

Biology 159: Skills of Biological Investigation
2 credits: 1 credit lab, 1 credit discussion
The University of Tennessee, Spring, 2016

Lab/Discussion: One three hour lab OR one three hour discussion per week (25 students)

Lab Coordinator: Dr. Crystal McAlvin, Biology 159 Laboratory Coordinator
Room 128 NBA: cbickley@utk.edu

Lab/Discussion Instructor: Instructor name and contact information

Course Learning Goal:

This course is designed for you to practice the skills necessary to do scientific research. Scientists read about the work of other scientists, formulate ideas and questions for their own experiments, conduct experiments, come to conclusions, present their results, and continue the process over again. This course will explore how scientists conduct and report their work by using faculty research at UT as examples of this process. Students will then put these principles into practice in laboratory each week.

Course Learning Objectives

By the end of the course, you should demonstrate proficiency in the following **scientific practices**:

1. Distinguish between, and develop your own, scientifically-appropriate hypotheses and predictions
2. Find and use scientific literature to frame your experimental designs
3. Organize, analyze and interpret your scientific data
4. Communicate your scientific results in written and verbal forms (including creation of figures and tables)
5. Design and carry out your own scientific investigations

The content of the course will also emphasize the **five BIG IDEAS of Biology**:

1. **Evolution:** Populations of organisms and their cellular components have changed over time through both selective and non-selective evolutionary processes.
2. **Structure and Function:** All living systems (organisms, ecosystems, etc.) are made of structural components whose arrangement determines the function of the systems.
3. **Information Flow and Storage:** Information (DNA, for example) and signals are used and exchanged within and among organisms to direct their functioning.
4. **Transformations of Energy and Matter:** All living things acquire, use, and release and cycle matter and energy for cellular / organismal functioning.
5. **Systems:** Living systems are interconnected, and they interact and influence each other on multiple levels.

Catalog Description: Intended for science majors, an exploration of the skills necessary to conduct research in biology. Emphasis will be on reading primary literature, designing and carrying out experiments, summarizing and analyzing data, coming to conclusions from data, and presenting investigations in oral and written forms.

Support for learning

Texts and Materials:

- Biology 159 Lab Manual. Only available at the University Center Bookstore.

Course website: <http://online.utk.edu/> (Blackboard).

Communications:

- If you can't make office hours, please use your UTK e-mail (spam filters may exclude other addresses) to schedule a meeting.
- Please allow up to 24 hours for responses to your e-mails. E-mails will likely not be answered after the workday is over or on the weekends, so please be patient outside of normal work hours.

Study Rooms:

417 Hesler is a quiet study room for majors in Biology. It can also be reserved for group study. There is also a student study room in Neyland Biology Annex, room 103.

Class Policies

Policies **MUST** be followed at all times – no exceptions. Violation will result in a loss of points, or dismissal from the lab and/or course.

Lab Safety:

- You must clean and dispose of laboratory materials as directed by your instructor before leaving lab.
- There will be **NO** food, drink or tobacco products (including E-cigs and vaporizers!) used in the lab **at any time**.
- Personal items should be stowed away and not placed on the lab bench
- **NO** open-toed shoes can be worn during lab. ****You will not be allowed to stay in the laboratory if you have improper shoes.**

Course Policies:

- Prepare for the upcoming class prior to attending class each week – this includes reading the lab manual about the upcoming labs, any assigned articles, and preparing for quizzes as per instructions from your instructor. **Always type your homework!** No handwritten work will be accepted unless it is work done in-class. *Print out any printed assignments before coming to lab! There are no free printers in the biology annex.*
- No emailed assignments!; you may turn in your assignment to the Main General Biology Office in Neyland Biology Annex room 128. Your assignment will be time-stamped and placed in your TAs mailfolder. You must know your TA's name. If the office is closed, you may slide your assignment under the door (put your TA's name on it!) and it will be time-stamped first thing in the morning on the next day.
- Written lab communications are due in two formats at the **START** of class. You must upload a copy of the lab communication into SafeAssign in Blackboard, **AND** you must hand in a hardcopy at the start of your lab. Failure to do both will result in a late penalty of 25% per day late.
- Quizzes will be given at the beginning of lab – if you are late and miss the quiz, you miss the points. You will receive no points on your quiz if you leave early. There are no make-up quizzes.

- Class attendance is mandatory – if you miss a class, you miss the points associated with that class. If you need to miss class due to a University-sponsored activity, you must notify your instructor at least 1 week prior to class, and they will try to make arrangements for you to attend another class that week. Please note that this accommodation is only done for special circumstances. Even then, once the week is over, there is no way to “make-up” a lab exercise. Extra points are assigned in this lab to accommodate other absences.
- Spelling and grammar are considered when grading.
- This is a 3-hour class; you should expect to be there for the full three hours each week.

