

GOVERNMENT COLLEGE FOR WOMEN (AUTONOMOUS) KUMBAKONAM

(Common course structure – B.Sc. – 2023 - 2024)

Department : Botany

Programme Code:USBO

SEMESTER – I

Part	Course Type	Course Code	Title of the Course	Hrs/ Week	Credits
I	LC-I	U231T1	Tamil	6	3
II	ELC-I	U231E1	English	6	3
III	CC-I	U23BC- 101	Phycology	5	5
III	CC-II	U23BC-102P	Phycology-Practical	3	2
III	EC-I	U231E1	English	4	4
III	EC-II	U231E2	English	2	1
IV	VE	U231VE	Value education	2	2
IV	FC	U23V1FC	Basics of Botany	2	2
			Total	30	22

SEMESTER – II

Part	Course Type	Course Code	Title of the Course	Hrs/ Week	Credits
I	LC-II	U232T2	Tamil	6	3
II	ELC- II	U232E2	English	6	3
III	CC -III	U21BC-203	Fungi, Bacteria, Viruses, Plant Pathology and Lichens	5	5
III	CC-IV	U21BC- 204P	Fungi, Bacteria, Viruses, Plant Pathology and Lichens - Practical	3	2
III	EC - III	U232E2	English	4	4
	EC-IV	U232E3	English	2	1
IV	SEC-I	U23B2S E1	Herbal Medicine	2	2
IV	EVS	U232ES	Environmental Studies	2	2
			Total	30	22

SEMESTER - III

Part	Course Type	Title of the Course	Hrs/ Week	Credits
I	LC - III	Tamil	6	3
II	ELC - III	English	6	3
III	CC-V	Bryophytes , Pteridophytes , Gymnosperms and Paleobotony	6	6
III	CC-VI	Cryptogamous - Practical	3	2
III	EC-IV		4	4
III	EC-V		2	1
IV	SEC - II	Mushroom Technology	1	1
IV	SEC - III	Global Climate Change	2	2
		Total	30	22

SEMESTER - IV

Part	Course Type	Title of the Course	Hrs/ Week	Credits
I	LC-IV	Tamil	6	3
II	ELC - IV	English	6	3
III	CC - VII	Plant Anatomy and Embryology	5	5
III	CC - VIII	Plant Anatomy and Embryology - Practical	3	2
III	EC-VI		4	4
III	EC - VII	compound	2	1
IV	SEC - IV	Fermentation Technology	2	2
IV	SEC-V	Environmental impact analysis	2	2
		Total	30	22

SEMESTER - V

Part	Course Type	Title of the Course	Hrs/ Week	Credits
III	CC-IX	Plant Morphology, Taxonomy and Economic Botany	6	5
III	CC-X	Cell Biology, Genetics and Plant Breeding	6	5
III	CC-XI	Systematic Botany and Cytogenetics – Practical	5	3
III	CC - XII	Project and Viva Voce	3	3
III	DSE-I		4	3
III	DSE - II		4	3
IV	SEC - IV	Seed Biology	2	2
IV	AEC-I	Internship/Industrial training	-	2
		Total	30	26

SEMESTER - VI

Part	Course Type	Title of the Course	Hrs/ Week	Credits
III	CC - XIII	Ecology , Phytogeography and Biostatistics	5	5
III	CC - XIV	Plant Physiology, Biochemistry and Biotechnology	5	5
III	CC-XV	Physical and conservation Botany - Practical	6	3
III	DSE - III		5	4
III	DSE - IV		4	3
IV	SEC - VII	Forestry	2	2
IV	AEC - II	Professional competency skill – General awareness for competitive examinations	2	2
IV	GS	Gender studies	1	1
	EA	Extension Activity	-	1
		Total	30	26

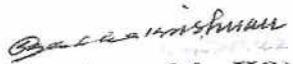
Department of Botany

List of Generic Elective Course

S.No	Subject Code	Title of the Paper	Credit
1.	U23BGE1	Cryptogamous– Botany	4
2.	U23BGE2P	Lab course in Cryptogamous –Botany	1
3.	U23BGE3	General principles of Botany	4
4.	U23BGE4P	Lab course in General Principles of botany	1

List of Discipline Specific Elective Course

S.No	Subject Code	Title of the Paper	Credit
1.	U23BDE1	Medical Botany and Human welfare	3
2.	U23BDE2	Bio-Analytical Techniques	3
3.	U23BDE3	Plant Bio resources	3
4.	U23BDE4	Pomology	3
5.	U23BDE5	Horticulture	4
6.	U23BDE6	Forestry	4
7.	U23BDE7	Bio-nanotechnology	3
8.	U23BDE8	Forensic Botany	3


Signature of the HOD

SEMESTER-I
PHYCOLOGY

Theory Hours : 5	Course Code :U23BC101
Practical Hours :-	Credit :5
Exam Hours :3	Mark :100

OBJECTIVES

- To provide a comprehensive knowledge on the biology of algae.
- To provide a basis for better understanding of the evolution higher of plants.
- To understand reproductive biology, ecology of plants by studying the simpler systems in algae.
- To understand the role of algae in ecosystems as primary producers of nutrition.
- To understand importance of algae to animals and humans.

UNIT:I

Classification (Fritsch-1935-1945), criteria for classification, algal distribution.

UNIT:II

Thallus organization (unicellular-Chlorella, Diatoms, colonial-Volvox, filamentous-Anabaena, Oedogonium, siphonous-Caulerpa, parenchymatous- Sargassum, Gracilaria).

UNIT:III

Reproduction-Vegetative, asexual, sexual reproduction and life histories (haplontic-, Oedogonium and Chara, diplontic-Diatoms and Sargassum, diplohaplontic-Ulva and diplobiontic-Gracilaria) (Examples may be changed according to the availability of the specimens).

UNIT:IV

Algal cultivation methods, Algal production systems; indoor cultivation methods and large-scale cultivation of algae, harvesting of algae.

UNIT: V

Algae as food and feed: Agar-agar, Alginic acid and Carrageenan; Diatomite.
Resource potential of algae: Application of algae as fuel, agriculture and pharmaceutical.
Phycoremediation. Role of algae in CO₂ sequestration, Algae as indicator of water pollution, algal bioinoculants, Bioluminescence.

Басаринский

LEARNING OUTCOMES:

1. Relate to the structural organization, reproduction and significance of algae.
2. Demonstrate knowledge in understanding the various life cycle patterns and the fundamental concepts in algal growth
3. Explain the benefits of various algal technologies on the ecosystem.
4. Compare and contrast the thallus organization and modes of reproduction in algae.
5. Determine the emerging areas of Algal Biotechnology for identifying commercial potentials of algal products and their uses.

REFERENCE:

1. Aziz, F and Rasheed, R. 2019. A Course Book of Algae. Publisher: University of Sulaimani. ISBN: 978-9922-20-391-1.
2. Mihir Kumar, D. 2010. Algal Biotechnology. Daya Publishing House, New Delhi.
3. Chapman V.J. and Chapman D.J, 2013. The Algae. Alpha Numera.
4. Fritsch, F.E. 1945. Structure and reproduction of Algae. Cambridge University press.
5. Round, FE. 1984. The Ecology of Algae. Cambridge University Press.
6. Lee, R.D. 2008. Phycology 4th Edition, Cambridge University Press, New York.
7. Bold, H.C and Wynne, M.J. 1978. Introduction to the Algae: Structure and Function. Prantice Hall of India New Delhi.

MAPPING WITH PROGRAMME OUTCOMES:

COs	PO1	PO2	PO3	PO4	PO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	3	3	1	3	2	1	2	2	2	1
CO2	3	3	2	2	3	3	2	1	3	3
CO3	2	2	1	1	2	2	1	3	2	2
CO4	3	3	3	3	3	2	3	3	3	2
CO5	3	3	2	3	2	3	3	3	2	3

S-Strong

M-Medium (2)

L-Low(1)

Basirevishnu

PHYCOLOGY - PRACTICAL-I

Theory Hours

Practical Hours: 3

Exam Hours:3

Course Code :U23BGE2P

Credit:2

Mark :100

OBJECTIVE

- To develop skills to identify algae based on habitat, thallus structure and the internal organization.
- To identify microalgae in a mixture.
- To develop skills to prepare the microslides of algae.
- To study the economic importance of few species.
- To understand importance of algae to animals and humans

EXPERIMENTS

1. Micro-preparation of the types prescribed in the syllabus.
2. Identifying the micro slides relevant to the syllabus.
3. Identifying types of algal mixture.
4. Economic importance of Algae as: (i) Food (ii) Feed (iii) Biofertilizers (iv) Seaweed liquid fertilizer (v) Hydrogen production by algae (vi) SCP (vii) Agar Agar (viii) Alginate (ix) Diatomaceous earth.
5. Field visit to study fresh water/marine water algal habitats.
6. Visit to nearby industry actively engaged in algal technology.

1. CO1 Recall and identify algae using key identification characters.
2. CO2 Demonstrate practical skills in preparation of fresh mount and identification of algal forms from algal mixture.
3. CO3 Describe the internal structure of algae prescribed in the syllabus
4. CO4 Decipher the algal diversity in fresh/marine water and their economic significance
5. CO5 Evaluate the various techniques used to culture algae for commercial purposes

REFERENCE:

1. Nancy Serediak and M. Huynh. 2011. Algae identification lab Guide. Accompanying
2. Manual to algae identification field guide, Ottawa Agriculture and Agri food Canada publisher.
3. Chapman, V.J and Chapaman, D.J. 1960.The Algae, ELBS & MacMillan, London.
4. Lee, R.D. 2008.Phycology 4th Edition, Cambridge University Press, New York.
5. Dehradun. Edwardlee,R.2018. Phycology, 5th Ed., CambridgeUniversityPress, London.

MAPPING WITH PROGRAMME OUTCOMES:

COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	1	3	2	1	2	3	2	1
CO2	3	3	2	2	3	3	2	3	3	3
CO3	2	2	3	3	1	2	1	3	1	2
CO4	3	3	3	3	3	2	3	3	3	2
CO5	3	3	2	2	2	3	3	3	2	3

S-Strong (3)

M-Medium (2)

L-Low(1)

Dr. Lakshmi Anand

BASICS OF BOTANY

Theory Hours : 2
Practical Hours :
Exam Hours :3

Course Code :U23B1FC
Credit:2
Mark :100

OBJECTIVES

- To learn about the classification, distinguishing traits, geographic distribution, and reproductive cycle of algae, fungi, lichens, and bryophytes.
- To understand the biodiversity by describing and explaining the morphology and reproductive processes of algae, fungi, bryophytes and microorganisms.
- To investigate the classification, distinctive traits, distribution and reproduction and life history of the various classes and major types of Pteridophytes and Gymnosperms.
- Enable to learn various cell structures and functions of prokaryotes and eukaryotes and understand the salient features and functions of cellular organelles.
- Understanding of laws of inheritance, genetic basis of loci and alleles.

UNIT-I Biodiversity

Systematics : Two Kingdom and Five Kingdom systems - Salient features of various Plant Groups : Algae, Fungi, Bryophytes, Pteridophytes and Gymnosperms - Viruses - Bacteria.

UNIT-II Cell Biology

Cell as the basic unit of life - Prokaryotic and Eukaryotic Cell (Plan Cell) - Light Microscope and Electron Microscope Ultra Structure of Prokaryotic and Eukaryotic Cells - Cell Wall - Cell Membrane Plastids, Ribosomes.

UNIT-III Plant Morphology

Structure and Modification of Root, Stem and Leaf - Structure and Types of Inflorescences - Structure and Types of Flowers, Fruits and Seeds.

UNIT-IV Genetics

Concept of Heredity and Variation - Mendel's Laws of Inheritance.

UNIT-V Plant Physiology

Cell as a Physiological Unit : Water relations -Absorption and movement : Diffusion, Osmosis, Plasmolysis, Imbibition -Permeability, Water Potential - Transpiration - Movement- Mineral Nutrition.

LEARNING OUTCOMES

1. Increase the awareness and appreciation of human friendly algae and their economic importance.
2. Develop an understanding of microbes and fungi and appreciate their adaptive strategies
3. Develop critical understanding on morphology, anatomy and reproduction of Bryophytes, Pteridophytes and Gymnosperms
4. Compare the structure and function of cells and explain the development of cells.
5. Understand the core concepts and fundamentals of plant biotechnology and genetic engineering.

Dr. Anurag Mishra

REFERENCE

1. Parihar, N.S. 2012. An introduction to Embryophyta –Pteridophytes - Surjeet Publications, Delhi.
2. Alexopoulos, C.J. 2013. Introduction to Mycology. Willey Eastern Pvt. Ltd.
3. Vashishta, P.C. 2014. Botany for Degree Students Gymnosperms. Chand & Company Ltd, Delhi.
4. Coulter, M. Jhon, 2014. Morphology of Gymnosperms. Surjeet Publications, Delhi.
5. Vashishta, P.C. 2014. Botany for Degree Students Algae. 2014. Chand & Company Ltd, Delhi.
6. Parihar, N.S. 2013. An introduction to Embryophyta –Bryophytes -, Surjeet Publications, Delhi.

MAPPING WITH PROGRAMME OUTCOMES:

COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3
CO3	2	3	3	3	3	1	3	3	1	3
CO4	3	3	2	3	3	3	3	2	3	3
CO5	3	2	2	2	2	2	2	1	2	2

S-Strong (3) *

M-Medium (2)

L-Low (1)

By Dr. N.S. Parihar

SEMESTER-II
FUNGI, BACTERIA, VIRUSES, PLANTPATHOLOGY AND LICHENS

Theory Hours : 5	Course Code :U24BC203
Practical Hours :	Credit 5
Exam Hours :3	Mark 100

OBJECTIVES

- To describe the common characteristics of fungi as being heterotrophic, unicellular/multicellular.
- To understand the biology of fungi and to discuss the importance of fungi in various ecological roles
- To understand lichen structure, function, identification, and ecology; Comprehend the events of symbiosis and lichenization and to demonstrate the use of lichens as bioindicator species.
- To identify the main groups of plant pathogens, their symptoms.
- To understand the various types of plant diseases.

