Resolution No.: AC/I(19-20).2.RPS4

S.P. Mandali's

RAMNARAIN RUIA AUTONOMOUS COLLEGE

Syllabus for: Semester I and II

Program: M. Sc.

Course Code: Botany (RPSBOT)

(Credit Based Semester and Grading System with effect from the academic year 2019–2020)

SEMESTER I

Course Code	UNIT	TITLE	Credits	Lectures/ Week
RPSBOT 101	PLANT BIODIVERSITY: CRYPTOGAMS I			
	I	Phycology	4	1
	II	Applied Phycology		1
	III	Bryophyta I		1
	IV	Bryophyta II		1
RPSBOT 102	PLANT BIODIVERSITY: SPERMATOPHYTA I			
	I	Gymnosperms I	4	1
	II	Origin of Angiosperms		1
	III	Angiosperms I		1
	IV	Angiosperms II		1
RPSBOT 103	PLANT PHYSIOLOGY			
	I	Photosynthesis I (Eukaryotes)	4	1
	II	Photosynthesis II (Prokaryotes)		1
	III	Proteins		1
	IV	Plant Hormones		1
RPSBOT 104	CYTOGENETICS, MOLECULAR BIOLOGY, BIOTECHNOLOGY AND RESEARCH METHODOLOGY			
	I	Cytogenetics	4	1
	II	Molecular Biology		1
	III	Recombinant DNA technology		1
	IV	Research Methodology I		1
RPSBOTP 101	Plant Diversity :Cryptogams I (Algae and Bryophyta)		02	04
RPSBOTP 102	Plant Diversity – Spermatophyta I (Gymnosperms and Angiosperms)		02	04
RPSBOTP 103	Plant Physiology		02	04
RPSBOTP 104	Cytogenetics, Molecular Biology, Biotechnology & Research Methodology		02	04
			24	

SEMESTER II

Course Code	UNIT	TITLE	Credits	Lectures/ Week
RPSBOT 201	PLANT BIODIVERSITY: CRYPTOGAMS II			
	I	Mycology	4	1
	II	Applied Mycology		1
	III	Pteridophyta I		1
	IV	Pteridophyta II		1
RPSBOT 202	PLANT BIODIVERSITY: SPERMATOPHYTA II			
	I	Anatomy I	4	1
	II	Anatomy II		1
	III	Developmental Botany		1
	IV	Palynology		1
RPSBOT 203	PLANT PHYSIOLOGY AND ENVIRONMENTAL BOTANY			
	I	Seed Physiology	4	1
	II	Stress Physiology		1
	III	Environmental Botany I		1
	IV	Environmental Botany II		1
RPSBOT 204	MEDICINAL BOTANY ,DIETETICS AND RESEARCH METHODOLOGY			
	I	Traditional system of medicines	4	1
	II	Medicinal Botany		1
	III	Dietetics I		1
	IV	Research Methodology I		1
RPSBOTP 201	Plant Diversity :Cryptogams II (Mycology and Pteridophyta)		02	04
RPSBOTP 202	Plant Diversity: Spermatophyta II (Anatomy, Developmental Botany and Palynology)		02	04
RPSBOTP 203	Plant Physiology and Environmental Botany		02	04
RPSBOTP 204	Medicinal Botany, Dietetics and Research Methodology		02	04
			24	

SEMESTER I

Course Code: RPSBOT 101
Course Title:Plant Diversity-Cryptogams I
Academic year 2019 - 20

Learning objectives:

- The morphology, structure and importance of the organisms,
- Classification and interrelationships between various groups and reasons behind the same,
- Differentiation between various groups of Algae and Bryophytes, and Applications of algae and bryophytes in different fields.

