MOLECULAR BIOLOGY
BIOLOGY/BIOMEDICAL SCIENCE 3403.001 (Labs .101/.102/.103)

Department of Life Sciences
Spring 2020

A. COURSE INFORMATION
Course number/section: BIOL/BIMS 3403.001
Class meeting time: T, R 8:00-9:15; (Labs: 103 M 2-4:50; 101 T 2-4:50; 102 5:30-8:20)
Class location: BH 104 (Labs: TH 210B)
Course Website: See BlackBoard (https://bb9.tamucc.edu/)

B. INSTRUCTOR INFORMATION
Instructor: Kirk Cammarata
Office location: TH 338 (Research Lab: TH 314) [Check middle of TH 314 lab if not in office]
Office hours: M, W, F 10:15-12:00
Telephone: 361-825-2468
e-mail: 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 .103 Mon 2:00-4:50 K. Cammarata Office Hrs: See Above
Section .101 Tues 2:00-4:50
Section .102 Tues 5:30-8:20

C. COURSE DESCRIPTION
Catalog Course Description
Principles of molecular biology including advanced concepts of gene structure, expression and regulation, chromatin structure, recombination, and current molecular biology techniques. Laboratory emphasis is on basic skills for nucleic acid analyses, including extraction, PCR amplification, quantification, restriction, and electrophoresis. DNA sequencing-based approaches are covered including bioinformatics for sequence comparisons, polymorphisms and molecular identification.
Prerequisites: BIOL 2416 - Genetics and BIOL 2421 - Microbiology. CHEM 3411 highly recommended. Corequisite: Safety training given in SMTE 0092 - Biomedical Laboratory Safety Seminar is required for continued participation in this course. Offered spring semester every year.

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, CRISPR-Cas and genomics/bioinformatics will be considered. Laboratory will focus on
the practice of techniques central to DNA analysis 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
You MUST Register for SMTE 0092 (Lab Safety) (or have taken it) – Or you will not be allowed in lab!

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

Required Textbook. Textbook is required. Textbook is required. Textbook is required. 

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

BlackBoard: Course-associated site for messaging, 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 IT Help desk for assistance: (361) 825-2692 (local); (866) 353-2491 (toll free); email: computer.helpline@tamucc.edu; internet: Submit a Ticket
TUTORIALS: Island Online: https://iol.tamucc.edu/; IT website: http://it.tamucc.edu/
If you haven’t already prepared your computer for Blackboard, access Blackboard Technical Requirements and follow the directions.
You should subscribe to the Opportunities Listserv. Send a message to: “opportunities-list-request@listserv.tamucc.edu” and put “subscribe” in the subject line. This provides notification of scholarships, research/volunteer opportunities & science-related jobs.

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 protective equipment. Handouts and support materials for each lab should be read ahead of time!
Supplies REQUIRED for lab include:
   a. Lab coat, Closed-toe shoes and Safety glasses or goggles
   b. Lab Notebook: Binder to record data, organize handouts and data printouts
   c. Calculator and Sharpie for labeling
   d. 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 changes to regulation of gene expression
3. Describe and differentiate the genome organization, gene structure, and basic gene expression and regulation mechanisms characteristic of prokaryotes and eukaryotes
4. Explain cloning and other 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 & whole-genome techniques to study biology.

H. MAJOR COURSE REQUIREMENTS AND GRADING

Student Learning Outcomes will be assessed through exams, quizzes, 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>75</td>
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<tr>
<td>Quizzes, Assignments, Participation</td>
<td>25</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)

<table>
<thead>
<tr>
<th>I. Lecture (75 %)</th>
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<tr>
<td>3 Exams @ 100 pts</td>
<td>= 300</td>
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<tr>
<td>Quizzes, Assignments &amp; Participation (Tentative)</td>
<td>= 100</td>
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<th>II. Laboratory (25 %)</th>
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<tbody>
<tr>
<td>Lab Reports/Assignments</td>
<td>= 120</td>
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<tr>
<td>Lab Quizzes</td>
<td>= 60</td>
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<tr>
<td>Participation</td>
<td>= 20</td>
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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. You are NOT TO LEAVE THE ROOM DURING EXAMS. Taking, photocopying, photographing, scanning, etc exams are all strictly forbidden! Cell phones, iWatches, cameras, scanners, or any course materials are NOT allowed in plain sight during exams. 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 3 (Tuesday, May 12 from 8:00 - 10:30 AM) will contain new material from the end of the semester.

