CHEM 401: General Biochemistry I

Course Syllabus
Summer Session I – 2026

Instructor: Francesco Morena, Ph.D., Leonardo Donati, Ph.D
Credits: 3
Contact Hours: 45
Prerequisites: at least one semester of General Chemistry or Organic Chemistry
Class Meeting Days & Time: MONDAY AND WEDNESDAY (CLASS), 2:15 PM - 5:45 PM
TUESDAY AND THURSDAY (PROBLEM SETS), 2:15 PM - 3:30 PM
Office Hours: by appointment after a class or via Zoom (see Moodle site)

Course Type: Standard Course
Course Fee: NONE

Course Description
In this class, you will master fundamental biochemical principles and use this knowledge to solve biochemical problems.

Learning Outcomes and Assessment Measures
Below are the course's learning outcomes, followed by the methods that will be used to assess students' achievement for each learning outcome. By the end of this course, students will be able to:

- *apply* thermodynamic principles to biochemical reactions;
- *understand* the relationship between structure and function in biological molecules;
- *name* and *classify* the four primary types of biological molecules (proteins, sugars, lipids, and nucleic acids);
- *understand* the biochemical methods that are used to analyze biological molecules;
- *understand* how reaction rates are increased in biological processes;
- *understand* how biomolecular activity is regulated by chemical modification and intermolecular interactions;
- *discover* how receptor proteins and enzymes communicate in signaling pathways to control how a cell responds to its environment .

Course Materials
The course's Moodle site is the primary location for readings and assignments. This class will be based on Roger L. Miesfeld and Megan M. McEvoy *Biochemistry* (2nd edition). While not required, the textbook provides an important source and anchor for the course material. Physical copies of the textbook are available to students for consultation in the library of the Umbra Institute.

Assessment

Attendance	10%
In-Class Work	10%
Problem Sets	20%
Exams (4)	60%

Grading

Students are reminded that it is their responsibility to note the dates of exams and other assignments. No alternative exam dates will be offered and professors are not required to give partial credit for any late work (they do so at their discretion: the Institute's default policy is no extensions and a zero for any work turned in late). Students who book travel when they have an exam or other assessment will have to change their plans or accept a zero. Letter grades for student work are based on the following percentage scale:

Letter Grade Range	Numerical Score Equivalent	Student Performance
A	93% - 100%	Exceptional
A-	90% - 92%	Excellent
B+	87% -89%	Superior
B	83% - 86%	
B-	80% - 82%	
C+	77% - 79%	Satisfactory
C	73% - 76%	
C-	70% - 72%	
D+	67% - 69%	Low Pass
D	63% - 66%	
D-	60% - 62%	
F	59% or less	Fail (no credit)

Please note: decimal numerals between 1-4 are rounded down while 5-9 are rounded up: e.g., expect 89.4 to be 89.0 while 89.5 to round up to 90.

Course Requirements
Grades are based on the following criteria.

Attendance (10%)
Attendance is an important part of this course. You have one "sick day," per Institute policy. As long as you are at all the other meetings, you will receive the full 10% for this part of your grade. There are no make-ups offered for attendance.

In-Class Work (10%)
Students will be asked to complete some in-class work in groups.

Problem Sets (20%)
Eleven homework problem sets will be assigned over the course of the summer session through Moodle. The lowest grade will be dropped. Problem sets will require between 30 minutes and 1 hour to complete and you will have at least two weeks between when the assignment is posted and when it is due.

Exams (60%)
There will be a total of four exams including three midterm exams (15% each) administered during class and a fourth exam (15%) to be taken during the final week. Each exam will mostly focus on a set of lectures as outlined in the syllabus. However, exams will be cumulative in certain respects because we will build on topics from previous units. Exams can include a combination of multiple choice, fill in the blank, and open response questions. The instructor reserves the right to change the format of any exams over the course of the term.

Extension & Submitting Late Work
Work submitted after the deadline will receive a grade of zero, not partial credit. Each student is allowed one extension of 24 hours over the entire semester. This can be used for any assignment but the final project. Students need to email the instructor before the deadline and inform the instructor of their use of the extension. Any work submitted after the 24-hour extension will be marked zero. As for all policies, exceptions can be made by the Director for students with special accommodations or in case of medical emergencies, etc.

Attendance Policy

Attendance is expected and mandatory for classroom times and co-curricular activities. The first absence per course due to illness will be considered an excused "sick day" and does not require medical documentation. To receive additional excused absences due to illness, students are required to see a local physician or request a letter from an Institute-approved doctor documenting they should be excused from class for illness.
Unexcused absences will adversely affect a student's academic performance and will result in a reduction of the student's final course grade by 4% per absence up to a maximum of 10%. Excessive unexcused absences (4 or more, not including the excused "sick day") may lead to receiving a failing grade or disciplinary action. It is the student's responsibility to be aware of the number of absences or late arrivals for each course, and to ask the instructor when in doubt.
If students miss class, they are responsible for obtaining class notes from other students and/or for meeting the professor during office hours. Any work missed in class because of an excused absence may be made up within one week of the return to the class. Any work missed that was a quiz or other test must be made up outside of class time and will, in the interest of intellectual honesty, be a slightly different test than the one given in class.
Presence during mandatory field trips is especially important. Missing a mandatory field trip for a course, unless for a very serious reason that is communicated to Umbra staff in a timely manner, will lower the students' grade by half a letter grade (i.e., a final grade of a B+ would be lowered to a B).
Legitimate reasons for an excused absence or tardiness includes: death in immediate family, religious observances, illness or injury, local inclement weather, medical appointments that cannot be rescheduled.
Students who request an approved absence to observe a religious holiday must submit a formal request to the Institute's Director within one week after the add/drop period when course schedules, including any field trips, are finalized. No exceptions will be made after this deadline.
Except in the case of medical emergencies, absences are not accepted when tests are scheduled; tests cannot be made up. Furthermore, scheduled times and dates indicated for exams, quizzes, oral presentations, and any other graded assignments cannot be changed for any reason. Even if more sections of the same class are activated, students may only take exams during the scheduled times and dates for the section they are enrolled in.

