



BROWARD COMMUNITY COLLEGE COURSE OUTLINE

LAST REVIEW: 2010-2011
(i.e. 2003-2004)

NEXT REVIEW: 2015 - 2016
(i.e. 2008-2009)

STATUS: A
(A, I, D)

COURSE TITLE: General Biology Laboratory

COMMON COURSE NUMBER: BSC 1005L

CREDIT HOURS: 1

CONTACT HOUR BREAKDOWN

(per 16 week term)

CLOCK HOURS:
(Voc. Course ONLY)

Lecture: Lab: **32**

Clinic: Other:

PREREQUISITE(S):

COREQUISITE(S):

PRE/COREQUISITE(S): BSC 1005

COURSE DESCRIPTION *(750 characters, maximum):*

Two hours of laboratory weekly which provides hands on activities that develop basic laboratory skills while reinforcing basic concepts in biology. Dissection exercises may be a component of this course. Special fee charged.

General Education Requirements – Associate of Arts Degree (AA), meets Area(s): 4C

General Education Requirements – Associate in Science Degree (AS), meets Area(s): 4C

UNIT TITLES

1. Reading and Writing in the Biological Sciences
2. Laboratory and Safety Rules *
3. Microscopes *
4. Cell Chemistry *
5. Enzymes *
6. Membranes *
7. Bacteria: A Prokaryotic Cell *
8. Eukaryotic Cells *
9. Cell Structure
10. Cellular Reproduction *
11. Heredity *
12. Genetics of Drosophila
13. Growth and Development



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14. Animal Anatomy and Physiology
15. Plant Structure and Function
16. Animal Behavior
17. Plant Physiology
18. Study of an Ecological System
19. Utilizing the Scientific Method *
20. Biotechnology
21. Animal Diversity

*** Denotes a core concept which must be included in every general biology laboratory course.**



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*** Complete the following only if course is seeking general education status ***

GENERAL EDUCATION Competencies and Skills *:

In the box to the right of the Competency/Skill, enter all specific **student learning outcome** unit numbers, as indicated in the course outline (i.e. 1.1, 2.7, 4.2, 4.0 and 5.12) that apply.

Course must include <u>all</u> of the following:	
1. Read with critical comprehension**	1.0 – 21.0
2. Write clearly and coherently**	1.1
3. Demonstrate literacy as appropriate within a given discipline** a) Information b) Technology c) Workplace d) Cultural e) Quantitative f) Scientific g) Environmental	(b) 3.1 – 3.3; 4.1 – 4.2; 7.1 – 7.3; 8.3; 9.1; 9.3; 10.4; 17.2; 20.4 (e) 3.3; 4.2; 8.3; 11.1 – 11.3; 12.3; 13.6; 18.1 – 18.2; 19.5 - 19.6; (f) 2.0 – 21.0 (g) 16.1 – 16.3; 18.1 – 18.4;
4. Apply problem solving skills or methods to make informed decisions in a variety of contexts**	4.1; 5.1; 6.1 – 6.3; 7.1 – 7.4; 11.1; 12.1 – 12.3; 16.3; 18.2 - 18.4; 19.1 – 19.6
Course must include at least <u>one</u> of the following:	
5. Differentiate between ethical and unethical behavior	18.3, 18.4; 7.4
6. Demonstrate an understanding of the physical, biological, and social environments and how individual behaviors impact this complex system.	7.4; 18.1 – 18.4;
7. Demonstrate an understanding of and appreciation for human diversities and commonalities.	
8. Speak and listen effectively.	

**General Education Competencies and Skills endorsed by 2010-2011 General Education Task Force*

**Required Competencies

1) Read with critical comprehension.

The student will be introduced to the basic texts, concepts, vocabulary, and methods necessary for developing an understanding of the discipline and meeting the required benchmarks as stated in the course outline.

2) Write clearly and coherently.

The student will demonstrate an understanding and mastery of subject matter in a variety of ways, including writing. Writing activities may include both graded and ungraded essays, short answer quizzes, summaries, reactions, journals, and various other reports.

3) Demonstrate and apply literacy across all the disciplines (indicate which ones apply).

