

BIOLOGICAL SCIENCES 150, SECTION 401
FOUNDATIONS OF BIOLOGICAL SCIENCES I, SPRING 2023
LECTURES MEET IN LAPHAM 162 - MW 11:30AM - 12:45PM
LABORATORY MEETS IN LAPHAM S284

Foundations I (204-150) and Foundations II (204-152) form the introductory biology sequence for majors. Both courses are *required* for the Biological Sciences major and should be taken as soon as possible in your undergraduate career. Note that both 150 and 152 are prerequisites to many of our advanced courses. Credit for advanced courses is *not* possible without *first* taking both 150 and 152.

Please click on the web link below for UWM's covid-related policies for courses this semester.
<https://uwm.edu/cetl/wp-content/uploads/sites/128/2021/08/Syllabus-COVID-Statement.pdf>

PROFESSORS:

- Dr. Selvakumar Ramakrishnan (selvam@uwm.edu). Office: LAP N517. Office hours: Tue 11–12 or by appointment (Please contact by email)
- Dr. Emily Latch (latch@uwm.edu). Office: LAP N215. Office Hours: Mon 10-11 or by appointment (Please contact by email)

TEXT:

- Hillis, Sadava, Hill, and Price (2021) Principles of Life, 3rd edition, Sinauer Associates, Inc. ISBN: 9781319017712
- **Lab Manual** can be downloaded from your lab section's Canvas site. Also make sure to log into the UWM ecampus textbook website <https://uwm.ecampus.com/shop-by-course> and choose your respective lab section to order a **lab coat** for this course. You will need to use one when you are in the lab. You may use a lab coat you have purchased for another course.

LEARNING OBJECTIVES:

Scope and focus: This course provides an introduction to the fundamental principles of biology (molecular and cell biology, genetics, evolution, and ecology) integrated through an evolutionary framework. Lectures highlight key concepts and how they can be applied to the study of natural organisms. Laboratory exercises reinforce critical concepts from lecture and provide hands on learning of experimental methods for studying biological systems. Labs also teach students how to develop and test hypotheses, and how to analyze, graph and present their data.

This course addresses the following program objectives:

- 1) Describe and apply biological information and concepts to societal and ethical questions related to biology.
- 2) Apply the scientific method to questions, critically evaluate experimental design, and interpret numerical and graphical data used in professional research (for example, as published in peer reviewed journals).
- 3) Investigate scientific questions using diverse field and laboratory skills, including use of biological instrumentation and appropriate computer software.
- 4) Retrieve and process scientific information from library catalogs, literature search engines and computer databases.
- 5) Synthesize, integrate and effectively communicate scientific information both orally and in writing.
- 6) Demonstrate an understanding of molecular and cell biology, genetics, evolution, and ecology.

GRADING:

- **Lecture scores** (60% of total grade) are based on five equally weighted, non-cumulative exams covering lecture material. Exams are multiple choice.
- **Lab scores** (40% of total grade) will be based on attendance, written lab reports, lab manual question sheets and quizzes. See your lab section's syllabus for further grading details.

Grades will be assigned following the scale below:

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

This grade scale assumes a class average of no less than 75%. If necessary, class exam averages that fall below 75% will be adjusted to 75%, as will final course grades. The average grade in this course will be no less than a C.

LECTURE EXAM DATES (% TOTAL GRADE):

All Exams this semester will be taken in Canvas. Please see lecture schedule below when they will be posted and until what time each of these exams will be available. There will be no lecture on exam days; however, the lecture room (LAP162) will be open during class time and the professor will be in the room if you prefer to take the exam in the classroom (you will need to bring your own laptop) or if you have any questions.

| | | |
|------------------|--|-------|
| EXAM I: Feb 8 | <i>(covers lectures and readings from 1/23 through 2/6)</i> | (12%) |
| EXAM II: Mar 1 | <i>(covers lectures and readings from 2/13 through 2/27)</i> | (12%) |
| EXAM III: Mar 29 | <i>(covers lectures and readings from 3/6 through 3/27)</i> | (12%) |
| EXAM IV: Apr 19 | <i>(covers lectures and readings from 4/3 through 4/17)</i> | (12%) |
| EXAM V: May 17 | <i>(covers lectures and readings from 4/24 through 5/10)</i> | (12%) |