Learning outcomes: The student will be able to: Classify algae into various groups, understand the importance in various fields and will be able to collect and identify them and Classify Bryophytes into various groups, their importance

Detailed Syllabus

RPSBOT 101	Title: Plant Diversity-Cryptogams I	Credits – 4
UNIT I	**Phycology**	**15 Lectures**
	Classification of Algae upto orders as proposed by Gilbert M Smith	
	Origin and Evolution of Sex in Algae	
	Fossil Algae	
UNIT II	**Applied Phycology**	**15 Lectures**
	Techniques in commercial Cultivation of Algae for Protein & Secondary metabolites, Carbon credit, Antibiotics, Biofuel	
	Detrimental Algae and their control	
	Toxic Algae, Parasitic Algae	
	Water Blooms and Red Tides in India and across the world, Utility,	
	Disadvantages and Control of Algal blooms	
	Algae as a Source of Pharmaceuticals &Nutraceuticals	
	Algal collection and preservation	
UNIT III	**Bryophyta I**	**15 Lectures**
	Classification of Bryophyta, up to orders, according to the system proposed by G.M.Smith.	
	Alternation of generation in Bryophyta.	
	Evolution of the gametophyte and sex organs in Bryophytes	
UNIT IV	**Bryophyta II**	**15 Lectures**
	Origin and evolution of Bryophyta with reference to habitat and form	
	Evolution of the Sporophyte in Bryophyta,	
	Economic importance of Bryophytes	
PRACTICALS		
RPSBOTP	**Plant Diversity-Cryptogams I**	**Credits - 2**

101		
1	Study of following type with reference to their systematic position, thallus and reproductive structures: *Scytonema, Lyngbya, Anabaena, Volvox, Oedogonium, Scenedesmus, Ulothrix, Ulva, Pithophora, Closterium, Nitella, Padina* and *Gracilaria*.	
2	Extraction of algal pigments and their separation by paper chromatography.	
3	Culturing of algae / Estimation of metabolites	
4	Study of algal growth curve	
5	Students are to collect and identify algae from different habitat and prepare a key based on 5 characters or visit an Algal research station. Prepare and submit a report of the field work/research station visit.3& 4 project(submission)	
6	**Bryophyta:** Study of following type with reference to systematic position, thallus and reproductive structures: *Targionia, Plagiochasma, Fimbraria, Pellia, Poganatum.*	

References:

1. Chapman, V. J. 1962. The Algae. Macmillan & Co. Ltd.
2. Fritsch, F. E. (Vol. I, II) 1977. The structure and reproduction of Algae. Cambridge UniversityPress.
3. Gilbert M Smith.1951. Manual of Phycology. ChronicaBotanica Co.
4. Gilbert M Smith. 1971. Cryptogamic Botany (Vol. 1): Algae and Fungi. Tata McGraw Hill.
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12. Morris I (1986) Introduction to the Algae. Cambridge University Press, UK
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14. Banks H.P. (1968) The early history of Land plants. In evolution and environment, ed. E.T.Drake. New Haven: Yale Univ. Press, pp, 73-107
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16. Lacey, W. A. (1969). Fossil Bryophytes.Biological Reviews, 44,189-205. 21. Mehra, P.N. and O. N. Handoo (1953).
17. Morphology of Anthoceros erectus and A. himalayensis and the phylogeny of the anthocerotales. Bot. Gaz.114:371-382.
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Course Code: RPSBOT 102
Course Title:Plant Diversity – Spermatophyta I
Academic year 2019 - 20

Learning objectives:

- The evolutionary trends amongfossil gymnosperms,
- The evolution of angiosperms.
- Norms for Nomenclature
- Concept of characters in Angiosperms

Learning outcomes:

The students will be able to differentiate between gymnosperms and angiosperms, as well as their origin and Evolution in various eras. They will be able to grasp Rules for nomenclature according to ICN and will be able to understand the concept of presentation of evolutionary relationships in different ways.

Detailed Syllabus

RPSBOT 102	**Title: Plant Diversity – Spermatophyta I**	**Credits – 4**
UNIT I	**Gymnosperms I**	**15 Lectures**
	Classification of gymnosperms upto orders according to the system proposed by C. J. Chamberlain.	
	General characters; affinities and interrelationships of Cycadofilicales, Bennettitales and Cordaitales.	
UNIT II	**Origin of Angiosperms**	**15 Lectures**
	Origin and evolution of angiosperms	
	The primitive angiospermic flower; primitive and advanced character in angiosperms.	
UNIT III	**Angiosperms I**	**15 Lectures**
	An International Code of Nomenclature **(I.C.N)** History and basic Principles.	
	Principles for assessment of relationships, delimitation of taxa and attribution of rank: a. criteria b. guidelines c. practical considerations, d. use of categories	
UNIT IV	**Angiosperms II**	**15 Lectures**
	Evolution, Variation and speciation, Biosystematic categories, Biotypes and Ecotypes.	
	Concept of characters: Introduction, type function values of taxonomic importance. Variations; OTUs, character weighting and coding; cluster analysis; Phenograms, cladograms (definitions and differences), methods of illustrating evolutionary relationship (phylogenetic tree, cladogram).	
PRACTICALS		
RPSBOTP 102	**Plant Diversity – Spermatophyta I**	**Credits - 2**

