BHARATHIAR UNIVERSITY :: COIMBATORE - 641046

DEPARTMENT OF BOTANY

VISION

To become a leader in the basic and applied aspect of plant sciences

MISSION

To device strategies/technologies for conservation of plants and microbial

Programme Educational Objectives (PEO)

PEO1: To ensure an up-to-date level of understanding of Botany.

PEO2: Utilize major concepts and principles from different branches of biological science to explain plant-related phenomena.

PEO3: Articulate the influence of plants on the world.

Programme Outcomes (PO)

PO1 – To ensure students to achieve an up-to-date level of understanding and knowledge on the scope and significance of Botany.

PO2 – To provide training in scientific and transferable skills through modular lecture courses, research projects, written work, seminars and supervisions.

PO3 – Expose students to diverse plant life-forms and to inculcate curiosity towards nature.

PO4 – Help students to understand the need for conserving the plant resources.

PO5 – To serve a lasting and practical basis for a career in research (industry or academia) or teaching.

PO6 – Help students to increase their capacity to think critically; ability to design and execute an experiment independently; enhance their confidence and ability in communicating ideas.

PO7– To enable students to function as a member of an interdisciplinary problem solving team.

BHARATHIAR UNIVERSITY : : COIMBATORE-46

M.Sc. BOTANY [CBCS] UNIVERSITY DEPARTMENT

[FOR THE STUDENTS ADMITTING DURING THE ACADEMIC YEAR 2018-2019 BATCH & ONWARDS]

SCHEME OF EXAMINTION

This curriculum is only for the P.G. courses offered by the University Department

Sem	Code No.	Subjects	Class Hours	University Examination			
				Internal	External	Total	Credits
I	18BOTACO1	Microbiology	5	25	75	100	4
I	18BOTACO2	Plant Diversity -I (Algae, Fungi and Bryophytes)	5	25	75	100	4
1	18BOTACO3	Plant Diversity – II (Pteridophytes, Gymnosperms and Paleobotany)	5	25	75	100	4
I	18BOTA CO4	**Practicals:** Microbiology , Plant Diversity I & Plant Diversity II	5	25	75	100	4
I	18BOTA E1	Plant Breeding	5	25	75	100	4
I	18BOTA E2	Forest Botany					
I	18BOTA S1	Man and Microbes	2	12	38	50	2
II	18BOTA CO5	Plant Physiology	5	25	75	100	4
II	18BOTA CO6	Embryology and Tissue Culture	5	25	75	100	4
II	18BOTA CO7	Cytology and Anatomy	5	25	75	100	4
II	18BOTA CO8	**Practicals:** Plant Physiology, Embryology and Tissue Culture; Cytology and Anatomy	5	25	75	100	4
II	18BOTA E3	Economic Botany	5	25	75	100	4
II	18BOTA E4	Plant Genetics					
II	18BOTA S2	Biodiversity Conservation	2	12	38	50	2
III	18BOTA CO9	Plant Biochemistry	5	25	75	100	4

III	18BOTA CO10	Molecular Biology & Plant Biotechnology	5	25	75	100	4
III	18BOTA CO11	Plant Systematics	5	25	75	100	4
III	18BOTA CO12	**Practicals:** Plant Biochemistry, Molecular Biology & Plant Biotechnology, Plant Systematics	5	25	75	100	4
III	18BOTA E5	Horticulture	5	25	75	100	4
III	18BOTA E6	Applied Botany					
III	18BOTA S3	Plants and Medicine	2	12	38	50	2
IV	18BOTA CO13	Environmental Biology	5	25	75	100	4
IV	18BOTA CO14	Research methodology	5	25	75	100	4
IV	18BOTA CO15	**Practicals**: Environmental Biology ; Research methodology	5	25	75	100	4
IV	18BOTA PWV	Project Work & Viva voce	Thesis	50	150	250	10
			Viva voce	12	38		
IV	18BOTA FVR	Field / Industry / Institute visit Report *	-	12	38	50	2
	Online course (Swayam, Moocs and NPTEL)					50	2#
						2300	92

Total Marks for M.Sc. Botany: 2300 Credit: 92

* To be submitted along with Project work

NOTE: 75% ATTENDENCE IS COMPULSORY IN EACH SUBJECT.

18 = Year of starting (admitted during July, 2018); BOT= Department of Botany; A= Course 1; CO= Core paper; E = Elective paper; S= Supportive paper; PWV =- Project Work & Viva-voce; FVR = Field Visit Report#Non-scholastic credit (One course of 8 weeks duration); Mandatory. To be completed by the end of 3rd Semester

SCHEME OF VALUATION

CORE PAPERS
CREDITS – 4; MARKS - 100
Marks Distribution:
Internal – 25 Marks
External – 75 Marks

ELECTIVE PAPERS (No Practicals)
CREDITS – 4; MARKS - 100
Marks Distribution:
Internal – 25 Marks
External – 75 Marks

SUPPORTIVE PAPERS (No Practicals)
CREDITS – 2; MARKS - 50
Marks Distribution:

Internal – 12 Marks
External – 38 Marks

PROJECT WORK & Viva Voce
CREDITS – 10; MARKS – 250
Marks Distribution:
Project Work & Viva voce (250 Marks)
Thesis (200 Marks)
Internal = 50 Marks; External = 150 Marks
Viva Voce (50 Marks)
Internal – 12; External – 38

FIELD / INDUSTRY / INSTITUTE VISIT REPORT
CREDITS – 2 ; MARKS - 50
Marks Distribution:
Internal – 12; External – 38

SUPPORTIVE PAPERS OFFERED FOR OTHER DEPARTMENT STUDENTS

Semester	Code No.	Title of the Supportive Paper
1st	16BOT A S1	Man and Microbes
2nd	16BOT A S2	Biodiversity Conservation
3rd	16BOT A s3	Plants and Medicine

Title of the Subject: **Microbiology** No. of Credits : **4**

Code No. : **18 BOT A CO1** No. of Teaching hours: **5**

Course Objectives:

- To provide students with the latest information in the field of microbiology.
- To provide advanced knowledge, understanding, and critical judgment appropriate for the application of microbiology.
- To explain the processes of reproduction, adaptation, survival, and interaction of microorganisms with their associated hosts and environment.
- To explain the theoretical basis of the tools, technologies and methods commonly used in microbiology.
- To develop practical skills in the use microbiological methodologies, tools and techniques.
- To highlight the role microorganisms in the human welfare.

UNIT– I: MICROBIAL DIVERSITY

Scope of Microbiology; Microbial diversity [Bacteria, Fungi, Algae, Viruses and Protozoa] - a general account, classification, growth and reproduction.

UNIT– II: CULTURE OF MICROORGANISMS

Microbiological Media: Types, preparation, methods of sterilization; enumeration of microorganisms in soil, water and air; isolation of microorganisms from environment and infected plant tissue; Techniques of pure culture, maintenance and preservation; Staining; stains and dyes, types of staining.

UNIT– III: APPLICATION OF MICROORGANISMS

Microbial interactions – Mutualism, commensalism, antagonism and parasitism; Nitrogen fixation; symbiotic and asymbiotic; pollution indicator microorganisms, Quantification techniques - MPN and membrane filtration; Role of microorganisms in sewage treatment.

UNIT– IV: FOOD MICROBIOLOGY

Fermented foods; Beverages, fermented fruits and vegetables; Single cell protein, microbial spoilage of food.Food preservation, microbiology of milk and milk products.

UNIT– V: INDUSTRIAL MICROBIOLOGY

Fermenters, batch fermentation vs continuous fermentation, Industrial production of enzymes (cellulase, amylase and protease), amino acids (glutamic acid and L-Lysine), and organic acids (lactic acid and citric acid).

REFERENCE BOOKS:

1. Jay, J.M. 1983. Modern Food Microbiology, CBS Publishers, New Delhi.
2. Kanungo, R. 2017.Ananthanarayan and Paniker's Textbook of Microbiology (10th ed.). Universities Press, Hyderabad, India.
3. Maheshwari, D. K. A. 1999. Text Book of Microbiology. S. Chand & Company Ltd. New Delhi.
4. Matthews, K.R., Montville, T. J. and Kniel, K. E. 2017. Food Microbiology: An Introduction. ASM Press, Washington.
5. Pelczar, M.J., Reid, R.D. and Chan, E.C.S. 1993. Microbiology, Tata McGraw Hill Publishing Co., New Delhi.
6. Pommervi, J.C. 2018. Fundamentals of Microbiology (11th ed.). Jones & Bartlett Learning, USA.
7. Prescott, L.M., Harley, J.P. and Klien, D.A. 1996. Microbiology (3rd ed.), Brown W.C. Publishers, Boston, USA.
8. Reed, G. (ed.) 1983. Prescott & Dunn's Industrial Microbiology (4th ed.), AVI Publishing Co., Connecticut, USA.
9. Schlegel, H.B. (ed.) 1986. General Microbiology (6th ed.), Cambridge University Press, Cambridge.
10. Sinha, U. and Srinivasa, S. 1983. An Introduction to Bacteria, Vikas Publishing House Pvt. Ltd. New Delhi.
11. Stainer, R.Y., Ingraham, J.L., Wheelis, M.L. and Painter, P.R. 1986. General Microbiology (5th ed.), Macmillan Press Ltd., London.
12. Steindraus, K.H. (ed.) 1983. Hand Book of Indigenous Fermented Food, Parcel Dekker Inc., New York.
13. Sullia, S.B. and Shantharam, S. 1998. General Microbiology, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
14. Tortora, G.J., Funke, B.R. and Case, C.L. 1995. Microbiology-an Introduction (5th ed.), The Benjamin/Cummings Publishing Company Inc., Redwood city, California, U.S.A.
15. Willey J. M., Sherwood, L., Woolverton, C. J. and Prescott L.M. 2017. Prescott's Microbiology. McGraw-Hill, New York.
16. Wistreich, G.A. and Lechtman, M.D. 1988. Microbiology (5th ed.), Macmillan Publishing Company, New York, USA

Course Outcomes:

On the successful completion of the course, the student will be able to:

CO1–Describe the morphology, culture, physiology and reproduction of different groups of microorganisms.

CO2 – Demonstrate practical skills in fundamental microbiological techniques.
CO3 – Apply the microbiological concepts and basic research findings through description, interpretation, and analysis.
CO4 – Communicate the acquired knowledge with both specialist and non-specialist audiences to educate and improve the well-being of the human society.

Course prepared by :Dr. T. Muthukumar
Course verified by: Prof. A. Rajendran

Title of the subject: **PLANT DIVERSITY I** No. of Credits:**4**

Course Code: **18 BOT A CO2** No. of Teaching hours:**5**

Course Objectives:

- To understandthesalientfeaturesofAlgae
- To studythestructure and reproductionof various genera mentionedin thesyllabus.
- To understand the composition and levels (ecological, organizational, genetic and cultural) of diversity
- To acquire knowledge ongeneralcharacteristicsofFungi and tostudythe etiologyand controlof various plantdiseases.
- To familiarize the salient features and economic importance of Bryophytes

UNIT-I: INTRODUCTION TO ALGAE

Algae in diverse habitats (Terrestrial, Fresh water, Marine); Thallus organization (range of thallus) and reproduction (vegetative, asexual, sexual); Ultrastructure of cell, Flagella, Chloroplast, Pyrenoids and Eye Spot in major groups of algae; Principles of classification, classification of Fritsch; Life cycle patterns in Algae and Algal Blooms; Economic importance of Algae as food, bio-fuels, source of chemicals and drugs; Algal Bioinoculants.

