

## FLORIDA STATE COLLEGE AT JACKSONVILLE

## COLLEGE CREDIT COURSE OUTLINE

COURSE NUMBER: BSC 1005L

COURSE TITLE: Biology Laboratory

PREREQUISITE(S): BSC 1005  
OR

COREQUISITE(S): BSC 1005

CREDIT HOURS: 1

CONTACT HOURS/WEEK: 2

CONTACT HOUR BREAKDOWN:

Lecture/Discussion:

Laboratory: 2

Other \_\_\_\_\_:

FACULTY WORKLOAD POINTS: 1.4

STANDARDIZED CLASS SIZE  
ALLOCATION: 24

CATALOG COURSE DESCRIPTION:

This course provides students hands-on experience using concepts of biological science that are covered in the lecture course BSC 1005.

SUGGESTED TEXT(S): None

IMPLEMENTATION DATE: November 14, 1987

REVIEW OR MODIFICATION DATE: Fall Term, 2002 (20031)  
Fall Term, 2004 (20051)  
Fall Term, 2006 (20071)  
Fall Term, 2008 (20091) - Outline Review 2007

COURSE TOPICS	CONTACT HOURS <u>PER TOPIC</u>
I. Introduction to Life Processes - Taxonomy/Diversity	2
II. The Chemistry of Living Things	4
A. Molecules and Chemical Bonds (2)	
B. Biochemistry and Macromolecules (2)	
III. The Cellular Basis of Life	10
A. Microscopy/Cell Structure (2)	
B. Diffusion/Osmosis (2)	
C. Photosynthesis (2)	
D. Cellular Respiration (2)	
E. Disease/Human Health/Nutrition (2)	
IV. Genetics	6
A. Mitosis and Meiosis (2)	
B. Plant and/or Animal Genetics (2)	
B. Human Genetics (2)	
V. Evolution - Evolution	2
VI. Laboratory exercises at the Discretion of the Professor	6

**Learning Outcomes for Mandatory Laboratories BSC 1005L: Through the use of laboratory exercises, experimentation, and other hands-on activities; the student should successfully accomplish the learning outcomes listed below.**

- I. Introduction to Life Processes 2
- A. Taxonomy/Diversity  
 Students should be able to do the following:
1. Define the terms taxonomy, dichotomous key, common name, scientific name, genus, and species.
  2. List the classification groups (taxa) from the most inclusive to the least inclusive.
  3. Distinguish common names from scientific names and recognize the correct form of a scientific name.
  4. Name the kingdoms and recognize representative examples from each kingdom.
- Experimental Possibilities
- a. Use a dichotomous key to classify organisms or objects.
  - b. Develop a dichotomous key used to classify a set of organisms or objects. Let other students test the usefulness of the key.
  - c. Observe representative organisms for different kingdoms and major phyla and become familiar with their distinguishing features.
- II. The Chemistry of Living Things 4
- A. Molecules/Chemical Bonds  
 Students will be able to do the following:
1. Identify some of the biologically important elements on the periodic table by chemical symbol and name (e.g., C, H, O, N, P, S, Na, P, Cl, K, Ca, Fe, I, and others as appropriate).
  2. Determine the number of protons, neutrons, and electrons for elements, using information on a periodic table.
  3. Determine the atomic number and the atomic mass of selected elements, on the periodic table.
  4. Determine the number of valence electrons and the number of chemical bonds allowed for an element, using information on a periodic table.
  5. Define ionic bond and covalent bond.
- Experimental Possibilities
- a. Build chemical molecules using model kits and a periodic table.
- B. Biochemistry and Macromolecules  
 Students will be able to do the following:
1. Describe the structure and function of the four major categories of organic molecules important in living systems
    - Carbohydrates
    - Lipids
    - Proteins
    - Nucleic acids.
- Experimental Possibilities
- a. Test for the presence of reducing sugars, starch, lipids, and proteins in common foods.