- a) **Information literacy** means understanding how to locate needed information, using the appropriate technology for the task, managing and evaluating the extracted information and using it effectively and ethically.
- b) **Technology literacy** is the ability to responsibly and effectively use appropriate technology to access, manage, integrate, or create information, and/or use technology to accomplish a given task.
- c) **Workplace literacy** is having the appropriate knowledge and skills to communicate and work with others effectively and perform job duties, whether it is through the use of computers and/or other technology.
- d) **Cultural literacy** is recognizing, understanding, and appreciating the similarities and differences between one’s own culture and the cultures of others through a study of the arts, customs, beliefs, values, and history that define a culture.
- e) **Quantitative literacy** is having the ability to formulate, solve and interpret mathematical/statistical operations and graphical/tabular representations to make informed decisions.



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- f) **Scientific literacy** means understanding the methodology and application of the scientific process, the physical and biological worlds, and recognizing that scientific knowledge is continuously updated or revised as new information is discovered.
- g) **Environmental literacy** is creating a context within which environmental issues can be viewed, imparting knowledge to enhance one's ability to analyze the issues, make the connections between humans' decisions and actions and the challenges facing the environment, and instilling the desire to sustain the environment through ethical practices in both one's professional and personal lives.

4. Apply problem-solving skills or methods to make informed decisions in a variety of contexts.

The student will use acquired skills or methods to recognize, analyze, adapt, and apply critical thinking to solve problems and make informed decisions.



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EVALUATION:

In the box to the right of the Methods of Assessment, enter all specific learning outcome numbers (i.e. 1.1, 2.7, 4.0, 4.2 and 5.12) that apply.

1. Portfolio	
2. Short essays	
3. Research Papers	
4. Group projects	2.0 – 21.0
5. Discussions (In class and online)	1.0 – 21.0
6. Multiple Choice tests	2.0 – 21.0
7. Presentations	
8. Service Learning Projects	
9. Quizzes (pop, announced, etc.)	1.0 – 21.0
10. Take-home tests	
11. Summaries, critiques, and analyses	1.0 – 21.0
12. Reaction papers	
13. Surveys	18.0; 20.0; 21.0
14. Performance	
15. Short answer tests	1.0 – 21.0
16. Classroom debates and colloquia	
17. Blogs, wikis, web pages	1.0 – 21.0
18. Other (Please explain) Lab Reports	2.0 – 21.0



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Common Course Number: BSC1010L

Unit 1: Reading and Writing in the Biological Sciences

General Outcome:

- 1.0 The student shall be able to clearly communicate in writing information derived from course related readings the major concepts and themes in the biological sciences.

Specific Measurable Learning Outcomes:

Upon successful completion of this unit, the student shall be able to:

- 1.1 Demonstrate in writing the ability to analyze, evaluate, compare, and/or extract data relevant to biology from course related readings.
- 1.2 Evaluate the validity of information from a variety of sources, including but not limited to such sources as electronic, print sources, and data bases.
- 1.3 Demonstrate using diagrams, drawings, outlines, concept maps, and/or other methods connections among biological concepts.
- 1.4 Demonstrate the ability to use the appropriate technology to carry out course requirements.



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Common Course Number: BSC 1005L

UNITS

Unit 2: Laboratory Safety

General Outcome:

2.0 The students shall be able to (1) conduct an experiment using proper safety procedures, (2) recognize and deal with potentially hazardous situations, (3) demonstrate an understanding for the necessity of safe laboratory procedures, (4) collaborate with fellow students to perform laboratory experiments, and (5) demonstrate reading with critical comprehension by performing selected laboratory exercises.

Specific Measurable Learning Outcomes:

Upon successful completion of this unit, the student shall be able to:

- 2.1 Interpret the safety rules as provided by the instructor.
- 2.2 Explain why these safety rules are important.
- 2.3 Locate and describe the use of safety equipment including the following
 - 2.3.1 Fire extinguisher
 - 2.3.2 Fire blanket(s)
 - 2.3.3 Eye wash
 - 2.3.4 Safety shower
 - 2.3.5 First aid kit
 - 2.3.6 Utility shutoffs
- 2.4 Conduct experiments in accordance with safety rules.
- 2.5 Collaborate with fellow students to conduct experiments, gather data, and interpret results.
- 2.6 Demonstrate reading with critical comprehension by performing selected laboratory exercises.



