El Camino College
COURSE OUTLINE OF RECORD – Approved

I. GENERAL COURSE INFORMATION

Subject and Number: **Biology 102H**
Descriptive Title: **Honors Principles of Biology II**
Course Disciplines: **Biological Sciences**
Division: **Natural Sciences**

Catalog Description:
This honors course, intended for students in the Honors Transfer Program, offers a detailed study of eukaryotic cell anatomy, metabolism, and division, including the study of Mendelian genetics and the molecular genetics of eukaryotes. Prokaryotic cellular structure (eubacteria and archaea), microbial genetics, and viruses are also studied. The scientific method is discussed in the lecture component and students implement elements of the process in various laboratory exercises. This course is one of three courses in the biology series designed for biology majors, including those students planning to pursue a career in medicine, dentistry, or other life sciences. This course is enriched through extensive rigorous reading, writing, and research assignments.

Note: Students may take either Biology 102 or Biology 102H. Duplicate credit will not be awarded for Biology 102 and Biology 102H.

Conditions of Enrollment:
Prerequisite: Chemistry 1A with a minimum grade of C or equivalent
Recommended Preparation: eligibility for English 1A or English 1AH

Course Length: **X Full Term Other (Specify number of weeks):**
Hours Lecture: **3.00 hours per week TBA**
Hours Laboratory: **6.00 hours per week TBA**
Course Units: **5.00**

Grading Method: **Letter**
Credit Status: **Associate Degree Credit**

Transfer CSU: **X Effective Date: 12/19/2016**
Transfer UC: **X Effective Date: Proposed**

General Education:
El Camino College:
1 – Natural Sciences
Term: Fall 2017 Other:
CSU GE:
B2 - Life Science
Term: Fall 2017 Other: Proposed
B3 - Laboratory Sciences
Term: Fall 2017 Other: Proposed
IGETC:
5B - Biological Science with a Lab
Term: Fall 2017 Other: Proposed
5C - Science Laboratory
Term: Fall 2017 Other: Proposed

II. OUTCOMES AND OBJECTIVES

A. COURSE STUDENT LEARNING OUTCOMES (The course student learning outcomes are listed below, along with a representative assessment method for each. Student learning outcomes are not subject to review, revision or approval by the College Curriculum Committee)

1. The student will understand and apply principles of the scientific method and recognize an idea based on reproducible evidence. For Honors students, an in-class presentation or additional report on a laboratory exercise will be required.
2. The student will be able to use the compound and dissecting to observe cells and microorganisms.
3. The student will be able to describe key activities in cell replication.

The above SLOs were the most recent available SLOs at the time of course review. For the most current SLO statements, visit the El Camino College SLO webpage at http://www.elcamino.edu/academics/slo/.

B. Course Student Learning Objectives (The major learning objective for students enrolled in this course are listed below, along with a representative assessment method for each)

1. Identify the characteristics of living things and distinguish between organisms classified within the six kingdoms of living things.
   Objective Exams

2. Apply the principles of the scientific method to experimental cases.
   Objective Exams

3. Distinguish between the major types of biologically significant polymers.
   Essay Exams

4. Recognize and provide examples of the classes of amino acids and various types of polysaccharides and lipids.
   Objective Exams

5. Relate cellular structures with their functions.
   Objective Exams

6. Describe membrane structure and the various modes of transport across the membrane.
   Essay Exams

7. Utilize a compound light microscope.
   Laboratory Reports

8. Estimate the size of cells viewed with the compound microscope.
   Other Exams

9. Identify the various mechanisms of cell signaling.
   Objective Exams

10. Recognize the phases of mitosis using the compound microscope.
    Other Exams

11. Compare and contrast the processes of mitosis and meiosis.
    Essay Exams

12. Apply Mendel's Model of Heredity to predict outcomes of genetic crosses.
Objective Exams

13. Describe the structure of DNA and its replication process.
Essay Exams

14. Explain in detail the processes of transcription and translation in cells.
Essay Exams

15. Utilize restriction enzymes and gel electrophoresis.
Laboratory Reports

16. Evaluate the suitability of agarose gel electrophoresis for DNA fragment separation.
Laboratory Reports

17. Compose a laboratory report with the following elements (or variations thereof): Title, Abstract, Introduction, Materials and Methods, Results, Discussion, and References.
Term or Other Papers