UNIT-I Fungi

Classification of fungi - (Alexopoulos and Mims, 1979), criteria for classification, Characteristic features, thallus organization, mode of nutrition, structure, reproduction and life-history of classes, each with one suitable example: Zygomycotina (Pilobolus, Mucor, Rhizopus), Ascomycotina (Aspergillus, Saccharomyces, Peziza), Basidiomycotina (Agaricus, Pleurotus, Puccinia) and Deuteromycotina (Cercospora, Alternaria). (Examples may be changed according to the availability of the specimens). Importance of mycorrhizal association.

UNIT-II Economic Importance of Fungi

Cultivation of mushroom – Pleurotus (food). Fungi in agriculture application (biofertilizers): Mycotoxins (biopesticides), Production of industrially important products from fungi- alcohol (ethanol), organic acids (citric acid), enzymes (protease). Vitamins (Vitamin B-complex and Vitamin B-12), applications of fungi in pharmaceutical products (Penicillin). Importance of VAM fungi. Harmful effects of Fungi. Agriculture (Biofertilizers); Mycotoxins

UNIT-III Bacteria, Virus

Classification (Bergey's, 1994), structure and reproduction of bacteria, Mycoplasma, Virology -Viruses general characters, structure and reproduction.

UNIT-IV Plant Pathology

General symptoms of plant diseases; Geographical distribution of diseases; Etiology; Host- Pathogen relationships; Disease cycle and environmental relation; prevention and control of the following plant diseases. General characters of Bacteria and Viruses.

Bacterial diseases – Citrus canker and Bacterial wilt of Banana **Viral diseases** – Tobacco Mosaic and Vein clearing of Papaya **Fungal diseases** – Blast disease in rice and Tikka disease

B. S. Mishra

UNIT-V Lichen

Classification (Hale, 1969). Habitat, nature of association, Structure, Nature of Mycobionts and Phycobionts, Study of growth forms of lichens (crustose, foliose and fruticose), types, distribution, thallus organization, reproduction and ecological significance of lichens with special reference to Usnea.

Economic importance of Lichens: food, fodder and nutrition, flavor, tanning and dyeing, cosmetics and perfumes, Brewing and distillation, minerals, Natural products, medicine (Ayurvedic, Siddha), pharmaceutical products, biodegradation agent, air pollution and bio monitoring, soil formation, nitrogen fixation, Harmful aspects, poison from lichens.

LEARNING OUTCOMES

1. Recognize the general characteristics of microbes, fungi and lichens and disease symptoms.
2. Develop an understanding of microbes, fungi and lichens and appreciate their adaptive strategies based on structural organization.
3. Identify the common plant diseases, according to geographical locations and device control measures.
4. Analyze the emerging trends in fungal biotechnology with special reference to agricultural and pharmaceutical applications.
5. Determine the economic importance of microbes, fungi and lichens.

1. Alexopoulos, C.J., Mims, C.W., Blackwell, M. 1996. Introductory Mycology. 4th edition. John Wiley & Sons (Asia) Singapore.
2. Webster, J and Weber, R. 2007. Introduction to Fungi. 3rd edition. Cambridge University Press, Cambridge.
3. Sharma, O.P. 2011. Fungi and allied microbes The McGraw –Hill companies, New Delhi.
4. Burnett, J.H. 1971. The fundamentals of Mycology. ELBS Publication, London.
5. Bessey, E.A. 1979. Morphology and Taxonomy of fungi, Vikas publishing House Pvt. Ltd, New Delhi.
6. Dharani Dhar Awasthi. 2000. A Handbook of Lichens Vedams eBooks (P) Ltd. New Delhi.
7. Pelzer, M.J., Chan, E.C.S and Krieg, N.R. 1983. Microbiology, Tata McGraw Hill Publishing House, New Delhi.
8. Pandey, P.B. 2014. College Botany- 1: Including Algae, Fungi, Lichens, Bacteria, Viruses, Plant Pathology, Industrial Microbiology and Bryophyta. Chand Publishing, New Delhi.
9. Mishra, A. and Agarwal, R.P. 1978. Lichens – A Preliminary Text. Oxford and IBH.
10. Pandey, B.P. 2005. College Botany I: Including Algae, Fungi, Lichens, Bacteria, Viruses, Plant Pathology, Industrial Microbiology and Bryophyta. S Chand & Company.

MAPPING WITH PROGRAMME OUTCOMES:

COs	COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4
CO1	3	3	1	3	2	1	2	2	2	2
CO2	3	3	2	2	3	3	2	1	2	1
CO3	2	2	3	3	1	2	1	3	1	3
CO4	3	3	3	3	3	2	3	3	3	3
CO5	3	3	2	3	2	3	3	3	3	3

S-Strong (3)

M-Medium (2)

L-Low(1)

Dr. S. K. Mishra

**FUNGI, BACTERIA, VIRUSES, PATHOLOGY AND LICHENS -
PRACTICAL-II**

Theory Hours :

Practical Hours:

Exam Hours :3

Course Code :U21BC204P

Credit:2

Mark:100

OBJECTIVES

- To enable students to identify microscopic and macroscopic fungi.
- To prepare microslides of fungi and lichens.
- To know the presence of pathogen inside the plant tissues through microscopic sections.
- To identify the bryophytes based on the morphology, and microslides.
- To know the economic importance of the microbes studied.

EXPERIMENTS

1. Microscopic observation of vegetative and reproductive structures of types prescribed in the syllabus through temporary preparations and permanent slides.
2. Identifying the micro slides relevant to the syllabus.
3. Herbarium specimens of bacterial diseases/photograph.
3. Protocol for mushroom cultivation.
4. Inoculation techniques for fungal culture (Demonstration only).
5. Study of economically important products obtained from fungi: Fungal biofertilizers, biopesticides, biofungicide (*Trichoderma*),edible mushroom/Yeast,organic acids (citric acid) enzymes (protease), antibiotics and vitamins.
6. Mycorrhiza: ecto-mycorrhiza and endo-mycorrhiza (Photographs)
7. Visit to fungal biotechnology laboratories.
8. Ultrasturcture of bacteria.
9. Structure of bacteriophage.
10. Micro-preparation of *Usnea* to study vegetative and reproductive structures.
11. Identifying the micro slides relevant to the syllabus.
12. Study of thallus and reproductive structures (apothecium) through permanent slides.
13. Economic importance of Lichens - Dye and perfume.

LEARNING OUTCOMES:

1. Identify microbes, fungi and lichens using key identifying characters
2. Develop practical skills for culturing and cultivation of fungi.
3. Identify and select suitable control measures for the common plant diseases.
4. Analyze the characteristics of microbes, fungi and plant pathogens
5. Access the useful role of fungi in agriculture and pharmaceutical industry.

Basu Mishra

REFERENCE BOOKS

1. Alexopoulos, J and Mims, W. 1985 . Introductory Mycology, Wiley Eastern Limited New Delhi.
2. Bendre, M. Ashok and Ashok Kumar, A. 2020. Text Book of Practical Botany (10th ed). Rastogi Publications, Meerut.
3. Singh, R and U.C. Singh 2020. Modern mushroom cultivation, 3d Edition Agrobios(India), Jodhpur.
4. Poonam Singh and Ashok Pandey. 2009. Biotechnology for agro-Industrial residues utilization. Springer.
5. Satyanarayana T and Johri B.N. 2005. Microbial diversity, Current Perspectives and Potential Applications, IK International.

MAPPING WITH PROGRAMME OUTCOMES:

COs	COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4
CO1	3	3	1	* 3	2	1	2	2	2	1
CO2	2	3	2	2	3	3	2	3	3	3
CO3	2	2	3	3	1	2	1	3	1	2
CO4	3	3	3	3	3	2	3	3	3	2
CO5	3	3	2	3	2	3	3	3	2	3

S-Strong (3)

M-Medium (2)

L-Low(1)

Bhaskar Mishra

CRYPTOGAMOUS BOTANY-I

Theory Hours : 2

Course Code :U23BGE1

Practical Hours :

Credit:2

Exam Hours :3

Mark:100

OBJECTIVES

- To study morphological and anatomical adaptations of plants of various habitats.
- To demonstrate techniques of plant tissue culture.
- To familiarize with the structure of DNA, RNA.
- To carryout experiments related with plant physiology.
- To perform biochemistry experiments.

UNIT-I Algae

General characters of algae - Structure, reproduction and life cycle of the following genera - Anabaena and Sargassum and economic importance of algae.

UNIT-II Fungi, Bacteria and Virus

General characters of fungi, structure, reproduction and life cycle of the following genera - Penicillium and Agaricus and economic importance of fungi. Bacteria - general characters, structure and reproduction of Escherichia coli and economic importance of bacteria. Virus - general characters, structure of TMV, structure of bacteriophage.

UNIT-III Bryophytes, Pteridophytes and Gymnosperms

General characters of Bryophytes, Structure and life cycle of Funaria. General characters of Pteridophytes, Structure and life cycle of Lycopodium. General characters of Gymnosperms, Structure and life cycle of Cycas.

UNIT-IV Morphology of Flowering Plants:

Plant and its parts. Structure and function of root and stem. Leaf and its parts. Leaf types- simple and compound. Phyllotaxy and types. Inflorescence - Racemose, Cymose and Special types. Terminology with reference to flower description.

UNIT-V Taxonomy:

Study of the range of characters and plants of economic importance in the following families:
Rutaceae, Caesalpiniaceae, Asclepiadaceae, Euphorbiaceae and Cannaceae

Sachin Prakash

LEARNING OUTCOMES:

1. Increase the awareness and appreciation of human friendly algae and their economic importance.
2. Develop an understanding of microbes and fungi and appreciate their adaptive strategies
3. Develop critical understanding on morphology, anatomy and reproduction of Bryophytes, Pteridophytes and Gymnosperms.
4. Compare the structure and function of cells and explain the development of cells.
5. Understand the core concepts and fundamentals of plant biotechnology and genetic engineering.

REFERENCE

1. Parihar, N.S. 2012. An introduction to Embryophyta –Pteridophytes - Surjeet Publications, Delhi.
2. Alexopoulos, C.J. 2013. Introduction to Mycology. Willey Eastern Pvt. Ltd.
3. Vashishta, P.C. 2014. Botany for Degree Students Gymnosperms. Chand & Company Ltd, Delhi.
4. Coulter, M. Jhon, 2014. Morphology of Gymnosperms. Surjeet Publications, Delhi.
5. Vashishta, P.C. 2014. Botany for Degree Students Algae. 2014. Chand & Company Ltd, Delhi.
6. Parihar, N.S. 2013. An introduction to Embryophyta –Bryophytes -, Surjeet Publications, Delhi.
7. Pandey B.P. 1986, Text Book of Botany (College Botany) Vol I &II, S.Chand and Co. New Delhi.

MAPPING WITH PROGRAMME OUTCOMES:

COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3
CO3	2	3	3	3	3	1	3	3	3	3
CO4	3	3	2	3	3	3	2	3	2	3
CO5	3	2	2	2	2	2	2	1	2	1

S-Strong (3)

M-Medium (2)

L-Low(1)

By Ashwini

LAB COURSE PRINCIPALES OF BOTANY PRACTICALS

Theory Hours :

Course Code :U23BGE2P

Practical Hours: 2

Credit:2

Exam Hours:3

Mark :100

OBJECTIVES

- To enhance information on the identification of each taxonomical group by developing the skill-based detection of the morphology and microstructure of microorganisms, algae, and fungi.
- To comprehend the fundamental concepts and methods used to identify Bryophytes, Pteridophytes and Gymnosperms through morphological changes and evolution, anatomy and reproduction.
- To be familiar with the basic concepts and principles of plant systematics.
- Understanding of laws of inheritance, genetic basis of loci and alleles.
- To learn about the physiological processes that underlie plant metabolism.

EXPERIMENTS

1. Make suitable micro preparation of the types prescribed in Algae, Fungi, Bryophytes, Pteridophytes and Gymnosperms.
2. Micro photographs of the cell organelles ultra structure.
3. Simple genetic problems.
4. To describe in technical terms, plants belonging to any of the family prescribes and to identify the family.
5. To dissect a flower, construct floral diagram and write floral formula.
6. Demonstration experiments
 1. Ganong's Light screen
 2. Ganong's respiroscope
7. To make suitable micro preparations of anatomy materials prescribed in the syllabus.
8. Spotters - Algae, Fungi, Bryophytes, Pteridophytes, Gymnosperms and Angiosperm anatomy, Embryology, Cellbiology and Biotechnology.

LEARNING OUTCOMES

1. To study the internal organization of algae and fungi.
2. Develop critical understanding on morphology, anatomy and reproduction of Bryophytes, Pteridophytes and Gymnosperms.
3. To study the classical taxonomy with reference to different parameters.
4. Understand the fundamental concepts of plant anatomy and embryology
5. To study the effect of various physical factors on photosynthesis.

