CPS 461/561 Introduction to Computational Biology

Spring 2008

Time: TR 1:15 pm to 2:45 pm
Place: TBA

Instructor: Wensheng Shen
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Office hour: TR 11:00 (am) – 3:00 (pm) or by appointment

Prerequisite: basic knowledge of computers and molecular biology, any experience of computer language and Unix operating system is a plus

Textbook: Introduction to Computational Molecular Biology
Authors: J. Setubal and J. Meidanis
Publisher: PWS Publishing Company
ISBN: 0-534-95262-3

References: (1) Computational Biology, Unix/Linux, Data Processing and Programming
Author: Röbbe Wünschiers
Publisher: Springer
ISBN: 3-540-21142-X

(2) Introduction to Computational Biology: Maps, sequence and genomes
Author: Michael S. Waterman
Publisher: Chapman & Hall/CRC
ISBN: 0-412-99391-0

Description: Computational biology is a newly-emerged interdisciplinary field that applies computer science and mathematic techniques to solve problems in biology. This course focuses on how to use computers as a tool to study and conduct research in molecular biology. Due to the recent advancement of computational molecular biology and the existence of a huge amount of biological knowledge and databases, the role of a molecular biologist has changed largely from learning how to handle pipettes, extract DNA, use enzymes, and clone a gene to learning how to handle databases and extract all the information that has already known for the gene that he/she wants to study. In other words, the daily business of pipetting and gel running has increasingly given its way to data compiling and processing. A

molecular biologist should be proficient in computing to some extent, since working with data lists has become as important as extracting DNA. In this course we learn how to study molecular biology by manipulating computers and searching databases instead of pipette, culture flask, and rubber boots. The three one-hour session class will be scheduled as **two consecutive class room lectures followed by a computer lab practice to favor those who do not use computers routinely**.

Objectives: This course presents principles, algorithms, methods, and programming techniques in computational molecular biology. Outcomes of a successful completion of this course include: to understand the concept and procedures of biological modeling, to be able **to use computers as a tool to study biology**, to know how to extract useful information from biological dataset, to know how to program using script languages (awk and/or perl), to be confident in programming in Unix environment, to understand and apply algorithms in string matching and graphs to biological discovery, to be capable of searching large biological databases.

Topics: The topics in this course include: (1)basic concepts of molecular biology, (2) strings, graphs, and algorithms, (3) sequence comparison and database search using BLAST (Basic Local Alignment Search Tool) and ClustalW, (4) fragment assembly of DNA, (5) physical mapping of DNA, (6) molecular structure prediction, (7) Unix shell programming, (8) text searching and sorting, (9) awk and/or perl script languages, (10) regular expression.

Grading: Homework assignments (50%)
Projects (30%)
Midterm (10%)
Final exam (10%)

Average	100 – 90.0	87.0 – 89.9	83.0 – 86.9	80.0 – 82.9	77.0 – 79.9	73.0 – 76.9
Grade	A	A-	B+	B	B-	C+
Average	70.0 – 72.9	67.0 – 69.9	63.0 – 66.9	60.0 – 62.9	57.0 – 59.9	<57.0
Grade	C	C-	D+	D	D-	E

Note: extra credits may be given in home and project assignments as well as tests. Final exam may be replaced by a project.

Assignment policy: Homework assignments given in class will be due in two weeks and project assignments given in class will be due in four weeks after they are assigned. Late assignments can be accepted with a penalty at a rate of 10% per day. ***No makeup tests and no incompletes. A missed test will receive 0 points.*** Exceptions to these rules, at instructor's discretion, apply to cases of illness, personal tragedy, or extraordinary circumstances beyond a student's control, if it is documented to instructor's satisfaction. Arrangement for such an exception needs to be discussed with the instructor.

Attendance: Students are expected to attend all classes. Some of the material may not be contained in the textbook. If a student misses a class, it is his/her responsibility to get class notes and handouts. Absences will be excused for documented illness, official representation of the College, an unfortunate death of a close relative, religious holiday, and other circumstances beyond student's control.

Authorship: Students are allowed to discuss ideas and help others by explaining concepts and possible solutions. All the work that is submitted, however, must be performed by individual students independently. Students must provide appropriate citations for any text fragments in books, journals, conference proceedings, web-based resources, etc. that have been used in their assignments. Students also need to acknowledge any help from others. A student is considered cheating if he/she submits materials as his/her own work that is not entirely his/her own work, or if he/she intentionally provides an answer to another person. If cheating has been detected, the student will receive a zero grade for that assignment. Further disciplinary procedures many also be considered.

Policies: Students with documented disabilities may be entitled to specific accommodations. SUNY Brockport's Office for Students with Disabilities makes this determination. Please contact the Office for Students with Disabilities at 395-5409 to inquire about obtaining an official letter to the course instructor detailing approved accommodations. The student is responsible for providing the course instructor with the official letter. Faculty and staff work as a team with the Office for Students with Disabilities to meet the needs of students with disabilities