### III. The Cellular Basis of Life

#### A. Microscopy/Cell Structure

Concerning microscopy, students should be able to do the following:

1. Identify the parts of the microscope and describe the function of each.
2. Demonstrate how to correctly set up and focus the microscope using the scanning, low-power, high-power, and oil-immersion objective lenses.
3. Calculate the total magnification of any ocular and objective lens combination.
4. Define the following terms and concepts:
  - Resolving power
  - Parfocal
  - Working distance
  - Depth of field
  - Magnification
5. Demonstrate the proper handling, cleaning, and storage procedures for the microscope.

Concerning cell structure, students should be able to do the following:

1. Recognize the differences between prokaryotes and eukaryotes, as well as distinguish the cell structure characteristics of each.
2. Make a wet mount to view cells with a compound microscope.
3. Understand the role of organelles evident with a light microscope.
4. Observe a cell's structure and determine whether it is from a plant, animal, or protist.

Experimental Possibilities

- a. Observe living cells from a variety of sources: onion epidermis, cheek cell, potato parenchyma, pond water, etc.
- b. Follow instructions on the use of oil immersion microscopy to view bacteria from your mouth or from active yogurt.
- c. Determine the population density of a simple unicellular population such as bakers yeast, using the light microscope and a hemocytometer.

#### B. Diffusion/Osmosis

Students will be able to do the following:

1. Explain the mechanism of molecular diffusion.
2. List several factors that control the rate of diffusion.
3. Describe a selectively permeable membrane and describe its role in osmosis. Characterize hypotonic, hypertonic, and isotonic in terms of relative concentrations of osmotically active substances.
4. Discuss the affect of the cell wall on osmotic behavior in plant cells.
5. Explain why diffusion and osmosis are significant to cells.
6. Relate examples of osmotic activity, which are important to medical, domestic, and environmental activities.

Experimental Possibilities

- a. Brownian motion demonstration of Carmine red and soap.
- b. Use dialysis tubing to show the characteristics of a semi-permeable membrane.
- c. Show the effect of temperature on the diffusion of Methylene Blue.

#### C. Photosynthesis

Students will be able to do the following:

1. Define the following terms:
  - Photosynthesis

- Chloroplast
  - Chlorophyll
  - Light reactions
  - Dark reactions
2. List the substrates (starting materials) for photosynthesis.
  3. List the products for photosynthesis.
  4. Write and balance the overall equation for photosynthesis.
  5. Distinguish between light-dependent and light-independent reactions.

#### Experimental Possibilities

- a. Paper chromatography to separate pigments.
- b. The use of *Elodea* and bromothymol blue to show removal of  $CO_2$ .
- c. Placing *Elodea* under a funnel to catch released  $O_2$ . Inserting a glowing wood splint will show the presence of  $O_2$ .
- d. Comparing the presence or the absence of starch in *Coleus* leaves that have been kept in the light to leaves that have been kept in the dark.

#### D. Cellular Respiration

Students will be able to do the following:

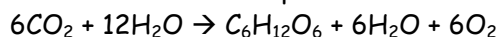
1. Define the following terms:
  - Respiration
  - Glycolysis
  - Mitochondria
  - Krebs cycle.
  - Electron transport system.
2. List the substrates (starting materials) for cellular respiration.
3. List the products for cellular respiration.
4. Write and balance the overall equation for cellular respiration.
5. Distinguish between aerobic and anaerobic respiration.

#### Experiment Possibilities

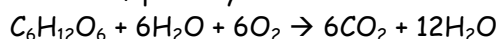
- a. Use of *Coleus* leaves from plants kept in the light and those kept in the dark to show how starch has been used by those in the dark.
- b. Activities using seed corn can demonstrate aspects of cellular respiration. Take two sealed containers with dry and soaked corn seeds suspended above bromothymol blue. Soaked seeds show that the solution has changed color due to the presence of  $CO_2$ .
- c. Dissect soaked corn seed and dry corn seed and place Tes-Tape against interior of each. It turns green in the presence of a simple sugar.
- d. Use starch agar and split soaked seeds placed against the agar. In the following lab, the Test-Tape can be used to test for simple sugars under the seeds and in the agar away from the seeds. Also, the surface of the plate can be treated with an iodine solution to demonstrate the presence of starch.

Also, after completing the photosynthesis lab and the cellular respiration lab, describe the inverse relationship of these two processes:

The products of cellular respiration are used as the reactants for photosynthesis.



