Miami Dade College

GENERAL INFORMATION	
Course Prefix/Number: CGS1021	Course Title: **SCIENTIFIC COMPUTING**
Number of Credits: 4 credits (3 hr. lecture; 2 hr. lab)	
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/Revised:	Effective Year/Term: 2007-1
☒ New Course Competency ☐ Revised Course Competency	
Course Description (limit to 50 words or less): This course explores the specialized features of common computer desktop applications as applied to biotechnology data. Through hands-on practical assigments, students will study and practice the computerized techniques by which to organize, manipulate, report, present, depict and analyze biomolecular data and information. Lab fee. 3hr. lecture; 2 hr. lab. Co-requisite: STA2023	
Prerequisite(s):	Corequisite(s): STA2023

Competency 1:
The student will demonstrate how to use the basic, computational and scientific features of a desktop word processing application by:

1. Creating, formatting, editing and saving a word processing document.
2. Using existing templates, forms and wizards to create documents.
3. Creating, formating, editing, and printing documents containing scientific and mathematical notations, graphs, and charts.
4. Creating documents that are linked to data-sourcing objects.
5. Accessing and linking to pages on the World Wide Web.

Competency 2:
The student will demonstrate the ability to produce scientific presentations by:

1. Creating, editing, and saving a presentation.
2. Using existing templates, forms, and wizards.
3. Creating, editing, printing, and showing to the class presentations with scientific and mathematical notations, graphs, and charts.
4. Creating presentations that are linked to data-sourcing objects.
5. Accessing and linking to pages on the World Wide Web.

Competency 3:
The student will demonstrate the ability to use the basic, computational, and scientific features of desktop spreadsheet applications by:

1. Developing and implementing
    a. numerical expressions
    b. formulas

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c. conditional statements.
2. Representing results in the appropriate data type and format.
3. Creating, editing, and printing spreadsheets that incorporate scientific and mathematical notations.
4. Creating, editing, and printing 2-, 3-, and n-dimensional graphs and charts.
5. Creating interactive functionality such as buttons, forms and menus.
6. Accessing and linking to pages on the World Wide Web .

Competency 4:
The student will use the basic, computational and scientific features of desktop database applications by:

1. Developing and implementing
   a. numerical expressions
   b. formulas
   c. conditional statements
2. Representing results in the appropriate data type and format.
3. Creating, editing, and printing spreadsheets with scientific and mathematical notations.
4. Creating, editing and printing 2, 3 and n-dimensional graphs and charts.
5. Developing interactive functionality such as buttons, forms, menus and switchboards.
6. Accessing and linking to pages on the World Wide Web .

Competency 5:
The student will obtain, interpret, store, and derive information from simple to moderately complex biomolecular datasets using a desktop database application by:

1. Accessing and downloading, via the internet, biomolecular data from public repositories.
2. Interpreting the metadata.
3. Creating and populating a biomolecular database from the data and metadata interpretation.
4. Developing and implementing
   a. queries
   b. join strategies
   c. referential integrity rules
5. Developing interactive functionality such as buttons, forms, menus, and switchboards.
6. Developing a desktop database application to derive information from the biomolecular database through the use of queries, joins, referential integrity and program functionality.
7. Outputting the data as an XML object.

Competency 6:
The student will demonstrate an understanding of simple to moderately complex biomolecular datasets using a spreadsheet application by:

1. Accessing and downloading via the internet biomolecular data from public repositories.
2. Interpreting the metadata.
3. Importing the data.

4. Deploying interactive functionality as a means to facilitate access to the data.
5. Outputting the data as an XML object.

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

1. Applying each of the following statistical methods to the data:
    a. Average, Median, Mode, Max, Min
    b. Frequency Distribution
    c. Normal and Bionomial distribution
    d. Cluster Analysis
    e. Trend analysis using the least-squares method.
2. Using ordering and roll-up techniques in order to summarize the data.
3. Converting data into multi-dimensional information by:
    a. Creating pivot tables.
    b. Creating 2, 3 and n-dimensional graphs, charts and pivot charts referencing the pivot tables.
4. Transforming the representation of the information into web-usable objects.
5. Creating a scoring matrix where the cells are logarithms of ratios of two probabilities.

Competency 8:
The student will perform statistical analysis on biomolecular data using a desktop database application by:

1. Applying each of the following statistical methods to the data:
    a. Average, Median, Mode, Max, Min
    b. Frequency Distribution
    c. Normal and Bionomial distribution
    d. Cluster Analysis
    e. Trend analysis using the least-squares method.
2. Converting data into multi-dimensional information by:
    a. Creating pivot tables and pivot web-forms.
    b. Generating 2, 3 and n-dimensional graphs, charts and pivot charts referencing the pivot tables and pivot web-forms.
3. Transforming the representation of the information into web-usable objects.

Competency 9:
The student will perform data analysis using a spreadsheet application on biomolecular data by:

1. Using ordering and roll-up techniques to summarize the data.
2. Creating and using data filters.
3. Applying statistical methods to the ordered, summarized, and filtered data.
4. Generating 2-, 3-, and n-dimensional graphs, charts and pivot tables from the ordered, summarized, and filtered data.
5. Transforming the representation of the information into web-usable objects.

Competency 10:
The student will demonstrate the use and interpretation of basic analytics on biomolecular information through the use of a spreadsheet by:

1. Drilling-down on pivot tables.
2. Interpreting 2, 3, and n-dimensional graphs and charts.
3. Creating and implementing what-if scenarios.
4. Composing word processing documents that are dynamically linked to pivot tables and charts detailing an analysis of the derived information.
5. Performing basic data mining.
6. Creating a user interface to dynamically perform basic data mining.