Biochemistry II – CHEM-4402
Department of Physical and Environmental Sciences
Fall 2019

A. Course information

Course number/section: CHEM 4402.001
Class meeting time: MW 2:00 – 3:15 p.m.
Class location: CS 115
Course Website: https://bb9.tamucc.edu/

B. Instructor information

Instructor: Dr. Narendra Narayana
Office: Center for Science 130D
Office Hours: M 11 a.m. – 1 p.m.; W 11 a.m. – 1 p.m.; R 12:00 p.m. – 1:00 p.m.
Phone: 825-3644
Email: nnarayana1@tamucc.edu
Appointments Please send email

C. Course description

Catalog Course Description

4 sem. hrs. (3:3) The study of lipids, cell membranes, biochemical signaling, and the metabolism of sugars, fats, and proteins. Laboratory exercises demonstrate the basic principles and techniques used in Biochemistry. This course is typically offered in the fall and spring. Prerequisites: CHEM 4401 and the associated lab. NOTE: All students registering for this course must also register for online SMTE 0093, a Chemistry Lab Safety course that must be completed before the end of the second week of the semester in order to be able to continue attending the lab sections of the course. Lecture and lab are linked so you cannot drop the lab without dropping the lecture as well.

Extended Course Description

CHEM 4402 is the second part of a two-semester biochemistry course that covers the structure and function of biomolecules (carbohydrates, lipids, nucleic acids and proteins) and the major metabolic pathways involved in their synthesis and degradation. This course has a laboratory component that dwells on a specific set of experiments. These practical classes build on the previous hands-on experience in Biochemistry I. Data acquisition, analysis, and interpretation will be performed.

Course objectives: In this course students will learn:

• To apply laws of thermodynamics to biochemical reactions and derive relationships between bioenergetics and thermodynamics.
• The role of cofactors and coenzymes in oxidation-reduction reactions and the production of energy-rich ATP molecule.

• The steps involved in the glycolytic pathway and citric acid cycle that result in the production of molecules required for the biosynthesis of larger molecules.

• The metabolic regulation of glycogen production and breakdown.

• About the carbohydrate, fatty acid, and protein catabolism.

• About the mechanism of phosphorylation and ATP synthesis.

• About the biosynthesis of lipids, carbohydrates, and proteins.

• To identify the key reaction mechanisms in metabolism, including oxidation-reduction, decarboxylation, and transamination reactions.

• About regulation and integration of mammalian metabolism.

• Perform basic biochemical laboratory techniques, including review of the primary literature, database analysis, bioinformatics, DNA extraction, digestion, ligation, transformation and sequencing, the polymerase chain reaction (PCR), gel electrophoresis, spectrophotometry, protein expression, purification, and analysis.

• Prepare a professional, written project report.

D. Pre-requisite and co-requisites:

Pre-requisites: CHEM 4401
SMTE-0093 (Chemistry Lab Safety Seminar)

Co-requisites: CHEM 4402-101/102 Lab associated with this course

E. Required Text


Note: The older version (6th ed.) is usable except the page numbers quoted in the study guidelines may be shifted.

Optional Textbook(s) or Other References:

SaplingPlus with Lehninger

Biochemistry: Lippincott’s Illustrated Reviews, Champe, Harvey and Ferrier
Supplies: Scientific Calculator

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.

By the end of this course students should be able to recognize different types of biochemical reactions involved in the catabolism of carbohydrates, proteins, and fats. Furthermore, students should be able to grasp 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

Attendance: Attendance is highly recommended to understand the concept in its true perspective. That is to connect different aspects of chemical principles to understand a specific phenomenon. Irregularity inevitably leads to poor grade. Please arrive on time and remain in the class until the lecture is completed to be eligible for attendance points. Arriving later than 10 minutes after the start of the class or leaving early is not acceptable in the interest of the whole class. Please minimize distractions in the class as some students tend to go out for a drink of water or restroom use. Keep in mind if few students do this in a large class (about 60 students) this will be too much of a disturbance. Please be aware that some of your own classmates are not comfortable with that type of disturbances. I suggest that you plan appropriately so that you do not have to leave the class in between the start and the conclusion of the lecture. Please avoid whispering with your neighbors as it is known to distract students in the vicinity. Please note, the class time belongs to all the students and the teacher, therefore, we need to be mindful of others that means we together must avoid disturbances whatsoever and be productive in the class!

