

**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**B.E. SEMESTER : VIII**  
**BIOMEDICAL ENGINEERING**

Subject Name: **BIOINFORMATICS (BI)**

| Sr. No. | Course Contents   | Total Hrs |
|---------|---|-----------|
| 1.      | <b>Introduction to Bioinformatics:</b> Introduction, Branches, Aim, Scope.  | 04        |
| 2.      | <b>Biological Databases:</b> Classification Schema, Retrieval Systems, Tools and Databases of NCBI, Nucleotide, Protein & Gene Expression Database of NCBI. Sequence Submission and Retrieval Tool.   | 08        |
| 3.      | <b>Sequence Alignments:</b> Concept, Scoring Matrices, Alignments of Pairs of Sequences, Alignment Algorithms, Heuristic Methods, Multiple Sequence Alignment (MSA).  | 06        |
| 4.      | <b>Gene Prediction Methods:</b> Biological Overview, Methods of Gene Prediction, Computational Methods, Combination of Two Methods, Difficulties.   | 08        |
| 5.      | <b>Protein Structure and Modeling:</b> Levels, Secondary Structure Types, Prediction & Limitations, Methods of Protein Modeling, Homology or Comparative Modeling, Refinement & Evaluation of Model.  | 08        |
| 6.      | <b>Simulation &amp; Statistical Protocols:</b> Monte Carlo Methods, Molecular Dynamics, Energy Minimization, Markov Chain and HMM, Application of Viterbi Algorithm, Application of HMMs, Advantages of HMMs.   | 10        |
| 7.      | <b>Application of LINUX and PERL for Bioinformatics:</b> Basic LINUX Commands, Shell Scripting for Creating Directory and perform mathematical operations, PERL programming for concatenate two sequences, Search in Sequence, Complement and Reverse Complement of the Sequence, percentage similarity of two sequences and Query Finding in sequence. | 06        |

**The Practical and Term work will be based on the topics covered in the syllabus.**

**Text Books:**

1. Ghosh, Zhumur, & Mallick, B., “” Bioinformatics: Principles and Applications”, Oxford University Press, 2009.
2. Rastogi, S. C., “Bioinformatics: Methods and Applications”, PHI Publications, 2006.

**Reference:**

1. Bosu, Orpita, Thukral, S., H., “Bioinformatics: Databases, Tools, and Algorithms”, Oxford University Press, 2009.