CMPSC 300 Introduction to Bioinformatics Syllabus

Fall 2019

Syllabus updated: August 26, 2019

Course Instructor

Dr. Oliver BONHAM-CARTER
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Exam Code: D
Project Due Date: 13^{th} Dec 2019, 9:00 am

Instructor's Office Hours

- Monday and Wednesday: 9:30 am – 10:30am (10 minute time slots)
- Tuesday and Thursday: 1:30pm – 3:30pm (10 minute time slots)

To schedule a meeting with me during my office hours, please visit my Web site and click the "Schedule" link in the top right-hand corner. Now, you can view my calendar or by clicking "schedule an appointment" link browse my office hours and schedule an appointment by clicking the correct link to reserve an open time slot.

Course Meeting Schedule

- Lecture, Discussion, Presentations and Group Work:
  Tuesday, Thursday, 11:00 am – 12:15 pm
- Laboratory Session:
  Monday, 2:30 pm – 4:20 pm

Academic Bulletin Description

An introduction to the development and application of methods, from the computational and information sciences, for the investigation of biological phenomena.

In this interdisciplinary course, students integrate computational techniques with biological knowledge to develop and use analytical tools for extracting, organizing, and interpreting information from genetic sequence data. Often participating in team-based and hands-on activities, students implement and apply useful bioinformatics algorithms. During a weekly laboratory session students employ cutting-edge software tools and programming environments to complete projects, reporting on their results through both written assignments and oral presentations. Prerequisites: BIO 221 and FSBIO 201, or CMPSC 111. Distribution Requirements: QR, SP.

Course Objectives

Students successfully completing this class will have developed:

1. A "big-picture" view of bioinformatics.
2. An understanding of the objectives and limitations of bioinformatics.
3. An understanding of the biological foundations of bioinformatics (genes and genomes, gene expression, etc.).
4. An understanding of the computational foundations of bioinformatics (programming, databases, etc.).
5. An understanding of how genetic information is obtained and processed.
6. The ability to use basic bioinformatics software tools to study genetic information.

Throughout the semester students also will enhance their ability to write and present ideas about bioinformatics in a clear and compelling fashion. Students will gain practical experience in the design, implementation, and analysis of bioinformatics research during laboratory sessions and a final project. Finally, students will develop a richer understanding of the fascinating connections between biological systems, analysis and automation.

Required Textbooks

- *Exploring Bioinformatics: A Project-based Approach, second edition*, by Caroline St. Clair and Jonathan E. Visick.
- *Think Python, first edition*, by Allen B. Downey.
  - Textbook: `http://greenteapress.com/thinkpython/thinkpython.pdf`
  - Publisher: `http://greenteapress.com/wp/think-python/`

Internet Resources

- Course web page:
  - `http://www.cs.allegheny.edu/sites/obonhamcarter/cs300.html`
  - You can access course materials on the course web page.
- Sakai page:
  - `https://sakai.allegheny.edu/`
  - The course page on Sakai will only be used for reporting student grades.
- GitHub:
  - `https://https://github.com/`
  - GitHub, a cloud based system for code development, storage and collaboration and will be used by the instructor for sharing course materials. In particular, we will be using GitHub Classroom for students to submit assignments and activities.

Class Policies

Grading

The grade that a student receives in this class will be based on the following categories. All percentages are approximate and, if the need to do so presents itself, it is possible for the assigned percentages to change during the academic semester.

Class Participation	15%
Exams (Three)	20%
Laboratory Assignments	30%
Final Project	35%

These grading categories have the following definitions:

- *Class Participation*: All students are required to actively participate during all of the class sessions. Your participation will take forms such as answering questions about the required reading assignments, completing in-class exercises, asking constructive questions of the other members of the class, giving presentations, leading a discussion session in class.
- *Exams*: The exams will cover all of the material in their associated module(s). The finalized date for each of the exams will be announced at least one week in advance of the scheduled date. Unless prior arrangements are made with the course instructor, all students will be expected to take these exams on the scheduled date and complete the exams in the stated period of time.

- *Laboratory Assignments*: These assignments invite students to explore the concepts, tools, and techniques associated with the field of bioinformatics. All of the laboratory assignments require the use of the provided tools to study, design, implement, and evaluate informatics systems that solve biology problems. To ensure that students are ready to utilize and develop appropriate software in both other classes at Allegheny College and after graduation, the instructor will assign individuals to teams for some of the laboratory assignments. Unless specified otherwise, each laboratory assignment will be due at the beginning of the next laboratory session. Some of the assignments in this course will expect students to give both a short presentation and a demonstration of the bioinformatics solution that they created.

- *Final Project*: This project will present you with an opportunity to design and implement a correct and carefully evaluated bioinformatics solution for a specific problem. Completion of the final project will require you to apply all of the knowledge and skills that you have acquired during the course of the semester to solve a bioinformatics problem. The details for the final project will be given approximately two months before the project due date (during finals week).

Assignment Submission

All assignments will have a stated due date. The electronic version of the class assignments are to be turned in at the beginning of the lab session on that due date. Submissions after the beginning of class are counted as being late. Assignments will be accepted for up to one week past the assigned due date with a 15% penalty. All late assignments must be submitted at the beginning of the session that is scheduled one week after the due date. The honor code (see below) is assumed for all submitted work.

