CREDIT COURSE OUTLINE

I. COVER PAGE

(1) BIOL 11A	(2) BIOLOGY FOR SCIENCE MAJORS I	(3) 5
Number	Title	Units

(4)	Lecture / Lab Hours:			
	Total Course Hours			
		Total Lec hours:		3.00
		Total Lab hours:		6.00
		Total Contact hours:		162.00
	Lec will generate 0 hour(s) outside work.			
	Lab will generate 0 hour(s) outside work.			
(5)	Grading Basis:	Grading Scale Only		X
		Pass/No Pass option		
		Pass/No Pass only		
(6)	Advisories: ENGL 1A - READING AND COMPOSITION BIOL 3 - INTRODUCTION TO LIFE SCIENCE			
(7)	Pre-requisites(requires C grade or better):			
	Corequisites: CHEM 1A			

(8)Classification:		
	Degree applicable:	X
	Non-degree applicable:	
	Basic skills:	
(9)RC	Fulfills AS/AA degree requirement: (area)	
	General education category:	
	Area A Natural Sciences	
Major:	BIOLOGICAL SCIENCE	
Certificate of:		
Certificate in:		
(10)CSU	Baccalaureate:	X
(11)Repeatable: (A course may be repeated three times)		0

(12) Catalog Description:
Students will study the chemistry of life, the cell, cellular structure, metabolism, photosynthesis, aerobic and anaerobic respiration, mitosis, meiosis, genetics, molecular biology, and evolution. Genetics will include Mendelian Genetics, Human Genetics, and Biotechnology. This course is intended for Science Majors and for pre-medical, pre-veterinarian, pre-dental, pre-optometry, and pre-pharmacy majors.

II. COURSE OUTCOMES:

(Specify the learning skills the student demonstrates through completing the course and link critical thinking skills to specific course content and objectives.)

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

I. Unit 1:
II. critically review the literature and prepare a term paper and present a poster.
III. design an experiment to test a hypothesis with appropriate controls based on current theories in the literature.
IV. diagram and explain electron configuration of elements common to life.
V. draw the atomic and molecular structure of ionic and covalent bonding.
VI. diagram the structure of water and show how it affects polarity, cohesion, and pH.
VII. complete the diagrams of different structures and list the functions of carbohydrates, lipids, proteins, and nucleic acids.
VIII. apply scientific method to design an experiment to test a hypothesis using appropriate controls based on current theories in literature.
IX. Unit 2:
X. demonstrate the principles and use of a microscope to study biological specimens.
XI. describe the cell's structural components and their functions.
XII. explain the structural components of plasma membranes and their functions.
XIII. discuss the concepts of the Laws of Thermodynamics in relation to enzymes, entropy and energy reactions.
XIV. describe the basic principles of energy and metabolism at the cellular level.
XV. relate glycolysis, Krebs, and the Electron Transport Chain to living organisms.
XVI. diagram and describe the light dependent reactions and Calvin cycle of photosynthesis.
XVII. compare normal mitosis to abnormal processes ie. Cancer.
XVIII. classify organisms into prokaryotic and eukaryotic divisions and apply these information at the organismal level.
XIX. Unit 3:
XX. examine and explain meiosis as it relates to biological diversity.
XXI. describe the concepts of Mendelian genetics and be able to apply their concepts to estimate phenotypic and genotypic ratios.
XXII. compare and contrast the process of reproduction and genetic transfer in prokaryote and eukaryote cells.

XXIII. demonstrate proficiency in the use of molecular biology techniques.
XXIV. recognize the applications and ethical issues associated with DNA technology.
XXV. understand and describe the genetic basis of development.
XXVI. develop critical thinking skills as the student evaluates the results of laboratory experiments in the form of a written report.
XXVII. Unit 4:
XXVIII. describe the historical aspect of Darwin's contributions, Darwin's Theory of descent with modification, and discuss examples.
XXIX. recognize the Hardy-Weinburg theorem and its relationship to a gene pool.
XXX. develop examples of genetic variation and how natural selection works on it.
XXXI. relate biological species concept to origin of the species.
XXXII. examine fossil records, geologic time, and taxonomy in phylogeny and systematics
XXXIII. relate biologic history to geologic history in the origin of life

III. COURSE OBJECTIVES:

(Specify major objectives in terms of the observable knowledge and/or skills to be attained.)

