

COURSE TITLE: Cell Biology
COURSE NUMBER: BIO 222
CREDIT HOURS: 3 credit hours – 4 contact hours
DEPARTMENT: Science and Technology

COURSE DESCRIPTION

This course is designed to provide students with an intensive study of cell structure and function. A wide range of topics will be covered and will include: Cell biochemistry, membrane structure and function, organelle structure and function, cell cycle and apoptosis, and cell signalling. Students will be exposed to the current scientific literature relating to research in cell biology and will lead discussions on topics related to cell structure and function.

The course will consist of lecture and discussion. Students will be required to lead discussions on selected topics and research papers. In addition, students will complete research projects that will be presented to the class for discussion.

GOALS AND OBJECTIVES

The course is intended to provide students with:

- Comprehensive information in the field of cell biology
- The ability to critically evaluate scientific literature in field of cell biology
- The skills necessary to lead discussions and present scientific information
- An understanding of the current methods in cell biology research
- Insights into the applications of cell biology in the field of biotechnology

MATERIALS

Becker, Wayne, Kleinsmith, L, Hardin, J. *The World of the Cell*. (5th ed.). Benjamin Cummings, 2003.

Biology Labs On-Line: Cell Version © 2002 California State University and Benjamin Cummings, an imprint of Pearson Education, Inc 0-8053-4865-4

LEARNING OUTCOMES

Writing:	Student research papers in selected topics
Oral Communication:	Student presentations of selected research papers
Reading:	Text and journal articles
Mathematics:	Problems in quantitative cell biology techniques
Problem-solving:	Text chapter questions and problems
Computer literacy:	Interactive CD-ROM, word processing, internet
Ethics and values:	Class discussions on the ethics of tissue engineering
Global concerns:	Applied techniques (medicine, tissue engineering)
Information resources:	Research (journal discussions and internet)

METHOD OF INSTRUCTION

Lecture

Class discussions (selected papers and topics)

Computer simulations of cell function (interactive CD-ROM)

Virtual Laboratory activities

Student presentations of selected topics

Library research (journal and internet)

METHODS OF EVALUATION

Students will be evaluated in the following areas

- Exams and quizzes
- Written papers in selected topics
- Problem solving (reading questions and problems)
- Laboratory write-ups.
- Oral presentations and leading discussions
- Participation

COURSE SCHEDULE

- I. Introduction to Cell Biology
 - A. History and discovery
 - B. Microscopy
 - C. Basic cell structure
 - D. Cell diversity
- II. Cell chemistry
 - A. Inorganic cell chemistry
 - B. Chemical bonds
 - C. Organic molecules and cell chemistry
 - D. Ions and membrane potential
- III. Cell energetics
 - A. Enzyme reactions and activated carrier molecules
 - B. Reaction energetics
 - C. Glycolysis and fermentation
 - D. Citric Acid Cycle
 - E. Electron Transport Chain
- IV. Protein structure and function
 - A. Protein structure and shape
 - B. Protein-protein interactions
 - C. Role of proteins in cell function
- V. DNA and genetics

- A. DNA Structure and function
 - B. DNA replication and repair
 - C. Transcription and transcription factors.
 - D. Post transcriptional modifications
 - E. Translation
- VI. Membrane structure and function
- A. Lipid bilayer chemistry
 - B. Membrane proteins
 - 1. Carrier proteins
 - 2. Ion channels
 - C. Membrane potential
 - D. Action potential
- VII. Intracellular compartments and protein transport
- A. Membrane bound organelles
 - B. Protein sorting
 - C. Vesicular transport and membrane fusion
 - D. Secretory Pathways
 - E. Endocytic pathways
- VIII. Cell signalling
- A. Principles of cell signalling
 - B. G-protein linked receptors
 - C. Enzyme linked receptors
 - D. Adhesion proteins and extracellular matrix
- IX. The cell cycle
- A. Overview of the cell cycle
 - B. Cell cycle control system
 - C. Control of cell numbers
 - D. Cell cycle and cancer
 - E. Apoptosis
- X. Tissues
- A. The extracellular matrix
 - B. Epithelial tissues and cell-cell junctions
 - C. Tissue maintenance, repair and renewal
 - D. Tissue development
 - E. Tissue engineering and biotechnology