

## **Bio 095: Evolutionary approach to cell and molecular biology.**

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Biology is the study of life and living organisms, interacting factors as different in scale as molecules and forests. Influence flows across these levels of scale, and this semester we will dive into the world of molecules and cells and study how processes at the microscopic level influence the function of whole animals and plants - including ourselves - as well as how what happens in the environment influences the function of cells and molecules. To better understand the links from one level to another, we will learn about genetics, cell structure and function, and the evolutionary processes that have forged these links over billions of years. Most importantly, we will become familiar with the manner in which scientific knowledge is gained and refined, the *scientific process*.

*I reserve the right to alter this syllabus as needed during the course.*

### Course goals:

By the end of this course, students should understand

1. The process of science as a way of understanding our world
2. How genetic information is structured, transmitted, and expressed
3. How energy is captured and moved within and among cells by plants and animals
4. The role of natural selection in shaping how organisms capture and utilize resources

### Learning outcomes:

By the end of this course, students will be able to

1. Recognize testable hypotheses
2. Imagine processes to collect data that would test an hypothesis
3. Dissect texts from the popular media to evaluate the quality of science presented
4. Describe common molecular processes in living organisms

## **General Course Expectations**

**A. Contributions:** Prepared participation in all classes and activities is essential to learning new material. I expect all students to read and think critically about assigned materials, and listen carefully and respond appropriately to fellow classmates in the discussions and other collaborative work. *Participation is a significant portion of your grade.*

**B. Work-load expectations:** I expect all students to spend at least an hour each evening during the on-campus portion of the class working on materials related to this course, including readings and viewing on-line powerpoint lectures. You are expected to attend all meetings. During the on-line portion of the course, I expect all students to spend on average 6 hours/week working on material and preparing final projects.

**C. Face-to-face weekly meetings.** The weekly meetings are not going to be lectures. I expect all students to have covered the content presented in the text and powerpoints, and to arrive prepared to ask questions. Once we are certain that everyone is comfortable with the content, we will turn our attention to the discussion topic and problems.

**C. Religious Observance:**

The official policy for excused absences for religious holidays: Students have the right to practice the religion of their choice. Each semester students should submit *in writing* to their instructors *by the end of the second full week of classes* their documented religious holiday schedule for the semester. Faculty must permit students who miss work for the purpose of religious observance to make up this work.

**D. Academic Honesty and Professionalism:**

All students are required to be familiar with and adhere to the “Academic Honesty Policy Procedures” delineated in the following website:

<http://www.uvm.edu/~uvmppg/ppg/student/acadintegrity.pdf> ).

Academic dishonesty includes:

Acquiring from other persons or from commercial organizations, or other sources, or utilizing other unauthorized assistance, and submitting, unattributed and as one's own work, homework assignments, term papers, research reports, laboratory reports, or comparable documents prepared in whole *or in part* by others than oneself.

Academic dishonesty *also* includes:

Presenting the same or substantially the same written work term paper, research report, essay or the like - as part of the requirements of more than one course, without the express prior written permission of the instructors involved.

**E. Accommodations:**

Accommodations will be provided to eligible students with disabilities. Please obtain an accommodation letter from the ACCESS office and contact me early in the course to discuss what accommodations will be necessary. If you are unfamiliar with ACCESS, visit their website at <http://www.uvm.edu/access> to learn more about the services they provide. ACCESS: A-170 Living Learning Center, University of Vermont, Burlington, VT 05405. PH: 802-656-7753, TTY: call 711 (relay), Fax: 802-656-0739, Email: [access@uvm.edu](mailto:access@uvm.edu), Instant Messenger: UVMaccess. General office hours: 8:30am – 4:30pm Monday through Friday. Call to make an appointment.

## Grading Criteria

My goal is to help you not only acquire factual knowledge about biology, but to become comfortable engaging in critical discussion of science and media reports about science. To help you overcome any fears, I have designed the class to allow you many opportunities to work individually and with your classmates. Your final grade will be calculated based upon five components:

Reading	10%
Journals	10%
Participation	20%
Projects	30%
short exams (2)	30%

**Reading:** Because we are focusing our face-to-face time on processes and problem solving, everyone must come to class having read the assignments and viewed the powerpoint lectures. I will evaluate this by using **content question sets** that you will hand in each evening via Blackboard Quizzes.

