

**BHARATHIAR UNUIVERSITY, COIMBATORE 654 046.**

**M.SC. BIOCHEMISTRY**

**(Revised papers for the candidates admitted from the academic year 2015-16 onwards)**

**Note: The revised syllabi for the following papers furnished below be followed and there is no change in the existing scheme of examinations and syllabi of remaining papers.**

**ELECTIVE GROUP B**

**PAPER I - COMPUTATIONAL MOLECULAR BIOLOGY**

**Preamble:**

**Scope:** To provide molecular biologists the modern molecular databases and tools including literature, sequence, structure and expression databases.

**Objective:** To provide information an understanding of the major computational problems in the field of molecular biology.

**Goal:** To gain knowledge on molecular databases, comparative genomics, pattern search, classification of sequence and structure, alignment of sequences, rapid similarity searching, phylogenies, automated pattern learning, representing and searching protein structure, gene expression profiling, clustering expressed genes, discovering transcription factor binding sites, discovering common functions of co-expressed genes, metabolic pathways, signal transduction pathways.

**Contents:**

**Unit – I**

Computational Molecular Biology: Bioinformatics - Bibliographic and Full Text Journal Access

Genome Databases - Molecular Biology Databases on the Web. **Nucleic acid databases- EMBL, GenBank, DDBJ**. DNA and protein forensics analysis. Probability and statistics **in bioinformatics** , Linkage analysis.

**Unit - II**

Pattern Matching with Consensus Sequences, Quantitative & Probabilistic Pattern Matching – **PSSM**. Sequence Alignment – Local and global alignment, Sequence Similarity Search, Near Optimal Sequence Alignments -Multiple Sequence Alignment ,Clustal w.

**Unit III**

Phylogenetic Analysis –**Phylogenetic trees, Distance Based method –Neighbour joining method.Character based method- Maximum parsimony and maximum likelihood**. Protein Sequence Motifs Protein Structural Motifs.

**Unit IV**

Clustering and Functional Analysis of Co-ordinately Regulated Genes - Discovering Transcriptional Regulatory Signals - Ultra conservation in the Human Genome - Pathway Bioinformatics- **KEGG**.

### Unit V

Introduction to the GCG SeqWeb. Interface - Sequence Comparison - GCG SeqWeb - BestFit and Gap - Description of Progressive Pair wise Algorithm. Sequence Blocks & Profiles.

### References:

1. Bioinformatics-A beginner's guide by Jean – Michel Claverie and Cedric Notredame, Wiley- Dream Tech India Pvt. Ltd.
2. Developing bioinformatics computer skills by Cynthia Gibas and Per Jambeck, O' Reilly publications.
3. Introduction to bioinformatics by T.K. Attwood and D.J. Parry –smith, Pearson Education Asia.
4. Bioinformatics by David.W.Mount, CBS publishers and distributors.
5. Instant notes in bioinformatics by D.R. Westhead, J.H.Parish and R.M.Twyman.
6. Biostatistical analysis. Zar.J.H
7. Peuzner, P.A., Computational molecular Biology, An algorithmic approach
8. Bioinformatics-Concepts, skills and applications by SC Rastogi, Namita Mendiretta, Parag Rastogi, CBS Publishers, Delhi.

## ELECTIVE GROUP B

### ELECTIVE PAPER - PAPER II – GENOMICS

#### Preamble:

**Scope:** To provide students a detailed through background various wet lab techniques and data

generation tools related to DNA sequences.

**Objective:** To handle the data in analyzing and interpretation including annotation.

**Goal:** To educate students on stand alone and online software for genetic studies.

Contents:

#### Unit I

Genome structure: Genome sizes and the C-value paradox, introns and exons, microbial and organelle genomes - Centromeres and telomeres, tandem repeats- dispersed repeats (transposons), gene density, intergenic DNA.

#### Unit II

Genome physical mapping –**High resolution and low resolution mapping**, Genetic mapping, Fragmenting the genome, the need for markers -marker sequences (RFLPs, AFLPs, SNPs, etc) - hybridization mapping .Genome sequencing- Basic Sanger sequencing, clone **by clone and whole genome shot gun method**. Automated sequencing. Finalizing sequences and re sequencing.

#### Unit III

Genome project and bioinformatics - www databases for genomes, **Human genome project**.DNA dynamics, Recombination, Gene evolution, Gene diversity, Sequence diversity, Polymorphism.

#### **Unit IV**

Phylogenetic Genome mapping - DNA sequence analysis – Random shearing, GenBank – Web based ORF finding, sequence alignment and 3-D matrix tools – Genotator, DNA modeling.

#### **Unit V**

Orthologues and paralogues, RNA transactions, comparative genomics of viruses, bacteria, organelles and eukaryotes, lateral gene transfer.

#### **Reference:**

1. The Human Genome Project; Deciphering the blueprint of heredity ; Edited by Nacia Grant Cooper; University Science books, CA, USA, 1994.
2. Bioinformatics-A beginner's guide by Jean – Michel Claverie and Cedric Notredame, Wiley- Dream Tech India Pvt. Ltd.
3. Developing bioinformatics computer skills by Cynthia Gibas and Per Jambeck, O' Reilly publications.
4. Principles of Gene manipulation and Genomics by S.B.Primrose and R.M.Twyman, Seventh Edition ,Blackwell publications.
5. Bioinformatics-Concepts, skills and applications by SC Rastogi, Namita Mendiretta, Parag Rastogi, CBS Publishers, Delhi.

