

**Fall 2015 Syllabus (Updated July 20, 2015),
Research Project Laboratory in Biology, BIOL 3910-071
3-Credits CRN# 60482**

Catalog Description

This course provides a hands-on, authentic research experience, and a comprehensive understanding of the scientific endeavor. This course may be repeated once for credit. A maximum of 3 hours may be applied to BIOL electives for credit in a major or minor. Prerequisites: BIOL2170 and BIOL2180.

The programmatic benefits of the course

To graduate, Biology majors must take two WAC courses, two lab courses, and nine BIOL elective credits above the 3000-level. BIOL3910-71 simultaneously satisfies all three requirements: 1) BIOL3910-71 is a WAC course, 2) BIOL3910-71 is a lab course, 3) BIOL3910-71 is an elective above 3000-level. In addition, BIOL3910-71 is the only elective you can take as a sophomore because the only prerequisites are BIOL2170 and BIOL2180.

Be advised that this is an intensive course (see details below) that requires a significant amount of both independent and group work outside of class.

Overview

This course gives students the opportunity to explore the scientific process using an authentic research approach. Students will establish research questions and a hypothesis, perform research, collect data and analyze it, learn about experimental design and how to pursue funding for their research, report on the research progress, and, write a research grant that summarizes their research findings and direction.

To provide students with a long-term research opportunity, students can repeat the course one time. Students interested in continuing with the research experience beyond the second repeat can continue their research as part of *BIOL 4910*.

When and Where?

Each student will be involved with 3 activities:

- 1) Recitations – Students will practice key concepts related to the course material. There are two recitations:
 - a. A recitation that provides the genetic background relevant to the research
 - b. A recitation that focuses on grant writing
- 2) Regular lab – Teaching assistant guided authentic research work
- 3) Open lab – Students perform independent research in the lab under supervision of the teaching assistant

- Regular lab - Tuesday 12–3 pm in Bowman-Oddy Room 1099 and Wolfe Hall Room 1265

- Recitations Lecture - Thursday 1:00-3:00 pm in Bowman-Oddy Room 1099

- Open lab - Wolfe Hall Room 1265. Open lab consists of 2-3 periods (about 1-2 hours each) of independent research per week.

Course Goal

The goal of this course is to select a research question, write a grant on the selected topic, set up a screen aimed at answering the research question, and analyze mutant flies.

Learning objectives

- Students will memorize and understand basic concepts in *Drosophila melanogaster* genetics and how they relate to human genetics
- Students will be able to apply concepts in genetics to design a reverse and forward genetic screen
- Students will be able to evaluate the outcome of a genetic screen
- Students will be able to write a grant proposal using appropriate writing conventions.
- Student will be able to describe and explain the various parts of a research grant.
- Students will be able to search for and read papers.
- Student will be able to use EndNote to manage citations.

Work collaboratively

At the beginning of the year, students will be divided into teams of ~4 students that will work together to practice the course material. Each team will select a team leader that will coordinate the team activity. Each team will meet at least once a week for at least 1 hour. The grades of students not participating will be reduced as much as 10%.

Recitation

- 1) Activities to practice applied concepts in *Drosophila* genetics
- 2) Activities to practice grant writing
- 3) Activities to practice how to present a seminar.

During grant writing recitation, each student will go up to the podium and present his or her assignment for ~5 minutes. The other students will give constructive criticisms to the presenter and discuss them as a class. Everyone will present each week, so come prepared.

Pre-class Activities:

Student must prepare for class recitation by reading the pre-class preparatory material.

Computers and computer programs:

Students will use the computer class during recitation. Students are expected to know the basic use of Word, Excel, and PowerPoint. Students that do not have experience with these programs can learn it from information on the internet.

TA-Led Lab Section

Students will learn:

- 1) Basic skills in fly genetics
- 2) Writing a research log
- 3) Learning schemes of genetic crosses
- 4) Summarizing their findings

Each lab section will start with a short quiz based on the previous week's material. Quizzes represent 10% (3 credits) of the student's total grade. The TA will conduct a short lecture of key concepts related to both fly work and genetics. Students will use this information to perform various lab tasks and activities.

Independent Research

Students will work in groups of ~4, and each student will need to come 1-2 times per week in the morning/evening to separate males from females, make crosses, and analyze flies. Each shift the student will make sure one of their partners collected females the previous morning. Students will indicate they came to the shift and write a summary of what they did in the group lab notebook and by sending an email to the group and TA.

Course Resources and Literature

Students are strongly recommended to buy the book:

“Grant Application Writer's Workbook - NIH” by Stephen W. Russell & David C. Morrison

The book can be purchased (\$75) at the web site: http://www.grantcentral.com/workbook_nih_sf424_shortened.html

Introductory information on fly genetics:

“How to design a genetic mating scheme: a basic training package for *Drosophila* genetics”. Roote J, Prokop A. G3 (Bethesda). 2013 Feb;3(2):353-8. doi: 10.1534/g3.112.004820. Uploaded to blackboard as: “*Drosophila* introduction”

*Introductory review papers on *Drosophila* testes:*

“*Drosophila* Spermiogenesis: Big things come from little packages” by Fabian L and Brill JA. Spermatogenesis. 2012 Jul 1;2(3):197-212.

