



**MASTERS OF PHILOSOPHY (M. PHIL.)**  
**BIOTECHNOLOGY**  
**DETAILED SYLLABUS**  
**SESSION 2013-14**



## **PAPER I**

### **RESEARCH METHODOLOGY THEORY AND TECHNIQUES**

#### **UNIT - I**

Research: Definition, Importance and Meaning of research, Characteristics of research, Types of Research, Steps in research, Identification, Selection and formulation of research problem, Research questions – Research design – Formulation of Hypo Dissertation, Review of Literature.

#### **UNIT – II**

Sampling techniques: Sampling theory, types of sampling – Steps in sampling – Sampling and Non-sampling error – Sample size – Advantages and limitations of sampling.

Collection of Data: Primary Data – Meaning – Data Collection methods – Secondary data – Meaning – Relevances, limitations and cautions.

#### **UNIT – III**

Statistics in Research – Measure of Central tendency, Dispersion, Skewness and Kurtosis in research, Hypo Dissertation, Fundamentals of Hypo Dissertation testing, Standard Error, Point and Interval estimates, Important Non-Parametric tests: Sign, Run, Kruskal, Wallis tests and Mann, Whitney test.

#### **UNIT – IV**

Para metric tests: Testing of significance, mean, Proportion, Variance and Correlation, testing for Significance of difference between means, proportions, variances and correlation co-efficient. Chi-square tests, ANOVA, One-way and Two-way.

#### **UNIT– V**

Research Report: Types of reports, contents, styles of reporting, Steps in drafting reports, editing the final draft, evaluating the final draft.

#### **Reference Books:**

1. Statistical Methods - S.P. Gupta
2. Research Methodology Methods and Techniques - C.R. Kothari
3. Statistics (Theory and Practice) - B.N. Gupta
4. Research Methodology Methods and Statistical Techniques - Santosh Gupta



## PAPER-III

# APPLIED BIOTECHNOLOGY

### UNIT-I:

**Industrial Biotechnology:** Microbial strain of industrial importance, microbial production of antibiotics (penicillin, streptomycin & tetracycline), Vitamins (Vit B12), amino acids (glutamic acid) & enzymes (amylase, protease, invertase & pectinase), microbial production of alcoholic beverages (whisky & brandy), vinegar, citric acid, acetic acid, glycerol, acetone, foods-SCP, Biotransformation of steroids and pesticides.

### UNIT-II:

**Agricultural Biotechnology:** Role of biofertilizers and biopesticides in sustainable development, petrocrops, aquaculture, Improvement of nutritional value of seed storage protein, starch, oil. Transgenic plants for increased shelf life molecular mapping of genes of agricultural importance, sericulture, transgenic fish, Plant Variety Protection Act, Plant breeders rights, International Convention on biological diversity.

### UNIT-III:

**Food Biotechnology:** Prokaryotic & Eukaryotic based products (fermented meats, milk products, yoghurt, cheese, cereal, wine, beer), Impact of biotechnology on microbial testing of food, current/traditional methodology and new approaches (use of gene probes, RDT, Bioluminescence), Safety evaluation of genetically engineered enzyme/novel food products, Natural Control of Micro Organism and preservation, Biogums, Bio-colours Fumaric acid, sweetener, fat substitutes, natural & modified starch, fats & oils food.

### UNIT-IV:

**Environmental Biotechnology:** Environmental pollution and their management, concept of Global Warming and Ozone depletion (Ecofarming, Green house effect & acid rain), Waste water treatment, solid waste management, conventional & modern fuels & their environmental impact, Bioremediation, Biodegradation of xenobiotic compounds, Biomineralization, Biotechnological approaches for preserving biodiversity (Gene banks, Germ Plasm Banks & their management).



## UNIT-V:

**Frontiers in Biotechnology:** Stem Cell Technology, Human Cloning Ethical issues & risks associated with it, Nano biotechnology:– Introduction to nanoscience, size matter, tools for measuring nanostructure Biosensor development and application, Nanofabrication, Nanotech impact on types of DNA chips & their production, SNP and genome mismatch signals, functional proteomics – RT PCR Human Genome Project , Bioterrorism.

### References:

1. Fundamental of food Biotechnology (1996). Lee, B.H.
2. Biotechnology & Food Ingredients (1991) Goldberg, I & Williams, R.
3. Food Biotechnology: Micro Organisms (1995) Hui, Y.H.
4. Biotechnology: Food Fermentation Vol. I & II (1999), Joshi, V.K. & Pandey, A.
5. Pesticide Microbiology, Hill I.R. & Asight, S.J.L.
6. Biotech in Industrial Waste treatment & Bioremediation (1996) Hickey, R.F. Smith, G.

## PAPER-III

### NEW TRENDS IN BIOTECHNOLOGY

#### UNIT I

- Genome & Genomics: Concept and methods of genome analysis, genome projects.
- Transcriptome & Transcriptomics: Concept and methods
- Proteome & Proteomics: Concept and methods of Proteome analysis
- Metabolome & Metabolomics

#### UNIT II

- Stem Cell technology: Types of stem cells
- Manipulations of stem cells and applications in medicine
- In vitro fertilization: Principle, methods, applications and ethics.
- Cloning of animals: Methods and applications.

#### UNIT III

- Nano biotechnology: Introduction, Biomaterials and biological materials-examples and uses
- DNA nanotechnology-structural DNA assembly-Nanopore and



- Nanoparticles-biological arrays- nanoprobes for analytical applications
- Nano biosensors-nanoscale organization-characterization-quantum size effects- sensors of the future.
- Tools for measuring nanostructures. Microscopies-SEM-TEM-AFM modern advancesmicroanalysis-optical detection of single molecules

#### **UNIT IV**

- Microarray chips: Concept, design of biochip, types of DNA chips
- Gene Therapy for Human Diseases.
- Protein Crystallization; Theory and methods: API Electro spray and MALDI-TOF.
- SNP's and GMS (Genome mismatch Signals)

#### **UNIT V**

- Biosensors: Concept, principle, Organization of biosensors & types
- Biosensors: Health & Medicine
- Biosensors: Food technology, Environment monitoring
- Bacterial biosensors; Array Biosensors

#### **References:**

1. DNA Microarrays and gene expression by **P. Baldi & GW Hatfield**
2. Protein – Protein Interactions by **Erica Golemis**
3. A passion for DNA (Genesm genomes and Society) By **JD Watson**
4. Modern Genetic analysis by **Anthony JF Griffiths et al.**
5. Nan biotechnology- next big idea by **Mark, Ratner Daniel Ratner**
6. Gene cloning by **TA Brown**
7. Latest information on academic Web sites

### **PAPER-IV DISSERTATION**