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.

Exam 1  100 pts
Exam 2  100 pts
Exam 3  100 pts
Final Exam  100 pts

Total  400 pts

Exams and quizzes will take place during regular class time. Please inform Dr. Narayana ahead of time if you have a university-approved excuse, if possible, alternate arrangements can be made for make-up exam. I 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>
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<tbody>
<tr>
<td>A</td>
<td>90 and above</td>
</tr>
<tr>
<td>B</td>
<td>80 and above and &lt; 90</td>
</tr>
<tr>
<td>C</td>
<td>70 and above and &lt; 80</td>
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<tr>
<td>D</td>
<td>55 and above and &lt; 70</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:

Lecture score: \[
\frac{(\text{exam points}) \times 70}{400}
\]

Laboratory score: \[
\frac{(\text{lab reports + worksheets + exam points}) \times 25}{183}
\]

As mentioned above, there are 400 points possible in lecture from the three regular and one final examination. There will be a total of 183 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. Please note that it is necessary to obtain good scores 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.
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. Please see the study guidelines for individual chapters posted on the blackboard. It is extensive, so begin early and keep up with the material as we proceed through the semester. Read or at least skim through the material discussed in the previous class before attending the class. Because the class material builds on itself, you cannot afford to get behind. In line with the adage – “well begun is half done”, I urge students to keep up with the subject as we proceed through the semester. 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>Chapter/section</th>
</tr>
</thead>
<tbody>
<tr>
<td>August 26</td>
<td>Introduction/Lipids</td>
<td>10.1 – 10.3</td>
</tr>
<tr>
<td>August 28</td>
<td>Lipids</td>
<td>10.1 – 10.3</td>
</tr>
<tr>
<td>September 04</td>
<td>Membranes</td>
<td>11.1 – 11.3</td>
</tr>
<tr>
<td>September 09</td>
<td>Bio-signaling</td>
<td>12.1 – 12.2</td>
</tr>
<tr>
<td>September 11</td>
<td>Bioenergetics</td>
<td>13.1 – 13.4</td>
</tr>
<tr>
<td>September 16</td>
<td>Exam 1</td>
<td></td>
</tr>
<tr>
<td>September 18</td>
<td>Bioenergetics</td>
<td>13.1 – 13.4</td>
</tr>
<tr>
<td>September 23</td>
<td>Glycolysis</td>
<td>14.1 – 14.3</td>
</tr>
<tr>
<td>September 25</td>
<td>Glycolysis</td>
<td>14.1 – 14.3</td>
</tr>
<tr>
<td>September 30</td>
<td>Gluconeogenesis and PP pathway</td>
<td>14.4 – 14.5</td>
</tr>
<tr>
<td>October 02</td>
<td>PP pathway and Glycogen</td>
<td>14.5, 15.4</td>
</tr>
<tr>
<td>October 07</td>
<td>Citric acid cycle</td>
<td>16.1 - 16.3</td>
</tr>
<tr>
<td>October 09</td>
<td>Citric acid cycle</td>
<td>16.1 - 16.3</td>
</tr>
<tr>
<td>October 14</td>
<td>Exam 2</td>
<td></td>
</tr>
<tr>
<td>October 16</td>
<td>Fatty acid oxidation</td>
<td>17.1 - 17.3</td>
</tr>
<tr>
<td>October 21</td>
<td>Fatty acid oxidation</td>
<td>17.1 – 17.3</td>
</tr>
<tr>
<td>October 23</td>
<td>Amino acid oxidation</td>
<td>18.1 – 18.3</td>
</tr>
<tr>
<td>October 28</td>
<td>Amino acid oxidation</td>
<td>18.1 - 18.3</td>
</tr>
<tr>
<td>October 30</td>
<td>Oxidative phosphorylation</td>
<td>19.1 – 19.5</td>
</tr>
<tr>
<td>November 04</td>
<td>Oxidative phosphorylation</td>
<td>19.1 – 19.5</td>
</tr>
<tr>
<td>November 06</td>
<td>Oxidative phosphorylation</td>
<td>19.1 – 19.5</td>
</tr>
<tr>
<td>November 11</td>
<td>Exam 3</td>
<td></td>
</tr>
<tr>
<td>November 18</td>
<td>Oxidative phosphorylation</td>
<td>19.1 – 19.5</td>
</tr>
<tr>
<td>November 20</td>
<td>Photophosphorylation</td>
<td>19.6 – 19.10</td>
</tr>
<tr>
<td>November 25</td>
<td>Carbohydrate biosynthesis</td>
<td>20.1 – 20.3</td>
</tr>
<tr>
<td>December 02</td>
<td>Lipid biosynthesis</td>
<td>21.1 – 21.4</td>
</tr>
</tbody>
</table>
December 04 Lipid biosynthesis (Final Lecture/Review) 21.1 – 21.4