1	**Gymnosperms:** Study of following type with reference to their systematic position, vegetative and reproductive structures: *Cordaites* (Fossil), *Auraucaria, Cupressus , Podocarpus* and *Juniperus*
2	**Angiosperms:** A study of the following plant families their morphological peculiarities and economic importance:Menispermaceae, Portulacaceae, Guttiferae, Passifloraceae, Rhamnaceae, Sapindaceae, Lythraceae, Boraginaceae, Chenopodiaceae, Liliaceae, Scitaminae, Cyperaceae
3	Identification of genus and species with the help of flora volumes. (In addition to the above mentioned families, all families studied in undergraduate classes are included)
4	Preparation of a cladogram with selected members of a family

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2. Biswas C. and Johri B.M. (1997) TheGymnosperms. Narosa Publishing House, New Delhi.
3. Chamberlain C.J. (1998) Gymnosperms: Structure and evolution. CBS Publishers, New Delhi.
4. Arnold C. A. (1947) An Introduction to Paleobotany. McGraw Hill Book company, New York.
5. Coulter J.M. and Chamberlain C.J. (1991) Morphology of Gymnosperms. Central Books, Allahabad.
6. Singh V.P. (2006) Gymnosperms. Sarup&Sons, New Delhi.
7. Sporne K.R. (1994) The morphology of gymnosperms. BI Publications Pvt. Ltd. New Delhi
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Course Code: RPSBOT 103
Course Title:Plant Physiology
Academic year 2019 - 20

Learning objectives:

- A comparative study of photosynthesis pathways involved in Eukaryotes and prokaryotes,
- Protein structure and folding methods
- Plant hormones- a comprehensive study

Learning outcomes: Students will be able to understand basic pathways in photosynthesis, protein dynamics and plant hormone production, utilisation and destruction. They will be able to understand the application of the basic concepts of Plant Physiology in other fields and also to know and discuss the concept of physiological processes of plants.

Detailed Syllabus

RPSBOT 103	**Title: Plant Physiology**	**Credits – 4**
UNIT I	**Photosynthesis I (Eukaryotes)**	**15 Lectures**
	Regulation of C_3, C_4 and CAM pathways of photosynthesis: Role of light in the activation of dark phase enzymes, regulation of RUBISCO, PEPcase, light effect, modulators and coordination of light , dark phase.	
	C_4 Photosynthesis: inter and intra-cellular transport of metabolites, carbonic anhydrase, PEPcase, NADP-MDH and PPDK.	
	Regulation of CAM through transport of metabolites.	
	Pentose Phosphate Pathway and its importance	
	Artificial photosynthesis	
UNIT II	**PhotosynthesisII (Prokaryotes)**	**15 Lectures**
	Photosynthesis of prokaryotes: Pigment systems in bacteria andCyanobacteria, light harvesting mechanisms, reductive TCA cycle.	
UNIT III	**Proteins**	**15 Lectures**
	Primary, secondary, tertiary and quaternary structural features andtheir analysis – Theoretical and experimental;	
	Protein folding – biophysical and cellular aspects.	
UNIT IV	**Plant hormones**	**15 Lectures**
	Biosynthesis, storage, breakdown and transport (Auxins, Gibberellins, Cytokines, Ethylene, Abscisic acid, Inositol, Jasmonic acid, Brassinosteroids).	
	Phytohormones in signal transduction, plant hormone receptors.	
PRACTICALS		
RPSBOTP 103	**Plant Physiology**	**Credits - 2**
1	Enzyme kinetics : Determination of Km and Vmax of the enzyme amylase purified	

	amylase)
2	Extraction of cellulase from a suitable fungal culture and study of enzyme activity by DNSA method
3	Immobilisation of yeast cells and study of invertase activity.
4	Quantitative study of diurnal fluctuation in titratable acid number (TAN) in a CAM plant.
5	Extraction and estimation of GOT and GPT from suitable plant material.
6	Separation of organic acids by paper chromatography.
7	Separation of sugars by paper chromatography
8	A study of the enzyme polyphenol oxidase, from potato peels.
9	Solvent extraction of chlorophyll a/b, xanthophylls and study of absorption pattern

