Miami Dade College

Course Description

BSC4434 | Bioinformatics for Biologists | 4.00 credits

The student will be introduced to the basic concepts and tools that scientists use to analyze biological information. Students will learn, through the examination of literature, development of projects and use of available web-based tools, how to store, retrieve and analyze genetic information. Prerequisites: BSC2010, 2010L, 2011, 2011L, and PCB3060, 3060L.

Course Competencies:

Competency 1: The student will explain the study of bioinformatics by:

1. Reviewing the basic principles of genomics
2. Describing the human genome project
3. Accessing public websites describing genomics
4. Reviewing public websites describing genomics
5. Detailing how to use computers to facilitate the study of molecular and evolutionary biology
6. Describing computational techniques to convert massive amounts of biological data

Competency 2: The student will explore shared web-based genomic tools, programs, and databases used for sequence analysis, visualization, and predicting three-dimensional structures by:

1. Using the basic features of the National Center for Biotechnology Information website using the basic features of the national center for biotechnology information website
2. Demonstrating the fundamental aspects of the BLAST program
3. Using the essential aspects of the web-based database, modeling, and mapping programs such as GenBank (database), protein data bank (database), or primer 3Primer (primers)

Competency 3: The student will demonstrate a practical understanding of biomolecular data by:

1. Downloading representative datasets from public Internet repositories
2. Storing the datasets in a desktop database
3. Creating forms, menus, and reports to display and access the data as information
4. Creating queries to find and access information, find patterns, and display sequences
5. Generating multi-dimensional depictions and representations of the data for dynamic querying

Competency 4: The student will demonstrate an understanding of how to use biomolecular data files by:

1. Obtaining web-based biomolecular data
2. Editing, merging, and cataloging text files
3. Storing and manipulating biomolecular text
4. Implementing security measures to control access to sensitive data

Competency 5: The student will demonstrate knowledge of the computer's operating system search and substitution methods by:

1. Searching archived sequence data files for patterns
2. Combining necessary commands to formulate complex searches and pattern substitutions across several biomolecular files
3. Comparing several biomolecular/bioinformatics datasets to find patterns across disparate and distributed sequences

Competency 6: The student will be able to describe and topically model the essential data structures of computational biology by:

1. Defining lists, stacks, and queues and describing their functions
2. Defining several variants of the tree and describing their functions
3. Defining hashes and describing their functions
4. Defining priority queues and describing their functions
5. Describing the steps used to sort data. Describing the steps used to merge data

Competency 7: The student will perform data analysis using a desktop database application on biomolecular data by:

1. Applying statistical methods to the ordered summarized and filtered data
2. Generating 2-, 3- and n-dimensional graphs and charts from clustered and filtered data
3. Transforming the representation of the information into web-usable objects

Competency 8: The student will demonstrate the use and interpretation of fundamental analyses on biomolecular information using a desktop database application by:

1. Interpreting 2-, 3- and n-dimensional graphs and charts.
2. Creating and implementing what-if scenarios.
3. Composing word processing documents that are dynamically linked to tables and charts detailing an analysis of the derived information.
4. Performing essential data mining.

Learning Outcomes:

- Communicate effectively using listening, speaking, reading, and writing skills
- Use quantitative analytical skills to evaluate and process numerical data
- Solve problems using critical and creative thinking and scientific reasoning
- Use computer and emerging technologies effectively