

Scheme of UG Programme: Bachelor of Science in Life Sciences

(Scheme UG A1: Botany (Multidisciplinary))

Semester 1

Course Code	Course Title	Course ID	L	T	P	L	T	P	Total Credits	MARKS				
			(Hrs)			Credits				TI	TE	PI	PE	Total
Core Course(s)														
CC-A1	Diversity of Microbes, Algae, Fungi and Archegoniates	2	3	-	2	3	-	1	4	25	50	5	20	100

Semester 2

Course Code	Course Title	Course ID	L	T	P	L	T	P	Total Credits	MARKS				
			(Hrs)			Credits				TI	TE	PI	PE	Total
Core Course(s)														
CC-A2	Plant Taxonomy and Ecology		3	-	2	3	-	1	4	25	50	5	20	100

Semester 3

Course Code	Course Title	Course ID	L	T	P	L	T	P	Total Credits	MARKS				
			(Hrs)			Credits				TI	TE	PI	PE	Total
Core Course(s)														
CC-A3	Plant Physiology		3	-	2	3	-	1	4	25	50	5	20	100

Semester 4

Course Code	Course Title	Course ID	L	T	P	L	T	P	Total Credits	MARKS				
			(Hrs)			Credits				TI	TE	PI	PE	Total
Core Course(s)														
CC-A4	Cytology and Genetics		3	-	2	3	-	1	4	25	50	5	20	100

Internship is to be done during summer break after 4th Semester, Marks will be added in 5th Semester.

Semester 5

Course Code	Course Title	Course ID	L	T	P	L	T	P	Credits	MARKS				
			(Hrs)			Credits				TI	TE	PI	PE	Total
Core Course(s)														
CC-A5	Economic Botany and Plant Biotechnology		3	-	2	3	-	1	4	25	50	5	20	100

Semester 6

Course Code	Course Title	Course ID	L	T	P	L	T	P	Total Credits	MARKS				
			(Hrs)			Credits				TI	TE	PI	PE	Total
Core Course(s)														
CC-A6	Plant Anatomy and Embryology		3	-	2	3	-	1	4	25	50	5	20	100

Semester 7; 8 (Honours) and Semester 8 (Honours with Research): Detailed Scheme will be prepared in due course of time.

Syllabus UG A1: Multidisciplinary

Session: 2024-25

Part A-Introduction

Session: 2024-25			
Part A-Introduction			
Subject	BOTANY		
Semester	1 st		
Name of the Course	Diversity of Microbes, Algae, Fungi and Archegoniatas		
Course Code	240/BOTL/CC101		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-A1		
Level of the course (As per Annexure-I)	100-109		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO):	<p>After completing this course, the learner will be able to:</p> <p>1. Students will be able to understand the general characteristics of bacteria, actinobacteria, viruses and fungi.</p> <p>2: Students will develop a conceptual understanding of Phycology. 3: Students will gain knowledge on the concepts of Bryology.</p> <p>4: Basic understanding of the biology of pteridophytes will be developed by the students.</p> <p>5: Students will gain the knowledge of practical aspects of microorganisms, algae, fungi, lichens, bryophytes, and pteridophytes.</p>		
	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
THEORY			
Max. Marks: 75 Internal Assessment Marks:25 End Term Exam Marks: 50		Time:3 Hours	
PRACTICAL			
Max. Marks: 25 Internal Assessment Marks:5 End Term Exam Marks: 20		Time: 4 Hours	
Part B-Contents of the Course			

Instructions for Paper-Setter

1. Nine questions will be set in all. All questions will carry equal marks.
2. Question No.1 will be short answer type covering the entire syllabus and will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each unit. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.