Dr. S. S. Mishra

REFERENCE

1. Strickberger, M.W. 2005. Genetics (III Ed). Prentice Hall, New Delhi, India.
2. Nancy Serediak and M. Huynh. 2011. Algae identification lab Guide. Accompanying manual to algae identification field guide, Ottawa Agriculture and Agri food Canada publisher.
3. Mohammed Gufran Khan, Shite Gatew and Bedilu Bekele. 2012. Practical manual for Bryophytes and Pteridophytes. Lambert Academic Publishing.
4. Aler Gingauz. 2001. Medicinal Chemistry. Oxford University Press & Wiley Publications.
5. Steward, F.C. 2012. Plant Physiology Academic Press, US

MAPPING WITH PROGRAMME OUTCOMES:

COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3
CO3	2	3	3	3	3	1	3	3	1	3
CO4	3	3	2	3	3	3	3	2	3	3
CO5	3	2	2	2	2	2	2	1	2	2

S-Strong (3)

M-Medium (2)

L-Low(1)

Baldev Singh

GENERAL PRINCIPLES OF BOTANY

Theory Hours : 4

Practical Hours:

Exam Hours :3

Course Code : U23BGE3

Credit:4

Mark:100

OBJECTIVES

- To be familiar with the basic concepts and principles of plant systematics.
- Learn the importance of plant anatomy in plant production systems.
- Understand the mechanism underlying the shift from vegetative to reproductive phase.
- To learn about the physiological processes that underlie plant metabolism.
- To know the energy production and its utilization in plants.

UNIT-I Cell Biology

Prokaryotic and Eukaryotic cell- structure /organization. Cell organelles - ultra structure and function of chloroplast, mitochondria and nucleus. Cell division - mitosis and meiosis.

UNIT-II Genetics and Plant Biotechnology

Mendelism - Law of dominance, Law of segregation, Incomplete dominance. Law of independent assortment. Monohybrid and dihybrid cross - Test cross - Back cross. Plant tissue culture - In vitro culture methods. Plant tissue culture and its application in biotechnology.

UNIT-III Anatomy

Tissue and tissue systems: Simple and complex tissues. Anatomy of monocot and dicot roots - anatomy of monocot and dicot stems - anatomy of dicot and monocot leaves.

UNIT-IV Embryology

Structure of mature anther and ovule - Types of ovules, structure of embryo sac, pollination - double fertilization, structure of dicotyledonous and monocotyledonous seeds.

UNIT-V Plant Physiology

Absorption of water, photosynthesis - light reaction - Calvin cycle; respiration - Glycolysis - Krebs cycle - electron transport system. Growth hormones - auxins and cytokinins and their applications.

UNIT-IV Cell Biology

Prokaryotic and Eukaryotic cell- structure /organization. Cell organelles - ultra structure and function of chloroplast, mitochondria and nucleus. Cell division - mitosis and meiosis.

By 22/11/2023

UNIT-V Genetics and Plant Biotechnology

Mendelism - Law of dominance, Law of segregation, Incomplete dominance. Law of independent assortment. Monohybrid and dihybrid cross - Test cross - Back cross. Plant tissue culture - In vitro culture methods. Plant tissue culture and its application in biotechnology.

LEARNING OUTCOMES

1. Understand the fundamental concepts of plant anatomy and embryology.
2. Analyze and recognize the different organs of plants and secondary growth.
3. Understand water relation of plants with respect to various physiological processes
4. Classify aerobic and anaerobic respiration.
5. Classify plant systematics and recognize the importance of herbarium and virtual herbarium.

REFERENCE

1. Lawrence.G.H.M. 1985. An Introduction to Plant Taxonomy, Central Book Depot, Allahabad.
2. Bhojwani, S.S and Bhatnagar, S.P. 2000. The Embryology of Angiosperms (4th revised and enlarged edition). Vikas Publishing House, New Delhi.
3. Pandey, B.P. 2012. Plant Anatomy. S Chand Publishing.
4. Jain, VK. 2006. Fundamentals of Plant Physiology, S. Chand and Company Ltd.
5. Rajni Gupta. 2012. Plant Taxonomy: Past, Present and Future. Vedams (P) Ltd. New Delhi.
6. Jain, V.K. 2006. Fundamentals of Plant Physiology, S.Chand and Company Ltd., New Delhi.
7. Verma, S.K. 2006. A Textbook of Plant Physiology, S.K.Chand & Co., New Delhi.

MAPPING WITH PROGRAMME OUTCOMES:

COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3
CO3	2	3	3	3	3	1	3	3	3	3
CO4	3	3	2	3	3	3	3	2	3	2
CO5	3	2	2	2	2	2	2	1	2	2

S-Strong (3)

M-Medium (2)

L-Low(1)

By the student

LAB COURSE PRINCIPALES OF BOTANY PRACTICALS

Theory Hours :	Course Code :U23PGE4P
Practical Hours :2	Credit 2
Exam Hours :3	Mark 100

OBJECTIVES

- To enhance information on the identification of each taxonomical group by developing the skill-based detection of the morphology and microstructure of microorganisms, algae, and fungi.
- To comprehend the fundamental concepts and methods used to identify Bryophytes, Pteridophytes and Gymnosperms through morphological changes and evolution, anatomy and reproduction.
- To be familiar with the basic concepts and principles of plant systematics.
- Understanding of laws of inheritance, genetic basis of loci and alleles.
- To learn about the physiological processes that underlie plant metabolism.

EXPERIMENTS

7. Make suitable micro preparation of the types prescribed in Algae, Fungi, Bryophytes, Pteridophytes and Gymnosperms.
8. Micro photographs of the cell organelles ultra structure.
9. Simple genetic problems.
10. To describe in technical terms, plants belonging to any of the family prescribes and to identify the family.
11. To dissect a flower, construct floral diagram and write floral formula.
12. Demonstration experiments
 1. Ganong's Light screen
 2. Ganong's respiroscope
7. To make suitable micro preparations of anatomy materials prescribed in the syllabus.
8. Spotters - Algae, Fungi, Bryophytes, Pteridophytes, Gymnosperms and Angiosperm anatomy, Embryology, Cellbiology and Biotechnology.

B. Srinivasan

LEARNING OUTCOMES

6. To study the internal organization of algae and fungi.
7. Develop critical understanding on morphology, anatomy and reproduction of Bryophytes, Pteridophytes and Gymnosperms.
8. To study the classical taxonomy with reference to different parameters.
9. Understand the fundamental concepts of plant anatomy and embryology
10. To study the effect of various physical factors on photosynthesis.

REFERENCE

6. Strickberger, M.W. 2005. Genetics (III Ed). Prentice Hall, New Delhi, India.
7. Nancy Sereidiak and M. Huynh. 2011. Algae identification lab Guide. Accompanying manual to algae identification field guide, Ottawa Agriculture and Agri food Canada publisher.
8. Mohammed Gufran Khan, Shite Gatew and Bedilu Bekele. 2012. Practical manual for Bryophytes and Pteridophytes. Lambert Academic Publishing.
9. Aler Gingauz. 2001. Medicinal Chemistry. Oxford University Press & Wiley Publications.
10. Steward, F.C. 2012. Plant Physiology Academic Press, US

MAPPING WITH PROGRAMME OUTCOMES:

COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3
CO3	2	3	3	3	3	1	3	3	1	3
CO4	3	3	2	3	3	3	3	2	3	3
CO5	3	2	2	2	2	2	2	1	2	2

S-Strong (3)

M-Medium (2)

L-Low(1)

Dr. S. S. Krishna

HERBAL MEDICINE

Theory Hours : 2	Course Code :U23B2SE1
Practical Hours :	Credit 2
Exam Hours :3	Mark 100

OBJECTIVES

- To understand the nuances of medicinal plants and their phytoconstituents of commercial value
- To design and develop medicinal garden.
- To apply the knowledge to cultivate medical plants.
- To know the pharmacological importance of medicinal plants.
- To enlist phytochemicals and secondary metabolites of market and commercial value.

UNIT-I

Importance and Relevance of Herbal drugs in Indian System of Medicine, Pharmacognosy – Aim and scope.

UNIT-II

Medicinal gardening – Gardens in the Hills and plains; House gardens; plants for gardening – Poisonous plants – Types of plant poison; action of poisons; treatment for poisons, some poisonous plants; their toxicity and action.

UNIT-III

Adulteration of crude drugs and its detection – methods of adulteration; types of adulteration. Medicinal plants of export values; rejuvenating herbs; Medicinal uses of Non-flowering plants.

UNIT-IV

Botanical description and active principles of Root drugs; Rhizomes woods and bark drugs (Two examples for each plant organs).

UNIT-V

Botanical description and active principles of leaves; Flowers; Fruits seed and entire plants as drugs. Taxonomic study of some selected herbals (Two examples for each plant organs)

Ganesh Mishra

LEARNING OUTCOMES:

1. Define and describe the principle of cultivation of herbal products.
2. Explain about the photochemistry of economically important medicinal herbs
3. Apply techniques for evaluation of drug adulteration through biological testing.
4. Formulate the value added processing / storage / quality control for the better use of herbal medicine.
5. Develop the skills for cultivation of plants and their value added processing/storage/quality control.

REFERENCE

1. Nair, N.C and Henry, A.N. 1983, Flora of Tamil Nadu, India, Botanical Survey of India.
2. Chopra, R.N., Nagar S.L., and Chopra, I.C. 1956, Glossary of Indian Medicinal Plants.
3. Chopra, R.N., Chopra, I.C., Handa, K.L., and Kapur L.D., 1994, Indigenous drugs of India.
4. Chopra, R.N., Badhuvar R.L and Gosh, G. 1965. Poisonous plants in India.
5. Miller, L and Miller, B. 2017. Ayurveda & Aromatherapy: The Earth Essential Guide to Ancient Wisdom and Modern Healing. *Motilal Banarsidass, Fourth edition.*
6. Patri, F and Silano, V. 2002. Plants in cosmetics: Plants and plant preparations used as ingredients for cosmetic products - Volume 1. ISBN 978-92-871-8474-0, pp 218.

MAPPING WITH PROGRAMME OUTCOMES:

COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	1	2	1	2	1	3	2	1
CO2	3	3	2	1	1	2	2	2	2	2
CO3	2	2	1	3	1	2	1	3	2	1
CO4	3	2	1	2	1	2	3	3	2	3
CO5	3	3	2	2	1	1	3	3	1	3

S-Strong (3)

M-Medium (2)

L-Low(1)

Bachchan

BIO-ANALYTICAL TECHNIQUES

Theory Hours

Course Code :

Practical Hours: 3

Credit:2

Exam Hours:3

Mark :100

OBJECTIVE

- To understand the principle, operation and maintenance of various tools/equipment in the laboratory.
- Perform experiments using the laboratory instruments, formulate experiments for project work and evaluate critically the acquisition of data.
- To equip students to collect, analyze and evaluate data generated by their own inquiries in a scientific manner.
- To give an exposure to various forms of field research and data analysis techniques.
- To provide an overview on modern equipments that they would help students gain confidences to instantly commence research careers and/or start entrepreneurial ventures.

Unit I MICROSCOPY

Principles of microscopy: Light microscopy; compound microscopy, bright field microscope, dark field microscope, phase-contrast microscope, Fluorescence microscopy; Transmission and Scanning electron microscopy. Microscopic measurements-micrometry, Microscopy drawing: Camera Lucida.

Unit II CHROMATOGRAPHIC PRINCIPLES AND APPLICATIONS

Principle; Paper chromatography, Thin Layer Chromatography (TLC), Column chromatography, Gas chromatography – Mass spectrometry (GCMS), High Performance Liquid Chromatography (HPLC).

Unit III ELECTROPHORESIS AND PH METER

Basic principle, construction and operation of pH meter. Polyacrylamide gel electrophoresis (PAGE), Agarose Gel Electrophoresis.

Unit IV SPECTROPHOTOMETRY AND CENTRIFUGATION TECHNIQUE

Principle and law of absorption, construction, operation and uses of colorimeter and UV-Visible spectrophotometer, Principles, methods of centrifugation, types of centrifuge and applications.

By sasmita

Unit V BIOSTATISTICS

Data collection methods, population, samples, parameters; Representation of Data: Tabular, Graphical– Histogram – frequency curve – Bar diagram–measures of central tendency – Mean, Median and Mode; Standard deviation, Standard error, Chi-square test and goodness of fit –t–test.

Reference Books

1. Matthew. R.A. 2009. Jon Barnett, Bryan McDonald. Global Environmental Change and Human Security. MIT Press., USA.
2. Hester, R.E and Harrison, R.M. 2002. Global Environmental Change. Royal Society of Chemistry.
3. Keddy, P.A. 2017. Plant Ecology: Origins, processes, consequences. 2nd ed. Cambridge University Press. ISBN. 978-1107114234.
4. Krishnamurthy, K.V. 2004. An Advanced Text Book of Biodiversity- Principles and Practices. Oxford and IBH Publications Co. Pvt. Ltd. New Delhi.
5. Kormondy, E.J. 2017. Concepts of Ecology. Prentice Hall, U.S.A. 4th edition.

Dr. S. S. Sushma

HORTICULTURE

Theory Hours

Course Code :

Practical Hours: 3

Credit:2

Exam Hours:3

Mark :100

OBJECTIVE

1. To gain an understanding of the fundamentals of horticulture and techniques needed to grow and maintain plants.
2. To develop skills in students to work as gardeners, therapists, designers, growers and technical advisors in the food and non-food sectors of horticulture.
4. To know about hydroponic culture.
5. To develop the various horticultural crop protection.
6. To impart the knowledge on market preparation.

Unit I

Importance and scope of horticulture. Classification of horticultural crops –fruits and vegetables. Essentials of nursery Management - Soil management: Garden soil, Physical and chemical properties of soil, Organic matter, Compost, Cultural practices; Water management: Water quality, Irrigation, Mulching. Nursery structures: Protected cultivation (greenhouses), environment controls.

Unit II

Hydroponic culture-types of container. Use of manures and fertilizers in Horticultural crop production. Principles of organic farming. Environmental factors influencing vegetable and fruit production.

Unit III

Horticultural crop protection; physical control - pruning. Chemical control- pesticides, fungicides. Plant propagation - cutting, layering, budding, grafting. Types of gardens: formal, informal, kitchen and Terrace. Indoor gardening-bottle garden. Floriculture, ornamental gardening.

Unit IV

A brief account of annual, biennials and perennials with reference to ornamental gardens. Green house, terrarium, water garden, rockery plants, bonsai techniques. Landscaping, principles and basic components.

