CHRIST COLLEGE (AUTONOMOUS), IRINJALAKUDA

Aesthetic Botany

Programme	B. Sc.				
Course Title	**Microbial Diversity and Phytopathology**				
Type of Course	**Minor**				
Semester	**II**				
Academic Level	100-199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75
Pre-requisites	Higher secondary level biology course				
Course Summary	This course aims to provide students with a comprehensive understanding of the microbiome and its significance in our surroundings. Students will explore the diversity of microflora and critically analyse their impact, both beneficial and harmful, on various aspects of human life and the biosphere.				

Course Outcomes: After completing the Course, the student should be able to:-

COs	Statement	Cognitive level*	Knowledge Category#	Evaluation Tools used
CO1	Explain characteristic features of microbial life and their importance	U	F	Instructor-created exams / Quiz
CO2	Explain characteristic features of bacteria	U	C & P	Seminar Presentation
CO3	Discuss general awareness on the diversity of microorganisms and their applications	U	F	Instructor-created exams / Quiz
CO4	Discuss plant diseases and derive control measures	U	C & P	Seminar presentation
CO5	Assess the different staining technique and isolation of bacteria and significance of plant diseases with respect to crop production is concerned	E	P	In-class discussions/ Practicals

* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C)

- Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Detailed Syllabus:

Module	Unit	Content	Hrs (45 + 30)
I	**Introduction to Microbiology and Virology**		**8**
	1	History, diversity of microbial world	1
	2	Whittaker's five kingdom system of classification. Evolutionary significance	1
	3	General characters of Viruses with emphasis on occurrence, architecture and multiplication	3
	4	Structure of Bacteriophages (T4), Virions, Prions, Mycoplasma	2
	5	General account on viral epidemics and pandemics and its pathogens - Covid, H1N1	1
II	**Bacteriology**		**15**
	6	General outline on Eubacteria and Archaebacteria, Thermophiles, Psychrophiles, and Halophiles	1
	7	Bacterial morphology and ultrastructure	3
	8	Cell Wall - Composition and detailed structure of Gram-positive and Gram-negative cell walls Gram and acid fast staining	2
	9	Effect of antibiotics and enzymes on the bacterial cell wall (brief account only).	1
	10	Cell membrane - Structure, function and chemical composition of bacterial cell membranes, mesosomes.	2
	11	Phases of growth (S-curve), Asexual methods of reproduction	1
	12	Gene transfer mechanism in bacteria - Conjugation, Transduction, and Transformation	3
	13	Pure culture isolation - Streaking, Serial dilution and Plating methods	1
	14	Cultivation, maintenance and preservation/stocking of pure cultures	1
III	**Applied Microbiology**		**12**
	15	Microbiology in agriculture - biofertilizer, bioinsecticides, nitrogen fixation, biofuels, Plant Growth Promoting Bacteria, Soil microbes and plant health	3
	16	Microbiology in medicine - Antibiotics, Antimicrobial resistance, Probiotics and Microbial therapeutics -	2

		microbiome.	
	17	Viruses as Tools in Genetic Engineering	2
	18	Biotechnological Applications of extremophiles Bacteria in Industrial Fermentation Bioaugmentation and Biostimulation	5
IV	**Phytopathology**		**10**
	19	Importance, Definition and concepts of diseases, Types of plant pathogens, Symptoms associated with microbial plant diseases.	1
	20	Koch's postulates, Host-parasite interaction Defense strategies in plants to pathogens- Phenolics, phytoalexin, elicitors, enzymes, toxins.	3
	21	Disease management strategies - Cultural, Botanical, Chemical, Biological and Integrated Disease Management. Environmental concern over chemical management - Residues and health hazards, fungicidal resistance in plant pathogens and its managements.	3
	22	Study of some important plant diseases giving emphasis on its etiology, symptoms, epidemiology and management i) Fungal diseases - Grey leaf spot disease of coconut, Quick wilt of pepper ii) Bacterial diseases - Citrus canker, Blast of paddy iii) Viral diseases - Tapioca mosaic disease, Bunchy top of Banana	3
V	**Practical (Mandatory list)**		**30**
	1. Gram staining - Curd, root-nodules 2. Culture and isolation of bacteria using nutrient agar medium (demonstration only) 3. Case study on microbial diseases 4. Identification of the disease, pathogen, symptoms and control measures of the plant diseases mentioned in the syllabus		
Practical (Open ended/Suggestive list)			
	5. Microbiology lab visit 6. Collections and dry preservation of diseased specimens of important crops. 7. Preparation of an assignment of 10 significant plant or human pathogens with the symptoms, epidemiology, life cycle and control measures (Photographs or sketch of stages of infection)		

Suggested Readings

- Agrios, G.N. 1997. Plant Pathology (4th ed) Academic Press.

- Bilgrami K.H. & H.C. Dube. 1976. A text book of Modern Plant Pathology. International
- Book Distributing Co. Lucknow.
- Mehrotra, R.S. 1980. Plant Pathology – TMH, New Delhi.
- Pandey, B.P. 1999. Plant Pathology. Pathogen and Plant diseases. Chand & Co., New Delhi.
- Rangaswami, G. 1999. Disease of Crop plants of India Prentice Hall of India Pvt. Ltd.
- Sharma P.D. 2004. Plant Pathology Rastogi Publishers.
- Gerard, J. T., Berdell, R. F., Christine, L. C. 2019. Microbiology: An Introduction. Pearson India, Noida, Uttar Pradesh.
- Joanne, W., Linda, S., Christopher, J. W. 2018. Prescott's Microbiology. McGraw Hill Education, Noida, Uttar Pradesh
- Trivedi, P.C. 2017. Introduction to Microbiology. S. Chand Publishing, Ram Nagar, New Delhi.
- Dubey, R. C. 2019. Microbiology: Principles and Applications. S. Chand Publishing, Ram Nagar, New Delhi.
- Jacquelyn, G. B., Laura, J. B. 2018. Microbiology: Principles and Explorations. John Wiley & Sons India Pvt. Ltd., Gurgaon, Haryana.
- Baveja, C.P. 2019. Microbiology: A Laboratory Manual. Arya Publications, 4221/1, Ansari Road, Daryaganj, New Delhi.

Mapping of COs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	-	3	1	3	1	3
CO2	3	-	2	1	3	1	3
CO3	3	-	3	1	3	1	3
CO4	3	-	2	1	2	1	2
CO5	3	-	2	1	3	1	3

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Project/Practical
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Practical/Project Evaluation	End Semester Examinations
CO 1	✓	✓		✓
CO 2	✓	✓	✓	✓
CO 3	✓	✓		✓
CO 4	✓	✓	✓	✓
CO 5	✓		✓	