

First-Semester Undergraduate Research in Biochemistry & Molecular Biology (BMB) for 4 credits

Guidelines and Expectations for both Students and Research Mentors

within or outside of the BMB Program

(BB 350 or BB 450)

The [general guidelines](#) for all courses for credit in undergraduate research and/or honors are applicable to this course and should be incorporated with the following guidelines that pertain the earning general education credit for taking this course.

Responsibilities of the Student:

HUB requirements: Earning general education units involves requirements for earning HUB units in RIL and OSC during your first semester 4-credit research course. This includes required attendance and participation in laboratory meetings on a regular basis and gaining experience in use of the online research information and literature.

Responsibilities of All Research Mentors:

In the first semester of research, all students should begin the learning of how to use the literature in their efforts to learn the background information for the project you are giving them. The timeframe for this achievement is mostly as a prerequisite before and during the application process. Work closely with your student and teach them how to access research information so they can prepare and submit a research proposal before being registered for their research course.

In addition, it is expected that you will have weekly group meetings to which you should invite your undergraduate research student. At some point during the semester, your student should be asked to give at least 1-1 oral presentations of their work and attain feedback on their performance from the group members.

General Education (BU Hub)

1. Research and Information Literacy (RIL):

Learning Outcome 1: Students will be able to search for, select, and use a range of publicly available and discipline-specific information sources ethically and strategically to address research questions.

Accessing Information: This skill is needed for selecting a group and a project, and student should become familiar with methods for exploring and understanding the research literature, if not already achieved from earlier courses. Among the many tools available in the biological sciences, PubMed stands out as the most critical for *accessing information*. Other platforms, such as SciFinder, can also play a vital role in achieving Information Literacy depending on the research group. Nonetheless, *comfortable*

familiarity with PubMed is an expected starting point for students engaged in the first semester of research.

Assessing Information: Progress in research and assessing research information is achieved in individual meetings with the group PI, and through group meetings, which all groups hold. At these meetings, literature is routinely discussed and judged as to the suitability for application to the research project at hand, and to the validity of the research. As with all courses, successful training in assessing information begins with the mentor. One advantage of Research and Information Literacy training in the research lab is the “flipped classroom” environment. In the sciences, the laboratory is the ultimate flipped classroom, and the novice researcher has the expertise and experiences of other undergraduate, graduate, and post-doctoral fellows also in the group as catalysts for the training. These other researchers serve as invaluable mentors, and the group meetings become a critical vehicle for information assessment.

Using Information Ethically: Ethics training is an important part of all research groups and should be incorporated in discussions at group and individual meetings.

Learning Outcome 2: Students will demonstrate understanding of the overall research process and its component parts, and be able to formulate good research questions or hypotheses, gather and analyze information, and critique, interpret, and communicate findings.

Producing Information through Inquiry: As per current practice, in order to register for research, a description of the project, and the student’s role in the project must be submitted. This process includes approval of the PI and/or BMB faculty-member sponsor in multiple rounds of drafts and final approval before submission. The Chair of the BMB Research and Honors Committee reads and approves all applications, and proper use of the literature is expected. Appropriate literature citations are required for the abstract of the project description and if found deficient, the Chair contacts the student for corrections in the research literacy and scholarship.

2. Oral/Signed Communication (OSC):

Learning Outcome 1: Students will be able to craft and deliver responsible, considered, and well-structured oral and/or signed arguments using media and modes of expression appropriate to the situation.

Learning Outcome 2: Students will demonstrate an understanding that oral/signed communication is generally interactive, and they should be able to attend and respond thoughtfully to others.

Learning Outcome 3: Students will be able to speak/sign effectively in situations ranging from the formal to the extemporaneous and interact comfortably with diverse audiences.

For students registering for 4 credits of research for credit for the first time (BB 350 or BB 450), HUB credit for Oral Communication will be earned. The ability to orally present and discuss one's research results is an essential part of successful scientific inquiry. We include within this domain poster presentations, which by nature require both the oral presentation and an often-intense subsequent discussion. The main procedure for this training is the weekly research group meetings, and (often) additional subgroup meetings. As noted, all research groups have group meetings, and it is expected that an undergraduate registered for four credits of research will present at these meetings. This was made clear for all UGR mentors before they can approve a student's on-line application. Research provides the ideal format for achieving the three learning outcomes accomplished for OSC proficiency:

- 1) Craft and deliver responsible and well-structured arguments using media – typically in group meetings using PowerPoint presentations or other media appropriate for each research group.
- 2) Understand the interactive nature of OSC is clearly in action during research group meetings, and in particular, the skill of responding during discussions that follow their presentation at group meeting presentations. There is often considerable give and take amongst the group members, often with follow-up "chalk talk" analyses.
- 3) Speak effectively to diverse audiences in both formal and extemporaneous modes – groups meetings fulfill this as well with formal presentations required for the full project, and "Progress Reports" being of less formal nature.

Training in the preparation and presentation of oral presentations is typical of research groups as well. Groups often have their own signature style, which has evolved over the years, with training of undergraduates prior to their presentation undertaken by an assigned graduate student or post-doctoral fellow as the mentor. Further opportunities for presentations exist as well, typically for juniors and seniors.