

# **CMPSC 300**

## **Bioinformatics**

### **Syllabus**

Spring 2021

#### **Course Instructor**

Dr. Oliver BONHAM-CARTER

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Exam Code: J

Final deliverable due: 20<sup>th</sup> May 2021, 9:00am

Distribution Requirements: *QR* and *SP*

Syllabus updated on: March 17, 2021

#### **Instructor's Office Hours**

- Wednesdays, Thursdays, Fridays: 2:00pm – 4:00pm (15 minute time slots)
- By appointment

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.

#### **Online Meetings**

We will be using Zoom to record our in-class meetings and labs for online students to participate in the course. The Zoom link for classes and the lab can be found on your shared course calendar for the event – the calendar link will be given by a separate communication.

#### **Technical Leaders**

- <https://www.cs.allegheny.edu/teaching/technicalleaders/>

## **Course Meeting Schedule**

### **Lecture, Discussion, Presentations, and Group Work:**

Duration: 23 Feb 2021 - 20 May 2021

Monday, Wednesdays and Fridays, 10:40 AM - 11:40 AM, Alden Hall, 109

### **Laboratory Session:**

Duration: 23 Feb 2021 - 20 May 2021

Monday, 2:50 PM - 4:40 PM, Alden Hall, 109

## **Calendar**

The calendar link is provided below to allow you to add the course and lab meeting times into your own Google calendar. Note, the whole link fits onto one line.

[https://calendar.google.com/calendar/u/0?cid=](https://calendar.google.com/calendar/u/0?cid=Y182aWs5ZGpub3Y0NzNqcDZmZ2YxZjUxMG00NEBncm91cC5jYWxlbnRhci5nb29nbGUuY29t)

[Y182aWs5ZGpub3Y0NzNqcDZmZ2YxZjUxMG00NEBncm91cC5jYWxlbnRhci5nb29nbGUuY29t](https://calendar.google.com/calendar/u/0?cid=Y182aWs5ZGpub3Y0NzNqcDZmZ2YxZjUxMG00NEBncm91cC5jYWxlbnRhci5nb29nbGUuY29t)

## **Slack Channel**

The below link will expire on the 21<sup>st</sup> March.

[https://join.slack.com/t/cs300s2021/shared\\_invite/zt-mleieaad-i6G1To2GRVjMqo0Jcak5qQ](https://join.slack.com/t/cs300s2021/shared_invite/zt-mleieaad-i6G1To2GRVjMqo0Jcak5qQ)

## **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 documents and oral presentations. Students are invited to use their own departmentally approved laptop in this course; a limited number of laptops are available for use during class and lab sessions.

Prerequisite: BIO 221 and FSBIO 201, or CMPSC 100.

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/>

### Suggested Reading

The below reading list is strongly recommended to improve students build technical writing skills and to gain a firm understanding in how to conduct responsible research in computer science.

- *BUGS in Writing: A Guide to Debugging Your Prose*. Lyn Dupré. Second Edition, ISBN-10: 020137921X, ISBN-13: 978-0201379211, 704 pages, 1998.
- *Writing for Computer Science*. Justin Zobel. Second Edition, ISBN-10: 1852338024, ISBN-13:978-1852338022, 270 pages, 2004.
- *On Being a Scientist: A Guide to Responsible Conduct in Research (Third Edition)*. Committee on Science, Engineering, and Public Policy, National Academy of Sciences, National Academy of Engineering, and Institute of Medicine. ISBN: 0309119715, 82 pages, 2009. References to the textbook are abbreviated as “OBAS”.

- Along with reading the required books, you will be asked to study many additional articles from a wide variety of conference proceedings, journals, and the popular press.

## The ClassDocs/ Repository

All materials given out in class will be accessible using the `classDocs/` repository. Note: The HTTP link works in absence of SSH keys.

### Main site on GitHub:

- <https://github.com/Allegheny-Computer-Science-300-S2021/classDocs>

### HTTP:

- `git clone https://github.com/Allegheny-Computer-Science-300-S2021/classDocs.git`

### SSH:

- `git clone git@github.com:Allegheny-Computer-Science-300-S2021/classDocs.git`

## Hybrid Class Sessions

Due to the COVID-19 pandemic (and the size of our classroom), the class will be divided into two groups to allow ample space between members of the class. Each group will alternate weeks of in-person and on-line teaching. For instance, Group 1 will be in-person for a week while Group 2 is on-line. If you would like to come to in-person classes each week, please let me know and I will see what arrangements I can make to accommodate your request. Please note, this accommodation will depend on number of people from each group who come to the in-person class during their week. It is mandatory for all students to attend only his or her scheduled class, as appropriate. **Switching groups without instructor permission will not be allowed due to regulations for classroom spacing.**

If you will not be able to attend your session, then please email the course instructor at least one week in advance to describe your situation. Students who miss more than five unexcused classes, laboratory sessions, or group project meetings will have their final grade in the course reduced by one letter grade. Students who miss more than ten of the aforementioned events will automatically fail the course.

