

## **Honors in Biology Syllabus** **01:119:408-409**

<b>Course Time:</b>	Hours by Arrangement
<b>Course Coordinator:</b>	Anne Carr-Schmid, Ph.D. Assistant Professor - Director of Undergraduate Advising, Biological Sciences
<b>Office Location:</b>	Nelson B112, Busch Campus
<b>Email:</b>	<a href="mailto:schmid@biology.rutgers.edu">schmid@biology.rutgers.edu</a>
<b>Class Website</b>	<a href="https://tlt.rutgers.edu/canvas">https://tlt.rutgers.edu/canvas</a>
<b>Credits:</b>	3-6 per semester, minimum 6 total required

**Course Description:** Honors in Biology is intended to provide highly motivated students with an opportunity to immerse themselves in a scientific research project. Students engage in laboratory or field experimentation under the direct supervision of a faculty mentor. Each student is expected to complete their own original research project. Direct laboratory exposure is an essential component of this course. Honors in Biology projects are expected to be more sophisticated than Research in Biology projects. Students must complete a minimum of 6 credits to qualify for Departmental Honors. Students must submit a written thesis accompanied by an oral presentation and thesis-defense in the spring semester. The thesis committee must be composed of at least three faculty members, including the research advisor and at least one member of the Division of Life Sciences faculty.

### **Learning Goals:**

**By the end of the two semester course series, students are expected to be able to:**

- 1) Demonstrate both factual and conceptual knowledge of the field.
- 2) Demonstrate the ability to analyze, present and interpret scientific data.
- 3) Demonstrate clear understanding and justification of their research hypothesis and the experimental methods/design and limitations.
- 4) Demonstrate ability to draw accurate and appropriate conclusions and identify implications and future directions of the research.

### **Honors Biology Requirements and Key Deadlines:**

A) **Written Thesis (30-50 pages)-**

**Recommended:** Submit your thesis to your research mentor one to two weeks in advance of your oral thesis defense. Submit thesis to committee 2-3 days in advance of your oral defense.

Your research mentor will likely be the one to give the most input on the thesis and you should allow him/her to review it at various stages and before giving it to your committee. Please talk with your research mentor about dates and deadlines and discuss their expectations. Guidelines for the organization of the thesis can be found in the Thesis Guideline Section.

**B) Oral Thesis Defense (30-45 minutes power point presentation) – Deadline to present- Thursday, April 12<sup>th</sup>.**

**Recommended: Select Committee and schedule defense (and location) by Spring Break.**

Students are required to defend their thesis orally to a committee of at least three Rutgers-NB faculty members. This committee must include your research mentor. At least one member of the committee must be a faculty member from the Division of Life Sciences (SAS departments of Genetics, Cell Bio & Neuroscience, Molecular Biology & Biochemistry, or Biological Sciences). We encourage students to select committee members that are familiar with the area of your research or model system the project involves. Talk with your research mentor about potential candidates for your committee or select previous course instructors or other faculty you are familiar with. If you are not able to find a DLS faculty member, Dr. Carr-Schmid can serve on your committee or help you find another member. If you have any questions about the departmental affiliation of the faculty in regards to fulfilling this requirement, please check with me! A post-doc is not a faculty member. If you want to have a post-doc from your lab on your committee, you may add them as a fourth member, but you still need three faculty members. We recommend having your thesis committee confirmed by Spring Break.

You will need to prepare a power point presentation of your thesis work and present a 30-45 minute talk. We recommend reviewing your slides and/or practicing the talk with other members of the lab or your research mentor. You and your research mentor may choose to open your thesis presentation to the rest of the department or lab, or choose only to have your committee members. If you have others attend your presentation, after completing it, your committee will meet with you privately to ask you questions. You will not have to defend in front of your lab or department. After completing your defense, you will exit the room and your committee will evaluate your performance and complete the thesis evaluation form and then bring you back in to explain your evaluation. The evaluation form will be emailed to you (and your faculty member) later in the semester and should be completed at the time of the oral defense. You should collect the original completed form and submit it with a hardcopy of your thesis to Nelson B112. You may be requested to make edits or additions to your thesis to complete it. You should include these in your final submitted version of the thesis.

Your thesis defense must be completed by April 12th. You can use Doodle ([doodle.com](http://doodle.com)) to simplify finding a convenient time your committee can meet that matches availability of seminar rooms in your department. Check with your research mentor about how to go about reserving a room in the building where you do research or other location. Please note there are many thesis defenses taking place in early April, so planning ahead is important. It is customary to provide light refreshments (water, coffee, cookies) for your defense and you are encouraged to send your committee members a brief thank you note for serving on your committee before the end of the semester.

Once you have selected your committee and have a thesis date and location, please email Dr Carr-Schmid the information, we can keep track of everyone's progress!