UNIT–II: MAJOR CLASSES AND GENERA OF ALGAE

Comparative study of classes of Cyanophyceae, Chlorophyceae, Xanthophyceae, Bacillariophyceae, Phaeophyceae and Rhodophyceae with reference to: Range of structure of plant body including Ultrastructure, Methods of reproduction and

Variations in life cycles; Life histories of: *Chlorella, Bulbochaete, Padina, Gelidium, Anabaena,* Diatoms and *Vaucheria*.

UNIT–III: FUNGI

General Characteristics of Fungi; Range of thallus Organization; The architecture of fungal cells, cell walls, cell membrane, cell organelles and cytoskeleton; Nutrition and growth in fungi including factors affecting fungal growth, Types of reproduction in fungi; Fungal Classification (Ainsworth, 1971); Diagnostic features of different classes of fungi; Structure and Life-historiesof *Plasmodiophora, Penicillium, Neurospora, Pleurotus, Fusarium* and *Cercospora*.

UNIT–IV: PLANT PAHTOLOGY

- Fungal genetic variation and evolution; Heterothallism, Heterokaryosis and Parasexual cycle; Saprotrophs and Ecosystems; Fungi as Parasitic and Mutualistic Symbionts; Economic Importance of Fungi; Mushroom Cultivation; Etiology and control of the following fungal diseases – Soft rot of Fruits and Vegetables, Leaf Blotch of turmeric, Powdery mildew of cereals; Panama disease of Banana, Leaf rust of coffee, Sheath Blight of rice; Fungi as biocontrol agents.

UNIT–V: BRYOPHYTES

- Classification of Bryophytes, Origin of Bryophyta, evolution (Proskauer, 1957) structural organization of gametophyte and sporophyte in different classes of Bryophytes,life histories of *Marchantia*, *Porella*, *Fossombronia*, *Anthoceros* and *Polytrichum*. Bryophytes as pollution indicators.

REFERENCE BOOKS

ALGAE

1. Chapman, V.J. and Chapman, D.J. 1962. The algae. ELBS & Macmillan, London.
2. Fritsch, F.F. 1972. The Structure and Reproduction of the Algae Vol. II. Cambridge University Press, UK.
3. Kumar, H.D. 1988. Introductory Phycology. Affiliated East-West Press Ltd. New Delhi.
4. Morris, I. 1986. An introduction to the Algae. Cambridge University Press, UK.
5. Round, F.E. 1986. The Biology of Algae. Cambridge University Press, UK.
6. Smith, G.M. 1938. Cryptogamic Botany. Vol, I. McGraw Hill Book Co., New York.
7. Smith, G.M. 1951. Manual of Phycology: An Introduction to the Algae and their Biology. ChronicaBotanica Co., Waltham, Massachusetts.

8. Van Den Hoek, C., Mann, D.G. and Jahns, H.,M. 1998. Algae and Introduction to Phycology, Cambridge University Press, UK.
9. VenkataRaman, G., Goyal, S.K., Kaushik, B.D. and Roychoudhury, P. 1974. Algae: Form and Function. Today and tomorrow's printers and Publishers, New Delhi.

FUNGI

1. Agrios, G.N. 1997. Plant Pathology. Academic Press, London.
2. Alexopoulos, C.J. and Mims, C.W. 1979. Introductory Mycology. Wiley Eastern Ltd, New Delhi.
3. Ainsworth, G.C. 1971. A Dictionary of the Fungi. Commonwealth Mycological Institute, Kew, Surrey, England.
4. Burnett, J.H. 1971. The Fundamentals of Mycology. ELBS, London.
5. Charlile, M.J., Watkinson, S.C. and Gooday, G.W. 2005. The Fungi. Elsevier, New Delhi.

Bryophytes

1. Chopra, R. N. 2005. Biology of bryophytes. New Age International (P) Ltd. New Delhi.
2. PremPuri. 2001. Bryophytes– morphology growth and differentiation. Atma Ram&Sons. Lucknow.

Course Outcome:

On successful completion of the course the students will be able to

CO1 : To learn about the morphology, structure, pigmentation, food reserves and methods of algae

CO2: To differentiate between various groups of Algae, Fungi, and Bryophytes

CO3 : To recognize fungal diseases in plants and apply scientific methods to control plant pathological problems.

CO4 : To familiarize with the morphological and systematic knowledge about Bryophytes

CO5 : To discuss the economic importance of Bryophytes

Course Prepared by: **Dr. P. Ponmurugan**

Course Verified by: **Prof. A. Rajendran**

Title of the subject: **Plant Diversity –II** No. of teaching hours: **5**

Code No. : **18BOTACO3** No. of Credits: **4**

Course objective:

- To understand the enormous diversity and range of diversity and range of diversification of all species in the world
- To understand the composition level of plant diversity emphasized in ecological, organizational, genetic and cultural.
- To realized the fundamental values of diversity and their importance of human welfare.
- To define and characterize diversity of lower vascular plants to understand the dynamics of diversity to realize the significance of diversity.

UNIT–I: PTERIDOPHYTES

Origin, Classification (Sporne); structure and life histories of *Isoetes*, *Selaginella*, *Equisetum*, *Ophioglossum*, *Marselia* and *Adiantum*.

UNIT–II: EVOLUTIONOF PTERIDOPHYTES

Heterospory and seed habit, Telome theory, Stelar system in Pteridophytes, Sorus evolution; Apogamy and Apospory, Economic importance.

UNIT–III: GYMNOSPERMS

Affinities of Gymnosperms with Angiosperms and Pteridophytes; Classification by Sporne; structure and life histories of *Cycas*, *Pinus*, *Araucaria*.

UNIT–IV: PHYLOGENY OF GYMNOSPERMS

Structure and life histories of *Ginkgo*, *Ephedra*; Phylogenetic considerations: *Ephedra*, *Welwitschia* and *Gnetum*. Economic importance.

UNIT–V: PALEOBOTANY

Geological Scale; Radiocarbon dating; Fossil Pteridophytes- Sphenophyllum, Lepidodendron Fossil gymnosperms- Heterangium, Lyginopteris, Lagenostoma; Fossil fuels, fossil pollen analysis.

REFERENCE BOOKS:

GYMNOSPERMS

1. Biswas, C. and Johrc, B.M. 1977. The Gymnosperms. Narosa publishing House, New Delhi.
2. Sporne, K.R. 1967. The Morphology of Gymnosperms. Hutchinson & Co., London.
3. Vashishta, P.C. 1991. Gymnosperms. S. Chand & Company Ltd., Ram Nagar, New Delhi.

PTERIDOPHYTES

1. Sporne, K.R. 1965. The Morphology of Pteridophytes. Hutchinson & Co., London
2. Vashishta, P.C. 1991. Vascular Cryptogams. S. Chand & Company Ltd., Ram Nagar, New Delhi. 3. Bower, F.O. 1923-28. The ferns. Vol 1-3; Cambridge University Press, London.
3. Bower, F.O. 1908. The origin of Land Flora. Macmillan Press, London.
4. Eames, A.J. 1936. Morphology of Vascular Plants. Lower groups, New York and London.

PALEOBOTANY

1. Arnold, C.A. 1947. An Introduction to Paleobotany. Academic Press, New York and Londo
2. Karl, J.N. 1981. Paleobotany, Paleoecology & Evolution. Praeger Publishing, New Delhi
3. Meyen, S.V. 1987. Fundamentals of Paleobotany. Chapman and Hall, New York.
4. Shripad, N.A. 1998. Paleobotany, Oxford and IBH Publishing Co. Pvt Ltd., New Delhi. Waston, R.T., Heywood, V.H., Baste, I., Dias, B., Camez, R., Janetos, T., Reid, W. and Ruark, C. 1995. Global Biodiversity Assessment Summary for Policy Makers. Cambridge University Press, UK.

Course outcomes:

CO1 – On successful completion of the course, the students will be to understand the goals of diversity of plants important and characterizes.

CO2 – To understanding the subject knowledge provide multiple goods to satisfy social need.

CO3 – To understanding the cultural and economic needs of the owners such as food.

CO4 – To acquired plant based the medicines, ornamental and spiritual wellbeing, fodder and fuel wood

Course prepared by: Dr.T.Sekar
Course verified by: Dr.A. Rajendran

Title of the Subject: **PRACTICALS: MICROBIOLOGY AND PLANT DIVERSITY I&II**

No. of Credits : **4**

Code No. : **18 BOT A CO4**

No. of Teaching hours: **5**

MICROBIOLOGY

1. Preparation of non-selective and selective media; enumeration of bacteria, fungi and actinomycetes [plate count] from soil and water.
2. Isolation of pathogenic microorganisms from infected tissue.
3. Observation of morphological characteristics of mould fungi.
4. Purification of mixed cultures.
5. Observation of motility of bacteria [hanging drop technique].
6. Staining methods: Preparation of smears for stains, simple staining, negative staining and Gram staining.
7. Test for Coliform bacteria.
8. Spoilage of milk by microorganisms [methylene blue test].

PLANT DIVERSITY –I

Vegetative and reproductive structures of:

(A) Algae:*Chlorella*,*Bulbochaete*,*Nitella*,*Padina*,*Turbinaria*,*Gelidium*,*Amphiroa*, *Anabaena*,*Nostoc*.

(B) Fungi:*Plasmodiophora*,*Penicillium*,*Neurospora*,*Pleurotus*,*Fusarium*, *Cercospora*,*Polyporus*.

(C) Bryophytes: *Marchantia*,*Anthoceros*,*Fossombronia*,*Polytrichum*

PLANT DIVERSITY –II

Vegetative and reproductive structures of:

Pteridophyte-*Selaginella*,*Isoetes*,*Equisetum*,*Ophioglossum*,*Adiantum*and *Marselia*.

Gymnosperms -*Cycas*,*Pinus*,*Araucaria*,*Ephedra*.

Paleobotany- Representatives from Pteridophytes and Gymnosperms.

Title of the subject: **PLANT BREEDING** No. of Credits: **4**

Course Code: **18BOTAE1** No. of Teaching hours: **5**

Course Objectives:

- To acquire a knowledge on features of sexual reproduction and understand the basic principles of genetics applied to plant breeding procedures;
- To familiarize the students with the established methods and techniques of various plant breeding
- To highlight the mission-orientation breeding developing upon production breeding, quality breeding, adaptive breeding and protection breeding regardless of breeding system ;
- To study the application of induced mutations, induced polyploidy and wide hybridization for crop improvement.