Unit	Topics	Contact Hours
I	<p>Bacteria: Structure, nutrition, reproduction and economic importance.</p> <p>Viruses: General account of Viruse including structure of TMV and Bacteriophages.</p> <p>Algae: General characters, Introductory classification; economic importance; and life cycle (excluding development) of <i>Nostoc</i> (Cyanophyceae), <i>Volvox</i>, (Chlorophyceae), <i>Vaucheria</i> (Xanthophyceae), <i>Ectocarpus</i> (Phaeophyceae) and <i>Polysiphonia</i> (Rhodophyceae).</p> <p>Fungi: General characters, Introductory classification; economic importance; and life- history of <i>Phytophthora</i> (Mastigomycotina), <i>Penicillium</i> (Ascomycotina), <i>Puccinia</i> (Basidiomycotina), <i>Colletotrichum</i> (Deuteromycotina).</p>	11
II	<p>General account of Lichens, types, ecological and economic importance.</p> <p>Bryophyta: Bryophytes: General characteristics, classification upto classes (Smith, 1935), alternation of generations, structure and reproduction (excluding development) of <i>Marchantia</i> (Hepaticopsida), <i>Anthoceros</i> (Anthocerotopsida), <i>Funaria</i> (Bryopsida), ecological and economic importance of bryophytes.</p>	11
III	<p>Pteridophyta: General characters, classification upto classes (A. R. Smith, 2006), structure and reproduction (excluding development) of <i>Rhynia</i> (Psilopsida): Structure and reproduction (excluding development) of <i>Selaginella</i> (Lycopsida), <i>Equisetum</i> (Sphenopsida) and <i>Pteris</i> (Pteropsida). heterospory and seed habit, stelar evolution;</p> <p>Ecological and economic importance.</p>	11
IV	<p>Gymnosperms: General characteristics, classification up to classes (Smith1955), morphology, anatomy and reproduction of <i>Cycas</i>, <i>Pinus</i>, <i>Ephedra</i> (developmental details not to be included); Distribution and economic importance; General account of paleobotany and Geological time scale.</p>	12
V*	<p>Viruses: EMs/Models of viruses: TMV, Line drawing/Photograph of Lytic and Lysogenic Cycles.</p> <p>Bacteria: Types of Bacteria from temporary/permanent slides/photographs; Binary Fission; Conjugation; Structure of root nodule.</p> <p>Cynobacteria & Algae: Study of vegetative and reproductive structures of <i>Nostoc</i>, <i>Volvox</i>, <i>Vaucheria</i>, <i>Ectocarpus</i> and <i>Polysiphonia</i> through temporary preparations and permanent slides.</p> <p>Fungi: Study of vegetative & reproductive structures of <i>Phytophthora</i>, <i>Mucor</i>, <i>Puccinia</i>, <i>Penicillium</i> & <i>Colletotrichum</i>: Asexual and sexual stages through temporary preparations and permanent slides.</p> <p>Lichens: Study of slides/photographs of lichens (crustose, foliose and fruticose).</p> <p>Marchantia-Morphology of thallus, W.M. rhizoids and scales, V.S. thallus with gemma cup, W.M. gemmae, V.S. antheridiophore, archegoniophore, L.S. sporophyte (temporary/permanent slides).</p> <p>Anthoceros- Morphology of thallus, W.M. rhizoids, V.S. thallus, VS Antheridia and Archegonia, L.S. sporophyte (temporary/permanent slides).</p>	30

Funaria- Morphology, W.M. leaf, rhizoids, operculum, peristome, annulus, spores, slides showing antheridial and archegonial heads, L.S. capsule (temporary/permanent slides).

Selaginella- Morphology, W.M. leaf with ligule, T.S. stem, W.M. strobilus, W.M. microsporophyll and megasporophyll, L.S. strobilus (temporary/permanent slide).

Equisetum- Morphology, T.S. internode, L.S. strobilus, T.S. strobilus, W.M. sporangiophore, W.M. spores (wet and dry) (temporary slides); T.S. rhizome (permanent slide).

Pteris- Morphology, T.S. rachis, V.S. sporophyll, W.M. sporangium, W.M. spores, T.S. rhizome, W.M. prothallus with sex organs and young sporophyte (temporary/permanent slide).

Cycas- Morphology (coralloid roots, bulbil, leaf, megasporophyll), T.S. coralloid root, T.S. rachis, V.S. leaflet, V.S. microsporophyll, W.M. microspores, L.S. ovule, T.S. root (temporary/permanent slide).