Extensions

Unless special arrangements are made with the course instructor, no assignments will be accepted after the late deadline. If you are requesting extensions for a lab assignment, then you are to email me with your request and also provide a *valid reason* for your extension. **This request must come *before* the due date of the lab and not on the due date.**

Requests will not be granted where the reason appears to be insignificant. Extensions are 24 hours of extra time (after the original due date) and are given out at my discretion. The decision to provide you with an extension (or not) will be weighed in light of fairness to your peers who are still able to complete their labs, regardless of their own busy schedules.

Attendance

It is mandatory for all students to attend all classes and laboratory sessions. You will receive a grade deduction of one letter grade on the laboratory submission if you did not attend the scheduled laboratory session, unless prior arrangements have been made with the instructor. If you will not be able to attend a session, then please see the instructor at least one week in advance to describe your situation. Students who miss more than five unexcused sessions will have their final grade in the course reduced by one letter grade. Frequent or prolonged absences due to illness should be documented by the student's doctor, the Health Center, the Dean of Students' Office, or the office of Student Disability Services. If you need to miss class due to a religious observance, please speak to the instructor in advance to make appropriate arrangements.

Use of Laboratory Facilities

Throughout the semester, we will investigate many different software tools that bioinformaticians use during the design, implementation, and evaluation of solutions.

To ensure that your software development experience in this course closely mirrors real-world practice, you are invited to use your own laptop during class and laboratory sessions. The course instructor and the department's systems administrator have invested a considerable amount of time to develop a container-based approach to support the completion of all of the assignments and projects on any laptop that satisfies minimal requirements. The department has a few laptops that students are allowed to check out during normal business hours for a limited time use. Also, Alden 103, open daily for student work, features desktop machines with an Ubuntu operating systems, and Alden 101 has several desktop machines that are open for student use outside of class sessions.

Class Preparation

In order to minimize confusion and maximize learning, students must invest time to prepare for the class discussions, lectures, and laboratory sessions. During the class periods, the course instructor will often pose questions that could require group discussion, the use of an online software tool, the creation or modification of a program or data set, or a group presentation. In order to help students remain organize and effectively prepare for classes, the course instructor will maintain a class schedule with reading assignments and presentation slides.

A Note on extenuating circumstances

If you should find yourself in difficult circumstances that significantly interfere with your ability to prepare for this class and to complete assignments, please inform the instructor immediately so that we can work something out together! Do not wait until the last day of class to ask for exceptions to what is stated in this syllabus. In such a situation, you

may also find it helpful to contact the campus Counseling Center (332-4368) in 304 Reis Hall, which is open from 8-5 but also has a 24 hour hotline.

Special Needs and Disabilities

Students with disabilities who believe they may need accommodations in this class are encouraged to contact Disability Services at (814) 332-2898. Disability Services is part of the Learning Commons and is located in Pelletier Library. Please do this as soon as possible to ensure that approved accommodations are implemented in a timely fashion.

Email

Using your Allegheny College email address, the instructor will sometimes send out class announcements about matters such as assignment clarifications or changes in the schedule. It is your responsibility to check your email at least once a day and to ensure that you can reliably send and receive emails. This class policy is based on the following statement in *The Compass*, the college's student handbook.

> "The use of email is a primary method of communication on campus. . . . All students are provided with a campus email account and address while enrolled at Allegheny and are expected to check the account on a regular basis."

Disability Services

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. Students with disabilities who believe they may need accommodations in this class are encouraged to contact Disability Services at 332-2898. Disability Services is part of the Learning Commons and is located in Pelletier Library. Please do this as soon as possible to ensure that approved accommodations are implemented in a timely fashion.

Honor Code

The Academic Honor Program that governs the entire academic program at Allegheny College is described in the Allegheny Course Catalogue. The Honor Program applies to all work that is submitted for academic credit or to meet non-credit requirements for graduation at Allegheny College. This includes all work assigned for this class (e.g., examinations, laboratory assignments, and the final project). All students who have enrolled in the College will work under the Honor Program. Each student who has matriculated at the College has acknowledged the following pledge:

> *I hereby recognize and pledge to fulfill my responsibilities, as defined in the Honor Code, and to maintain the integrity of both myself and the College community as a whole.*

Additionally, we expect that you will adhere to the following Department Policy:

Department of Computer Science Honor Code Policy

It is recognized that an important part of the learning process in any course, and particularly in computer science, derives from thoughtful discussions with teachers, student assistants, and fellow students. Such dialogue is encouraged. However, it is necessary to distinguish carefully between the student who discusses the principles underlying a problem with others, and the student who produces assignments that are identical to, or merely variations on, someone else's work. It will therefore be understood that all assignments submitted to faculty of the Department of Computer Science are to be the original work of the student submitting the assignment, and should be signed in accordance with the provisions of the Honor Code. Appropriate action will be taken when assignments give evidence that they were derived from the work of others.

> Note: You are encouraged to periodically review the specifics of the Honor Code as stated in the College Catalogue, The Compass, and elsewhere.