Fundamentals of Bioinformatics & Proteomics/Genomics

The University of Toledo
BRIM Program in Bioinformatics & Proteomics/Genomics
BIPG5100/7100 Fundamentals in BPG, Section 001, CRN #45060/45064

Instructor:	Robert Trumbly, PhD	**Course Website**:	Blackboard Learn
Email:	Robert.Trumbly@utoledo.edu	**Class Location**:	Online lectures
Office Hours:	by arrangement	**Class Day/Time**:	Online lectures
Office Location:	CCE 3105F	**Lab Location**:	127 HEB
Instructor Phone:	419-383-4347	**Lab Day/Time**:	TBA
Offered:	Fall 2021	**Credit Hours**:	3 cr

SPECIAL COURSE EXPECTATIONS DURING COVID-19

Maintaining a safe campus during the ongoing COVID-19 pandemic remains a top priority. UToledo continues to follow the guidance of the U.S. Centers for Disease Control and Prevention and Ohio Department of Health to keep our campus safe.

ATTENDANCE

The University of Toledo has a missed class policy. It is important that students and instructors discuss attendance requirements for the course. Before coming to campus each day, students should take their temperature and complete a self-assessment for symptoms of COVID-19, such as cough, chills, fatigue or shortness of breath. Anyone with a temperature at or above 100.0 degrees Fahrenheit or who is experiencing symptoms consistent with COVID-19 should not come to campus and contact their primary care physician or the University Health Center at 419.530.5549. For more information on the symptoms of COVID-19, please go to https://www.cdc.gov/coronavirus/2019-ncov/symptoms-testing/symptoms.html
COVID-19 testing for sick students is available on both Main Campus and Health Science Campus. Call 419.383.4545 for an appointment. Absences due to COVID-19 quarantine or isolation requirements **are** considered excused absences. Students should notify their instructors and follow the protocols summarized in this document on Navigating COVID-Related Course Concerns.
In the event that you have tested positive for COVID-19 or have been diagnosed as a probable case, please review the CDC guidance on self-isolation and symptom monitoring, and report the disclosure to the Division of Student Affairs by emailing StudentAffairs@utoledo.edu or by connecting with their on-call representative at 419.343.9946. Disclosure is voluntary and will only be shared on a need to know basis with staff such as in the Office of Student Advocacy and Support, The Office of Residence Life, and/or the Office of Accessibility and Disability Resources to coordinate supportive measures and meet contact tracing requirements.

FACE COVERINGS

Face coverings are required while on campus, except while eating, alone in an enclosed space, or outdoors practicing social distancing. Students will not be permitted in class without a face covering. If you have a medical reason preventing you from wearing a face covering due to a health condition deemed high-risk by the CDC, submit an online application to request an accommodation through the Office of Accessibility and Disability Resources. Students will need to provide documentation that verifies their health condition or disability and supports the need for accommodations. Students already affiliated with the Office of Accessibility and Disability Resources who would like to request additional

accommodations due to the impact of COVID-19, should contact their accessibility specialist to discuss their specific needs. You may connect with the office by calling 419.530.4981 or sending an email to StudentDisability@utoledo.edu.

VACCINATION

Doctors and other health care professionals agree that the best way to protect ourselves and each other is to get vaccinated. Case data clearly show that vaccines remain highly effective at preventing serious illness from COVID, including the highly contagious delta variant. If you have not yet received your COVID vaccine, the University encourages you do so as soon as possible. No appointment is needed to get the shot at the UTMC Outpatient Pharmacy, University Health Clinic or Main Campus Pharmacy. Once you receive the COVID vaccination, please register on the COVID Vaccine Registry site at: https://utvaccinereg.utoledo.edu/.

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 patient 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.

CATALOG/COURSE DESCRIPTION

Introduction to bioinformatics and computational biology. Both theory and practical methods for evaluating and managing biomedical data will be covered. Topics range from sequence analysis to structure prediction. Includes computer laboratory sessions. May be taken concurrently with BIPG5200/7200.

COURSE OVERVIEW

Bioinformatics is now central to understanding the tsunami of biological and medical data coming from genome sequencing and various systems biology approaches. This course provides an overview of bioinformatic methods, though in enough depth to understand the strengths and limitations of the various methods. It is team-taught by lecturers from the faculty at the University of Toledo and Bowling Green State University. All lectures are posted online or emailed directly to students.

STUDENT LEARNING OUTCOMES

The successful student will be able to:

L1. Describe mammalian and nonmammalian genome structure and function, including (for example) repeat element distribution in chromosomes, and transcription factor binding sites.

L2. Discuss the processes of genome evolution, including (for example) phylogenetics.

L3. Describe and use analytic tools associated with systems/bioinformatic approaches, including (for example) transcriptomics, proteomic mass spectroscopic methods, and determining statistical significance in large bioinformatic datasets.

L4. Execute appropriate statistical analysis of sequence information, including (for example) probabilistic methods, deterministic methods, and cluster analysis.

L5. Use existing bioinformatic and statistical software, including (for example) sequence alignments and their interpretation, phylogenetic analyses, prediction of genes and transcription factor binding sites, and display, prediction, and analysis of 3D biomolecule structures.