Papers to be discussed in class:

- “The Zuker collection: a resource for the analysis of autosomal gene function in *Drosophila melanogaster*” by Koundakjian EJ, Cowan DM, Hardy RW, and Becker AH. Genetics. 2004 May;167(1):203-6.
- “Toward a comprehensive genetic analysis of male fertility in *Drosophila melanogaster*” by Wakimoto BT, Lindsley DL, and Herrera C. Genetics. 2004 May;167(1):207-16.

Instructor:

- Tomer Avidor-Reiss, Ph.D.

- Offices: Wolfe Hall room 4259B

- Email: Tomer.AvidorReiss@utoledo.edu

Please make sure the subject line starts with: "Fall 2014, Course 3910"

- Website: Go to "https://blackboard.utdl.edu/webapps/login/", Log in using UTAD and University of Toledo password and then select "[2015:4 Fall, BIOL3910:001 Research Project Laboratory](#)"

Office Hours: By appointment - Thursday during the hour after class (2:30-3:30); Wolfe Hall Room 4259B

Grading

Grades will be determined based on 7 factors with an approximate weight as follows:

Recitation and participation:	10%
Research performances	20%
Quizzes:	20%
Assignments:	10%
Midterm and Final exam:	10%
Oral Presentation:	10%
Grant proposal:	20%
Total:	100%

Recitation and Lab Attendance and Participation

Unexcused absences will not be tolerated, and excused absences should be rare and supported by a physician's note or other piece of documentation.

Students must participate in class discussions and activities to demonstrate that they prepared for class. Students are expected to read the assigned material, analyze it critically, and do the extra background research needed to comprehend the material. Prior to class, students should research all aspects of the class material until they understand it fully, or come to class with prepared questions about material they did not understand.

Rubric:	Full grade (1 point) – the student made 2 or more meaningful contributions to the discussion.
	0.8 points – the student made 1 contribution to the discussion.
	0.5 points – the student listened attentively to the discussion.
	0 points - unexcused absence from class or not listening to the discussion.

Recitation material will be available before class on Blackboard, and students will need to read it to be prepared for class.

Students will be supervised by the TA during their independent research time. Group lab notebooks will be kept and students are expected to create a log describing what they did each time they come to open lab.

Midterm

The midterm will cover all biology, genetic, and grant writing concepts learned in the first half of the course. The maximum grade is 100/100, and will correspond to 10% (3 credit) or 20% (2 credit) of the final grade for the course.

Team meeting attendance

This meeting cannot take place in the same day as the course's class (Tuesday and Thursday).

Research performances

Student must report the time they collected flies and about any issues with the collection to the TA by email. Failing to do so or not performing the collection as instructed will result in up to 10% reduction in overall course grade.

Original research paper writing assignments

Before the discussion of each research paper, you must complete an assignment. All writing assignments must be uploaded to Blackboard, brought to class as a hard copy, and handed in on the due date. Because this preparation is critical for your participation in class, failing to submit this assignment before the first discussion of each paper will result in getting 0 points for the assignment.

Read the paper and write your answer to the following 3 questions into text box of Blackboard:

- 1) How was the reading experience?
- 2) Please write 3 points of interest to discuss in class.
- 3) Answer the following:
 1. **Background** - What is the subject? What is known about it? Why is this important?
 2. **Question** - What is not known? How significant is this question?
 3. **Hypothesis** - What is the author's hypothesis? What is the basis of this hypothesis? Is it significant?
 4. **Method** - How did the authors study the subject? What are the advantages and limitations of their method?
 5. **Results** - What did the authors find?
 6. **Conclusion** - What is the author's interpretation? Would you agree with that?
 7. **Future direction** - What is next?

Rubric:

Weight	Subject	4	3	2	1 or 0
15%	Reading experience	Satisfactory: A clear and concise supported statement	Statements needs a few improvements	Statements need substantial improvement	Rudimentary or missing statement
15%	Points of interest				
10%	Background	Satisfactory: Clear, supported by evidence, concise, and includes an evaluation	<u>Can be improved:</u> More evidence is needed, too long, missing, or incomplete evaluation.	<u>Requires substantial improvement:</u> Text is unclear, needs a lot of evidence added, missing evaluation.	<u>Deficient:</u> Attempt was done to address the subjects Or <u>Missing:</u> No attempt to do assignment
10%	Question				
10%	Hypothesis				
10%	Method				
10%	Results				
10%	Conclusion				
10%	Future direction				

Research summary

As pair of preliminary data write for each finding a paragraph with the following information:

1. **Background** - What is the subject? What is known about it? Why is this important?
2. **Question** - What is not known? How significant is this question?
3. **Hypothesis** - What is your hypothesis? What is the basis of this hypothesis? Is it significant?
4. **Method** - How did you study the subject? What are the advantages and limitations of the method?
5. **Results** - What did you find? (make sure to present your data as a graph and/or tables)
6. **Conclusion** - What is your interpretation?
7. **Future direction** - What is next?

