Bioinformatics

BIOL 4005.005   BIOL 5005.005   MATH 5220.002   CSCE 5933.004

Course Information (Spring 2023)

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

Lectures: Thursday 6:00 – 8:50 PM

Location: GAB 310

Office hours: Friday, 10:30 - 11:30 AM at LSC B314 and Thursday, 9:00 – 10:00 AM via Zoom: https://unt.zoom.us/j/2298672063, or by appointment

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 (15%: 10% for attendance, 5% for discussions), in-class presentation (10%), homework assignments (35%), project (25%), and exam (15%). Above 90% ≡ A, 80-89.99% ≡ B, 70-79.99% ≡ C, 60-69.99% ≡ D, and Below 60% ≡ F

Attendance Policy: Attendance is essential and thus is expected.