UNIT–I:INTRODUCTION TO PLANT BREEDING

History and objectives of plant breeding; centers of origin, plant introduction – history, agencies, procedure, germplasm collection, merits and demerits.Modes of reproduction; Control of pollination – self incompatibility, male sterility.

UNIT–II:METHODS OF PLANT BREEDING

Selection – mass selection, pureline selection, clonal selection with reference to methodology, merits and demerits, their application.

UNIT–III:HETEROSIS AND INBREEDING DEPRESSION

Heterosis and Inbreeding depression – effects of inbreeding, genetic basis of heterosis – theories explaining heterosis and inbreeding depression.

UNIT–IV:METHODS OF CROP IMPROVEMENTS

Improvement of crop plants by pedigree method, bulk method, backcross method – procedure, merits and demerits of the above breeding methods. Breeding for specific characters.

UNIT–V:MUTATION FOR CROP IMPROVEMENT

Improvement of crop plants through Induced mutations, polyploidy and distant hybridization. Molecular Markers in plant breeding, application of genomics in plant breeding.

REFERENCE BOOKS

1. Allard, R.W. 1960. Principles of Plant Breeding, John Wiley and Sons, Inc. New York.
2. Simmonds, N.W. 1979. Principles of Crop improvement. Longman, London.
3. Singh, E.D. 1990. Plant Breeding. Kalyani Publishers, New Delhi.

Course Outcome

On successful completion of the course the students will be able to

CO1 : To apply basic principles of genetics for genetic improvement and describe partitioning of phenotypic variations

CO2: To discuss selection techniques and methods used in genetic improvement of self and cross pollinated crops

CO3 : To understand the basic principles of hybrid vigour and to discuss the genetic basis and theories of hybrid vigour.

CO4 : To state the improvement of crop plants and describe various methods of crop improvement.

CO5 : To explain the importance of mutations and polyploidy for the improvement of crop plants and to apply the usage of molecular markers in genetic improvement of crops.

Course Prepared by: **Dr. P. Ponmurugan**

Course Verified by:**Dr. A. Rajendran**

Title of the Subject: **Forest Botany** No. of Credits : **4**

Code No. : **18 BOTAE2** No. of Teaching hours: **5**

Course Objectives:

- To enable the students to understand the importance of forests.
- To enable them tocontribute meaningfully in the conservation of the forest.
- It also makes students aware of the current global problems in forestry related to human intervention and the need of developing a sustainable way of life.
- It provides a platform to appreciate biodiversity and the importance of conservation strategies.

UNIT–I: GENERAL INTRODUCTION TO FORESTS

Natural and Manmade; Tropical, temperate, evergreen, semi evergreen, deciduous; Monoculture, multipurpose, social and industrial.Forest and gene conservation; Forest types in South India with special emphasis to Tamil Nadu.

UNIT–II: SILVICULTURE

Concept and scope of study of natural and artificial regeneration of forests.Clear felling, uniform shelter, wood selection, coppice and conservation systems. Silviculture of some of the economically important species in India such as *Azadirachta indica, Tectona grandis, Eucalyptus,* Mahogany (*Swietenia mahagoni*), *Dalbergia sissoo* and *Santalum album*, jack wood (*Cryptocarya glaucescens*), Rubber (*Hevea brasiliensis*), Sal (*Shorea robusta*), Paduok (*Pterocarpus*). Wood: Homogenous and heterogenous- spring and autumn wood- Porous and non-porous wood- Heart and sap wood. Relevance of wood anatomical studies - Identification of wood - preparation of key and their uses.

UNIT–III: SOCIAL AND AGRO FORESTRY

Selection of species and role of multipurpose trees.Food, fodder and energy.Social forest- Avenue plantation.Sacred plants- definition, importance of sacred trees like *Ficusreligiosa, Emblicaofficinalis, Aeglemarmelos*.

UNIT–IV: TREE PRODUCTION

Seed orchards, seed dormancy - Types of dormancy, physical and chemical methods to overcome seed dormancy.Forest laws- necessity, General principles, Indian forest act 1927 and their amendment.

UNIT–V: FOREST RESOURCES AND UTILIZATION

Forest products- timber, pulp wood, secondary timbers, non-timber forest products (NTFPs). Definition and scope (brief outline) - Gums, resins, fibers, oil seeds, nuts, rubber, canes and bamboos, medicinal plants, charcoal. Lac collection andmarketing.

REFERENCE BOOKS:

1. Chundawat, B.S. and Gautham, S.K. 1996. Text book of Agroforestry. Oxford and IBH publisher, New Delhi.
2. Dhiman, A.K. 2003. Sacred plants and their medicinal uses. Daya publishing house, New Delhi.
3. Kollmann, F.F.P. and Cote, W.A. 1988. Wood science and Technology. Vol. I & II Springer Verlag, New York.
4. Mehta, T. 1981. A handbook of forest utilization. Periodical Expert Book Agency, New Delhi.
5. Nair, N.C. and Henry, A.N. 1983. Flora of Tamilnadu, India. Series: 1, Analysis, Vol.1. BSI, Coimbatore, India.
6. Rao, K.R. and Juneja, J.D. 1971. A handbook for field identification of fifty important timbers of India. The Manager of Publications, Govt. of India, New Delhi.
7. Sagreiya, K.P. 1994. Forests and Forestry (Revised by S.S. Negi). National Book Trust. New Delhi.
8. Sharma, P.D. 2004. Ecology and Environment. Rastogi Publications, Meerut.
9. Singh, M.P. and Vishwakarma, V. 1997. Forest environment and Biodiversity. Daya Publishing House, New Delhi.
10. Tiwari, K.M. 1983. Social forestry in India. Nataraj Publishers, Dehra Dun.
11. WWF. 2007. Timber identification manual. TRAFFIC, New Delhi.

Course Outcomes:

On the successful completion of the course, the student will be able to:

CO1–Identify, name and classify various tree species.
CO2 – Identify various tree species and their suitability for different purposes and growing conditions
CO3 – Appreciate tree use and distribution for plantation and natural forest habitats.
CO4– Understand the importance of forestry for social, ecological, economic, cultural and environmental purposes.

Course prepared by :Dr. T. Muthukumar
Course verified by: Prof. A. Rajendran

Title of the subject: **MAN AND MICROBES** No of Credit: **2**

Code No: **18 BOTAS1** No of Teaching hours: **2**

Course Objectives: To enable the students to

- know the techniques involved in the culturing of microbes
- learn the methods of food preservation and technology of edible mushroom cultivation
- know about symbiotic bacteria and their nitrogen fixing ability

UNIT–I: MICROBIAL CULTURING TECHNIQUES

Culturing and maintenance of microorganisms: Glassware used in microbiology laboratory, media preparation (PDA and nutrient agar), sterilization, isolation of microorganism, their purification and maintenance. Staining of microorganisms (simple and Gram staining).

UNIT–II: FOOD MICROBIOLOGY

Food microbiology: Microbial spoilage of food, food preservation, fermented food, Microbiology of milk, single cell protein; Mushroom cultivation.

UNIT–III: AGRICULTURAL MICROBIOLOGY

Agricultural microbiology: Nitrogen fixing microorganisms, mycorrhizae, microbial biopesticides, microbes causing important crop diseases.

UNIT–IV: ENVIRONMENTAL MICROBIOLOGY

Environmental microbiology: Microbiology of potable water, water purification, role of microorganisms in sewage treatment, processing of solid waste, oil eating bugs.

UNIT–V:INDUSTRIAL MICROBIOLOGY

Industrial microbiology: Selection and improvement of industrially useful microorganisms, fermentation process and recovery of end product, Industrial production of alcohol, Vinegar, antibiotic c (penicillin), and enzymes (cellulase).

REFERENCE BOOKS

1. Sullia, S.B. and Shantharam, S. 1998. General Microbiology, Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
2. Pelczar, M.J., Reid, R.D. and Chan, E.C.S. 1983. Microbiology, Tata McGraw Hill Publishing Co., New Delhi.
3. Jay, J.M. 1983. Modern Food Microbiology, CBS Publishers, New Delhi.
4. Reed, G. 1983. Prescott & Dunn's Industrial Microbiology (4^{th} ed.), AVI Publishing Co., Connecticut, USA.
5. Steindraus, K.H. 1983. Hand Book of Indigenous Fermented Food, Parcel Decker Inc, New York.

6. Schlegel, H.B. 1986. General Microbiology (6th ed.), Cambridge University Press, UK.

Course Outcomes:

On successful completion of the course, the student will be able to:

CO 1- Understand the various techniques in microbial culturing and maintenance

CO 2- Upgrade the skills in quality aspects of food processing

CO 3- Be familiar with the role of microbes in environment biotechnology.

CO4-Appreciate the beneficial uses of microbes in food, agricultural and pharmaceutical industries

Course prepared by: **Dr. P. Gurusaravanan**

Course verified by: Prof. A. Rajendran

Title of the Subject : **PLANT PHYSIOLOGY** No. Credits: **4**

Code No : **18 BOTACO5** No. Teaching Hours: **5**

Course objectives

- To learn the mechanism involved in plant growth
- To know the energy production and its utilization in plants
- To be familiar with the hormones and its metabolism in plants
- To study about the movements in plants
- To know the various responses of plants against stress and its mechanism of resistance

UNIT–I: PLANT WATER RELATIONS AND MINERAL NUTRITION

Solute transport: Properties of water, Diffusion, Osmosis and Water potential. Translocation of water and solutes through cells, xylem and phloem. Mechanisms of loading and unloading of photo-assimilates. Transpiration and stomatal movement.

UNIT–II : PHOTOSYNTHESIS AND RESPIRATION

Photosynthesis: Principles of light absorption, energy transfer and electron transfer; CO2 fixation - C3, C4 and CAM pathway. Respiration: Glycolysis, TCA cycle and Photorespiration.

UNIT–III : BIOENERGETICS

Laws of thermodynamics, concepts of free energy, oxidation reduction reaction.Mitochondrial electron transport and ATP cycle.Electron transport inhibitors.

UNIT–IV : PLANT HORMONES & NITROGEN METABOLISM

Plant Hormones: Biosynthesis and transport of Auxins, Gibberellins, Ethylene and Abscisic acid.

Nitrogen metabolism: Nitrogen cycle, Biological Nitrogen fixation. Photobiology:
Functions of Phytochrome, Photoperiodism and Biological clocks. Plant Movements

UNIT–V : STRESS PHYSIOLOGY

Physiological responses of plants to biotic (insects and pathogens) and abiotic stresses (water, temperature and salt).Mechanism of resistance to biotic stress and tolerance to abiotic stress. Free Radicals and Antioxidants.

Text Books:

1. Jain, V.K. 2000. Fundamentals of Plant Physiology (5th ed.), S. Chand & Co Ltd; New Delhi.

2. Pandey, S.N. and Sinha, B.K. 2010. Plant Physiology, Vikas Publishing, New Delhi.

Reference Books:

1. Devlin, R.M. and Baker, N.R. 1973. Photosynthesis, Reinhold Affiliated East-West Press Pvt. Ltd, New Delhi.
2. Hewitt, E.J. and Cutting, C.V. 1979. Nitrogen metabolism of plants, Academic Press, London.
3. Peach, K. and Tracey, M.V. 1955. Modern methods of plant analysis (1st ed.), New Delhi.