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Unit 3: Microscopes

General Outcome:

- 3.0 The students shall be able to demonstrate the proper use and care of optical compound microscopes.

Specific Measurable Learning Outcomes:

Upon successful completion of this unit, the student shall be able to:

- 3.1 Examine and distinguish the parts of the microscope and demonstrate their functions.
- 3.2 Prepare specimens for microscopic viewing.
- 3.3 Demonstrate knowledge of the metric measurement appropriate to microscope use.



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Unit 4: Cell Chemistry

General Outcome:

4.0 The students shall be able to perform various tests used for examining characteristics of organic and inorganic compounds found in cells.

Specific Measurable Learning Outcomes:

Upon successful completion of this unit, the student shall be able to:

- 4.1 Perform experiments to separate and identify biological macromolecules. Analyze and evaluate results.
- 4.2 Measure the pH of a solution.
- 4.3 Analyze the molecular structure of selected biologically important compounds.



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Unit 5: Enzymes

General Outcome:

5.0 The students shall be able to examine and discuss characteristics of enzymes and the factors affecting enzyme activity.

Specific Measurable Learning Outcomes:

Upon successful completion of this unit, the student shall be able to:

- 5.1 Perform experiments to demonstrate the effects of temperature and pH on enzyme activity.
- 5.2 Describe and analyze substrate structure in relation to enzyme specificity.



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Unit 6: Membranes

General Outcome:

6.0 The students shall be able to demonstrate and examine the principles of transport through living and non-living membranes.

Specific Measurable Learning Outcomes:

Upon successful completion of this unit, the student shall be able to:

- 6.1 Examine molecular movement in diffusion and membrane transport.
- 6.2 Perform experiments that demonstrate diffusion and osmosis. Analyze results to determine what molecules pass through a selectively permeable membrane.
- 6.3 Perform experiments that demonstrate the effects of tonicity on cells.



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Unit 7: Bacteria: A Prokaryotic Cell

General Outcome:

7.0 The students shall be able to categorize prokaryotic cells and demonstrate the aseptic technique.

Specific Measurable Learning Outcomes:

Upon successful completion of this unit, the student shall be able to:

- 7.1 Demonstrate aseptic technique and explain its rationale.
- 7.2 Demonstrate the effects of antiseptics and antibiotics on bacteria and evaluate experimental results.
- 7.3 Prepare a bacterial smear for staining.
- 7.4 Investigate examples of beneficial and harmful bacteria.



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Unit 8: Eukaryotic Cells

General Outcome:

8.0 The students shall be able to compare and contrast the structure and function of eukaryotic cells.

Specific Measurable Learning Outcomes:

Upon successful completion of this unit, the student shall be able to:

- 8.1 Examine taxis and locomotion via cilia.
- 8.2 Differentiate selected cellular organelles and describe their function.
- 8.3 Measure and compare size of various cells.
- 8.4 Examine physiological processes in selected eukaryotic cells.



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Unit 9: Cell Structure

General Outcome:

9.0 The students shall be able to evaluate methods of separation and identification of various cellular organelles.

Specific Measurable Learning Outcomes:

Upon successful completion of this unit, the student shall be able to:

- 9.1 Examine the use of homogenization, filtration and centrifugation in the separation of cellular components.
- 9.2 Distinguish between sediment layers and supernatant after centrifugation.
- 9.3 Perform microscopic and chemical tests to distinguish among various cellular organelles.
- 9.4 Interpret the tetrazolium test in relation to the function of mitochondria.
- 9.5 Demonstrate reading with critical comprehension by completing a variety of selected experiments that separate and identify various cellular organelles.



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Unit 10: Cellular Reproduction

General Outcome:

10.0 The students shall be able to analyze the processes of mitosis and cytokinesis.

Specific Measurable Learning Outcomes:

Upon successful completion of this unit, the student shall be able to:

10.1 Examine the stages of plant and animal cell division.

10.2 Compare and contrast plant and animal cell division.

10.3 Relate DNA replication to cell division.

10.4 Prepare an *Allium* root tip slide using the squash technique and locate various mitotic stages.



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Unit 11: Heredity

General Outcome:

11.0 The students shall be able to apply the principles of probability and Mendelian ratios to the study of selected traits.

