RARITAN VALLEY COMMUNITY COLLEGE
ACADEMIC COURSE OUTLINE

BIOL 246 INTRODUCTION TO BIOINFORMATICS

I. Basic Course Information

A. Introduction to Bioinformatics, BIOL-246

B. Modified course

C. Date of Proposal: Semester: Spring Year: 2009

D. Sponsoring Department: Science & Engineering

E. Semester Credit Hours: 3.0

E. Weekly Contact Hours: Lecture: 2
Laboratory: 2

F. Prerequisite: General Biology II BIOL-102 or Principles of Microbiology BIOL-133

G. Laboratory Fees: Yes

II. Catalog Description

Prerequisite: General Biology II (BIOL-102) or Principles of Microbiology BIOL-133

This course is designed to provide an introduction to the emerging technology of Bioinformatics for students in the following programs: Biotechnology, Biology, Chemistry, health sciences and computer science. This course will examine the major issues concerning representation and analysis of biological, molecular and biochemical information. Offered in the Fall Semester.

III. Statement of Course Need

This course serves as a required second year course in the Biotechnology AS and Certificate of Completion Program. This course will also serve as an elective to other science majors in Biology, Chemistry, health sciences and computer science by those students meeting the prerequisites.

IV. Place of Course in College Curriculum

A. This course is a free elective.

B. This course does not satisfy a general education requirement.

C. This course meets a requirement for the Biotechnology AS Program.

D. Course transferability; for New Jersey schools go to the NJ Transfer website, www.njtransfer.org. For all other colleges and universities go their individual websites.

V. Outline of Course Content

A. Understanding gene structure and function
   1. Storage and expression of genetic information
   2. Structure and function of genomes
   3. Molecular structure of eukaryotic and prokaryotic genes

B. Data search and sequence comparisons
   1. Sequence alignment methods
   2. Database searching methods
   3. Multiple sequence alignments

C. Structure Prediction
   1. Basic concepts
   2. Methods for secondary structure prediction
   3. Tertiary and quaternary structure
   4. Protein folding models and structure prediction

D. Substitution patterns and phylogenetics
   1. Substitution patterns
   2. Molecular phylogenetics

E. Genomics
   1. Prokaryotic genomes and gene recognition
   2. Eukaryotic genomes and gene recognition
   3. Gene expression analysis and microarrays

F. Proteomics
   1. Proteome, Protein Classification and techniques
   2. Post-translational modification and other predictions
   3. Ligand screening and drug design

VI. Educational Goals and Learning Outcomes

A. Educational Goals

Students will:

1. Develop an ability to apply principles and generalizations already learned about science and technology to new problems and situations. (GE-RVCC 1; NJ GE 3)
2. Learn terms and facts of bioinformatics.
3. Learn concepts and theories of bioinformatics. (GE-RVCC 3, 7; NJ GE 2)
4. Develop an ability to synthesize and integrate information and ideas. (GE-RVCC 3, 7; NJ GE 2)
5. Analyze and interpret data (information) and draw logical conclusions. (GE-RVCC 3, 7; NJ GE 2)
6. Apply mathematical and computing skills to the solution of problems. (G.E. 7)
7. Improve computer skills. (GE-RVCC 3; NJ GE 4)
8. Develop an informed understanding of the role of science and technology in society. (GE-RVCC 5; NJ GE 9)

B. Learning Outcomes

Students will be able to:

1. Describe the field of bioinformatics.

2. Describe the fundamental concepts of bioinformatics and its applications to genomics and proteomics.
3. Define the structure and applications of genetic, nucleic acid and protein databases.
4. Search, retrieve and format information from biological databases.
5. Perform a variety of bioinformatics analyses using biological databases.

VII. Modes of Teaching and Learning

A. Lecture/discussion
B. Laboratory in an Internet equipped computer lab
C. Internet resources
D. Handouts prepared from the latest articles relevant to Bioinformatics
E. Scientific articles and news
F. Guest speakers

VIII. Papers, Examinations, and other Assessment Instruments

A. Unit exercises
B. Small-group projects
C. Individual projects
D. Participation in class/small group discussion

IX. Grade Determinants

A. Unit exercises
B. Small-group projects
C. Individual projects

X. Texts and Materials

A. Suggested Textbook
    1. Krane, D.E. and Raymer, M.L. (2003) *Fundamental Concepts of Bioinformatics*. Benjamin Cummings.
B. Supplementary Texts
    2. Baxevanis, A.D. and Ouellette, B.F. (2001) *Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins, 2nd Ed.* John Wiley and Sons, Inc.
C. Current event articles
D. Web resources
E. Computer-based resources

(Please Note: The course outline is intended only as a guide to course content and resources. Do not purchase textbooks based on this outline. The RVCC Bookstore is the sole resource for the most up-to-date information about textbooks.)

XI. Resources

The library has the resources necessary for students to complete assignments necessary for this course.

XII. Honors Options

This is not an honors course.