4. Machlis, L. and Torrey, J.G. 1956. Plant in action: Laboratory manual of plant physiology. W.H. Freeman publisher, SanFrancisco.

5. Moore, T.C. 1979. Biochemistry and physiology of plant hormones. Narosa book Distributors, New Delhi.

6. Roberts, E.A. 1987. Plant growth regulators. Kluwer Academic publishers, London.

Course outcomes

On successful completion of the course, the student will be able to:

- CO 1- Understand the various steps involved in the basic functioning of plant growth and the nutritive value of food
- CO 2- Gain awareness about the various process involved in the energy production in plants
- CO 3- Understand the various hormones and its functioning in plants, plant movements and also the photobiology
- CO 4- Able to identify the plant stress based on its responses.

Course prepared by : Dr.T. Parimelazhagan
Course verified by : Prof. A.Rajendran

Title of the Subject :**EMBRYOLOGY AND TISSUE CULTURE**

No. Credits: **4**

Code No : **18 BOTACO6**

No. Teaching Hours: **5**

Course objectives

- To know the mechanism underlining the shift from vegetative to reproductive phase.
- To trace the development of male and female gametophyte.
- To understand the incompatibility barriers and evolve methods to overcome it at the time of breeding
- To highlight the physiological role of endosperm in the morphogenesis of embryo.
- To assess the process of seed setting.
- Application of various tools and techniques of *in vitro* methods in plant improvement.

UNIT- I

A brief historical account, microsporangium and male gametophyte-structure and development; incompatibility-types, mechanism and methods to overcome incompatibility.

UNIT- II

Megasporogenesis, development of female gametophyte (3 types), organization and ultra structure of mature embryosac, nutrition.

UNIT- III

Post pollination events: Fertilization - germination of pollen, path of pollen tube; Endosperm – types and function; Embryogenesis-development of a typical monocot and dicot embryo, polyembryony.

UNIT- IV

Plant tissue culture - history, concept of totipotency, callus induction, organogenesis, somatic embryogenesis and synthetic seeds; Basics of suspension culture, production of secondary metabolites.

UNIT – V

Micropropagation- methods and application, androgenesis and gynogenesis for haploid production, protoplast culture and somatic hybridization, somaclonal variation and conservation of germplasm.

REFERENCE BOOKS

1. Bierhorst, D.W. 1971. Morphology of Vascular plants. Macmillan publisher, New York.
2. Johri, B.M. (ed) 1983. Embryology of Angiosperms, Springer-Verlag, New York.
3. Bhojwani, S.S. and Bhatnagar, S.P. 1986. The Embryology and Angiosperms. Vikas publishing house pvt. Ltd, New Delhi.
4. Eames, A.J. 1961. Morphology of angiosperms. Sinnott, E.W. (ed.), McGraw-Hill publications in the Botanical Sciences, New York.
5. Maheshwari, P. 1963. Recent Advances in Embryology of Angiosperms. Intl. Soc. Plant Morphologists, New Delhi.
6. Pullaiah, T., Lakshiminarayana, K. and HanumanthaRao, B. 2006. Text book of Embryology of Angiosperms. Regency Publications, New Delhi.
7. Bhojwani, S.S. and Razdan, M.K. 1996. Plant Tissue Culture: Theory and Practice (revised edition). Elsevier Science Publishers, New York, USA
8. Bhojwani, S.S. 1990. Plant Tissue Culture: Applications and Limitations Elsevier Science Publishers, New York, USA.
9. Jain, S.M., Sopory, S.K. and Veilleux, R.E. 1996. In Vitro Haploid Production in Higher Plants, Vols. 1-5, Fundamental Aspects and Methods. Kluwer Academic Publishers, Dordrecht, The Netherlands
10. Kartha, K.K. 1985. Cryopreservation of Plant Cells and Organs. CRC Press, Boca Raton, Florida, USA.
11. Raghavan, V. 1986. Embryogenesis in Angiosperms: A Developmental and Experimental Study, Cambridge University Press, New York, USA.
12. Raghavan, V. 1997. Molecular Biology of Flowering Plants. Cambridge University Press, New York, USA.
13. Vasil, I.K. and Thorpe, T.A. 1994. Plant Cell and Tissue Culture. Kluwer Academic Publishers, The Netherlands.

Course outcomes

On successful completion of the course, the student will be able to:

- CO 1- Understand the intricacies involved in the reproduction of plants.
- CO 2- Gain awareness about the various process of compatibility involved in plant reproduction
- CO 3- Understand the basis of plant tissue culture technique
- CO 4- Employ various tissue culture techniques in plant propagation and conservation

Course prepared by :Dr.N. Geetha
Course verified by : Prof. A.Rajendran

Title of the Subject: **Cytology and Anatomy** No. of Credits: **4**

Course Code: **18BOTAC07** No. of Teaching hours: **5**

Course Objective:

- To enable students to learn various cell structures and functions of prokaryotes and eukaryotes.
- To understand the anatomical features and functions of cellular organelles in dicot and monocot plants.
- To enable students to describe the basic signal transduction pathway and to recognize the general principles of cellular communication
- To classify meristems and to identify their structures, functions and roles of apical vs lateral meristems in plant growth
- To describe the function and organization of woody stems derived from secondary growth in dicot and monocot plants

UNIT–I: GENERAL FEATURES OF CELLS

Cell and the Cell theory – Cell structure in prokaryotes and eukaryotes, Ultra structure of Cell Wall and cell organelles (nucleus and nucleoli, mitochondria, plastids, cytoplasm, endoplasmic reticulum, ribosomes, chromatin and chromosomes). Cytoskeletal proteins. Cell division –Mitosis and meiosis and their significance: Synoptemal complex.

UNIT–II: MEMBRANE STRUCTURE AND TRANSPORT

Plasma membrane – Ultra structure**,** Models of plasma membrane, membrane proteins, Properties and functions of plasma membrane; Passive and Active transport across cell membrane, sodium and potassium pumps, Ca^{2+} ATPase pumps; Co-transport symport, Antiport; Endo and Exocytosis.

UNIT–III: CELLULAR COMMUNICATION

Cell Signalling – Cell surface receptors; General principles of cellular communication; Role of G-protein, Cyclic AMP, Calcium ion flux in signal transduction; Bacterial chemotaxis and quorum sensing.

Unit–IV: MERISTEMS

Meristems – Classification, structure and functions, Cambium and seasonal Activities, Cambium in monocotyledons.

Unit–V: SECONDARY GROWTH IN PLANTS

Stem – Secondary structure, Anomalous secondary growth in Dicots and monocots. Wood – sap wood and heartwood, Reaction wood, growth rings and Nodal anatomy.

REFERENCE BOOKS

1. Baker, J.R. 1966. Cytological Techniques (5th ed.), Methuen, London.
2. Bierhorst, D.W. 1971. Morphology of vascular plants. Macmillan publishers, New York.
3. Easu, K. 1985. Plant Anatomy, Wiley Eastern Pvt. Ltd., New Delhi.
4. Faweett, D.W. 1979. The Cell – Its Organelles and inclusions, (2nd ed.), W.B. Saunders Co. Philadelphia, USA.
5. Pandey, B.P. 1993. Plant anatomy, S. Chand & Co, New Delhi.
6. Raghuvanshi, R.K., Chauhan, A.K.S. and Siddiqui, B.A. 1995. Practical exercises in Cytology, genetics, Plant Breeding and Biostatistics. CBS Publishers & Distributors, New Delhi.
7. Swanson, P. and Webster, P. 1977. The Cell. Prentice Hall, Inc. Englewood Cliffs, New Jersey, USA.

Course Outcome

On successful completion of the course the students will be able to

CO1 : To recognize the general features and organization of cell wall and cell organelles

CO2: To understand cell membrane structure and transport system.

CO3 : To understand the basic principles of signal transduction mechanisms and to discuss the concept of cellular communication

CO4 : To state the types of growth and to compare their structure and functions and processes of primary growth in stem and roots

CO5 : To explain the importance of secondary growth and to state the location of tissues involved in secondary growth in dicot and monocot plants

Course Prepared by: Dr. P. Ponmurugan

Course Verified by: Prof. A. Rajendran

Title of the Subject: **PRACTICALS: PLANT PHYSIOLOGY, EMBRYOLOGY AND TISSUE CULTURE & CYTOLOGY AND ANATOMY** No. of Credits : **4**

Code No. : **18 BOT A CO8** No. of Teaching hours: **5**

PLANT PHYSIOLOGY

1. Rate of photosynthesis under varying CO_2 concentration in water plants.
2. Separation of plant pigments by Thin Layer Chromatography.
3. Separation of plant pigments by Column Chromatography.
4. Estimation of Chlorophyll and Carotenoid pigments.
5. Determination of Total Antioxidant activity by phosphomolybdenum reduction method.
6. Determination of Superoxide radical scavenging activity
7. Estimation of Nitrate reductase activity.
8. Calculation of stomatal index of upper and lower epidermal peelings of *Moringa*.

EMBRYOLOGY

1. Anther development
2. Female gametophyte
3. Endosperm-types and haustoria
4. Dissection of embryos

TISSUE CULTURE

1. Sterilization of ex-plants, preparation of media. 2. Callus induction and organogenesis. 3. Preparation of artificial seed.
4. Demonstration of androgenesis in *Datura.*
5. Isolation of protoplast from various plant tissues and testing their viability

ANATOMY

1. Anomalous secondary thickening (Monocot and Dicot)
2. Microtomy
3. Maceration
4. Slide submission (Microtomy – 5 nos. free hand sections – 5)

CYTOLOGY

1. Study of cells and chromosome morphology
2. Banding pattern of chromosomes
3. Specialized chromosomes

4. Mitotic and meiotic divisions
5. Fixatives and staining methods; Preparation of temporary and permanent slides.
6. Preparation of sections of stem, root, and leaf
7. Staining of various plant tissues

Title of the subject: **ECONOMIC BOTANY** No of Credit: **4**

Code No: **18BOTAE3** No of Teaching hours: **5**

Course Objectives: To enable the students to

- know the origin, history and farming process of cereals and pulses
- study the economic importance of vegetables, fruits, spices and condiments
- know the features of fibres, timber and oil yielding plants

UNIT–I: CEREALS AND LEGUMES

Origin and History, Botanical description, Cultivation, Harvesting and uses of Cereals and Legumes: Wheat, Rice, Maize, Sorghum, Barley, Black gram, Red gram, Chick pea, Pigeon pea and Broad beans.

UNIT–II: VEGETABLES AND FRUITS

Origin and History, Botanical description and economic importance of Vegetables and Fruits: Banana, Grapes, Citrus, Mango, Jack fruit, Potato, Cassava, *Dioscorea* and Tomato.

UNIT–III: SPICES AND CONDIMENTS

Origin and History, Botanical description, Cultivation and uses of Spices and Condiments: Ginger, Pepper, Cardamom, Clove, Nut-Meg, Chilly, *Coriandrum*, Turmeric and All-spice.

