

CHEMISTRY 752 / BIOLOGY 718
REGULATION AND INTEGRATION OF METABOLISM
Course Syllabus - Spring 2024

Instructors: Dr. Caryn E. Outten
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Dr. Maria M. Peña
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Class Time/Place: M/W 2:20 – 3:35 PM, Jones 104

Instructional Mode: Face-to-Face

Office Hrs: Outten: M/W 3:35-5:00 PM or by appointment (best option)

Peña: M/W 3:35-5:00 PM or by appointment

Graduate Bulletin Description:

CHEM 752 / BIOL 718 (3 credits). Biochemical organization of the cell. Regulation and integration of metabolism. Energy transduction processes.

Recommended (not Required) Textbook: [Voet & Voet, Biochemistry, 2011, 4th Edition](#). This textbook is a useful resource but is not required for this course.

Blackboard Site: This course is cross-listed as Chem 752 and Biol 718. To simplify distributing course materials, both courses are merged under the **CHEM752** Blackboard site. The **CHEM752** site will be used exclusively for posting lecture videos/recordings, online quizzes, class assignments, and other course materials. ALL students should be able to access this site to view and download course materials. All instructional materials (pre-recorded videos, PowerPoint presentations, case study handouts, study guides, exams, etc.) are the intellectual property of the faculty and may not be shared or reproduced without the explicit written consent of the faculty member. Further, students may not share these materials with those not in the class or upload them to any other online environment. Doing so would be a breach of the UofSC Honor Code.

Instructional Delivery (Dr. Outten's section): This section of the course will use an active learning or "flipped classroom" approach, which means that recorded lectures and other course materials providing fundamental background information on metabolic pathways will be posted on Blackboard (Bb) (25%), while the class period will be used for exploring real-world biomedical problems and cases related to the lecture material (75%). Recorded lectures will be posted on Bb for students to view and digest before class. After viewing and/or reading these materials, students are required to take a short quiz on Bb. These quizzes must be completed BEFORE the accompanying lesson. During class meetings, students will work through biochemistry case studies and solve problems together using group discussion and the free Poll everywhere app (www.polleverywhere.com) to understand the real-world applications of the lecture material. All PowerPoint slides and other instructional materials used for in-class lessons will also be posted on Bb after the lesson begins.

Instructional Delivery (Dr. Peña's section): This section of the course will consist of lectures, assigned problems, and group discussions of recent literature. PowerPoint lectures, assigned readings, and instructional materials will be posted on Bb before each lecture.

Chem 752/Biol 718 LESSON & EXAM SCHEDULE

| Day | Date | Topic | Textbook |
|--|-------------|---|-----------------|
| Part I: Carbohydrate Metabolism and Regulation – Dr. Outten | | | |
| 1 | M, 1/8 | Lesson 1: Bioenergetics & Fuel Metabolism | Chapter 16 |
| 2 | W, 1/10 | Lesson 2: Glycolysis | Chapters 16-17 |
| | M, 1/15 | No class – Martin Luther King, Jr. Day | |
| 3 | W, 1/17 | Lesson 3: Glycogen Metabolism | Chapter 18 |
| 4 | M, 1/22 | Lesson 4: Citric Acid Cycle (via BLACKBOARD Collaborate) | Chapter 21 |
| 5 | W, 1/24 | No class – Dr. Outten at a conference | |
| 6 | M, 1/29 | Lesson 5: Oxidative Phosphorylation (ETC) | Chapter 22 |
| 7 | W, 1/31 | Lesson 6: Oxidative Phosphorylation (ATPase) | Chapter 22 |
| 8 | M, 2/5 | Lesson 7: Gluconeogenesis | Chapter 22 |
| 9 | W, 2/7 | Lesson 8: Hormone Regulation of Metabolism | Chapter 19 |
| 10 | M, 2/12 | Exam 1 (Lessons 1-8) | |
| Part II: Amino Acid and Nucleotide Metabolism and Other Topics – Dr. Peña | | | |
| 11 | W, 2/14 | Lesson 9: Pentose Phosphate Pathway | Chapter 23.4 |
| 12 | M, 2/19 | Lesson 10: Lipid Metabolism | Chapter 25 |
| 13 | W, 2/21 | Lesson 11: Nitrogen Fixation/Sulfur Fixation | Chapter 26 |
| 14 | M, 2/26 | Lesson 12: Amino Acid Metabolism I | Chapter 26 |
| 15 | W, 2/28 | Lesson 13: Amino Acid Metabolism II | Chapter 26 |
| | 3/4-3/8 | No classes – Spring Break | |
| 16 | M, 3/11 | Lesson 14: Amino Acid Metabolism III | Chapter 26 |
| 17 | W, 3/13 | Exam 2 (Lessons 9-14) | |
| 18 | M, 3/18 | Lesson 15: Nucleotide Metabolism I | Chapter 28 |
| 19 | W, 3/20 | Lesson 16: Nucleotide Metabolism II | Chapter 28 |
| 20 | M, 3/25 | Lesson 17: Integration of Metabolism I | Chapter 27 |
| | M, 3/25 | Last day to drop without “WF” grade | |
| 21 | W, 3/27 | Lesson 18: Integration of Metabolism II | Chapter 27 |
| 22 | M, 4/1 | Lesson 19: Photosynthesis I | Chapter 24 |
| 23 | W, 4/3 | Lesson 20: Photosynthesis II | Chapter 24 |
| 24 | M, 4/8 | Remote class if needed (Dr. Pena at a conference) | |
| 26 | W, 4/10 | Exam 3 (Lessons 15-20) | |
| Part III: Special Topics in Metabolism – Dr. Outten | | | |
| 25 | M, 4/15 | Student Oral Presentations | Papers on Bb* |
| 27 | W, 4/17 | Student Oral Presentations | Papers on Bb |
| 28 | M, 4/22 | Student Oral Presentations | Papers on Bb |
| | M, 4/29 | Student Oral Presentations (if needed), class meets at 12:30 pm | Papers on Bb |

