

Fundamentals of Computational Biology

3 Credit Course (2+1+0)

Dr. Divyashri Baraniya (Guest Instructor)

Unit 1. Working with sequences (basics I): In this unit students will understand biological sequences and details of the specification and representation of biological sequence data. Differences between different formats of sequences, different categories of databases and an overview of some important open source databases will be taught.

Unit 2: Working with sequences (basics II): Introduction to sequence alignment, its significance, pairwise and multiple sequence alignments (MSA), different algorithms used for alignments, scoring matrices for amino acid substitution.

Unit 3. Introduction to Linux: basics of Linux, working on command line interface (CLI), performing various common operations including creating and opening folders, viewing lists, moving, copying and deleting files and folders, changing formats and renaming, use of important commands including grep, awk, echo, chmod etc. with examples.

Unit 4. Basics of R: Introduction to R and R studio. Fundamentals of R, creation and execution of R file, working with R scripts, importing data, data handling and restructuring, reading different formats of data files.

Unit 5: Computational analysis with examples: Performing various statistical analyses including measurement of central tendencies, hypothesis testing, Correlation and regression on data from lab experiments and plotting various types of graphs using R.

Unit 6. Biological and ecological diversity: Different components of alpha and beta diversities, parametric and non-parametric tests.

Suggested readings:

1. "Bioinformatics: Sequence and Genome Analysis" by David W. Mount
2. "Introduction to computational Biology" by Bernhard Haubold and Thomas Wiehe.
3. "R for data science" by Hadley Wickham and Garrett Grolemund
4. "Practical R for Biologists: An introduction" by Donald Quicke, Buntika A. Butcher, Rachel Krufft Welton.
5. "The Linux command line: A complete Introduction" by William Shotts.