L6. Assess evidence linking specific genotypes to given human diseases.

L7. Communicate bioinformatic information in an accurate and comprehensible manner.

PREREQUISITES AND COREQUISITES

BMSP6340/8340 Current Problems & Research Approaches in Genes and Genomics (2.5cr) is recommended, and can be taken concurrently. However, this should not be necessary for students who have had upper-level courses in biology or biochemistry.

TEXTS AND ANCILLARY MATERIALS

BOOK ISBN: 978-1-118-58178-0 Jonathan Pevsner, Bioinformatics and Functional Genomics, third edition, Wiley Blackwell, copyright 2015 The second edition of Pevsner, copyright 2009 may also be used.

TECHNOLOGY REQUIREMENTS

Computer with internet connection, current browser, Microsoft Office (or other software that can save documents in .docx, .xlsx, and .pptx formats).

ACADEMIC POLICIES

Graduate Policies: http://www.utoledo.edu/policies/academic/graduate/

COURSE EXPECTATIONS

The weekly homework assignments must be completed in a timely manner to receive full credit.

OVERVIEW OF COURSE GRADE ASSIGNMENT

Most of the course grade will be determined by the weekly homework assignments. The term project will represent 30% of the course grade.

Midterm Grading

The grading scale for the midterm grade will be same as for the final grading. Midterm grades are important for tracking the progress of students midway through the course.

Final Grading

Grading scale: 90 and above: A, 80-89: B, 70-79: C, 60-69: D, below 60: F. Students who complete all assignments should obtain an A or B in the course.

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.
Students can find this policy along with other university policies listed by audience on the University Policy webpage (http://www.utoledo.edu/policies/audience.html/#students).

https://www.utoledo.edu/title-ix/policies.html
https://www.utoledo.edu/policies/administration/diversity/pdfs/3364_50_01.pdf
https://www.utoledo.edu/policies/main_campus/student_life/pdfs/3364_30_04_Student_code_of_conduct.pdf

Academic Accommodations

The University of Toledo embraces the inclusion of students with disabilities. We are committed to ensuring equal opportunity and seamless access for full participation in all courses. For students who have an accommodations memo from Student Disability Services, I invite you to correspond with me as soon as possible so that we can

communicate confidentially about implementing accommodations in this course. For students who have not established affiliation with Student Disability Services and are experiencing disability access barriers or are interested in a referral to healthcare resources for a potential disability or would like information regarding eligibility for academic accommodations, please contact the Student Disability Services Office (http://www.utoledo.edu/offices/student-disability-services/) by calling 419.530.4981 or sending an email to StudentDisability@utoledo.edu.

ACADEMIC AND SUPPORT SERVICES

Please follow this link to view a comprehensive list of Student Academic and Support Services (http://www.utoledo.edu/studentaffairs/departments.html) available to you as a student.

SAFETY AND HEALTH SERVICES FOR UT STUDENTS

Please use the following link to view a comprehensive list Campus Health and Safety Services available to you as a student.

COURSE SCHEDULE

	Date	Lecturer	Chapter	Topic
Tu	Aug 31	Trumbly UTHSC	1	Introduction
Th	Sept 2	Trumbly	2	Databases
Tu	Sept 7	Trumbly	3	Pair-wise sequence alignments
Th	Sept 9	Gray UT	4	Databases searching
Tu	Sept 14	Gray	6	Multiple Sequence Alignment
Th	Sept 16	Rogers BGSU	7	Phylogenetic analysis
Tu	Sept 21	Rogers	7	Phylogenetic analysis
Th	Sept 23	Hu UT	13	Protein structure
Tu	Sept 28	Hu	13	Protein structure
Th	Sept 30	Isailovic UT	12	Proteomics/Mass spec
Tu	Oct 5	Trumbly	13	Protein families
Th	Oct7	Blumenthal UTHSC	16-18	Microbial genomics
Tu	Oct 12	Xi Cheng UTHSC	17	Metagenomics
Th	Oct 14	Trumbly	11	Microarrays and gene expression
Tu	Oct 19	Gray	20	Human genome
Th	Oct 21	TBA	10	RNA structure and biology
Tu	Oct 26	Trumbly	20	Next generation sequencing
Th	Oct 28	Trumbly	20	Galaxy and RNA-seq
Tu	Nov 2	Trumbly		Transcription factors
Th	Nov 4	Trumbly		ENCODE project
Tu	Nov 9	Trumbly	8	Cancer genome
Th	Nov 11	**Holiday**		**Veterans Day**
Tu	Nov 16	Trumbly	8	Genome comparison
Th	Nov 18	Trumbly	12	Gene ontology
Tu	Nov 23	Trumbly	12	Networks & pathways
Th	Nov 25	**Holiday**		**Thanksgiving**
Tu	Nov30	Cicila UTHSC	21	Mapping of disease genes
Th	Dec 2	Cicila	21	Mapping of disease genes
Tu	Dec 7	Work on term projects		

Th	Dec 9	Work on term projects		
Tu	Dec 14	Trumbly/Rogers		Submit term projects

Text: Bioinformatics and Functional Genomics, Pevsner, 3rd ed (recommended)