Texas A&M University - Corpus Christi
Biochemistry I – CHEM 4401
Department of Physical and Life Sciences
Spring 2017

A. Course information

**Course number/section:** CHEM 4401.001  
**Class meeting time:** MW 3:30 –4:45 p.m.  
**Class location:** CI 107  
**Course Website:** https://bb9.tamucc.edu/

B. Instructor information

**Instructor:** Dr. Narendra Narayana  
**Office location:** Center for Science 208  
**Office hours:** M 2 p.m. – 3 p.m.; T 11 a.m. – 2 p.m. R 9 a.m. – 11 a.m.  
**Phone:** 825-3644  
**e-mail:** nnarayana1@tamucc.edu  
**Appointments:** please send email

C. Course description

CHEM 4401 is the first part of a two-semester biochemistry course that covers the composition, structure, and function of bio-molecules (carbohydrates, lipids, nucleic acids and proteins) and the enzyme kinetics. This course has a laboratory component that covers basic biochemical techniques – preparation of buffer solutions, enzyme kinetics, protein quantification, analysis of sugar content, and DNA extraction. Students shall have experience in the analysis and presentation of biochemical data.

**Course objectives:** In this course students will learn:

- To identify important biochemical functional groups, the types of molecular interactions (hydrogen, ionic, hydrophobic, etc.), and their role in biochemical structure and activity.

- To recognize and describe the chemical and physical properties of the universal solvent “water”, its relationship to ionization constants, the pH of a solution, and its role in the structure and function of proteins, nucleic acids, carbohydrates and lipids.

- To identify the building blocks of biopolymers (proteins, polysaccharides, nucleotides, and lipids), compare and contrast their chemical characteristics and biological roles.
• About the primary features of protein structure and function, including 3-
dimensional architecture and folding, ligand binding, and enzyme catalysis and its
regulation.

• About the primary features of polysaccharide structure and function, and describe
their major biological roles.

• About the nucleic acid (DNA, RNA) structure, chemistry, and applications in
biology.

• To describe the construction and function of biological membranes.

• To identify and describe the basic mechanisms of biological signal transduction.

• To perform basic biochemistry procedures including buffer preparation,
spectrophotometry, chromatography, enzyme preparation, kinetic analysis and
standard bioinformatics techniques.

• To analyze experimental protocols, perform standard biochemical calculations,
critique data, and prepare results for oral or written presentation.

D. Pre-requisites and Co-requisites

Pre-requisites: Organic Chemistry II and Biology I
SMTE-0093 (Chemistry Lab Safety Seminar)

Co-requisites: Lab attached to this course

E. Required Textbook(s), readings and supplies


Other references:
Biochemistry: Lippincott’s Illustrated Reviews, Champe, Harvey and Ferrier

Supplies: None

F. Student learning outcomes and assessment

By the end of this course students should be:
1. able to recognize the role of physical forces operating between atoms and ions.
2. familiar with the building blocks of proteins, DNA, and sugars.
3. proficient in the basic principles of protein and DNA structures.
4. aware of enzyme kinetics and the importance of catalysis in biological systems.
5. knowledgeable in the role of lipids and membrane structure in cells.
6. able to comprehend a variety of themes in biochemistry and laboratory skills as listed above. Assessment of students learning is based on the lecture exams, laboratory performance, and quizzes throughout the semester as detailed below.

G. Instructional methods and activities

Lectures will be followed by a review of chapters, problem solving, and student participation.

H. Major course requirements and grading

Lecture Exams: There will be three semester examinations in addition to a comprehensive final examination. Examinations will be predominantly multiple choices but may include short answer, brief calculation or structure drawing questions. All answers on exam scantron cards are final, so please fill in your answer choices on your scantron card carefully.

<table>
<thead>
<tr>
<th>Exam</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exam 1</td>
<td>100 pts</td>
</tr>
<tr>
<td>Exam 2</td>
<td>100 pts</td>
</tr>
<tr>
<td>Exam 3</td>
<td>100 pts</td>
</tr>
<tr>
<td>Final Exam</td>
<td>100 pts</td>
</tr>
</tbody>
</table>

**Total 400 pts**

Exams will take place during regular class time. We will not “drop” any of the examinations in the calculation of your final grade.

Course Grading: A combined grade for both lecture and laboratory will be given for the course. The lecture component will count for 75% of the grade and the laboratory component for 25%. The scale below indicates the minimum course score (out of a possible 100) required to obtain a particular grade. **In the lecture class, 5% of your grade will be set apart for attendance and/or quizzes.**

<table>
<thead>
<tr>
<th>Grade</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>90</td>
</tr>
<tr>
<td>B</td>
<td>80</td>
</tr>
<tr>
<td>C</td>
<td>70</td>
</tr>
<tr>
<td>D</td>
<td>55</td>
</tr>
<tr>
<td>F</td>
<td>&lt;55</td>
</tr>
</tbody>
</table>

The course score is calculated by adding the lecture \((70 + 5)\) and laboratory (25) scores:

\[
\text{Lecture score: } \frac{(\text{exam points}) \times 70}{400}
\]
Laboratory score: \((\text{lab reports} + \text{worksheets} + \text{exam points}) \times 25\)

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As mentioned above, there are 400 points possible in lecture from the three regular and one final examination. There will be a total of 200 points that can be earned in the laboratory component of the course from lab reports, worksheets, a mid-term exam, a final exam and laboratory performance.

