



# **PALAMURU UNIVERSITY**

(Accredited with Grade 'B' by NAAC)

**MAHABUBNAGAR – TS.**

## **SYLLABUS for Ph.D. COURSE WORK in MICROBIOLOGY**

4 Credits – Max Marks: 100

### **PAPER-I**

## **RESEARCH METHODOLOGY**

### **UNIT-I: INSTRUMENTATION**

Chromatographic techniques- TLC, HPLC, FPLC, GC, LCMS, dialysis, ion exchange, FT-IR, UV, NMR, Spectrophotometry, SDS-PAGE, 2D electrophoreses is electric focusing PFGE, centrifugation techniques, Microscopes-fluorescent, SEM & TEM; PCR; Real-time PCR.

### **UNIT-II: BIOINFORMATICS**

Searching, retrieving biological databases – Primary, Secondary and Functional databases, protein and nucleic acid sequence analysis - gene prediction, primer designing, bioinformatics tools in microbial taxonomy – BLAST – construction of phylogenetic tree SPSS. Accessing, genome data analysis.

### **UNIT-III: COMPUTER APPLICATIONS & STATISTICAL METHODS**

Computers: Disk Operating Systems (DOS); Windows: MS Office Applications. Design of experiments- collection, analysis and presentation of research data- measure of centraltendency- mean, mode and median- standard deviation, correlation and regression, probability an chisquare tests, test of hypothesis, analysis of variance (ANOVA) & covariance (ANCOVA).

### **UNIT-IV: REVIEW OF LITERATURE & ETHICS IN RESEARCH**

Writing scientific articles – Design criteria and components of the article (abstract, introduction materials and methods, results, discussion and reference) conflict of interest- review articles, research papers, reports, short communications and thesis; review of literature- bibliography and citations- Indices, publications- Impact Factor, SCOPUS, h-index, web of sciences, ISSN, ISBN.

Good manufacturing practices- intellectual property rights- patenting and patent laws ethical issues in research, Plagiarism – Definition, types, issues, prevention and animal experimentation; antibiotic policies.

**PAPER-II**

**APPLIED MICROBIOLOGY**

**UNIT-I: INDUSTRIAL MICROBIOLOGY**

Introduction to industrial microbiology, scope, history, microorganisms, and industrial products. Design of an ideal fermenter, Types of fermentations, detection and assay of fermentation products. Scale up of fermentations, product recovery methods, strain development strategies. Immobilization methods. Fermentative production of ethanol, beer, wine, antibiotics (Penicillin), citric acid, vitamin B12, Glutamic acid and microbial enzymes (Amylases).

**UNIT-II: MEDICAL MICROBIOLOGY AND PHARMACEUTICAL MICROBIOLOGY**

Principles of Medical Microbiology, Normal flora of human body. Properties of pathogenic microorganisms, principles of diagnostic microbiology, use of lab animals in diagnostic microbiology. Systematic Medical Microbiology: *Mycobacterium tuberculosis*, *Neisseria gonorrhoea*, *E.coli*, *Salmonella typhi*, *Clostridium tetani*, Influenza, HIV, Polio, Rabies Trichomoniasis and Fungal diseases (Systemic Mycosis).

Microbiological assays for antibiotics. Sterility testing methods for pharmaceutical products. Mode of action of important drugs – Cell wall inhibitors (Beta-lactam – eg. Penicillin), membrane inhibitors (polymyxins), macromolecular synthesis inhibitors (streptomycin), Antifungal antibiotics (nystatin), Drug resistance, Antiviral agents.

**UNIT-III: MOLECULAR BIOTECHNOLOGY**

Isolation and purification of proteins, RNA, Genomic and plasmid DNA. Production of Monoclonal antibodies, Biochips (DNA chips & micro array assays). DNA markers: RFLP, RAPDs and AFLP. Finger printing. Gene therapy, Cloning strategies and gene expression. Library Construction- rRNA / Genomic / c-DNA. Screening, transformation, selection and detection of cloned genes.

**UNIT-IV: FOOD, ENVIRONMENT AND AGRICULTURE MICROBIOLOGY**

Dairy Microbiology- Role of Microorganisms in Dairy Industry, Fermented foods (Yoghurt, Cheese and Sauerkraut), Bacteriological examination of fresh and canned foods, Food preservation methods, current and future implications concerning food safety, hazards and risks, Probiotics, Prebiotics and their significance in human beings and animals. Microorganisms in air, water and soil and their importance. Microbial diversity in the environment. Rhizosphere Microbiology. Degradation of carbonaceous materials in soil. Biology of Nitrogen fixation. Biofertilizers, Biopesticides.