Pinus- Morphology (long and dwarf shoots, W.M. dwarf shoot, male cones and female cones), W.M. dwarf shoot, T.S. needle, T.S. stem, L.S./T.S. male cone, W.M. microsporophyll, W.M. microspores (temporary slides), L.S. female cone (temporary/permanent slide).

Ephedra- Morphology, T.S. internode, L.S./T.S. male and female strobili, W.M. spores (wet and dry), T.S. rhizome (temporary/permanent slide).

Excursion Report: Report on excursion tours with photographs, collection and preservation specimens related to Algae, Fungi, Bryophytes, Pteridophytes and Gymnosperms.

Recommended Books/e-resources/LMS:

- Wiley, J.M., Sherwood, L.M. and Woolverton, C.J. (2019) Prescott's Microbiology. 11th Edition. McGraw Hill International.
- Lee, R.E. (2018) Phycology. 5th Edition. Cambridge University Press.
- Aluwalia, A.S. (2020). Phycology: Principles, Processes and Applications. Daya Publishing House, New Delhi.
- Dube, H.C. (2012). An Introduction to Fungi, Vikas Publishing House Pvt. Ltd., Delhi. 4th edition.
- Mehrotra, R.S. and Aggarwal, Ashok (2013) Fundamentals of Plant Pathology, Tata McGraw-Hill Publishing company Ltd, New Delhi
- Pelczar, M.J. (2001) Microbiology, 5th edition, Tata McGraw-Hill Co, New Delhi.
- Sethi, I.K. and Walia, S.K. (2011). Textbook of Fungi & Their Allies, MacMillan Publishers Pvt. Ltd., Delhi.
- Raven, P.H., Johnson, G.B., Losos, J.B., Singer, S.R. (2005). Biology. Tata McGraw Hill, Delhi, India.
- Sharma, O.P. (2017). Text Book of Pteridophyta, McMillan India Ltd.
- Thakur, A.K. and Bassi, S.K. (2008). Diversity of Microbes and Cryptogams. S. Chand & Co., Delhi.
- Vanderpoorten, A. & Goffinet, B. (2009) Introduction to Bryophytes. Cambridge University Press.

Syllabus UG A1: Multidisciplinary

Session:2024-25			
Part A-Introduction			
Subject	BOTANY		
Semester	nd 2		
Name of the Course	Plant Taxonomy and Ecology		
Course Code	240/BOTL/CC201		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-A2		
Level of the course (As per Annexure-I)			
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO):	<p>After completing this course, the learner will be able to:</p> <ol style="list-style-type: none"> 1. Students will gain knowledge about taxonomy, including the rules of nomenclature and other essential aspects. 2: Students will acquire a conceptual understanding of angiosperm classification systems and the diversity of families within them. 3. Students will gain knowledge about Ecology and Environmental interactions. 4: Students will acquire a conceptual understanding of ecosystem structure, environmental pollution and biodiversity conservation. 5: Students will gain the knowledge about the diagnostic features, morphology, internal structure, economic value of angiosperms and ecological concepts and biodiversity indices. 		
	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
THEORY			
Max. Marks: 75 Internal Assessment Marks: 25 End Term Exam Marks: 50		Time: 3 Hours	
PRACTICAL			
Max. Marks: 25 Internal Assessment Marks: 5 End Term Exam Marks: 20		Time: 4 Hours	
Part B- Contents of the Course			

Instructions for Paper-Setter

1. Nine questions will be set in all. All questions will carry equal marks.
2. Question No.1 will be short answer type covering the entire syllabus and will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each unit. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.