### **ELECTIVE GROUP B PAPER I - COMPUTATIONAL MOLECULAR BIOLOGY**

#### **Preamble:**

**Scope:** To provide molecular biologists the modern molecular databases and tools including literature, sequence, structure and expression databases.

**Objective:** To provide information an understanding of the major computational problems in the field of molecular biology.

**Goal:** To gain knowledge on molecular databases, comparative genomics, pattern search, classification of sequence and structure, alignment of sequences, rapid similarity searching, phylogenies, automated pattern learning, representing and searching protein structure, gene expression profiling, clustering expressed genes, discovering transcription factor binding sites, discovering common functions of co-expressed genes, metabolic pathways, signal transduction pathways.

#### **Contents:**

##### **Unit – I**

Computational Molecular Biology: Bioinformatics - Bibliographic and Full Text Journal Access

Genome Databases - Molecular Biology Databases on the Web. Nucleic acid databases- EMBL, GenBank, DDBJ. DNA and protein forensics analysis. Probability and statistics in bioinformatics , Linkage analysis.

### **Unit - II**

Pattern Matching with Consensus Sequences, Quantitative & Probabilistic Pattern Matching – PSSM. Sequence Alignment – Local and global alignment, Sequence Similarity Search, Near Optimal Sequence Alignments -Multiple Sequence Alignment ,Clustal w.

### **Unit III**

Phylogenetic Analysis –Phylogenetic trees, Distance Based method –Neighbour joining method.Character based method- Maximum parsimony and maximum likelihood. Protein Sequence Motifs Protein Structural Motifs.

### **Unit IV**

Clustering and Functional Analysis of Co-ordinately Regulated Genes - Discovering Transcriptional Regulatory Signals - Ultra conservation in the Human Genome - Pathway Bioinformatics- KEGG.

### **Unit V**

Introduction to the GCG SeqWeb. Interface - Sequence Comparison - GCG SeqWeb - BestFit and Gap - Description of Progressive Pair wise Algorithm. Sequence Blocks & Profiles.

### **References:**

1. Bioinformatics-A beginner's guide by Jean – Michel Claverie and Cedric Notredame, Wiley- Dream Tech India Pvt. Ltd.
2. Developing bioinformatics computer skills by Cynthia Gibas and Per Jambeck, O' Reilly publications.
3. Introduction to bioinformatics by T.K. Attwood and D.J. Parry –smith, Pearson Education Asia.
4. Bioinformatics by David.W.Mount, CBS publishers and distributors.
5. Instant notes in bioinformatics by D.R. Westhead, J.H.Parish and R.M.Twyman.
6. Biostatistical analysis. Zar.J.H
7. Peuzner, P.A., Computational molecular Biology, An algorithmic approach
8. Bioinformatics-Concepts, skills and applications by SC Rastogi, Namita Mendiretta, Parag Rastogi, CBS Publishers, Delhi.

## **ELECTIVE GROUP B ELECTIVE PAPER - PAPER II – GENOMICS**

### **Preamble:**

**Scope:** To provide students a detailed through background various wet lab techniques and data

generation tools related to DNA sequences.

**Objective:** To handle the data in analyzing and interepretation including annotation.

**Goal:** To educate students on stand alone and online software for genetic studies.

Contents:

### **Unit I**

Genome structure: Genome sizes and the C-value paradox, introns and exons, microbial and organelle genomes - Centromeres and telomeres, tandem repeats- dispersed repeats

(transposons), gene density, intergenic DNA.

## **Unit II**

Genome physical mapping –High resolution and low resolution mapping, Genetic mapping, Fragmenting the genome, the need for markers -marker sequences (RFLPs, AFLPs, SNPs, etc) - hybridization mapping .Genome sequencing- Basic Sanger sequencing, clone by clone and whole genome shot gun method. Automated sequencing. Finalizing sequences and re sequencing.

## **Unit III**

Genome project and bioinformatics - www databases for genomes, Human genome project.DNA dynamics, Recombination, Gene evolution, Gene diversity, Sequence diversity, Polymorphism.

## **Unit IV**

Phylogenetic Genome mapping - DNA sequence analysis – Random shearing, GenBank – Web based ORF finding, sequence alignment and 3-D matrix tools – Genotator, DNA modeling.

## **Unit V**

Orthologues and paralogues, RNA transactions, comparative genomics of viruses, bacteria, organelles and eukaryotes, lateral gene transfer.

## **Reference:**

- 1.The Human Genome Project; Deciphering the blueprint of heredity ; Edited by Nacia Grant Cooper; University Science books, CA, USA, 1994.
2. Bioinformatics-A beginner's guide by Jean – Michel Claverie and Cedric Notredame, Wiley-Dream Tech India Pvt. Ltd.
3. Developing bioinformatics computer skills by Cynthia Gibas and Per Jambeck, O' Reilly publications.
4. Principles of Gene manipulation and Genomics by S.B.Primrose and R.M.Twyman,Seventh Edition ,Blackwell publications.
5. Bioinformatics-Concepts, skills and applications by SC Rastogi, Namita Mendiretta, Parag Rastogi, CBS Publishers, Delhi.