Dates	Topics
Jan 17-21	**1. Fertilization and Embryonic Development**
Jan 24-28	**2. Neuron Simulation**
Jan 31-Feb 4	**3. Structure and Function of Eyes.**
Feb 7-11	**4. Examination of Human White Blood Cells**
Feb 14-18	**5. Plant Reproduction and Diversity**
Feb 21-25	**6. Immunological Methods**
Feb 28-Mar 4	**7. Introduction to *Drosophila melanogaster* and Hypothesis Testing**
Mar 7-11	Spring break
Mar 14-18	**8. Mendelian Genetics and *Drosophila* F_1 Generation**
Mar 21-25	**9. Allozyme Electrophoresis and Population Structure in *Silene latifolia*.**
Mar 28-Apr 1	**10. Analysis of Chromosomal Linkage**
Apr 4-8	**11. Simulation of Population Genetics and Evolution**
Apr 11-15	**12. Analysis of Interspecific Competition in *Tribolium***
Apr 18-22	**13. Invasive Species Field Trip to Warner Parks**

Syllabus
Introduction to Biological Sciences 111b (BSCI 111b)

Instructor: Dr. Steve Baskauf
office: 2129 Stevenson Center
office hours: Monday and Friday 10:30-11:45 AM
email: steve.baskauf@vanderbilt.edu
phone: 3-4582 (email preferred and more reliable)

I am generally in the laboratory area during all of the scheduled laboratory times (every afternoon and Tue & Thu mornings). During much of this time you can look me up in the lab if you need to see me. I am usually on campus most of the day each weekday, so if you cannot find me **please ask one of the staff members where I am**. To ensure that you can find me when you need to see me, email me in advance to arrange a specific time. **Please do not ask me to meet with you during the last half hour before the start of a lab, or during the first half hour after the start of a lab.**

Purpose of BSCI 111 Lab

The purpose of the laboratory experiments and assignments in this course is to give you practical experience related to important biological concepts and scientific principles. The experiments will give you real experience with methods and techniques similar to those used in research laboratories around the world investigating problems in modern biology. You will have an opportunity to analyze and evaluate real data, which is the real job of scientists.

As much as possible, the sequence of labs is coordinated with topics in lecture. However, practical considerations dictate that we cover some topics at different times than in lecture. This is particularly true with the labs involving living plants and animals. In addition, some topics in lab may not be covered at all in lecture because their study requires physical presence in the lab environment or because there is not time in lecture to explore them to the depth we can in lab. Although it is hoped that lab will compliment the topics covered in lecture, **it is not intended to be a "review session" for lecture**.

General Information

The lab manual contains prelab assignments, objectives, background information, protocols, and the required problem sets for each of the experiments that will be performed this semester. Supplemental information for each lab is available online at:

http://www.cas.vanderbilt.edu/bsci111b

Click on the link for a particular lab to navigate to the page for that lab. Please note that additional resources related to the lab, such as class data sets, may be available via buttons at the top of the experiment page. Answer keys for problem sets will be posted on the web site after the last section has turned that assignment in. At that time **a button linking to the answer key will appear at the top of the experiment page**.

Each student should keep a laboratory notebook. The lab notebook should be used to record notes on each experiment; the data and sketches from the experiment and any deviations from the protocols in the lab manual, whether they were done on purpose or by mistake. These notebooks will <u>not</u> be used in the determination of your course grade. Your lab notebook is important for you to answer the questions/problems posed in problem sets. Many students prefer to use a looseleaf notebook so that they can keep their assignments there as well.

Safety

Most materials used during this course are not hazardous. However, certain materials require special precautions. These will be listed at the appropriate place in the manual. Goggles are not required for any of the experiments this semester.

At no time should you eat or drink in the laboratory. Students will be required to sign a laboratory safety statement as a condition of participating in the course.

Email use

All students are expected to check their email regularly and to ensure that they are able to receive email (i.e. that they are not over quota and that their default email address in the university system is valid). Occasionally important information (protocol changes, announcements, etc.) will be sent to all students in a section. This will be done using the course mailing list. If you have opted to not provide your email address to the campus system, please send it to Dr. Baskauf so that you can be added to the mailing list manually.

Assignments

All assignments must be turned in to your TA at the beginning of the lab period on the day in which they are due. **Late assignments will not be accepted and you will receive a zero for the missing work.** Although you are welcome to ask your TA or Dr. Baskauf specific questions about assignments, do not ask your TA to "pregrade" an assignment or question. Regrade requests for an assignment should be made using the form on the class web page and addressed to the TA that graded it (or to Dr. Baskauf in the case of a test). Regrade requests must be made within two weeks of the date on which the work was returned to you. Regrade appeals to Dr. Baskauf should be made only after a regrade rejection by the grading TA. At the end of the semester, regrade requests must be made as soon as possible to allow time for grade changes to be included in calculation of the final grade. Graded work will be of three types: prelab assignments, problem sets, and tests.

