ACEGID introduction to bioinformatics course outline. The following topics will be covered to help introduce the students and researchers to fundamentals of bioinformatics.

1. Introduction to Bioinformatics:

- Overview of bioinformatics and its applications in biology and medicine.

- Introduction to biological databases and data types (sequences, structures, gene expressions, etc.).

- Overview of key computational tools and resources in bioinformatics.

2. Biological Data Retrieval and Manipulation:

- Introduction to sequence data (DNA, RNA, protein) and file formats (FASTA, GenBank).

- Retrieving sequences from databases and local files.

- Sequence alignment algorithms and pairwise sequence alignment.

- Introduction to sequence databases (NCBI, UniProt) and their search tools.

3. Sequence Analysis:

- Multiple sequence alignment and its applications.

- Phylogenetic analysis and tree construction.

- Introduction to sequence similarity searching and basic BLAST usage.

- Introduction to sequence motif analysis and identification.

4. Structural Bioinformatics:

- Introduction to protein structure and its representation.

- Protein structure databases (PDB) and their tools.

- Homology modeling and structure prediction.

- Introduction to protein-ligand interactions and drug discovery.

5. Genomics and Transcriptomics:

- Introduction to genome sequencing and assembly.

- Annotation of genomes and gene prediction.

- Introduction to RNA sequencing (RNA-Seq) and data analysis.

- Gene expression analysis and differential expression.

6. Data Visualization and Analysis:

- Introduction to data visualization techniques in bioinformatics.

- Exploratory data analysis and statistical analysis.

- Introduction to R and its bioinformatics packages.

- Visualization and interpretation of biological networks and pathways.

7. Introduction to Machine Learning in Bioinformatics:

- Overview of machine learning techniques and their applications.

- Introduction to classification and regression in bioinformatics.

- Feature selection and dimensionality reduction.

- Hands-on exercises using machine learning tools in bioinformatics.

8. Practical Projects:

- Assign hands-on projects to apply the knowledge gained throughout the course.

- Provide real-world datasets and guide students in solving bioinformatics problems.

- Encourage students to explore additional topics of interest and present their findings.

9. Ethical and Legal Considerations:

- Discuss ethical considerations in bioinformatics research.

- Overview of data privacy, security, and intellectual property.

- Responsible conduct of research and publication ethics.

10. Emerging Trends in Bioinformatics:

- Introduce students to emerging areas like metagenomics, single-cell sequencing, and precision medicine.

- Discuss recent advances and future directions in bioinformatics research.

Remember to provide hands-on exercises, assignments, and practical projects throughout the course to reinforce learning. Additionally, encourage discussions, group activities, and guest lectures by experts in the field to provide a well-rounded learning experience.

**Unix 101**

This hands-on class introduces the essentials of the Unix operating system. Knowing how to use Unix from the command line gives you access to a large set of powerful and flexible tools, including many of the fundamental tools of bioinformatics. This course will help you take advantage of the power of Unix for your research.

Throughout the class, we’ll use concrete examples of typical tasks to illustrate core concepts, focusing particular attention on tab- and comma-delimited files.

The class will cover:

* Managing files and organizing directories
* Viewing files in the Unix environment
* Some of the oddly named but powerful Unix text utilities: cut, grep, head, sort, tail, uniq, and wc
* Common ways of getting help with Unix commands.

***Prerequisites:***  None.  This class is intended for beginners; no previous experience with Unix, bioinformatics, or the MacOS is required.

Proposed tutorials

1. Genetic diversity: <https://introtogenomics.readthedocs.io/en/latest/2021_diversityTutorial.html>