References:

1. William G. Hopkins, 1999. Introduction to Plant Physiology, 2nd edition, John Wiley A Sons, Inc.
2. Lincoln Taiz and Eduardo Zeiger, 2002. Plant Physiology 2nd edition, Sinauer Associates, Inc. Publishers Sunderland, Massachusetts.
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5. Goodwin Y.W. and Mercer E.I., 2003 Introduction to Plant Biochemistry, 2nd edition. CBS Publishers and distributors.
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8. Copeland, R.A. 1996. Enzymes: A Practical Introduction to Structure, Mechanism andData Analysis. VCH Publishers, New York.
9. Dennison C. 1999.A guide to Protein Isolation. Kluwer Academic Publishers, Dordrecht,The Netherland.
10. Devi, P. 2000. Principles and Methods of Plant Molecular Biology, Biochemistry and Genetics. Agrobios, Jodhpur, India.

Course Code: RPSBOT 104
Course Title: Cytogenetic, Molecular Biology, Biotechnology and Research Methodology
Academic year 2019 - 20

Learning objectives:

- Karyotype analysis, chromosome visualisation techniques and dermatoglyphic analysis.
- Recombinant DNA technology and its applications
- Research methodology - basic aspects.

Learning outcomes: Students will be able to learn applications of karyotype analysis, rDNA technology and dermatoglyphics in view of recent findings.They will also be able to outline the genomic technologies, events involved in generating recombinant DNA molecules also basics of research methodology.

Students will understand a general definition of research design. Theywould know why educational research is undertaken, and the audiences that profit from research studies. Students should be able to identify the overall process of designing a research study from its inception to its report. Students should be familiar with ethical issues in educational research, including those issues that arise in using quantitative and qualitative research.

Detailed Syllabus

RPSBOT 104	**Title: Cytogenetic, Molecular Biology, Biotechnology and Research Methodology**	**Credits – 4**
UNIT I	**Cytogenetics**	**15 Lectures**
	Karyotype Studies: Analysis and Nomenclature, Banding Techniques- Giemsa banding, R- banding, C- banding, Techniques of Detecting human syndromes	
	Molecular Cytogenetics Methods: Principle, Technique and Applications of FISH, CGH, SKY	
	Dermatoglyphics: Meaning and terminology. Finger patterns – types, ridge count. Different types of palmer patterns, soles and flexion creases. Methods of observation and printing of dermal ridges.	
	Dermatoglyphic analysis: Its uses and limits. Finger printing in Forensic Analysis. Dermatoglyphic features of syndromes. Abnormal dermatoglyphics	
UNIT II	**Genetics**	**15 Lectures**
	Molecular basis of transformation, transduction, conjugation; fine structure of the gene, T4 Phage, complementation analysis, deletion mapping, cis-trans tests.	
	Molecular biology of nitrogen fixation: Genetic engineering of nitrogenase cluster, genetic engineering of nodulation genes	
UNIT III	**Recombinant DNA Technology**	**15 Lectures**
	Vectors in gene cloning: pUC19, phage, cosmid, BAC and YAC	

	vectors, High and low copy number plasmids and its regulation.	
	Application of recombinant DNA technology for production of herbicide resistant plants, insect resistant plants, improving seed storage proteins and golden rice	
UNIT IV	**Research Methodology**	**15 Lectures**
	Introduction: Research designprinciples, execution of work, interpretation of results.	
	R**eview of literature** • Library: Structure of a scientific library, journals, books, Digital library and E books • Catalogue: • Classification of books (Universal Decimal System). • Journals: Indexing journals, H-index, abstracting journals, research journals,review journals, e-journals. • Impact factor of journals, NCBI-Pub Med. • Reprints, Secondary storage devices, Internet, open access initiative, INFLIBNET, INSDOC. Google Scholar • Preparation of index cards: Author index and subject index; Open source, bibliography management system.	
PRACTICALS		
RPSBOTP 104	**Cytogenetic, Molecular Biology, Biotechnology and Research Methodology**	**Credits - 2**
1	Preparation of cytological stains, fixatives and pretreatment agents.	
2	Squash preparation from pre-treated root tips (colchicines/ Paradichlorobenzene/ Aesculin	
3	Squash preparation from mutagen treated root tips for study of aberrations.	
4	Smear preparation from any suitable plant material.	
5	Study of dermatoglyphics analysis	
6	Giemsa Staining of blood sample	
7	Problems based on: Restriction map analysis and construction of restriction maps,	
8	Tetrad analysis in *Neurospora* – two genes and entromere, Deletion mapping in Bacteriophage	
9	**Research Methodology** Visit a scientific library or documentation centre and submit a report Prepare a project proposal Prepare an outline of dissertation and research paper Prepare a list of references. Present a published project	