MISSED EXAMS AND LABS:

Make-up exams will only be given for **legitimate** reasons (illness, emergency, religious holiday), and must be documented. Except for extreme emergencies, notification of absence from an exam must be given *prior to* the exam date to avoid a grade of 0%. Make-up exams may not be the same as the ones taken by the rest of the class; they may be essay exams, oral exams or a combination of the two.

MISSED LABS CANNOT BE MADE UP.

TIME INVESTMENT:

On average, students should spend 48 hours per credit per semester on in-class activities and activities outside of the classroom (i.e., 192 hours for a 4-credit course). Class meets for 6 hours each week for a total of 90 hours over the 16-week semester. The exact breakdown of hours per week varies by week, but over the course of the semester we expect students to spend an additional 6-8 hours per week outside of class working on: reading assigned material (~2 hours per week), reviewing notes and protocols (~1 hour per week), maintaining a laboratory notebook (~1 hour per week), preparing lab reports (~1 hour per week), and studying for quizzes, exams and lab practicals (~2 hours per week).

PLEASE SEE UNIVERSITY AND DEPARTMENTAL POLICIES POSTED AFTER LECTURE SCHEDULE.

LECTURE SCHEDULE:

****Please note that while the syllabus follows the material in your textbook, additional material to add or supplement the information given in your textbook will be added to lectures when necessary and will be posted in Canvas.**

| Date | Topic | Readings |
|-------------------|---|-----------------|
| Mon, Jan 23 | Introduction, Scientific Method, Chemistry <i>Scope of biology and why is it important to understand how life exists and proliferates on earth? Hypothesis, falsification, and statistical analysis as the basis of scientific enquiry. Why do all living systems follow the laws of thermodynamics and why is water an essential ingredient for life?</i> | Chapter 1 |
| Wed, Jan 25 | Organic molecules: Lipids, Carbohydrates <i>Why is carbon the essential element around which all macromolecules are built and the importance of lipids and carbohydrates?</i> | Chapter 2 |
| Mon, Jan 30 | Organic molecules: Nucleic acids, Proteins <i>What is the origin of nucleic acids and proteins?</i> | Chapter 3 |
| Wed, Feb 1 | Cell structure and function <i>Why is the cell considered as the fundamental unit of life?</i> | Chapter 4 |
| Mon, Feb 6 | Cells, continued <i>Origin of eukaryotes and how do organelles form?</i> | Chapter 4 |
| Wed, Feb 8 | Exam I (available from 12:01am until 11:59pm) | |
| Mon, Feb 13 | Membranes and receptors <i>Why are structures important and how do cells communicate with each other?</i> | Chapter 4, 6 |
| Wed, Feb 15 | Membranes and receptors continued <i>How do pathogens such as SARV-COV2 enter our cells?</i> | Chapter 6 |
| Mon, Feb 20 | Origin of the Krebs cycle and Cellular Respiration <i>What role did glycolysis play in the early evolution of life and is the sun necessary for all life on earth? Can the Krebs cycle run in both directions?</i> | Chapter 5 |
| Wed, Feb 22 | Respiration, Fermentation and Chemosynthesis(continued) <i>How do cells obtain energy if they are incapable of photosynthesis?</i> | Chapter 5 |
| Mon, Feb 27 | Photosynthesis <i>How do photosynthetic organisms trap energy from the sun? Why is understanding the molecular basis of photosynthesis needed to understand the current climate change?</i> | Chapter 5 |
| Wed, Mar 1 | Exam II (available from 12:01am until 11:59pm) | |