Unit	Topics	Contact Hours
I	Botanical nomenclature and major rules of ICBN and ICN; Keys to identification of plants. General introduction and importance of herbaria and botanical gardens. Documentation of Floristic Diversity: Brief idea about floras, monographs and journals. Brief idea of taxonomic evidences. Types of inflorescence, flower and parts of flower.	11
II	Artificial, natural and phylogenetic classifications. Bentham and Hooker system of classification (upto series), Angiosperm Phylogeny Group- general account. Diagnostic features and economic importance of the following families: Ranunculaceae, Brassicaceae, Malvaceae, Euphorbiaceae, Rutaceae, Leguminosae, Apocynaceae, Lamiaceae, Solanaceae, Asteraceae, Poaceae and Orchidaceae.	12
III	Ecology: Definition; scope and importance; levels of organization. Environmental factors- climatic factors, edaphic factors, topographic; and Biotic factors. Population Ecology: Basic concept; characteristics; biotic potential, growth curves; ecotypes and ecads. Community Ecology: Concepts; characteristics (qualitative and quantitative- analytical and synthetic); methods of analysis; ecological succession.	11
IV	Ecosystem: Structure and functions (trophic levels, food chains, food webs, ecological pyramids and energy flow). Phyto-geography: Phyto-geographical regions of India; vegetation types of India (forests). Environmental Pollution: Sources, types and control of air and water pollution. Global Change: Green house effect and green house gases; impacts of global warming; carbon trading. Biodiversity: levels, types, significance, threats and conservation.	11
V*	<ul style="list-style-type: none"> • Study of instruments used to measure microclimatic variables: Soil thermometer, maximum and minimum thermometer, anemometer, psychrometer/hygrometer, rain gauge and lux meter. • Determination of pH, and analysis of two soil samples for carbonates, chlorides and sulphates by rapid field test. • Comparison of bulk density, porosity and rate of infiltration of water in soil of three habitats. • To determine inorganic carbon content of given soil samples. • To determine organic carbon content of given soil samples by acid dilution method. <p>(a) Study of morphological adaptations of hydrophytes and xerophytes (four each). (b) Study of biotic interactions of the following: Stem parasite (<i>Cuscuta</i>), Root parasite (<i>Orobanch</i>), Epiphytes (Orchid) and Predation (Insectivorous plants) using museum specimens/ live plants.</p>	30

- Determination of minimal quadrat size for the study of herbaceous vegetation in the college campus or nearby fields by species area curve method (species to be listed).
- Quantitative analysis of herbaceous vegetation in the college campus or nearby fields for frequency and comparison with Raunkiaer's frequency distribution law.
- Study of vegetative and floral characters of the one or two member of each family/sub-family mentioned in theory syllabus (Description, V.S. flower, section of ovary, floral diagram/s, floral formula/e and systematic position according to Bentham & Hooker's system of classification).
- Excursion Report: Report on excursion tours with photographs, collection, preservation and preparation of herbarium sheets and specimens related to Angiosperms. Mounting of a collected, properly dried and pressed specimen of minimum 20 wild plants with herbarium label.

Part C-Learning Resources

Recommended Books/e-resources/LMS:

- Singh, G. (2021). Plant Systematics: An Integrated Approach, CRC Press.
 - Sharma, O.P. (2017). Plant Taxonomy, McGraw Hill Publication.
 - Levetin, E. & McMahon, K. 2015. Plants and Society, McGraw-Hill Education. 7th edition.
 - Smith, T.M. & Smith, R.L. 2014. Elements of Ecology. Pearson. 9th edition.
 - Gangulee, Das and Datta (2011). College Botany Volume 1, New Central Book Agency
 - Gangulee, Das and Datta (2011). College Botany Volume 2, New Central Book Agency
 - Vashishta, P.C., Sinha, A.K., Kumar, A., (2010). Gymnosperms, S. Chand.
 - Taylor, E.L., Taylor, T.N., Krings, M. (2009). Paleobotany: The Biology and Evolution of Fossil Plants, Academic Press.
 - Pandey, B.P. (2001). A Text book of Botany-Angiosperms, S. Chand.
 - Pandey, B.P. (2001). A Text book of Botany-Angiosperms, S. Chand.
- Chapman, J.L. & Reiss, M.J. 1999. Ecology: Principles and Applications. Cambridge University Press.
- Odum E.P. (1971): Fundamentals of Ecology 3rd edition. Saunders College Publishing/Harcourt Brace.