References

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15. Hartl D L and Jones E W 1998 Genetics: Principles and Analysis (4thed.). Jones and Barflett Publishers, USA.

SEMESTER II

Course Code: RPSBOT 201
Course Title:Plant Diversity-Cryptogams I
Academic year 2019 - 20

Learning objectives:

- Fungal classification, reproduction and to develop basic methods in mycological studies and also to plant pathology and importance of fungi.
- The characteristics, classification, and importance of the group Pteridophytaand fossil pteridophytes.

Learning outcomes: Upon successful completion of this course, the student will be able toClassify fungi into various groups, understand the role of fungi in various fields and will be ableto collect and identify fungi, fungal pathogens and culture them. They will be able to classify pteridophytes into various groups, and also understand their importance and multiplication of important ferns

Detailed Syllabus

RPSBOT 201	Title: Plant Diversity-Cryptogams II	Credits – 4
UNIT I	**Mycology**	**15 Lectures**
	Classification of fungi, upto orders, according to the system proposed by Alexopoulos	
	Sexuality in Fungi	
	General account of spore bearing organs and their arrangements in various groups of fungi; spore release and dispersal.	
	History of plant pathology, Host-parasite relationship	
	Classification of plant diseases based on symptoms	
	Study of the following diseases with reference to symptoms, causal organism and disease cycle : Late blight of potato Covered smut of barley, Citrus canker, Leaf curl	
UNIT II	**Applied Mycology**	**15 Lectures**
	Economic importance of fungi: Application of fungi with respect to - agriculture, industries, food and medicine, Harmful activities.	
	Mycorrhiza: type, distribution and significance with reference to agriculture and forestry.	
UNIT III	**Pteridophyta I**	**15 Lectures**
	Classification of Pteridophyta, up to orders, according to the system proposed by G.M.Smith.	
	Cultivation and maintenance of ornamental Ferns	
	Economic importance of Pteridophytes.	
UNIT IV	**Pteridophyta II**	**15 Lectures**
	The geological time scale and a study of fossil Pteridophytes (*Horneophyton,Cladoxylon*, *Sphenophyllum*, *Glossopteris*,	

	Williamsonia, Medullosa)	
PRACTICALS		
RPSBOTP 201	**Plant Diversity-Cryptogams II**	**Credits - 2**
1	**Mycology:** *Stemonitis, Saprolegnia, Phytophthora, Xylaria, Peziza, Daedalea, Ganoderma, Alternaria* and*Trichoderma.*	
2	Collection and identification of common forest fungi (5 types).	
3	**Plant diseases:** Late blight of potato Covered smut of barley, Citrus canker, Leaf curl	
4	**Economic Importance of fungi**: *Beauveria, Verticillium, Penicillium , Yeast, Ganoderma, Mycorrhiza*	
5	**Pteridophyta:** Study of following type with reference to their systematic position, thallus and reproductive structures: *Isoetes, Ophioglossum, Pteris, Angiopteris, Lygodium*and*Azolla*	
6	**Economic Importance Pterdiophytes :** *Lycopodium***,** *Azolla*	
7	**Study of fossils:** *Horneophyton, , Cladoxylon*, *Sphenophyllum*, *Glossopteris*, *Williamsonia, Medullosa*	

References:

