

## DEPARTMENT OF AGRICULTURAL MICROBIOLOGY AND BIOENERGY

AMBE 102

Credits 3(2+1)

### BASIC AND APPLIED MICROBIOLOGY

#### Theory

Brief history and scope of microbiology - spontaneous generation, fermentation, germ theory of diseases, development of pure culture methods, protection against infection, groups of microorganisms, applied areas of microbiology.

Structure and organization of microbial cells - Prokaryotes, eukaryotes, morphology and fine structure of bacteria. Microbial taxonomy - major characteristics of identification of bacteria, nomenclature and classification. Growth and nutrition of microorganisms - nutritional types, cultural conditions, enrichment, growth cycle, synchronous growth, continuous culture, growth measurement.

Heterotrophic and Phototrophic metabolism. Viruses and bacteriophages - structure and properties of viruses, lytic and lysogenic cycles. Bacterial genetics and recombination - variation, mutation, conjugation, transformation, replication, transcription, translation; induction and repression. Principles of food spoilage and preservation, Microbiology of potable water. Microbes in cycling of major nutrients in soil, role of microbes in composting.

Beneficial micro organisms (BMOs), PGPR – Bio-fertilizers, Microbial pesticides, Biodegradation, Bio-energy production. Microbial production of alcoholic beverages, enzymes, amino acids, organic acids, hormones, antibiotics, single cell proteins, biodegradable plastics. Genetically modified micro organisms (GMOs) and their application in Agriculture.

#### Practicals

1. Familiarization with instruments, materials, glassware etc, in a microbiology Laboratory
2. Aseptic Technique
3. Sterilization methods
4. Preparation of media
5. Determination of optimal growth condition for a culture
6. Morphological examination of bacteria by staining

7. Biochemical tests for identification of bacteria
- 8&11. Enumeration of microorganisms by viable counts In soil, air, water and food
12. Isolation and Enrichment of microorganisms
13. Purification of bacterial culture
14. Preservation of bacterial cultures
- 15&16. Production and Quality control of a Bacterial (Rhizobial) inoculants –Industrial visit

### References

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| 1. | Microbiology  | Pelczar Jr M J Chan E C Sand Krug N R<br>1996 McGraw Hill Incorporated, New <i>Delhi</i> |
| 2. | Brock Biology of<br>Microorganisms                        | Madigan M T 9 <sup>th</sup> Edition 2003. Presstie Hall<br>Publication, New Delhi        |
| 3. | Microbiology  | Prescott L M Harley J P and Klein D A 1996.<br>Wm.C. Brown Publishing New Delhi          |
| 4. | An Introduction Microbiology                              | Tauro P Kapoor K K and Yadav K S 1998.<br>Wiley Eastern Limited, New Delhi               |
| 5  | Microbiology  | Daginawala   |
| 6  | A Laboratory Manual for Basic<br>and Applied Microbiology | Subhash Reddy R  |