

M.Phil BIOTECHNOLOGY SYLLABUS

MPBT01: PAPER I. RESEARCH METHODOLOGY

Credits: 4

Hours: 4/Wk

Unit I

Basic and applied research, Research/Experimental design, Literature collection. components, Format of thesis and dissertation,. Preparation of Research report – Thesis - dissertation -Manuscript/research article – monograph/review.

Unit II

Microscopy- Fluorescence, Scanning and Transmission Electron microscopy, Affinity chromatography, HPLC, UV-Visible spectrophotometer, ICP, NMR, GC-MS and Microarray technique. Autoradiography and Liquid Scintillation Counter.

Unit III

Centrifugation, SDS-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. Fermentor-Types, design, downstream process.

Unit V

Measures of Mean, Median and Mode: Standard Deviation and Standard Error. Regression and Correlation coefficient analysis; Student's t-test; Analysis of Variance (ANOVA); Chi-Square test. Bioinformatics: BLAST N & P, Gene discovery using EST. Genbank Database- NCBI, EMBL & DDBJ. Protein sequence Database- Swis Port & PDB.

Reference Books

- Biostatistics : A foundation for Analysis in the Health Sciences 7/E Wayne W. Daniel, Wiley Series in Probability and Statistics.
- Prem S. Mann, 2004. Introductory Statistics. Fifth Edition. John Wiley and Sons (ASIA) Pvt. Ltd.
- S. C. Rastogi, N. Mendiratta, and P. Rastogi. Bioinformatics Methods and Applications Genomics, Proteomics, and Drug Discovery.
- Introduction to Bioinformatics, (Atwood, T. K. and Parry-Smith, D. J).
- Protein Purification by Robert Scopes, Springer Verlag Publication, 1982
- Tools in Biochemistry David Cooper
- Methods of Protein and Nucleic acid Research, Osterman Vol I – III
- Joseph Sambrook & David W. Russell, Molecular Cloning – A laboratory Manual (Third Edition) – Cold Spring Harbor laboratory Press, Cold Spring Harbor, New York.
- M. Prakash, C.K. Arora, Laboratory Instrumentation, – Anmol Publications Pvt Ltd.,
- Charles N. Rely, Donald T. Sawyer, Robert E. Krieger Huntington Experiments of Instrumental methods, A Laboratory Manual, New York.
- Hobart, H. Willard, Lynne L. Meritt J.R. John Dean, Instrumental Methods of Analysis, East West Press Pvt Ltd.
- Gelvin, Plant Molecular Biology, A Laboratory Manual, Kluwer Academic Press.
- P.N. Arora and P.K. Malhotra, Biostatistics
- Norman T.S. Bailey, Statistical Methods in Biology. 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.

Unit II

Transformation, Transgenic plants - Pest and Disease resistance. Recombinant proteins and edible vaccines. Molecular Markers- RAPD, RFLP, AFLP, SNPs. Production of secondary metabolites.

Unit III

Development of cell line, Separation of viable and non - viable cells. Cell cultures, cytotoxicity of cultured cells. Tissue culture techniques. Recombinant subunit and DNA vaccines. Monoclonal antibody production. Nucleic acid probes and hybridization. Tissue typing.

Unit IV

Embryo transfer technology. *In-vitro* fertilization. Transfer of genes: micro injection, electroporation and liposome mediated transformation. Stem cells – Embryonic and adult. Molecular pharming: Production of pharmaceuticals and biomolecules – Hormones and Steroids.

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.
- R.Spier and J.Griffiths, 1994. Animal Cell Biotechnology.. Academic Press.
- D.C. Darling and S.J. Morgan, 1994. Animal Cells Culture and media, BIOS Scientific Publishers Limited.
- Jennie P. Mather and David Barnes, 1998. Methods in Cell Biology, Volume 57: Animal Cell Culture Methods Academic Press.
- Ann Harris, 1996. Epithelial Cell Culture, Cambridge University Press.
- M .M. Ranga, 2000. Animal Biotechnology ,Agrobios (India),
- Kalyan Kumar De, 1992. Plant Tissue Culture , New Central Book Agency ,Calcutta
- Robert N. Trigiano, Dennis J. Gray, 1996. Plant Tissue Culture Concept and Laboratory Exercises , CRC Press , London.
- P.S. Srivasta, 1998. Plant Tissue Culture and Molecular Biology , Narosa Publishing House ,New Delhi.
- David W. Galbraith, Hans J. Bohnert and Don P. Bourque, 1995. Methods in Plant Cell Biology, Academic Press, New York.
- John H. Dodds and Lorrin W. Roberts , 1995. Experiments in Plant Tissue Culture, Cambridge University Press , USA.

- Singh, S.K. & Srivastava, Seema. 2006. Plant Tissue Culture Eastern Book Corporation, India
- Narayanaswamy, S, 1994. Plant Cell And Tissue Culture Tata McGraw Hill Publishers