1. Alexopoulos C.J., Mims, C.W. & Blackwell, M. 1996. lntroductory Mycology. 4th edition. John Wiley& Sons lnc.
2. Ainsworth, G.C., Sparrow, K.F.&Susmann, A.S.(Eds.) 1973.The Fungi - An Advanced Treatise. Vol 1 -4. Academic Press.
3. Burnett, J.H. 1970. Fundamentals of Mycology. Edward Amolds.
4. Dubey, H.C. 1990. An lntroduction to Fungi. 2nd Edition. Vikas Publishers, New Delhi.
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12. Agrios, G. N. 1997. Plant pathology. 4th Ed., Academic Press. 13.Bilgrami, K.H. &Dube, H C. A Text Book of Modern Plant Pathology. Vikas Publishers, New Delhi.
13. Mehrotra, R.S.1980. Plant Pathology. Tata McGraw Hill.
14. Pandey, B. P. 1999. Plant Pathology -pathogen and plant disease. S. Chand & Co.

Course Code: RPSBOT 202
Course Title:SpermatophytaII
Academic year 2019 - 20

Learning objectives:

- Meristem tissue and its role in plant development and growth, with focus on organogenesis.
- The pollen, pollen development, fertilization and to apply the information they learned in basic palynology, to various fields related to palynology.

Learning outcomes: The students will be able to understand the process of meristem development and organogenesis.Students will be able to understand the development of pollen, spore, and fertilization and to apply palynological information to plant systematic and other fields.

Detailed Syllabus

RPSBOT 202	**Title: SpermatophytaII**	**Credits – 4**
UNIT I	**Anatomy I**	**15 Lectures**
	Meristems: Definition type of meristems, apical cell theory, histogen theory and Tunica corpus theory	
	Sensory and tactile tissue system: Tactile sense organs, gravitationaland optical sense organs	
UNIT II	**Anatomy II**	**15 Lectures**
	Morphogenesis and organogenesis in plants: Organization of shoot and root apical meristems; shoot and root development, Quiescent centre, Root cap, origin of lateral root.	
	leaf development and phyllotaxy; transition of flowering, floral meristems and floral development in *Arabidopsis* and *Antirrhinum*	
UNIT III	**Developmental Botany**	**15 Lectures**
	Male gametophyte: Gene expression, male sterility sperm dimorphism and hybrid seed production; pollen storage; pollen embryos.	
	Female gametophyte: Types of embryo sacs; structure of embryo sac cells.	
	Pollination, pollen-pistil interaction and fertilization: floral characteristics	
	Seed development and fruit growth; endosperm development during Early, Maturation and Desiccation stages; embryogenesis, ultrastructure and nucellar cytology; cell lineage during late embryo development; storage proteins of endosperm and embryo; apomixis; embryo culture; dynamics of fruit growth; biochemistry and molecular biology of fruit maturation	
UNIT IV	**Palynology**	**15 Lectures**
	Special relationships of pollen grain in pollen tetrads. Pollen wall	

	morphogenesis, ultrastructure, primexin formation.	
	• Phylogeny of Pollen and Spores	
	Systemic Palynology- Monocotyledonae and Dicotyledonae	
	Evolutionary Trends among pollen grains based on Palynotaxonomical works	
	Applications of Palynology in Agriculture and Horticulture	
PRACTICALS		
RPSBOTP 202	**SpermatophytaII**	**Credits - 2**
1	Study of wood elements in *Annona, Michelia, Sterculia* and *Thuja*, using the maceration technique.	
2	Study of the following leaves with respect to leaf surface characters (wax, cuticle, epidermis, stomata, epidermal outgrowth): *Pistia , Ficus, Avicennia* and *Peperomia*	
3	Photosynthetic system in *Pinus* (arm palisade): *Cyperus, Ficus,* and *Oxalis*	
4	A study of Microsporogenesis and megasorogenesis with the help of permanent sides	
5	*In vitro* germination of pollen grains, effect of temperature on pollen viability and short - term storage.	
6	Study of the morphology of the pollen (using Chitale's and acetolysis method) from the families; Malvaceae, Asteraceae, Convolvulaceae, Labiatae and Graminae.	

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Course Code: RPSBOT 203
Course Title:Plant Physiology and Environmental Botany
Academic year 2019 - 20

Learning objectives1:

- The seed physiology and biochemistry – basic aspects
- Flowering Physiological aspects
- Physiological and morphological response of plants to the environmental stress.
- Ecological interactions and conservation.