UNIT–IV: BEVERAGES PLANTS, FIBRES AND TIMBER

Origin and History, Botanical description, Cultivation, Processing and uses of Beverages plants*:* Tea, Coffee and Cocoa. *Sugars and Starch*: Sugarcane and *Manihot*. Fibers and Timber: Cotton, Jute, Sunhemp, Teak, Rosewood, Ebony, Sal and Mahogany.

UNIT–V: OIL YIELDING PLANTS

Origin and History, Botanical description, Harvesting, Extraction and uses of Fatty oils and Vegetable Fats: Sun flower, Soya bean, Peanut, Palm Oil, Coconut and Gingelly. Medicinal Plants: *Rauvolfia*, *Aconitum*, Jatamansi, Sathavari, Goggul,

Basil, *Saraca* and Neem.

REFERENCE BOOKS

1. Vardhana, R. 2009. Economic Botany (1st ed.), Sarup Book Publishers Pvt. Ltd., New Delhi.
2. Hill, A.F. 1952. Economic Botany; A Textbook of Useful Plants and Plant Products (2nded.), McGraw- Hill Book Co., Inc., New York.
3. Pandey, B.P. 1990. Economic Botany (4th ed.), S. Chand & Company Ltd, New Delhi.
4. Thompson, H.C. 1949. Vegetable Crops (4th ed.), McGraw- Hill Book Co., Inc., New York.
5. Wallis, T.E. 1946. Text book of Pharmacognos*y.* J. & A. Churchill Ltd, London.
6. Verma, V.A. 1980. Textbook of Economic Botany (3rd ed.), Emkay Publications, New Delhi.
7. Maheshwari, P. and Singh, U. 1965. Dictionary of Economic plants in India. I.C.A.R. New Delhi.

Course Outcomes:

On successful completion of the course, the student will be able to:

CO 1- Understand the applied facet of botany

CO 2- Be familiar with the various commercial products of plant origin

CO 3- Understand the utility of different plant families.

CO 4 - To have a first- hand knowledge on economic Botany

Course prepared by: **Dr. P. Gurusaravanan**
Course Verified by: Prof. A. Rajendran

Title of the Subject: **Plant Genetics** No. of Credits : **4**

Code No. : **18BOTAE4** No. of Teaching hours: **5**

Course Objectives:

- To apprise students on the basic genetic principles.

- To provide students advanced knowledge on microbial and plant genetics and its applications.
- To familiarize students on the various types of genetical techniques and procedures.
- Understanding of how genetic concepts affect broad societal issues including health and disease, food and natural resources, environmental sustainability, etc.

UNIT–I: INTRODUCTION TO GENETICS

Mendelian principles – dominance, segregation, independent assortment; Co-dominance, incomplete dominance.

UNIT–II: BASIS OF HERIDITY

Extensions of Mendelian principles- gene interactions, pleiotropy, genomic imprinting, penetrance and expressivity, phenocopy, linkage and crossing over, Theories of sex determination, sex linkage, sex limited and sex influenced characters.

UNIT–III: ORGANEL GENOME

Extrachromosomal inheritance– inheritance of mitochondrial and chloroplast genes; maternal inheritance

UNIT–IV: MICROBIAL GENETICS

Microbial genetics– methods of genetic transfers, transformation, conjugation, transduction and sexduction, mapping genes by interrupted mating, fine structure analysis of genes Recombination – homologous and non-homologous recombination including transposition

UNIT– QUANTITATIVE GENETICS

Quantitative genetics– polygenic inheritance, heritability and itsmeasurements, QTL mapping.

Mutation– types, causes and detection, mutant types – lethal, conditional, biochemical loss of function, gain of function, germinal verses somatic mutants, insertional mutagenesis.

REFERENCE BOOKS

1. Gardener, E.J. 1975. Principles of Genetics (5^{th} ed.), John wiley, New York.
2. Gilber, N.W. 1978. Organellar heredity, Revan press, New York.

3. Gupta, P.K. 1994. Genetics, Rashtogi Publication, Meerut, India
4. King, R.C. 1975. A Hand book of Genetics, Plenum Press, New York.
5. Maloy, S.R., Cronan, J.E. and Freifelder, D. 1994. Microbial Genetics (2nd ed.), Jones andBartlett Publisher, Inc., Sudbury, Massachusetts, USA.
6. Strickboarger, M.V. 1977. Genetics, Macmillan Publishers, New York.

Course Outcomes:

On the successful completion of the course, the student will be able to:

CO1–Comprehensive, detailed understanding of the basis of heredity.

CO2 – Understanding the role of genetic mechanisms in evolution.

CO3 – The ability to evaluate conclusions that are based on genetic data.

CO4–Understanding the role of genetic technologies in industries related to biotechnology, pharmaceuticals, energy, and other fields.

Course prepared by :Dr.T. Muthukumar
Course verified by : Prof. A.Rajendran

Title of the Subject: **Biodiversity Conservation** No. of Credits : **2**

Code No. : **18 BOTA S2** No. of Teaching hours: **2**

Course Objectives:

- To plan and co-ordinate conservation efforts; to sustainability use biodiversity within management systems such as forestry, fisheries and agriculture.
- To protect and restore ecosystems, species and genetic diversity using a variety of in situ and ex situ methods.
- To equitably share the benefits of biodiversity through social andeconomic instruments.
- To know about the laws and acts for the conservation of biodiversity.
- To provide a legal basis for conservation and sustainable use and to build human and institutional capacity to integrate measures at bioregional scales.

UNIT–I: INTRODUCTION

Historical account of conservation of flora in India: Phytogeographical regions and agro - climatic regions of India; Plants as protectors of environment. Principles of conservation.

UNIT–II: PLANT BIODIVERSITY

Role of wildlife sanctuaries, biosphere reserves, national parks and sacred groves in plant biodiversity conservation. Role of GIS in plant conservation

UNIT–III: BIODIVERSITY CONSERVATION

Plant genetic resources: Endangered and threatened plant species-conservation strategies [*in-situ*, *ex situ* and community conservation]-Red data book.

UNIT–IV: BIODIVERSITY MANAGEMENT

Indian Forest Act, Rio earth summit [1992]-role of WWF, UNDP and FAO in forestry programs in India; Biodiversity Act (2004).

UNIT–IV: ETHNOBOTANY

Predominant ethnic communities of India in general and Tamil Nadu in particular and their distribution – ethnomedicine – role of traditional knowledge for therapeutic purposes.

REFERENCES

1. Doshi, S.L. 1997. Emerging Tribal Image. Rewat Publication, Jaipur, New Delhi.
2. Khan, T.I. and Shishoda, Y.S. 1998. Biodiversity Conservation and Sustainable Development. Pointer Publishers, Jaipur, India.
3. Chires, D.D. 1987. Environment Science. Prentice-Hall Inc., Englewood Cliffs, New Jersey.
4. Trivedi, P.R. and Raj, G. 1992. Environmental Wildlife and Plant. Conservation. Akashdeep Publishing House, New Delhi, India.
5. Agarwal, K.C. 1996. Biodiversity. Agrobotancial Publishers, India.
6. Jain, S.K. 1994. A Manual of Ethnobotany (2^{nd}ed.), Scientific Publishers, Jodhpur, India.
7. Sinha, K.R. 1996. Global Biodiversity. INA Shree Publishers, Jaipur, India.
8. Sharma, P.D. 1975. Ecology and Environment. RastogiPublicatons, Meerut, India.
9. Mukharjee, B. 1997 Environmental Biology. Tata McGraw Hill PublishingCompany Ltd., New Delhi.
10. Frame, B., Victory, J. and Joshi, Y. 1994. Biodiversity Conservation: Forests, Wetlands and Deserts. Tata Energy Research Institute, New Delhi.

Course Outcomes:

On the successful completion of the course, the student will be able to:

CO1– Apply various methods for the conservation of biodiversity.

CO2–Acquire knowledge on ethnomedicine.

CO3 –To protect the biodiversity through ecological programmes.

CO4 –Communicate the acquire knowledge for the well-being of the human society.

Course prepared by :Dr. K. Chitra
Course verified by : Prof. A.Rajendran

Title of the Subject : **PLANT BIOCHEMISTRY** No. Credits: **4**

Code No : **18 BOT A CO9** No. Teaching Hours: **5**

Course Objective:

- To afford knowledge on functions of various biomolecules and their metabolism
- To learn structural and functional properties of carbohydrates, proteins and lipids
- To elucidate the interrelationships of the cellular components
- To provide knowledge of the Secondary metabolites and its functions

UNIT–I:PRINCIPALS OF BIOCHEMISTRY

Basic principles: Structure of atoms, molecules and chemical bonds. Van der waal forces, Hydrogen bonding, Electrostatic. Buffer solutions, pH, concentration of solutions and colligative properties.

UNIT–II : CARBOHYDRATES & LIPIDS

Carbohydrates: Classification, structure and properties. Metabolism - Gluconeogenesis, Glycogenolysis and Glycogenesis.
Lipids: Classification, structure and properties.Biosynthesis and Oxidation of fatty acids. Plant waxes, cholesterol and lecithin.

UNIT–III: PROTEINS

Structure, classification and properties of Protein. Amino acids: Structure, classification and properties. Biosynthesis and Degradation of amino acids.Mineral nutrition and deficiencies.

UNIT–IV : ENZYMES

Nomenclature and properties of enzymes.Apo-enzymes, co-enzymes and co-factors. Mechanism of enzyme action and Enzyme inhibition; Michaelis-Menten equation and Line waver – burk plot of enzyme activity. Vitamins: Classification, Functions and Deficiencies.

UNIT–V : SECONDARY METABOLITES & PIGMENTS

Secondary metabolites: Classification, functions and biosynthesis of Alkaloids, Phenols, Terpenoids and Flavonoids. Plant Pigments - Structure, Classification and functions of chlorophyll, anthocyanins, carotenoids and antho-xanthins

TEXT BOOKS:

1. Nelson, D.L. and Cox, M.M. 2012. Lehninger's Principles of biochemistry (6th ed.), W. H.Freeman Publishers, New York.
2. Berg, J.M., Tymoczko, J.L. and Stryer, L. 2002. Biochemistry (5thed.) WH Freeman &Co.,New York.

REFERENCE BOOKS:

1. Murray, R.K., Granner, D.K., Mayes, P.A. and Rodwell, V.W. 2003. Harper’s Illustrated Biochemistry (26th ed.), The McGraw-Hill Companies, Inc., USA.
2. Zubay, G. 1988. Biochemistry. Macmillan Publishing Co., New York.
3. Harold, F.M. 1986. The vital force: A study of bioenergetics. Freeman & Co., New York.
4. Murray, R.K., Mayes, P.A., Granner, D.K. and Rodwell, V.W. 1990. Harper’s Biochemistry Lange Medical Book. Connecticut McGraw hill, Stanford.
5. Conn, E.E., Stumpf, P.K., Bruring, G. and Doi, R.H. 1998. Outline of Biochemistry (5thed.) John Wiley & Sons, N-Y-Singapore, Toronto.
6. Wey, P.M. and Harbone, J.B. 2000. Plant biochemistry. Panima Educational Book agency, New Delhi.