Unit V

Technology of horticultural crops - market preparation: harvesting and handling, packaging and transport, storage; chemical treatment. Economics of cultivation Crops:

Bassalichuan

Cardamom, pepper, clove. Food processing - freezing, bottling and canning, drying and chemical preservation.

Reference Books

1. Arditti, A. 1977. Orchid biology, Cornell Univ., Press. Ithaca.
2. Bailey, S. 1971. Perpetual flowering carnation, Fabner and Fabner, London.
3. Laurie, A., Kiplinger, D.D and Nelson, K.S. 1968. Commercial flower forcing. McGraw-Hill Book, London.
4. Cumming, R.W. 1964. The chrysanthemum Book. D. Van., Nostrand Inc.
5. Biswas, T.D. 1984. Rose growing – Principles and Practices – Assoc., Pub., Co., New Delhi.
6. Hartman, H.T and Kester, D.E. 1989. Plant propagation. Printice Hall Ltd., New Delhi.
7. Abraham, A and Vatsala, P. 1981. Introduction to Orchids. Trop. Bot. Garden, Trivandrum.
8. Bose, T.K and Yadav, L.P. 1989. Commercial flowers. Naya Prakash, Calcutta.
9. Mc Daniel, G.L. 1982. Ornamental horticulture. Reston Publ., London.
10. Helleyer, A. 1976. The Collingridge Encyclopedia of gardening Chartwell Book, Inc., New Jersey.

Prashant Kumar

FORESTRY

Theory Hours

Course Code :

Practical Hours: 3

Credit:2

Exam Hours:3

Mark :100

OBJECTIVE

1. To study the distribution pattern, composition and diversity of forest ecosystem
2. To understand the method of forest management principles and conservation.
3. To enable them to meaningfully contribute in the forest conservation.
4. To raise student awareness of the need to create a sustainable way of living and the current global issues with forestry caused by human interference.
5. To provide a platform to appreciate biodiversity and the importance.

Unit I SILVICULTURE:

Forests - definition. Extent of forests in India and other countries. Forest types of India and Tamil Nadu - revised classification - pure and mixed stands - even and uneven aged stands. Role of forests. Factors of locality - climatic - edaphic - topographic - biotic - interaction of forest with the environment. Silviculture - objectives - scope - general principles. Regeneration - natural and artificial. Nursery techniques - containerized seedling production - techniques and methods. Vegetative and clonal propagation techniques and methods - macro and micro propagation techniques.

Unit II FOREST MENSURATION AND MANAGEMENT:

Forest Mensuration - Definition and objectives. Measurement of diameter, girth, height, crown and volume of trees - methods and principles - tree stem form - form factor. Volume estimation of stand - age - basal area determinations Stem and Stump Analysis. Forest inventory – sampling techniques and methods - measurement of crops - sample plots. Yield calculation - CAI and MAI - volume, yield and stand tables preparation.

Unit III FOREST UTILIZATION AND WOOD TECHNOLOGY:

Logging - extraction of timber - felling rules and methods – conversion methods - conversion season. Implements used - cross cutting system – sawing - different types - extraction methods. Grading of timbers. Transportation of timbers - major and minor transportation methods Storage and sales of logs - sales depot - management of depots. Recent trends in logging – Ergonomics and RIL. Forest products - Timber - timber, fuel, pulp, paper, rayon and match. Wood Composites - plywood, particle board, fiber boards, MDF, hardboard, insulation boards - production technology. Non timber forest products (NTFP) - collection - processing and storage of NTFP - fibres and flosses - bamboos and

Бессаиришан

canes - katha and bidi leaves - essential oils and oil seeds - gums and resins - tans and dyes - drugs - insecticides - lac and shellac - tassar silk - role of tribal co-operative societies.

Unit IV FOREST BIOLOGY AND BOTANY:

Forest ecology - definition - biotic and abiotic components - forest ecosystem - forest community - concepts - succession - primary productivity – nutrient cycling. Composition of forest types in India - classification of India's forests - species composition - association and diversity. Restoration ecology – global warming - green house effects - ozone layer depletion - acid rain - role of trees in environmental conservation. Biodiversity - Definition, origin, types - factors endangering biodiversity - biodiversity hotspots - endemism – Red Data Book. Biodiversity assessments - principles and methods.

Unit V FOREST BOTANY:

Importance of botany - taxonomic classification of plant species - identification of species - composition and association. Dendrology - principles and establishment of herbaria and arboreta. Tree Improvement - Forest Genetics and Tree Breeding - Definition and concepts - Steps in tree improvement - Variation and selection - Progeny Evaluation Test (PET) - Candidate Tree, Plus Tree, Elite trees - use of provenances and seed sources - heritability and genetic gains - hybrids in tree improvement – heterosis exploitation. Seed production Area and seed orchards - types and establishment. In situ and ex situ gene conservation. Exotics - role of exotic forest trees in India - application of biotechnological methods in forestry.

Reference Books

1. Donald L. Grebner, Jacek P. Siry and Pete Bettinger. 2012. Introduction to forestry and Natural resources Academic press
2. West, P.W. 2015. Tree and forest measurement, Springer international publishing Switzerland.
3. Kollmann, F.F.P and Cote, W.A. 1988. Wood science and Technology. Vol. I & II Springer Verlag, New York.
4. Agarwala, V.P. 1990. Forests in India, Environmental and Protection Frontiers. Oxford IBH Publishing Co., New Delhi.
5. Belcher, B.M. 1998. A production-to-consumption systems approach: Lessons from the bamboo and rattan sectors in Asia. In: Wollenberg, E and A. Ingles (Eds.). Incomes from the forest: methods for the development and conservation of forest products for local communities. Center for International Forestry Research (CIFOR), Bogor, Indonesia.

Badrashwari

6. Chomitz, K.M., with P. Buys, G. De Luca, T.S. Thomas, and S. WertzKanounnikoff. 2007. Incentives and constraints shape forest outcomes. In: At loggerheads? Agricultural expansion, poverty reduction and environment in tropical forests. The World Bank, Washington, DC.
7. Rao, K.R. and Juneja, K.B.S. 1992. Field identification of 50 important timbers of India. ICFRE Publi. Dehradun 123 p.

Ra. Sa. Islam

BIONANOTECHNOLOGY

Theory Hours

Course Code :

Practical Hours: 3

Credit:2

Exam Hours:3

Mark :100

OBJECTIVE

1. To provide students with comprehensive knowledge of basics in nanotechnology.
2. To enable the students understand and appreciate the various applications of nanoparticles.
3. To give perspective to researchers and students who are interested in nanoscale physical and biological systems and their applications in medicine.
4. To introduce the concepts in nanomaterials and their use with biocomponents to synthesize and interact with larger systems.
5. To impart knowledge on the most recent molecular diagnostic and therapeutic tools used to treat various diseases.

Unit I INTRODUCTION TO NANOTECHNOLOGY:

History, Concepts, Prospects and Challenges. Scope of nanotechnology in Indian and global perspectives. Definition - Nanoscience, Nanotechnology. Classification based on the dimensionality- basic understanding of 1D, 2D and 3D nanostructures. Overview of nanoparticles, nanoclusters - nanotubes, nanowires and nanodots. Biotemplates – DNA to build nanocubes and hinges – smart glue, DNA as wire template.

Unit II SYNTHESIS OF NANOPARTICLES:

Synthesis of nanoparticles - Top down and bottom up approach. Methods of synthesis: Physical, Chemical reduction – reducing agents, capping agents, stabilizing of nanoparticles and Biological – Novel synthetic methods using plant extracts, bacteria and fungi.

Unit III FOREST UTILIZATION AND WOOD TECHNOLOGY:

PROPERTIES & CHARACTERIZATION OF NANOPARTICLES:

Nano size effects - optical, electrical, mechanical, magnetic and catalytic activity. Characterization of nanoparticles using UV-Visible spectroscopy, SEM, TEM, Atomic force microscopy, Scanning tunnel microscopy, NMR, X-ray Crystallography and Photoluminescence.

Dr. S. S. Mishra

Unit IV NANOCARRIERS:

Introduction. Nanocarriers for drug delivery (DDS) – Polymeric nanotubes and solid lipid nanoparticles (SLN) as carriers, controlled release, site specific targeting. Magnetic nanoparticles as drug carriers and its applications.

Unit V APPLICATIONS OF NANOPARTICLES:

Textiles, Food industry - nutraceutical, Medicine - antimicrobial activity, wound healing and dressing; Environment – green manufacturing. Agriculture - nanofertilizers and nanopesticides. Smart biosensors – Components and its application.

References

1. Claudio Nicolini. 2009. Nanotechnology Nanosciences, Pon Stanford Pub.Pvt.Ltd,
2. Robert, A and Ferias, Jr. 1999. Nanomedicine, Volume I: Basic capabilities, Landes Bioscience.
3. Barbara Panessa-Warren. 2006 Understanding cell-nanoparticle interactions making nanoparticles more biocompatible. Brookhaven National Laboratory.
4. European Commission, SCENIHR. 2006. Potential risks associated with engineered and adventitious products of nanotechnologies, European Union.
5. Gysell Mortimer, 2011. The interaction of synthetic nanoparticles with biological systems PhD Thesis, School of Biomedical Sciences, Univ.of Queensland.
6. Murty, B.S., Shankar, P., Raj, B., Rath, B.B., Murday, J. 2013. Textbook of Nanoscience and Nanotechnology. Springer Publication.
7. Prashant Kesharwani. 2019. Nanotechnology-Based Targeted Drug Delivery Systems for Lung Cancer. Academic Press. An imprint of Elsevier.

Prashant Kesharwani

FORENSIC BOTANY

Theory Hours

Course Code :

Practical Hours: 3

Credit:2

Exam Hours:3

Mark :100

OBJECTIVE

1. To provide basic knowledge about the application of Botany to Forensic investigations and legal disputes.
2. To provide students with knowledge of palynology, dendrology, plant anatomy, pharmacognosy, molecular biology and toxic compounds from plants that could serve as leads in crime spots.
3. To learn classification of plants from forensic point of view.
4. To understand forensic importance of different parts of plants.
5. To develop and identify main morphological and anatomical features of plants, which could be useful for forensic investigations.

Unit I

General plant classification schemes, Sub specialization of forensic botany plant morphology, plant anatomy, plant systematic, palynology, plant ecology, limnology, Plant architecture- roots, stems, flowers, leaves. Practical plant classification schemes: vegetables and herbs, fruits bearing trees and plants, landscaping plants: trees, shrubs and vines, grasses, plant cell structure and functions.

Unit II

Various types of woods, timbers, seeds and leaves and their forensic importance, Identification and matching of various types of wood, timber varieties, seeds and leaves. Types of fibers – forensic aspects of fiber examinations, Identification and comparison of man-made and natural fibres. Various types of planktons and diatoms and their forensic importance. Study and identification of pollen grains, Identification of starch grains, powder and stains of spices etc. Paper and Paper Pulp identification.

Unit III

Various types of poisonous plants: *Abrus precatorius*, *Aconitum napellus*, *Anacardium occidentale*, *Argemone mexicana*, *Cannabis sativa*, *Claviceps purpuria*, *Croton tiglium*, *Atropa belladonna*, *Gloriosa superba*, *Jatropha curcas*, *Lathyrus sativus*, *Nerium indicum*, *Nicotiana tabacum*, *Strychnos nux vomica*, *Thevetia nerifolia*. Types of plants yielding drugs of abuse – opium, cannabis, coca, tobacco, datura, Psilocybin mushrooms.

Dr. S. S. Srinivasan

Unit IV

Collection and preservation of botanical evidences: Botanical samples, outdoor crime scene consideration.

Unit V

Analysis of samples, DNA analysis, plant DNA typing, Classic forensic botany cases: Case histories by using Plant anatomy and systematic, Palynology, Plant ecology, Limnology, Plant Molecular Biology and DNA, Drug enforcement and DNA.

References

1. Hall, D.W and Byrd, J. 2012. Forensic Botany: a practical guide. Wiley- Blackwell, 1 edition.
2. Bock, J.H and Norris, D.O. 2016. Forensic Plant Science, Academic Press.
3. Nicholas Marquez Grant, John Wiley. 2012. Forensic Ecology Handbook. Wiley Backwell.
4. David W. Hall, Jason Byrd. 2012. Forensic Botany: A Practical Guide. Wiley-Blackwell.
5. Heather Miller Coyle. 2007. Forensic Botany: Principles and Applications to Criminal Casework is packed with details — David M. Jarzen, Florida Museum of Natural History, University of Florida, in AASP Newsletter, Vol. 40, No. 2.

Basalambina

UBC 305

**SEMESTER – III CORE COURSE- V
BRYOPHYTES, PTERIDOPHYTES, GYMNASPERMS AND PALEOBOTANY**

Category	Hours			Credits	Marks		
	Lecture	Tutorial	Practical		CIA	External	Total
Theory	6	-	-	5	25	75	100

Objectives:

1. To understand the salient features of Bryophytes, Pteridophytes and Gymnosperms.
2. To study the structure and reproduction of various genera mentioned in the syllabus.
3. To understand the salient features and importance of fossils and fossilization process in tracing evolution.

Unit IBryophytes-General Characteristics, Classification – Liverworts (Stotler *et al.*, 2009), hornworts (Renzaglia *et al.*, 2009) and Mosses (Goffinet *et al.*, 2009); Morphology, Structure, Reproduction and life history of the following genera: *Riccia*, *Marchantia*, *Anthoceros*, *Polytrichum* and *Funaria*.

Unit II Pteridophytes– General characteristics and classification by Smith; Morphology, Structure, Reproduction and life-history of the following genera: *Psilotum*, *Lycopodium*, *Selaginella* and *Equisetum*.

Unit III

Morphology, structure, Reproduction and life-history of *Adiantum*, *Marsilea*; Stellar evolution in Pteridophytes; Heterospory and origin of seed habit.

