ST. JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS) VISAKHAPATNAM

VI SEMESTER **BOTANY** TIME:3Hrs/week

B-A2-6102(3) **MICROBIOLOGY-METHODS AND APPLICATIONS** Marks:100

19-20 Admitted Batch (17AE) **SYLLABUS**

OBJECTIVES: To enable the students to-

- Trace the history of Microbiology
- Understand the characteristic features of important microorganisms
- Understand the methods and techniques used in Microbiology
- Appreciate the applications of Microbiology in the areas of Environment, Industry and Medicine.

Course out comes:

CO1: Microscopy and other imaging techniques provide employability as medical lab technicians.

CO2: Experience in instrumentation Techniques of centrifugation, Sonication, freeze drying and Spectrophotometry enables students to take up positions in Industrial Research & Development.

CO3: Skills in Chromatographic techniques help in Drug discovery and Drug design.

CO4: Biological Instrumentation skills fetch jobs in Quality & Control Departments of many Food Industries.

CO5: Art of Scientific writing enables students to publish new findings in science.

COURSE SYLLABUS

UNIT–I: HISTORY AND DIVERSITYOF MICRO ORGANISMS

1. Land marks in the history of Microbiology
2. Contributions of Anton Von Leuwenhoek, Louise Pasture, Robert Koch to the field of Microbiology
3. Morphology of important microorganisms:

Bacteria, Actinomycetes, Cyanobacteria: Nostoc, Anabaena
Viruses: TMV, Bacteriophage, HIV, Influenza virus
Algae: Chlorella, Senedesmus, Spirulina, Diatoms
Fungi: Yeast, Penicillium, Aspergillus, Rhizopus, Mucor, Mushroom

UNIT–II: TECHNIQUES IN MICROBIOLOGY

1. Sterilization methods – physical and chemical
2. Staining techniques: Basic staining, Acidic staining, Differential staining by Gram's staining technique, Acid fast staining, special staining methods for spores and capsules
3. Microscopic Techniques:

a) Hanging drop technique
b) Micrometry
c) Counting the microbial cells and spores

UNIT–III: METHODS IN MICROBIOLOGY

1. Different types of Culture Media
2. Inoculation Methods to Isolate Pure Cultures: Serial dilution technique, Pour plate method, Streak plate method, Spread plate method, Special culture methods.
3. Maintenance and methods of Preservation of Pure Microbial cultures

UNIT–IV: APPLICATIONS OF MICROBIOLOGY IN ENVIRONMENT& MEDICINE

1. Role of Microbes in Agriculture-Soil fertility, Biofertilizers, Biopesticides, Bio-weedicides; as Decomposers; Biofuels, Biofouling; Environmental Cleanup –Bioremediation; Single Cell Proteins; Insulin production; Plant and animal diseases.
2. Microbiology of Water: Municipal Water Purification; Bacterial analysis of water
3. Microbiology of Sewage: Sewage treatment – Small scale treatment, Large scale treatment.
4. Microbes and Human health: Important Microbial diseases in man; Disease control –Vaccines and interferons; Antibiotics-Most commonly used Antibiotics, Mode of action of Antibiotics, Antibiotic sensitivity assays.

UNIT–V: INDUSTRIALAPPLICATIONS

1. Microbiology of Milk and Dairy products- Composition and Microflora of Milk, Methods of Pasteurization, important Dairy products.
2. Microbiology of Foods: Vegetables, fruits, poultry, eggs, sea foods and meat; Methods of Food Preservation; Food poisoning.
3. Fermentation: Types of Fermentation, Structure of Fermenter; Production of Ethanol from molasses using Yeast; Production of Citric acid using Aspergillus
4. Production of Alcoholic Beverages: Beer, Wine and Vinegar

TEXT BOOK: Microbiology {2015), P.D. Sharma, Rasthogi Publications, New Delhi, India.

REFERENCES:

1. Elements of Microbiology – Michael J Pelczar& E.C.S. Chan, Mc Graw Hill International Book Company, New York (1995)

2. An Introduction to Microbiology- P. Tauro K.K. Kapoor, K.S. Yadav, Wiley Eastern Ltd., New Delhi.

3. Microbiology- Anna K Joshua, Popular Book Depot, Madras (1998)

4. A Text book of Microbiology – By R.C.Dubey, D.K.Maheshwari, S.Chand Publications, Delhi, 2005

5. General Microbiology – By R.P.Singh, Kalyani Publications, 2005.

6. Microbiology and Cell Biology-R.N. Bhattacharjee, Kalyani Publishers, New Delhi, 2017

ST. JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS) VISAKHAPATNA

VI SEMESTER **BOTANY** TIME:2 Hrs/week

B-A2-6152 (2) **MICROBIOLOGY-METHODS AND APPLICATIONS** Max. Marks: 50

PRACTICAL SYLLABUS – IV A2

OBJECTIVES: To enable the students to

- Learn rules and regulations in Microbiology laboratory and to become familiarise with the equipment.
- Observe and identify important microorganisms.
- Learn staining techniques and methods of microscopic observation.
- Perform experiments for culturing Bacteria & Fungi on Nutrient Agar medium.
- Develop skills to isolate pure cultures

Course Outcomes:

CO1: Develop Competence in Microbiological techniques to gain employability in industry in Quality & Control divisions.

CO2: Operate Inoculation methods to isolate pure cultures help to discover new strains for drug discovery.

CO3: Master in microbial culture methods and become an entrepreneur in Biofertilizer, Bio pesticide and Bio-weedicide production.

CO4: Acquire Expertise in vaccines and Antibiotic synthesis and administration provide employment opportunities in Hospitals and clinical laboratories.

CO5: Establish and execute Food and Beverage production & processing units.

COURSE PRACTICAL SYLLABUS – IV A2

1. Rules and regulations to be observed in a Microbiology laboratory.
2. Microbiological Equipment:
   - Hot air oven
   - Autoclave
   - Laminar airflow
   - Incubator
   - Colony counter
3. Identification of important microorganisms belonging to Bacteria, Cyanobacteria, Algae and Fungi.
4. Microbiological Methods:
   a. Cleaning and sterilization of glassware; wrapping and plugging
   b. Culture media
      i) Preparation of Nutrient Broth (NB) and Nutrient agar (NA) for Bacteria, Potato Dextrose Agar (PDA) for Fungi
      ii) Sterilization and distribution of media.
   c. Inoculation methods:
      i) Pour plate method
      ii) Streaking of plates and slants
      iii) Stab method
      iv) Inoculation of liquid media
   d. Report of cultures:
   Microbiological examination of Bacterial and Fungal growth in cultures and presentation of reports.
5. Special Techniques:
   a. Gram staining technique
   b. Hanging drop method
   c. Micrometry
   d. Counting Microbial cells or spores
6. Antibiotic sensitivity assay by Agar diffusion method.
7. Preparation of Wine from grapes by simple fermentation process.
8. Visit to Microbiology laboratory in Hospital or Research station, Dairy farm, Brewing or backing industry, Mushroom cultivation unit, Municipal Water treatment plant, Sewage treatment plant, Solid waste management unit, Canning industry etc

PRACTICAL BOOKS:

1. Experiments with Microorganisms (1986) R.N. Bhattacharya, EMKAY Publications, Delhi, India.
2. Laboratory Manual in Microbiology, Dr. P. Gunasekharan, New Age International (P) Ltd. Publisher, Delhi & Mumbai, India.
3. Practical Microbiology (2002), R.C. Dubey & D.K. Maheswari; S. Chand & Company Ltd., New Delhi, India.