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	✓		✓	

CHRIST COLLEGE (AUTONOMOUS), IRINJALAKUDA

BOTANICAL DIVERSITY

Programme	B. Sc.				
Course Title	**Plant Morphology, Physiology & Plant Resources**				
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 covers a comprehensive study of the structure, function, and utilization of plants. Students will explore the morphology of plants, and the physiological processes that occur within plants. Furthermore, students will learn about the diverse uses of plants as valuable resources for food, medicine, and more.				

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

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools
CO1	Explain the various morphological characteristics of a plant	U	F	Quiz/ Test/Assignments/ Practical/ Field studies
CO2	Explain the physiological processes that drive plant growth, development and responses to the environment	U	F&C	Assignments/Quiz/Test
CO3	Discus the process of growth in plants	U	C	Presentations
CO4	Explain the importance of plants as valuable resources for food, medicine and more	U	C	Group project/Class discussion
CO5	Apply knowledge of plant morphology and physiology to analyze problems related to plant health and productivity	Ap	C&P	Field work/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		**Plant Morphology**	**7**
	1	Morphology of leaf; Structure, simple, compound, venation and phyllotaxy.	2
	2	Inflorescence - Racemose, cymose, special, types with examples	2
	3	Flower - as a modified shoot, structure of flower, symmetry of flower, floral parts - their arrangement, types of aestivation, relative position of parts, cohesion and adhesion of stamens and placentation.	3
II		**Plant Physiology**	**18**
	4	Water relations: Permeability, Imbibition, Diffusion, Osmosis and water potential.	2
	5	Absorption of water: passive mechanism.	1
	6	Ascent of sap: Transpiration pull or cohesion-tension theory.	2
	7	Transpiration: Types, mechanism of stomatal movement: K^+ ion theory.	2
	8	Significance of transpiration, antitranspirants.	2
	9	Photosynthesis: Introduction, significance, Two pigment systems, red drop, Emerson enhancement effect, action and absorption spectra.	3
	10	Mechanism of photosynthesis: Light reaction, cyclic & non-cyclic photo phosphorylation, Dark reactions-Calvin cycle, C_4 cycle, photorespiration (a brief account only). Factors affecting photosynthesis.	6
III		**Plant Growth**	**10**
	11	Plant growth - Definition, phases of growth, Auxins, gibberellins, cytokinin, abscisic acid and ethylene, their physiological roles.	2
	12	Senescence and abscission.	2
	13	Photo-periodism and vernalization.	2
	14	Dormancy of seeds - Factors causing dormancy, photoblasticism, techniques to break dormancy.	2
	15	Physiology of fruit ripening.	2
IV		**Plant Resources**	**10**
	16	Brief account on the various categories of plants based on their economic importance	1
	17	Study the following plants with special reference to their binomial, family, morphology of the useful part and their uses. Cereals: Paddy, Wheat; Pulses: Black gram, Green gram; Oil: Coconut, Gingelly	3

	18	Fibre: Cotton; Latex: Rubber; Beverages: Tea, Coffee	2
	19	Spices: Pepper, Cardamom, Clove	2
	20	Medicinal plants: *Rauvolfia serpentina*, *Justicia adhatoda*, *Santalum album and Curcuma longa.*	2
V	**Practical (Mandatory experiments)**		**30**

4. Identify the types of inflorescences mentioned in the syllabus.
5. Learn the principle and working of the following apparatus/experiments
   - Thistle funnel osmoscope
   - Ganong's potometer
   - Ganong's light-screen
   - Absorbo transpirometer
   - Mohl's half-leaf experiment
   - Experiment to show evolution of O_2 during photosynthesis
6. Identify at sight the economically important plant produces and products mentioned in module IV, and learn the binomial and family of the source plants, morphology of the useful parts and uses

Practical (Open ended)

1. Preparation of dried specimen or photo album of the morphological types studied
2. Setting up and understanding the working of any two physiological experiments and recording the result
3. Group project on the preparation of sample specimens of the economically important plants studied

Suggested Readings

- Sporne K. R. 1974. Morphology of Angiosperms. Hutchinson.
- William G. Hopkins. 1999. Introduction to Plant Physiology, 2nd edition, John Wiley & Sons, Inc.
- Frank B. Salisbury and Cleon W. Ross. 2002. Plant Physiology 3rd edition. CBS publishers and distributers.
- G. Ray Noggle and George J. Fritz. 1983. Introductory Plant Physiology Prentice Hall.
- Pandey B. P. 1987. Economic Botany
- Verma V. 1984. Economic Botany
- Hill A.W. 1981. Economic Botany, McGraw Hill Pub
- Alam, Afroz. 2020. A Textbook of Economic Botany and Ethnobotany. IK International Publishing House.
- Atal C.K. and Kapur B. M. 1982. Cultivation and Utilization of Medicinal Plants. CSIR-RRL, Jammu.
- Sambamurty and Subrahmanyam, N. S. 2008. A Textbook of Modern Economic Botany. CBS Publishers & Distributors Pvt. Ltd.
- Bhutya, R. K. 2021. Medicinal Plants of India Vol. I & II. Scientific Publishers.

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CO 2	✓	✓	✓	✓
CO 3	✓	✓		✓
CO 4	✓	✓	✓	✓
CO 5	✓		✓	