Miami Dade College

Course Competencies Template – Form 112

GENERAL INFORMATION	
Course Prefix/Number: PCB-2061	Course Title: Genetics
Number of Credits: 3	
Degree Type	☐ B.A. ☐ B.S. ☐ B.A.S ☒ A.A. ☒ A.S. ☐ A.A.S. ☐ C.C.C. ☒ A.T.C. ☐ V.C.C
Date Submitted:	Effective Year/Term:
☒ New Course Competency	☐ Revised Course Competency
Course Description (limit to 50 words or less): This course provides a understanding of the mechanisms of transmission of heritable information including classical principles of Mendelian genetic analysis, principles of modern genetic analysis, gene mapping, change and regulation of gene expression. Quantitative genetic analysis, genomics, genetic basis of cell and cancer development will also be explored.	
Prerequisite(s): BSC 2010 and BSC 2010L	Corequisite(s):

Course Competencies: (for further instruction/guidelines go to: http://www.mdc.edu/asa/curriculum.asp)

Competency 1: Upon successful completion of this course, students will demonstrate knowledge of the *basics principles of Mendelian genetics* by:

1. Discussing the progression of discovery from Classical to Modern Genetics.
2. Defining basic concepts of Classical Genetics.
3. Describing Mendel’s experimental design.
4. Utilizing conventional Mendelian genetic terminology.
5. Explaining Mendel’s principles of segregation, and independent assortment.
6. Solving monohybrid-cross genetic outcomes utilizing branch diagrams and/or Punnett squares.
7. Using testcrosses to identify parental genotype and confirm the principle of segregation.
8. Solving dihybrid cross genetic outcomes utilizing branch diagrams and/or Punnett squares.
9. Analyzing the results of multihybrid crosses to confirm the principle of Independent Assortment.
10. Using the laws of probability to statistically analyze the outcomes of genetic crosses.

Revision Date: Draft#4--9/11/2008—6:02 PM

Approved By Academic Dean Date: ____________ Reviewed By Director of Academic Programs Date: ____________

<u>Competency 2</u>: Upon successful completion of this course, students will demonstrate *deviations from classical Mendelian analysis* by:

1. Describing the chromosomal basis of inheritance.
2. Comparing and contrasting genes, chromosomes, and genomes.
3. Explaining how genetics and the environment can influence gender determination.
4. Describing gene linkage.
5. Analyzing sex influence and linkage.
6. Explaining genetic anomalies caused by changes in chromosome number.
7. Summarizing genetic anomalies caused by changes in chromosome structure.
8. Describing genetic deviations from Mendelian principles of genetic analysis.
9. Differentiating between essential genes and both dominant and recessive lethal alleles.
10. Explaining the environmental influences on gene expression.
11. Listing examples of non-Mendelian inheritance.

<u>Competency 3</u>: Upon successful completion of this course, students will demonstrate knowledge of *principles of modern genetic analysis* by:

1. Summarizing major experiments and discoveries that influenced the development of modern genetics.
2. Explaining the mechanism leading to genetic recombination.
3. Describing the methods to generate genetic maps and calculate gene distances in eukaryotic genomes.
4. Discussing the structure of the bacterial genome.
5. Describing the process of bacterial conjugation and how it is used to map bacterial genes.
6. Differentiating between the processes of transformation and transduction and their applications to genetic mapping.

7. Explaining the various methods, such as deletion mapping, used to map and/or define genes in bacteriophages.

<u>Competency 4</u>: Upon successful completion of this course students will demonstrate *regulation of gene expression* by:

1. Explaining the regulation of gene expression in bacteria and bacteriophages.
2. Comparing and contrasting the catabolic and biosynthetic operons of *Escherichia coli*.
3. Demonstrating the regulation of gene expression in lytic and lysogenic bacteriophages.
4. Examining the levels of gene expression regulation in eukaryotes.
5. Listing steps of genetic regulation in cellular differentiation and organismal development.
6. Evaluating development as influenced by gene regulation in *Drosophila melanogaster* and other model organisms.
7. Evaluating cellular differentiation as influenced by genetic regulation.

<u>Competency 5</u>: Upon successful completion of this course, students will demonstrate knowledge of the *mechanisms of genetic change* by:

1. Explaining DNA mutation and repair.
2. Comparing and contrasting different mutation mechanisms.
3. Comparing and contrasting different DNA repair mechanisms.
4. Describing methods for detecting mutations.
5. Explaining general features of transposable elements in prokaryotes and eukaryotes.
6. Relating variations in chromosome number and structure to phenotypic variation.

<u>Competency 6</u>: Upon successful completion of this course, students will demonstrate knowledge of *population genetics* by:

1. Describing population structure in terms of genetic variation.

2. Evaluating the principles to describe the genetics profile of populations as specified by Hardy-Weinberg.

3. Evaluating mechanisms that change gene frequencies in populations.

4. Describing genetic and environmental processes leading to speciation.

5. Comparing and contrasting the effects of discrete and continuous traits.

6. Applying statistical methods to describe population structure.

7. Differentiating organismal and molecular evolution.

8. Describing how mutation and genetic recombination influences evolutionary adaptation.

9. Assessing the role of genetics in conservation biology.

Competency 7: Upon successful completion of this course, students will demonstrate knowledge of *gene manipulation and analysis* by:

1. Describing the processes and applications of Recombinant DNA Technology.

2. Explaining the role of restriction endonucleases in gene manipulation.

3. Determining the applicability of different kinds of cloning vectors.

4. Illustrating the use of genomic libraries in gene detection and characterization.

5. Examining the process of restriction mapping.

6. Describing the process of Southern Blot analysis.

7. Summarizing methods used for DNA sequencing.

8. Describing the principles of the Polymerase Chain Reaction (PCR) and their applications.

Competency 8: Upon successful completion of this course, students will demonstrate knowledge of the genetic basis of cellular development and cancer by:

1. Explaining prototype models for developmental genetics.

2. Analyzing gene interactions influencing differentiation and development.

3. Describing the relationship of the cell cycle to cancer.

4. Assessing the relationship between genes and cancers.

5. Summarizing the multi-step etiology of cancer.

6. Assessing the role of different mutagens in cell transformation.

Competency 9: Upon successful completion of this course, students will demonstrate knowledge of how *genetic analysis influences modern discovery* by:

1. Describing the major trends in genetic analysis.

2. Analyzing the function of applied genetic research in technology, nature, and society.

3. Assessing the impact of genomics, proteomics and bioinformatics on society.

4. Identifying ethical issues related to gene manipulation and analysis.