C) **Submission of Revised Thesis and Honors in Biology Paperwork- Deadline: Friday, April 13<sup>th</sup> at 5 pm at Nelson B112.**

You must submit a hard copy of the thesis and the honors paperwork **to Nelson B112** by the 5 pm on Friday, April 13<sup>th</sup>. If your thesis requires additional modifications and you are not able to complete them by April 13<sup>th</sup>, you should still submit a hard copy by the 13<sup>th</sup>. Students may submit a further revised hard copy of the thesis up to two weeks after the deadline. Students must submit a copy of their thesis through the Canvas site for turnitin review and should only submit the finalized version to the site.

Often students (and sometimes research mentors) want to delay the thesis defense for additional experiments they deem critical. Students who do not submit the a hardcopy of their thesis and honors paperwork by the 13<sup>th</sup> will not be listed in their graduation commencement booklets as receiving honors and will not be eligible for additional departmental or school awards. Students are expected to continue their work in the lab through the end of the semester. Therefore, it is not necessary that every experiment is completed for the defense. Often one or two students will rush at the end to complete “just one more experiment”. This rush usually results in experiments that most often don’t pan out and then the student is not well prepared for their defense. You can continue conducting experiments, but be sure to set aside the necessary time to prepare your thesis and defense. There will always be one more experiments to do. Your laboratory research, your written thesis, and your oral presentation are all factored together in your final grade and in your level of honors.

**If you have any questions or concerns, please don’t hesitate to contact Dr. Carr-Schmid!**

**Thesis Guidelines:**

**Purpose of honors thesis:** to show that you have mastered the scientific process.

You understand the purpose/significance of your study, you can formulate a workable hypothesis, you can analyze your data qualitatively and quantitatively, you can troubleshoot your experiments, you can draw logical conclusions based on your data and you can communicate your findings effectively.

**Overall writing format:** DOUBLE-SPACE with font size no less than 12 in doc, docx or pdf

**Thesis format:**

**Total: double-spaced 30-50 pages**

**Title page: 1 page**

**Abstract: 1-2 pages** (summarize the results/observations/troubleshooting of your project)

**Acknowledgement: 1 page** (acknowledge the lab personnel or collaborator for any result in your thesis that is not done by you)

**Table of content: optional**

**Introduction: 5-10 pages** (literature relevant to your research project)

**Materials and methods: 4-8 pages** (Describe the procedures in your own words, do not copy literature)

**Results: 10-25 pages;** organize data/observations/troubleshooting strategies/expected results in figures and tables. All figures and tables should have detailed figure legends and labeling.

**Discussions: 2-6 pages** (compare research data with literature, discuss expected results or propose future directions/experiments/troubleshooting strategies)

**References: 1-3 pages** (alphabetized your reference)

## Components of your thesis:

- (A) Title:** should describe the purpose and/or the conclusion of your project. Use the appropriate title page for your thesis.
- (B) Abstract:** A good abstract will have the following points in the following order:
1. Purpose of your study and/or the significance of the molecule you are studying (or state your hypothesis).
  2. Summarize the results of each major experiment. Do not include experimental details unless they are novel findings.
  3. Conclusion of your project. What do your results contribute to the scientific field or possible future implications (studies) that can be derived from your results?
- (C) Acknowledgement:**  
Thank everyone who had contributed to your project. If some of the experiments in your thesis were carried out by other lab members, acknowledge their contributions here.
- (D) Table of Content:** Optional
- (E) Introduction** (should be divided into subsections with meaningful subtitles)  
-A generic format is as follows (notice that this is an upside-down triangle format, going from broad to specific):  
-The physiological significance of your study and the molecular mechanisms underlying the physiological phenomenon that you are interested to study.  
-The current knowledge on the molecule (or a part of the process) that you are studying.  
-What additional knowledge is needed (or what additional questions can be asked) for this molecule (or part of the process).  
-What experiments (or experimental approaches) you are proposing to answer the above question (list the major experiments in your lab report). State your hypothesis.
- (F) Materials and Methods**  
-List the procedures carried out in your project.  
-Include pictures or diagrams to explain your procedures whenever you can (a picture is worth a thousand words).  
-If you have pictures or diagrams, you **MUST** have figure legends describing them.  
-Use a flowchart, table or diagram to summarize your experimental approaches in your project if possible.
- (G) Results:**
1. Organize your results into subsections with meaningful titles that help the readers to predict what this subsection is about.
  2. Use tables to summarize your qualitative and quantitative results. Whenever you can, be quantitative in your data analysis (ie. error bars, statistical significance, number of times you have repeated the experiments).
  3. Discuss ALL presented figures. Each figure **MUST** have a clear figure legend that describes what the figure is about. When you discuss the figure, use arrows to show specific details that you have discussed in your results (don't forget to explain what the arrows mean in your figure legend).

