BROWARD 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: Introduction to Biology I

COMMON COURSE NUMBER: BSC1010

CREDIT HOURS: 3

CONTACT HOUR BREAKDOWN *(per 16 week term)*

CLOCK HOURS: *(Voc. Course ONLY)*

Lecture: **48** Lab:

Clinic: Other:

PREREQUISITE(S): CHM 1040 or CHM 1045 with a minimum grade of C

COREQUISITE(S): BSC1010L or CHM1040 or CHM1045 with a minimum grade of C

PRE/COREQUISITE(S):

COURSE DESCRIPTION *(750 characters, maximum)*:

This course is the first of a two-semester sequence introducing science majors to biological principles including cell structure, function, communication, reproduction, biochemistry and metabolism, classical and molecular genetics, and genetic engineering. Upon successful completion of this course, the students will be able to explain the methods of science, describe the characteristics of life, describe structure, function, and communication of cells, distinguish mitosis and meiosis, describe cell energetics, photosynthesis and respiration, solve genetics problems, and describe major advances in genetic engineering. Three hours lecture per week.

General Education Requirements – Associate of Arts Degree (AA), meets Area(s): 4A
General Education Requirements – Associate in Science Degree (AS), meets Area(s): 4A
General Education Requirements – Associate in Applied Science Degree (AAS), meets Area(s): Area

UNIT TITLES

1. Reading and Writing in the Biological Sciences
2. Introduction
3. Chemistry of Life
4. Cells: Structure, Function, and Reproduction
5. Cell Energetics, Photosynthesis & Respiration
6. Classical Genetics
7. Molecular Genetics and Genetic Engineering

***** 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 all of the following:	
1. Read with critical comprehension**	1.0
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	(a) 2.1-2.3, (e) 2.1-2.3, 3.0, 5.0, 6.2, 6.5, 6.8, 6.9, 7.13 (f) 2.1-2.3, 3.0, 4.0, 5.0, 6.0, 7.0 (g) 3.4, 3.5
4. Apply problem solving skills or methods to make informed decisions in a variety of contexts**	2.1 – 2.3, 3.0, 4.0, 5.0, 6.0, 7.0
Course must include at least one of the following:	
5. Differentiate between ethical and unethical behavior	7.16
6. Demonstrate an understanding of the physical, biological, and social environments and how individual behaviors impact this complex system.	2.0, 3.4, 3.5, 4.6
7. Demonstrate an understanding of and appreciation for human diversities and commonalities.	6.3, 6.5, 6.6, 6.7, 6.8, 6.9
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.

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.

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	1.0
3. Research Papers	1.0; 3.0 – 7.0
4. Group projects	5.0, 6.0, 7.0
5. Discussions (In class and online)	2.0 - 7.0
6. Multiple Choice tests	1.0 - 7.0
7. Presentations	3.0 - 7.0
8. Service Learning Projects	
9. Quizzes (pop, announced, etc.)	1.0 - 7.0
10. Take-home tests	2.0 - 7.0
11. Summaries, critiques, and analyses	1.0 - 7.0
12. Reaction papers	
13. Surveys	6.0
14. Performance	
15. Short answer tests	1.0 - 7.0
16. Classroom debates and colloquia	
17. Blogs, wikis, web pages	1.0, 2.0, 3.0, 4.0. 5.0, 6.0, 7.0
18. Other (Please explain)	

Common Course Number: BSC1010

UNITS

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.

Unit 2: Introduction

General Outcome:

2.0 The students shall: be able to argue why biology is the foundation for sciences and how the application of the scientific method of investigation is used to evaluate knowledge and demonstrate how this method is used in the development of a biological theory.

Specific Measurable Learning Outcomes:

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

2.1 Assess the processes and procedures that led to the development of a major biological theory.

2.2 Demonstrate how the scientific method of acquiring knowledge is applied.

2.3 Compare and contrast hypotheses, theories, laws, and the standards applied to each.

2.4 Identify and examine the characteristics that are normally associated with life.

Unit 3: Chemistry of Life

General Outcome:

3.0 The students will be able to interpret atomic structure; chemical bonding; properties of acids, bases, and water; structure and function of the four major groups of organic compounds found in living things.

Specific Measurable Learning Outcomes:

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

3.1 Examine the basic structure of matter in terms of the atoms and molecules of the chemical elements.

3.2 Explain and relate how the electron configurations of atoms affect the chemical characteristics of the element, and explain the roles of electron configurations in formation of chemical bonds.

3.3 Identify the key functional groups and how they are used to categorize biologically important molecules.

3.4 Outline the chemical nature of water, and explain the physical and chemical properties that make it such an important substance for living organisms.

3.5 Distinguish the properties of acidic, basic, and neutral solutions and show how the pH scale is used to measure the relative acidity of solutions.

3.6 Identify the molecular building blocks and give the functions of the major groups of organic compounds important in living organisms and explain dehydration synthesis (condensation synthesis) and hydrolysis as these reactions relate to carbohydrates, lipids, polypeptides and proteins, and nucleic acids.

3.7 Differentiate the structural characteristics of the most common types of carbohydrates, and give examples of each.

3.8 Illustrate how fatty acids, glycerol, and other components are combined to produce lipids.

3.9 Explain how peptide bonds are formed between amino acids to produce polypeptides.

3.10 Differentiate the primary, secondary, tertiary and quaternary structures of proteins and give examples of the functions typical of different kinds of proteins.

3.11 Recognize the basic structure and function of nucleotides and demonstrate how they are bonded to one another.

Common Course Number: BSC1010

Unit 4: Cells: Structure, Function, and Reproduction

General Outcome:

4.0 The students will be able to explain the cell theory, discriminate prokaryotic from eukaryotic cells, describe cell organelles and their function, explain membrane function, describe cell reproduction and communication.

