, unless specified otherwise, the assignments must be turned in individually and be written in your own words, NOT COPIED. An assignment grade of ZERO will be given if the work is not in your own words.

All assignments and examination answers must be legible to the Instructor. Illegible answers will receive a “0”.


I. **COURSE CONTENT/SCHEDULE**

**Important Dates:**

<table>
<thead>
<tr>
<th>Important Date</th>
<th>Date</th>
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<tbody>
<tr>
<td>Classes Begin</td>
<td>Jan 20</td>
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<tr>
<td>Last day to register</td>
<td>Jan 27</td>
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<tr>
<td>Spring Break</td>
<td>Mar 14-18</td>
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<td>Last Day to Drop without record</td>
<td>Apr 8</td>
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<tr>
<td>Last Day to withdrawal</td>
<td>May 2</td>
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<tr>
<td>Last Class Day</td>
<td>May 3</td>
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<tr>
<td><strong>FINAL EXAM 4</strong></td>
<td>Thurs May 5 (8:00 – 10:30 AM)</td>
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<table>
<thead>
<tr>
<th>DATE (BY DAY OR WEEK)</th>
<th>TOPIC</th>
<th>ACTIVITIES</th>
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<tbody>
<tr>
<td>Wk1: Jan 21</td>
<td>Overview; Ch 1.1 Evol of Life, RNA World (pp 1-12); Ch 2.4 Foundations of Molecular Genetics (pp 43-55)</td>
<td>No Lab; Take-Home Lab Calc Handouts To Work On</td>
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<tr>
<td>Wk 2: Jan 26, 28</td>
<td>No Lectures This Week - View Pre-Recorded Lectures; Ch 3.1 – 3.3 Chem of Information Molecules; Ch 4 Protein Structure</td>
<td>Lab 1: Intro; Lab Safety; In-Lab Problem Set Chaps 1-4; Take-Home Lab Calcs</td>
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<tr>
<td>Wk 3: Feb 2, 4</td>
<td>Review Questions from Ch 3-4; Ch 5 Protein Function</td>
<td>Lab 2: Lab Calcs, Pipetting; Lab Calc Handout; <strong>GCAT Pre-Survey</strong></td>
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<tr>
<td>Wk 4: Feb 9, 11</td>
<td>Ch 5 Protein Function</td>
<td>Lab 3: Lab Calcs, Pipetting; EtOH PPT &amp; Spectrophotometry; Lab Calc Handout</td>
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<td>Wk 5: Feb 16, 18</td>
<td>Ch 6 DNA/RNA Structure</td>
<td>Lab 4: Lab Calcs; Lab Quiz 1; Restriction Digests; Multi-Task: Extraction of Environmental DNA</td>
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<td>Wk 6: Feb 23, 25</td>
<td>Ch 7 Studying Genes, Part I</td>
<td><strong>EXAM I</strong></td>
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<td><strong>EXAM I (Thurs Feb 25; Ch 1-6)</strong></td>
<td>Lab 5: Lab Quiz 2; Gel Electrophoresis &amp; Analysis of RE Digests</td>
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<td>Wk 7: Mar 1, 3</td>
<td>Ch 8 Genomes, Transcriptomes &amp; Proteomes</td>
<td>Lab 6: Review of Techniques; Lab Quiz 3; Exam Corrections; PCR #1 of Env DNA</td>
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<tr>
<td>Wk 8: Mar 8, 10</td>
<td>Ch 7 Studying Genes, Part II</td>
<td>Lab 7: Lab Quiz 4; Gels &amp; Analysis of PCR #1; Start PCR #2</td>
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<tr>
<td>Wk 9: Mar 15, 17</td>
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<td><strong>SPRING BREAK</strong></td>
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<td>Wk 10: Mar 22, 24</td>
<td>Ch 9 DNA Topology</td>
<td>Lab 8: Gels/Analysis of PCR #2 for HTS; Multitask: Bioinformatics I-BLAST &amp; RDPII Analysis of single seqs</td>
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<tr>
<td>Wk 11: Mar 29, 31</td>
<td>Ch 10 Nucleosomes &amp; Chromatin Structure</td>
<td>Lab 9: Lab Quiz 5; GALAXY Tutorial of HTS Seq Processing</td>
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<tr>
<td>Wk 12: Apr 5, 7</td>
<td>Ch 15.1 Transcription (pp 519-527) <strong>EXAM II (Thurs Apr 7; Ch 7-10)</strong></td>
<td>EXAM II Lab 10: HTS Bioinformatics: LINUX Tutorial</td>
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<tr>
<td>Wk 13: Apr 12, 14</td>
<td>Ch 15.3 Transcription (pp 537-552) Ch 16.1 &amp; 16.2 RNA Processing &amp; Regulatory RNA (pp 553-573; 579-580)</td>
<td>Lab 11: HTS Bioinf: Generate OTU Tables Using Cluster; Exam Corrections</td>
</tr>
<tr>
<td>Wk 14: Apr 19, 21</td>
<td>Ch 19 Overview of Regulation of Gene Expression</td>
<td>Lab 12: HTS Bioinf: Alpha Diversity</td>
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<tr>
<td>Wk 15: Apr 26, 28</td>
<td>Ch 21 Transcriptional Regulation in Eukaryotes</td>
<td>Lab 13: HTS Bioinf: Beta Diversity Plots; Multitask: Q-PCR</td>
</tr>
<tr>
<td>Wk 16: May 3</td>
<td>Ch 22.1 &amp; 22.4 Posttranscriptional Regulation in Eukaryotes and RNAi (pp 759-765; 774-781)</td>
<td>Lab 14: Q-PCR Data Analysis; GCA T Post-Survey Lab Wrap-Up</td>
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<tr>
<td>Wk 17: May 5</td>
<td><strong>FINAL EXAM 3; 8:00 – 10:30 AM</strong></td>
<td><strong>FINAL EXAM 3</strong></td>
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**The time and point schedule may require adjustment.** Additional assignments may or may not be provided at the Instructor’s discretion. Such assignments might include homeworks, group projects, reading assignments, quizzes, etc. Every attempt will be made to follow the time and evaluation schedules shown here. **It is the student’s duty to attend each class session, subscribe to the listserv, and regularly visit BlackBoard to be aware of all assignments, deadlines, and changes to such.**
Other Course Requirements:
1. All Exams are the property of the Instructor as they will be saved for course records.
2. All students must access BlackBoard on a regular basis, as well as READ their TAMUCC email, to watch for class announcements, changes, and for laboratory materials, readings, etc.