| | | |
|--------------------|---|----------------|
| Mon, Mar 6 | Mendelian Genetics <i>How do organisms maintain variation and transmit genetic information from one generation to the next?</i> | Chapter 8 |
| Wed, Mar 8 | Mitosis and Meiosis, Cell cycle and Cancer <i>What is the difference between Mitosis and Meiosis and how does Meiosis explain Mendelian genetics? What is the role of cyclins, CDK, p53, p16 and other associated proteins in the cell cycle?</i> | Chapter 7 |
| Wed, Mar 13 | Structure of DNA and Replication <i>How does the structure of DNA render itself for replication?</i> | Chapter 9 |
| Mon, Mar 15 | Gene Expression, Transcription <i>Why are so few genes expressed in every cell of eukaryotes when all cells have the full complement of genes? How did molecular biologists design the current vaccines against covid-19, and why are they safe to take?</i> | Chapter 10, 11 |
| Mon, Mar 20 | Spring Break (NO CLASS) | |
| Wed, Mar 22 | Spring break (NO CLASS) | |
| Mon, Mar 27 | Regulation of Gene Expression, Genomes <i>How can individuals have similar genotypes yet drastically differ in their phenotypes? How do honeybees have morphologically distinct individuals within a colony? How can comparing entire genomes of different species help us uncover how they function and how they evolved?</i> | Chapter 11, 12 |
| Wed, Mar 29 | Exam III (available from 12:01am until 11:59pm) | |
| Mon, Apr 3 | Introduction to Darwin, Variation, and Evolution <i>Why is variation essential for evolution?</i> | Chapter 13 |
| Wed, Apr 5 | Mechanisms of Evolution: Selection <i>Why is natural selection an essential but not the only mechanism to explain evolution?</i> | Chapter 13 |
| Mon, Apr 10 | Mechanisms of Evolution: Population genetics <i>How do we quantify evolutionary change in populations? What conditions lead to evolutionary changes within and among populations?</i> | Chapter 13 |
| Wed, Apr 12 | Reproductive isolation and Speciation <i>Why is reproductive isolation essential for speciation and can it occur if there is no geographical isolation? How and why did life diverge into the numerous species we see today?</i> | Chapter 16 |
| Mon, Apr 17 | History of life on Earth <i>Why is understanding the fossil record essential to understand the origin of life? How have geological forces constrained the distribution of organisms in time and in geographical space?</i> | Chapter 17 |

| | | |
|--------------------|--|----------------|
| Wed, Apr 19 | Exam IV (available from 12:01am until 11:59pm) | |
| Mon, Apr 24 | Behavioral Ecology <i>How do individuals respond to their environment?</i> | Chapter 37 |
| Wed, Apr 26 | Population Ecology <i>How do populations grow exponentially until constrained by limiting factors? (Mathematical models)</i> | Chapter 39 |
| Mon, May 1 | Species Interactions <i>How do different species in an ecosystem interact and affect their population numbers?</i> | Chapter 40 |
| Wed, May 3 | Species and Community Ecology <i>Why are some species are considered keystone species and is there "balance of nature" in the natural world?</i> | Chapter 40, 41 |
| Mon, May 8 | Community Ecology and Succession <i>What is the importance of biodiversity? What is meant by stability in ecological communities? What kinds of plant communities are present in Wisconsin?</i> | Chapter 41 |
| Wed, May 10 | Climate change and Conservation biology <i>How does understanding "deep time" and biogeographical cycles explain current climate change patterns?</i> | Chapter 38, 42 |
| Wed, May 17 | Exam V (available 12:01am until 11:59pm) | |

****Exam 5 is held during final exam week. Please be sure to note the exam time on your calendar!****

All exams are multiple choice and will be online in Canvas and must be completed before the posted deadline. You will have one hour to complete each exam once you begin it.