The products of photosynthesis are used as the reactants for cellular respiration.



1. Describe the dependency of non-photosynthetic organisms on photosynthetic organisms.
2. Explain how energy from sunlight is used to put potential energy into chemical bonds.
3. Explain how potential chemical energy is stored and then used to do work.

E. Disease/Human Health/Nutrition

Learning outcomes may vary based upon the particular laboratory exercises chosen.

Experimental Possibilities

- a. Body fat analysis
- b. Electrocardiogram exercise
- c. Spirometry/Respiration
- d. Urine sedimentation
- e. Vital signs (blood pressure/pulse)
- f. Blood typing

IV. Genetics

A. Mitosis/Meiosis

Students will be able to do the following:

1. Name and explain the phases of mitosis with attention to the movement of chromosomes.
2. Distinguish the phases of mitosis in models and microscope slides for animal and/or plant cells.
3. Explain the differences between animal- and plant-cell cytokinesis.
4. Specify and explain the phases of meiosis I and II with attention to the movement of chromosomes.
5. Contrast the actions of chromosomes during mitosis to the actions of chromosomes during meiosis I.

Experimental Possibilities

- a. Use slides and/or models to illustrate the processes above.
- b. Use slides and/or models to contrast animal and plant cell division.
- c. Use colored toothpicks to show duplication, movement, and assortment of chromosomes.
- d. Identify stages of mitosis in a root tip or in whitefish blastula cells.

B. Plant/Animal Genetics

Students will be able to do the following:

1. Perform a monohybrid and dihybrid cross (on paper) to predict the results between two individuals (plant/animal) given the parental genetic traits.
2. State the genotype and phenotype of the resulting offspring from a given monohybrid or dihybrid cross.
3. State the genotypic and phenotypic ratio of the resulting offspring from a monohybrid or dihybrid cross.

Experimental Possibilities

- a. Count the kernels of maize (corn) to determine the ratio of one color to another. Indicate the possible parents and the possible offspring.
- b. Do *Drosophila* mating (crossing). Indicate the phenotype and possible genotype you plan to examine in the male and female. Mate the flies then observe the phenotype and indicate the possible genotypes of the offspring.

C. Human Genetics

Students will be able to do the following:

1. Understand the nature of mutations and how they contribute to human variability and disease.
2. Explain how gametes are formed in humans.

3. Explain why meiosis is necessary for gametes to be produced.
4. Explain how genes are transmitted from parent to child.
5. Explain the patterns of inheritance for dominant, recessive, and x-linked traits.

#### Experimental Possibilities

- a. Use various materials (puzzle pieces, colored shapes, popsicle sticks, etc.) to construct a DNA model.
- b. Demonstrate the 5' and 3' ends. Use the model to show the process of DNA replication, RNA transcription, and protein synthesis.
- c. Pair students and have them list various physical characteristics of themselves and give the characteristics symbols to use in doing a monohybrid and dihybrid cross to determine the characteristics (phenotype and genotype) of the offspring.
- d. Construct a pedigree chart for any given X-linked trait and determine its movement through generations.

## V. Evolution

### A. Evolution

Students will be able to do the following:

1. Define the following terms:
  - Evolution
  - Fitness
  - Selective pressure
  - Natural selection.
2. State the Hardy-Weinberg Principle and discuss its significance in population genetics.
3. Determine the genotypic and phenotypic frequency of a population using the following terms:
  - Allele
  - Dominant
  - Recessive
  - Homozygous
  - Heterozygous.
4. Describe the effects of natural selection, gene flow, and mutation on a model population.

#### Experimental Possibilities

- a. Using the fossils provided, identify them and place them into the correct period or epoch based on the chart provided.
- b. Using the vertebrate limbs provided, describe the similarities and differences as they relate to their use in differing environments.
- c. Study the models of human skulls provided. Note the physical differences between the skulls of different species. Chart the age, location, brain capacity and approximate height of each species.
- d. Manipulate model populations through several generations, comparing a population in genetic equilibrium to one with a mutant gene causing a genetic disease such as sickle cell anemia.

## VI. Professor's Discretion

Examples:      Field trips to: Fort Caroline  
                          Jacksonville Zoo  
                          St Augustine Wild



NOTE: Use either the Tab key or mouse click to move from field to field. The box will expand to accommodate your entry.