COURSE SYLLABUS

| Week | Agenda | Due |
|--------------|--|--|
| Jan 13-15 | Classes begin – No labs/discussion | |
| Jan 18-21 | Martin Luther King Day; NO Biology 159 labs | |
| Jan 25-28 | Discussion – Introduce basic experimental design, hypotheses/predictions, Excel, and scientific literature – Meter stick drop “experiment” | Participation – 7 pt, Exp design – 5 pt |
| Feb 1-4 | Plant & Fungal interactions – week 1 | Excel hw – 5 pt, Quiz – 15 pt |
| Feb 8-11 | Fungal & plant interactions – week 2 | Practice Oral communication Borrel Article – 10 pt, |
| Feb 15-18 | Discussion – How to write a lab communication | Lab com outline – 10 pt |
| Feb 22-25 | Antibiotic resistance – week 1 | Quiz – 15 pt |
| Feb 29-Mar 3 | Antibiotic resistance – week 2 | Oral com – 7 pt Final pres group – 3 pt |
| Mar 7-10 | Discussion –Peer review of lab communication, synthesis of literature to frame hypothesis, empirical data vs. inference | Slater Article – 10 pt, Peer review – 6 pt, Phylogeny – 4 pt |
| Mar 14-17 | Spring Break; NO Biology 159 labs | |
| Mar 21-24 | Selection & Adaptation (skulls) – week 1 | Lab com – 30 pt Quiz 15 pt |

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| Mar 28-31 | Selection & Adaptation (skulls)– week 2 | Oral com – 7 pt |
| Apr 4-7 | Discussion – Independent experimental design (propose beetle experiment) | Romero Article – 10 pt, Exp design – 10 pt, Skull Lab com – 30 pt Pre-proposal- 7 pt, |
| Apr 11-14 | Beetle Behavior – week 1 (conduct beetle experiment, propose follow-up experiment, present) | Quiz 15 pt, |
| Apr 18-21 | Beetle Behavior- week 2 (conduct beetle experiment, present) | Oral com- 14 pt |
| Apr 25-28 | Discussion – Student Presentations | Presentation – 50 pt Beetle Lab Com-30 pt |

ASSESSMENT OF LEARNING

| | |
|--|------------------------------|
| Quizzes | 60 points (4 x 15) |
| Oral Communications..... | 28 points (14+2 x 7) |
| 3 Written Lab Communications..... | 90 points (3 x 30) |
| Student Final Oral Presentations..... | 60 points (50 + 10) |
| Assignments and Participation in Discussion..... | 77 points (17+20 x 3) |

Total **315** points*

*A maximum of 300 points can be earned. The extra 15 points are to account for absence(s).

ACADEMIC MATTERS

Academic dishonesty of any sort will not be tolerated. Students should refer to **Hilltopics** for University policies and procedures regarding these instances. You are expected to abide by The University of Tennessee honor statement in all of your university activities.

"An essential feature of The University of Tennessee is a commitment to maintaining an atmosphere of intellectual integrity and academic honesty. As a student of the University, I pledge that I will neither knowingly give nor receive any inappropriate assistance in academic work, thus affirming my own personal commitment to honor and integrity." (Hilltopics, the UT Student Handbook)

Copying sentences, portions of sentences, or re-phrasing sentences in the same order as another student's will all be flagged as plagiarism by the University's plagiarism software. You may discuss your labs with other students, but write your lab work from your own thoughts. Your lab communications and presentations will be submitted through "SafeAssign" and plagiarism will not be tolerated.

It is expected that all students attending lab will conduct themselves in a manner that is both respectful and accommodating to their laboratory instructors and to their working lab partners/fellow students. Rude and disruptive behavior cannot be tolerated and will result in the dismissal of the student from the lab period and possibly the course.

Please place a copy of this syllabus in your lab notebook for reference throughout the semester.

Final Grades

Final letter grades will be determined by the total percentage of 300 points accumulated as follows:

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

Other course information

Tennessee Education Lottery Scholarship Recipients: All courses for which you are enrolled count toward your attempted hour total. You must receive approval from the Office of Financial Aid & Scholarships when withdrawing from UT or changing your enrollment status from full-time to part time in order to maintain good standing for the TELS program. Approvals are only issued for extraordinary circumstances, such as the death of an immediate family member, documented serious illness, or military mobilization. See Financial Aid website at: <http://web.utk.edu/~finaid>

Final exams: Finals are scheduled by the University Registrar during the university final exam period. There are no conflicting times. “Students are not required to take more than two written exams on any day. The instructor(s) of the last non-departmental exam(s) on that day must reschedule the student's exam during the exam period. It is the obligation of students with such conflicts to make appropriate arrangements with the instructor at least two weeks prior to the end of classes.” “All final exams must be given during the final exam period at the scheduled time.”

(http://registrar.tennessee.edu/academic_calendar/finalexams.shtml)

Disability Services: If you need course adaptations or accommodations because of a documented disability, or if you have questions or concerns about disabilities or emergency information to share, please contact Disability Services: 2227 Dunford Hall; 974-6807; Email: ods@utk.edu; Website: <http://ods.utk.edu/>).

Counseling Center: <http://counselingcenter.utk.edu/>

900 Volunteer Boulevard

865-974-2196, Email: counselingcenter@utk.edu

Academic Assistance:

Tutoring: The Division of Biology does not offer tutoring services. Contact the Student Success Center and the Academic Support Unit of The Office of Minority Student Affairs for information about tutoring opportunities.

- **Student Success Center:** The comprehensive source for information, services, and resources to assist your success at UT: <http://studentsuccess.tennessee.edu/studentsuccesscenter/>
 - 1817 Melrose Avenue, and 812 Volunteer Boulevard, 865-974-6641, Email: studentsuccess@utk.edu
- **Academic Support Unit of The Office of Minority Student Affairs** offers some tutoring services available to all students, but openings are limited and are filled quickly. The office offers other types academic assistance and support as well: <http://omsa.utk.edu/services/>
 - 1800 Melrose Avenue, 865-974-6861, Email: omsa@utk.edu

Technical Assistance:

Blackboard, clickers, or general information technology assistance:

- <http://remedy.utk.edu/contact/>
- Help Desk: 865 974 9900 (M – F, 8:00 – 5:00)
- OIT Computer Support Service Center and Walk-In Help Desk: Commons South, 2nd floor Hodges Library
- Turning Technologies (clickers): 866-746-3015