UNIVERSITY AND DEPARTMENTAL POLICIES:

1. *Students with disabilities.* The Accessibility Resource Center at the University of Wisconsin Milwaukee is dedicated to providing equal access to students with disabilities in all academic, social, cultural and recreational programs. Please notify the Professor, and see this link: <http://uwm.edu/arc/>
2. *Religious observances.* Students who will miss class due to religious observances should make arrangements with the Professors or Lab TAs to make up missed work. <https://apps.uwm.edu/secu-policies/storage/other/SAAP%201-2.%20Accommodation%20of%20Religious%20Beliefs.pdf>
3. *Students called to active military duty.* If you are called to active military duty, please contact the Professors to make arrangements for accommodations for absences.

Students: <https://uwm.edu/onestop/students-called-to-active-duty/>

Employees: <https://www.wisconsin.edu/ohrwd/download/policies/ops/bn9.pdf>

4. *Incompletes.* A notation of "incomplete" may be given in lieu of a final grade to a student who has carried a subject successfully until the end of a semester but who, because of illness or other unusual and substantiated cause beyond the student's control, has been unable to take or complete the final examination or to complete some limited amount of term work.
<https://apps.uwm.edu/secu-policies/storage/other/SAAP%201-13.%20Incomplete%20Grades.pdf>
5. *Discriminatory conduct.* Discriminatory conduct will not be tolerated by the University. It poisons the work and learning environment of the University and threatens the careers, educational experience, and well-being of students, faculty, and staff. <https://apps.uwm.edu/secu-policies/storage/other/SAAP%205-1.%20Discriminatory%20Conduct%20Policy.pdf>
6. *Title IX/Sexual Violence.* Title IX is a federal law that prohibits sex discrimination in education program or activities, and UWM policy prohibits such conduct (see Discriminatory Conduct, above). This includes sexual violence, which may include sexual harassment, sexual assault, relationship violence, and/or stalking in all educational programs and education-related areas. UWM strongly encourages its students to report any instance of sex discrimination to UWM's Title IX Coordinator (titleix@uwm.edu). Whether or not a student wishes to report an incident of sexual violence, the Title IX Coordinator can connect students to resources at UWM and/or in the community including, but not limited to, victim advocacy, medical and counseling services, and/or law enforcement. For more information, please visit: <https://uwm.edu/sexual-assault/>.
7. *Academic misconduct.* Cheating on exams or plagiarism are violations of the academic honor code and carry severe sanctions, including failing a course or even suspension or dismissal from the University.
<https://uwm.edu/deanofstudents/academic-misconduct-2/>
8. *Complaint procedures.* Students may direct complaints to the head of the academic unit or department in which the complaint occurs. If the complaint allegedly violates a specific university policy, it may be directed to the head of the department or academic unit in which the complaint occurred or to the appropriate university office responsible for enforcing the policy. <https://apps.uwm.edu/secu-policies/storage/other/SAAP%205-1.%20Discriminatory%20Conduct%20Policy.pdf>

9. *Grade appeal procedures.* A student may appeal a grade on the grounds that it is based on a capricious or arbitrary decision of the course instructor. Such an appeal shall follow the established procedures adopted by the department, college, or school in which the course resides or in the case of graduate students, the Graduate School. These procedures are available in writing from the respective department chairperson or the Academic Dean of the College/School. <https://apps.uwm.edu/secu-policies/storage/other/SAAP%201-10.%20Grade%20Appeals%20by%20Students.pdf>
10. *LGBT+ resources.* Faculty and staff can find resources to support inclusivity of students who identify as LGBT+ in the learning environment. <http://uwm.edu/lgbtrc/>
11. *Smoke and Tobacco-Free campus.* UWM prohibits smoking and the use of tobacco on all campus property. <https://apps.uwm.edu/secu-policies/storage/other/SAAP%2010-8.%20Smoke%20and%20Tobacco-Free%20Campus%20Policy.pdf>
12. *Synchronous Online Class Recording*
Our class sessions will be audio-visually recorded for students who are unable to attend at the scheduled time. Students who participate with their camera engaged or who utilize a profile image are agreeing to have their audio/video or image recorded. Likewise, students who un-mute during class and participate orally are agreeing to have their voices recorded.
13. *Navigate Student Success Platform and Mobile App*
Students are encouraged to use a tool called Navigate. This tool can help you learn about academic resources, set up study groups in your courses, make appointments with your academic advisor, get reminders on important dates, and much more. In addition, Navigate allows instructors to send Progress Reports to students throughout the term, allowing for updates on your academic progress in a course in addition to your grade. You can log into the platform here: <https://uwmilwaukee.campus.eab.com/> or by finding the Navigate link under the Current Students tab on the [UWM home page](#). More information on how you can use Navigate and the app, including tutorials, can be found on [UWM's Navigate website](#).