Section 1	
COURSE PREFIX AND NUMBER: <b>BSC1005L</b>	SEMESTER CREDIT HOURS: <b>1</b>
COURSE TITLE: <b>Biology Laboratory</b>	

Section 2

TYPE OF COURSE: (Click on the box to check all that apply)

**AA Elective**
 **AS Required Professional Course**
 **College Prep**  
 **AS Professional Elective**
 **AAS Required Professional Course**
 **Technical Certificate**  
 **Other** \_\_\_\_\_  
 **General Education: (For General Education courses, you must also complete Section 3 and Section 7)**

Section 3 (If applicable)

INDICATE BELOW THE DISCIPLINE AREA FOR GENERAL EDUCATION COURSES:

**Communication**
 **Social & Behavioral Sciences**
 **Mathematics**  
 **Natural Sciences**
 **Humanities**

Section 4

INTELLECTUAL COMPETENCIES:

**Reading**
 **Speaking**
 **Critical Analysis**
 **Quantitative Skills**
 **Scientific Method of Inquiry**  
 **Writing**
 **Listening**
 **Information Literacy**
 **Ethical Judgment**
 **Working Collaboratively**

Section 5		
LEARNING OUTCOMES		METHOD OF ASSESSMENT
•	Explain and apply major concepts in general biology	Written tests, reports and/or use of equipment to demonstrate student competency in field
•	Demonstrate knowledge of the scientific method	Formulate problem, make observations, derive and test hypothesis and make conclusions
•	Communicate scientific ideas through oral and written assignments	Written reports and/or oral presentations demonstrate ability to communicate scientific ideas.
•	Interpret scientific models such as formulas, graphs, tables, and schematics, draw inference from them and recognize their limitations	Written reports of lab experiments and/or written tests demonstrate student competency in the application of scientific knowledge
•	Demonstrate problem solving methods in situations that are encouraged outside the classroom	Students use demonstrations, group discussions, written tests, laboratory reports, research projects and or field experiences to illustrate competence in recognizing and evaluating various scientific processes
•	Demonstrate proper laboratory technique including safety in the use and care of laboratory equipment and materials	Results from laboratory work and experiments demonstrate student competency in laboratory technique.

Section 6

Name of Person Completing This Form: Pam Dement-Liebenow, David Byres, Cate Hurlbut Date: 11/14/07

**SECTION 7 MUST BE COMPLETED FOR ALL GENERAL EDUCATION COURSES.**

<i>Section 7</i>	<i>Primary</i>	<i>Secondary</i>	<i>N/A</i>		<i>Primary</i>	<i>Secondary</i>	<i>N/A</i>
KNOWLEDGE				VALUE			
A. Global and Historical Knowledge & Understanding	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Intellectual honesty	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Comprehends a general knowledge of the nature, origins and contributions of major civilizations	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Curiosity and openness to new ideas	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Comprehends the workings and interrelations of personal, business and government economies	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Recognition of one's own creative potential	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Comprehends political, social and economic systems and their effects upon society	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Acceptance of and respect for differences among people and cultures	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
B. Cultural and Aesthetic Knowledge and Understanding	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
• Comprehends the contributions of the arts and humanities to the human experience on a personal, national or global level	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Civic Engagement	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Comprehends the historical development of the arts and sciences	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Lifelong Learning	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Comprehends religious and cultural systems and their effects upon society	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>				
C. Human Awareness and Understanding	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
• Comprehends the dynamics of human behavior and the process of increasing self-awareness, growth and development	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
• Comprehends the stages of human development and the dynamics of human relationships in diverse cultures	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
• Comprehends the factors that promote physical, mental and social well-being	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>				
D. Mathematics, Science and Technology	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
• Comprehends the basic concepts and investigative processes of the natural sciences	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
• Comprehends the breadth, significance and development of the mathematical sciences	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
• Comprehends the ways science and technology have shaped and continue to reshape human cultures and the environment	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				

**Section 8**

Name of Person Completing This Form: Pam Dement-Liebenow, David Byres, Cate Hurlbut

Date: 11/14/2007