

MITCHELL COLLEGE

Bi 143B: Fundamentals of Life Sciences

Fall 2001

4 Credits

Instructor: Dr. Victoria Brennan (Section A is taught by: Dr. Kimberly Blake, blake_k@mitchell.edu)

Office: BH 304

Office Hours: MW: 1:30-2:30PM; TTh: 10:30-11:30AM; F: 10-11AM; special appointments as necessary

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Lecture: Tuesdays, Thursdays 1:55-3:10PM BH202

Laboratory: Fridays 1:00-2:50PM BH205

Course description: Fundamentals of Life Science is an introductory course designed for non-science majors. This course will provide the student with the information necessary to understand the basic processes characteristic of all living things. Students will use the scientific method of observation to understand living systems. Emphasis is placed on the nature of life at the cellular and molecular level and includes an understanding of the functional and structural hierarchy from cell to organism. Genetics, evolution and ecology will also be discussed. The laboratory exercises will introduce students to the proper use of a microscope. They will involve experiments and demonstrations illustrating the topics covered during the lecture periods.

Prerequisites: None.

Text: Starr, C. (2000). Biology: Concepts and Applications, 4th edition. Stamford, CT: Brooks/Cole

Student learning objectives:

Students will:

- appreciate the unity and diversity of life
- describe the interdependencies among organisms
- explain the key points of the theory of evolution and the origin of life
- use the scientific method and the metric system
- explain how atoms and molecules interact in living systems
- describe the pH scale and its importance in living systems
- discuss the importance of water and its properties in living systems
- list the four major organic polymers, outline their formation from basic building blocks and describe their functions in living organisms
- explain the importance of ATP as a cellular energy form; describe its formation and uses
- outline the three insights which comprise the cell theory
- describe the differences and similarities between prokaryotic and eukaryotic cells/ plant and animal cells
- list the major cellular organelles and describe the functions of each
- explain how enzymes work in organismal and cellular metabolism
- describe the ways in which materials enter and leave cells
- explain the differences among isotonic, hypertonic and hypotonic solutions

- compare and contrast energy-yielding and energy-releasing mechanisms in living systems
- write the basic chemical equations for photosynthesis and cellular respiration
- outline mitosis and meiosis; explain the different processes for which each is important
- explain inheritance patterns with reference to the following genetic terms: gene, chromosome, genotype, phenotype, homozygous, heterozygous, dominant, recessive
- describe the structure of DNA and RNA
- explain the processes of DNA replication, RNA transcription and protein translation
- describe the results of genetic mutations
- describe the hierarchy of organization: cells-> tissues-> organs-> organ systems.
- identify the types of animal tissues and their functions.
- identify the structures of the integumentary, muscular and skeletal systems and their functions.
- identify the organs of the digestive system and explain the function of each
- identify the organs of the respiratory system and explain the function of each
- identify the organs of the circulatory system and explain the function of each
- identify the organs of the excretory system and explain the function of each
- identify the organs of the reproductive system and explain the function of each
- discuss the interactions of the organ systems in maintaining homeostasis
- explain the importance of a healthy life style in maintaining homeostasis
- discuss the impact of human civilization on the environment

Technology focus: Students will access the CD-ROM accompanying the text and the publisher's website for review activities, study aids and reference direction. They are required to use word-processing for preparation of their paper and project summaries. They also have access to Internet resources, the Biologyplace website as well as traditional library materials, for preparation of any homework assignments. Videos will be used to complement some lectures and laboratory activities.

Course Requirements:

Paper, Service Learning Project, Lab Reports/Assignments, Lecture Homework, Three exams (multiple choice/short answer & take-home essay questions) and a Take-home, Essay Final Exam.

***Students are encouraged to discuss essay questions with each other. These questions will require critical thinking and the ability to integrate the knowledge you have obtained on the various topics covered during the course.**

***See Lecture, Laboratory and Service Learning Schedules for assignment information.**

Instructional Strategies:

Lecture
 Discussion/Questioning
 Viewing/Listening/Answering
 Problem Finding/Solving
 Data Collection
 Discovery
 Collaborative Learning Groups Laboratory
 Simulation
 Independent Learning
 Field Trips
 Computer Applications

Grading:

Homework:	Extra credit points (see lecture schedule)
Exams 1,2,3:	40%
Paper:	15%
Final Exam:	10%
Lab Grade:	15%
Service Learning Assignments:	20%

*** See Lecture Schedule, Laboratory Schedule and Service Learning Schedule for other information regarding grades.**

***Important Dates:**

Add/Drop ends: 9/10

5 week grades: 10/5; 10 week grades: 11/9; Last day of classes: 12/14

No Classes: 10/8 & 10/9; Thanksgiving Break (no classes): 11/19-11/25

Last day to withdraw: 11/16

Attendance: Class attendance is expected and necessary for fully understanding the material covered in this course. Each absence (including tardiness by more than 10 minutes and early departure), without a legitimate, documented excuse, will result in a decrease, by 1 point, of your grade average in this course. See the Laboratory Schedule for the lab attendance policy.