18. Identify genetic abnormalities caused by nondisjunction and gene mutation.
Objective Exams

19. Describe mechanisms for controlling gene expression in prokaryotic and eukaryotic cells.
Essay Exams

20. Demonstrate aseptic technique, the Gram stain, and endospore staining procedures.
Other Exams

21. Compare and contrast the lytic and lysogenic cycles of viruses.
Essay Exams

22. Describe the characteristics of significant bacterial groups.
Objective Exams

23. Explain the effects that prokaryotes have on the environment.
Objective Exams

24. Explain the role of enzymes in cellular metabolism.
Objective Exams

25. Describe catabolic (glycolysis and cellular respiration) and anabolic (photosynthesis) pathways and relate them to organismal function and bioenergetics.
Objective exams

III. OUTLINE OF SUBJECT MATTER (Topics are detailed enough to enable a qualified instructor to determine the major areas that should be covered as well as ensure consistency from instructor to instructor and semester to semester.)

Lecture or Lab	Approximate Hours	Topic Number	Major Topic
Lecture	2	I	Introduction A. Characteristics of Life B. Scientific Method
Lecture	4	II	Biochemistry A. Biologically Significant Carbon-Based Polymers
Lecture	4	III	Cytology A. Cell Theory B. Eukaryotic Cell Anatomy
Lecture	4	IV	Membranes and Transport A. Classes of Membrane Proteins B. Passive Transport C. Active Transport
Lecture	4	V	Cell Signaling A. Ligands B. Signal Transduction C. Receptor Proteins
Lecture	8	VI	Cell Metabolism A. Energy B. Cellular Respiration C. Photosynthesis
Lecture	4	VII	Cell Division A. Mitosis B. Meiosis
Lecture	7	VIII	Mendelian Genetics A. Monohybrid and Dihybrid Crosses B. Linkage and Epistasis C. Multiple Allele and Sex-Linked Inheritance D. Human Genetic Disorders
Lecture	10	IX	Molecular Genetics A. DNA Structure and Replication B. Gene Mutation C. Gene Expression 1. Transcription 2. Translation D. Control of Gene Expression 1. Bacterial Operons 2. Transcription Factors E. Gene Technology
Lecture	2	X	Viruses A. Lytic and Lysogenic Cycles B. Viral Diseases

Lecture	5	XI	Bacteria A. Prokaryotic Anatomy and Physiology B. Bacterial Diseases C. Significant Bacterial Groups
Lab	3	XII	Introduction to Laboratory Procedure **The students will review:** A. Safety B. Use of Statistics **The students will practice lab safety and employ statistical analyses in lab work.**
Lab	3	XIII	Use of the Microscope **The students will employ:** A. Field of View Assessment B. Total Magnification Determination
Lab	3	XIV	Biochemical Polymers **The students will learn about biochemical polymers by performing biochemical tests to gain an understanding of structural characteristics.** A. Carbohydrates B. Lipids C. Proteins D. Nucleic Acids
Lab	7	XV	Cell Structure **The students will microscopically evaluate eukaryotic and prokaryotic cellular structures.** A. Eukaryotic 1. Plant 2. Animal 3. Protist B. Prokaryotic 1. Cyanobacteria
Lab	7	XVI	Membranes **The students will perform various experiments to evaluate membrane structural and functional integrity.** A. Structure B. Transport 1. Diffusion 2. Osmosis
Lab	21	XVII	Cell Metabolism **The students will perform various hands-on activities that assess cellular metabolism.** A. Enzymes B. Cellular Respiration C. Photosynthesis
Lab	7	XVIII	Cell Division **The students will microscopically assess mitotic and meiotic stages to gain an understanding of cellular division processes.** A. Mitosis B. Meiosis