Tardiness Policy
Students are expected to attend all classes punctually. Any student arriving up to 15 minutes late or leaving up to 15 minutes earlier than the scheduled class end time will be marked as tardy. Each incident of tardiness (late arrivals to or early departures from class) is 1% off the final grade. However, should a student arrive more than 15 minutes late or depart more than 15 minutes before the conclusion of the class, it will be recorded as an absence.
Students are also expected to remain in class during the time of instruction except for a reasonable amount of time to use the restroom. Students who leave class and do not return during the class session will receive an unexcused absence or late penalty.

Academic Integrity
All forms of cheating (i.e., copying during exam either from a fellow student or making unauthorized use of notes) and plagiarism (i.e., presenting the ideas or words of another person for academic evaluation without acknowledging the source) will be handled according to the Institute Academic Policy, which can be found in the Umbra Institute Academic Policies and Conduct Guidelines.
Utilizing ChatGPT or other artificial intelligence (AI) tools for the generation of content submitted by a student as their own as part of any assignment for academic credit at the Institute constitutes a form of plagiarism. Should the Institute become aware of a student's use of such platforms and services, the student will be subject to the same consequences and judicial proceedings as are in place for plagiarism (defined above).

Classroom Policy
Students are expected to follow the policy of the Institute and demonstrate the appropriate respect for the historical premises that the school occupies. Students are not allowed to use their cell phones, ear buds, or laptops while in class or during co-curricular events and activities, unless otherwise specified in the course syllabus or expressly permitted by the instructor for special learning. This policy also applies to earbuds, smartwatches, headsets, and the like. Students who do not respect these rules will be subject to disciplinary warnings and probation, be given an unexcused absence from class, and other disciplinary action including dismissal from the course.

Moodle
Please note that Moodle, not this syllabus, is the ultimate reference for due dates, assignment prompts, and course announcements. It is *the student's responsibility* to check the site regularly to be aware of announcements as well as to see and record all due dates for assignments.

Schedule of Topics, Readings, and Assignments

WEEK 1

Introduction, Water, & Amino Acids

Meeting 1 (Monday)
- Introduction: review of general chemistry and thermodynamics
- Water: chemical bonding, properties of water, ionization and pH
- Water: acids and bases, buffers

Meeting 2 (Tuesday)
- In-class problem set: Thermodynamics & Water

Meeting 3 (Wednesday)
- Amino acids: properties, stereochemistry
- Amino acids: ionization
- Proteins: 3D structure (part 1)

Meeting 4 (Thursday)
- In-class problem set: Aminoacids and Protein Structure

Readings for the week:
Miesfeld, R. L., & McEvoy, M. M. (2021). *Biochemistry* (2nd ed.). Norton. Read chapters 2, 4, and 5.

WEEK 2

Proteins & Analytical Techniques

Meeting 5 (Monday)
- Proteins: 3D structure (part 2)
- Proteins: Folding, Dynamics and Stability

Meeting 6 (Tuesday)
- In-class problem set: Protein Folding

Meeting 7 (Wednesday)
- **EXAM 1**
- Analytical Techniques

Meeting 8 (Thursday)
- In-class problem set: Analytical Techniques

Assignment: Protein structure and folding; Analytical techniques

Readings for the week:
Miesfeld & McEvoy, *Biochemistry*, (re)read chapter 4.

WEEK 3

Myoglobins, Hemoglobins, Antibodies, & Nucleic Acids

Meeting 9 (Monday)
- Myoglobin and Hemoglobin
- Antibodies

Meeting 10 (Tuesday)
- In-class problem set

Meeting 11 (Wednesday)
- **Exam 2**
- Nucleic acids: Structure and Function
- Nucleic acids: Methods

Meeting 12 (Thursday)
- In-class problem set

Readings for the week:
Miesfeld & McEvoy, *Biochemistry*, read chapters 3 and 6; reread chapters 4 and 5.

WEEK 4

Carbohydrates & Lipids

Meeting 13 (Monday)
- Carbohydrates – classification and nomenclature
- Carbohydrates – glycoconjugates

Meeting 14 (Tuesday)
- In-class problem set

Meeting 15 (Wednesday)
- Lipids: structure and function
- Lipids and membranes
- Membrane transport

Meeting 16 (Thursday)
- In-class problem set

Readings for the week:
Miesfeld & McEvoy, *Biochemistry*, read chapters 13 and 15; reread chapters 2 and 6.

WEEK 5

Enzymes

Meeting 17 (Monday)
- **Exam 3**
- Enzymes: Classification and mechanisms
- Enzymes: kinetics and inhibitors

Meeting 18 (Tuesday)

- In-class problem set

Meeting 19 (Wednesday)

- Review for Final Exam

Meeting 20 (Thursday)

- In-class problem set

Meeting 21 (Friday)

- **Exam 4**

Readings for the week:
Miesfeld & McEvoy, *Biochemistry*, read chapters 7 and 8.