Unit IV

Gymnosperms– General characteristics and classification of Gymnosperms by Sporne; Morphology, structure, mode of reproduction and life-history of the following genera: *Cycas*, *Pinus* and *Gnetum*.

Unit V

Paleobotany– fossils and methods of fossilization – Geological time-scale – an elementary knowledge of the computation of the age of fossils – Radio-Carbon dating technique. Contributions of Birbal Sahni. A brief study of the following fossil plants:

a) *Rhynia*, b) *Lepidodendron*, c) *Pentoxylon* and d) *Williamsonia*.

Unit VI (Not for Semester Examination)

Current trends in plant diversity, evolution of wood in gymnosperm, fossil evidences in Tamilnadu and India and keeladi palaeontological study, Autoradiography, carbon dating, geological studies related to botany

Books:

BRYOPHYTES

1. Chopra, R.N. and Kumara, P.K.
2. Jeyaraman, (1978). *Indiyavinlive*
3. Palaniyappan, S. (1988). *Bryoph*
4. Prem, P. (1981). *Bryophytes: A* New Delhi.
5. Rashid, A. (1998). *An Introducti*
6. Smith, G.M. (1955). *Cryptogam* McGraw Hill Publishing Co., Ne
7. Srivastava, N.N., (1996). *Bryoph*
8. Vashista, B.R. (1983). *Botany fo* New Delhi.

PTERIDOPHYTES

1. Rashhed, A. (1999). *An Introdu* Delhi.
2. Sharma, O.P. (1990). *Textbook o*
3. Smith, G.M. (1955). *Cryptogam* McGraw-Hill Publishing Co., Ne
4. Sporne, K.R. (1970). *The Morp* (Plants). Hutchinson University L
5. SundaraRajan, S. (1994). *Introdu* Wiley Eastern Ltd., New Delhi.
6. Vashista, P.C. (1997). *Botany fo* New Delhi.

GYMNASPERMS

1. Bhatnagar, S.P. and Alok M. (19) New Delhi.
2. Coulter, J.M. and Chamberlain, C. Allahabad.
3. Sharma, O.P. (1997). *Gymnosper*
4. Sporne, K.R. (1971). *The Morp* (Primitive seed Plants). Hutchinso
5. Srivastava, H.N. (1998). *Gymnos*
6. Vashishta, P.C. (1996). *Botany* Company Ltd., New Delhi.

PALEOBOTANY

1. Delavoryas, T. (1962). *Morphology* New York. 26
2. Scott, D.H. (1962). *Studies in F* York.
3. Seward, A.C. (1959). *Plant Life T*
4. Shukla, A.C. and Misra, S.P. (19) Ltd., New Delhi.
5. Stewart, W.N. (1983). *Paleobota* Cambridge, London.
6. Venkatachala, B.S., Shukla, M. a *BirbalSahni Birth Centenary Trib*

Course Outcomes: On completion of the course, students will be able to		Level
CO 1	Describe the general characteristics and classification of liver worts and mosses	K1
CO 2	Acquire knowledge about stelar evolution in pteridophytes, Heterospory and origin of seed habit.	K2
CO 3	Learn more about the structure, reproduction and life history of the following genera:-1. <i>Psilotum</i> 2. <i>Lycopodium</i> 3. <i>Selaginella</i> 4. <i>Equisetum</i> 5. <i>Adiantum</i> and 6. <i>Marsilea</i>	K3
CO 4	Realize morphology, mode of reproduction and life history of the following genera :- 1. <i>Cycas</i> 2. <i>Pinus</i> 3. <i>Gnetum</i> .	K4
CO 5	Analyse the types of fossils and methods of fossilization.	K5

MAPPING WITH PROGRAMME OUTCOMES:

COs	PO1	PO2	PO3	PO4	PO 5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	1	3	2	1	2	3	2	1
CO2	3	3	2	2	3	3	2	3	3	3
CO3	2	2	3	3	1	2	1	3	1	2
CO4	3	3	3	3	3	2	3	3	3	2
CO5	3	3	2	2	2	3	3	3	2	3

S-Strong(3) M-Medium(2) L-Low(1)

U.G Question pattern (SEM: 75 mark +CIA: 25 mark =Total:100 marks)

Section-A	Twenty multiple choice question (Four Question from each unit)	20×1=20marks
Section-B	Five Question (Two Question from each unit –Either or type)	5×5=25 marks
Section-C	Three Question (Out of five one question from each unit)	3×10=30marks

Question pattern:

Section A	Section B	Section C
2 Multiple choice question from each unit (10×1=10)	1 question from each unit (5×2=10)	5 × 5 = 25 (Each Unit Carries Two Questions (Either or Type)
		3 × 10 = 30 (Each Unit Carries One Questions)

UBC306P

CORE BOTANY PRACTICAL – III

Category	Hours			Credits	Marks		
	Lecture	Tutorial	Practical		CIA	External	Total
Theory	6	-	-	5	25	75	100

Objectives:

1. To learn about bryophytes, its classification, morphology and reproduction.
2. To study the pteridophytic plants classification, morphology and reproduction.
3. To learn about to demonstrate the plant section Eg- sorus, stem, cone, rachis.

BRYOPHYTES

- Riccia* - Thallus –T.S, antheridium, archegonium and capsule- L.S
- Marchantia* -Thallus –T.S, antheridium, archegonium and capsule- L.S
- Anthoceros* - Antheridium, archegonium and sporophyte
- Polytrichum* - Rhizome, stem and leaf -T.S, antheridium, archegonium and capsule- L.S

FERIDOPHYTES

- Ptilotum* - Demonstration only
- Lycopodium* - Stem and Cone only
- Selaginella* - Stem and Cone only
- Equisetum* - Stem, cone slide Demonstration only
- Adiantum* - Rachis, Sorus
- Marsilea* - Stem.Sporocarp slides

Gymnosperms

- Cycas* - Rachis, Leaflet – T.S.; Coralloid root, male cone microsporophyll, Megasporephyll – Demonstration only
- Pinus* - Needle –T.S., Young stem – T.S.; Male & Female cone – Demonstration only
- Gnetum* - Stem – T.S.; Male & Female Strobilus – Demonstration only

PALEOBOTANY

Ryinea, Lepidodendron, Lepidocarpon, Calamites (slides), *Williamsonia*

Course Outcomes: On completion of the course, students will be able to		Level
CO 1	Observe the following Bryophytes - <i>Riccia</i> , <i>Marchantia</i> , <i>Anthoceros</i> and <i>Polytrichum</i> through specimens and slides	K1
CO 2	Identify the stems and cones of pteridophytes – 1. <i>Psilotum</i> 2. <i>Lycopodium</i> 3. <i>Selaginella</i> 4. <i>Equisetum</i> 5. <i>Marsilea</i> and 6. <i>Adiantum</i> . Sorus of <i>Adiantum</i> through slides and specimens.	K2
CO 3	Identify the Rachis, Coralloid root, Leaf let, Needle, Young stem, T.S of <i>Cycas</i> , <i>Pinus</i> and <i>Gnetum</i> through slides.	K3
CO 4	Analyse the male and female cones, of <i>Cycas</i> , <i>Pinus</i> and <i>Gnetum</i> .	K4
CO 5	Identify the following genera come under paleobotany - <i>Ryinea</i> , <i>Lepidodendron</i> , <i>Lepidocarpon</i> , <i>Calamites</i> and <i>William Sonia</i> through slides and models.	K5

MAPPING WITH PROGRAMME OUTCOMES

COs	PO1	PO2	PO3	PO4
CO1	3	3	1	
CO2	3	3	2	
CO3	2	2	3	
CO4	3	3	3	
CO5	3	3	2	

S-Strong(3)

M-Medium(3)

U.G Question Paper Pattern (S)

B. S. Krishnan

UB 3MT

SKILL ENHANCEMENT COURSE - II (SEC II)

I. MUSHROOM TECHNOLOGY

Category	Hours			Credits	Marks		
	Lecture	Tutorial	Practical		CIA	External	Total
U234BOSE	6	-	-	5	25	75	100

Objectives:

1. To acquire knowledge on various types of mushrooms.
2. To understand cultivable species of mushrooms.
3. To learn the culture techniques of edible mushrooms.
4. To study the economic of mushroom.

Unit I

History of Mushroom cultivation – economic importance of Mushroom as food – selection 'starter' – preparation of spawn – preparation of Compost (outdoor and indoor beds – incubation – Harvesting and marketing.

Unit II

Life cycle of Mushrooms – identification – edible and poisonous Mushrooms – external factors for growth.

Unit III

Spawn production – grain, powder and granular spawn – mother spawn – planting spawn – preparation of cultures and spore culture), preservation and storage of culture – various media (PDA, malt extract, Wheat extract, Compost extract)

Unit IV

Cultivation of White Button Mushrooms (*Agaricus bisporus*) and Oyster Mushrooms (*Pleurotus* spp) – materials – sterilization – spawning and fruiting – house design for *Pleurotus* preservation, canning drying.

Unit V

Control of major diseases of microbes (green moulds, dry bubble, wet bubble, bacterial spot, viral brown disease) – pests (Sciarid flies, phorid flies, beetles) – nematodes (Mycophages)

References:

1. Kanaiyan. S and Ramasamy.K, 1980.A Handbook of Edible Mushroom.Today and Tomorrows.Printers and Publishers, New Delhi, 104 p.
2. Pathak V.N, NagendraYadav and Maneesha Gaur, 1998.Mushroom Production and Processing Technology, Agrobios (India) Jodhpur, 179 p.

Course Outcomes: On completion

CO 1	Describe the history of mushroom.
CO 2	Identify the edible mushrooms.
CO 3	Explain the life cycle and growth of mushrooms.
CO 4	Understand the different spawn production methods.
CO 5	Learn the various substrates and oyster mushroom cultivation.

MAPPING WITH PROGRAMME OBJECTIVES

COs	PO1	PO2	PO3
CO1	3	3	1
CO2	3	3	2
CO3	2	2	3
CO4	3	3	3
CO5	3	3	2

S-Strong(3)

M-Medium

U.G Question pattern (SE)

Five Question (Two Question from each)

**SKILL ENHANCEMENT COURSE - IV (SEC IV)
FERMENTATION TECHNOLOGYS**

Category	Hours			Credits	Marks		
	Lecture	Tutorial	Practical		CIA	External	Total
U23BOTS46	6	-	-	5	25	75	100

Course outcomes:On completion of

CO 1	Enumerate the significance
CO2	Explain the design and production of fermented products.
CO3	Explain the process of main
CO4	Analyze the various aspects of fermentative production.
CO5	Validate the experimental enzymes: amylase and protease, bio products.

References

1. Waites M.J. 2008. Industrial Microbiology, 2nd Edition, Science, London, UK.
2. Prescott S.C., Dunn C.G., 1994. 3rd Edition, AVI Pub. Co., USA.
3. Reed G. 2004. Prescott & Dunn's Microbiology, 4th Edition, USA.
4. JR Casida L.E. 2015. Industrial Microbiology, 2nd Edition, Limited Publishers, New Delhi.
5. Waites M.J., Morgan N.L., 1990. Introduction. 1st Edition, Blackwell Publishing Company Limited, New York.

Pelczar M.J., Chan E.C.S. and Kriegelberg A.M. 1989. Microbiology, 2nd Edition, Publishing Company Limited, New York.

Mapping with Programme Outcomes

COs	PO1	PO2	PO3
CO1	3	2	1
CO2	3	3	2
CO3	2	2	3
CO4	3	3	2
CO5	3	3	2

S-Strongly

UNIT	CONTENTS
I	Preparation of microbial culture, Preparation and sterilization of fermentation media. Isolation and improvement of industrially important microorganisms.
II	Maintenance and preservation of microorganisms, Metabolic regulations and overproduction of metabolites. Kinetics of microbial growth and product formation.
III	Scope and opportunities of fermentation technology. Principles of fermentation: Submerged, solid state, batch, fed-batch and continuous culture.
IV	Fermentative production of vinegar, alcohol (ethanol, wine, beer), acids (citric acid and gluconic acid), amino acids (lysine and glutamic acid) and antibiotics (penicillin and streptomycin).
V	Microbial production of enzymes: Amylase and Protease. Bioproduct recovery.
Pre-requisite	To students to know about the various fermentation technology.
Learning Objectives	
C1	To appreciate the significance of microbes synthesizing fermented products.
C2	To gain insights on safety and quality control in large scale production of fermentative products.
C3	To design and operation of industrial practices in mass production of fermented products.
C4	To know about the various fermentation technology.
C5	To learn about the bioproduct recovery.

SKILL ENHANCEMENT COURSE - II (SEC II)

UB3GC

GLOBAL CLIMATE CHANGE

Course Code	Hours			Credits	Marks		
	Lecture	Tutorial	Practical		CIA	External	Total
U234BOSE2	6	-	-	5	25	75	100

Objectives

1. To gain insights on the impact of greenhouse effect on global climate change and mitigation measures.
2. To understand the implications of carbon and ecological footprint.
3. To apply the knowledge to green house effects.
4. To know the rain and its effects on plants.
5. To know about Global Environmental change issues.

COURSE UNITS

Unit I	Global Environmental change issues. UNFCC. IPCC, Koyoto protocol, CDM, Carbon footprint and ecological footprint.
Unit II	Stratospheric ozone layer: Evolution of ozone layer, Causes of depletion and consequences; Effects of enhanced UV-B on plants, microbes, animals, human health and materials; Global efforts for mitigation ozone layer depletion.
Unit III	Climate change: Green house effects; causes; Green house gases and their sources; Consequences of climate, oceans, agriculture, natural vegetation and humans; International efforts on climate change issues.
Unit IV	Atmospheric deposition: Past and present scenario; Causes and consequences of excessive atmospheric deposition of nutrients and trace elements; Eutrophication.
Unit V	Acid rain and its effects on plants, animals, microbes and ecosystems.