Two examples are provided below that outline the type of final grade one might expect with a laboratory percentage of either 90% or 80%. Each example shows the final outcomes expected when varying levels of lecture points have been earned. The point is to show that a good score needs to be obtained in BOTH lecture AND laboratory in order to obtain a good overall grade for the course. DO NOT expect a good lab score to boost a weak lecture score by a full letter grade.

<table>
<thead>
<tr>
<th>Total Lecture points earned</th>
<th>Lecture Score</th>
<th>Total Laboratory points earned</th>
<th>Laboratory Score</th>
<th>Course Score (Lecture + Lab Score)</th>
<th>Final Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>200 (50%)</td>
<td>37.5</td>
<td>180 (90%)</td>
<td>22.5</td>
<td>60.0</td>
<td>D</td>
</tr>
<tr>
<td>240 (60%)</td>
<td>45.0</td>
<td>180 (90%)</td>
<td>22.5</td>
<td>67.5</td>
<td>D</td>
</tr>
<tr>
<td>280 (70%)</td>
<td>52.5</td>
<td>180 (90%)</td>
<td>22.5</td>
<td>74.5</td>
<td>C</td>
</tr>
<tr>
<td>320 (80%)</td>
<td>60.0</td>
<td>180 (90%)</td>
<td>22.5</td>
<td>82.5</td>
<td>B</td>
</tr>
<tr>
<td>360 (90%)</td>
<td>67.5</td>
<td>180 (90%)</td>
<td>22.5</td>
<td>90.0</td>
<td>A</td>
</tr>
<tr>
<td>200 (50%)</td>
<td>37.5</td>
<td>160 (80%)</td>
<td>20.0</td>
<td>57.5</td>
<td>D</td>
</tr>
<tr>
<td>240 (60%)</td>
<td>45.0</td>
<td>160 (80%)</td>
<td>20.0</td>
<td>65.0</td>
<td>D</td>
</tr>
<tr>
<td>280 (70%)</td>
<td>52.5</td>
<td>160 (80%)</td>
<td>20.0</td>
<td>72.5</td>
<td>C</td>
</tr>
<tr>
<td>320 (80%)</td>
<td>60.0</td>
<td>160 (80%)</td>
<td>20.0</td>
<td>80.0</td>
<td>B</td>
</tr>
<tr>
<td>360 (90%)</td>
<td>67.5</td>
<td>160 (80%)</td>
<td>20.0</td>
<td>87.5</td>
<td>B</td>
</tr>
</tbody>
</table>

**Study guidance**: Keep up with the reading, do end-of chapter problems, come to class, review and annotate your notes. I suggest that you prepare one or two pages summary of the material covered in the class on all class days. This will help you review faster as well as to connect with materials covered later. It is extensive, so begin early and keep up with the material as we proceed through the semester. This mode of regular studies is in line with the adage “well begun is half done”. An additional, study guide (Osgood and Ocorr) is available on reserve at the library. Forming a study group with other students is another strategy many students find helpful.
I. Course content/schedule

