University of Houston-Downtown

Course Prefix, Number, and Title: BIOL 1301: General Biology I

Credits/Lecture/Lab Hours: 3/3/0

Foundational Component Area: Life and Physical Sciences

Prerequisites: Credit or enrollment in MATH 1301, ENG 1301 and BIOL 1101.
Co-requisites: None

Course Description: A survey of current biological concepts for students majoring in the sciences. Emphasis will be placed on biological molecules, cellular metabolism, cell division, heredity and the regulation of genes.

TCCNS Number: BIOL 1306

Demonstration of Core Objectives within the Course:

Assigned Core Objective	Learning Outcome Students will be able to:	Instructional strategy or content used to achieve the outcome	Method by which students' mastery of this outcome will be evaluated
Critical Thinking Empirical & Quantitative Reasoning	Utilize scientific processes to identify questions pertaining to natural phenomena.	Students will receive didactic and interactive instructions on topics such as cellular respiration, membrane structure and function, cell cycle, meiosis, Mendelian genetic, replication, transcription and translation. For example: An activity involving students to explain electron transport chain (details of activity provided separately)	Students will be assessed by exams, quizzes and homework assignments. Questions will be designed to test their ability to recall, understand, apply, analyze, evaluate and synthesize the information on various topics listed in content section. Students will be graded on their ability to give correct answers to both multiple choice and short answer questions.
Critical Thinking Empirical & Quantitative Reasoning	Utilize scientific processes to develop hypotheses, collect and analyze data using quantitative and qualitative measures.	In the co-requisite lab students will: a). Receive instruction on, and practice with data analysis (quantitative, qualitative & graphical). b). Review the scientific method & elements of sound experimental design. c.) Generate hypotheses on various topics such as; (i) what is the optimal pH, temperature or	a). Students will accurately interpret scientific data (figures, graphs, tables, etc…) in one concise paragraph or during exercises using an Immediate Feedback Assessment Technique (IF-AT) (see Appendices) b). Students will participate in interactive in-class activities (i.e. Home Group/Expert Group Jigsaw strategy) to correctly interpret hypothetical data, form possible

		substrate for Catalase? (ii) what part of white light is used in photosynthesis? d.) Students will test their hypothesis by designing experiment, performing experiment, collecting and analyzing data	hypotheses, and plan potential experiments. Performance will be assessed with activity worksheets, IF-AT sheets (see Appendices), and/or clicker technology. c.) Students will be required to maintain a laboratory notebook and record all the experiments including hypothesis, experimental design, results and conclusion. Assessment will include grading of lab note-books and lab reports in terms of their quality, completion, recorded data and correct data analysis.
Critical Thinking Empirical & Quantitative Reasoning Communication	Utilize scientific processes to effectively communicate the analysis and results using written, oral and visual communication.	Students will communicate the data collected in lab via oral presentation. Students will presents various difficult concepts such as (cellular respiration, photosynthesis, cell division, DNA replication, Translation) as poster in lecture class.	The poster and oral presentations will be assessed using a rubric which will include evaluation of both scientific information, visual and oral communication skills.
Teamwork	Collaborate in the evaluation of the quality of scientific evidence from multiple perspectives toward the goal of reaching a shared objective.	Students will work in groups on multiple occasions such as (i) Performing experiments in lab (ii) Problem solving via in-class group discussions (iii) On-line discussion forums During group lab experiments students will have to work together to collect consistent and reliable data (as determined by the faculty). With in-class group discussions or on-line discussion forums students will need to communicate in a professional manner to solve problems or get feedback on discussion groups on related course material.	The level of individual's engagement and participation will be assessed. in-class exercises using Immediate Feedback Assessment Technique sheets or clicker technology. Participation points will be given based on attendance and level of engagement in activities as measured by the number of correct answers in-class activities (above).