December 11 Final Exam 1:45 p.m. – 4:15 p.m. Comprehensive

Note: Changes in this course schedule may be necessary and will be announced to the class by the Instructor. I usually continue from where I stopped in Biochemistry I (spring and summer semesters that I teach), therefore, the chapter number that I begin the semester will usually be prior to the chapter number mentioned above. The assignments and exams shown are directly related to the Student Learning Outcomes described in Section F. Total number of lecture classes: 27 – 3 exams = 24

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. I believe this provides an incentive to students to attend the classes as well as to learn and be ahead.

Late Work and Make-up Exams

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

Extra Credit

Depending on the class performance there may be an opportunity for extra credit to enhance the students’ grade points via assignments or quizzes. However, please note this is not a routine procedure and not an obligation for the course. I shall decide on extra credits in the course of the semester.

Cell Phone Use

Cell phone use and photography is prohibited in the classroom. This is a severe distraction to the entire class. Cell phones are not allowed during all quizzes and exams or you will receive a zero!!

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.
Food in Class

Although food is allowed in the lecture classes, please consume only as a necessity on some occasions and ensure it does not distract the neighbors.

Missed Exam

If a student is absent for the exam on the designated date, he or she should provide a university-approved permission to take the exam at a mutually convenient date. With regards to the quiz, if a student is absent on the day of the quiz, the student forfeits the quiz points unless there is a university-approved excuse.

Participation

Students are encouraged to participate collectively in the class discussion and should not involve in cross talk with the neighbors privately on the subject matter during the lecture period. You are expected to be attentive and ask or answer pertinent questions.

Others

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. Please note that I am very sensitive for disturbances so does many students if not all, so I urge all students to be focused throughout the class time (only for an hour and 15 minutes please!). Cell phone use and photography is prohibited in the classroom. Please turn OFF your cell phone while in the class. Electronic interruptions will NOT be allowed, and laptops are to be used only for the lecture material. Most of these involve common sense and courtesy. All students are expected to treat other students and the instructor with due respect. If a student’s behavior breaches the general code, the student will be asked to leave the class and continued miss-conduct can lead to further disciplinary action. 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)

I hope that you never find it necessary to drop this or any other class. However, events can sometimes occur that make dropping a course necessary or wise. Please consult with your academic advisor, the Financial Aid Office, and me, before you decide to drop this course. Should dropping the course be the best course of action, you must initiate the process to drop the course by going to the Student Services Center and filling out a course drop form. Just stopping attendance and participation WILL NOT automatically result in your being dropped from the class. 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/

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 necessary. I will announce such changes in a timely manner during regularly scheduled lecture periods.