Course Outcomes:

- CO 1- Describe the catabolic and anabolic pathway of primary metabolites of the plants
- CO 2- Acquire knowledge on properties and nature of protein and method of isolating and characterizing.
- CO 3- Illustrate the mechanism of enzyme action and interpret the plots of enzymatic kinetics
- CO 4- Understand the Secondary metabolites and its biosynthesis pathways

Course prepared by :Dr.T. Parimelazhagan
Course verified by : Prof. A.Rajendran

Title of the Subject: Molecular Biology and Plant Biotechnology No. of Credits : **4**

Code No. : **18 BOT A CO10** No. of Teaching hours: **5**

Course Objectives :

- To know molecular structure and function of chromosomes, genes and mutations.
- To explain how genetic engineering involves the use of recombinant DNA technology for crop improvement and to identify the molecular markers for selection of superior genotypes.
- To acquire fundamental knowledge on the application of various molecular tools and techniques for improvement of microbes and higher plants.

Unit–I

Chromosomes and their structure – Euchromatin and heterochromatin; role of chromatin in gene expression and gene silencing; banding pattern for identification of chromosomes; B-chromosomes.Chromosomal aberrations–duplications, deficiencies, inversions and translocations.

Unit–II

Biotechnology-basic concepts and scope. Molecular tools: Restriction enzymes, endoandexonuclease, reverse transcriptase, methylases, alkaline phosphatase and ligases. Gene cloning strategies: Genomic cDNA libraries. Vector: Plasmid, pBR 322 and Ti Plasmid; Cosmids.

Unit–III

Chemistry of the gene – composition and structure, function, metabolism of nucleic acids; Nucleic acids as genetic material; replication of DNA, models of DNA replication with experimental evidences. Organization of genetic material - nucleosome concept, techniques involved in nucleosome discovery, Chromosomal DNA content and C-Value paradox; repetitive DNA, satellite DNA; selfish DNA.

Unit–IV

Genetic code – properties, codon assignments, mutations in genetic code, new genetic code in mitochondria and ciliate protozoa.; Gene expression – protein synthesis in prokaryotes and eukaryotes – transcription and translation; Post transcriptional modification; regulation of gene expression – induction and repression systems, the operon model (lac, try).

Unit–V

Methods of gene transfer to plants: microinjection, particle bombardment; Direct gene transfer methods – Agrobacterium mediated method; Application of engineering: Golden rice and Bt cotton. Ethical, legal and social issues related to Biotechnology. Antisense

RNA, RNAi and micro RNA techniques in crop improvement. Biosafety and Biohazard - IBSC.

REFERENCE BOOKS

1. Stickberger, M.W. 1977. Genetics (2nd ed.), Macmillan, New York.
2. Swanson, C.P., Mertz, T. and Young, W.J. 1988. Cytogenetics(2nd ed.),Englewood Clifa, NewJersey.
3. Watson, J.P. 1975. Molecular Biology of the Gene (3rd ed.), Benjamin, New York.
4. Darlington, C.D. 1985. Cytology, Churchill, London.
5. Henry, R.J. 1997. Practical Applications of Plant Molecular Biology. Chapman &Hall, London, UK.
6. Old, R.W. and Primrose, S.B. 1989, Principles of Gene Manipulation. Blackwell Scientific Publications, Oxford, UK.
7. Chawla, H.S. 2002. Plant biotechnology(2nd ed.), Oxford IBH Publishing Co. Pvt. Ltd., New Delhi.
8. Primrose, S.B. 1995. Principles of Genome Analysis. Blackwell Science Ltd., Oxford, UK.
9. Raghavan, V. 1997. Molecular Biology of Flowering Plants. Cambridge University Press, UK.
10. Primrose, S.B. 1995. Principles of Genome Analysis. Blackwell Science Ltd., Oxford, UK.
11. Glick, B.R., and Pasternak, J.J.1998. “Molecular Biotechnology – Principles and Applications.
12. Karp G (2008). Cell and Molecular Biology: Concepts and Experiments. John Wiley & Sons.
13. Harvey Lodish (2008) Molecular Cell Biology Sixth edition. W. H. Freeman and Company
14. David Clark (2010). Molecular Biology, Academic Press Publications.
15. Gelvin, S.B. &Schilperoort R.A. (2000) Plant Molecular Biology Manual. Springer Netherlands.

Course Outcomes :

On successful completion of the course, the students will be able to:

CO 1- To understand the molecular mechanism of gene and protein expression.

CO 2- To improve the crop quality and quantity.

CO 3- To give awareness of ethical aspects of research and development.

CO-4- To demonstrate insight into the potential and limitations of biology and its role in society.

Course prepared by : Dr. K. Vasanth

Course Verified by : Prof. A. Rajendran

Title of the Subject: **Plant Systematics** No. of Credits : **4**

Code No. : **18BOT A CO11** No. of Teaching hours: **5**

Course Objectives:

- To acquire the fundamental values of plant systematics.
- To know about the basic concepts and principles of plant systematics.
- To establish a suitable method for correct identification and adequate characterization of plants
- To be aware of the importance of taxonomic relationships in plant systematic studies.

Unit–I: SCOPE AND IMPORTANCE OF SYSTEMATICS

Principle and goal; History of Classification- Sexual system (Carlos Linnaeus), natural system and phylogenetic system. Major systems of classification: Bentham & Hooker, Engler & Prantl, John Hutchinson, Bessey, Takhtajan; Outline of APG-III Plant Classification. Taxonomic Hierarchy: Species, Genus, Family and Other Categories; Species Concepts and intraspecific categories – subspecies, varieties and forms.

Unit–II: BOTANICAL NOMENCLATURE

Botanical nomenclature (ICN) with reference to IAPT - History of ICBN; Rule of Priority, Typification, Effective and Valid publication, Naming a new species, synonyms, identification key- indented and bracketed – their utilization. Herbarium, Botanical Garden; Botanical Survey of India (BSI); Flora and Literature in Taxonomic Studies. RET Book.

Unit–III: SOURCES OF TAXONOMIC CHARACTERS

Morphology, Anatomy, Palynology, Embryology, Cytology. Modern trends in Cytotaxonomy, Chemotaxonomy, Numerical taxonomy, Molecular taxonomy.

Unit –IV: SYSTEMATIC ANALYSIS –I

Study of Systematic Position, salient features, description, distribution of economic importance of Papaveraceae, Capparidaceae, Menispermaceace, Caryophyllaceae, Sapindaceae, Rutaceae, Meliaceae, Anacardiaceae, Anonaceae, Rhamnaceae, Fabaceae, Lythraceae, Cucurbitaceae, Combretaceae, Passifloraceae.

Unit–V: SYSTEMATIC ANALYSIS –II

Study of Systematic Position, salient features, description, distribution of economic importance of Rubiaceae, Asteraceae, Sapotaceae, Apocynaceae, Asclepiadaceae, Solanaceae, Bignoniaceae, Acanthaceae, Lamiaceae, Amarantaceae, Euphorbiaceae, Orchidaceae, Zingiberaceae, Cyperaceae, Poaceae.

REFERENCE BOOKS

1. Hutchinson, J. 1973. The Families of Flowering Plants (3rd ed.), Oxford University Press, UK.

2. Lawrence, G.H.M. 1951. Taxonomy of Vascular Plants. Macmillan publishers, New York.
3. Rendle, A.B. 1904. Classification of Flowering plants (2nd ed. Vol.1), Cambridge University Press, England.
4. Stace, C.A. 1989. Plant Taxonomy and Biosystematics (2nd ed.), Edward Arnold. London.
5. Takhtajan, A.L. 1997. Diversity and Classification of Flowering Plants. Columbia University Press, New York. M.Sc. Botany (UD) 2014-15 onwards Annexure No. 59 A Page 32 of 44 SCAA Dt. 06.02.2014
6. Woodland, D.W. 1991. Contemporary Plant Systematics. Prentice Hall. New Jersey.
7. Bensen, L.D. 1957. Plant Classification. Oxford & IBH Publishing Co., New Delhi.
8. Cronquist, A. 1968. Evolution and Classification of Flowering Plants. Thomas & Nelson (Pvt.) Ltd., London.
9. Davis, P.H. and Heywood, V.M. 1963. Principles of Angiosperm Taxonomy. Oliver & Boyed, London.
10. Henry, A.N. and Bose, C. 1980. An aid to the International Code of Botanical Nomenclature, Today& Tomorrow's Printers & Publishers, New Delhi.
11. Lawrence, G.H.M. 1961. Taxonomy of Vascular Plants. MacMillan and Co., New Delhi.
12. Street, H.E. 1978. Essay in Plant Taxonomy, Academic press, London.
13. Nalk, V.N. 1984. Taxonomy of Angiosperms. Tata McGraw-Hill Publishing Company Ltd., New Delhi.
14. Singh, G. 1999. Plant Systematics- Theory and Practice. Oxford and IBH Publishing Co. Pvt Ltd., New Delhi.
15. Sharma, O.P. 1958. Plant Taxonomy. Tata McGraw Hill Publishing Company Ltd., New Delhi.
16. Bentham, G. 1988. Handbook of British Flora. (7th ed., revised by Rendle A.B. in 1930). Ashford, Kent.
17. Cronquist, A. 1988. The Evolution and Classification of Flowering Plants. (2nd ed.), New York Botanical Garden, NY, USA.
18. Pullaiah, T. 2007. Taxonomy of Angiosperms. Regency Publications, New Delhi.

Course Outcomes:

On the successful completion of the course, the student will be able to:

CO1– Demonstrate understanding of the basic principles of systematics, including identification, nomenclature, classification, and the inference of evolutionary patterns from data.

CO2– Demonstrate understanding of evolutionary processes and patterns in the major plant groups

CO3 – Demonstrate the ability to handle and analyze plant materials in the laboratory and herbarium and in the field.

CO4 – Demonstrate comprehension of basic concepts and the ability to use scientific terminology accurately through effective oral and written communication and the use of dichotomous keys in a regional floristic manual.

Course prepared by :Dr. T. Muthukumar
Course verified by: Prof. A. Rajendran

Title of the Subject: **PRACTICALS: PLANT BIOCHEMISTRY, MOLECULAR BIOLOGY AND PLANT BIOTECHNOLOGY & PLANT SYSTEMATICS**

No. of Credits : **4**

Code No. : **18 BOTACO12**

No. of Teaching hours: **5**

BIOCHEMISTRY

1. Estimation of total soluble carbohydrates (Anthrone reagent method).
2. Estimation of total proteins (Lowry's method).
3. Estimation of total free amino acids (Ninhydrin reagent method).
4. Estimation of total free fatty acids (Titration method).
5. Estimation of total phenolics (Folin-Ciocalteu reagent method).
6. Estimation of flavonoids by colorimetric method.
7. Separation of proteins by sodium dodecyl sulfate polyacrylamide gel electrophoresis (SDS-PAGE).

