wBIOL492 UNDERGRADUATE RESEARCH SYLLABUS

Sections: 001-004

Instructor of Record: Dr. Sarah Golding **segolding@vcu.edu** Office: LFSCB 218B

Enrollment: By override after approval by the Department of Biology. Please direct all questions to Dr. Golding.

PLEASE NOTE: To register for this class you must request an override using the form below. Overrides will not be released until after May 1st for summer and fall registration and Dec 1st for spring semester studies. Mentor confirmation must have been received for the overrides to be issued.

BIOL 492. Undergraduate Research. 1-4 Hours.

Semester course; 4-16 Research Hours. 1-4 credits. Prerequisites: BIOZ 151 and BIOZ 152, each with a minimum grade of C; and permission of the faculty mentor and the department of biology. May be repeated for credit. A maximum total of six credits for all research and internship courses (BIOL 395, BIOL 451, BIOL 453, BIOL 492, BIOL 493, BIOL494, BIOL 495 and/or BIOZ 395) may be applied to the 40 credits of biology required for the major. Additional credits from these courses may be applied to upper-level and open elective credits toward the degree. A minimum of two credits is required for the course to count as a laboratory experience. In this course, students will immerse themselves in biologically relevant primary research under the mentorship of a VCU faculty member. Students will actively participate in projects that involve data collection and analysis, mastering field and/or laboratory techniques, and executing experimental procedures. The course will cumulate in the submission of a written research report. The course emphasizes hands-on learning through mentorship. This experience is designed to enhance students' practical skills, critical thinking, and application of research methodologies while contributing to cutting-edge science.

To request registration for this course please complete the: Research Courses Registration Request Form

VCU REAL (Relevant Experiential and Applied Learning).

This course has been approved by the REAL Council as a: REAL Research Experience Level 3

To learn more about the requirements for REAL course designations please see the REAL website: https://provost.vcu.edu/initiatives/real/levels/

This course offers:

Hands-on learning in a research laboratory that engages the student in applying or exploring disciplinary knowledge in real-world or simulated contexts

Mentored experiences Mentored experience where the student is embedded in the research group and mentored by the faculty and additional lab members. The research faculty member regularly responds to student work, supports student reflection and integration of learning throughout the activity, and encourages goal-setting for future learning

Guided reflection students engage in ongoing reflective troubleshooting and discussion of experimental challenges at a minimum in bi-weekly research meetings. Students will engage in a final reflective assignment as an intentional metacognitive practice where students articulate personal, civic/social, or academic learning; identify values and attitudes developed through the activity; and/or explore and clarify career goals.

Course Expectations for Students: Undergraduate Research Independent study in the Biological sciences requires investigating a biologically relevant problem through literature search and laboratory and/or field experimentation under the supervision of a VCU Faculty mentor.

Students must be in good academic standing. Students are required to find their own research mentors and secure a position in their research group to conduct their study prior to requesting registration. It is suggested that this relationship is fostered in the semester preceding registration as it often takes a week or so for the student and mentor to agree and the Dept. of Biology to issue the overrides.

Once a mentor is secured, students must complete the online Research Courses Registration Request Form. In addition, mentors must provide their approval by email to Dr. Golding segolding@vcu.edu.

Applications for Undergraduate Research approval will be given priority before May 1st for summer and fall registration and Dec 1st for spring semester studies but may be approved through Add/Drop

Research Course Commitment Attestation: Students registering for research courses must understand that participation in Biology Research Experiences requires hands-on work, most often performed in person at a physical laboratory or research site defined by the research mentor. They must discuss their in-person availability with their research mentor and mutually agree on a schedule and tentative plan for their contributions to the research group. This agreement must be re-evaluated before each semester for continuing research experiences.

Course Goal: Students will participate in a mentored undergraduate research experience in a VCU research group.

Course Objectives: Students will leave this course having acquired knowledge and comprehension of the research process, including but not limited to reviewing the scientific literature, application of technical procedures, data collection, and data analyses. Students will have seen how to apply their knowledge to a scientific problem and draw logical conclusions.

Course Outcomes for Students and Mentors:

The Department Chairman generally will not authorize the direction of more than nine credits of research courses by a faculty member during any one semester. Please contact Dr. Golding if you have concerns.

It is expected that mentors ensure that students achieve the following learning outcomes:

To enable the student to demonstrate an ability to;

- Search the literature relevant to the topic
- Differentiate between primary, secondary and tertiary sources of information
- Produce a critical review of the literature relevant to the topic to be studied
- Carry out the investigations
- Collect, collate and analyze data from their investigations
- Weekly reflective trouble-shooting to ensure project moves forward
- Draw valid conclusions from the analysis of the data
- Discuss the relevance of the conclusions in the context of the literature relating to that topic
- Report the findings of the investigation in writing
- Display professional behavior at all times
- Communicate clearly with mentors and larger lab group
- Work well in a team
- Display independence
- Respond well to critique

Mentors are required to edit and proofread all assignments before submission to Dr. Golding. Dr. Golding will issue the final grades to e-services after receiving mentor feedback. If mentors have any worries regarding the quality and quantity of work their mentees are producing they should contact Dr. Golding

Grading: To receive a passing grade in this course students must dedicate 3-4 hrs per credit hour per week to hands-on data gathering and experimentation. This time will be monitored by the research mentor. Students must also work with their mentors to complete all required assignments and learning outcomes outlined in the syllabus. Students must ensure that mentors have read and approved the final product before submission to Dr. Golding.

