CH444 – Advanced Topics in Biochemistry

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Office Hours: open or by appointment

Course website: http://wiki.colby.edu/display/CH444


- Reading assignments will be posted weekly on the course website.
- Supplemental reading from the literature will also be assigned regularly.

Course description: CH444 will transcend the fundamentals established in BC367 to investigate modern problem solving strategies in experimental biochemistry. The course will begin with a systematic overview of biochemical research methodology, including biochemical separations, molecular cloning, spectroscopic techniques, and enzyme analysis. We will then look at how research strategies have evolved and how new approaches can be used to address challenging questions. We will attempt to rethink traditionally singular approaches to research science – reflecting an experimentalist’s approach to “do what’s necessary” rather than “do what I’m used to doing”. We will use examples from the recent literature to illustrate this point. Writing skills in the discipline will be of principal focus in this course and intended to build from the technical writing you learned in BC367. Problem solving approaches will be developed as research proposals. The culminating experience of this course will be for each student to identify an unresolved problem from the literature and propose an experimental strategy to address it in the form of a grant proposal.

CH444 student learning goals:

1. To comprehensively understand the standard experimental tools of biochemical research.
2. To apply knowledge of biochemical experimental techniques to specific problems.
3. To understand and critique the primary biochemical literature.
4. To strengthen writing skills in the discipline and learn how to write effective grant proposals.
5. To strengthen oral communication skills and gain confidence in their abilities to present science to their peers.
6. To learn how to identify unresolved problems in the biochemical literature and develop experimental strategies for solving them.

CH444 responsibilities, assignments, and means of assessment:

- Lectures, discussions, and reading assignments for the first section of the course will be focused on learning the biochemist’s experimental "toolkit". We will go through much of the textbook, plus introduce many other experimental concepts and approaches, many of which will involve using the primary and secondary literature. The second part of the course will examine more modern and integrative approaches to experimental biochemistry, which will rely almost entirely on current literature. As the course progresses, there will be an increasing focus on identifying the kinds of experiments that are appropriate for certain research problems. Students will be expected to attend every lecture and be engaged in all discussions. (Learning goals 1, 2, 3) Instructor's assessment of student engagement represents 10% of your grade.

- Following the primary literature is an important part of being a well-prepared research scientist. Toward this end, students will be expected to read the Journal of Biological Chemistry (www.jbc.org), which is published weekly. Students will be asked to identify papers that use
methodology discussed in that week’s lecture and write brief reviews of their chosen paper. These reviews should be no more than a half page (single-spaced) and include an analysis of the experimental approach. These assignments will be assessed for demonstrative effort. The instructor may also ask students to briefly describe the chosen paper from that week’s issue to the class and illustrate what she/he found interesting. (Learning goals 1, 3, 4) The literature reviews represent 5% of your grade.

- The first writing project will assess students’ ability to propose experimental solutions to assigned biochemical problems. This project will be will be assigned in several stages, culminating in a final revision. Significant class time will be devoted to writing instruction including peer review. (Learning goals 1-4) The first writing project represents 20% of your grade.

- There will be one, midterm examination (on or around Monday, April 7th) that will have the same intent. This exam will be short answer / essay format. There will be no make-up exam if not explicitly approved by the Instructor. (Learning goals 1, 2, 4) The midterm exam represents 15% of your grade.

- Students will give oral presentations a paper from the primary literature (chosen from a provided list of papers that cover relevant topics) and present it to the class on March 16th. These presentations will include critical analyses of the methods used, original interpretations of the paper’s significance, and judgment on logical subsequent steps, including the techniques necessary for these steps. Students will be expected to answer questions posed by the class and the instructor on the nature of the work presented and the presenter’s interpretations. Students in the class will submit evaluations of the oral presentations and will be asked to identify what they learned from the work presented and from the presentation itself. The peer evaluations will not affect the evaluated students’ grades but rather contribute toward the evaluators’ grades in order to assess students’ understanding and engagement. (Learning goals 1, 2, 3, 5) The oral presentation represents 15% of your grade.

- A summative project will be assigned to all students in which they will be expected to identify an unresolved problem in the biochemical literature and develop a proposal to address it. The problem to be investigated must be thoroughly explained and justified by citing the relevant literature. A thorough experimental plan must also be described that incorporates several different experimental techniques, anticipates potential pitfalls, and explains the significance of the results. A brief Executive Summary, in which the problem and the overall strategy to solve it will be introduced, will be due on April 3rd. The student will meet with the instructor one-on-one to discuss the proposal after which the instructor will either approve the proposal or ask to student to revise and resubmit it. A first draft of the introduction will be due on April 16th and a first draft of the entire assignment will be due on April 24th. Students will present their proposals orally during the final week of the semester and will have to defend it to the class and to the instructor. A revised, final version of the proposal is due by May 17th. Both the oral and written proposals will be assessed for students’ understanding of the chosen problem and its underlying scientific principles, the validity and complexity of the proposed experiments, and the quality of the presentations/proposals themselves. (Learning goals 1-6) The final proposal represents 35% of your grade.

Academic dishonesty will not be tolerated. Please refer to the Student Handbook as well as the Chemistry Department policy on academic dishonesty and accommodations for students with learning differences (www.colby.edu/chemistry/Attend_Exam.html).