Academic Honesty: Any individual assignments or papers which are plagiarized will receive a grade of zero.

COURSE CONTENT:

Bi143 Fundamentals of Life Sciences LectureSchedule,Fall2001

<u>Dates</u>	<u>Topics</u>	<u>Text chapters</u>
9/4 – 10/11	Course Introduction	
	Methods & Concepts in Biology	1
	Chemical Foundations for Cells	2, 3
	Origin & Evolution of Life	19
	Cell Structure & Function	4
	Metabolism	5
	Energy-Acquiring Pathways	6
	Energy-Releasing Pathways	7
10/11 – 11/8	Cell Reproduction (Mitosis/Meiosis)	8, 9
	Inheritance	10
	Chromosomes & Human Genetics	11
	DNA Structure & Function	12
	DNA to Protein	13
	Bacteria & Viruses	20
11/8 – 12/4	Animal Tissues	28
	Skin, Skeleton & Muscles	32
	Digestion	36
	Circulation	33
	Respiration	35
12/4 – 12/13	The Internal Environment	37
	Reproduction	38
	Human Impact on the Biosphere	43

HOMEWORK ASSIGNMENTS

- The text should be read before and after a topic is covered in class.
- Three sets of questions will be assigned as homework before each of the three exams. These homework assignments will correspond to specific text chapters. Extra credit points will be added to exam grades based on the results of these assignments:
 - +5 pts. (90-100)
 - +4 pts. (80-89)
 - +3 pts. (70-79)
 - +2 pts. (60-69)
 - +1 pt. (50-59)
 - +0 pts. (below 50)
 - -2 pts. (Homework not handed in ON TIME)

EXAM#1: 10/2 EXAM#2: 11/6 EXAM#3: 12/11

Only one makeup exam will be allowed. I must be notified BEFORE the exam. The exam must be taken by the next scheduled class period.

Bi 143 Fundamentals of Life Sciences Laboratory Schedule, Fall 2001

<u>Week of:</u>	<u>Topic</u>
9/10	Field Trip to Mitchell Woods: Examination of Biological Diversity & Collection of Pond Water Samples (for Microscopy Lab)
9/17	Measurement; Microscopy (Examination of Pond Water Samples); Cell Structure & Function
9/24	Diffusion & Osmosis; Service Learning Project
10/1	Enzymes; Service Learning Project
10/8	No Labs (Some lecture time will be devoted to the Service Learning Project)
10/15	Photosynthesis (Design your own experiment)
10/22	Mitosis & Meiosis; Service Learning Project
10/29	Genetics Exercise; Genetics Problems; Service Learning Project
11/5	Animal Tissues; Research for Paper
11/12	Skeleton; Research for Paper
11/19	Examination of Domestic Fowl Anatomy!!! (No Labs)
11/26	Mammalian External Anatomy; Research for Paper
12/3	Fetal Pig Dissection, Part I (Digestive, Respiratory & Circulatory Systems)
12/10	Fetal Pig Dissection, Part II (Urinary & Reproductive Systems)

Grading will generally be done in the form of lab reports, which are due at the **next scheduled lab period**. Late lab reports will lose 10 points from the final laboratory grade and will NOT be accepted once graded reports are returned to students. Some labs will require a lab quiz in place of a report. The lowest lab grade will be dropped.

Attendance: Missed labs will result in a zero for the lab report grade. Labs may only be switched with advance permission of the instructor.

SERVICE LEARNING ASSIGNMENTS:

- 1.) **Students will keep a notebook containing research and notes taken during group discussions and activities. The notebooks will periodically be collected by the instructor.**
- 2.) Students will be responsible for their own papers.
- 3.) Students will visit Mitchell Woods. A Service Learning Project associated with The Mitchell Woods Nature Trail will be described in outline form and approved by the instructor.
- 4.) Students will work individually or in small groups to complete the project. Some lab time will be devoted to these projects.
- 5.) Students will report to the class on their Mitchell Woods Project.

