
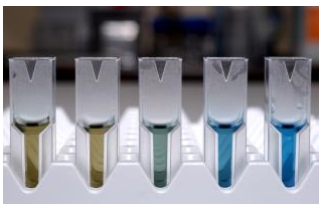


BIO 340R – Independent Research and Discovery in Biology
Fall Semester 2018

Professor: Dr. LaTonia Taliaferro-Smith
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Office: OSB Room 324 **Phone**: (770) 784-8607
Lecture Hours: Friday 2pm-5pm **Room**: OSB Rooms 309 (lab) and OSB 301/317 (lecture)

Office Hours: Students are encouraged to see Dr. Taliaferro-Smith during class or lab to make appointments for times that match our schedules.

Course Pre-requisites/Co-requisites: Pre-requisite: BIO 141; Pre-requisite/Co-requisite: BIO 142 or BIO 242 and permission of the instructor. All pre-requisite classes and laboratories must be completed with a grade of B or higher.

Reading Assignments: There is no textbook required for this course. Instead, all reading assignments will come from the primary literature, news articles, and the instructor. Readings will be distributed to you as needed.

Lab Notebook and Data Collection: You will be provided with a laboratory notebook for data collection. You are expected to maintain a well-kept lab notebook, containing accurate and detailed notes regarding each experiment, data collected, and conclusions drawn from their results. It should be neat and legible.

Course Learning Objectives: The Biology Department recognizes the benefits that relevant undergraduate research experiences can play in solidifying a student's education and interests in medical and graduate schools. The primary purpose of this course is to provide the student an opportunity to be actively involved in firsthand, supervised research. Research is defined as mentored, but self-directed, work that enable an individual or a small group of students to explore an issue of interest and to communicate the results to others. As part of a research team, students will design and complete a biological research study using the scientific method as a guideline. Projects will involve inquiry, critical-thinking, design, investigation, scholarship, discovery, and application, depending on the topic. The students will be aware of how his or her project fits into and contributes to solving a larger problem to which it belongs. After completion of this course, the students will be able to:

- Demonstrate the ability to work as small research teams to design and implement a biological research study using the scientific method as a guideline
- Recognize the applicability of scientific principles to studying real world problems
- Demonstrate a knowledge of the importance of using high ethical standards and considerations for conducting biological research in the selected area of research
- Effectively communicate their scientific findings through a variety of formal and informal written, visual, and oral methods

Skills Learning Outcomes: The course is designed in modules that are designed to introduce students to basic principles and techniques used in modern molecular biology labs. The methods that students will learn are fundamental to molecular biology research and establish a firm foundation for understanding more complex molecular biology techniques. In addition to becoming familiar with a range of equipment and molecular biology techniques, students should be able to:

- Critically examine and integrate primary literature in the formulation of molecular hypotheses and experimental designs.
- Practice basic laboratory techniques and safety protocols
- Explain, demonstrate, and practice principles of sterile techniques for cell culture, RNA and protein purification and quantification
- Perform basic molecular biology techniques, including Western blotting, Real-time PCR, confocal microscopy, and siRNA and drug inhibition.
- Utilize statistics and data analyses tools for data analysis

TENATIVE GOALS AND DUE DATES			
Week	**DATE**	**TOPIC**	**READING/ WRITTEN ASSIGNMENTS**
1	**Aug 31**	**<u>Lecture 1</u>:** ❑ Overview of Triple-Negative Breast Cancer ❑ Introduction to Research Design ❑ Labster	**Handouts:** ❑ Research articles ❑ Sample Research Proposals ❑ Proposal Worksheet
2	**Sep 7**	**<u>Lecture 2</u>:** ❑ Research Ethics/Case Studies ❑ Maintaining Laboratory Notebooks	❑ Experimental techniques handout ★ ***Due Today: Labster Module-Cell Culture Basics***
3	**Sep 14**	**<u>Lecture 3</u>:** ❑ Cell culture techniques: Thawing and Passaging Cells ❑ Writing work day: Discuss/design research projects	**Handouts:** ❑ Proposal worksheet (in class) ❑ Cell culture worksheet (in class)
4	**Sep 21**	**<u>Lecture 4</u>:** ❑ Laboratory Safety ❑ Cell culture techniques: Freezing, counting, plating, treating, harvesting	**Handouts:** ❑ Western blot worksheet (***due next week***) ❑ Hemacytometer worksheet (in class) ❑ Cell passaging worksheet ★ ***1st draft of proposal background/intro. due***
5	**Sep 28**	❑ Discussion: Cell passaging worksheet ***Laboratory work:*** *Day in the tissue culture lab setting up cell cultures*	★ ***Due Today: Labster Module-Cell -Gene Expression*** ★ ***Western blots worksheet due***
6	**Oct 5**	**<u>Lecture 5</u>:** ❑ Protein isolation and Western blotting ***Laboratory Work***	★ ***First draft of proposal methods section due***
7	**Oct 12**	***Laboratory Work***	★ ***Final completed proposal due*** ★ ***Due Today: Labster Module-Cell - Mammalian Transient Protein Expression*** ❑ Data collection; **1st Weekly group meeting**
8	**Oct 19**	***Laboratory Work***	★ ***Due Today: Labster Module-Cell -Viral Gene Therapy***

