COURSE STRUCTURE FOR
M.TECH.BIOINFORMATICS
(W.e.f. July 2012)

Semester I

S.No.	Paper Code	Subject Title	Credit	L.T.P.
1.	CBBI-701	Fundamental of Bioinformatics & Information Technology	3	2-0-2
2.	CBBI-702	Biological Databases and Data Analysis	3	2-0-2
3.	CSIT-703	Object Oriented Programming	3	2-0-2
4.	PHY-701	Molecular Biophysics	2	2-0-0
5.	BCBT-704	Biomolecules	2	2-0-0

Deficiency Courses

S.No.	Paper Code	Subject Title	Credit	L.T.P.
1.	MAS-312	Elementary Mathematics	4	3-1-0
2.	MCE-302	Molecular Biology	3	3-0-0

Semester II

S.No.	Paper Code	Subject Title	Credit	L.T.P.
1.	CBBI-703	Phylogenetic Analysis	3	2-0-2
2.	CBBI-704	Genomics and Proteomics	3	2-0-2
3.	CBBI-705	Sequence Analysis and Data Mining	3	2-0-2
4.	CBBI-706	IPR Issues in Bioinformatics	2	2-0-0
5.	CBBI-708	Biomolecular Modeling	3	2-0-2
6.	CBBI-710	Perl for Bioinformatics	3	2-0-2
7.	MAS-815	Experimental Design	3	2-0-2
8.	CBBI-780	Seminar-I	1	0-0-2

Deficiency Course

1.	MAS-411	Engineering Mathematics-I	4	3-1-0

1.	CBBI-800	Summer Training	1	0-0-2

Semester III

S.No.	Paper Code	Subject Title	Credit	L.T.P.
1.	CBBI-803	Computer Aided Drug Designing	3	2-0-2
2.	CBBI-806	Pattern Recognition	2	2-0-0
3.	CBBI-814	Microarray Data Analysis	3	2-0-2
4.	CBBI-816	Algorithms in Bioinformatics	3	2-0-2
5.	ME -749	Design Theory & Methodology	3	3-0-0
6.	CBBI-880	Seminar-II	1	0-0-2

Electives (Any Two)

S.No.	Paper Code	Subject Title	Credit	L.T.P.
1.	CBBI-802	Chemo Informatics	3	2-0-2
2.	CBBI-804	Biodiversity & Informatics	3	2-0-2
3.	CBBI-805	Bio-Image Processing	3	2-0-2
4.	CBBI-815	Agroinformatics	3	2-0-2
5.	CBBI-817	Immunoinformatics	3	2-0-2
6.	CBBI-818	Medical Informatics	3	2-0-2
7.	CBBI-819	Nutriinformatics	3	2-0-2
8.	CBBI-820	Microbial Informatics	3	2-0-2

Deficiency Courses

1.	MAS-490	Engineering Mathematics-II	4	3-1-0

Semester IV

S.No.	Paper Code	Subject Title	Credit	Credit
1.	CBBI-899	Research Project (Dissertation)	15	0-0-15

CBBI-815   Agroinformatics   3(2-0-2)

Unit-1

Introduction to Bioinformatics, background of bioinformatics. Information network - Internet, web Browser and address (NCBI, EBI etc). Introduction to Agroinformatics, Indian and International Scenario, Intelligent Technology in Agroinformatics, Organic Farming and Information Technology, Geographical Information System (GIS).

Unit-2

Agriculture Information Sources, Scientific Communications, Agriculture Literature, Journals, Technical Reports, Electronic Publishing, Flow of agriculture and Scientific information, Agriculture Information System-AGRIS/CARIS/AGROVOC/ARIS, Decision Support System(DSS) and its types .

Unit-3

Database concepts and their types, database architecture, data normalization, File Transfer Protocol, DBMS,RDBMS, Agricultural Databases and their importance, Functioning of Agricultural Databases, Plant Genome Databases, AGRICOLA, Plants National Databases (PPMdb, TAIR, GrainGene, BrassicaDB, MaizeDB, Soybase, TIGR etc).

Unit-4

Bioinformatics Applications-EMBL, Genbank, OMIM, DDBJ, Gene Cards, Sequence search and Retrieval, Sequence Identification (BLAST),Alignment, Sequence analysis/ submission/translation, Proteomic and Genomic Web resources

Unit-5

AgriInformatics tools-Crop Nutrient Tool, Vegspec, NAT, Ecological Site Descriptor, other farm and risk management softwares.

CBBI-816   Algorithms in Bioinformatics   3(2-0-2)

Unit 1

Introduction, Algorithms and Complexity, Biological algorithms versus computer algorithms, iterative versus recursive algorithms, algorithms design techniques.