In the process of completing this course, students will:

I. Unit 1:
II. use their text book, laboratory manual, and scientific literature along with the scientific method to design laboratory experiments to test an hypothesis.
III. understand the structure of elements and how elements are bonded to make molecules.
IV. understand how the structure of water affects its polarity, cohesion, pH.
V. understand the function and structure of the molecular basis of life; carbohydrates, lipids, proteins, and nucleic acids.
VI. Unit 2:
VII. identify prokaryotic and eukaryotic cells, organelles, and tissues.
VIII. diagram the plasma membrane of a cell and list their functions and structural components.
IX. describe transport across a membrane in diffusion, osmosis, and active transport.
X. list, in order, the parts of glycolysis, Krebs, and the Electron Transport Chain.
XI. compare and contrast the light-dependent and light-independent reactions of photosynthesis.
XII. define the structure and function of a cell signaling pathway.
XIII. state the cell cycle, mitosis, and its controls.
XIV. Unit 3:
XV. perform and analyze a human Karyotype.
XVI. demonstrate proficiency in pedigree analysis.
XVII. calculate phenotypic and genotypic ratios.
XVIII. acquire and apply basic DNA technological laboratory skills.
XIX. understand microbial genetics and nutrition using prokaryote microorganisms and viruses.
XX. examine the concepts and techniques associated with embryological development.
XXI. use critical thinking skills to perform and analyze laboratory experiments.
XXII. Unit 4:
XXIII. set up an evolutionary chart of a representative organism.
XXIV. cite examples of evolutionary adaptations.
XXV. use the Hardy-Weinburg theorem in frequency of alleles in a population.
XXVI. examine macroevolution.
XXVII. compare and contrast mass extinctions in evolutionary history.
XXVIII. draw out the branches if new phylogenies.
XXIX. compare eukaryotes to prokaryotes and the diversity of organisms on earth.

IV. COURSE OUTLINE:

Lecture Content:

A. Unit One:
1. Scientific Method - Theories, Hypothesis, and Controls
2. Chemical Elements and Compounds – Atoms, Molecules, and Bonding
3. Properties of Water: Polarity, Cohesion, pH, and Temperature
4. The Carbon basis of life – Proteins, Carbohydrates, lipids, and Nucleic Acids

B. Unit Two:
1. A Tour of the Cell – Prokaryotes, Eukaryotes, Cell Organelles, Cytoskeleton, and Cell Junctions
2. Plasma Membrane Structure and Function – phospholipid bilayer, Fluid Mosaic Model, Proteins (transport, signaling, structural, and enzymatic)
3. An Introduction to Metabolism - First Law of Thermodynamics, Second Law of Thermodynamics, Entropy, ATP, Enzymes, and Energy of Reactions
4. Cellular Respiration – Glycolysis, Krebs Cycle, and the Electron Transport Chain (Proton Pump)
5. Photosynthesis – Light dependent and Light independent reactions, C3 vs C4 vs CAM
6. Cell Signaling
7. The Cell Cycle and Mitosis

C. Unit Three:
1. Meiosis and Sexual Cycles
2. Mendelian Genetics: Genes, Alleles, Pedigrees, Monohybrid Crosses, and Dihybrid Crosses
3. Chromosomes – Structure, Autosomal and Sexual, Mutations, Structural Abnormalities, History, and Replication
4. Transcription and Translation: RNA synthesis and function, Protein Synthesis

5. Viruses and Bacteria – Structure, Transduction, Conjugation, and Transformation, Gene Expression Control
6. Eukaryotic Genome and Control – Promoters, Repressors, and Inducers
7. DNA Technology – Cloning, Restriction Enzymes, PCR, Practical Applications
8. The Genetic Basis of Development – Genetic Control of embryonic development, Cell division, Cell Differentiation, and Morphogenesis

D. Unit 4:
1. Descent with Modification: Darwin's View
2. The Evolution of Populations
3. The Origin of Species
4. Phylogeny and Systematics

Lab Content:

1. Biological Molecules
2. Transport Across a Membrane
3. The Microscope and The Cell
4. Enzymes
5. Respiration
6. Photosynthesis
7. Mitosis and Meiosis
8. Karyotyping
9. Mendelian Genetics
10. Restriction Enzymes and Gel Electrophoresis
11. Transformation
12. Microbial Metabolism and Virology
13. Population Genetics
14. PCR
15. Embryology