Lab	7	XIX	Genetics **The students will perform activities focused on Mendelian crosses, hypothetical blood typing, and pedigree analysis to gain an understanding of fundamental genetic principles.** A. Mendelian Crosses B. Blood Typing C. Pedigree Analysis
Lab	30	XX	Gene Technology **The students will perform activities to gain a fundamental understanding of molecular biological processes. All below are hands-on activities.** A. Equipment B. Methodology 1. Agarose Gel Electrophoresis 2. Polyacrylamide Gel Electrophoresis C. Polymerase Chain Reaction (PCR) D. Restriction Enzymes (Endonucleases) E. DNA and Protein Separation and Analyses
Lab	10	XXI	Transformation **The students will perform a transformation experiment that employs the control of gene expression to gain an understanding of molecular biological processes and phenotypic change.** A. Bacterial Culture 1. Bacteria 2. Medium B. Plasmid Utilization C. Control of Gene Expression
Lab	10	XXII	Bacteria **The students will perform activities to gain an understanding of prokaryotic structural and functional characteristics. All below are hand-on activities (e.g. inoculating media, propagating bacteria, preparing and staining specimen-based slides, and analyzing results).** A. Morphological Characteristics 1. Culture Appearance 2. Gram and Spore Stains **(including microscopic assessments)** B. Motility Assessment C. Physiological Requirements D. Antibiotic Susceptibility E. Mutagenesis
Total Lecture Hours		54	
Total Laboratory Hours		108	
Total Hours		162	

IV. PRIMARY METHOD OF EVALUATION AND SAMPLE ASSIGNMENTS

A. **PRIMARY METHOD OF EVALUATION:**

Substantial writing assignments

B. **TYPICAL ASSIGNMENT USING PRIMARY METHOD OF EVALUATION:**

Write a formal laboratory report for the Gel Electrophoresis Separation of DNA lab exercise (or another exercise of the instructor's preference) and include an abstract. The introduction should be researched and written with references cited. The procedure that was followed and the results of the exercise, using appropriate tables and graphs, should be included. Conclude the paper by evaluating the results and listing the references cited (a minimum of three). The paper should be two to three pages.

C. **COLLEGE-LEVEL CRITICAL THINKING ASSIGNMENTS:**

1. Using agglutination test results with simulated blood, determine the blood types of two infants and link each infant with probable parents, whose blood types are known. Students can either make a verbal presentation or prepare a one to two-page paper with a minimum of two references.
2. Hypothesize and predict the degree of membrane damage to beet cells from temperature stress and organic solvents, and test your predictions using relative color intensity of damaged cells. Write a two-page report detailing your results and conclusions. For Honors students, a 5-page lab report is required with a minimum of three references.

D. **OTHER TYPICAL ASSESSMENT AND EVALUATION METHODS:**

Essay Exams
Objective Exams
Other exams
Written homework
Laboratory reports
Homework Problems
Term or other papers/Presentations
Multiple Choice
Completion
Matching Items
True/False

V. INSTRUCTIONAL METHODS

Demonstration
Laboratory
Lecture
Multimedia presentations

Note: In compliance with Board Policies 1600 and 3410, Title 5 California Code of Regulations, the Rehabilitation Act of 1973, and Sections 504 and 508 of the Americans with Disabilities Act, instruction delivery shall provide access, full inclusion, and effective communication for students with disabilities.

VI. WORK OUTSIDE OF CLASS

Study
Answer questions
Required reading
Problem solving activities
Written work

Estimated Independent Study Hours per Week: 6

VII. TEXTS AND MATERIALS

A. UP-TO-DATE REPRESENTATIVE TEXTBOOKS

Russell et al. Biology. 4th ed. Cengage Learning, 2017.
Vodopich and Moore. Biology Laboratory Manual. 11th ed. McGraw-Hill, 2017.

B. ALTERNATIVE TEXTBOOKS

Urry et al. Campbell Biology, 11th ed. Pearson, 2017.

C. REQUIRED SUPPLEMENTARY READINGS

Scientific articles (primary sources), articles in science magazines, and newspapers as the instructor deems relevant for the subject matter presented in the lecture and/or laboratory.

D. OTHER REQUIRED MATERIALS

Laboratory notebook and colored pencils are the other required materials.