For help with access to BlackBoard, email or internet, please contact the IT Helpdesk by phone (825-2692) or electronically (computer.helpline@tamucc.edu; http://it.tamucc.edu/selfservice/index.html)

3. Attendance at lecture and lab, preparedness and participation in all learning activities is required and counts towards your participation points. Assignments cannot be made up later if absent without a recognized excuse (see below).

J. COURSE POLICIES

Attendance/Tardiness

Attendance is the student’s responsibility. You are responsible for the material covered in every lecture or online activity, regardless of your (lack of) attendance or participation. Nothing missed during an unexcused absence can be made up. An excused absence allows us to make alternative arrangements to complete an assignment. Only unavoidable absences are excused. Routine events (non-emergency medical visits, parent-teacher conferences, household or auto repairs) should be scheduled to avoid conflicts with class. Plane tickets booked to conflict with class do NOT constitute an excusable absence. An acceptable excuse must be:
* from an appropriate source (doctor, dentist, funeral director) who states the nature and dates of the event
* In writing, on official letterhead, and signed (it will not be returned)
* presented prior to, or within 3 days of, the absence

Late Work and Make-up Exams

Nothing missed during an unexcused absence can be made up. An excused absence allows us to make alternative arrangements to complete an assignment. Only unavoidable absences are excused. Routine events (non-emergency medical visits, parent-teacher conferences, household or auto repairs) should be scheduled to avoid conflicts with class. Plane tickets booked to conflict with class do NOT constitute an excusable absence. An acceptable excuse must be:
* from an appropriate source (doctor, dentist, funeral director) who states the nature and dates of the event
* In writing, on official letterhead, and signed (it will not be returned)
* presented prior to, or within 3 days of, the absence

There are No make-up examinations: For some scheduled events, you may arrange to take a lecture exam before, but not after, its scheduled time.

Extra Credit
Extra credit is provided in the form of Exam Correction Assignments and occasional built-in exam points or impromptu assignments (e.g., seminar attendance). However, these opportunities are solely at the instructor’s discretion and available to the entire class. NO SPECIAL EXCEPTIONS/ASSIGMENTS FOR INDIVIDUALS. Please do not ask. Use your energy and focus to do it right the first time.

Cell Phone Use
As adult university students, you are expected to act with courtesy and common sense. Disruptive, disrespectful, or abusive language/behavior towards anyone in class (student, staff, faculty) will not be tolerated and could result in permanent removal from class. This includes tardiness to class, talking in class, insubordination, and electronic disturbances (cell phones, etc). Turn it off unless specifically being used for class.

Participation
All students are expected to attend the full class and lab periods, complete all learning assignments, complete reading assignments fully and carefully, and to participate in class discussions. A portion of your grade is earned by participation. You must show up and be attentive.

