

Syllabus for B.Sc. (Hons) Agriculture Year – III (Sem. VI)

Subject Code: 16AS0618

Subject Short Name: Pl. Path. 6.3

Subject Name: Agricultural Microbiology and Phyto-remediation

Objective:

1. To get an introduction to microbiology with specific focus on its significance in agriculture science.
2. To get acquainted with the bacterial structure and the function of the different bacterial components.
3. To get highlights on different fields of microbiology.
4. To get highlights on the bioremediation of polluted soils using microbial mediators and phytoremediation
5. To get a concept of biological control and the role of biopesticides in plant disease management.

Credits Earned: 2 Credits (1+1)

Course Outcomes: After completion of this course, Students will be able to

- Articulate and retain knowledge regarding importance of different
- Know the role of microbes in soil fertility and crop productivity.
- Know the different field of microbiology
- Know the concept of rhizosphere microbiology
- Know the plant growth promoting Rhizobacteria

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE (E)	Mid Sem (M)	Progressive Assessment (PA)	Viva (V)	Term work (TW)	
1	0	2	2	40	20	20	10	10	100

Theory Content:

Unit	Topics	Contact Hours
1	Introduction to Microbiology: Definition, applied areas of Microbiology and Importance of Microbiology.	1
2	History of Microbiology: Discovery of microorganisms, spontaneous generation theory, Germ theory of diseases, Immunization, fermentation, and origin of life.	1
3	Bacteria: cell structure, chemoautotrophy, photo autotrophy, growth.	1
4	Bacterial genetics: Genetic recombination- transformation, conjugation and transduction, genetic engineering	2
5	Soil Microbiology: Nutrient mineralization and transformation	1
6	Air Microbiology: Phyllosphere microflora, Phylloplane microflora, microflora of floral parts etc.	1
7	Food Microbiology: Microbial spoilage and principles of food preservations, Food poisoning.	1
8	Water Microbiology: Types of water, water microorganisms, and microbial analysis of water e.g. coliform test, Purification of water.	1
9	Industrial Microbiology: Microbial products, Biodegradation, Biogas production, Biodegradable plastics etc.	1
10	Biological control: Microbial biopesticides for plant disease management	1
11	Concepts of rhizosphere microbiology- Rhizodeposits -biochemical nature, release mechanism in rhizosphere, function, Carbon flow in rhizosphere, Rhizosphere microbiome residents and their roles.	2
12	Potential of plant growth promoting rhizobacteria (PGPR) and endophytes on soil health and sustainability	1
13	Bioremediation of polluted soils using microbial mediators. Phytoremediation of polluted soils	1
	Total	15

Practical Content:

Unit	Topics	Contact Hours
1	Study of the microscope; Acquaintance with laboratory material and equipment	2
2	Microscopic observation of different groups of microorganisms: moulds (Fungi)	2
3	Direct staining of bacteria by crystal violet; Negative or indirect staining of bacteria by nigrosin; Gram staining of bacteria	2
4	Study of phyllosphere and rhizosphere microflora	2
5	Measurement of microorganisms	2
6	Preparation of culture media	2
7	Isolation and purification of rhizospheric microbes	2
8	Isolation and purification of N-fixers	2
9	Isolation and purification of Nutrient solubilizers	2
10	Isolation and purification of Endophytes	2
	Total	20

Reference Books:

- Pelczar, M.J., Chan, E.C.S. and Kreig, N.R. 2002. Microbiology. 5th Edition, Tata McGraw-Hill, New Delhi.
- Rangaswami, G. and Bagyaraj, D. J. 2005. Agricultural Microbiology. Prentice-Hall of India Pvt. Ltd., New Delhi.
- Mukherjee, N. and Ghosh, T. 2004. Agricultural Microbiology. Kalyani Publishers, Calcutta
- Dubey, H.C. 2007. A Textbook of Fungi, Bacteria and Viruses. Vikas Publishing House Ltd., New Delhi – 10014
- Salyers, A. A. and Whitt, D. D. 2001. Microbiology: diversity, disease, and the environment. Fitzgerald Science Press, Inc.
- Prescott, L. M. 2002. Microbiology 5th Edition. McGraw-Hill Inc, US

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
25%	25%	20%	10%	10%	10%

Instructional Method:

1. The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by white board may also use any of tools such as demonstration, role play, quiz, brain storming, MOOCs etc.
2. The internal evaluation will be done on the basis of continuous evaluation of students in the class-rooms.
3. Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory/ field.
4. Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory.