

Bioinformatics

BIOL 4005.005

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MATH 5220.001

CSCE 5933.001

Course Information (Spring 2022)

Instructor: Rajeev Azad (Rajeev.Azad@unt.edu)

Lectures: Tuesday & Thursday 11:00 AM – 12:20 PM

Location: GAB 114

Office hours: Tuesday 12:25 – 2:25 PM, GAB 434

Recommended Textbooks: The course content will be based on selected Bioinformatics textbooks considering diverse background of the prospective students and with no expectation of the prior exposure to this interdisciplinary area. The recommended textbooks are Biological Sequence Analysis by Durbin *et al.*, Bioinformatics and Functional Genomics by Pevsner, and Statistical Methods in Bioinformatics by Ewens & Grant. New research developments will also be covered in this course, based mainly on research articles and review papers.

Course objective: The aim of this course is to familiarize students with state-of-the-art methodologies in Bioinformatics and Computational Biology, and help them understand how to apply these techniques to solving biological and biomedical problems. This course will include the following topics:

- An introduction to Bioinformatics
- An introduction to probability and probabilistic models for interpreting biological sequence data
- Biological Databases and Genome Browsers
- Markov chain models, hidden Markov models, profile hidden Markov models
- Genome architecture, genome assembly, gene prediction, protein topology prediction
- Pairwise and multiple sequence alignment
- Molecular phylogeny
- Genome evolution: vertical and horizontal modes of gene transfer
- Microarray, RNA-Seq, and next generation sequencing data analysis
- Metagenomics and Metatranscriptomics
- Human genomic variations: detection of structural variations and copy number polymorphisms, identification of disease-associated genes

Course outcomes: Appreciation of the interdisciplinary approaches to solving problems in biology; understanding of the essence of computational and mathematical methods in biology and medicine; familiarization with principles and models underlying standard bioinformatics methods/algorithms; practical experience of using bioinformatics tools for biological data analysis.

Grading: Based on class participation (20%: 10% for attendance, 10% for discussions), homework assignments (30%), project (30%), and exam (20%).

For the project (30% of the grade), undergraduate students will be graded based on work performed and PowerPoint presentation, and graduate students will be graded based on work performed, PowerPoint presentation, and written report.

Above 90% \equiv A, 80-89.99% \equiv B, 70-79.99% \equiv C, 60-69.99% \equiv D, and Below 60% \equiv F

Attendance Policy: Attendance is essential and thus is expected.

Attendance: Students are expected to attend class meetings regularly and to abide by the attendance policy established for the course. It is important that you communicate with the professor and the instructional team prior to being absent, so you, the professor, and the instructional team can discuss and mitigate the impact of the absence on your attainment of course learning goals. Please inform the professor and instructional team if you are unable to attend class meetings because you are ill, in mindfulness of the health and safety of everyone in our community.

If you are experiencing any symptoms of COVID-19 please seek medical attention from the Student Health and Wellness Center (940-565-2333 or askSHWC@unt.edu) or your health care provider PRIOR to coming to campus. UNT also requires you to contact the UNT COVID Team at COVID@unt.edu for guidance on actions to take due to symptoms, pending or positive test results, or potential exposure.