Panther Community Health and Safety Standards: UWM has implemented health and safety protocols, taking into account recommendations by local, state, and national public health authorities, in response to the COVID-19 pandemic. As a member of our campus community, you are expected to abide by the Panther [Interim COVID-Related Health & Safety Policy](#), which was developed in accordance with public health guidelines. These standards apply to anyone who is physically present on campus, UWM grounds, or participating in a UWM-sponsored activity:

- UWM recommends that all individuals visiting UWM facilities wear face coverings while indoors.
- UWM recommends getting vaccinated for COVID-19 and getting the most recent booster shot available to you.
- UWM requires that you check daily for COVID-19 symptoms and not come to campus if you are feeling sick. If you are feeling sick, get tested for COVID-19 and quarantine until symptoms subside. Use the [CDC Quarantine and Isolation Calculator](#) to determine next steps.
- If you test positive for COVID-19, UWM requires that you self-report at the [Dean of Students Reporting Form](#). Use the [CDC Quarantine and Isolation Calculator](#) to determine next steps.

Additional details about student and employee expectations can be found on the [UWM COVID-19 webpage](#).

DEPARTMENT OF BIOLOGICAL SCIENCES MAJORS INFORMATION

UWM's Department of Biological Sciences is home to the study of diverse aspects of Biology and Life Sciences. There are several ways students can tailor their major to specific interests and career goals. First, there are two undergraduate majors - Biological Sciences and Microbiology. Within Biological Sciences, students can choose the General Biology option for a wide breadth of electives, or they may choose to specialize with either the Cell and Molecular Biology (CMB) or Ecology, Evolution and Behavior (EEB) options. The Department of Biological Sciences also contributes to the interdisciplinary major in Conservation and Environmental Sciences.

- The **Biological Science major, CMB option** is a popular for students who intend to go on to a professional life sciences program such as medical school, veterinary school, or dental school, and for students interested in forensic science and biotechnology. It is also the choice of students wishing to double major in Neuroscience.
- The **Biological Sciences major, EEB option** prepares students with the competitive skill sets they need to succeed in a wide variety of careers including biodiversity conservation, biotechnology, public health, natural resource management, environmental consulting, education (e.g., schools, museums, nature centers), government agencies, nonprofit programs, and graduate programs. The EEB option can be readily combined with a major in Conservation and Environmental Sciences.
- The **Biological Sciences major, General Biology option** provides broad course choices for students who find all areas of Biology exciting and want to explore diverse interests in multiple areas of study.
- The **Microbiology major** allows students to be on the cutting edge of developments in public health, industrial production processes, biotechnology, and drug discovery. The Microbiology major prepares students for a variety of careers in the fields of microbiology, virology, molecular biology, biotechnology, and health-related professions, for graduate studies in medical microbiology, industrial microbiology, environmental microbiology, microbial biotechnology, and molecular biology, and for professional studies in pharmacy, dentistry, and medicine.

A detailed listing of the requirements and recommended courses for the Biological Sciences majors can be found at <https://uwm.edu/biology/undergraduate/>.

Students may have entered UWM with an intended major, which is helpful for staying up-to-date on news, scholarship opportunities, and upcoming events. However, all students will have to officially **declare their major**, which you can do after completing this course (Bio Sci 150) with a C or better. Please see <https://uwm.edu/biology/undergraduate/declare-your-major/> for information about declaring your major. Once you declare your major, you will be connected with a Biological Sciences faculty member in your area of interest who will be able to help you with course selection and career planning.