

Course	Skill Enhancement Course
Semester	IV
Paper Number	MBTSE4021T
Paper Title	TECHNIQUES IN MOLECULAR AND CELL BIOLOGY
No. of Credits	2
Theory/Composite	Theory
No. of periods assigned	2 Theory
Course description/objective	The course aims to <ol style="list-style-type: none"> 1. give the students an essence of molecular tools and techniques. 2. expose students to cell biological tools and techniques. 3. provide an overview of protein purification, DNA and RNA related methods used in molecular biology and gene transfer in bacteria. 4. provide an overview of histochemical assays, immunotechniques, electrophysiological, biophysical and radioactive methods.
Syllabus	<p>Module A: Molecular Biology Methods (40 Marks)</p> <p>UNIT I: Gene transfer: Gene transfer in bacteria (Conjugation, transformation, transduction)</p> <p>UNIT II: Methods and techniques: DNA (Genomic, cDNA, plasmids and episomes) and RNA related methods; Restriction enzymes; concept of PCR; Gel electrophoresis (agarose and PAGE); Northern and Southern hybridisation; Dot/Slot blots; DNA sequencing; Protein purification methods; Immunoblotting, Enzyme immunoassays after immunoblotting; DNA-protein interaction techniques (South-western blots, EMSA, DNaseI foot printing, immunoprecipitations). Basics of cloning and sub-cloning: Cloning strategies.</p> <p>No. of Classes: 1 Class per week</p> <p>Module B: Cell Biology Methods (40 Marks)</p> <p>UNIT III: Histochemical assays and immunotechniques: Reporter assays - CAT, luciferase, βgalactosidase, GFP and β-glucuronidase; protein localization in organelle; detection of molecules in living cells; histochemical stains; in situ localization by techniques such as FISH and GISH; chromosome painting; chromosome banding; DNA barcoding; detection of molecules using ELISA and RIA; flow cytometry and cell sorting and immunofluorescence; immunodiagnostic test (dengue); Widal test (detection of microbial infection); enzyme immunoassay in diagnostic microbiology</p> <p>UNIT IV: Electrophysiological methods: Membrane filtration and dialysis; patch-clamp technique; ECG; PET; MRI; CAT (outline)</p> <p>UNIT V: Radioactive and microscopic methods - radioisotopes used in biology; incorporation of radioisotopes in biological tissues; liquid scintillation counter and Geiger counter; molecular imaging of radioactive material; electron microscopy (EM); different fixation and staining techniques for EM, freeze-etch and freeze fracture methods for EM.</p>

	<p>UNIT VI: Biophysical methods: Sedimentation and density gradient; GLC; hydroxyapatite chromatography; viscosity; mass spectrometry; GC-MS and LC-MS; isoelectric focusing; ground and remote sensing methods and applications.</p> <p>No. of Classes: 1 Class per week</p>
Readings	<p>Module A</p> <ol style="list-style-type: none"> 1) Principles of Genetics- Gardner <i>et al.</i> 2) An Introduction to genetic analysis- David Suzuki 3) Genetics- Strickberger 4) Principles of Gene Manipulation & Genomics-Primrose & Twyman 5) Molecular Cloning- Sambrook <i>et al.</i> <p>Module B</p> <ol style="list-style-type: none"> 6) Biophysical Chemistry - David Friefelder 7) Molecular Cloning: A Laboratory Manual - Sambrook and Russell 8) Cell and Molecular Biology – P. Sheeler, D.E. Bianchi (3rd Edition)
Evaluation	<p>Continuous Internal Assessment: 20 marks</p> <p>End-Semester Theory Examination: 80 marks</p>
Paper Structure for End Sem Theory	<p>Module A (40 marks)</p> <p>10 questions, 1 mark each; i.e. 1x10=10 marks</p> <p>3 questions, 10 marks each; i.e. 3x10=30 marks</p> <p>Module B (40 marks)</p> <p>10 questions, 1 mark each; i.e. 1x10=10 marks</p> <p>3 questions, 10 marks each; i.e. 3x10=30 marks</p>