Reference Books

1. Matthew R.A. 2009. Jon Barnett, Bryan McDonald. Global Environmental Change and Human Security. MIT Press., USA.
2. Hester, R.E and Harrison, R.M. 2002. Global Environmental Change. Royal Society of Chemistry.
3. Keddy, P.A. 2017. Plant Ecology: Origins, processes, consequences. 2nd ed. Cambridge University Press. ISBN. 978-1107114234.
1. Krishnamurthy, K.V. 2004. An Advanced Text Book of Biodiversity- Principles and Practices. Oxford and IBH Publications Co. Pvt. Ltd. New Delhi.
- Kormondy, E.J. 2017. Concepts of Ecology. Prentice Hall, U.S.A. 4th edition.

Course Outcomes: On completion	
CO 1	Global environmental cl
CO 2	Detected the depletion o living organism to preve
CO 3	To avoid hydrochloro co
CO 4	To prevent excessive atr
CO 5	To reduce carbon level i acid rain in future.

Mapping with Programme Outcomes

COs	PO1	PO2	PO3
CO1	2	3	1
CO2	2	3	1
CO3	1	2	3
CO4	3	2	3
CO5	2	3	2

S-Strong (3) M-Medium (2)

U.G Question Paper Pattern (SEM:)

U23BGE4P

SEMESTER-III

GENERAL

CORE COURSE

LAB COURSE PRINCIPLES OF BOTANY PRACTICALS

Course Code	Hours			Credits	Marks		
	Lecture	Tutorial	Practical		CIA	External	Total
U23BGE3	6	-	-	5	25	75	100

OBJECTIVES

- To enhance information on the identification of each taxonomical group by developing the skill-based detection of the morphology and microstructure of microorganisms, algae, and fungi.
- To comprehend the fundamental concepts and methods used to identify Bryophytes, Pteridophytes and Gymnosperms through morphological changes and evolution, anatomy and reproduction.
- To be familiar with the basic concepts and principles of plant systematics.
- Understanding of laws of inheritance, genetic basis of loci and alleles.
- To learn about the physiological processes that underlie plant metabolism.

EXPERIMENTS

7. Make suitable micro preparation of the types prescribed in Algae, Fungi, Bryophytes, Pteridophytes and Gymnosperms.
8. Microphotographs of the cell organelles ultrastructure.
9. Simple genetic problems.
10. To describe in technical terms, plants belonging to any of the family prescribes and to identify the family.
11. To dissect a flower, construct floral diagram and write floral formula.
12. Demonstration experiments
 1. Ganong's Light screen
 2. Ganong's respiroscope
7. To make suitable micro preparation of anatomy materials prescribed in the syllabus.
8. Spotters-Algae, Fungi, Bryophytes, Pteridophytes, Gymnosperms and Angiosperm anatomy, Embryology, Cellbiology and Biotechnology.

REFERENCE

6. Strickberger, M.W. 2005. General Microbiology.
7. Nancy Sereidiak and M. Huynh. 2005. Field guide to algae identification field guide.
8. Mohammed Gufran Khan, Shit. 2005. Bryophytes and Pteridophytes.
9. AlerGingauz. 2001. Medicinal Botany.
10. Steward, F.C. 2012. Plant Physiology.

Course Outcomes: On completion of the course	
CO 1	To study the internal structure of the cell.
CO 2	Develop critical thinking skills for reproduction of the cell.
CO 3	To study the cell cycle.
CO 4	Understand the cell cycle.
CO 5	To study the cell cycle.

MAPPING WITH PROGRAM

COs	PO1	PO2	PO3
CO1	3	3	3
CO2	3	3	3
CO3	2	3	3
CO4	3	3	2
CO5	3	2	2

S-Strong(3)

M-Medium

Question pattern:

Section A	
2 Multiple choice question from each unit (10X1=10)	1 question (5X2=10)

U23BC407/UBC407

SEMESTER – IV

CORE COURSE -VII ANATOMY, EMBRYOLOGY AND MICROTECHNIQUE

Category	Hours			Credits	Marks		
	Lecture	Tutorial	Practical		CIA	External	Total
U23BC407	6	-	-	5	25	75	100

Objectives:

1. To inculcate the basics of tissues and anatomical features of plants.
2. To impart the knowledge about the various aspects of morphogenesis.
3. To understand the key aspects of embryology of Angiosperms.

Unit I

Anatomy: Plant tissue- classification, Meristems, definition, differentiation, redifferentiation and dedifferentiation. Classification of meristems- apical meristems and lateral meristems intercalary meristem, various Concepts of apical meristem theories, apical cell theory, Tunica – Corpus and Histogen theory.

Unit II

Epidermal tissue system, stomatal types. Permanent tissue – simple – Parenchyma, collenchyma and sclerenchyma. Complex Permanent Tissues: Xylem – Components, Ontogeny and Phylogeny; Phloem – Components, Ontogeny and Phylogeny. Laticifer types.

Unit III

Primary structure of root, stem and leaf in dicots and monocots. Normal Secondary growth in stem and root-annual rings – heart Wood, sapwood. Periderm formation. Anomalous secondary growth in dicot stems: *Nyctanthes* and *Boerhaavia* and monocot stem-*Dracaena*. Nodal anatomy – uni and trilacunar types.

Unit IV

Embryology – Structure and development of anther. Microsporogenesis; Microgametogenesis; Ultrastructure of pollen wall – structure, development and types of ovules, megasporogenesis, Megagametogenesis (*Polygonum* type of embryo sac development), Fertilization. Endosperm types. Development of embryo – dicot and Monocot. Basic concepts of apomixis, apospory, Polyembryony and Parthenogenesis

Unit V Microtechniques

Micrometry, Fixation, dehydration, embedding, hand sectioning, microtome sectioning, stain types, staining and mounting. Preparation of double staining using saffranin and fast green. whole mounts, temporary mounts, maceration and epidermal peeling.

Unit VI (Not for Semester Examination)

Current trends in histological studies, Microphotography, measuring cell size, leaf thickness, advances in microscopic techniques, anatomy in relation to plant taxonomy, advances and disadvantages of parthenocarp.

Books:

ANATOMY

1. Cutter, E.G. (1978). *Plant Anatomy Part-I: Cells and Tissues* (2nd Edn.). *Plant Anatomy Part-II: Experiments and Interpretations*. Edward Arnold, London.
2. Esau, K. (1965). *Vascular Differentiation in Plants*. Holt, Rinehart and Winston, New York.
3. Esau, K. (1980). *Plant Anatomy* (2nd Edition). Wiley Eastern Ltd., New Delhi.
4. Fahn, A. (1997). *Plant Anatomy*. Pergamon Press, Oxford.
5. Foster, A.S. (1960). *Practical Plant Anatomy*. Van Nostrand and East-West Press, New Delhi.
6. Govindarajulu, A. (1980). "*Marangal*" (*Trees*) (In Tamil). Tamilnadu Textbook Society, Chennai.
7. Krishnamurthy, K.V. (1980). *Wood*. Tetrahedron Publications, Tiruchirappalli.
8. Vasishtha, P.C. (1977). *A Text Book of Plant Anatomy*. S. Nagin and Co., New Delhi.

EMBRYOLOGY

1. Bhojwani, S.S. and Bhatnagar, S. House (P) Ltd., UBS Publisher's
2. Johri, B.M. (1982). *Experimente* Heidelberg.
3. Maheswari, P. (1985). *An Intro* Publishing Co. Ltd., New Delhi.
4. Maheswari, P. (1963). *Recent* Society of Plant Morphologists, U
5. Rogland, A. (2000). *Developme* Nagercoil.
6. Swamy, B.G.L. and Krishnamoo Publishing Co. Ltd., New Delhi.

Course Outcomes: On completi

CO 1	Distinguish the various
CO 2	Identify the primary st monocots.
CO 3	Acquire more knowled
CO 4	Learn the structure and
CO 5	Understand the types o

MAPPING WITH PROGRAMME

COs	PO1	PO2	PO3
CO1	3	3	
CO2	3	3	
CO3	2	2	
CO4	3	3	
CO5	3	3	

S-Strong(3)

M-Medium

Question pattern:

Section A	
2 Multiple choice question from each unit (10X1=10)	1 question from (5X2=10)

U28 BC408 P

UBC 408 P

BOTANY PARACTICAL – IV
ANATOMY EMBRYOLOGY AND MICRO TECHNIQUE

MAPPING WITH PROGRAMME

Category	Hours			Credits	Marks		
	Lecture	Tutorial	Practical		CIA	External	Total
U23BOC408P	6	-	-	5	25	75	100

COs	PO1	PO2	PO3
CO1	3	3	1
CO2	3	3	2
CO3	2	2	3
CO4	3	3	3
CO5	3	3	2

Objective:

1. To study about plant anatomy and embryology.
2. To practice cross section for monocot stem, root, leaf and dicot stem, root and leaf.
3. To learn about the structure and development of ovule and anther.
4. To study about types of ovule and mature anther.
5. To study understand the polygonal type of embryosac.

ANATOMY

Cross section of monocot root, stem, leaf

Cross section of dicot root, stem, leaf and microscopic observation of anomalous secondary growth in monocot and dicot stems through slides

Nodal anatomy (Uni-*Justicia*, Tri-*Azadirachta* and Multi-*Arachis*)

Stomatal studies

EMBRYOLOGY

Identify the structure of development of Anther and Ovules through slides.

Dissect the flower buds and observe the embryo.

1. To dissect out and mount Dicot embryo (*Tridax*)
2. To study and write critical notes on permanent micro preparations showing development of anther, types of ovules, Embryosac, Dicot embryo and Monocot embryos.
3. Take T.S of anther (*Datura/Cassia*)
4. Type of endosperm

MICROTECHNIQUE

Measurement of cell size (Ocular and stage micrometer)

Preparation of Temporary and Permanent slides, Microtome sectioning

Micropreparation of cystolith (Ficus leaf), Raphides (Araceae members eg: *Arum* petiole) and starch grains (Potato and Rice grains)

S-Strong(3)

M-Medium

U.G Question Paper Pattern

Course Outcomes: On completion of the course, students will be able to		Level
CO 1	Compare the primary structure of root, stem and leaf in Dicots and monocots through slides.	K1
CO 2	Differentiate the anomalous secondary growth in dicot and monocot stems through slides	K2
CO 3	Dissect the embryo from a plant – <i>Tridax</i>	K3
CO 4	Identify the structure and development of anther and ovules through slides.	K4
CO 5	Learn to prepare a permanent slide.	K5

Bachchanisfina

U23B4BB

SKILL ENHANCEMENT COURSE - II (SEC II)

UB4BB

MAPPING WITH PROGRAMME

II. BIOFERTILIZERS AND BIOPESTICIDES

Category	Hours			Credits	Marks		
	Lecture	Tutorial	Practical		CIA	External	Total
Theory	2	-	-	2	25	75	100

COs	PO1	PO2	PO3
CO1	3	3	1
CO2	3	3	2
CO3	2	2	3
CO4	3	3	3
CO5	3	3	2

Objectives:

1. To understand the basics of biofertilizers and their cultivation
2. To study about mycorrhiza and their isolation and production
3. To impart knowledge on pesticides and their control by biopesticides, including their production and commercialization.

Unit I

Biofertilizers – Definition, kinds of microbes as biofertilizers, Rhizobium-legume Symbiotic association – mass cultivation and carrier materials.

Unit II

Cultural method of *Azospirillum*, *Azotobacter*, *Azolla* and *Anabaena*, carrier materials.

Unit III

Mycorrhiza– VAM association, types, isolation and inoculum production.

Unit IV

Pesticides – Introduction – Biological Magnification concept. Biopesticides – Viral origin, fungal origin.

Unit V

Biopesticides – Bacterial origin, *Bacillus thuringiensis* mechanism of action and application. Advantages of biopesticides and commercialization.

Books:

1. SubbaRao, N.S. (2000). *Soil Microbiology*. Oxford and IBH Publishing Co. Ltd., New Delhi.
2. Varma, A. and Hock, B. (1995). *Mycorrhiza*. Springer-Verlag, Berlin.
3. Wicklow, D.T. and Soderstrom, B.E. (1997). *Environmental and Microbial Relationships*. Springer-Verlag, Berlin.
4. YaacoVokan (1994). *Azospirillum/Plant Associations*. CRC Press, Boca Raton, FL.

S-Strong(3)

M-Medium

U.G Question pattern (S)

Five Question (Two Question)

Course Outcomes: On completion of the course, students will be able to		Level
CO 1	Acquire knowledge about the rhizobium – legume symbiotic association – mass cultivation and carrier materials used in soil inoculum.	K1
CO 2	Understand the cultural methods of various biofertilizers – <i>Azospirillum</i> , <i>Azotobacter</i> , <i>Azolla</i> and <i>Anabaena</i> .	K2
CO 3	Describe the types of micorrhiza, Isolation and inoculum production.	K3
CO 4	Realize the biopesticides – viral, fungal and bacteria origin, mechanism of action and application.	K4
CO 5	Explain the advantages of bio-pesticides and commercialization.	K5

By a student

U23B4IDC

UB4IDC

**SKILL ENHANCEMENT COURSE-IV
II.HORTICULTURE**

Category	Hours			Credits	Marks		
	Lecture	Tutorial	Practical		CIA	External	Total
U23BO4NMEC:2	6	-	-	5	25	75	100

Objectives:

1. To study the importance of horticultural crops and their propagation methods
2. To understand the types of gardens and their establishment
3. To educate floriculture and fruit culture, greenhouse and nursery management

Unit I

Horticulture: Importance and scope of Horticulture, Classification of horticultural crops – fruits, vegetables crops, climate, soil, water, nutrition needs of horticultural crops,

Unit II

Plant propagation methods, cutting, layering, grafting, budding, stock-scion relationship. Use of plant regulators in horticulture.