Unit 2

Molecular Biology background: how can we analyze DNA? , how do individuals of a species differ? And how do different species differ? Bioinformatics Perspective.

Unit 3

Exhaustive Search: Regulatory motifs in DNA sequences, Profiles, motif finding problem, search trees etc.

Unit 4

Greedy Algorithms: Genome Rearrangements, Approximation Algorithms, a greedy approach to motif finding.

Unit 5

Dynamic Programming Algorithms, local and multiple alignment, gene prediction, statistical approach etc.

Unit 6

Divide and Conquer Algorithms, Space-Efficient sequence alignment, constructing alignments in sub-quadratic time, Graph Algorithms.

Unit 7

Combinatorial pattern matching, clustering and trees, Hidden Markov Models and Randomized Algorithms.

CBBI-817 **Immunoinformatics** **3(2-0-2)**

Unit 1

Introduction, Databases, Tools, and Web Resources for Immunoinformatics.

Unit 2

Structural Immunoinformatics: Introduction, Structural Features of MHC Peptides, MHC-peptide Interaction Parameters, Structural Prediction Techniques, Application of Docking Protocol, Available Resources.

Unit 3

In Silico QSAR-Based Predictions of Class I and Class II MHC Epitopes, Peptide Database, Additive Method – Class I and Class II Alleles.

Unit 4

Allergen Bioinformatics: Allergen Databases, Allergenicity Prediction.

Unit 5

Immunoinformatics Applied to Modifying and Improving Biological Therapeutics, Computational Immunology, Discrete Models of HIV Infection, Simulation of HIV-1 Infection

CBBI-818   Medical Informatics   3(2-0-2)

Unit 1
Knowledge Management, Data Mining and Text Mining in Medical Informatics

Unit 2
Bioinformatics Challenges and Opportunities in medical informatics: Informatics and Biological perspective.

Unit 3
Ethical and Social Challenges of Electronic Health Information, Evidence-based Medicine, outcome Measures and Practice Guidelines, Data mining.

Unit 4
Information Retrieval and Digital Libraries, Modeling Text Retrieval in Biomedicine, Public Access to Anatomic Images

Unit 5
Infectious Disease Informatics and Outbreak Detection, Identification of Biological Relationships from Text Documents.

Unit 6
Creating. Modeling and Visualizing Metabolic Networks: FCModeler and PathBinder for Network Modeling and Creation, Gene Pathway Text Mining and Visualization.

CBBI-819   Nutriinformatics   3(2-0-2)

Unit 1
An introduction and overview of nutritional, GENOMICS, Bioinformatics and Bio-computation, Health Disparities, Public and International Policies

Unit 2
Gene–environment interactions: Defining the playfield, genetic variability, environmental factors, gene–environment interactions, gene–microorganisms interactions.

Unit 3
Metabolomics: bringing nutrigenomics to practice in individualized health assessment, metabolome assembly and annotation, bioinformatics: knowledge management from genomics and metabolomics to health assessment.

Unit 4

Nutrients and gene expression: introduction, nuclear receptors: structure and function, phytoestrogens: nutrients mimicking estrogens, polymorphisms

Unit 5

The informatics and bioinformatics infrastructure of a nutrigenomics biobank, assumptions, use cases, and design criteria. Biocomputation and the analysis of complex Data sets in nutritional genomics.

Unit 6

Nutrients and norms: ethical issues in nutritional genomics, managing nutrigenomics information, methods for delivering nutrigenomics services, nutrigenomics products

CBBI-820   **Microbial Informatics**   **3(2-0-2)**

Unit 1
Bioinformatics, Genomics, and Antimicrobial Drug Discovery, Genomics of Bacterial Pathogens, Global Aspects of Antibiotic Resistance

Unit 2
The Pathway Tools Software and Its Role in Antimicrobial Drug Discovery.

Unit 3
Genomic Strategies in Antibacterial Drug Discovery, Genomics-Based Approaches to Novel Antimicrobial Target Discovery, Pathogenesis Genes as Novel Targets.

Unit 4
Microbial Proteomics: New Approaches for Therapeutic Vaccines and Drug Discovery

Unit 5
Phenotype Micro Arrays: Their Use in Antibiotic Discovery, Surrogate Ligand-Based Assay Systems for Discovery of Antibacterial Agents for Genomic Targets.

Unit 6
Using Fungal Genomes for the Discovery, Development, and Clinical Application of Novel and Current Antifungal Therapeutics, Genomics in Novel Natural Products Generation.