Prelab assignments:

Prelab assignments are designed to help you prepare for each upcoming lab. The particular requirements for each prelab will be specified in the lab manual. You may be asked to summarize the experimental design, describe concepts outlined in the introduction, or other tasks that may help you prepare for the lab. Prelabs are due **at the beginning of the period of the relevant lab** and should be turned in to your teaching assistant. The prelabs will be graded by different TAs on different weeks - refer to the initials at the top of the page to determine who graded it. The lowest score will be dropped before determining your average in the prelab category.

Problem Sets:

After each experiment, an assignment consisting of several short answer questions or problems will be given. These questions or problems will be based on the experiment performed in class that week. You will be expected in many instances to incorporate the results of your experiment into the answers to these problems.

Problem sets are printed at the end of the protocol for each lab. The problem sets are due **at the beginning of the <u>following</u> lab period** and should be turned in to your teaching assistant. The problem sets will be rotated and graded by the same TA who graded the prelab you turned in that week - refer to the initials at the top of your paper and to the grading schedule on the TA web page to determine who graded the problem set. The lowest score will be dropped before determining your average in the problem set category.

Tests:

Tests are designed to test your understanding of the concepts used in the experiments. Questions will address thinking skills on all levels, including application, analysis, synthesis, and evaluation as well as recall of information. All tests will be scheduled in advance and will cover topics from specified labs as listed below. All material on the tests will come from lab -- information from lecture will **not** be required. Please see the discussion of "learning skills" and "experimental goals and objectives" below for further information. The format will be multiple choice and the tests will be taken on computers in the BSCI lab during the days listed in the schedule below. **It is not acceptable to take the tests on computers outside the BSCI lab without permission. Doing so constitutes an honor code violation.** The computers in the lab will be available on the testing days (Tuesdays and Wednesdays) from 7:30 AM until 7 PM, except during scheduled laboratory periods (9:00 AM to 12:00 noon and 1:00 PM to 4:00 PM on Tuesdays and 1:00 PM to 4:00 PM on Wednesdays). During the scheduled laboratory periods, one computer in the back of the lab will be available for use on a first-come, first-served basis (although users at that time should expect the normal laboratory noise levels). **Except in the most extreme emergencies, you will not be**

allowed to make up or be excused from a test. Except in unusual circumstances, tests will not be given after the end of the last day on which they are scheduled.

The lowest test score will be dropped before determining your average in the test category. Answer keys for each test will be posted in the display case in the hall outside the BSCI lab.

Schedule of tests:

Test Number	Experiments covered	Tue and Wed*
1	1 - 2	Feb 8-9
2	3 - 4	Feb 22-23
3	5 - 6	Mar 15-16
4	7 - 8	Mar 29-30
5	9 - 10	Apr 12-13
6	11 - 12	Apr 25-26**

* In order to complete the last test before the start of final exams, the last test will take place on Monday and Tuesday rather than Tue and Wed.
**Authorization has been obtained to from the Administrative Committee to administer a laboratory test during "dead week" (which begins on Apr 20). See the Academic Regulations in the A&S Undergraduate catalog for additional details about "dead week".

Grades
The weights of the three categories will be:
problem sets 50%
tests 40%
prelabs 10%

Attendance in lab is mandatory. Teaching assistants will monitor attendance and record absences. Excused absences with the possibility of make-up work will be granted by Dr. Baskauf according to established college guidelines. Please refer to the Academic Regulations section of the A&S Undergraduate Catalog for further details:

http://www.vanderbilt.edu/catalogs/undergrad/acadreg.html

Except in the case of true emergencies, a possible excused absence should be discussed with Dr. Baskauf as far in advance as possible - you should not assume that an excused absence will automatically be granted. Generally, this discussion occurs via email. If you discuss your situation verbally, please send a summary of the discussion via email to Dr. Baskauf. An unexcused absence will result in a zero for any graded work that should have been performed for or during the missed lab.

Rescheduled or missed labs
If you do not attend your usual lab section because of an excused absence, please follow this procedure:

1. Print out the absence form posted on the course web site and fill it out. If you are making up the missed lab on another day, separate the bottom part of the form. If you are not making up the lab, indicate this on the bottom part of the form and leave it attached.
2. To the top section, attach a copy of the email from Dr. Baskauf excusing your absence from the lab, and the assignments that should have been turned in on the day that you missed lab. Give these papers to your bench's grader for the day when you missed lab**. Do not give these papers to your own bench TA** unless that TA happens to also be the grader. You can find out who the grader is by consulting the schedule on the TA web page**. It is your responsibility to make sure that the grader TA actually gets these papers.** It is best to

give the papers to the TA personally. Do not put the papers in a mailbox, under a lab or office door, etc. unless you have made arrangements with the grader to do so.

3. If you make up the lab during another section, give the bottom section of the form to the TA on the bench where you make up the lab.
4. Turn in your problem set for the missed lab when you attend your next regularly scheduled lab.