Specific Measurable Learning Outcomes:

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

4.1 Analyze and explain the cell theory and why the cell is considered the basic unit of life.

4.2 Compare and contrast the characteristics of prokaryotic and eukaryotic cells.

4.3 Describe and interpret the structure and function of the principal organelles in plant and animal cells.

4.4 Distinguish plant cells from animal cells.

4.5 Discuss and explain the structure and function of the cell membrane and relate its role to cell communication.

4.6 Compare and contrast active and passive transport mechanisms in the cell.

4.7 Describe the structures and compare the functions of desmosomes, tight junctions, gap junctions, and plasmodesmata.

4.8 Identify the stages in the cell cycle, and describe the principal events characteristic of each.

4.9 Explain the significance of mitosis and meiosis and describe the sequence of events in each process.

4.10 Compare the roles of mitosis and meiosis and haploidy and diploidy in various generalized life cycles.

Common Course Number: BSC1010

Unit 5: Cell Energetics, Photosynthesis and Respiration

General Outcome:

5.0 The students will be able to evaluate the importance of energy conversions within cells, the role of enzymes and ATP, the processes of photosynthesis and respiration.

Specific Measurable Learning Outcomes:

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

5.1 List the various forms energy may take, and apply the laws of thermodynamics that govern all chemical reactions.

5.2 Explain the involvement of free energy, energy of activation, and catalysts in determining the rates and directions of reactions in cells.

5.3 Differentiate the ways that enzymes are thought to work, and list the factors that influence enzyme activity.

5.4 Compare the basic structure of the important energy-carrying molecule ATP and the co-enzymes NAD, NADP, and FAD and explain their roles in biochemical reactions.

5.5 Outline the energetic basis for ATP production via chemiosmotic phosphorylation.

5.6 Relate the entire process of photosynthesis by describing events of the two sub-reactions: light-dependent phase and light-independent phase.

5.7 Explain how chloroplast structure and the light reactions are involved in producing ATP and NADPH.

5.8 Demonstrate an understanding of the sequence of events in the light-independent reactions of the Calvin cycle.

5.9 Compare alternative pathways found in photorespiration.

5.10 Differentiate and relate the major pathways of cellular respiration.

5.11 Interpret the pathway of glycolysis, including reactants, products and energy yield.

5.12 Relate the structure to the function of the mitochondrion.

5.13 Interpret the citric acid cycle, including reactants, products, and energy yield.

5.14 Explain how the electron transport system in the cristae establishes a chemiosmotic gradient which leads to ATP synthesis.

5.15 Describe anaerobic fermentation pathways that lead to alcohol and lactate.

Common Course Number: BSC1010

Unit 6 Classical Genetics

General Outcome:

6.0 The students will be able to predict the inheritance of selected genetic traits utilizing classical genetics principles and recognize these principles.

Specific Measurable Learning Outcomes:
Upon successful completion of this unit, the student shall be able to:

6.1 List and explain Mendel's principles of inheritance.

6.2 Predict the results of monohybrid and dihybrid crosses involving simple traits.

6.3 Explain how dominance relations are altered or modified by incomplete dominance, co-dominance, and lethal alleles.

6.4 Assess the consequences of multiple alleles for a genetic locus.

6.5 Illustrate or interpret an example of polygenic inheritance.

6.6 Describe the ways in which gene expression may be influenced by environment, incomplete penetrance, or variation in expressivity.

6.7 Compare sex-limited, sex-influenced, and sex-linked traits.

6.8 Explain the chromosomal basis for genetic linkage, and use cross over frequency to estimate the locations of linked genes.

6.9 Evaluate the specific patterns of inheritance that are characteristic of sex-linked traits.

Common Course Number: BSC1010

Unit 7 Molecular Genetics and Genetic Engineering

General Outcome:

7.0 The students will demonstrate an understanding of the chemical and physical structure of the gene, explain the essential features of the central dogma of molecular biology, and evaluate the scope and importance of activities that scientists call genetic engineering.

Specific Measurable Learning Outcomes:
Upon successful completion of this unit, the student shall be able to:

7.1 Justify the evidence that led to the conclusion that DNA is the molecule responsible for hereditary information.

7.2 Interpret the structure of DNA and outline the steps of replication.

7.3 Explain the relationship between genes and protein production.

7.4 Compare the organization of DNA in chromosomes of prokaryotic cells with that in eukaryotic cells.

7.5 Compare the molecules involved in and organize and explain the sequence of events of protein synthesis.

7.6 Discuss the structure of the ribosome and explain the roles different parts of its structure play in protein synthesis.

7.7 Describe the post-transcriptional modifications that occur with eukaryotic RNA and relate their role in protein synthesis.

7.8 Discuss the evolutionary implications for a universal genetic code.

7.9 Discuss mechanisms of mutation that affect the DNA.

7.10 Contrast regulation of gene expression in prokaryotes and eukaryotes.

7.11 Explain the utility of viruses and bacteria as they relate to genetic phenomena.

7.12 Explain plasmid structure and function as it relates to bacterial genetics.

7.13 Propose how a genetic map is constructed.

7.14 Explain the techniques utilized in genetic engineering, including gene isolation, vector creation and cloning.

7.15 Discuss the current practical applications of genetic engineering techniques.

7.16 Discuss the societal and ethical implications of potential application of genetic engineering.

7.17 Assess the common DNA repair systems that occur in cells.

7.18 Evaluate the consequences of the different types of micromutations: base substitutions, additions, and deletions.

7.19 Explain how chromosomal macromutations occur, and describe their effects.

7.20 Explain the role of transposons and transposable elements in genetic change.