4. For pictures of DNA and protein gels, show labeled molecular weight standards at the same size as your gel. Label each lane with appropriate names instead of numbers or letters whenever possible. Label bands of interest on your gel that you are discussing in the text.
5. For cell staining/labeling micrographs, show scale bars and label each image panel with names rather than numbers or letters whenever possible. Make sure that the features you want the readers to see are clearly visible on your picture.
6. For graphs, show error bars, number of trials (n) and statistical significance analysis.
7. What to write in results:
  - Discuss ALL figures
  - For each figure, include the following discussions:
    - Summary of concepts/purpose behind each experiment discussed in the figure
    - state the obtained results, compare them with the predicted results (your hypothesis) and/or literature. Try to be quantitative in your description of results whenever possible (ie. percentage of cell population, number of mice).
    - If there is total agreement, confirm that you have achieved the specific purpose for that experiment.
    - If there is any discrepancy, discuss the differences and the reasons for the differences. Discuss that, even with these discrepancies, did you achieve the specific purpose for that experiment.
    - If an experiment did not work, discuss potential reasons and plans of troubleshooting.
    - If your results are novel, discuss why and how they are different from what is known in that area so far.

#### **(H) Discussion**

- A generic format for discussion is as follows:
- State the purpose of your study (why you are carrying out your studies and what is your hypothesis).
- State whether your overall experiments have achieved the purpose. Summarize the contribution of each major experiment to your overall goal.
- Include an explanation of why do think you have or have not achieved your purpose.
- How do you think your findings contribute to the current understanding of the studied process or molecule.
- State experiments or experimental approaches that you think would improve the current experimental design and/or further our current understanding of the molecule or of process you are studying.

#### **(I) References:**

- Organize your references in alphabetical order.

Any questions or concerns, speak with your Faculty Research Mentor. If not resolved, speak with Dr. Carr-Schmid! We are all here to help!

#### **School Policies:**

##### **Current Academic Integrity Policy:**

<http://academicintegrity.rutgers.edu/academic-integrity-policy/>

Violations include: cheating, fabrication, plagiarism, denying others access to information or material, and facilitating violations of academic integrity.

##### **Student-Wellness Services:**

[Just In Case Web App](#)

<http://codu.co/cee05e>

Access helpful mental health information and resources for yourself or a friend in a mental health crisis on your smartphone or tablet and easily contact CAPS or RUPD.

### **Counseling, ADAP & Psychiatric Services (CAPS)**

**(848) 932-7884 / 17 Senior Street, New Brunswick, NJ 08901/ [www.rhscaps.rutgers.edu/](http://www.rhscaps.rutgers.edu/)**

CAPS is a University mental health support service that includes counseling, alcohol and other drug assistance, and psychiatric services staffed by a team of professional within Rutgers Health services to support students' efforts to succeed at Rutgers University. CAPS offers a variety of services that include: individual therapy, group therapy and workshops, crisis intervention, referral to specialists in the community and consultation and collaboration with campus partners.

### **Violence Prevention & Victim Assistance (VPVA)**

**(848) 932-1181 / 3 Bartlett Street, New Brunswick, NJ 08901 / [www.vpva.rutgers.edu/](http://www.vpva.rutgers.edu/)**

The Office for Violence Prevention and Victim Assistance provides confidential crisis intervention, counseling and advocacy for victims of sexual and relationship violence and stalking to students, staff and faculty. To reach staff during office hours when the university is open or to reach an advocate after hours, call 848-932-1181.

### **Disability Services**

**(848) 445-6800 / Lucy Stone Hall, Suite A145, Livingston Campus, 54 Joyce Kilmer Avenue, Piscataway, NJ 08854 / <https://ods.rutgers.edu/>**

Rutgers University welcomes students with disabilities into all of the University's educational programs. In order to receive consideration for reasonable accommodations, a student with a disability must contact the appropriate disability services office at the campus where you are officially enrolled, participate in an intake interview, and provide documentation:

<https://ods.rutgers.edu/students/documentation-guidelines>. If the documentation supports your request for reasonable accommodations, your campus' disability services office will provide you with a Letter of Accommodations. Please share this letter with your instructors and discuss the accommodations with them as early in your courses as possible. To begin this process, please complete the Registration form on the ODS web site at: <https://ods.rutgers.edu/students/registration-form>.

### **Scarlet Listeners**

**(732) 247-5555 / <http://www.scarletlisteners.com/>**

Free and confidential peer counseling and referral hotline, providing a comforting and supportive safe space

**Please note: Rutgers University Policies and Services are also posted on the eCollege Course Website (including the above).**