

**M.PHIL. BIOTECHNOLOGY  
(FT/PT)  
CORE COURSE I  
RESEARCH METHODOLOGY**

**UNIT-I: RESEARCH METHODOLOGY**

Meaning of research – Objectives of research – motivation of research – Types, approaches and significance – Methods versus methodology – Research in scientific methods – Research process – Criteria for good research – Problem encountered by research in India – Funding agencies.

**UNIT-II: RESEARCH DESIGN**

Research Problem: Selecting the problem – Necessity of defining the problem – Techniques involved in defining the problem – Research design – Needs and features of good design – Different research design – Basic principles of experimental designs.

**UNIT-III: DATA COLLECTION AND DOCUMENTATION**

Data collection methods – Data types – Processing and presentation of data – Techniques of ordering data – Meaning of primary and secondary data – The uses of computers in research – The library and internet – Uses of search engines – virtual libraries – common software for documentation and presentation.

**UNIT-IV: DATA AND ERROR ANALYSIS**

Statistical analysis of data – Standard deviation – Correlation – Comparison of sets of data – Chi squared analysis for data – Characteristics of probability distribution – Binomial, Poisson and normal distribution – Principle of least square fittings – Curve

fitting – Measurement of errors – Types and sources of errors – Determination and control of errors.

## **UNIT-V: RESEARCH COMMUNICATION**

Meaning of research report – Logical format for writing thesis and paper – Essential of scientific report: abstract, introduction, review of literature, materials and methods and discussion – Write up steps in drafting report – Effective illustrations: tables and figures – Reference styles: Harvard and Vancouver systems.

### **REFERENCE BOOKS:**

1. Research Methodology, Methods and Techniques – C.R. Kothari – Wishwa Prakasam Publications, II Edition.
2. Research: An introduction – Robert Ross – Harper and Row Publications.
3. Research methodology – P. Saravanavel – Kitlab Mahal, Sixth Edition.
4. A Hand book of Methodology of Research – Rajammal P.A. Devadass – Vidyalaya Press
5. Introduction to Computers – N. Subramanian
6. Statistical methods – G.W. Snedecor and W. Cochran – Oxford and IBH, New Delhi.
7. Research Methodology Methods and Statistical Techniques – Santosh Gupta.
8. Statistical Methods – S.P. Gupta
9. Scientific social surveys and research – P. Young – Asia Publishers, Bombay.
10. How to write and publish a scientific paper – R.A. Day – Cambridge University Press.
11. Thesis and Assignment writing – Anderson – Wiley Eastern Ltd.

**PART I**  
**PAPER II**  
**ADVANCED BIOTECHNOLOGY**

**UNIT-I**

Genetic engineering of Herbicide resistant plants – insect resistance – viral resistance. Stress tolerant plants, flower pigmentation – modification of nutritional content – appearance and taste of food plants – delayed fruit ripening. Artificial seeds – terminator seed technology. Role of molecular techniques in crop improvement – Nif gene transfer.

**UNIT-II**

Transgenic animals: cattle, mice, fish and super ovulation – embryo transfer – IVF. Preservation methods: production of recombinant products – growth hormones – human interferons. Dairy Biotechnology – stem cell therapy – ethical issues of animal biotechnology.

**UNIT-III**

Fermentation: types – fermentor – types – strain improvement – media formulation, upstream & Down stream processing. Production of industrially important enzymes, antibiotics, organic acids, vitamins amino acids and SCP. Biosensors – types – role of GMOs in biodegradation – bioleaching.

**UNIT-IV**

Immunoglobulin genes – functions & phylogenetic analysis. Isolation, characterization, purification and production of lymphocytes. Role of Immuno suppressors and Modulators. Molecular Immunodiagnostic methods. Specificity of T-cell

receptors. Monoclonal antibodies & plantibodies. Role of Biotechnology in vaccine production.

## UNIT-V

Nanoparticles – metals – biological networks – bionano particles – nanostarch, nanoparticulates, nanocomposites and nanobiosensors – dendrimers as nanoparticulates. Nanotechnology in molecular diagnosis – nanotechnology in drug discovery & delivery – applications of nanomaterials in medicine.

### Suggested Readings

1. J. Hammond, P. Mc Garvey & V. Yusibov (2000). Plant Biotechnology. Springer verlag.
2. Paul Christou & Harry klee. (2004). Hand Book of plant Biotechnology. Vol I & II. John Wiley & sons. Ltd.
3. H.S. Chawla. (1998). Biotechnology in crop improvement. International Book Distributing Company.
4. Nigel Jenkins. Animal Cell Biotechnology: Methods and protocols. Human press
5. John, R.W.Masters. (2000). Animal cell culture – Practical approach. Third edn. Oxford University Press.
6. U. Satyanarayana. (2005). Biotechnology. Books and Allied (p) Ltd.
7. Peter F. Stanbury. Principles of Fermentation technology. Butterworth Heinemann, Elsevier Science Ltd.
8. Alexender. N.Glazer & Hiroshi Nikaido. W.H. (1995) Microbial Biotechnology. Freeman and Company.
9. Rajasekara pandian M & Senthilkumar B (2007) Immunology and Immuno Technology. Panima Publishing Corporation, New Delhi.

10. Kuby J (1997) Immunology 3<sup>rd</sup> Edn. WH Freeman & Co. New York.
11. Christof M. Niemayer, Chad A. Mirkin (2004). Nanobiotechnology: Concepts, applications and perspectives. Wiley VCH publishers.