

DEPARTMENT OF
BIOTECHNOLOGY

PERIYAR UNIVERSITY, SALEM- 11

M.PHIL. BIOTECHNOLOGY
(CURRICULUM DETAILS)

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I- SEMESTER		Credits
MPBT01	Research Methodology	4
MPBT02	Plant and Animal Biotechnology	4
MPBT03	Guide Paper	4
 II – SEMESTER		
	Project	8
	Viva-Voce	4

		24

M. Phil. BIOTECHNOLOGY SYLLABUS

MPBT01: PAPER I - RESEARCH METHODOLOGY

Credits: 4

Hours: 4/Wk

Unit I

Centrifugation: Basic principles, Ultra centrifuge, Density Gradient Centrifugation and Sub cellular fractionation by differential centrifugation, Spectroscopy: UV-Visible Spectrophotometer, FT-IR and AAS.

Unit II

Microscopy: Fluorescence, Confocal, Scanning and Transmission Electron microscopes, Super Resolution Microscopy, Image analysis technique for living cells, Gel filtration, Affinity chromatography, HPLC, NMR, GC-MS, MALDI-TOF and Microarray technique. Autoradiography and Liquid Scintillation Counter.

Unit III

Electrophoresis methods: PAGE, Agarose gel electrophoresis, Capillary Electrophoresis, 2D-Electrophoresis and Gel Documentation. Histochemical and Immunotechniques: Antibody generation, detection of molecules using ELISA, Western blot and Immunoprecipitation.

Unit IV

Principles and techniques of Southern and Northern hybridization: Principles and applications of PCR, RT-PCR, and qPCR. Automated DNA sequencing, Next Generation sequencing, DNA Chip Technology, preparation of DNA probes and hybridization, FISH, DNA and Protein Microarray, Flow Cytometry, Chromatin Immunoprecipitation. Fermentor-Types, design and downstream process.

Unit V

Research Ethics, Research/Experimental design, Preparation of Research report, Measures central tendency and Dispersion, Standard error, Regression and Correlation analysis; Student's t-test; Analysis of Variance; Chi-Square test; Application of computers in biostatistics; Bioinformatics: BLAST N & P, multiple sequence analysis, Gene discovery using EST. Genbank Databases: NCBI, EMBL & DDBJ. Protein sequence Database: Swiss Prot & PDB.

Reference Books

- Keith Wilson and John Walker, 2010. Principles and Techniques of Biochemistry and Molecular Biology. 7th Edn. Cambridge University Press.

- Wayne W. Daniel, Chad L. Cross. 2013. Biostatistics: A foundation for Analysis in the Health Sciences. 10th Edn. Wiley Series in Probability and Statistics.
- Rastogi S. C., Mendiratta N. and Rastogi P. 2013. Bioinformatics Methods and Applications Genomics, Proteomics, and Drug Discovery. 3rd Edn. PHI Learning.
- Terrance G. Cooper. 1977. Tools in Biochemistry. Wiley-Interscience publication, New York.
- Joseph Sambrook & David W. Russell. 2001. Molecular Cloning – A laboratory Manual. 3rd Edn. Cold Spring Harbor Laboratory Press, Cold Spring Harbor, New York.
- Charles N. Rely, Donalds. T. Sawyer, Robert E. Krieger Huntington. 1979. Experiments of Instrumental methods: A Laboratory Manual, New York.
- Gelvin, S.B., and Schilperoort, R.A. 2000. Plant Molecular Biology Manual, 2nd Edn. Springer Netherlands.
- Norman T.S. Bailey, 1995. Statistical Methods in Biology. 3rd Edn. Cambridge University Press, UK

MPBT02: PAPER II - PLANT AND ANIMAL BIOTECHNOLOGY

Credits: 4

Hours: 4/Wk

Unit I

Plant tissue culture: Nutritional requirements, plant growth hormones, genetic variation and chromosome stability. Protoplast isolation, culture and Somatic hybridization. Production of haploid plants. Germplasm conservation. Application of Plant Tissue culture, callus and suspension culture, Protoplast culture: synthetic seed production.

Unit II

Transformation: Agrobacterium mediated, Particle bombardment and Virus mediated. Transgenic plants: Pest and Disease resistance. Recombinant proteins and edible vaccines. Molecular Markers: RAPD, RFLP, AFLP, SNPs. Reporter genes, GUS, resistant markers. Production of secondary metabolites.

Unit III

Cell cultures: primary, secondary, sub culture, pilot and large scale culture. Development of cell line, Separation of viable and non - viable cells, cytotoxicity of cultured cells. Tissue culture techniques. Recombinant subunit and DNA vaccines. Single domain antibody production.

Unit IV

Embryo transfer technology: *In-vitro* fertilization. Transfer of genes: microinjection, electroporation and liposome mediated transformation. Method of producing transgenic animals and applications – gene knockout and knock down. Stem cells – Embryonic and adult. Molecular pharming: Production of pharmaceuticals and biomolecules.

Unit V

Intellectual Property rights (IPR), General agreement on tariff and trade (GATT), Trade related intellectual property (TRIP), Patents for plants, animals, transgenic organisms and DNA sequences. Plant breeder's and farmer's rights. Biosafety and ethical issues.

Recommended Books

- Ralf Pörtner, 2007. *Animal Cell Biotechnology: Methods and Protocols* (Methods in Biotechnology). 2nd Edition. Humana Press.
- Spier R. and J.Griffiths, 1994. *Animal Cell Biotechnology*. Academic Press.
- Darling D.C. and S.J. Morgan, 1994. *Animal Cells: Culture and Media: Essential Data* (Essential Data Series), Wiley-Blackwell Publishers.
- Jennie P. Mather and David Barnes, 1998. *Methods in Cell Biology, Volume 57: Animal Cell Culture Methods* Academic Press.
- Kalyan Kumar De, 1992. *Plant Tissue Culture*, New Central Book Agency, Calcutta.
- Robert N. Trigiano, and Dennis J. Gray, 1996. *Plant Tissue Culture Concept and Laboratory Exercises*, CRC Press, London.
- Srivasta P.S. 1998. *Plant Tissue Culture and Molecular Biology*, Narosa Publishing House, New Delhi.
- Narayanaswamy, S. 1994. *Plant Cell and Tissue Culture*, Tata McGraw Hill Publishers.