Tentative Course Outline

*Disclaimer: This syllabus is subject to change*

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>Introduction/Foundations</td>
<td></td>
</tr>
<tr>
<td>January</td>
<td>Cells &amp; Organelles</td>
<td>1:1-11</td>
</tr>
<tr>
<td>January</td>
<td>Biomolecules/Reactions</td>
<td>1:11-29</td>
</tr>
<tr>
<td>January</td>
<td>Biomolecules/Reactions</td>
<td>1:11-29</td>
</tr>
<tr>
<td>February</td>
<td>Biomolecules/Water</td>
<td>2:47-70</td>
</tr>
<tr>
<td>February</td>
<td>Water</td>
<td>2:47-70</td>
</tr>
<tr>
<td>February</td>
<td>Water</td>
<td>2:47-70</td>
</tr>
<tr>
<td>February</td>
<td>Amino Acids</td>
<td>3:76-85</td>
</tr>
<tr>
<td>February</td>
<td>Exam 1</td>
<td></td>
</tr>
<tr>
<td>February</td>
<td>Peptides and Proteins</td>
<td>3:85-89; 96 - 109</td>
</tr>
<tr>
<td>February</td>
<td>Protein Structure</td>
<td>4:115-152</td>
</tr>
<tr>
<td>February</td>
<td>Protein Function: Ligand binding</td>
<td>5:157-174</td>
</tr>
<tr>
<td>March</td>
<td>Protein Function: Ligand binding</td>
<td>5:174-184</td>
</tr>
<tr>
<td>March</td>
<td>Enzymes: General Function</td>
<td>6:189-200</td>
</tr>
<tr>
<td>March</td>
<td>Enzymes: Kinetics</td>
<td>6:200-213</td>
</tr>
<tr>
<td>March</td>
<td>Enzymes: Kinetics</td>
<td>6:200-213</td>
</tr>
<tr>
<td>March</td>
<td>Exam 2</td>
<td></td>
</tr>
<tr>
<td>March</td>
<td>Enzymes: Mechanisms</td>
<td>6:214-226</td>
</tr>
<tr>
<td>March</td>
<td>Enzymes: Regulation</td>
<td>6:226-236</td>
</tr>
<tr>
<td>April</td>
<td>Carbohydrates</td>
<td>7:243-263</td>
</tr>
<tr>
<td>April</td>
<td>Carbohydrates</td>
<td>7:263-274</td>
</tr>
<tr>
<td>April</td>
<td>Nucleic Acids</td>
<td>8:271-297</td>
</tr>
<tr>
<td>April</td>
<td>Nucleic Acids</td>
<td>8:297-308</td>
</tr>
<tr>
<td>April</td>
<td>Lipids</td>
<td>10:357-370</td>
</tr>
<tr>
<td>April</td>
<td>Exam 3</td>
<td></td>
</tr>
<tr>
<td>April</td>
<td>Lipids</td>
<td>10:370-380</td>
</tr>
<tr>
<td>April</td>
<td>Membranes</td>
<td>11:385-395</td>
</tr>
<tr>
<td>May</td>
<td>Membranes / Final Lecture</td>
<td>11:395-427</td>
</tr>
<tr>
<td>May</td>
<td>Final Exam (1:45 p.m – 4:15 p.m.)</td>
<td>Comprehensive</td>
</tr>
</tbody>
</table>
J. **Course policies**

**Attendance/Tardiness**

Students are encouraged to attend all lecture classes. Attendance will be taken in the class and 5% of the total grade is allocated for attendance.

**Make-up Exams**

Please inform Dr. Narayana ahead of time if you have a university-approved excuse, if at all possible, alternate arrangements can be made.

**Cell Phone Use**

Cell phone use and photography is **prohibited** in the classroom. This is a severe distraction to the entire class.

**Laptop Use**

Use of laptop in the class is permitted provided it is used solely for taking notes related to the ongoing lecture in the classroom. Further its use should not distract or interfere with other students in the class.

**Decorum**

The best way to encourage learning is to provide an environment conducive to listening, concentration, and discussion. As in any class, students are expected to maintain the highest standards of decorum and to conform to college-level standards of ethics and academic integrity. Most of these involve common sense and courtesy, but please refer to the section on academic policies and regulations in the university catalog for a more thorough description of these expectations.

**Student responsibility**

Student should be aware of the contents of this syllabus and the course website on Blackboard. Announcements and changes are communicated in the classroom, Blackboard, and/or emails.

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/](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. 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.
### Biochemistry Laboratory I Schedule

**Tentative Course Outline**

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Sections 101/102/103: Location: CS228

<table>
<thead>
<tr>
<th>Date</th>
<th>Lab</th>
<th>Topic</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week of</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>January 16</td>
<td></td>
<td>No Laboratory</td>
<td></td>
</tr>
<tr>
<td>January 23</td>
<td>1</td>
<td>Units, Concentration, Solutions &amp; Dilutions</td>
<td>15</td>
</tr>
<tr>
<td>January 23</td>
<td>2</td>
<td>Pipeting &amp; Scales</td>
<td>10</td>
</tr>
<tr>
<td>January 30</td>
<td>3</td>
<td>Buffers &amp; pH</td>
<td>17</td>
</tr>
<tr>
<td>February 6</td>
<td>4</td>
<td>Photometry</td>
<td>17</td>
</tr>
<tr>
<td>February 13</td>
<td>5</td>
<td>Amino Acid Chromatography</td>
<td>17</td>
</tr>
<tr>
<td>February 20</td>
<td>6</td>
<td>Protein Structure Analysis (10) / <strong>Mid-term exam</strong> (10)</td>
<td>20</td>
</tr>
<tr>
<td>February 27</td>
<td>7</td>
<td>Enzyme Activity: Polyphenoloxidase</td>
<td>33</td>
</tr>
<tr>
<td>March 6</td>
<td>8</td>
<td>Enzyme Kinetics</td>
<td>-</td>
</tr>
<tr>
<td>March 20</td>
<td>9</td>
<td>Protein Quantification</td>
<td>10</td>
</tr>
<tr>
<td>March 27</td>
<td>10</td>
<td>Glucose determination</td>
<td>17</td>
</tr>
<tr>
<td>April 3</td>
<td>11</td>
<td>Nucleic Acids</td>
<td>17</td>
</tr>
<tr>
<td>April 10</td>
<td></td>
<td><strong>Final exam</strong> / Lab clean-up</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Total</strong></td>
<td>183</td>
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