MOLECULAR BIOLOGY AND PLANT BIOTECHNOLOGY

1. Synthetic seeds
2. Plasmid DNA Isolation
3. Electrophoresis – AGE
4. Agrobacterium mediated gene transformation in Plant
5. GUS Assay.
6. Genomic DNA isolation.
7. PCR amplification

PLANT SYSTEMATICS

1. Study of the morphological and floral characteristics and economic importance of Papaveraceae, Capparidaceae, Menispermaceace, Caryophyllaceae, Sapindaceae, Rutaceae, Meliaceae, Anacardiaceae, Anonaceae, Rhamnaceae, Fabaceae, Cucurbitaceae, Combretaceae, Passifloraceae, Rubiaceae, Asteraceae, Sapotaceae, Apocynaceae, Asclepiadaceae, Solanaceae, Bignoniaceae, Acanthaceae, Lamiaceae, Amarantaceae, Euphorbiaceae, Orchidaceae, Zingiberaceae, Cyperaceae, Poaceae.

2. Preparation of Artificial keys.

3. Preparation and submission of 25 Herbarium.

4. A field trip to a floristically rich area to study plants in nature and field report submission.

No. of Credits : **4**

Title of the Subject: **Horticulture**

Code No. : **18 BOTAE5** No. of Teaching hours: **5**

Course Objectives:

- To know about the brief history, divisions, classification and structure of horticultural plants. To acquire knowledge on plant growth processes and stages of plant growth.
- To enable the students to understand the plant growth environment in relation with soil, nutrients, fertilizers, and bio inoculants.
- To understand the techniques in directing plant growth. To study the propagation methods and propagation through various specialized underground structures.
- To develop practical skills in micro propagation techniques and soil-less production of horticultural crops.
- To highlight the aesthetics of horticulture and postharvest handling of horticultural products.

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UNIT–I: INTRODUCTION TO HORTICULTURE

Definition; Brief History; Divisions of Horticulture; Classification of horticultural plants; Structure of Horticultural Plants – Cell and Tissue systems, Anatomy of stem root and leaf, Morphological structures; Plant growth processes- A brief account of Photosynthesis, Respiration, Transpiration and Translocation; Stages of plant growth.

UNIT–II: FACTORS AFFECTING PLANT GROWTH

Plant Growth Environment: Abiotic factors; Soil – Profile structure; Primary and Secondary nutrients and their functions; Organic matter; Fertilizers – organic, Inorganic and Potting Media; Bio inoculants; Methods of fertilizer application; Directing Plant growth- Training - Pruning and thinning.

UNIT –III: PLANT PROPAGATION

Plant propagation: Seeds – Advantages, Viability, Mechanism of Dormancy and Dormancy Breaking: Methods of Direct and Indirect Seedling Production in Nurseries and Transplantation; Propagation through specialized underground structures – Corm, Tuber, Sucker, Bulb, Bulbil, Rhizome; Vegetative Propagation – Cutting, Layering, Grafting and Budding.

UNIT – IV: MICROPROPAGATION TECHNIQUES

Stages, multiplication by shoot tip, Nodal culture and Callus culture- Application and Limitations; Somatic embryogenesis; Synthetic seeds – Preparation and Potential uses of artificial seeds; Embryo Rescue, Soil-less Production of Horticultural crops – Hydroponics, sand culture, gravel culture.

UNIT – V: AESTHETICS OF HORTICULTURE

Design; Elements and Principles of Design; Flower Arrangement; Terrarium Culture; Bonsai; Growing Plants Indoors; Turf Production; Landscaping-Principles, Types of Parks; Xeriscaping. Postharvest handling of Horticultural Products – Harvesting; Storage; Processing; Elements of Marketing

REFERENCE BOOKS

1. Acquaah, G. 2002. Horticulture principles and practices (2nd ed.), Pearson Education (Singapore) Pvt. Ltd. M.Sc. Botany (UD)-2017-18 onwards Annexure No: 51A Page 30 of 37 SCAA Dated: 03.07.2017
2. Ashman, M.A. and Puri, G. 2002. Essential soil science- A clear and concise introduction to soil science. Blackwell scientific publishers, London.
3. Bose, T.K., Maiti, R.G., Dhua, R.S. and Das, P. 1999. Floriculture and Landscaping. NayaProkash, Calcutta.
4. Denisen, E.L. 1979. Principles of Horticulture. MacMillan Publishing co, Inc. New York.
5. Janik, J. 1972. Horticultural Science. W.H. Freeman & Company, San Francisco.
6. Kumar, N. 1994. Introduction to Horticulture, Rajalakshmi Publication, India.
7. Millar, C.E. 2004. Soil fertility. Delhi Biotech Books, New Delhi.
8. Rai, M.K. 2006. Handbook of Microbial Biofertilizers. The Haworth Press Inc.
9. SubbaRao, N.S. 1997. Biofertilizers in Agriculture and Forestry. India Book House Limited, Oxford and IBH publishing Co. Pvt. Ltd, New Delhi.
10. Thomson, L.M. and Troen, F.R. 1975. Soils and soil fertility Tata, McGraw Hill Publication Co. Ltd. New Delhi.
11. Tisdale, S.L., Helson, W.L. and Beaton, J.D. 1990. Soil fertility and Fertilizers (5th ed.), The MacMillan Publishing Co., New York.
12. Tolanus, S. 2006. Soil fertility, Fertilizer and Integrated Nutrient management. International Book Distributory Co.
13. Trivedy, P.P. 1987. Home gardening. ECA Publication, New Delhi.
14. White, R.E. 2005. Principles and practice of soil science (4th ed.), Blackwell publishers, Oxford.

Course Outcomes:

On the successful completion of the course, the student will be able to:

CO1 - Students will acquire knowledge about the fundamental aspects ofhorticulture.
CO2 - Adoption of soil conservation technique like green manuring.
CO3 - To understand the importance of horticultural plants and promote
the cultivation of horticultural plants through various techniques.
CO4 - Promoting organic farming as a way of life.

Course prepared by :Dr. K. Chitra
Course verified by : Prof. A. Rajendran

Title of the subject: **APPLIED BOTANY** No of Credit: **4**

Code No: **18BOTA E6** No of Teaching hours: **5**

Course Objectives: To enable the students

- admire the role of microbes in the commercial production
- study the forest types and know the facets of social forestry
- learn the principles and application of genetic engineering and molecular markers forhuman welfare
- know the importance of Biosafety, Bioethics and IPR

UNIT–I: MICROBIAL GROWTH AND BIOSENSORS

Microbial growth – Quantification of microbial rates - Stoichiometry of microbial growth and product formation. The fermentation process: Mode of operation of fermentation process - Design and operation of Fermenters (Packed bed reactor, Bubble column reactor, Scale up of Bioreactor) - Down Stream processing - Recovery of product- Application of fermentation. Biosensors: General principle –Types of biosensors, Biochips and biosensor arrays, Problems and limitations - Application of modern sensor technologies.

UNIT–II: FOREST AND SOCIAL FORESTRY

Forest: Components of forest - Types and classification of forest - Ecological and economic importance of forest - Afforestation and Deforestation - Chipko movements - forest production act - forest conservation methods. Social Forestry: scope, objectives and types - silviculture and agroforestry - Application of social forestry - Forest products - major and minor Forest Products.

UNIT–III:PLANT IMPROVEMENT

Plant improvement: Concepts and Scope of Plant breeding - Methods of plant breeding - Selection: Pure line and clonal selection; Hybridization: Mutation breeding. rDNA Technology: Scope of Plant transgenics - Plant transformation techniques for crop improvement. Molecular markers: DNA finger printing - Genetic markers - SSR, ISSR. cDNA Library, PCR techniques - Genome sequencing.

UNIT–IV: IMMUNOLOGY

The immune system: Principles of application – Types of immunity: Active, Innate, Adaptive – Antibodies – Immunizing agents: Passive and Active, Replicating and non-replicating vaccines – Antibody response to vaccine, Factors influencing the vaccine immune response -Immunodiagnostics: ELISA. Genomics and its application – Gene therapy.

Unit – V: BIOSAFETY AND IPR

Biosafety**:** Introduction, guidelines and regulation (Government of India), biosafety issues in biotechnology - historical background; GMOs – Definition and application in food and Agriculture; Roles of Institutional Biosafety Committee, RCGM, GEAC. Bioethics**:** Introduction, benefits and risk of genetic engineering - Bioethics - framework for ethical decision making - Ethical, legal and social issues of GMOs. IPR: patents – trademarks - copyrights and industrial design; Plant variety certification and protection - Farmers rights.

REFERENCE BOOKS:

1. Pirt, S.J. 1975. Principles of Microbial and Cell Cultivation. Blackwell Scientific Publication, London.
2. Stanbury, P.E. and Whitaker, A. 1984. Principles of Fermentation Technology Pergamon Press, Oxford.
3. Canh, T.M. 1993. Biosensors. Chapman & Hall. New York. Cunningham, A. 1998. Introduction to bioanalytical sensors. John Wiley& Sons, New York.
4. Sagriya, K.P. “Forests and Forestry”, National Book Trust, India, New Delhi, 1987.
5. Arora, M.P. 2010. Immunology. Ane Books Pvt., Ltd. New Delhi.
6. Sinha, J.K. and Bhattacharaya, S. 2006. A text book of immunology. Academic Publishers, Kolkata.
7. Erbish, F.H. and M. Maredia, 1998, Intellectual Property Rights in Agricultural Biotechnology. Universities Press, India.
8. BAREACT, Indian Patent Act 1970 Acts & Rules, Universal Law Publishing Co. Pvt. Ltd., 2007.
9. Kankanala, K.C. 2007. Genetic Patent Law & Strategy, 1st Edition. Manupatra Information Solution Pvt.Ltd.,.Noida, India.

Course Outcomes:

On successful completion of the course, the student will be able to:

CO 1 - understand the modern botanical scope & its diverse applications
CO 2 - In addition, it also provides a solid foundation & knowledge of social forestry & various commercial producers of plant origin.
CO 3 - enhance the student knowledge and skills needed for self-employment
CO 4 - gain an insight into the biosafety and farmers rights

Course prepared by: **Dr. P. Gurusaravanan**
Course Verified by :**Prof. A. Rajendran**

Title of the Subject :**PLANTS AND MEDICINE** No. Credits:**2**

Code No : **18 BOTAS3** No. Teaching Hours: **2**

Course objectives

- To study the habit and habitat of medicinal plants
- To know their scientific names
- To acquire knowledge of their chemical composition in relation to environmental factors
- To understand the medicinal value of plants and their use in various components of Ayurvedic, Siddha, Homeopathy and Unani systems of medicine
- To understand their importance in commercial market.

UNIT– I

Difference between allopathic and ayurvedic medicines; historical account of medicinal plants usage in India; some important medicinal used in India-Tulsi, Bael, Pudina, Henna, Neem, Cinnamon, Lavender, Marigold and their uses; any five medicinal plant gardens of India and their activities; ethanomedicinal importance of any five sacred plants of India; trade record for some Indian drugs; any five folk healing practices and household remedies followed in India against five illness.

