

Introduction to Bioinformatic Computation

The University of Toledo

BRIM Program in Bioinformatics & Proteomics/Genomics BIPG 6100/8100

Intro to Bioinformatic Computation,

Section 001, CRN #15301

Instructor: Alexei Fedorov

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Office Hours: Mon/Wed 2-3pm Office Location: 308 BHS Building; or via Skype (Afedorov_lab). For other time please request an appointment via email (alexei.fedorov@utoledo.edu) at least one day in advance.

Office Location: 308 BHS Building

Instructor Phone: 419-383-5270

Offered: Spring 2021

Course Website: [Blackboard Learn](#)

Class Location: HEB 127

Class Day/Time: Monday/Wednesday, 3:00-5:00pm

Lab Location:

Credit Hours: 3

SPECIAL COURSE EXPECTATIONS DURING COVID-19

ATTENDANCE

The University of Toledo has a missed class policy. It is important that students and instructors discuss attendance requirements for the course. Students must perform a daily health assessment, based on based on [CDC guidelines](#), before coming to campus each day, which included taking their temperature. Students who are symptomatic/sick should not come to class and should contact the Main Campus Health Center at 419-530-3451. *Absences due to COVID-19 quarantine or isolation requirements **are** considered excused absences.* Students should notify their instructors and these absences may not require written notice.

FACE COVERINGS

All students must wear face coverings while on campus, except while eating, alone in an enclosed space, or outdoors practicing social distancing. NO students will be permitted in class without a face covering. If you have a medical reason that prevents you from wearing a face covering due to a health condition deemed high-risk for COVID-19 by the Centers for Disease Control and Prevention (CDC), you should submit a request for an accommodation through the Student Disability Services Office (SDS) by completing the [online application](#). Students will need to provide documentation that verifies their health condition or disability and supports the need for accommodations. If a student is already affiliated with SDS and would like to request additional accommodations due to the impact of COVID-19, should contact their accessibility specialist to discuss their specific needs.

SOCIAL DISTANCING

Students should practice social distancing inside and outside the classroom please follow signage and pay attention to the seating arrangements. Do not remove stickers or tape from seats and/or tables, this is there to provide guidance on the appropriate classroom capacity based on the recommended 6 feet of social distancing between individuals. Please be conscious of your personal space and respectful of others. Also be cognizant of how you enter and exit the room; always try to maintain at least 6 feet of distance between yourself and others.

DESKS AND WORK SPACES

Students will need to sanitize their desks and/or work space before class with the University provided

sanitizing spray and paper towels their desks.

SPECIAL NOTES

It's important to note that based on the unpredictability of the COVID-19 virus things can change at any time so please be patience and understanding as we move through the semester. I also ask that you keep me informed of concerns you may have about class, completing course work/assignments timely and/or health concerns related to COVID.

COURSE/CATALOG DESCRIPTION

Lab Location: Lab Day/Time: Credit Hours:

127 HEB

Mon/Wed, 3:00-5:00pm 3cr hr

Delivery: All procedures related to current COVID-19 requirements will be engaged. Currently, no conventional seminars/lectures are allowed by UT Administration. Thus, all teaching activities will be provided via online Blackboard web site and Collaborate Ultra facilities. Online lectures/seminars will be every Monday and Wednesday from 3:00 pm till 5:00pm.

COURSE OVERVIEW

Several programming languages are used in bioinformatics, but PERL still plays an important role due to its relative flexibility and ease of use. Students will learn the basics of working in the Linux environment and writing Perl programs relevant to bioinformatics. Students also will learn principles in Python programming language. The strengths and limitations of bioinformatic analysis on desktop computers will also be discussed, along with the advantages and complications of using supercomputers. The course includes multiple computer laboratory sessions. The last portion of the course is devoted to a group project – in the past, some of these group projects have resulted in peer- reviewed publications with the most-active students as co- authors.

STUDENT LEARNING OUTCOMES

Successful students WILL BE ABLE TO:

- Demonstrate basic familiarity with the Linux/Unix environment
- Write basic PERL programs for extracting information from, or creating, databases
- Describe the basic tasks needed to interface with supercomputers
- Communicate competently with fellow team members in projects

TEACHING STRATEGIES

There will be five introductory lectures at the beginning of this course, followed by work in the computer laboratory. Students will design Perl programs under the guidance of the Course Director. All classes will be in the face-to-face format. At the end of the course there will be a final project and exam (or take-home exam).

PREREQUISITES AND COREQUISITES

None. However, previous completion of BIPG5100 (Fundamentals of BPG) is suggested.

REQUIRED TEXTS AND ANCILLARY MATERIALS

No textbooks are required. Students will work with the information/instructions provided online.

All assignments, quizzes, video-lectures, and supporting materials will be available through UT Blackboard portal.

TECHNOLOGY REQUIREMENTS

None. Computers will be provided in the computer lab.

UNIVERSITY POLICIES

Policy Statement on Non-Discrimination on the basis of Disability (ADA)

The University is an equal opportunity educational institution. Please read The University's Policy Statement on Nondiscrimination on the Basis of Disability Americans with Disability Act Compliance.

ACADEMIC ACCOMMODATIONS

The University of Toledo is committed to providing equal access to education for all students. If you have a documented disability or you believe you have a disability and would like information regarding academic accommodations/adjustments in this course, please contact the Student Disability Services Office.

ACADEMIC POLICIES

This course follows the main UT policies.

COURSE EXPECTATIONS

Homework time policy: There are ~15 homework assignments (one per week) and also short online quizzes after each lecture. Each homework assignment must be returned in seven calendar days by noon. (For example, for a Wednesday class this homework must be returned via email by the following Wednesday at 12pm).

GRADING

Grading principles:

Homework/project: 40% Labs + activities: 20% Mid-term exam 10% Final Exam 30%

COMMUNICATION GUIDELINES

Office hours will be held every Monday and Wednesday from 2:00-3:00 PM in Dr. Fedorov's office, room 308, Health Science Building or via Skype.

STUDENT SUPPORT SERVICES

Student Support Services can help students succeed in this course by providing academic services when needed in the areas of, advising, tutoring, financial resources, self-directed learning, and by directing students to other specific resources, as needed. Students can access these services by calling Student Services at, 419-383-6286.

COURSE SCHEDULE

- The first two weeks focus on the Linux environment. Students must learn a designated list of 30 commands with their main options. After one month, there is an exam on Linux use.
- Beginning in the third week of the course the focus shifts to development of programming skills. Students will study the following topics:

- 1) Variables (numeric and strings)

- 2) Loops (while, for, redo block)

- 3) If-else control statements

- 4) Arrays
- 5) Hashes
- 6) Multiple arrays, anonymous arrays
- 7) Array of hashes, hash of arrays
- 8) Regular expressions
- 9) System calls to invoke various programs inside Perl scripts
- 10) Subroutines
- 11) Packages and modules
- 12) References

- In the second half of the course, students begin a real bioinformatics project, working as a single team. The goal is to attack one of the important problems/challenges in genomics and collect sufficient data for a publication. The most active students will be among the co-authors.