# ST. JOSEPH’S COLLEGE FOR WOMEN (AUTONOMOUS) VISAKHAPATNAM

# III SEMESTER SKILL COURSE Time:15hrs/week

# AMRD 202 (2) AGRICULTURE MICROBIOLOGY Marks:50

w.e.f AK 2023-2024 (Admitted batch)

**OBJECTIVES:**

* To understand introduction to microbiology and fermentation.
* To understand microbial nutrition.
* To explain biological nitrogen cycle.

**Course Outcomes**

**CO1:** Understand about Nutritional media and their preparations.

**CO2:** Isolation of azotobacter from soil.

**CO3:** Isolation of Rhizobium from legume root nodule.

**CO4:** Staining and microscopic examination of microbes.

**UNIT- I: (3 Hrs.)**

1. Introduction- Definition- The hidden world of microbiology- How microbes evolved on earth- General classification of microbes-Microorganisms and principles of microbiology- Scope of microbiology. Brief History of microbiology - Spontaneous generation theory- Contributions of Antony Van Leeuwenhoek Francesco Redi- Lazzaro Spallanzani- Franz Schulze- Schroder and Von Dusch- Louis Pasteur- John Tyndall.
2. Role of microbes in fermentation-Contributions of Cagnaird Latour-Theodor Schwann, F.Kutzing- Louis Pasteur - Germ theory of disease - Contribution of Hippocrates-Louis Pasteur- Robert Koch - Pure Culture Methods- Joseph ListerRobert Koch- Beijerinck-Winogradsky- Francois Appert- Schroder and Von DushJohn Tyndall.
3. Protection against infection-Contributions of Edward Jenner- F. Loeffler- Behirng Kitasasto- Louis Pasteur - Applied aspects of Microbiology- Agricultural microbiology-Industrial microbiology-Food Microbiology - Medical microbiology – Water Microbiology - Geochemical Microbiology- Pollution microbiology – Air microbiology – Exo-Microbiology - Microbial biotechnology.
4. Morphological types of Bacteria , Bacteria cell Structure- External and internal cell structures- Differences between Prokaryotes and Eukaryotes.

**UNIT- II: (3 Hrs.)**

1. Microbial Nutrition- Autotrophy - Chemoautotrophy- Photoautotrophy
2. Heterotrophy – Metabolic pathways-Glycolysis-HMP-ED-TCA cycle.
3. Growth of Microorganisms - Cell Division - Growth cycle of bacteria [ Lag phase, Log phase, Stationary and Death phase]- Generation time- Growth rate- Growth yield- Synchronous - Diauxic growth.

**UNIT- III: (3 Hrs.)**

1. Bacterial genetics- Genetic recombination- Transformation- ConjugationTransduction- Plasmids- Transposon.
2. Role of microbes in fertility of soils and plant growth - Rhizosphere- RhizoplanePhyllosphere- Phylloplane - Microflora- Carbon cycle- Carbon dioxide fixation.
3. Nitrogen cycle - Mineralisation- Immobilisation- Nitrification- DenitrificationNitrogen Fixation - Phosphorus cycle, phosphorus solubilisation – Oxidation – Reduction - Sulphur cycle-Oxidation and reduction.

AMRD 202 (2) ::2::

**UNIT- IV: (3 Hrs.)**

1. Biological nitrogen fixation - Symbiotic- Associative- Asymbiotic- Nitrogen fixation In Azolla - Blue green algae - Actinorhizal symbiosis - Frankia, Phosphate solubilizing microorganisms - Bacillus - Pseudomonas- Mycorrhiza for Phosphorous uptake.
2. PGPR Organisms - Bacillus – Pseudomonas – Azotobacter – Azospirillum - Rhizobium -Microbes in human welfare.
3. Types of fermentations - Batch - Batch fed- Continuous - Solid State Fermentations, Common microbial fermentations-Alcohol- Lactic acid- Butyric acid- Formic acid - Butanediol- Propionic Acid- Mixed Acid - Fermentation technology- Alcoholic beverages production.

**UNIT-V: (3 Hrs.)**

1. Biofertilizers (Bacterial-Cyanobacterial-Fungal) production technology- Silage Production Technology.
2. Biopesticides- Viruses (Nucleo polyhedrosis virus - Granular viruses) – Bacteria (Bacillus thuringiensis, Bacillus papilliae) - fungi (Beauveria - Verticillium) - Protozoa (Malameba locustae-Mattesia Spp)-Mode of action.
3. Biofuel Production- Biodegradation - Biogas, Biomanures and Composting Technologies.

**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. Brock Biology of Microorganisms.Madigan, M.,Martinko, J.M and Parker, J. (14Ed.) 2015. Prentice hall of India Pvt Ltd., New Delhi.
4. Soil Microbiology: Subba Rao, N.S. (4th Ed.) 2014. Oxford and IBH Publishing Company Pvt. Ltd., New Delhi.
5. Microbiology A Laboratory Manual: James, C and Natile, S. (10th Ed.) 2014. Pearson India Education Services Pvt. Ltd., South Asia.
6. Experiments in Microbiology, Plant Pathology and Biotechnology. Aneja, K.R.2011. New Age International (P) Ltd., Publishers, New Delhi.

**\*\* \*\* \*\***