Unit III

Garden designs, types of gardens – formal, informal and kitchen garden, units of garden, hedge, border, popiary arches and lawn maintenance.

Unit IV

Floriculture, cultivation of commercial flowers – rose and jasmines. Cultivation of important fruit trees – Mangoes and Banana.

Unit V

Green house, Indoor gardening – Bonsai – flower arrangements – nursery management and maintenance.

Books:

1. Bose, T.K. and Mukherjee, D. (1972). *Gardening in India*. Oxford & IBH Publishing Co., Kolkatta.
2. Edmond, J.B., Musser, A.M. and Andrews, F.S. (1951). *Fundamentals of Horticulture*. McGraw-Hill Book Company, Inc., New York.
3. Jitendra Singh. (2014). *Basic Horticulture*. Kalyani Publishers, Chennai.
4. Kumar, N. (1997). *Introduction to Horticulture*. Rajalakshmi Publications, Nagercoil.
5. LexLauries and Victor, H.R. (1950). *Floriculture – Fundamental and Practices*. McGraw Hill Publishers, New York.
6. Naik, K.C. (1963). *South Indian Fruits and Their Culture*. Vardhachary & Co., Madras.
7. Randhawa, G.C. (1973). *Ornamental Horticulture in India*. Today & Tomorrow Publishers, New Delhi.
8. Sandhu, M.K. (1989). *Plant Propagation*. Wiley Eastern Ltd., New Delhi.
9. Sundararajan, J.S., Muthuswamy, J., Shanmugavelu, K.G. and Balakrishnan, R. *A Guide to Horticulture*. Thiruvankadam Printers, Coimbatore.

CO 1	Understand the
CO 2	Learn the clas vegetables.
CO 3	Realize the fl trees.
CO 4	Differentiate. Flower arrang
CO 5	Acquire more maintenance.

MAPPING WITH PROGRAMME

COs	PO1	PO2	PO3
CO1	3	3	1
CO2	3	3	2
CO3	2	2	3
CO4	3	3	3
CO5	3	3	2

S-Strong(3) M-Med

U.G Question pattern (SEM

Five Question (Two Question f

SKILL ENHANCEMENT COURSE -(SEC - V) : 23UBOTS47:

ENVIRONMENTAL IMPACT ANALYSIS

Category	Hours			Credits	Marks		
	Lecture	Tutorial	Practical		CIA	External	Total
U23BOTS47	2	-	-	5	25	75	100

Pre-requisite	To students to know about the environmental impact assessment.
Learning Objectives	
C1	To understand about the theory and practice of environmental impact assessment.
C2	To develop skills in identifying and solving problems of environmental concerns.
C3	Define and classify Environmental Impacts and the terminology.
C4	Understands the environmental Impact assessment procedure.
C5	List and describe environmental audits.
UNIT	Course Units
I	Origin and Development Purpose and aim, core values and principles, History of EIA development, Environmental Management Plan, Environmental Impact Statement, Scope of EIA in Project planning and Implementation.
II	EIA Process Components of EIA, EIA Methodology- Screening, Scoping, Baseline data, Impact Identification, Prediction, Evaluation and Mitigation, Appendices and Forms of Application,
III	Techniques of Assessment-Cost-benefit Analysis, Matrices, Checklist, Overlays, Impact on Environmental component: air, noise, water, land, biological, social and environmental factors. EIA Document.
IV	Main participants in EIA Process Role of Project proponent, environmental consultant, PCBs, PCCs, public and IAA. Public participation.
V	Environmental Appraisal and Procedures in India and EIA Methodology, indicators and mitigation, Environmental Audit of different environmental resources, Risk Analysis, Strategic environmental assessment, ecological impact assessment: legislation.

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination Question paper)	Question sUPSC (Tobedi
Skills acquired from this Course	Knowledge Compet
Recommended Books	Morris, P. and Th UCL Press, London. 2. Petts, J. 1999. Ha Blackwell Science, C 3. Therivel, R. and I Assessment, Earthsca 4. Vanclay, F. and Assessment, Wiley & 5. Rau, J.G. and Woo Pub. Co., New York,
Reference Books	1. Kulkarni, V. and I Pub. Co. New Delhi. 2. Petts, J. 2005. Han Blackwell Publishers, 3. Glasson, J. Theriv Impact Assessment. R 4. Canter, W.L. 1992 Engineering/ Math, Ne 5. Jain, R.K., Urban, L Nostrand Reinhold Co
Web resources	1. https://www.an Khandeshwar-c 2. https://www.iki sciences/enviro 3. https://www.els assessment/mar 4. https://link.spring 5. https://onlinelib

PLANT MORPHOLOGY, TAXONOMY AND ECONOMIC BOTANY

Theory Hours : 6
 Practical Hours :- 3
 Exam Hours : 3

Course code:
 Credit:5
 Marks:100

Objectives:

To enable the students

1. To study morphological features of vegetative, inflorescence, fruits and seed characters.
2. To impart knowledge on botanical nomenclature, classifications, merits and demerits of various systems of classifications.
3. To understand the systematic of the selected families of the flowering plants with their economic importance.
4. To have knowledge on the economically important plants with their systematic treatment.

Unit I

Morphology: vegetative, floral and fruit parts – Inflorescence – Types – racemose, cymose, mixed and special types. Fruit - simple, fleshy, dry dehiscent and dry indehiscent, aggregate and multiple fruits.

Unit II

Binomial nomenclature – ICBN rules – taxonomic types. Systems of Classification – Bentham and Hooker classification – Merits and demerits. Phylogenetic classification – anatomical, embryological, biochemical and palynological evidence for taxonomy, numerical taxonomy, Herbarium techniques.

Unit III

A detailed study of the following families with their economic importance – Annonaceae, Capparidaceae, Tiliaceae, Rutaceae, Anacardiaceae, Cesalpiniaceae, Cucurbitaceae and Amaranthaceae

Unit IV

A detailed study of the following families with their economic importance – Rubiaceae, Asteraceae, Apocynaceae, Asclepiadaceae, Solanaceae, Verbenaceae, Euphorbiaceae, Orchidaceae, Cannaceae and Poaceae.

Unit V

Economic Botany: A brief study of the following economically important plants:

Food – Cereals (*Oryza sativa*, *Eleusine coracana*); Pulses – Black gram (*Phaseolus mungo*), Edible – Gingelly oil (*Sesamum indicum*); Root tubers – Tapioca (*Manihot esculenta*); Sugar – Sugarcane (*Saccharum officinarum*).

Fibres – Textiles (*Gossypium*); Others – *Crotalaria*, *Agave*.

Medicinal Plants – *Ocimum*, *Phyllanthus*, *Solanum*.

Forest Products – Timber: Teak (*Tectona grandis*), Jack (*Artocarpus heterophyllus*). Tannins, Gums, Resins, Turpentine.

BOOKS:**TAXONOMY**

1. Gurcharan Singh (1999). *Plant Systematics - Theory & Practice*. Oxford & IBH Publishing Co. (P) Ltd., New Delhi.
2. Jaques, H.E. (1999). *Plant Families-How to know them?*. Agro Botanical Publishers (India), Bikaner.
3. Jefferey, C. (1968). *An Introduction to Plant Taxonomy*. J.A. Churchill, London.
4. Lawrence, G.H.M. (1953). *Taxonomy of Vascular Plants*. Oxford & IBH Publishers, New Delhi.
5. Lawrence, G.H.M. (1955). *An Introduction to Plant Taxonomy*. The Central Book Depot, Allahabad.
6. Mathews, K.M. (1987-90). *Flora of Tamilnadu Carnatic* (1-4vols.) Rapinat Herbarium, Trichy.
7. Mathur, R.C. (1970). *Systematic Botany* (Angiosperms). Agra Book Stores, Lucknow.

Gaurav Kumar

8. Mitra, J.N. (1964). *An Introduction to Systematic Botany & Ecology*. The World Press (P) Ltd., Calcutta.
9. Naik, V.N. (1996). *Taxonomy of Angiosperms* (9th Ed.). Tata McGraw-Hill Publishing Co., (P) Ltd., New Delhi.
10. Narayanaswamy, R.V. and Rao, K.N. (1976). *Outlines of Botany*. S. Viswanathan Printers & Publishers, Chennai.
11. Palaniyappan, S. (2000). *AngiospermgalinVagaippadu (Taxonomy of Angiosperms)*. V.K. Publishing House, Chennai.
12. Pandey, B.P. (1997). *Taxonomy of Angiosperms*. S. Chand & Company Pvt. Ltd., New Delhi.
13. Porter, C.L. (1967). *Taxonomy of flowering Plants*. Eurasia Publishing House, New Delhi.
14. Ramaswami, S.N., Lakshminarayana, S. and Venkateswaralu, V. (1976). *Taxonomy (Systematic Botany) for Degree Course*. Maruthi Book Depot, Guntur, Hyderabad.
15. Sharma. O.P. (2007). *Plant Taxonomy*. Tata McGraw-Hill Publishing Co., New Delhi.

ECONOMIC BOTANY

1. Ashok Bendre and Ashok Kumar (1998-99). *Economic Botany*. Rastogi Publications, Meerut.
2. GovindaPraksh and Sharma, S.K. (1975). *Introductory Economic Botany*. Jai PrakashNath, Meerut.
3. Gupta, S.K. and Kaushik, M.P. (1973). *An Introduction to Economic Botany*. K. Nath & Co., Meerut.
4. Hill, A.W. (1952). *Economic Botany*. Tata McGraw-Hill Publishing Co., New Delhi.
5. Pandey, B.P. (2000). *Economic Botany*. S. Chand & Company Ltd., New Delhi.
6. Sambamurthy, A.V.V.S. and Subrahmanyam, N.S. (1989). *A Text Book of Economic Botany*. Wiley Eastern Ltd., Madras.
7. Sen, S. (1992). *Economic Botany*. New Central Book Agency, Calcutta.
8. Verma, V. (1974). *A Text Book of Economic Botany*. Emkay Publications, New Delhi

Course Outcomes:-

Students could be able to

1. Describe the morphological features of vegetative, floral and fruit parts.
2. Explain the types of inflorescence and fruits.
3. Understand the binomial nomenclature and ICBN Rules.
4. Illustrate the systems of classification (Bentham and Hooker's) its merits and demerits and various techniques of Herbarium.
5. Describe the detailed study of selected families and their economic importance.
6. Acquire knowledge about the economic importance of plants Fruits, Edible, Sugar, Fibres, Medicinal plants and Forest products.

COs	PO1	PO2	PO3	PO4	PO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3
CO3	2	3	3	3	3	1	3	3	3	3
CO4	3	3	3	2	3	2	3	3	3	3
CO5	3	2	3	2	2	2	2	1	2	2

U.G Question pattern (SEM: 75 mark +CIA: 25 mark =Total:100 marks)

Section-A	Twenty multiple choice question (Four Question from each unit)	20×1=20marks
Section-B	Five Question (Two Question from each unit –Either or type)	5×5=25 marks
Section-C	Three Question (Out of five one question from each unit)	3×10=30mark

By the instructor

CORE COURSE-X - CELL BIOLOGY, GENETICS AND PLANT BREEDING

Theory Hours : 5
Practical Hours :- 3
Exam Hours : 3

Course code:
Credit:5
Marks:100

Objectives:

1. To study microscopy, cell organelles of Prokaryotic and Eukaryotic cells, chromosomes, cell divisions, DNA and RNA.
2. To understand gene regulation and chloroplast and mitochondria genome organization.
3. To study Mendelian genetics, recombination of chromosomes, structure and function of genes and their various units
4. To educate on mutation
5. the various methods of plant breeding and plant propagation

Unit I – CELL BIOLOGY

Basic principles of microscopy. Differentiating features of Prokaryotic and Eukaryotic cells – Ultra structure and functions of plasma membrane – Ultra structure of cell organelles – Plastids, Mitochondria, Golgi bodies, Endoplasmic Reticulum, Lysosomes, Cell Inclusions.

Unit II

Nucleus – Nucleolus - Structure of euchromatin and heterochromatin – Special types of chromosomes – Lamp brush chromosomes and polytene chromosomes. Cell cycle, Cell Division: Mitosis and meiosis.

Unit III-GENETICS

Genetics: Mendel's laws, monohybrid, dihybrid, back cross and test cross. Allelic interactions: Incomplete dominance and co-dominance – complementary factor hypothesis, epistasis (Dominant and recessive), Non-allelic interaction – Lethal factor, Multiple factor hypothesis.

Unit IV- PLANT BREEDING

Methods of crop improvement – Introduction, acclimatization, selection methods (Mass, pure line and clonal). Hybridization techniques – interspecific and Intergeneric hybridization, Heterosis.

Unit V

Back crossing, Mutation breeding, Polyploidy and its application in plant breeding, Role of auto- and allopolyploid, breeding for crop improvement with reference to Paddy, Wheat, Sugarcane and Groundnut.

BOOKS:**CELL BIOLOGY**

1. De Robertis, E.D.P. and De Robertis, E.M.F. Jr. (1980). *Cell and Molecular Biology* (7th Ed). Saunders College/Holt, Rinehart and Winson, Philadelphia.
2. Grierson, D. and Convey, S.N. (1989). *Plant Molecular Biology*. Blackie Publishers, New York.
3. Lea, P.J. and Leegood, R.C. (1999). *Plant Biochemistry and Molecular Biology*. John Wiley and Sons, London.
4. Old, R.W. and Primrose, S.B. (1994). *Principles of Gene Manipulation*. Blackwell Science, London.
5. Power, C.B. (1984). *Cell Biology*. Himalaya Publishing Co., Mumbai.
6. Sharma, N.S. (2005). *Molecular Cell Biology*. International Book distributors, Dehradun.
7. Verma, P.S. and Agarwal, V.K. (1986). *Cell Biology and Molecular Biology (Cytology)*. S. Chand and Company Ltd., New Delhi.

