

Applications of Bioinformatics and Genomics/Proteomics.

The University of Toledo

BRIM Program in Bioinformatics & Proteomics/Genomics BIPG6400/8400, Application of Bioinformatics

Section 001, CRN #15302

Term: Spring

Class Location: 127HEB

Class Day/Time: Wed and Friday, 10:00-11:30 am

Instructor: Alexei Fedorov, Ph.D.

Email: alexei.fedorov@utoledo.edu

Office Hours: Wed/Fri 9-10 am 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 Phone: 419-383-5270

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 WORKSPACES

Students will need to sanitize their desks and/or workspace 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

Wed/Fri, 10:00-11:30 am 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 Wednesday and Friday from 10:00 am till 11:30 am.

COURSE OVERVIEW

In this course, students will be familiarized with the most advanced computational techniques, programs and databases used at the frontiers of biomedical sciences. Advanced applications will be covered in four broad areas: new bioinformatics tools, genomics, proteomics, and RNomics/transcriptomics. The course is team-taught by faculty from The University of Toledo and Bowling Green State University.

- Assignment and/or quiz will be given after each session. Students will have ten days to complete an assignment and upload it into Blackboard. At the end of first half of the course there will be a mid-term take-home exam. At the end of the course there will be a final exam.
- Grading principles: Homework/projects and quizzes= 55%; Mid-term exam = 15%; Final exam = 20%; Class and labs activity = 10%.
- 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.

STUDENT LEARNING OUTCOMES

Successful students WILL BE ABLE TO:

- Understand and perform RNAseq gene expression investigation starting from raw Fastq datafiles to the expression matrices.
- Be able to perform large-scale SNP analysis of individual human genome based on initial SNP microarray chip or Next Generation Sequencing datasets.
- Understand whole-genome sequencing data from FASTQ, BAM, SAM, and VCF formatted files
- Examine mRNA expression using GALAXY web platform.
- Appreciate organization and structure of the Human genome, and use RepeatMasker program for finding and characterization of DNA repeats.
- Be familiarized with Artificial Intelligence and Machine Learning approaches in Bioinformatics, with concentration on Data Mining in Bioinformatics; Cluster Analysis; Pattern Recognition; and Gene Regulatory Networks.
- Gain experience in Advanced Molecular Phylogenetics.
- Grasp insights into epigenetic control of activation and silencing genes.
- Comprehend the roles of Biomarkers in modern Biomedical Sciences
- Analyze various non-coding RNA molecules using online tools.
- Communicate competently both in writing and orally.

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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

Due to COVID restrictions, this term the computer lab will not be available. For this reason, to participate in the course you will need to have your own laptop or desk top computer.

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.

GRADING

Grading principles:

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|------------------|-----|
| • Homework | 55% |
| • LABs+ activity | 10% |
| • Mid-term Exam | 15% |
| • Final Exam | 20% |
- Extra points for outstanding homework and SPECIAL ASSIGNMENTS are possible!
 - Students receive a waiver to change one homework grade to the A-grade.

Homework time policy: Each homework assignment must be returned in ten days by noon. (For example, for a Wednesday class this homework must be returned via e-mail next Saturday by noon). Absolutely NO excuse for a late homework return (automatic 0 points). Several EXTRA assignments will be available through the course. They are designed to improve grades. Special assignments must be returned in two weeks.

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.