**Laboratory information:**

**CHEM 4402 Laboratory** (Tuesday 11:00 a.m. – 01:50 p.m. OR 2 p.m.–4:50 p.m.)

**Green Fluorescent Protein - The Project**

This semester will revolve around a central theme, the isolation, characterization and purification of the Green Fluorescent Protein (GFP). GFP is a naturally occurring protein found in certain species of jellyfish (*Aequorea victoria*). As the name indicates, its unique structure allows it to fluoresce, that is, radiate energy in the electromagnetic spectrum that we interpret as yellow-green light. The theme of the semester will involve several investigations of GFP: locating the DNA sequence for GFP in genomic databases, producing copies of the gene using the Polymerase Chain Reaction (PCR), purifying the expressed protein from a bacterial strain which carries a cloned copy of the gene, etc. Throughout this process, you will be exposed to several molecular techniques such as DNA isolation, PCR, electrophoresis, cloning, DNA sequencing and chromatography. It is hoped that by focusing on a single gene and progressing sequentially through the various steps involved in expressing that gene, that you will attain a greater understanding of the relevant biochemical processes involved in the conversion of genetic materials (DNA) to functional proteins.

Due to the fact, that successive labs build upon information and data obtained during the previous week, it is crucial that you show up for every lab. We will not be turning in formal lab reports every week. Instead, you will be responsible for acquiring data and formatting it for presentation on a weekly basis. At the end of the semester, you will combine this data into a comprehensive lab report. Therefore, you will still need to keep a laboratory notebook/folder with each week’s relevant experimental details and results as well as an electronic copy of any formatted results. For the most part, course grading will be based upon preparation of these results in the proper format and upon assigned questions covering the theory and technique of the week’s experiment.

**Required Laboratory Materials**

**Text:** Experiments will be posted in portable document format (.pdf files) on the blackboard. Please download and print a copy prior to lab. You will need adobe acrobat on your computer to download the documents. Provision of hardcopies of each week’s experiment is the student’s responsibility, not the laboratory instructor.

**Laboratory Notebook** (required): A separate (not used for other classes) notebook is required for performing pre-laboratory work, recording observations, etc. Traditional, string-bound hard-covered versions are available at the University Bookstore.

**Laboratory supplies:** Safety Glasses/goggles and Lab Coat is mandatory
Attendance: Students are required to attend all laboratory periods. Please arrive on time and remain until the laboratory procedure is completed. Check with your instructor before leaving. Absence from laboratory without a university approved excuse and/or prior approval from the instructor will result in a grade of zero for that class. Occasionally a student may be permitted to attend another laboratory section if a conflict arises with their scheduled section, and IF it is cleared with all instructors involved BEFOREHAND, but no make-up lab periods will be held outside of the scheduled sections.

Safety

Safety Lecture: You must be registered for, and complete, one of the Lab Safety Briefings SMTE 0093 prior to performing experiments in the laboratory.

Eye Safety: When in lab, always wear your safety goggles. A first violation will result in a verbal notification. Subsequent violations may result in the student being asked to leave the laboratory, with a grade of zero for the day. Also, be advised that wearing contact lenses in the laboratory can be harmful to your eyes, even when you wear safety goggles over them.

Clothing: No open toe shoes or shorts (or short dresses) are allowed in the laboratory. A lab coat must be worn at all time.

Keep it Clean: Keeping things clean will keep any chemicals in the lab and not in your home. Always wash your hands just before leaving the lab. Never take samples or glassware out of the lab. Do not place your coats, backpacks and other personal items on the bench tops or floor in the lab. They can be placed in the cabinets under the benches. Keep in mind; anything you bring into the lab should be treated with care at home. Your notebook and lab book may be picking up stuff you spilled on the bench or floor and did not clean up.

Disposal of Chemical Wastes: During the experiments, you will generate several types of waste, which need to be handled properly. Organic wastes should be placed in an appropriately marked bottle for organic waste. Aqueous (water-based) waste should be poured into the appropriately marked bottles. Solid wastes should be placed in an appropriately labeled solid waste bottle. Broken glassware should be placed in the broken glassware box. Never put glass into the regular trashcans.

Ask for Assistance: If you have any questions about the safety of any procedure, please ask your instructor before proceeding.

A few reminders:
• No eating or drinking is allowed in the laboratory
• Know the location of fire extinguishers, eyewash stations, safety showers, fire alarms and Material Data Safety Sheets (MSDS forms)
• If an accident occurs, immediately notify the instructor or TA

Laboratory Facilities

We will teach you how to use the necessary equipment for each exercise. To ensure optimal performance of instruments, do not attempt to use any equipment until your
instructor gives you directions. If equipment malfunctions, notify the instructor immediately so we can repair or replace it as soon as possible.

This laboratory receives heavy use. As a courtesy to your fellow students, all lab teams are expected to clean up their stations after each period. This includes replacing all equipment to their original locations, turning off and covering instruments, cleaning glassware, and wiping down laboratory workspaces. Each team must check out with their instructor prior to leaving.

Grading

Your laboratory score will be determined based on points earned from weekly assignments, laboratory reports, a mid-term exam, a final exam and laboratory performance. There is a total of 183 points that can be earned. Laboratory counts for 25% of your course grade and is calculated as follows:

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

183

All assignments are due at the beginning of the next laboratory period. We realize that the average student has a great many academic demands during the semester. Therefore, we offer a special stress-relief clause. You may turn in one assignment late (except the final laboratory report) for any reason. Please let your instructor know that you intend to use your “free late” in writing at the time you submit the late assignment. Your assignment will then be due at the beginning of lab the following week. Any other assignments turned in late will be penalized 10% for each additional day. Please note the lab report turned in after two weeks from the due date will not be graded.

Laboratory performance. A portion of your grade (~ 5%) will also depend on your laboratory performance. This is not “extra credit”, but a score based on individual student behavior. Points are earned by avoiding behavior including, but not limited to:

- Arriving late to class
- Being unprepared for the laboratory
- Performing in a lackluster manner (not paying attention, not taking initiative, etc.)
- Leaving the laboratory before completing the exercise
- Being disrespectful to your instructor or fellow students
- Failing to clean up at the end of the laboratory
- Violating safety regulations
- Plagiarizing another student’s work
- In general, conducting oneself unprofessionally

Instructor is in-charge of his/her laboratory sections, including attendance, instruction, and assistance with assignments, grading, and handling of missed laboratory periods. Your instructor should be the first person you go to with questions related to the laboratory. Be sure to find out the best way to contact your instructor, their office location and office hours.
Laboratory Assignments and final Report

A final report will be required at the end of the semester. Be sure to retain both electronic and “hard” copies of all data results from the labs (photographs, tables, charts, etc.). The standard laboratory report format will be used, as described below.

Even though students work in teams, lab reports and assignments are expected to be the result of individual effort. Thus, while we encourage students to work together with regards to data analysis and interpretation, we also expect individuality in interpretation and style of writing, especially regarding the introduction and discussion sections. If we suspect copying or plagiarism both the assignments will not be accepted and a grade of zero will be recorded.

Laboratory reports are to be type-written, photocopies taken directly from your laboratory notebooks are not acceptable. Reports should meet the key tests of being both legible and understandable. Legible means correct spelling and intelligible, complete sentences. Understandable means complete tables and graphs, with units, legends, column headings and axis titles present and clearly identified. Graphs and tables are to be computer-generated. Many software packages, such as Microsoft Excel and Word have convenient tutorials (“wizards”) for the construction of tables and graphs.

The full lab report due at the end of the semester (additional information will be posted on the blackboard) should consist of a title page, introduction, procedure, results and discussion.

Title Page:
- Laboratory report title
- Your name
- Your lab partner’s name
- Your section number
- The name of your instructor
- The date

Introduction: Clearly state the aim of the procedures used during the semester, include background information on the basic principles and theory underlying a particular experimental technique.