* A list of papers to choose from for the presentation will be available on Bb on March 15th

Learning Outcomes:

At the end of this course the student will be able to outline and describe:

1. The thermodynamics and kinetics of metabolism.
2. The citric acid cycle.
3. Oxidative phosphorylation.
4. Glycolysis.
5. Glycogen metabolism.
6. Gluconeogenesis.
7. The nitrogen cycle.
8. The sulfur cycle.
9. The pathways for amino acid synthesis and degradation.
10. The pathways for nucleotide synthesis and degradation.
11. The mechanisms of action of hormones.
12. How metabolism is coordinated by hormones.
13. Photosynthesis.
14. How plants handle excessive light stimulation.
15. How desert plants store carbon dioxide.
16. How photosynthesis is regulated.

Grades: Grades to be determined as follows: CEO: 50% of Grade, MMP: 50% of Grade

Course Points:

| | |
|---------------------------|---------------|
| Exam 1: | 100 pts |
| Exam 2: | 100 pts |
| Exam 3: | 100 pts |
| Bb quizzes: | 20 pts |
| <u>Oral Presentation:</u> | <u>80 pts</u> |
| Total: | 400 pts |

Grading Scale

| | | |
|----|---|---------|
| A | = | 90–100% |
| B+ | = | 85–89% |
| B | = | 80–84% |
| C+ | = | 75–79% |
| C | = | 70–74% |
| D+ | = | 65–69% |
| D | = | 60–64% |
| F | = | < 60% |

At our discretion, we may choose to lower the grade cutoffs systematically if the class average at the end of the semester is below 85%.

Dr. Outten's Exam: 1 exam @ 100 pts each. Dr. Outten will give one exam in class on the date specified in the syllabus. The format will include approximately 2/3 (~ 66 pts) of multiple choice, true-false, or matching questions, and approximately 1/3 (~ 33 pts) of short answer and essay questions.

Dr. Outten's Bb quizzes: 7 quizzes @ 4 pts each – drop 2 lowest grades = 20 pts. There will be 7 quizzes assigned on Bb that are each worth 4 pts. The quizzes (6-8 questions each) each have a 20-min time limit and must be taken online by the specified due date & time. The two lowest grades for these Bb quizzes will be dropped to add up to 20 possible points.

Dr. Peña's Exams: 2 exams @ 100 pts each. Dr. Pena will give two in class exams on the indicated dates on the syllabus. Exam format includes multiple choice and true-false questions, problem solving and short essay questions.

Dr. Outten's Oral presentations: 1 presentation @ 80 pts each. Students will form groups of 2-3 to prepare a 30-minute literature presentation to deliver in class. Groups will select a recent high-impact metabolism paper from a list provided on Bb. The presentation should be divided evenly among the group members covering all components of the article (background, methods, results, discussion, significance, future directions).

Excused Absences: Students who miss classes due to COVID-19 quarantine, a diagnosed health condition, or registered disability should contact the [Office of Student Advocacy](#) or [Student Disability Resource Center](#) to document the reason for their absence. **ALL excused absences and accommodations for disabilities MUST have proper official documentation.** All absences due to documented illness/disability will be excused, and no grade penalty will be assessed for missing classes for this reason. Students with documented absences may be offered previously recorded classes and have the opportunity to reschedule exams at the instructor's discretion.

Exam Make-Up Policy: Students are required to notify the instructor *by e-mail and/or phone* **prior to an exam** if circumstances will prevent them from attending. In the case of accidents or illness, **a valid documented excuse is required** before you can take a makeup exam. In the event classes are officially cancelled on the day of an exam, the exam will be administered during the *next regularly scheduled class period*.

Disability Statement: Reasonable accommodations are available for students with a documented disability. If you have a disability and may need accommodations to fully participate in this class, contact the [Student Disability Resource Center](#): 803-777-6142, email sadrc@mailbox.sc.edu, or stop by Close-Hipp, Suite 102. All accommodations must be approved through the Student Disability Resource Center.

Diversity and Inclusion: The university is committed to a campus environment that is inclusive, safe, and respectful for all persons, and one that fully embraces the Carolinian Creed. To that end, all course activities will be conducted in an atmosphere of friendly participation and interaction among colleagues, recognizing and appreciating the unique experiences, background, and point of view each student brings. You are expected at all times to treat others with dignity and respect.

Academic Integrity: You are expected to practice the highest possible standards of academic integrity. Any deviation from this expectation will result in a minimum academic penalty of your failing the assignment, and will result in additional disciplinary measures. This includes improper citation of sources, using another student's work, and any other form of academic misrepresentation.

Hazardous Weather: In case of emergency class cancellations and/or closure of the university, any syllabus changes will be posted on Blackboard. Emergency closures are announced on the university's Carolina alert website: <http://carolinaalert.sc.edu/>