V. APPROPRIATE READINGS

Reading assignments may include but are not limited to the following:

I. Sample Text Title:
1. Recommended - Campbell and Reece *Biology ,* ed. 8th Pearson - Benjamin Cummings, 2009,
or
2. Recommended - Raven, P., Johnson, G., Mason, K., Losos, J., & Singer, S. *Biology,* ed. 9th McGraw Hill, 2009,

II. Other Readings

___ Global or international materials or concepts are appropriately included in this course
___ Multicultural materials and concepts are appropriately included in this course

If either line is checked, write a paragraph indicating specifically how global/international and/or multicultural materials and concepts relate to content outline and/or readings.

VI. METHODS TO MEASURE STUDENT ACHIEVEMENT AND DETERMINE GRADES:

Students in this course will be graded in at least one of the following four categories. Please check those appropriate. A degree applicable course must have a minimum of one response in category A, B, or C.

A. Writing Check either 1 or 2 below			
X	***1. Substantial writing assignments are required. Check the appropriate boxes below and provide a written description in the space provided.***		
	2. Substantial writing assignments are NOT required. If this box is checked leave this section blank. For degree applicable courses you must complete category B and/or C.		
X	a) essay exam(s)	X	d) written homework
X	b) term or other paper(s)	X	e) reading reports
X	c) laboratory report(s)		f) other (specify)

Required assignments may include but are not limited to the following:
Term Paper – sample: Explain the polymerase chain reaction and how it is used in genetic cloning.
Poster with Presentation – sample: Present data and an experiment showing the effect of increased CO2 in the atmosphere.
Laboratory Write-ups – sample: Diagram the transmission of a gene defect from the P generation to the F2 generation.

B. Problem Solving
Computational or non-computational problem-solving demonstrations, including:

X	a) exam(s)	X	d) laboratory reports
X	b) quizzes	X	e) field work
X	c) homework problems		f) other (specify):

Required assignments may include but are not limited to the following:
1. perform monohybrid and dihybrid crosses

2. Determine a percentage of the population with dominant and recessive traits.

Sample of Problem Solving Questions:

1. Follow one recessive trait in a population by performing monohybrid crosses and estimate the percentage of the trait in each succeeding population.
2. Using a disease causing mutation (ie. Sickle cell anemia) like the human hemoglobin molecule and follow the genotype and phenotype through the percentages in a population.

C. Skill demonstrations, including:			
X	a) class performance(s)	X	c) performance exams(s)
	b) field work		d) other (specify)

Required assignments may include but are not limited to the following:
A. learn how to operate a microscope
B. diagram atomic structures
C. learn the use of the Hardy Weinburg theorem

D. Objective examinations including:			
X	a) multiple choice	X	d) completion
X	b) true/false		e) other (specify):
X	c) matching items		

COURSE GRADE DETERMINATION:
Description/Explanation: Based on the categories checked in A-D, it is the recommendation of the department that the instructor's grading methods fall within the following departmental guidelines; however, the final method of grading is still at the discretion of the individual instructor. The instructor's syllabus must reflect the criteria by which the student's grade has been determined. (A minimum of five (5) grades must be recorded on the final roster.)

If several methods to measure student achievement are used, indicate here the approximate weight or percentage each has in determining student final grades.
40% Lecture Exams 30% Lab Exams 30% Written and Oral Activities

VII. EDUCATIONAL MATERIALS

For degree applicable courses, the adopted texts, as listed in the college bookstore, or instructor-prepared materials have been certified to contain college-level materials.

Validation Language Level (check where applicable):	College-Level Criteria Met YES	NO
Textbook	X	
Reference materials	X	
Instructor-prepared materials	X	
Audio-visual materials	X	

Indicate Method of evaluation:

Used readability formulae (grade level 10 or higher)	
Text is used in a college-level course	X
Used grading provided by publisher	
Other: (please explain; relate to Skills Levels)	

Computation Level (Eligible for MATH 101 level or higher where applicable)		X
Content		
Breadth of ideas covered clearly meets college-level learning objectives of this course	X	
Presentation of content and/or exercises/projects:		
Requires a variety of problem-solving strategies including inductive and deductive reasoning.	X	
Requires independent thought and study	X	
Applies transferring knowledge and skills appropriately and efficiently to new situations or problems.	X	