Oral presentation

Students in the three-credit section will give an oral presentation to the class about his or her research proposal. The presentation will consist of a multi-slide powerpoint presentation that also includes what the presenter is going to say typed into the “notes” section. At the end of the presentation the student will answer any questions raised by the peer review committee and defend their proposal.

Rubric:

Weight	Percent of maximum grade	100% Clear, comprehensive, focused and concise	75% Can be improved	50% Requires substantial improvement	25% Deficient
Introductory Statement: A short statement that describes the presentation’s subject, conclusion, and significance.					
5%					
Significance: Slides explaining the work’s importance, providing background about what is known, and the student’s research questions.					
10%					
Innovation: A slide that provides an explanation for why the work is different or better than what has been done before.					
5%					
Question, Aim, and Hypothesis: One or more slides that describe the question, hypothesis, and overall approach.					
10%					
Research Approach: Slides explaining the activities that will be performed to achieve each of the aims					
5%					
Research Design: Slides explaining each of the activities in detail including: methods, reagents, equipment, animal number, statistics, controls, replication, results, interpretation, and time.					
20%					
Outcome: Slide(s) describing the expected outcome for each aim.					
10%					
Pitfalls and Alternative Strategies: slides describing the pitfalls/alternative strategies for each aim.					
5%					
Time line: A graphical summary of the time each aim and activity is expected to take.					
5%					
Future direction: A slide giving the future projects and goals of the research.					
5%					
General					
5%	Slide Titles	Described concisely the take home message	Vague, too long, or not to the point	Misses the premise of the slide	Missing
5%	Cohesiveness of Presentation	There is a clear connection in the transition between slides	There is a connection in the transition between slides that can be improved	The transition between slides needs major improvements	Missing
5%	Presentation Mechanics	Student faced the audience and pointed to all slide elements at the appropriate time.	Student inconsistently faced the audience or pointed to slide elements.	Student rarely faced the audience and pointed to the slide elements.	Student did not face the audience and point to the slide elements.
5%	Question and Answer Section	Question content is repeated and not its tone, and answer is to the point	Inconsistent question repeating, or answering in the question tone, or the answer is unfocused	Failing to repeat the question and providing an answer that needs major improvements	Failing to repeat the question and providing an irrelevant or wrong answer

Grant proposal: (20%):

The final term paper will be a 6 page proposal not including an additional few pages for a bibliography:

1. Title (5%)– clear, concise, comprehensive, and focused
2. Aim Page (25%) – includes a hypothesis and at least one aim
3. Significance (10%) - What is the subject? What is known about it? What is not known? Why is this important?
4. Innovation (5%) - Why is this research better or different than past research?
5. Approach (for each aim) (to a total of 34%)
 - a. Introduction (3%)
 - b. Justification and Feasibility (3%)
 - c. Experimental design (or each activity) (to a total of 22%)
 - i. Approach (2%)
 - ii. Methods (2%)
 - iii. Reagents (2%)
 - iv. Equipment (2%)
 - v. Animal Number (2%)
 - vi. Statistics (2%)
 - vii. Controls (2%)
 - viii. Replication (2%)
 - ix. Expected Results (2%)
 - x. Interpretation (2%)
 - xi. Time (2%)
 - d. Expected Outcomes (3%) - What are your expected results if your hypothesis is correct or incorrect?
 - e. Potential Problems and Alternative Strategies (3%) - What are potential pitfalls that can prevent you from making any progress?
6. Timeline (6%)
7. Future Direction (5%) - What is next?
8. References (5%)
9. Correct over all format (5%)

Rubric: Sections of your assignment will be highlighted according to grading.

4	3	2	1 or 0
<u>Satisfactory:</u> Clear, supported by evidence, concise, and includes an evaluation	<u>Can be improved:</u> More evidence is needed, too long, missing, or incomplete evaluation.	<u>Requires substantial improvement:</u> Text is unclear, needs a lot of evidence added, missing evaluation.	<u>Deficient:</u> Attempt was done to address the subjects <u>Missing:</u> No attempt to do assignment

Writing assignments format and grading criteria

Do not exceed the page limits for assignments. **Make sure to put section tytels.** Use size 11 Arial font, 1-inch margins, and single spacing. Remember, scientific writing should always be simple, clear, and concise. Not adhering to the format guidelines will result in the rejection of assignments or a severely reduced grade. The only accepted format is a Microsoft Word Document.

Grand writind section: During weekly assigment grades will be based mainly on writhing the grant with proper format. For the final grant proposal, grades will based both on format and content. Each week before wrting the grant except old changes and trck the new changes

Statement on academic dishonesty

Students handing in assignments that do not represent their own work will receive a failing grade in this course. This means that you cannot copy the instructor’s examples and simply modify a few words. Even if you need to express a similar concept, you will need to reconstruct each sentence and paragraph in your own words.

Grades:

100-93 A	92-90 A-	89-87 B+	86-83 B	82-80 B-	79-77 C+
76-73 C	72-70 C-	69-67 D+	66-63 D	62-60 D-	59- 0 F