Course Syllabus and Overview

CSC 391/691; PHY 327/627; BIO 301: BCH 715

Time: 9:30-10:45 am TR

Instructors: Drs. William Turkett and Jacquelyn Fetrow

Office: Turkett: Manchester 240; Fetrow: Manchester 236 & Olin 301B

Email: turketwh(at)wfu(dot)edu, fetrowjs(at)wfu(dot)edu

Web page: **http://www.wfu.edu/~fetrowjs/Teaching.htm**

Office Hours: Dr. Fetrow Wed 2:00-3:00 (Manchester 236); Friday 10-11:00 (Olin 101B); Dr. Turkett 3-5 pm TR

Focus: This version of the course will focus on the area of *Computational Systems Biology*.

Course meeting time: TR 9:30-10:45 am; Lectures will be held in Manchester 017. The course will be taught using a "Studio Style" of instruction. Some class time will be lectures, some will be in-class exercises, some will be discussions, or some combination. For the in-class exercises, students will work in teams with both computer scientists and biologists as members.

Learning objectives:

- Gain an appreciation for the field of systems biology
- Understand and learn the technical details of several current experiments or technologies used in the field of systems biology
- Understand some of the larger questions and issues with systems biology and large scale data collection and analysis
    - Understand complexity in algorithm design for large scale data sets
    - Gain an appreciation for some of the statistical issues involved with systems biology experiments
    - Become acquainted with some of the nomenclature and annotation issues in systems biology
- Gain experience in, and appreciation of, working on an interdisciplinary team
    - Become familiar with some of the language and communication issues in working with people from other fields
    - Become familiar with some of the issues involved in organization and implementation of large scale projects
    - Gain an appreciation for maintaining and upgrading available software

Course requirements:

CSC 391/691: To get credit for this course number, students will be required to actively participate in the software engineering and algorithm design aspects of the course. All students will be required to understand the research issues and master the key concepts in the field of bioinformatics.

BIO 301;BCH 715: To get credit for this course number, students will be required to master the biotechnical details behind the projects and effectively communicate those details to the students who are doing the engineering and algorithm design. All students will be required to understand the research issues and master the key concepts in the field of bioinformatics.

Course numbers and prerequisites:

CSC 391/691: Prerequisite for registering for this course number is CSC 112 (or permission of the instructor).

BIO 301; BCH 715: Prerequisites for registering for this course number are introductory courses in biology, chemistry, and molecular biology or biochemistry (or permission of the instructor).

Textbook: No textbook required for the class. A collection of relevant review and research articles will be distributed in class as required reading. See schedule for a list of the required readings. These papers are posted on the Blackboard course web site.

Blackboard: Papers and in-class exercises will be posted on Blackboard under the CSC 391 course number. The reading quizzes will be done through Blackboard, as well.

Reading assignments and quizzes: Reading assignments are to be done prior to class. Online reading quizzes, due before each TR lecture marked with a (+) in the schedule below, cover the material in the reading assignments. These will be due by midnight the night before the class. The reading quizzes are to be completed without any assistance. Points cannot be earned on these assignments when there is an unexcused absence from class on the same day.

Research-based learning: The best way to learn to use bioinformatics and computational biology methods is to apply those methods in a research-based format. We will follow this learning approach in this course. We will teach methods and theory, but you will apply the methods and theory to a problem for which we do not yet know the "right answer;" however, it is a problem in which we are interested. The project topic will be presented in more detail in several weeks.

Software/hardware required: A laptop computer is required for this class. You must bring the laptop computer to each class, as we will usually be connecting to the internet to learn to use bioinformatics tools. Students registered for one of the CSC course numbers will be required to utilize certain programming tools and languages.

Students with the Medical standard load will need to check with course instructors at the beginning of the semester as to software availability.

Students with disabilities: If you have a disability that may require an accommodation for taking this course, then please contact the Learning Assistance Center (758-5929) within the first two weeks of the semester.

In the event of closure of the university for a significant part of the semester: In the event that the university closes due to pandemic or other disaster, please read and study the required papers (see list below). Reading quizzes (distributed over Blackboard, if the internet is available; or by postal mail if the internet is not available) must be completed to test your comprehension of the reading. Work the exercises (to be distributed either through Blackboard, email, or postal mail) that are listed on the schedule and send the solutions to: Jacque Fetrow (fetrowjs(at)wfu(dot)edu, if the internet is available; or 1014 Oaklawn Avenue, Winston-Salem, NC 27104). You will be mailed or e-mailed a mid-term test and a final examination that should be taken closed book, without access to papers, persons, or resources other than a calculator. The return dates for the examinations will be specified in the mailing. In the event of university closure, more detailed exercises and longer mid-term and final exams will be used for grading, in place of the course project. If the internet is available, Professor Fetrow will be available for normal office hours by instant messenger: jsfetrow on Yahoo IM and jacquef40 on AIM. Professor Turkett will be available for office hours on Yahoo IM as roguetester and on turketwh@gmail.com (only if WFU email doesn't work).

Grading:

Requirement	Undergraduate points (total)	Graduate points (total)
Reading quizzes (18 quizzes at 4 points each)	72	72
In-class exercises—5 exercises, as follows:		
• MatLab	20	25
• Database and visualization	25	30
• Protein interaction networks	35	40
• Literature mining	20	25
• Microarray analysis	35	40
Project parts (40 points each) • Hypothesis/Aims/Requirements • Aims/Tasks/Design • Final application document, to include hypothesis, aims, requirements, design, application documentation, and assessment of what biology was learned • Working application	160	160
Final project presentation	20	20
Class participation, observations, and creativity	50	100
Final examination	100	120
Total:	537	632

Graduate credit: Students registered for any of the graduate course numbers and receiving graduate credit will be held to higher expectations than students receiving undergraduate credit. Graduate students will be expected to answer lab and exam questions in more detail. Often, there will be an additional, more difficult question that graduate students must answer in addition to the other questions, so the total number of allowed points will be higher for graduate students. Graduate students are expected to participate in class more often and to offer more insightful observations.