Learning outcomes: On completion of the course students should be able to distinguish key physiological processes underlying the seed germination. Identify the physiological factors that regulate growth and developmental processes of plants. Demonstrate clear understanding of crop-environment interaction and its implication on crop growth and yield. Integrate and apply their knowledge of crop physiology for analytical thinking and solving practical problems experienced in agricultural systems. They will be able to develop a deeper understanding of ecological principles and apply the same for learning techniques of conservation.

Detailed Syllabus

RPSBOT 203	**Title: Plant Physiology and Environmental Botany**	**Credits – 4**
UNIT I	**Seed Physiologyandphysiologyof flowering**	**15 Lectures**
	Physiology and biochemistry of seed germination mobilization of food reserves, germination and growth factors, seed dormancy, control and release of dormancy	
	MADS - box genes	
UNIT II	**Stress Physiology**	**15 Lectures**
	Responses of plants to biotic (pathogen and insects) and abiotic (water, temperature and salt) stresses; mechanism of resistance to biotic stress and tolerance to abiotic stress	
UNIT III	**Environmental Botany I**	**15 Lectures**
	The Environment: Physical environment; biotic environment; biotic andabiotic interactions.	
	Habitat and Niche: concept of habitat and niche; niche width and overlap;fundamental and realized niche; resource partitioning; character displacement.	
	Population Ecology: Characteristics of a population; population growth curves; population regulation; life history strategies (r and K selection); concept of meta-population–demes and dispersal, interdemic extinctions, age structured population.	
UNIT IV	**Environmental Botany II**	**15 Lectures**
	Species interactions: types of interactions, interspecific competition, herbivory, carnivory, pollination and symbiosis	
	Biogeography: Major terrestrial biomes, theory of island biogeography; biogeographical zones of India.	
	Environmental Botany- Present concern: Conservation of genetic	

	resources, gene pools land races, Global warming and costal ecosystems.	
	Depletion of forest cover, threats to mangroves. Urbanization and plant cover	
PRACTICALS		
RPSBOTP 203	**Plant Physiology and Environmental Botany**	**Credits - 2**
1	Practical exercises are planned for better understanding of the state of environment, rather than 5-hour units. Field exercises are expected to be completed during excursion and field diaries maintained for submission during tests. Other practical work can be carried out in the laboratory with help of plant and soil samples collect from the field.	
2	Breaking of seed dormancy by Physical and Chemical methods	
3	Effect of water and salinity stress on chlorophyll content of leaves.	
4	Effect of water and salinity stress on Proline content of leaves	
5	Comparison of two population of a species collected from two areas.	
6	Determination of primary production of an area by harvest method (Terrestrial/ aquatic).	
7	Determination of primary production of an area by chlorophyll method.	
8	Determination of Nygard index of algae in a water body.	
9	Determination of dust load on leaves of roadside plant.	
10	Determination of Stomatal Index of leaves	
11	Determination of epidermal architecture of leaves.	
12	Determination of LAI of different types of trees.	
13	**Field exercises:** Assessment of pollution in ambient air, on the basis of injured leaf area. Assessment of erosion status of land along a 'stream' on a slope or on flat land Assessment of status of waste land, on the basis of its appearance and visible plant growth. Assessment of degradation of a forest on the basis of its canopy cover and height, strata and species diversity	

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Course Code: RPSBOT 204
Course Title: Medicinal Botany, Dietetics and Research Methodology
Academic year 2019 - 20

Learning objectives:

- The uses and therapeutic effects of medicinal plants, including herbal supplements.
- Students will learn how different cultures perceive diseases and then utilize plants to treat them.
- Advanced research methodology.

Learning outcomes: Students will get a deeper exposure to traditional forms of medicine and understand their basic principles. They will be able to critically evaluate the various pharmaceutical forms for administration of herbs therapeutically and their appropriateness to different health conditions. Students will be able to identify medicinal plants and understand the effects of plant chemical constituents on humans. Students will be familiar with conducting a literature review for an educational study and different types of literature reviews. Students should be able design good research hypotheses and select an appropriate data analysis method.

