Genetics 545 – Fall 2016

Section 1 – Tuesday, 1:20 – 5:00 1408, 1340 Genetics/Biotechnology Center
Section 2 – Wednesday, 1:20 – 5:00 1408, 1340 Genetics/Biotechnology Center

Instructor: Kit Tilmann
1428 Genetics/Biotech (425 Henry Mall)
263-7580
cetilmann@wisc.edu
Office hours: by appointment

Course Description and Objectives:

This course provides an introduction to the principles and basic experimental techniques of classical and molecular genetics. In addition, students will gain experience with some of the model organisms used in genetics research. You will have to deal with the technical difficulties of setting up and performing experiments, with living organisms, and the ambiguities associated with analyzing real results. The course is also designed to demonstrate how the techniques of genetic analysis can be used in a research lab to address a biological question. During a large part of the course, you will be performing experiments that are not just isolated demonstrations of genetic principles, but are directed toward investigating a larger problem. In this way you can begin to see how the principles that you have learned are also a set of genetic tools that can be applied to the type of investigation that might be undertaken in a research lab.

We will be performing experiments bacteria (*R. centenum*), and fruit flies (*Drosophila melanogaster*). The experiments will overlap; during any given lab period, you may be working with more than one organism (you can get an idea of how this will work by looking at the lab schedule). Because of the nature of the experiments and the life cycles of these organisms, it will be necessary for you to work on your experiments outside of the scheduled lab period. This is especially true for the fruit fly experiment, where the bulk of your work will likely be done outside of the regular class session. However, you will be working with a partner(s), so it will be possible to split the workload. We have arranged for your ID cards to give you 24-hour access to the lab.

The laboratory is also being used by the Biotechnology Center as part of its biology education program. This means that when our class is not in session, the room will be used by biology teachers and students from preschool to high school. For your sake and for the sake of the visiting students and teachers, your lab benches must be completely cleared after you are finished working. We will try to have a schedule available with the times that the lab will be in use by other classes, however you can still have access to the room during these times as long as there is not a lecture in progress. You will just have to get the things you need and go into the adjoining lab (room 1330) to do your work.

Text

There is no text required for this course. *Principles of Genetics* by Snustad and Simmons and *Introduction to Genetic Analysis* by Griffiths et al. contain relevant background information.

Grading

Grading will be based on two quizzes and three lab reports. The due dates for the lab reports and quiz dates are indicated on the lab schedule. Your grade in the course will be determined as follows:

Report 1 Bacterial mutagenesis, first half – 22.5%
Report 1 Bacterial mutagenesis, second half – 22.5%
Report 2 Fruit flies – 45%
Participation – 10%

A 90	C 70	F <60
B 80	D 60	

Since the class meets only once a week, it is important that you attend every session. If for some reason you cannot attend, let me know in advance and I will schedule a time for you to make up the lab. If you miss more than one lab period (unexcused), you will fail the course. If you turn in a lab report late, 5% per day late will be deducted from your grade. After 5 days, you will receive a zero for the report.

Lab Notebooks

Each student will be required to keep a bound lab notebook. This book will be a record of everything you do in lab including your statement of the objectives of the experiment, the methods you used, the data you collected, your analysis and interpretation of the data, and your conclusions. It should also include the details of failed experiments and mistakes. Since the book documents your lab work, entries should be made during the lab period, not at home, and nothing should ever be recopied and discarded. I will not collect your lab notebook. However, keep in mind that lab reports are based on experiments that are performed over a period of many weeks. Your ability to write these reports is directly related to the quality of your lab book.

General Lab Rules

1. Do not remove anything from the laboratory.
2. Remember that other people will be using the lab. Be sure your bench space is clean when you leave. Put everything away where you found it.
3. No food or drinks. You may step out of the lab to eat or drink.
4. Since you will have access to the lab at any time, it is important that you not let anyone else in the building when you are entering during times when the building is locked.
5. No sandals/ flip-flops.

Approximate lab schedule (actual dates may vary):

Date	Discussion Topic	Lab activities	Lab report deadlines
Week 1 7 Sept.	Introductions; Using genetics to understand biological problems; fly and bacteria basics	Flies: learn to observe and handle flies, maintain fly stocks	
Week 2 14 Sept.	Using genetics to understand biological problems	Bacteria: sterile technique Flies: learn to observe and handle flies, begin collecting virgins.	
Week 3 21 Sept.	Mutagenesis screens; Studying genes using crosses	Bacteria: perform mutagenesis procedure. Plate on selective media. Flies: set up outcross of unknown mutants to wild-type and marker stocks.	
Week 4 28 Sept.	Studying genes using crosses	Bacteria: screen for mutants. Grow in liquid culture	
Week 5 5 Oct.		Bacteria: plate on selective media. Flies: begin to score F1s and collect virgins for backcrosses, set up intercross	
Week 6 12 Oct.	Recombinant DNA technology and its applications	Bacteria: grow mutant for DNA analysis. Flies: set up backcrosses and intercross.	
Week 7 19 Oct.	Recombinant DNA technology and its applications	Bacteria: genomic DNA isolation and PCR Flies: begin scoring F2 progeny from crosses.	

Week 8 26 Oct.	Recombinant DNA technology and its applications; Results of F2 crosses	Bacteria: Gel electrophoresis of PCR product. Flies: continue experiments as needed	**First half of bacteria report due**
Week 9 2 Nov.	Recombinant DNA technology and its applications	Bacteria: restriction digest of gDNA and pUC19 vector. Flies: continue experiments as needed	
Week 10 9 Nov.	Recombinant DNA technology and its applications; Statistical analysis fly cross results	Bacteria: purification of gDNA and pUC19 vector. Flies: continue experiments as needed	
Week 11 16 Nov.	Statistical analysis fly cross results	Bacteria: ligation of gDNA and pUC19 vector. Transformation into competent cells. Flies: continue experiments as needed	
Week 12 23 Nov.	Results of fly crosses (F2s): 3-point test crosses	Flies: continue experiments as needed	
Week 13 30 Nov.		Open	**Full bacteria report due**
Week 14 7 Dec.		Lab clean-up	**Drosophila lab report due**

Group work

Over the course of the semester, you will have a lab partner (or two). It is important that each group member contributes equally to all of the experiments and the lab reports. If a group member is not carrying there weight, their grade will be affected.