List of Reading/Educational Materials
Recommended - Campbell and Reece *Biology ,* ed. 8th Pearson - Benjamin Cummings, 2009,
Recommended - Raven, P., Johnson, G., Mason, K., Losos, J., & Singer, S. *Biology,* ed. 9th McGraw Hill, 2009,

Comments:

_____ This course requires special or additional library materials (list attached).
__X__ This course requires special facilities:
Biology Lab Room

Attached Files:

BASIC SKILLS ADVISORIES PAGE The skills listed are those needed for eligibility for English 125, 126, and Math 101. These skills are listed as the outcomes from English 252, 262, and Math 250. In the right hand column, list at least three major basic skills needed at the beginning of the target course and check off the corresponding basic skills listed at the left.

Check the appropriate spaces.
_____ Eligibility for Math 101 is advisory for the target course.
_____ Eligibility for English 126 is advisory for the target course.
_____ Eligibility for English 125 is advisory for the target course.
If the reviewers determine that an advisory or advisories in Basic Skills are all that are necessary for success in the target course, stop here, provide the required signatures, and forward this form to the department chair, the appropriate associate dean, and the curriculum committee.

CONTENT REVIEW	
CHEM 1A GENERAL CHEMISTRY	
Collect and analyze data and have reasonable conclusions. Assessed by the lab practical.	
Competent knowledge of the periodic table, molecules, and compounds. Assessed from a pre-test administered at the beginning of the semester and the final exam administered at the end of the semester.	
Ability to apply skills to solve chemical problems especially math skills. Assessed from a pre-test administered at the beginning of the semester and the final exam administered at the end of the semester.	

REQUISITES

Corequisite -- CHEM 1A GENERAL CHEMISTRY

- Collect and analyze data and have reasonable conclusions. Assessed by the lab practical.
- Competent knowledge of the periodic table, molecules, and compounds. Assessed from a pre-test administered at the beginning of the semester and the final exam administered at the end of the semester.
- Ability to apply skills to solve chemical problems especially math skills. Assessed from a pre-test administered at the beginning of the semester and the final exam administered at the end of the semester.

- use their text book, laboratory manual, and scientific literature along with the scientific method to design laboratory experiments to test an hypothesis.
- understand the structure of elements and how elements are bonded to make molecules.
- diagram the plasma membrane of a cell and list their functions and structural components.
- list, in order, the parts of glycolysis, Krebs, and the Electron Transport Chain.
- compare and contrast the light-dependent and light-independent reactions of photosynthesis.
- understand how the structure of water affects its polarity, cohesion, pH.
- understand the function and structure of the molecular basis of life; carbohydrates, lipids, proteins, and nucleic acids.

ESTABLISHING PREREQUISITES OR COREQUISITES

Every prerequisite or corequisite requires content review plus justification of at least one of the seven kinds below. Prerequisite courses in communication and math outside of their disciplines require justification through statistical evidence. Kinds of justification that may establish a prerequisite are listed below.

Check one of the following that apply. Documentation may be attached.

1. _____ The prerequisite/corequisite is required by law or government regulations.
   Explain or cite regulation numbers:
2. _____ The health or safety of the students in this course requires the prerequisite.
   Justification: Indicate how this is so.
3. _____ The safety or equipment operation skills learned in the prerequisite course are required for the successful or safe completion of this course.
   Justification: Indicate how this is so.
4. _____ The prerequisite is required in order for the course to be accepted for transfer to the UC or CSU systems.
   Justification: Indicate how this is so.
5. _____ Significant statistical evidence indicates that the absence of the prerequisite course is related to unsatisfactory performance in the target course.
   Justification: Cite the statistical evidence from the research.
6. _____ The prerequisite course is part of a sequence of courses within or across a discipline.
7. __X__ Three CSU/UC campuses require an equivalent prerequisite or corequisite for a course equivalent to the target course:
   UC Davis - 1A Introductory Biology - Prerequisite (may be taken concurrently) Chemistry 2B, UC Berkeley - 1A General Biology - Prerequisite Chemistry 1A-1B Concurrent enrollment in Chemistry 3A may be used in lieu of Chemistry 1B, UC Merced - BIS 1 Contemporary Biology - All sample study plans for biology majors list Chem-2 General Chemistry as a corequisite for BIS 1