			❑ Data collection; **2nd Weekly group meeting**
9	**Oct 26**	***Laboratory Work***	★ ***Due Today: Labster Module-Cell -Viral Gene Therapy*** ❑ Data collection; **3rd Weekly group meeting** ★ ***Due Today: Labster Module---------***
10	**Nov 2**		**NO CLASS**
11	**Nov 9**	**Lecture 6:** ❑ Preparing Oral Presentations ***Laboratory Work***	❑ Data collection; **4th Weekly group meeting**
12	**Nov 16**	**Lecture 7:** ❑ Writing Scientific Manuscripts ***Laboratory Work***	❑ Data collection; **5th Weekly group meeting**
13	**Nov 23**	**THANKSGIVING BREAK**	**NO LAB**
14	**Nov 30**	★ **GROUP ORAL PRESENTATIONS**	❑ Self-evaluations due
15	**Dec 7**	★ **FINAL WRITTEN PAPERS DUE by 4pm**	❑ **MANDATORY LABORATORY CLEAN-UP**
16	**Dec 14**	***FINAL EXAMS WEEK (Dec 13th-14th; Dec 17th-19th)***	

Expectations for work outside of regular weekly class meetings:

- Each student will be expected to attend a weekly lecture/lab discussion group (3 hours) which will be held on Fridays from 2:30-5:30pm. These meetings will be a discussion forum for course materials and group activities, primary research papers, progress of group research projects, and work sessions for data collection, data analysis, poster making, and presentation practice.
- Each student group will meet with their Faculty Advisor on a **weekly** schedule. These meetings will be used to update the advisor on research and writing progress in order to trouble shoot and improve student work. The students are expected to come prepared with an organized PowerPoint if presenting data or other relevant documentation and materials as appropriate to the topic of the meeting. Students will be expected to show progress each week at lab meetings.
- The practice of molecular biology cannot easily be restricted to a 3-hour lab period once per week. The remaining hours of expected effort are independent. Students can spend them in the lab, the library, or at home, so long as you are working on your project. It is unavoidable that students will be required on many occasions to come to the lab and work at times outside of the Friday afternoon sessions as necessary. Students must consult with their group members and the Faculty advisor to perform experiments during pre-approved times. Students might also schedule specific hours each week to work in the lab. This is the best way to ensure that I am available to help you while you are working on your project. Students are not allowed to work in the laboratory unsupervised after hours and on the weekends.
- Students are expected to maintain a weekly log of hours spent working on their proposal and in the laboratory. This log should be kept in the back or front of their laboratory notebook.

Emory University Undergraduate Research Symposium: Every April, Emory has a research symposium where students from all departments display their research posters. This is an informal and fun way to inform other students about

your independent research project. The abstract is due by mid-February and the poster is due by late March. Your participation is voluntary, but is strongly encouraged.

Evaluation Criteria:

Research Proposal: Each research proposal will include

- A title
- An overview of background behind your research topic
- A hypothesis or research question
- A brief timeline of proposed study
- A proposed methodology section
- At least 6-10 references

Lab exercises: In-class assignments will be collected from time to time. These will often be based on the discussions we have about scientific literature in the field but could also relate directly to your research project. In addition, you will receive points for actively participating each week in discussions and lab work as well as points for maintaining a lab notebook.

