BCMB INDEPENDENT RESEARCH PROJECTS
(BCMB 4960R, BCMB 4970R, BCMB 4980R)

Course Description for SPRING and/or SUMMER, 2023

All students who major in Biochemistry & Molecular Biology are required to take ***two semesters*** of independent research (BCMB 4960R and BCMB 4970R, each 4 hr credit). For more than two semesters of research, BCMB 4970R can be repeated and/or students can take up to two semesters of BCMB 4980R. BCMB 4960R requires no previous lab experience. ***It is highly recommended that students consider taking these classes in their junior year or earlier. There is no formal pre-requisite for BCMB 4960R.***

Objective: The objective of these courses is to train students in the basic techniques used in biochemistry and molecular biology, and the application of the scientific method. Students typically become part of a dynamic research environment and gain experience in both the experimental approach and the culture of a research laboratory. Students in these courses have been co-authors of research papers published in the primary scientific literature.

How to find a Laboratory: These courses are unusual in that the onus is on the student to find a Faculty member that will accept the student into their laboratory. A list of BCMB faculty mentors and their research interests is given below. All are familiar with the requirements of these courses and have mentored students in the past. Prospective students should arrange for an appointment with prospective Faculty mentors to discuss research areas. Students choose laboratories based on personal research interests, their knowledge of the professor, recommendations from other students, etc. Although it is possible for students to take BCMB 4960R and BCMB 4970R courses in different laboratories, they are usually carried out in the same laboratory.

Laboratories outside of BCMB: Students can take the BCMB 4960R and/or 4970R courses with faculty members not affiliated with the Department and a list of non-BCMB mentors is given below. It is also possible to carry out research with faculty not on that list as long as the research is biochemically-related and it is pre-approved the prior semester by the BCMB undergraduate committee. To obtain approval, please submit to Dr. Adams (adamsm@uga.edu) a one-page abstract of the proposed research together the name and email address of the proposed mentor.

When to find a Laboratory: BCMB 4960R and BCMB 4970R courses must be arranged during the semester ***prior*** to when the student will begin the course. It is never too early to talk to prospective Faculty mentors about their research and about the possibility of taking this course with them. It is highly recommended that arrangements are made before the mid-point of the prior semester.

Registration: Permission of the Department is required to register for these courses. A **REGISTRATION FORM** must also be completed by the student and signed by the Faculty mentor. The form can be obtained from the Departmental web site (https://www.bmb.uga.edu/undergraduate-research), from the Biochemistry Advisor, Kathy Bolt (kabolt@uga.edu) or from Dr. Adams (adamsm@uga.edu). Once the reistration form is signed by you and by the Faculty mentor, you must provide the form to Angie Stockton in the Biochemistry Office either in person (Davison Life Sci., room B122) or by email (angie1@uga.edu) and you will be cleared to register.

Time Requirement: BCMB 4960R and BCMB 4970R are taken for 4 hr credit each. Students should expect to be in the laboratory for a minimum of 12 hr/ week (for 15 weeks) in the spring/fall or 24 hr/week (for 7.5 weeks) in the summer. The exact schedule is to be determined by the Faculty mentor and the student.

Examinations and Grades: The final grade is determined by the Faculty mentor. This is based on:
a) Performance in the laboratory (75%). This does not mean the number or accuracy of the results! It reflects the aptitude, effort, reliability, dependability, perseverance and meticulousness of the student in the laboratory setting.
b) Written Presentation of Research (25%). Each student must write a **Research Report**, which describes what has been accomplished in the laboratory. The report should resemble a brief scientific paper and be of at least 8 pages in length (double spaced, 1" margins). The report should be sub-divided into a) Summary, b) Introduction, c) Experimental Methods, d) Results, e) Discussion and f) References. The rubric for writing the Research Report is on the next page.

The Research Report should be sent by email as a single word.docx or pdf file attachment to Dr. Adams (adamsm@uga.edu) **by 5 pm on the last day of classes**.

Note that Research Reports not received by 5 pm on Monday, May 1st (spring) or Wednesday, Aug. 2nd (summer) will result in a C grade (no exceptions)

(10/07/22)

Rubric for BCMB 4960R/4970R/4980R Research Reports

This rubric will be used by your faculty mentor to evaluate your research report. This rubric is holistic, meaning that all of the criteria will be considered together to generate a final grade. We encourage you to refer to it as you do your research this semester, especially while you are writing and revising your paper.

Criteria	Definition
Introduction	
Context	Demonstrates a clear understanding of the big picture; Why is this question important/interesting in the field of biochemistry and molecular biology?
Accuracy	Content knowledge is accurate, relevant and provides appropriate background including defining critical terms.
Hypotheses / Research Directions	
Testable	For hypothesis-driven research, hypotheses are clearly stated, testable and consider plausible alternative explanations.
Scientific Merit	The hypotheses or research directions are novel, insightful, and have the potential to contribute useful knowledge to the field.
Methods	
Controls and replication	Appropriate controls (including appropriate replication) are present and explained.
Study design	The study design is likely to produce salient and fruitful results (actually tests the hypotheses posed and/or directly addresses the research direction).
Results	
Data selection	Data chosen are comprehensive, accurate and relevant.
Data presentation	Data are summarized in a logical format. Table or graph types are appropriate. Data are properly labelled including units. Graph axes are appropriately labelled and scaled and captions are informative and complete.
Statistical analysis	Any statistical analysis is appropriate for hypotheses tested and appears correctly performed and interpreted with relevant values reported and explained.
Discussion	
Conclusions based on data	Conclusion is clearly and logically drawn from data provided. A logical chain of reasoning from hypothesis to data to conclusions is clearly and persuasively explained. Conflicting data, if present, are adequately addressed.
Alternative explanations	Alternative explanations (hypotheses) are considered and clearly eliminated by data in a persuasive discussion.
Limitations of design	Limitations of the data and/or study design and corresponding implications for data interpretation are discussed.
Significance of research	Paper gives a clear indication of the significance and direction of the research in the future.
Primary literature	Writer provides a relevant and reasonably complete discussion of how this research project relates to others' work in the field (scientific context provided) using primary literature.
Writing quality	Grammar, word usage, and organization facilitate the reader's understanding of the paper.

Adapted from the Rubric for Science Writing, Timmerman, Strickland, Johnson, & Payne. (2011) Development of a 'Universal' Rubric for Assessing Undergraduates' Scientific Reasoning Skills Using Scientific Writing. *Assessment & Evaluation in Higher Education* 36, 509–47. https://doi.org/10.1080/02602930903540991.