**Journals:** Scientific reasoning underlies all good scientific writing, and to provide practice and regular feedback every student will do a weekly short writing exercise. Each week, I will post a question for you to respond to as a journal, which only I can see. These will be the foundation for our weekly discussions at our meetings.

**Participation:** In class: You are expected to come to class prepared to thoughtfully and logically respond to the discussion question (journal question) and to your classmates' ideas.

On-line: The best way to become comfortable with new skills is to practice. I have designed on-line quizzes that you are required to take every week. These quizzes are to help you evaluate your understanding of the material. You are allowed to take every quiz three times, and only your top score will count towards your final grade. The quizzes draw from a large question database, so you will see some new questions every time you attempt the quiz. I will maintain a weekly on-line discussion related to the quizzes.

*Participation is recommended during the face-to-face portion of the course and required during the on-line portion of the course.* You can query each other (and me) about the rationale behind solutions. Also, I sometimes make mistakes. The discussion board is an excellent place to notify me of an error in a quiz question. Always identify the question by content (not the number) because the numbering changes with each round of the quiz.

**Projects:** Group project: I will break the class into groups of four to five students, and you will work together to create a wiki describing the development of scientific thought and knowledge in a topic related to course content. You are required to discuss the topic together (I will create a group discussion board for this), and present me with your topic and an outline of the content of the wiki at least one week before the group project is due. The structure of the wiki and the content are of your design, but must be appropriate for the content you have chosen. The rubric for grading the group project will be posted during the first week of class.

Midterm project: The midterm project is the first step in your final individual project. At the midpoint of the course, I expect each of you to have identified a topic for your final project *that is distinct from all of the group project topics*. Your midterm

project will be to write a short blog that identifies, describes, and defends your project topic, with at least three references to *peer reviewed* scientific articles. Note that although we won't yet have covered all the material in this class, you can consider problems from throughout the content of the course. You are also required to comment on at least three of your classmates' project descriptions. More detailed information and the rubric for grading the midterm project will be posted during the first week of the semester.

**Final project:** Using a format of your choosing (web page(s), mini documentary, written blog or term paper), describe a scientific process or problem that (1) is often misunderstood in the general public, (2) has a consensus opinion at least in basic principles among scientists, and (3) is important for society. After providing evidence for each of these three points, your project should then present a comprehensible explanation of the process. Be prepared to share your final product with the class, and to watch/read and comment upon at least half of the projects from classmates.

**Exams:** There will be two exams, a midterm and a comprehensive final. The exams will be a mixture of multiple-choice, short-answer, and essay questions that will allow me to ascertain your ability to solve problems and discuss biological processes.

### **Technical Help Resources**

Technical help can be obtained on-line Blackboard help

**For Blackboard telephone support,** call

UVM Computing Helpline:

**(802) 656-2604**

[helpline@uvm.edu](mailto:helpline@uvm.edu)

Academic hours: Mon - Fri, .....*Closed on UVM Holidays*

[test taking tips](#)

**Tentative Calendar** [note that the official calendar will be an .html document that has hot-links to the web sites for assigned readings, and will be divided into sixteen weeks of material that echoes the course materials entries on the Blackboard website]

<b>Dates</b>	<b>Module</b>	<b>Topic</b>	<b>Assignments</b>
Monday-Tuesday	I. Science as a way of understanding the world	What makes an hypothesis "testable"?	Read Chapter 1
		How is science self-correcting?	Read Chapter 3
Wednesday-Friday	II. Evolution: an introduction	The process of biological adaptation	Thursday: first paper - reflection on evolution through natural selection
		How do humans influence evolution?	on-line exam 1
Monday-Tuesday	III. Molecular genetics	The changing paradigms of molecular genetics	Read Chapter 6
		The molecular mechanisms of information control	
Wednesday-Thursday	IV. Energy capture and management	Photosynthesis and cellular respiration	
Friday	Wrap-up - evolution of molecular systems. Is there such a thing as a "selfish gene"?		on-line exam 2 Mid-term project due
Week 3	V. Cell Cycle Control		Group projects due end of this week
Week 4			Final projects due end of this week