Detailed Syllabus

RPSBOT 204	Title: Medicinal Botany, Dietetics and Research Methodology	Credits – 4
UNIT I	**Traditional system of medicines**	**15 Lectures**
	History, scope and importance of medicinal botany	
	Principles of traditional systems of medicines: • Ayurveda • Siddha • Unani	
	Traditional systems of medicine as an alternate/ complementary system of medicine	
	Ayurvedic concepts of Nutrition	
	Preparation and uses of the following (any two): • Churnas/ Vatis/Tailas/ Arishtas	
UNIT II	**Medicinal Botany**	**15 Lectures**
	Monograph of Drugs with respect to Botanical Source, Geographical distribution, Macroscopic and microscopic Characters, Chemical constituents and therapeutic uses.	
	Adulterants: a) *Terminalia chebula*(fruits), b) *Terminalia bellerica* (fruits) and c) *Butea monosperma*(Flowers, leaves and bark), d) *Curcuma longa* (Rhizome) e) *Tinospora cordifolia* (stem)	
	Essential oils (*Eucalyptus* and *Citronella*), fatty oil (Sesame, and coconut), Vegetable fat (Cocum butter) and Medicinal uses of the above.	
UNIT III	**Dietetics**	**15 Lectures**
	Food as Medicine for the treatment of –Arthritis, Renal Disease (Kidney Stone and nephrotoxicity), Constipation, Piles, blood pressure and female reproductive disorders.	

	Therapeutic value of Indian Plant Foods: • Cereals –Oats and Ragi; • Pulses – Green Gram, Black Gram andSoyabean; • Fruits – Jambul, Amla, Guava, Mulberry and Ber; • Spices and Condiments – Coriander, Cumin, Asafoetida and Clove	
UNIT IV	**Research Methodology**	**15 Lectures**
	Research and sampling design	
	Measurement of scaling technique	
	Methods of data collection	
	Data analysis –SPAS/ SPSS,/ Origin/ GraphPad Prism	
	Ethics in research	
PRACTICALS		
RPSBOTP 204	**Medicinal Botany, Dietetics and Research Methodology**	**Credits - 2**
1	Preparation of a traditional formulation *Churnas/ Vati/ Tailas/ Arishtas/ Sufoofs*	
2	A study of the following medicinal plants/plant parts with respect to their pharmacognostic characters for authentication of the drug source: a) *Terminalia chebula*(fruits), b) *Terminalia bellerica* (fruits) c) *Butea monosperma* (Flowers, leaves and bark), d) *Curcuma longa* (Rhizome) e) *Tinospora cordifolia*(stem)	
3	Estimation of total ash content, extractive values in solvents of varying polarities and using different extraction techniques from any medicinal plant material as per Indian Pharmacopeia standards.	

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MODALITY OF ASSESSMENT

Theory Examination Pattern:

A) Internal Assessment - 40%: 40 marks.

Sr No	Evaluation type	Marks
1	Seminar presentation/ Short Project presentation / Photo documentation report of field visit/ Industry Visit Report /Presentation based on Research papers and references/Class Tests	30
2	Continuous assessment on the basis of participation in departmental activities	10

B) External examination - 60 %

Semester End Theory Assessment - 60 marks

i. Duration - These examinations shall be of **2½ hours** duration.
ii. Paper Pattern:
   1. There shall be **05** questions each of **12** marks and **01** question of **12** marks. On each unit there will be one question & last question will be based on all the **04** units.
   2. All questions shall be compulsory with internal choice within the questions.

Questions	Options	Marks	Questions on
Q.1)	None	12	Unit I
Q.2)	Any 1 out of 2	12	Unit II
Q.3)	Any 1 out of 2	12	Unit III
Q.4)	Any 1 out of 2	12	Unit IV
Q.5)	4 short notes	12	All Units

Practical Examination Pattern:

(A) External (Semester end practical examination):

Particulars	Practical 1
Laboratory work and /or *Viva voce*	50
Total	**50**

PRACTICAL BOOK/JOURNAL

The students are required to present a duly certified journal for appearing at the practical examination, failing which they will not be allowed to appear for the examination.

In case of loss of Journal and/ or Report, a Lost Certificate should be obtained from Head/ Co-ordinator / Incharge of the department; failing which the student will not be allowed to appear for the practical examination.

Overall Examination and Marks Distribution Pattern

Semester- I and II

Course	101/201		102/202		103/203		104/204		Total per Course	Grand Total
	Internal	External	Internal	External	Internal	External	Internal	External		
Theory	40	60	40	60	40	60	40	60	100	400
Practicals	50		50		50		50		50	200

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