Procedure (Materials & Methods): Include a brief narrative description of the major steps for a particular technique/procedure (“using primers “X” and “Y” and the Polymerase Chain Reaction”, using Gel permeation chromatography with “X” as the chromatography matrix”, etc.). You do not need to rewrite a step-by-step description of the procedure from your text but try to summarize the important steps.

Results: This section should include all experimental data and its manipulation in the form of example calculations, photographs, tables, etc. Example calculations should be used instead of separate calculations for each sample. Be sure all experimental data is clearly labeled with column headings, axis titles, figure legends, chart and graph titles, etc. This is where students lose the most points.

Discussion: This section is for showing your understanding of the experiments. Be sure to analyze your results and argue why you can draw certain conclusions. Discuss any
expected results compared with your actual results and observations. Draw on the theory and your experience in order to rationalize the outcome of the experiment, especially possible reasons for deviations from the expected results.

**Laboratory Notebooks:** A well-written laboratory notebook will be an invaluable aid in preparing your reports. However, laboratory notebooks are not intended to look perfect. Use your notebook to write down notes on what you think is happening in the experiment, hand-draw rough graphs and jot down observations to aid your analysis or conclusions. In addition, each notebook should contain your name, section number and a table of contents. This makes it much easier to find data, results, procedures, etc. on any given experiment. It also makes it easier for us to return a notebook if it should be left in the laboratory.

**Pre-lab:** As part of each experiment, we ask that you prepare a pre-lab in your laboratory notebook. This section should provide enough specific information on the procedure (e.g., identity and quantity of materials, times, temperatures, etc.) to enable you to perform the experiment. It should be organized in a summary format and include: title of the experiment, purpose of the experiment, technique(s) or procedure(s) being used, outline of steps, tables for data and sample preparation. Your Pre-lab will not be turned in as part of your formal laboratory report.

**Biochemistry Laboratory II Schedule**

**Tentative Course Outline**

*Disclaimer: This syllabus is subject to change*

**Room CS 228**

**Tuesday 11 a.m. – 1:50 p.m. OR 2:00 p.m. – 4:50 p.m.**

<table>
<thead>
<tr>
<th>Date</th>
<th>Laboratory</th>
<th>Topic</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>September 03</td>
<td>1</td>
<td>Introduction/Literature Searching</td>
<td>12</td>
</tr>
<tr>
<td>September 03</td>
<td>2</td>
<td>Database Searching</td>
<td>12</td>
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<tr>
<td>September 10</td>
<td>3</td>
<td>Primer Design &amp; PCR</td>
<td>12</td>
</tr>
<tr>
<td>September 17</td>
<td>4</td>
<td>Electrophoresis &amp; gel-extraction of DNA</td>
<td>12</td>
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<tr>
<td>September 24</td>
<td>5</td>
<td>Ligation &amp; Bacterial Transformation</td>
<td>12</td>
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<tr>
<td>October 1</td>
<td>6</td>
<td>Plasmid DNA isolation/Restriction enzymes I</td>
<td>12</td>
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<td>October 8</td>
<td>7</td>
<td>Restriction Enzymes II/DNA sequencing I</td>
<td>12</td>
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<td>October 15</td>
<td>8</td>
<td>DNA sequencing II/ <strong>Mid-term exam</strong></td>
<td>12, 10</td>
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<tr>
<td>October 22</td>
<td>9</td>
<td>Protein Explorer (Bioinformatics)</td>
<td>12</td>
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<td>October 29</td>
<td>10</td>
<td>GFP Induction</td>
<td>12</td>
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<td>November 05</td>
<td>11</td>
<td>Gel Permeation Chromatography</td>
<td>12</td>
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<td>November 12</td>
<td>12</td>
<td>SDS-Polyacrylamide Gel Electrophoresis</td>
<td>12</td>
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<td>November 19</td>
<td>12(cont'd)</td>
<td>SDS Gel Photo/Checkout/ <strong>Final exam</strong></td>
<td>2, 10</td>
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<tr>
<td>December 2</td>
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<td><strong>Final lab report due by 5 p.m.</strong></td>
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