Specific Measurable Learning Outcomes:

Upon successful completion of this unit, the student shall be able to:

- 11.1 State and apply the product rule of probability.
- 11.2 Analyze the four phenotypes of a dihybrid cross and calculate the phenotypic ratio.
- 11.3 Illustrate the mode of inheritance using a Punnett Square.



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Unit 12: Genetics of *Drosophila*

General Outcome:

12.0 The students shall be able to describe the preparation and genetic analysis of a *Drosophila* culture.

Specific Measurable Learning Outcomes:

Upon successful completion of this unit, the student shall be able to:

12.1 Prepare a culture vial, add the F₁ flies, and observe the development of the F₂ generation.

12.2 Analyze the F₂ generation of flies with respect to autosomal and sex-linked phenotype.

12.3 Tabulate the results and compare the actual values of the experimental sample with the theoretically predicted values using a statistical analysis.

12.4 Demonstrate reading with critical comprehension by completing a variety of selected experiments that require preparation and genetic analysis of a *Drosophila* culture.



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Unit 13: Growth and Development

General Outcome:

13.0 The students shall be able to describe fertilization and early development in echinoderms.

Specific Measurable Learning Outcomes:

Upon successful completion of this unit, the student shall be able to:

- 13.1 Examine the events occurring at the moment of fertilization of the sea urchin egg.
- 13.2 Compare gamete formation and cleavage in the processes of meiosis and mitosis.
- 13.3 Distinguish the stages of early development.
- 13.4 Explain the differentiation of the 3 primary cell layers into adult structures.
- 13.5 Compare body symmetry of the echinoderm larvae with that of the adult.
- 13.6 Compare the size of a blastomere to that of a fertilized egg.
- 13.7 Demonstrate reading with critical comprehension by completing a variety of selected experiments that describe fertilization and early development in echinoderms.



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Unit 14: Animal Anatomy and Physiology

General Outcome:

14.0 The students shall be able to recognize and compare the major external and internal anatomical features of a representative animal, and evaluate their functions within the various organ systems.

Specific Measurable Learning Outcomes:

Upon successful completion of this unit, the student shall be able to:

- 14.1 Perform a dissection to reveal the internal structures.
- 14.2 Contrast appropriate anatomical regional terms.
- 14.3 Examine external anatomical features of a representative animal and explain their functions.
- 14.4 Distinguish selected internal organs and structures of the representative animal and explain their functions.
- 14.5 Evaluate the action of opposing muscle groups as they relate to limb movement.
- 14.6 Examine muscle movement through nerve stimulation.
- 14.7 Demonstrate reading with critical comprehension by completing a variety of selected experiments that examine major external and internal anatomical features of a representative animal.



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Unit 15: Plant Structure and Function

General Outcome:

15.0 The students shall be able to categorize the major structures of plants and interpret the relationship between structure and function of selected parts.

Specific Measurable Learning Outcomes:

Upon successful completion of this unit, the student shall be able to:

- 15.1 Compare the microscopic structure of angiosperm stem.
- 15.2 Distinguish monocots and dicots on the basis of stem, leaf and flower characteristics.
- 15.3 Interpret the opening and closing of stomata in relation to turgor pressure in guard cells.
- 15.4 Distinguish the major male and female flower parts and describe their roles in reproduction.
- 15.5 Examine various plant structures and evaluate their structure and function.
- 15.6 Demonstrate reading with critical comprehension by completing a variety of selected experiments that describe major structures of plants relating structure to function.



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Common Course Number: BSC 1005L

Unit 16: Animal Behavior

General Outcome:

16.0 The students shall be able to distinguish the differences among instinctive behavior, learned behavior, social behavior, and non-social behavior as they relate to the study animal, the Siamese fighting fish, *Betta splendens*.