## 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	10%
Exams	20%
Laboratory Assignments	40%
Final Project	30%

## Definitions of Grading Categories

- *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 Completion

All assignments will have a stated due date. To accommodate for unforeseen life events, each student will be given an option of dropping one activity grade at the end of the semester. The dropped grade cannot include the final proposal assignment. Otherwise, unless severe extenuating circumstances have been presented to the instructor, no assignments will be accepted after the deadline.

## 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.

## 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 me 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 one of the available resources on campus:

- The Maytum Learning Commons, Library/Academic Commons,  
<http://sites.allegheny.edu/learningcommons/tutoring/>,  
814-332-2898
- Counseling & Personal Development Center,  
<https://sites.allegheny.edu/counseling/>,  
814-332-2105
- Winslow Health Center,  
<https://sites.allegheny.edu/healthcenter/>,  
814-332-4355

## Communication

Various digital channels will be used in this course for communication, including email, Slack, and the GitHub issue tracker. It is strongly advised for the student to install the Slack app on their computer and smart-phone to be sure to receive all communications from the instructor, as well as, the other members of the class.

Additionally, the course website will be used to store the syllabus, course schedule and information about the `classDocs/` repository using the GitHub. Sakai will be used to report student's numerical grades. Students are responsible for regularly checking all platforms to ensure that the important messages are not being missed.

## Special Needs and 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.*

It is recognized that an important part of the learning process in any course, and particularly one in computer science, derives from thoughtful discussions with teachers 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. While it is acceptable for students in this class to discuss their programs, technical diagrams, proposals, paper reviews, presentations, and other items with their classmates or other individuals, deliverables that are nearly identical to the work of others will be taken as evidence of violating the Honor Code.

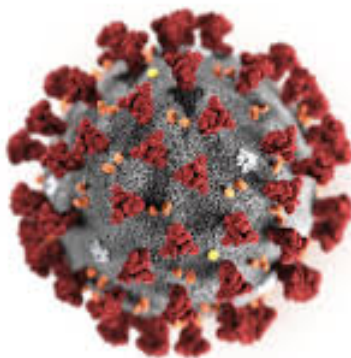


Figure 1: Safety first: Face masks and social distancing in effect.

The pandemic from the coronavirus (shown in Figure 1) has changed the usual style of teaching of this course. Please follow the below points carefully.

- **Remote Attendance:** If you are participating entirely remotely this semester and relying on technology to attend class meetings, occasional technology problems that disrupt your participation will not harm your participation grade, but as with illnesses and family emergencies, chronic absences for this reason will require a more extensive discussion with me and may impact your grade.
- **Face Coverings and Physical Distancing:** For your safety, a mask covering both your mouth and your nose is required for all in-person activities, per College policy; you will not be permitted to enter or stay in a classroom or other learning space without a face covering, and class time missed for this reason may count against your participation grade. Face coverings are also required for in-person office hours and consultations with other campus professionals. Physical distancing must be respected at all times in the classroom. Chairs will be positioned 6 feet apart, and should remain so.
- **Illness and In-person Attendance:** If you feel ill, please stay in your residence and complete the daily health screening, and err on the side of caution when deciding whether or not to come to class. Especially if you feel feverish or have a cough, please avoid contact with others; if you feel like you'd like to "power through" class rather than miss it and have to make it up, please do so remotely.
- **Keeping Devices Charged:** You will need to ensure that your laptop, tablet, or other device is sufficiently charged so that you may participate in class(es). Even if you are in-person in the classroom, you may need to use a device, especially as you will be 6 feet from your nearest peer. It won't be possible for all students to charge their devices at once in the classroom, so please make sure you bring the power cord(s) for your devices to class, pack a power strip if you have multiple devices, and pay attention to the power meter on your device.
- **Video and Microphones:** Please turn off your microphone when not speaking during any meeting where you are using your computer. The microphone may allow for background sound to contribute to noise during the meeting. It is strongly encouraged that you use your video to show yourself during meeting. Enabling your video will allow the instructor to see hands to indicate questions. Showing video also helps to stimulate group discussions.

## Welcome to Computer Science Research!

Computer hardware and software are everywhere! Conducting research in computer science is a challenging and rewarding activity that leads to the production of hardware, software, and scientific insights that have the potential to positively influence the lives of many people. As you learn more about research methods in computer science you will also enhance your ability to effectively write and speak about a wide range of topics in



computer science. I ask that you bring your best effort and highest enthusiasm as you pursue research in computer science this semester.