Pop 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:

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<tr>
<th>DATE</th>
<th>TOPIC</th>
<th>ACTIVITIES</th>
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<tr>
<td>Wk1: Jan 21, 23</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 Handout (BB) To Work On GCAT Pre-Survey</td>
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<tr>
<td>Wk 2: Jan 28, 30</td>
<td>Ch 3.1 – 3.3 Chem of Information Molecules; Ch 4 Protein Structure (Problem Set Chaps 1-4; Recorded Lec)</td>
<td>MLK Holiday No Lab, Do Lab Handout (on BB) &amp; Safety Course</td>
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<td>Wk 3: Feb 4, 6</td>
<td>Review Questions from Ch 3-4; Ch 5 Protein Function</td>
<td>Lab 1: Quiz; Review Lab Calcs, Review Pipetting; Lab Calc Handout</td>
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<tr>
<td>Wk 4: Feb 11, 13</td>
<td>Ch 5 Protein Function Ch 6 DNA/RNA Structure</td>
<td>Lab 2: Quiz; Lab Calc Handout; Pipetting</td>
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<tr>
<td>Wk 5: Feb 18, 20</td>
<td>Ch 6 DNA/RNA Structure Ch 7 Studying Genes, Part I</td>
<td>Lab 3: Quiz; EtOH PPT; Spectro DNA Analysis</td>
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<td>Wk 6: Feb 25, 27</td>
<td>Ch 7 Studying Genes, Part I EXAM I (Thurs Feb 27; Ch 1-6)</td>
<td>EXAM I Lab 4: Quiz; Restriction Digests</td>
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<td>Wk 7: Mar 3, 5</td>
<td>Ch 8 Genomes, Transcriptomes &amp; Proteomes</td>
<td>Lab 5: Quiz; Gel Electro of RE Digests; Interpretation</td>
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<td>Wk 8: Mar 10, 12</td>
<td><strong>SPRING BREAK !</strong> (Mar. 9-13)</td>
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<tr>
<td>Wk 9: Mar 17, 19</td>
<td>Ch 7 Studying Genes, Part II</td>
<td>Lab 6: Quiz; Extraction of Environmental DNA; PCR #1 of Env DNA</td>
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<td>Wk 10: Mar 24, 26</td>
<td>Ch 9 DNA Topology</td>
<td>Lab 8: Gels &amp; Analysis of PCR #1; Start PCR #2; Multitask: Bioinformatics I-BLAST &amp; RDPII</td>
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<tr>
<td>Wk 11: Mar 31; Apr 2</td>
<td>Ch 10 Nucleosomes &amp; Chromatin Structure</td>
<td>Lab 9: Quiz; Gels/Analysis of PCR #2 for HTS</td>
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<tr>
<td>Wk 12: Apr 7, 9</td>
<td>Ch 15.1 Transcription (pp 519-527) <strong>EXAM II (Thurs Apr 9; Ch 7-10)</strong></td>
<td><strong>EXAM II</strong> Lab 10: Nucleosome Str of DNA</td>
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<tr>
<td>Wk 13: Apr 14, 16</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 Bioinformatics: GALAXY Tutorial of HTS Seq Processing</td>
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<tr>
<td>Wk 14: Apr 21, 23</td>
<td>Ch 19 Overview of Regulation of Gene Expression</td>
<td>Lab 12: HTS Bioinformatics: OTU Tables</td>
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<tr>
<td>Wk 15: Apr 28, 30</td>
<td>Ch 21 Transcriptional Regulation in Eukaryotes</td>
<td>Lab 13: Q-PCR</td>
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<td>Wk 16: May 5</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; GCAT Post-Survey Lab Wrap-Up</td>
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<tr>
<td>Wk 17: May 12</td>
<td><strong>FINAL EXAM 3; 8:00 – 10:30</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, receive and READ email from BB, 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. You are not allowed to take, copy, photograph or otherwise reproduce exams. No phones, iWatches, cameras or other recording devices are allowed in the room when taking exams. You will fail the course if you do not comply.
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). Makeups must occur ASAP upon return to classes, not when you feel like it.
4. It is required, and the student’s responsibility to notify the Instructor ASAP if you must miss a test, quiz or lab. A notification must occur as soon as possible. Written excuse, with appropriate dates and contact person, will be required. Makeup for missing activities must occur ASAP upon return to school. Delays are not possible.

J. COURSEPOLICIES
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. Missing work will need to be made up ASAP upon return to school.

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. Missing work will need to be made up ASAP upon return to school.

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 occasional built-in exam points or impromptu assignments (eg seminar attendance). However, these opportunities are solely at the instructor’s discretion and available to the entire class. NO SPECIAL EXCEPTIONS/ASSIGNMENTS 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 (ie 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 be 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/) 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, and the College of Science and Engineering Grade Appeals webpage at 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/](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.