MIDDLESEX COUNTY COLLEGE
EDISON, NEW JERSEY
DEPARTMENT OF NATURAL SCIENCES

Course ID and Name: BIO 135: Concepts of Biology

Department: Department of Natural Sciences

Chairperson: Dr. Donna Howell
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Prerequisites: None

Co-requisites: None

Course Description:

A survey of principles and concepts in biological sciences. The topics include the scientific method, evolution, the cell theory, genetics and applications of biotechnology and the human body. The ethical issues emerging from advances in sciences will be emphasized throughout the course using relevant case studies and current news articles.

Recommended for students in the non-Science majors.

General Education Status: Science

Credits: 3 **Lecture Hours:** 2 **Lab Hours:** 2

Learning Outcomes:

Upon successful completion of this course, students will be able to:

1. Identify important anatomical structures and functions of cells and tissues, and of the Circulatory, Respiratory, Nervous and Reproductive Systems and Special Senses.

2. Demonstrate understanding of structural and functional interrelationship of different systems of the body particularly homeostasis and biological feedback mechanisms.

3. Understand how scientific method is applied to gain knowledge about functions of human organ systems.

4. Comprehend and use appropriate vocabulary specific to anatomy and physiology.

Course Requirements:

Students are encouraged to attend every lecture and laboratory session. Lecture performance is evaluated by exams, homework assignments, and quizzes. Laboratory performance is measured by practical examinations, laboratory reports, and quizzes.

GRADING STANDARD:

Upon completion of the course, grades will be assigned as follows:

Lecture quizzes: 10%
Lecture assignments: 10%
Lecture exams: 30%
Lecture discussions: 10%
Lab quizzes: 20%
Lab assignments: 20 %

Textbooks for Course:

Author	Title	Publisher	Copyright
Fowler, S. et. Al.	Concepts of Biology	Openstax	Creative Commons Attribution License v.4. 2019

Lecture Outline

Module I. Cell Theory and Genetics

Chapter 1. Introduction to Biology
- 1.1 Themes and Concepts of Biology
- 1.2 The process of Science
- 1.3 The Scientific Method
- 1.4 Evolution

Chapter 3. Cell Structure and Function
- 3.1 How cells are studied
- 3.2 Comparing Prokaryotic and Eukaryotic Cells
- 3.3 Eukaryotic Cells
- 3.4 The Cell Membrane

Chapter 6. Reproduction at the Cellular Level
- 6.1 The Genome
- 6.2 The Cell Cycle
- 6.3 Cancer

Chapter 7. The Cellular Basis of Inheritance
- 7.1 Sexual Reproduction
- 7.2 Meiosis

Chapter 8. Patterns of Inheritance
- 8.1 Mendel's Experiments
- 8.2 Laws of Inheritance

Module II. Biotechnology and Society

Chapter 9. Molecular Biology
- 9.1 The Structure of DNA
- 9.2 DNA Replication
- 9.3 Transcription
- 9.4 Translation

Chapter 10. Biotechnology
- 10.1 Cloning and Genetic Engineering
- 10.2 Biotechnology in Medicine

Module III. Animal Structure and Function

Chapter 16. The Body's Systems
- 16.1 Homeostasis and Osmoregulation
- 16.3 Circulatory and Respiratory Systems
- 16.6 Nervous System

Chapter 18. Animal Reproduction and Development
- 18.1 How Animals Reproduce
- 18.2 Development and Organogenesis
- 18.3 Human Reproduction

LABORATORY SCHEDULE

Week	Description

1. **Introduction and Lab Safety; Scientific Method:** Students will learn the steps of the scientific method by designing an experiment based on their hypotheses. They will perform the experiment, collect and analyze data, and draw conclusions. They will also learn to differentiate between qualitative and quantitative data.
2. **Introduction to Microscopy; Eukaryotic Cell Structure and Function:** Students will be introduced to various forms of microscopy, and trained to use the light microscope (both compound and stereo microscopy). Using prepared and stained slides of various protists and histology of animal tissues, students will learn the structure and function of the eukaryotic cell and its organelles.
3. **Cell Cycle: Mitosis and Meiosis:** Students will learn that the purpose of mitosis is to make copies of cells for cell regeneration, growth, and asexual reproduction, while the purpose of meiosis is the production of gametes for sexual reproduction. Students will also learn about stem cells and stem cell therapy.
4. **Human Skin Color, Evidence for evolution:** Using the latest research data on the evolution of skin color in humans, students will further practice formulating hypotheses and interpreting the

graphical data. They will also have an opportunity to test their original hypotheses with a skin tone detector and use their classmates as test subjects.

5. **Scientific Method: Tuskegee Study**: Students will discuss the lessons learned from the Tuskegee study, the rights of research subjects and ethical issues such as informed consent, safety of patient's' medical data, personalized genetic testing and ownership of DNA information.
6. **Genes in Human Population:** Students will learn about the following terms: genotype, phenotype, genome, alleles, homozygous, heterozygous, autosomal and sex-linked traits. Using various physical features such as PTC tasting, hitch hiker's thumb, Cow lick, etc. they will practice calculating the probability of inheritance of these traits.
7. **Midterm Lecture Exam**
8. **Term project:** Students will submit a written paper and prepare a brief presentation on a topic relating to bioethical issue. The selection of the topic will be in consultation and with the approval of the instructor.
9. **Plasma Membrane, Cell Transport: Diffusion and Osmosis**: student will understand what happens to a cell when it is put into a hypotonic and hypertonic solution and why water moves across the cell membrane. They will continue to practice formulating a hypotheses and designing an experiment to further explore the cell transport mechanisms.
10. **Circulatory and Respiratory Systems: Anatomy and Physiology**: Students will learn about various parts of the heart and organs involved in the respiratory system. They will continue to hone their skills in formulating a hypotheses and perform an experiment to study the effect of exercise on heart rate and blood pressure.
11. **Blood Typing and Infectious Disease Transmission (HIV):** Students will learn about ABO blood groups, use a blood-typing simulator kit to see how blood is typed and transfused safely. Students will simulate a clinical test for HIV. They will apply their knowledge from genetics and explain the inheritance of the ABO blood groups.
12. **Nervous System: anatomy and Physiology**: Students will learn about the various parts of the brain and spinal cord. Students will formulate a hypotheses and perform experiments to investigate reaction time and nervous system reflexes.
13. **Special Senses in Humans**: Students will learn about the structure and function of various parts of the human eye and ear. They will perform experiments to learn about accommodation, field of vision, blind spot, etc.
14. **Final Exam**