

# **Course Approval Form**

For instructions see: http://registrar.gmu.edu/facultystaff/catalogrevisions/course/

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### For Registrar Office's Use Only: Banner\_

# Course Proposal Submitted to the College of Science Curriculum Committee (COSCC)

The form above is processed by the Office of the University Registrar. This second page is for the COSCC's reference. Please complete the applicable portions of this page to clearly communicate what the form above is requesting.

FOR ALL COURSES (required)

Course Number and Title: CDS 230- Modeling and simulation I

Date of Departmental Approval: 9/3/2015

### FOR INACTIVATED/REINSTATED COURSES

### FOR MODIFIED COURSES

### FOR NEW COURSES

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- Reason for the New Course: To provide a continuation to CDS 130 and provide a necessary bridge to the CDS 300 and 400-level courses.
- Relationship to Existing Programs: A lower-level CDS course to satisfy the computational needs of students in other programs such as Biology and Neuroscience.
- Relationship to Existing Courses: Similar to CDS 130, but more advanced and a suitable prerequisite to CDS 411.
- Semester of Initial Offering: Fall 2016
- Proposed Instructor: TBA

# CDS 230 Modeling and Simulation I

### -- SYLLABUS --

Prerequisites: CDS 130, or permission of instructor

Credits: 3

Instructor: TBD Office Hours: TBD

**Course Description:** This course presents fundamental computational techniques with an emphasis on biological informatics. This course emphasizes problem solving path from concept, through theory and finally into realization in a computational environment. Continued development of student's algorithmic thinking skills will be emphasized through the use of three different computational environments.

### Lecture Content:

- 1. Computations in a Spreadsheet
  - a. Data types and cells
  - b. Alternate formats (CSV, text)
  - c. Simple computations
  - d. Computations spanning multiple pages
  - e. Queries
  - f. Data visualization (plotting)
  - g. Function estimation
  - h. Applications in micro-array data
  - i. Shortcomings of spreadsheets
- 2. Introduction to Sequential Scripting (Python)
  - a. Data types
  - b. Data collections
  - c. Strings and searches
  - d. Input and output

- e. Loops (while loops, for loops, etc.)
- f. Decisions (if constructs)
- g. Functions
- h. Error handling
- i. Applications in sequence analysis
- j. Object Oriented Programming
- 3. Introduction to Databases
  - a. Justification
  - b. Schema design
  - c. Data duplications
  - d. Simple queries
  - e. Complex queries and JOINS
  - f. Connection with Python
  - g. Applications in multiple domain biological data
  - h. Efficiency in queries

**Homework:** Students will be expected to complete weekly assignments and two projects. **Exams:** There will be one final exam.

Evaluation: Homework (30%), Project I (20%), Project II (20%), Final Exam (30%)

### Required Textbooks: Instructor provided

## **RATIONALE FOR NEW COURSE**

The intent of this course is to provide students with insights on the process that carries an idea through algorithm development and finally into realization through a computational implementation. Students will use three different types of environments that are heavily used in biological analysis: spreadsheets, a programming language and a database environment.

Students will be required to write short computer programming scripts in this course. The second project will require the use of these rudimentary skills.

By the end of the course the student should be able to design and implement a simple pipeline that starts with digitized data and the concept of which analysis is needed and end with a functioning tool that completes the analysis.