Service Learning Grade:

- Notebook (20%)
- Attendance (10%)
- Report to class (10%)
- Outline (10%)
- Project (50%)

Dates:

- Notebook Collection: Will be announced.
- Project & Outline Approval: **10/2**
- Project Due: **11/16**
- Report to the class: Will be announced.
- Paper topic approved: **10/26**
- Paper outline due (questions answered): **11/30**
- Pre-submit (optional): **11/30**
- Paper due: **12/7**

SERVICE LEARNING PROJECTS

- 1.) Complete the identification of tree species along the Nature Trail (including completion of leaf collection).
- 2.) Complete Butterfly Garden.
- 3.) Update Nature Trail brochure with map.
- 4.) Identify and research mammals/birds/or insects of Mitchell Woods.
- 5.) Create a website for The Mitchell Woods Nature Trail.
- 6.) Create and implement a plan to promote the Nature Trail.
- 7.) Produce time-lapse photographs of Mitchell Woods showing changes (day/night; seasons; weather).
- 8.) Map different areas of the trail for soil-type, sun/shade, temperature, pH etc.
- 9.) Create a weather station in the woods.
- 10.) Preserve and identify flowering plants along the trail.
- 11.) Create a forensic science activity involving the different Mitchell campus (outdoor) environments.
- 12.) Research and photograph tadpole development in Mitchell Pond.
- 13.) Identify and research organisms at Mitchell Beach.
- 14.) Develop Fall/Winter science activities for young children involving Mitchell Woods.
- 15.) Erect different types (heights; types of food etc.) of permanent bird feeders in Mitchell Woods and identify the birds using them.

Service Learning Paper:

1.) You will work in a small group to research and discuss an environmental or life science related issue. Time will be scheduled during the lab sessions for this purpose. The following questions should be answered:

- What issue have you chosen?
- What scientists/government agencies/environmental groups are involved with this issue?
- Describe the issue and the scientific concepts behind it (include statistical data if possible).
- What concepts have you studied in Bi143 that relate to this issue?
- What are the consequences of this issue?
- How can the problem be solved or alleviated?
- Who should be working to solve the problem (i.e. governments, private industry, citizens)?
- Are there groups with different opinions about this issue? What do they think?
- Discuss your personal opinion of the issue and how you believe the problem should be alleviated.
- How can projects like The Mitchell Woods Nature Trail help to improve our environment? What do you see as the purpose of this project?

Each member of the group will write his/her own paper based on the group research and discussions.

Service Learning Paper Structure:

1) *Choose* a topic related to issues of current concern – environmental, biotechnology (genetic engineering, stem cell research cloning), medical, to name a few. You may already have a particular interest; if not, consult local newspapers, magazines or, with caution, Internet sources. Your reference sources must be **real news articles**; avoid topics from on-line encyclopedias, indexes or product advertisements. Since the topic **MUST BE APPROVED BY THE INSTRUCTOR** prior to starting the paper, make certain that the above criteria are met before submitting your topic for instructor approval. I'll only return it to you for resubmission and you'll be behind schedule for your writing.

2) *Collect* reference materials and *create* an outline for the paper you plan to write. Address the questions on the accompanying sheet. Submit your notebook containing this outline and a list of **a minimum of four references by the assigned date.**

3) *Write* a rough draft, using information gained from the reference materials and inserting your own reaction where appropriate, using the following format:

- a) Cover page with your own name, the names of your group members, date and paper title
- b) Two to four pages of text, double-spaced, font size 12, one-inch margins on all sides
- c) References cited page
- d) Copies of the reference materials used
- e) Submit the paper in both paper and digital format so that your instructor can make comments directly on your paper and also check for originality.

- 4) *Be original.* **USE YOUR OWN WORDS**. Remember, I have access to these references and I want to be sure you understand what you've read. You also need to be original and honest. Refer to the section in the student handbook regarding plagiarism.
- 5) With your "paper partner", a classmate, *proofread* one another's drafts. Keeping constructive criticism in mind, note any typos, spelling or grammatical errors. In order to have time to exchange papers, you'll need to avoid waiting until the night before the paper is due. Plan accordingly. Forms for this review will be available closer to the review due date.
- 6) *Correct* any typos, grammar or spelling errors and submit a final draft. If you submit your paper by the pre-submission date, I'll review the draft, make a note of any errors remaining and ask you to revise and resubmit as necessary. Careful work with your partner may eliminate this next step!! Note that only papers submitted by the pre-submission date will receive this extra review and the chance to revise before a final grade is applied.
- 7) Late papers will lose 10 points. No papers will be accepted once graded papers are returned to students.