DEPARTMENT OF MOLECULAR BIOLOGY AND BIOINFORMATICS

Ph.D. COURSE WORK SYLLABUS

TRIPURA UNIVERSITY

Syllabus prescribed for the degree of Doctor in Philosophy in Molecular Biology and Bioinformatics.

The following are the details for the Examination:

Course work	Max Marks
Theory	
MBBI -9001: Research Methodology I	(100)
MBBI -9002: Research Methodology II	(100)
MBBI -9003: ADVANCED CONCEPTS IN MOLECULAR BIOLOGY AND BIOINFORMATICS	(100)
MBBI -9004: RESEARCH TRENDS IN MODERN MOLECULAR BIOLOGY AND BIOINFORMATICS	(100)
Total	400

MBBI -9002(Paper-II):

Techniques in Molecular Biology and Bioinformatics:

PCR, qPCR, Western Blot, Agarose Gel Electrophoresis, SDS PAGE, Proteomics analysis, Southern Blotting, Northern Blotting.

Review and Critique of Published Research paper on the Following specified topics:

1. Immunology of Host-pathogen interaction: Host defense and immune responses to protozoan and bacterial pathogens, Development of immune-diagnostic tools, Development of immune-therapeutics, Vaccine development.

2. Cell Signaling: G-Protein Coupled Receptors. Receptor Tyrosine Kinases, G protein, ras and rho family signaling, MAP Kinases, Phosphatidylinositol, Nuclear signaling, Bacterial Signaling, Notch signaling, DNA Damage Response.

3. Microbiology and Bacterial Biofilm. Biofilm attenuation, Drug screening against drug resistant bacteria like MDR, XDR and TDR.

4. Mining and handling biological data bases: Biological Databases: Organization and purpose of Biological Databases: NCBI, EBI, DDBJ, RCSB. Literature Databases: PubMed, BioMed Central, PloS.

5. Evaluation of gene expression and regulation: Consequences of gene regulation, Gene Interaction and Disease, Genetic Imprinting and X Inactivation, Genetic Regulation of Cancer, Chromatin Remodeling and Histone Modifications, the Complexity of Gene Expression, Protein Interaction, and Cell Differentiation, Transcription factors, Genetic Signaling, Regulation of Transcription, Epigenetics, and Gene Regulation, Small Non-coding RNA and Gene Expression.

6. Communication skill in terms of Presentation on the subjects.

MBBI -9003 (Paper-III):

RESEARCH TRENDS IN SPECIFIC SUBJECT AREA **(100)**

Unit-1: Molecular biology of the cell:

Concepts of genetic regulation in bacteria, protozoa, yeast and fungi. Generation knock-in, knock-out and knock-down strains and mutants. Complementation analysis. Strategies of heterologous gene expression. Dynamic relationship between the structure of cells and the biochemical reactions that are necessary for cell growth, differentiation, survival and death with an emphasis on eukaryotic cells.

Unit- 2: Infection Biology and Host pathogen interaction

Techniques for host pathogen interaction analysis. Analyzing host response against pathogens (Signaling and gene regulation). Identification of virulence factors. Immunological methods for studying the host-pathogen interaction. Signaling events during host-pathogen interaction.

Unit-3: Genome Sequence Analysis

Basic principle of genome assembly and annotation. Scoring matrices for nucleic acid and protein sequence analysis: PAM and BLOSUM. Pairwise and multiple sequence alignment. Gap penalties. Database searching using BLAST. Phylogenetic analysis.

Unit -4: Microbial biofilm

Biofilm Development (attachment, differentiation and dispersal). Biofilm Physiology, Viability and Antibiotic Resistance. Microbial Ecology Techniques. Environmental Biofilms. Clinical Biofilms. Biofilms in Industry and Biofilms in Drinking Water). Evolutionary/Population Processes in Biofilms.

Paper-IV: (100)

Project AND Assignment:/ Field work, Seminar and other academic activities:

A. Writing Research Proposal on advanced topics in Molecular Biology and Bioinformatics and seminar presentation.

B. Practical on general Molecular Biology and Bioinformatics methods.

C. Review on a selected topic using existing literature and seminar presentation.

D. Design and teach one practical (experiment) to the M.Sc. students/Teach.