UNIT– II

Distribution of Indian medicinal plants; Eco-distribution, mapping distribution in different bio-geographic zones, natural distribution of Indian medicinal plants included in the CITES' appendices.

UNIT – III

Industrial uses of medicinal plants; Processing of medicinal plants, constraints associated with medicinal plants; process technology [modern and traditional], value added products.

UNIT–IV

Trade in Medicinal plants: Medicinal Plants demand and supply, channels of supply, major importing countries and regions.

UNIT– V

Protection of plant varieties bill [PPV bill]; The provisions of PPV bill, suggestions for the proposed PPV bill, elements of PPV bill, community based enterprise in medicinal plants sector-medicinal plant enterprise for the benefit of the stakeholders.

REFERENCES

1. Amruth, 1994. The Medicinal Plants Magazine-all volumes. Medplant

Conservatory Society, Bangalore.

2. GuhaBakshi, D.N., Sen Sharma, P. and Pal, D.C. 1996. A Lexicon of Medicinal Plants in India. NayaProkash, Calcutta.
3. Joshi, S.G. 2000. Medicinal Plants. Oxford and IBH publishing company Pvt. Ltd., New Delhi.
4. Lindley, J. 1984. Medical and Economical Botany. Bishen Singh Mahendra Pal Singh publisher, 23-A New Connaught Place, India.
5. Medicinal Plants for Forest Conservation and Health Care. 1997. Non-wood Forest Products Series 11, FAQ, Rome.
6. Medicinal Plants Source Book India. 1996. International Library Association, Switzerland.
7. Nayar, M.P., Ramamurthy, K. and Agarwal, V.S. 1989. (eds.). Economic Plants of India. Botanical Survey of India, Calcutta.
8. Pal, D.C. and Jain, S.K. 1998. Tribal Medicine, NayaProkash, Calcutta.
9. Rastogi, R.P. and Mehrotra, B. M. 1990 Compendium of Indian Medicinal Plants Vol. 1. Central Drug Research Institute, Lucknow, Publications and Information Directorate, New Delhi.
10. Sharma, O.P. 1996. Hill's Economic Botany. Tata McGraw Hill Publishing Company Ltd.,
New Delhi.
11. Singh, R. 1998. Vedic Medicine, Anmol Publications Pvt. Ltd, New Delhi.
12. Warrier, P.K., Nambiar, V.P.K. and Ramankutty, C. (eds.) 1996. Indian Medicinal Plants Vol. 1-5, Orient Longman Ltd, Hyderabad.
13. Pullaiah, T. 2005. Medicinal plants in India. Regency Publications, New Delhi.

Course outcomes

On successful completion of the course, the student will be able to:

- CO 1– Understand the different types of medicine systems available.
- CO 2– Gain knowledge on the distribution of medicinal plants.
- CO 3– Understand the uses of medicinal plants in industries.
- CO 4 – Realize the different approaches in conservation of plants with therapeutic value.

Course prepared by :Dr.N. Geetha
Course verified by : Prof. A.Rajendran

Title of the subject: **Environmental Biology** No of Credit: **4**

Code No. : **18BOTACO13** No of Teaching hours: **5**

Course Objectives: To empower the student to

- Know the concept and principle of ecology.
- Study the plant communities and stages of plant succession.
- Know the causes, effects and control measure of pollution.
- Learn Biodiversity conservation and management.

UNIT–I: Concept and Principle of Ecology

Concept and principle of Ecology: Concept of Ecosystem, its structure and function and Ecological factors. Principle of ecology - Food chain, food web - Bio-gio chemical cycles; energy flow and mineral cycling - Carban cycle; nitrogen cycle; phosphorous cycle - Terrestrial ecosystems, Fresh water ecosystem, Marine ecosystem. Biogeography: Principles and importance of biogeography; Terrestrial, Aquatic and island biogeography; biogeography zones of India.

UNIT–II: Synecology

Methods of studying plant communities, quadrat, transects frequency, abundance, density cover, ecotone, community dynamics: Population ecology- characteristics of population, population growth curves, population regulation; ecological life cycle – ecotypic differentiation study of populations.

UNIT–III: Ecology succession

Serial and Climax communities – Hydrosere, Xerosere. Bog succession, sand dune succession. Plant indicators. Habitat and Niche: concept of habitat and Niche-fundamentals, resource
and character displacement of niche. Species diversity: Species interaction - types and interspecific, competition, predation and Mutual.

UNIT–IV: Functional ecology

Environmental pollution; Types, causes, effects and control measures of air, soil, water, thermal, noise and heavy metal; Bioremediation and biodegradation - Bio-mining, microbes in leaching metals.

UNIT–V: Biodiversity and conservation

Biodiversity and conservation- Definition-Types-value-genetic Diversity; Conservation – principle of conservation –*in situ* and *ex situ* conservation - Biodiversity management; climate change and its consequences; global environmental change; greenhouse effect; Environmental Impact Assessment (EIA).

REFERENCE BOOKS

1. Verma, P.S. and Agarwal, U.K. “Environmental Biology” S. Chand and company Ltd, New Delhi-2006.
2. Odum, E.P. “Fundamental of ecology”. Third Edition, B. Sunnders, International Ltd., Philadelphia 2002.
3. Krishnamoorthy, K.V. “An Advanced Text Book of Biodiversity” Oxford and IBH Book Company, New Delhi.
4. Anathakrishnan, T.N. 1982. Bioresource Ecology, Oxford & IBH Publ. Co., Inc., Belmont.
5. Billings, W.B. 1965. Plants and the ecosystem, Wardsworth Publ. Co., Inc., Belmont.
6. Dash, M,.C. 2003. “Fundamentals of Ecology”, Second Edition, Tata McGraw Hill Publications, New Delhi, 2003.
7. Kumar, H.D. 1986. Modern Concepts of Ecology, Vikas Publishing House, New Delhi.
8. Misra, K.C. 1974. Manual of Plant Ecology, Oxford & IBH Publishing & Co., Calcutta.
9. Cain, S.A. 1944. Foundation of Plant Geography, Harper & Brothers, New York.
10. Gates, D.M. 1980. Biophysical Ecology, Springer Verlag, New York.

Course Outcomes:

On successful completion of the course, the student will be able to :

CO 1- Understand the applied aspect of environmental botany

CO 2- Be familiar with biogeography and ecological adaptation of plant

CO 3- Develop skills in biodiversity conservation through *In- situ* and *Ex- situ*.

CO 4- Gain an insight into the vegetation types, species interaction and their importance.

Course prepared by: **Dr. P. Gurusaravanan**

Course Verified by :**Prof. A. Rajendran**

Title of the subject: **Research Methodology** No. of Credits: **4**

Code No. : **18 BOT A CO14** No. of teaching hours: **5**

Course objectives:

- To understand the concepts involved in the function of plants
- To introduce the various techniques and methods involved in plant science which will enable them to pursue various research activities.
- Bio statistics intended to provide the student with a conceptual overview of statistical methods with emphasis on applications commonly used analysis research experiment value.
- Topics such as how probability theory explains plant reproduction and how agricultural food is produced will be investigated. Through these topics, graphical representation of data, estimation, elementary probability, and statistical inference will be covered.

UNIT– I: INSTRUMENTATION

Principles, methodology and the types of spectrophotometer (UV, NMR and IR); Lyophilization; Centrifugation – principles and different types; Chromatography – TLC, GLC and HPLC; Electrophoresis- Agarose electrophoresis and PAGE.

UNIT–II : MICROBIAL AND PLANT TISSUE CULTURE TECHNIQUES

Types of media for microbes, sterilization techniques; Isolation of microbes; Pure culture techniques – maintenance and preservation of cultures and staining methods.

Aseptic manipulation, media preparation (MS and B5 media); Isolation and culture of protoplasts; Preparation of synthetic seeds.

UNIT–III: CYTOLOGICAL TECHNIQUES

Pretreatment, fixatives and stains; Nucleic acids-Isolation and purification; Southern, Western and Northern hybridization techniques, colony hybridization, PCR & RAPD**.**

UNIT–IV: BIOSTATISTICS

Bio statistics – definition – basic principles – variables – Collection of data, sample, population and sampling techniques – Primary and secondary data – Tabulation and presentation of data - Measures of central tendency – Mean, Mode, Median and Geometric mean - Measures of dispersion – Range, standard deviation and standard error - Hypothesis testing – test of significance – test in large and small sample – t-test, F-test and Chi square test - Correlation and Regression analysis.

UNIT–V: DISSERTATION WRITING

Objectives and planning of study, review of literature, presentation and interpretation of results; paper presentation (oral/poster).

REFERENCE BOOKS:

1. Pillai,R.S.N. and Bagavathi,V. S. 2010. Statistics theory and practice. Chand & Co. Ltd, New Delhi
2. Gupta, S.P. 1990. Statistical Methods. S. Chand & Co. Ltd, New Delhi.
3. Kothari,C.R. and Garg,G. 2014. Research methodology –Method and techniques. New Age International (P) Ltd. New Delhi.
4. Panse, V.G. and Sukhatme, P.V. 1978. Statistical Methods for Agricultural Workers. ICAR, New Delhi.
5. Rastogi, V.B. 2006. Fundamentals of Biostatistics. Ane Book India, New Delhi.
6. Zar, J.H. 1984. Biostatistics Analysis. Prentice Hall International, New Jersy.

Course outcomes:

By the end of this course, students will be able to:

CO1– Handle the lab equipments independently for carrying out the experiments.CO2 – Capable of initiating and maintaining microbial and plant tissue cultures.

CO3 – Use statistical procedures to analyse the experimental results.

CO4 – Plan, design and execute the dissemination of scientific knowledge.

Course prepared by: Dr.T.Sekar
Course verified by: Dr.A. Rajendran

Title of the Subject: **PRACTICALS: ENVIRONMENTAL BIOLOGY AND RESEARCH METHODOLOGY** No. of Credits : **4**

Code No. : **18 BOT A CO15** No. of Teaching hours: **5**

ENVIRONMENTAL BIOLOGY

1. Vegetation sampling methods – Different types of quadrate, line and belt transects.
2. Zonation: stratum transect, charting and mapping vegetation.
3. Importance Value Index (Abundance).
4. Estimation of acid/alkaline phosphatase enzymes in the given sample.
5. Determination of acidity/alkalinity.
6. Estimation of total suspended solids/ total dissolved solids.
7. Estimation of dissolved oxygen.
8. CO_2 estimation in the water sample.

RESEARCH METHODOLOGY

1. Staining techniques for microbes.
2. Preparation of root squashes for observation of root endophytic fungi.
3. Pretreatment, fixatives and stains used in chromosomal studies.
4. Tissue culture media preparation, sterilization techniques.
5. Preparation of buffers.
6. Protein extraction.
7. Estimation of proline
8. Estimation of vitamin E in plant samples.
9. Nitric oxide scavenging activity.
10. Demonstration of PCR & RAPD.
11. Guidelines in dissertation preparation and paper presentation.
12. Solving biostatistical problems: Standard deviation and standard error; Chi-square test; F-test; Correlation and Regression.