Final paper and presentation: You will write up your results in the style of a journal article from the field of study to be turned in at the end of the semester. This final paper will take the place of a final exam in the course. In addition, you will give a scientific talk on your findings to the class and Biology faculty at the end of the semester. The final paper must include

- A title, authors, and school affiliations
- Abstract
- Background
- Hypothesis
- Methods
- Results (using appropriate graphs, pictures, and statistics for the field of study)
- Conclusions/Discussions/Future Directions
- Cited references

Grading: In order to earn a satisfactory grade, a student is expected to attend the weekly discussion groups, conduct research, and present the results as a poster, oral presentation, and/or written manuscript. Students are expected to demonstrate genuine interest and become intellectually involved in their research project. This may be demonstrated (among other ways) by:

- *Completing all assigned readings for their research (e.g. published journal articles, previous lab theses, etc.)*
- *Level of preparation for lab presentations where the student receives feedback from peers/and instructor.*
- *Frequency or kind of questions asked and interest in discussing the research with their instructor and peers.*
- *Level* of responsibility and dedication toward their independent experiments.

Contribution to Overall Grade:

Research Project - 40%

Written Proposal (15%)
Research Progress (10%)
Engagement/Participation (10%)
Laboratory Notebook and Work Log (5%)

Weekly meetings and Progress Reports – 15%

Perception (understanding of subject) - (7.5%)
Preparation (PowerPoint slides, Pictures, Video clips) - (7.5%)

Assignments – 10%

Labster Modules (7.5%)

Written Assignments/Worksheets (7.5%)
Final Presentation (content delivery, time management) - (15%)
Final Written Paper (20%)

Grading Scale:
95 - 100% = A
90 - 94% = A-
87 - 89% = B+
84 - 86% = B
83 - 80% = B-
79 - 77% = C+
76 - 74% = C
70 - 73% = C-
69% or below = F

Lab Supplies and Research Expenses: Most of the supplies you will need for your project will be found in labs 309A or 309B. You will have to plan your experiment according to the resources and equipment that is available.

OTHER IMPORTANT ASPECTS OF THIS COURSE:
Honor Code: All work for credit in this course come under the regulations of the Honor Code. Your signature on your work attests to your upholding the Honor Code. Please read the information on **plagiarism** on the Library web page and always ask if you have any questions about assignments. Note that writing assignments will be submitted to **an appropriate plagiarism software.** Please follow the Honor Code in **ALL** aspects of this course and include your signature on your work as your pledge.

Class Participation: Biology 340R is an interactive course. Points are assigned for participation. These points are assigned based on your overall engagement in the classroom and laboratory throughout the semester (asking and answering questions, problem solving abilities, level of preparation, displaying your interest by contributing to overall discussion).

Attendance/Absentee Policy: Students conducting undergraduate research are expected to exercise a significant degree of autonomy in their work, completing research tasks with relatively little direct oversight from their research advisor. Nevertheless, the student should dedicate a minimum number of hours on their project that is consistent with the total credit hours sought for the experience. Besides the minimum expectations outlined in the Expectations section of this syllabus, the faculty advisor may also have additional expectations for participation, including attendance at group meetings, individual meetings, etc. Unexcused absences, tardiness, or a failure to follow the procedures can result in a reduction in your grade. It is your responsibility to clearly communicate with the instructor as much in advance as possible about medical or family emergencies.

Cell Phones: The use of cell phones is strictly prohibited in the classroom and the laboratory. Please turn off your phone before you come to class. Photography with camera phones is only permitted to gather evidence for your research project.

Personal Computer or Tablet: If you would like to take notes on your personal laptop or tablet, you must first seek special permission from the instructor. Surfing the web, Facebook, Skype or other multitasking/networking/chat during lecture and lab is completely unacceptable and will not be tolerated.

Access, Disability Services and Resources (ADSR) provides academic services and accommodations for students with diagnosed disabilities. Students are responsible for initiating the accommodation request process by self-disclosing their disability directly to the ADSR office. All requests and materials are handled in the strictest of confidence. The documentation provided regarding the disability diagnosis must demonstrate a disability covered under Section 504

of the Rehabilitation Act of 1973 and Title II of the Americans with Disabilities Act (ADA) of 1990, amended as of 2008. The ADA defines a disability as a physical or mental impairment that substantially limits one or more major life activities. For more information about applying for accommodations, disability services, and other services associated with the ADSR office please follow the link below for the specific area and forms you are searching for.

Emory Access, Disability Services, and Resources Office: http://equityandinclusion.emory.edu/

College-Wide Assessment: Student work submitted as part of this course may be reviewed by Oxford College and Emory College faculty and staff for the purposes of improving instruction and enhancing Emory education.