Specific Measurable Learning Outcomes:

Upon successful completion of this unit, the student shall be able to:

- 16.1 Distinguish between male and female Siamese fighting fish.
- 16.2 Describe and evaluate the behavior of a study animal.
- 16.3 Compare the function of intraspecific aggression among male Siamese fighting fish living in the natural habitat.
- 16.4 Demonstrate reading with critical comprehension by completing a variety of selected experiments that compare related behaviors of study animals.



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Unit 17: Plant Physiology

General Outcome:

17.0 The students shall be able to analyze the mechanism of photosynthesis and evaluate the roles of light, pigments and carbon dioxide in the process.

Specific Measurable Learning Outcomes:

Upon successful completion of this unit, the student shall be able to:

- 17.1 Describe the nature and composition of light.
- 17.2 Extract and separate plant pigments.
- 17.3 Examine the wavelengths of light utilized by plants in photosynthesis.
- 17.4 Analyze the major products of photosynthesis.
- 17.5 Perform experiments to demonstrate how environmental factors such as light quality, light intensity, wind and water affect photosynthesis.
- 17.6 Demonstrate reading with critical comprehension by completing a variety of selected experiments that identify the mechanism of photosynthesis and the roles of light, pigments, and carbon dioxide.



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Unit 18: Study of an Ecological System

General Outcome:

18.0 The students shall be able to collect and interpret data concerning the abiotic and biotic processes at work in ecosystems.

Specific Measurable Learning Outcomes:

Upon successful completion of this unit, the student shall be able to:

- 18.1 Collect and analyze data regarding the processes at work in an ecosystem such as selected nutrient levels and population dynamics.
- 18.2 Analyze data collected and draw conclusions relative to the processes studied in the ecosystem.
- 18.3 Evaluate possible sources of pollution entering the ecosystem.
- 18.4 Evaluate the possible influences of human activities on the ecosystem studied.
- 18.5 Demonstrate reading with critical comprehension by completing a variety of selected experiments that allows the student to collect and interpret data concerning the abiotic and biotic processes at work in ecosystems.



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Unit 19: Utilizing the Scientific Method

General Outcome:

19.0 The students shall be able to design an experiment that utilizes the scientific method to collect and analyze quantitative data.

Specific Measurable Learning Outcomes:

Upon successful completion of this unit, the student shall be able to:

19.1 Identify a problem to investigate utilizing the scientific method.

19.2 Design an experiment to answer a question regarding the problem of interest.

19.3 Interpret the role of a control, 1 independent variable, and 1 dependent variable in the experimental procedure.

19.4 State a hypothesis and make a prediction based on the hypothesis.

19.5 Collect and analyze quantitative data, graph the results, and state a conclusion.

19.6 Organize data from several individual experiments to recognize the value of replica experiments.



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Unit 20: Biotechnology

General Outcome:

20.0 The students shall be able to describe and perform basic techniques used in biotechnology such as micropipeting and macromolecule isolation and separation.

Specific Measurable Learning Outcomes:

Upon successful completion of this unit, the student shall be able to:

- 20.1 Examine and describe the structure and function of the DNA molecule.
- 20.2 Extract DNA from an experimental sample.
- 20.3 Evaluate the role of enzymes in the preparation of DNA for gel electrophoresis.
- 20.4 Perform gel electrophoresis and explain the principles governing the separation of DNA fragments. (Another major class of biological macromolecules could be substituted for DNA.)
- 20.5 Demonstrate reading with critical comprehension by completing a variety of selected experiments involving micropipeting and macromolecule isolation and separation.



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Common Course Number: BSC 1005L

Unit 21: Animal Diversity

General Outcome:

21.0 The students shall be able to categorize the kingdoms of organisms, and to examine and differentiate examples of each.

Specific Measurable Learning Outcomes:

Upon successful completion of this unit, the student shall be able to:

21.1 Analyze the major features shared by all members of the animal kingdom.

21.2 Examine live and/or preserved organisms representing the major phyla.

21.3 Recognize specific examples of organisms representing the major phyla.

21.4 Analyze the differences in structure and function among animals that are used to distinguish phyla from one another.

21.5 Analyze the basic system of taxonomy and evaluate its importance.

21.6 Demonstrate reading with critical comprehension by completing a variety of selected experiments that separate and identify the five kingdoms of organisms.