VIII. CONDITIONS OF ENROLLMENT

A. Requisites (Course and Non-Course Prerequisites and Corequisites)

Requisites	Category and Justification
Course Prerequisite Chemistry-1A or	Standard Requisite
Non-Course Prerequisite	

B. Requisite Skills

Requisites	Category and Justification
Use the language of general chemistry (vocabulary nomenclature, formulas and equations) to describe chemical systems and changes (physical and chemical) they undergo. CHEM 1A - The student will be more proficient in a. the use of scientific terminology. b. the naming and writing of chemical formulas for inorganic compounds: binary nonmetal compounds, salts, acids and bases. c. writing and classifying chemical equations for elementary chemical reactions. d. performing stoichiometric calculations involving chemical reactions.	

Describe the structure of the atom in terms of the arrangement of subatomic particles and electronic configuration. CHEM 1A - Structure: The student will a. provide a historical picture of the development of atomic theory. b. be able to state the fundamentals of quantum theory; assign quantum numbers and construct orbital diagrams. c. predict and explain periodic trends of elements in terms of electronic configurations. d. describe and illustrate the structure and bonding of molecules by constructing Lewis structures, sketching and labeling the molecular geometries of a molecule, describing the hybridization of the atoms involved, and determining polarity. e. predict and explain properties of molecules in terms of structure and bonding. f. predict and explain properties of conductors, semiconductors and insulators in terms of structure and bonding.
Distinguish between ionic and covalent bonding and write Lewis structures for molecules and polyatomic ions. CHEM 1A - Structure: The student will a. provide a historical picture of the development of atomic theory. b. be able to state the fundamentals of quantum theory; assign quantum numbers and construct orbital diagrams. c. predict and explain periodic trends of elements in terms of electronic configurations. d. describe and illustrate the structure and bonding of molecules by constructing Lewis structures, sketching and labeling the molecular geometries of a molecule, describing the hybridization of the atoms involved, and determining polarity. e. predict and explain properties of molecules in terms of structure and bonding. f. predict and explain properties of conductors, semiconductors and insulators in terms of structure and bonding.
State the properties and definitions of acids and bases and interpret elementary acid-base equilibria. CHEM 1A - Acids and bases: The student will a. compare and contrast acid-base theories b. predict acid strengths based on structure. c. write and classify acid-base reactions.
Recognize simple organic compounds and classes and draw their structures. CHEM 1A - Nonmetals: The student will a. compare and contrast properties and reactions within a family of compounds. b. describe the role of nonmetals and nonmetal compounds in pollution. c. draw Lewis structures and name simple organic compounds. d. identify the classes of organic compounds.

C. Recommended Preparations (Course and Non-Course)

Recommended Preparation	Category and Justification
Non-Course Recommended Preparation Eligibility for English 1A or English 1AH	Students in this course need to have reading skills to understand and interpret information in college-level textbooks. The appropriate reading skills will greatly enhance their chance for understanding the reading material and successfully completing this course. Students are required to answer essay questions and write a research paper or lab journal. A student needs to have good writing skills to effectively write a paper or essay to explain the concepts and principles in this field.

D. Recommended Skills

Recommended Skills
Read the college-level text and scientific journal articles with understanding. ENGL A - Read and apply critical thinking skills to college-level expository prose for the purposes of writing and discussion. ENGL 84 - Select and employ reading strategies to interpret the content of a college-level textbook, with special focus on constructing a thesis statement and providing valid support.
Write a journal-style paper which includes an abstract, introduction, description of experimental methods and results, and conclusion. ENGL A - Apply appropriate strategies in the writing process including prewriting, composing, revising, and editing techniques.
Use the library to research information and find primary sources for use in a lab paper assignment. ENGL A - Utilize MLA guidelines to format a document, to cite sources in the text of an essay, and to compile a Works Cited list.

E. Enrollment Limitations

Enrollment Limitations and Category	Enrollment Limitations Impact

Course created by Thanh-Thuy Bui on 12/10/2015.

BOARD APPROVAL DATE: 12/19/2016

LAST BOARD APPROVAL DATE: 01/22/2019

Last Reviewed and/or Revised by: Teresa Palos **Date:** 09/25/2018

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