

21AMBE101 AGRICULTURAL MICROBIOLOGY

Hours Per Week :

L	T	P	C
1	-	2	2

Total Hours :

L	T	P
15	-	30

COURSE DESCRIPTION AND OBJECTIVES:

This course provides information to understand the role of microbes in agriculture and importance of Bio-fertilizers and Bio-pesticides in practicing Sustainable Agriculture

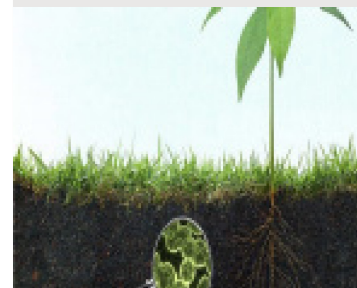
COURSE OUTCOMES:

Upon completion of the course, the student will be able to achieve the following outcomes:

COs	Course Outcomes
1	Ability to plan and improve soil structure, soil fertility and soil health and promote environmentally safe measure in crop production and protection
2	Able to employ microbes for the Biodegradation of toxicants in soil
3	Acquire knowledge on Prokaryotic and Eukaryotic microbes, about the biofuel production and biodegradation of agro-waste

SKILLS:

- ✓ *Isolation and multiplication of microorganisms*
- ✓ *Identification of beneficial and harmful microorganisms*
- ✓ *Handling of microorganisms under laminar airflow*



Source :

https://www.fiverr.com/tabinda_athar/write-about-soil-and-plant-microbiology

ACTIVITIES:

- o *Maintain pure cultures of microorganisms*
- o *Prepare media for different microorganisms*
- o *Isolation of microorganisms from diseased plant parts, rhizosphere and soil*
- o *Prepare permanent slides of different microorganisms*

UNIT - 1

Economic importance; Microbial world- Prokaryotic and eukaryotic microbes and their differences; Morphological characteristics, cell structure, organelles and their functions of bacteria, archaea, algae, viroids, fungi, actinomycetes, mycoplasma, rickettsias, viruses, bacteriophages; Microflora of Rhizosphere and Phyllosphere. Microbial Nutrition- Autotrophy-chemoautotrophy, photoautotrophy, heterotrophy; Microbiology of water, food & milk

UNIT - 2

Phases in bacterial growth - synchronous and diauxic Growth; reproduction; Bacterial genetics- Genetic recombination- transformation, conjugation and transduction, plasmids, transposon; Plant - Microbe interactions

UNIT - 3

Role of microbes in soil fertility and crop production: Decomposition of organic matter; Bio-degradation of starch, cellulose, pectin and lignin; Carbon cycle; Root nodule bacteria; Nitrogen, Phosphorus and Sulphur cycles; Biological nitrogen fixation- symbiotic, associative and asymbiotic;

Legume - Rhizobium symbiosi; Frankia - Actinorhizal symbioses; Formation of nodules in leguminous plants; Phosphorus solubilizing microorganisms and mycorrhiza; PGPR microorganisms

UNIT - 4

Theory and principles of industrial fermentation; Algal Biofuel; Production of growth promoting substances; Blue green algal biofertilizer; role of algae in reclamation of saline/sodic soils and in fertility and productivity of soil; Production of growth promoting substances by algae; P- solubilisation; Azolla - Production, utilization and economic importance

UNIT - 5

Microbes in human welfare; Types of Fermentation and Fermentation technology; Biofertilizers; Biopesticides - Mode of action; types of biopesticides; Biofuel production; biodegradation - Gobar gas (Biogas) and composting technology; Biodegradable plastics; Biomass production; Microbial insecticides

LABORATORY EXPERIMENTS**LIST OF EXPERIMENTS**

1. Introduction to microbiology laboratory and its equipment
2. Methods of sterilization
3. Bacterial staining procedures - Simple staining - Gram's staining and Endospore staining
4. Nutritional media and their preparations
5. Enumeration of microbial population in Soil - Bacteria, fungi and actinomycetes
6. Methods of isolation, purification and maintenance of microbial cultures
7. Isolation of Rhizobium from legume root nodule
8. Isolation of Azotobacter

9. Isolation of phosphate solubilising bacteria / Phosphate solubilizing fungi PSB/ PSF
10. Isolation of Azospirillum from roots
11. Staining and microscopic examination of biofertilizer organisms
12. Isolation of VAM from soil by wet sieving and decantation technique; Determination of VAM root colonization by staining the infected roots
13. Techniques of composting and vermi-composting
14. Biomass production, and Decomposition of organic matter
15. Visit to the different industries covered in theory (Bio fertilizer industry, Bio-gas industry Bio-pesticides industry, Microbial insecticides industry, Fermentation industry)

REFERENCES:

1. Microbiology. Pelczar, J.R., M.J.E.C.S.Chan and Krieg, N.R. (5th Ed.) 2015. McGraw Hill Publishers, New York
2. Microbiology. Prescott, L.M., Harley, J.P. and Klein, D.A. (9th Ed.) 2014. McGraw Hill Publishers, New York
3. Soil Microbiology: Subba Rao, N.S. (4th Ed.) 2014. Oxford and IBH Publishing Company Pvt. Ltd., New Delhi
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5. Experiments in Microbiology, Plant Pathology and Biotechnology. Aneja, K.R.2011. New Age International (P) Ltd., Publishers, New Delhi
6. Jayaraman, J. and Verma, J. P. 2002. *Fundamentals of Plant Bacteriology* (Reprint, 2015). Kalyani publishers, New Delhi
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