Additional Course Outcomes:

Lecture:

Students will be able to:

- Identify and illustrate the unifying themes of biology
- Identify the components of the methodology of scientific investigation
- Diagram the atom and differentiate between its component parts
- Identify types of chemical bonds and determine what types of bonds can be formed by atoms based on their chemical makeup
- Discuss the characteristics of water
- Classify solutions with regard to pH
- Recognize the major types of organic compounds and functional groups
- Demonstrate the synthesis and breakdown of polymers and recognize the types of polymers unique to living things
- Characterize the component parts of prokaryotic and eukaryotic cells and relate the function and structure of each
- Describe cell membranes with regard to chemical makeup, organization, and permeability
- Classify mechanisms of transport as either passive or active and identify types of each
- Identify catalyzed reactions as either exergonic or endergonic using numerical data provided or by interpreting a graph representing the reaction
- List or describe characteristics of enzymes and describe types of enzymatic inhibition
- Describe feedback inhibition with regard to allosteric enzymes
- Know the beginning and end products and energy harvest of the catabolic pathways studied and the mechanism of ATP synthesis
- Know the makeup and function of the photosynthetic light reactions and their products
- Describe the Calvin cycle with regard to its components, products, regeneration and energy cost
- Differentiate between C3, C4 and CAM plants
- Characterize the component stages of mitosis and meiosis and know the differences between each type of cell division with regard to events occurring during each stage, number of cells produced and ploidy number
- Know the four different life-cycle strategies seen in the living world
- Solve monohybrid and dihybrid genetic crosses
- State the laws of segregation and independent assortment
- Know the difference between interactions between alleles, between genes, and the effect of environment on phenotype
- Know the patterns of inheritance with regard to sex-linked traits and the effects of X inactivation on phenotype
- Recognize the important experiments leading to proof of DNA as the hereditary material
- Describe DNA replication, transcription of m RNA, and translation of the genetic code into protein

Lab:

- Learn and be able to make conversions between English and Metric measuring systems
- Be able to write into or convert from scientific notation, multiple and divide using scientific notation, and create and appropriately label graphs

- Be able to use laboratory equipment to make scientific measurements
- Be able to identify acids, bases, and buffers from their physical and chemical properties
- Learn to identify the classes of macromolecules and their components using various test reagents
- Learn the parts of the microscope, how it works, how to compute magnification, and how to use it
- Describe the action of enzymes utilized, their substrates and products, and factors that affect enzyme function
- Be able to describe and identify the processes of diffusion and osmosis from experiments performed
- Be able to give the chemical equation for respiration and photosynthesis, and demonstrate their action by interpretation of lab results of various chemical tests performed
- Describe and identify the stages of mitosis; know the difference between mitosis and meiosis and the purpose of each; describe the chemical and physical make-up of chromosomes
- Be able to work genetics problems using both monohybrid and dihybrid crosses; evaluate dihybrid crosses utilizing chi-square analysis

Course Outline:

Lecture:

- Introduction to Course; Intro.
- Themes in Study of Life
- Chemistry of Life
- Water and Life
- Carbon and Molecular Diversity
- Structure & Function of Macromolecules
- Tour of the cell
- Membrane Structure & transport
- Introduction to metabolism
- Cellular respiration and Fermentation
- Photosynthesis
- Cell Cycle
- Meiosis
- Mendel's and gene Idea
- Chromosomal Inheritance
- Molecular Basis of Inheritance
- From gene to protein
- Poster Presentations

Lecture: Grading/Course Content which Demonstrates Student Achievement of Core Objectives

Course Grade ***A: 90-100*** ***B: 80-89*** ***C: 70-79*** ***D: 60-69*** ***F: 0-59***

Activity	Percent of Final Grade
Exam 1	12.5%
Exam 2	12.5%
Exam 3	12.5%
Exam 4	12.5%
Final	20%
Assignment/Quizzes	20%
Poster Presentation	10%

Lab: Grading/Course Content which Demonstrates Student Achievement of Core Objectives

Course Grade ***A: 90-100*** ***B: 80-89*** ***C: 70-79*** ***D: 60-69*** ***F: 0-59***

Summary of Course Exams, Quizzes, Activities, and Final	
Quizzes	18%
Pre-lab Homework Exercises	12%
Midterm Exam	20%
Final Exam	20%
Oral Presentation	10%
Discussion/Participation	10%
Lab Notebook	10%