The Honor Code

The Honor Code is in effect for all assignments in BSCI 111. Consulting with your lab partner, other students currently enrolled in other laboratory sections, the TA's or the instructor PRIOR TO preparation of an assignment is acceptable. Use of problem sets or work from previous semesters is NOT acceptable. The final version of **all** assignments should be done INDEPENDENTLY and should represent YOUR WORK ALONE. Thus, even though the data will be the same for you and your lab partner, the assignments completed in this course should reflect your individual input**. Lab partners may not turn in duplicate copies of all or any part of any assignment.** The exception to this is computer output (graphs, statistical output, results of database searches) that is necessitated by shared use of a computer during the lab period. Students making up assignments or tests due to excused absences are bound by the honor code not to consult with any posted keys or to use information returned to other students. As a condition for participation in the BSCI 111 lab, you will be required to score a 100% on a test covering the application of the Honor Code in the course.

Accommodations

If you need course accommodations due to a disability, if you have emergency medical information to share with me, of if you need special arrangements in case the building must be evacuated, please make an appointment with me as soon as possible.

Learning Skills

Learning requires a wide range of skills. Knowledge and comprehension are the most basic learning skills and the ones most frequently tested. Learning on these levels lays the foundation for all other learning. However, a university is challenged to help its students develop higher order thinking skills: application, analysis, evaluation, and synthesis. As a scientist, physician, engineer, or other professional, you will routinely have to think on these levels. You can be fairly sure that no one in your job is going to ask you to "list the five biological kingdoms".

The following types of learning are arranged from the simplest level to increasingly complex levels requiring abstract thinking (Bloom 1956):

Knowledge - recall and recognition of information in the form in which they were learned
Comprehension - translation or interpretation of information based on prior learning
Application - selection and use of data to complete a problem or task
Analysis - distinguish and classify the assumptions, hypotheses, evidence, or structure of a statement
Evaluation - assess or critique on the basis of specific standards or criteria
Synthesis - integrate or combine ideas into a new product or plan

In lab, we are ideally positioned to practice higher order thinking skills, since we collect data that must be analyzed and evaluated. Through data analysis in the problem sets, you should be gaining practice at applying the skills of **application** (e.g. performing calculations and statistics), **analysis** (e.g. experimental design), and **evaluation** (e.g. hypothesis testing). I also try to ask some questions on the problem set that require **synthesis**.

Experimental Goals and Objectives

The lab tests will contain some questions requiring knowledge and comprehension. However, many of the questions will require thinking on higher levels. I am sometimes asked by students how they should study to prepare for the tests. Simply memorizing background information from the lab manual will help you with knowledge questions, but will do little to prepare you for questions requiring thinking on a higher level. To prepare yourself for such questions, as you are in lab you should be constantly asking yourself how the tasks you are doing or data you are collecting fit into the larger scheme of things. For example:

- What assumptions am I making in order to apply a particular equation or statistical test? What would be the consequences if I violated these assumptions?
- Why are we using this particular combination of reagents rather than another that we used previously?
- Why does the particular experimental design we have chosen allow us to evaluate the hypothesis we are testing?
- How would I need to modify this protocol if I used a different organism or wanted to test different hypotheses?
- Why do my results vary from those of other groups? Is this variation important, or is it just experimental "noise"?
- Why didn't I get the results that I expected? Could this be a result of mistakes I made in the protocol and if so, what could they have been? Or is this an unavoidable result of uncontrollable biological variation or experimental conditions?

To assist you in looking beyond the details and facts of the protocol, experimental goals and objectives for each lab are listed in the lab manual. Experimental goals are a general description of the result we are trying to physically accomplish by doing the lab. In contrast, the learning objectives state the skills that you should have achieved by the time you have finished the lab and problem set. These goals and objectives are intended to guide your thinking in a general way - they are not a list of questions I will ask you on the test. Understanding the background material and protocol in the lab manual, thinking about the experimental goals and objectives, and completing the problem set in a thoughtful way should be your best means to prepare for the lab tests.

Some Final Thoughts...

Be aware that we are, in many cases, at the mercy of living organisms. No matter how much we might wish it to be otherwise, fruit flies, ferns, *Brassica* plants, and *Tribolium* beetles take weeks to complete their life cycle. For this reason, parts of long-term experiments are scattered throughout the semester. Thus a particular week's lab may have pieces of several experiments combined.

This course is scheduled to take place for two hours and fifty minutes each week. Although some weeks' experiments will not take this long, you should be prepared to be in the lab during your scheduled period. Make use of this scheduled time to discuss the learning objectives and problem sets with the lab personnel.

Most of the experiments that we will perform are relatively straightforward and should give the expected results. However, an important part of science is recognizing that things do not always go as expected. When things do not turn out as planned, it is our task to try to figure out what our results mean and to seek alternative explanations for what has happened. Not getting the expected results is not synonymous with failure if you are able to draw appropriate conclusions from the results.

I hope that you have an enjoyable semester and that your interest in the biological sciences is stimulated by your laboratory experience.

Reference:

Bloom, B.S. (Ed.), 1956. *Taxonomy of educational objectives: The classification of educational goals. Handbook I: Cognitive domain*