Input on the final grade for this course is provided by the research mentor. Mentors are asked to provide holistic feedback on the students research experience. A copy of the grading form and rubric can be found here: **BIOL492 Mentor grading form**

At the end of each semester, mentor feedback will be solicited. Dr. Golding will review the grade in comparison to other submissions. Any grade disagreements will be resolved in a Biology faculty meeting. At any time should a mentor feel that a student's contribution is insufficient, they must contact Dr. Golding as soon as possible.

A grade of "incomplete" should only be given on the student's request and after consultation with the student/mentor and Dr. Golding. All incomplete work must be completed within 30 days of the next semester.

Students repeating the course: The Department of Biology allows students to use BIOL/Z395, BIOL492, and/or BIOL495 to meet TWO Biology lab experiences. It is common and encouraged for students to stay with the same research mentor to continue their work. It is, however expected that written work submitted for subsequent semesters is significantly expanded and improved over prior submissions. All

course assignments will be scanned via the TurnItIn software for plagiarism. Students submitting duplicate assignments are at risk of honor code violations. If your work is continuing from a previous semester, and you believe a lot of your work will be similar, please feel free to contact the instructor of record for additional guidance.

Attendance: Students are required to work with their research mentors for 3-4 hrs per week per credit hour. This time is monitored by the research mentor and attendance issues are reported to the course coordinator.

Generative AI Use: It is a violation of university policy to misrepresent work that you submit by characterizing it as your own, such as submitting responses to assignments that do not acknowledge the use of generative AI tools. Generative AI responses should be cited as personal communication as described in the writing and citation guidelines. Please feel free to reach out to me with any questions you may have about any use of generative AI tools.

Assignments Details: ALL assignments must be proofread, edited and approved by the supervising faculty member prior to submission to Dr. Golding via Canvas.

Research plan/proposal:

Due dates: Feb 5th for Spring semester, June 5th for Summer semester, and September 5th for Fall semester.

This deadline is enforced by your mentor. Dr. Golding will offer an automatic 10 day grace period. Any student who has not submitted a research plan to Canvas by Feb 15th, June 15th or Sept 15th can be administratively removed from the course.

The research plan will include:

– A title

– An overview of the background behind your research topic

– A hypothesis or research question

– A brief timeline of the proposed study

– at least 3 in-text citations

Responsible Conduct of Research Requirement: All students registering for this class must complete responsible conduct of research training (RCR). BIOL392 completes this requirement. Students who have

not completed BIOL392 must take an online course hosted by the Collaborative Institutional Training Initiative (CITI) and can be found at www.citiprogram.org. At this site, Select "Create an Account", enter your organization (VCU), create an account, and then select 'general RCR training'. Training is free but requires a vcu.edu account. Students must take a screenshot to confirm they have completed this requirement and upload to the Canvas page for this class. If you have previously completed the CITI RCR training for another class you do not need to repeat it but you must provide proof. The CITI Human Subjects training cannot be substituted.

Final research report:

Due dates: May 1st for spring semester, July 20th for Summer semester, and December 1st for fall semester.

This deadline is enforced by your mentor. Dr. Golding offers an automatic 10 day grace period. Any student who has not submitted a final paper to Canvas by May 10th, Aug 1st, or Dec 10th will receive a grade of "F". Mentors will be responsible for filing the paperwork to remove the "F" grade. A grade of "Incomplete, I" can only be issued on the students request with approval from the mentor and Dr. Golding.

Written in the style of a journal article from the research field of study the research report must include:

- A title, authors, affiliations
- Abstract
- Background
- Hypothesis
- Methods
- Results (using appropriate graphs and statistics for that field of study)
- Conclusions/Discussion/Future Directions

- In-text citations (at least 8).

Writing guidelines/expectations: Please follow the writing guidelines posted to canvas under course documents. Primary literature and full citations in the style of a journal of the field will be expected for all assignments. Research-Report-Guidelines 2019 (hyperlink). If you cannot find information on citation style from your mentor follow these guidelines. Citation guidelines (hyperlink)

PLEASE NOTE: We are aware that much of the work will be preliminary in nature. But we still require that students share their findings in the format of a research paper. If the student has encountered significant technical difficulties and the data generated is weak or questionable, the student is advised to focus on the cause of the technical difficulties in the results section and suggest strategies to overcome these issues in the discussion section of the paper.

Final Reflection*:* In 1500 words or less take a moment to reflect on your REAL experience this semester with respect to the following;

1) Perseverance: What challenges did you face during your experience and how did you overcome them? Upon reviewing the experience can you identify and describe an example of a different approach (e.g., decision or action) you could have taken. Envisage the impact of such a change.

2) Professional Skills: In addition to scientific knowledge what life skills did you acquire this semester? How will you incorporate those into your future learning/career?

3) The Big Picture: What societal issue was your research focused on addressing? How will your work help to improve the human condition?

Assignment Submission: To reduce the chance of plagiarism all assignments for BIOL492 must be submitted via the safe assign database in Bb. Please see the BIOL492 Bb page for instructions on how to submit.

Please note seniors: If during the duration of your biology degree you have registered for more than six credits of Directed Study, Independent Study, or Research and Thesis degree works may not slot your credits correctly. Please bring this up with your biology advisor.

Additional VCU Academic rules and regulations: Students should visit http://go.vcu.edu/syllabus and review all syllabus statement information. The full university syllabus statement includes information on safety, registration, the VCU Honor Code, student conduct, withdrawal and more.

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