Expectations:
You are responsible for your own education. Take notes in class, during lab discussions, and when completing assignments. Be Proactive! Ask questions when you have them and seek help when you need it. The instructor is here to help you. Be aware of university-imposed deadlines (i.e., drop dates).

K. COLLEGE AND UNIVERSITY POLICIES

- Academic Integrity (University)
University students are expected to conduct themselves in accordance with the highest standards of academic honesty. Academic misconduct for which a student is subject to penalty includes all forms of cheating, such as illicit possession of examinations or examination materials, falsification, forgery, complicity or plagiarism. (Plagiarism is the presentation of the work of another as one’s own work.) In this class, academic misconduct or complicity in an act of academic misconduct on an assignment or test will result in a failing grade.

- Classroom/Professional Behavior
Texas A&M University-Corpus Christi, as an academic community, requires that each individual respect the needs of others to study and learn in a peaceful atmosphere. Under Article III of the Student Code of Conduct, classroom behavior that interferes with either (a) the instructor’s ability to conduct the class or (b) the ability of other students to profit from the instructional program may be considered a breach of the peace and is subject to disciplinary sanction outlined in article VII of the Student Code of Conduct. Students engaging in unacceptable behavior may be instructed to leave the classroom. This
prohibition applies to all instructional forums, including classrooms, electronic classrooms, labs, discussion groups, field trips, etc.

- **Statement of Civility**
  Texas A&M University-Corpus Christi has a diverse student population that represents the population of the state. Our goal is to provide you with a high quality educational experience that is free from repression. You are responsible for following the rules of the University, city, state and federal government. We expect that you will behave in a manner that is dignified, respectful and courteous to all people, regardless of sex, ethnic/racial origin, religious background, sexual orientation or disability. Behaviors that infringe on the rights of another individual will not be tolerated.

- **Deadline for Dropping a Course with a Grade of W (University)**
  The grade of W will be assigned to any student officially dropping a course. Please consult with the instructor before you decide to drop to be sure it is the best thing to do. Just stopping attendance and participation WILL NOT automatically result in your being dropped from the class. Should dropping the course be the best course of action, visit the Office of the University Registrar for the **Course Drop Form that must submitted**. No student is eligible to receive a W without completing the official drop process by this deadline. Please consult the Academic Calendar ([http://www.tamucc.edu/academics/calendar/](http://www.tamucc.edu/academics/calendar/)) for the last day to drop a course.

- **Grade Appeals (College of Science and Engineering)**
  As stated in University Procedure 13.02.99.C2.01, 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 upon 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, see University Procedure 13.02.99.C2.01, Student Grade Appeal Procedures. These documents are accessible through the University Rules website at [http://www.tamucc.edu/provost/university_rules/index.html](http://www.tamucc.edu/provost/university_rules/index.html), and the College of Science and Engineering Grade Appeals webpage at [http://sci.tamucc.edu/students/GradeAppeal.html](http://sci.tamucc.edu/students/GradeAppeal.html). For assistance and/or guidance in the grade appeal process, students may contact the chair or director of the appropriate department or school, the Office of the College of Science and Engineering Dean, or the Office of the Provost.

- **Disability Services**
  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. If you believe you have a disability requiring an accommodation, please call (361) 825-5816 or visit Disability Services in Corpus Christi Hall 116.

If you are a returning veteran and are experiencing cognitive and/or physical access issues in the classroom or on campus, please contact the Disability Services office for assistance at (361) 825-5816.

http://disabilityservices.tamucc.edu/

- **Statement of Academic Continuity**
  In the event of an unforeseen adverse event, such as a major hurricane and classes could not be held on the campus of Texas A&M University–Corpus Christi; this course would continue through the use of Blackboard and/or email. In addition, the syllabus and class activities may be modified to allow continuation of the course. Ideally, University facilities (i.e., emails, web sites, and Blackboard) will be operational within two days of the closing of the physical campus. However, students need to make certain that the course instructor has a primary and a secondary means of contacting each student.

L. **OTHER INFORMATION**

- **Academic Advising**
  The College of Science & Engineering requires that students meet with an Academic Advisor as soon as they are ready to declare a major. The Academic Advisor will set up a degree plan, which must be signed by the student, a faculty mentor, and the department chair. Meetings are by appointment only; advisors do not take walk-ins. Please call or stop by the Advising Center to check availability and schedule an appointment. The College’s Academic Advising Center is located in Center for Instruction 350 or can be reached at (361) 825-3928.

**GENERAL DISCLAIMER**

I reserve the right to modify the information, schedule, assignments, deadlines, and course policies in this syllabus if and when necessary. I will announce such changes in a timely manner during regularly scheduled lecture periods.