GENETICS

1. Adrin, M.S.R.B., Owen, R.D. and Edger, R.S. (1979). *General Genetics*. In: Mendelism. Eurasia Publishing House (P) Ltd., New Delhi.
2. Agarwal, V.K. (2000). *Simplified course in Genetics* (B.Sc., Zoology). S. Chand & Company Ltd., New Delhi.
3. Ahluwalia, K.B. (1990). *Genetics*. Wiley Eastern Ltd., Madras.
4. Chandrasekaran, S.N. and Parathasarathy, S.V. (1965). *Cytogenetics and Plant Breeding*. P. Varadhachari & Co., Madras.

5. Daniel Sundararaj, D. and Thulsidas, G. (1972). *Introduction to Cytogenetics & Plant Breeding* (3rd Ed.). Popular Book Depot, Madras.
6. Gardner, E.J. and Snusted, D.P. (1984). *Principles of Genetics* (7th edition). John Wiley & Sons, New York.
7. Gupta, P.K. (2000). *Genetics*. Rastogi Publishers, Meerut.
8. Herskowitz, I.H. (1977). *Principles of Genetics* (2nd Ed.). MacMillan Publishing Co. Inc., New York.
9. Hexter, W. and Yost, H.T. Jr. (1977). *The Science of Genetics*. Prentice Hall of India (P) Ltd., New Delhi.
10. Jain, H.K. (1999). *Genetics-Principles, Concepts & Implications*. Oxford & IBH Publishing Co., (P) Ltd., New Delhi.
11. Lewin, B. (1990). *Genes IV*. Oxford University Press, Oxford.
12. Meyyan, R.P. (2000). *Genetics & Evolution*. Saras Publication, Nagercoil.

PLANT BREEDING

1. Allard, R.W. (1960). *Principles of Plant Breeding*. John Wiley & Sons, New York.
2. Bose, T.K., Maiti, R.G., Dhua, R.S. and Das, P. (1999). *Floriculture and Landscaping*. NayaPrakash, Calcutta.
3. Chopra, V.L. (1989). *Plant Breeding*. Oxford IBH, New Delhi.
4. Jenson, N.F. (1988). *Plant Breeding Methodology*. Wiley Interscience Publication, New York.

Course Outcomes:-

Students could be able to

1. Describe the basic principles of microscopy, ultra structure and functions of plasma membrane and cell inclusions.
2. Differentiate the prokaryotic and Eukaryotic cells.
3. Apply the Mendel law's in monohybrid, Dihybrid, Backcross and test cross.
4. Differentiate allelic and non – Allelic interactions.
5. Learn about the recombination, linkage and crossing over, cytoplasm inheritance and sex determination.
6. Describe the different functional units of gene and operon concept.
7. Understand the classification, types, mechanism and application of mutation.
8. Describe the different methods of crop improvement such as introduction, acclimatization and selection.
9. Learn the various techniques of hybridization

COs	PO1	PO2	PO3	PO4	PO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3
CO3	2	3	3	3	3	1	3	3	3	3
CO4	3	3	3	2	3	2	3	3	3	3
CO5	3	2	3	2	2	2	2	1	2	2

U.G Question pattern (SEM: 75 mark +CIA:25 mark =Total:100 marks)

Section-A	Twenty multiple choice question (Four Question from each unit)	10×1=20marks
Section-B	Five Question (Two Question from each unit –Either or type)	5×5=25 marks
Section-C	Three Question (Out of five one question from each unit)	3×10=30marks

Dr. Arvind Kumar

CORE – XI (PRACTICAL)

MORPHOLOGY, TAXONOMY OF ANGIOSPERMS AND ECONOMIC BOTANY, CELL BIOLOGY, GENETICS AND PLANT BREEDING.

Theory Hours : -
Practical Hours :6
Exam Hours : 3

Course code:
Credit:3
Marks:100

Objective:

1. To study about the cell and molecular biology to know about the cell structure, cell division like mitosis and meiosis
2. To know about the genetics, monohybrid, dihybrid ratios with problems
3. To Training in dissection the plant and study about the morphology, classification and economic Botany.

MORPHOLOGY, TAXONOMY & ECONOMIC BOTANY

1. Training in dissection, observation, identification and sketching of floral parts of plants belonging to the families mentioned in the syllabus along with floral diagrams and floral formula.
2. Description of plants in technical terms.
3. Field study flora.
4. Submission of 25 Herbarium specimens.
5. Economic plants covered in theory part in taxonomy and economic botany and their importance.

CELL BIOLOGY

1. Observation of plant cells in Onion peeling and *Rheo* leaf
2. Non-living inclusions: Raphides, cystolith and Starch grains.
3. Cell division: Mitosis and Meiosis – Squash technique in onion toot tips and *Tradescantia/Rheo* flower bud respectively
4. Isolation of cell organelles through differential centrifugation
5. Photographs: Ultra Structure of cell organelles.

GENETICS

Problems on simple monohybrid and dihybrid ratios. Simple problems on interaction on factors included in the theory.

PLANT BREEDING.

Hybridization techniques

Course Outcomes:-

Students could be able to

1. Observe the plant cells and types of cell division by peeling method and squash technique.
2. Identify the Ultra-structure of cell organelles and living inclusions through slides and photographs.
3. Isolate the *cell organelle* through differential centrifugation
4. Evaluate the simple problems on monohybrid, Dihybrid ratios and interaction of factors.
5. Determine the mean, median and mode by simple experiments.
6. Illustrate the graphic represented data using simple analysis.
7. Describe the plants in technical terms.
8. Dissect and draw the floral parts, floral diagrams and formulas of the plants belong to the families mentioned in the syllabus.
9. Learn the economically important parts of the plants.

COs	PO1	PO2	PO3	PO4	PO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3
CO3	2	3	3	3	3	1	3	3	3	3
CO4	3	3	3	2	3	2	3	3	3	3
CO5	3	2	3	2	2	2	2	1	2	2

U.G Question Paper Patten (SEM: 60 Mark+CIA: 40Marks=Total: 100 marks).

CORE – XII – PROJECT AND VIVA VOCE

U23 BCP512

SEMESTER V	PROJECT WITH VIVA-VOCE	H/W	C
CORE – XII		3	3

Assessment of Project

The Project Report/Dissertation shall be submitted as per the guidelines laid down by the University. The Project Work/Dissertation shall carry a maximum of 100 marks. CIA for Project will consist of a Review of literature survey, experimentation/field work, attendance etc. The Project Report evaluation and viva-voce will be conducted by a committee constituted by the Head of the Department. The Project Evaluation Committee will comprise the Head of the Department, Project Supervisor, and a senior faculty. Project guides should not mentor more than five students in a group project. A student may work on projects in collaboration with an industry/ research partner with the approval of the Guide and the HOD.

The student will have a guide from the department and an expert from the partner organization. The student will have to meet the guide regularly to assess the progress. The students may also undertake the Project work in his own department with the permission of the Guide and HOD if an industry/external organization could not accommodate a student for project work.

The project report / dissertation must contain minimum of about 25 pages, with certificate page with a provision for Faculty in charge/ internal, HOD signature and External examiner signature.

The marks shall be distributed as follows:

Continuous Internal Assessment (25 Marks)		End Semester Examination (75 Marks)	
Review-I: 10	Review-II: 15	Originality of approach	10
		Relevance of the Topic	10
		Involvement	10
		Dissertation	25
		Viva-voce	20

Dr. S. S. Srinivas

DISCIPLINE SPECIFIC ELECTIVE-I (DSE-I)
i. HORTICULTURE

U23BGE5:1

Theory Hours : - 4
Practical Hours :
Exam Hours : 3

Course code:
Credit:3
Marks:100

UNIT	CONTENTS
I	Importance and scope of horticulture. Classification of horticultural crops –fruits and vegetables. Essentials of nursery Management - Soil management: Garden soil, Physical and chemical properties of soil, Organic matter, Compost, Cultural practices; Water management: Water quality, Irrigation, Mulching. Nursery structures: Protected cultivation (greenhouses), environment controls.
II	Hydroponic culture-types of container. Use of manures and fertilizers in Horticultural crop production. Principles of organic farming. Environmental factors influencing vegetable and fruit production.
III	Horticultural crop protection; physical control - pruning. Chemical control- pesticides, fungicides. Plant propagation - cutting, layering, budding, grafting. Types of gardens: formal, informal, kitchen and Terrace. Indoor gardening-bottle garden. Floriculture, ornamental gardening.
IV	A brief account of annual, biennials and perennials with reference to ornamental gardens. Green house, terrarium, water garden, rockery plants, bonsai techniques. Landscaping, principles and basic components.
V	Technology of horticultural crops - market preparation: harvesting and handling, packaging and transport, storage; chemical treatment. Economics of cultivation Crops: Cardamom, pepper, clove. Food processing - freezing, bottling and canning, drying and chemical preservation.
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/TRB/NET/UGC– CSIR/GATE/TNPSC/other to be solved (To be discussed during the Tutorial hour)
Skills acquired from this Course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferable Skill
Recommended Texts	1. Hartmann, H.T and D.E. Kester. 1989. Plant propagation – principles and practices. Half of India. New Delhi. 2. Bose, T.K and Mitra and Sadhu. 1991. Propagation of tropical and subtropical horticultural crops. Naya Prakash. 3. Singh, S.P. 1989. Mist propagation Metropolitan book Co., New Delhi. 4. Chadha, K.L. 1986. Ornamental horticulture in India ICAR, Krishi Bhavan, New Delhi. 5. Bose, T.K and Mukharjee, D. 1977. Gardening in India. Oxford & IBH Pub., Co., Calcutta.

Signature

	6. Gopalswamy Iyyangar. 1970. Complete gardening in India, Kalyan Printers, Bangalore. 7. Rangaswami, G and Mahadevan, A. 1999. Diseases of Crop Plants in India (4th edition). Prentice Hall of India Pvt. Ltd., New Delhi
Reference Books	1. Arditti, A. 1977. Orchid biology, Gornell Univ., Press. Ithaca. 2. Bailey, S. 1971. Perpetual flowering carnation, Fabner and Fabner, London. 3. Laurie, A., Kiplinger, D.D and Nelson, K.S. 1968. Commercial flower forcing. Mc Graw-Hill Book, London. 4. Cumming, R.W. 1964. The chrysanthemum Book. D.Van., Nostrand Inc. 5. Biswas, T.D. 1984. Rose growing – Principles and Practices – Assoc., Pub., Co., New Delhi. 6. Hartman, H.T and Kester, D.E. 1989. Plant propagation. Printice Hall Ltd., New Delhi. 7. Abraham, A and Vatsala, P. 1981. Introduction to Orchids. Trop. Bot. Garden, Trivandrum. 8. Bose, T.K and Yadav, L.P. 1989. Commercial flowers. Naya Prakash, Calcutta. 9. Mc Daniel, G.L. 1982. Ornamental horticulture. Reston Publ., London. 10. Helleyer, A. 1976. The Collingridge Encyclopedia of gardening Chartwell Book, Inc., New Jercey.
Web Resources	1. https://www.kopykitab.com/Precision-Horticulture-by-Archarya-SK 2. https://www.ebooks.com/en-us/subjects/science-horticulture-ebooks/423/ 3. http://www.agrimoon.com/horticulture-icar-ecourse-pdf-books/ 4. https://www.worldcat.org/title/handbook-of-horticulture/oclc/688653648 5. https://cbseportal.com/ebook/vocational-books-horticulture 6. http://www.digitalbookindex.org/_search/search010agriculhortigardena.asp

COs	PO1	PO2	PO3	PO4	PO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3
CO3	2	3	3	3	3	1	3	3	3	3
CO4	3	3	3	2	3	2	3	3	3	3
CO5	3	2	3	2	2	2	2	1	2	2

Dr. Sachindran

DISCIPLINE SPECIFIC ELECTIVE-I (DSE-I)

II. PLANT BIORESOURCES

U23B4ES:2

Theory Hours : - 4

Practical Hours :

Exam Hours : 3

Course code:

Credit:3

Marks:100

Objectives:

1. Students to learn about the uses of microorganisms eg. Single cell protein, antioxidants, vitamins and enzymes.
2. To know the plant sources like coffee, poppy, cotton, oil and rubber.
3. Understand the traditional medicine and their economic importance.

Unit-I

Useful products from microorganisms- Single cell proteins from fungi (Yeast), Algae (*Spirulina*), Antioxidants from *Dunaliella salina*, edible uses and nutritional values of Mushrooms, Vitamins, enzymes, Organic acids, antibiotics and alcohol (With one example each).

Unit-II

Medicinal and edible uses of Bryophytes and Pteridophytes. Useful products from Gymnosperms: Edible uses, Wood (Pine), Drugs (Turpentine, Taxol, Ephedrine), Ornamental value of Pteridophytes and Gymnosperms.

Unit-III

Study of plants for the source, method of collection, processing and applications, Beverage (Coffee), Narcotics (Poppy), Fiber (Cotton), Oil seeds (Sesame), Latex (Rubber), Spices and condiments (Cardamom and pepper). Start up for plant based industries in Tamil Nadu.

Unit-IV

Importance and application areas: Biomass production- Food (Single cell proteins), Biofertilizers. Environmental biotechnology: Waste treatment-Solid (Compost), Liquid (Industrial effluents), Sewage treatment (Domestic sewage). Microbial bioremediation. Phytoremediation.

Unit-V

Direct and indirect uses of economically valuable wood plant species in India: Acacia, Albizia, Bambusa, Dalbergia, Tectona, Terminalia, Azadirachta and Thespesia. Minor and major forest products.

Books

1. Parihar, N.S. 1996. The Biology and Morphology of Pteridophytes. Central Book Depot, Allahabad.
2. Chopra, R. N. 2005. Biology of bryophytes. New Age International (P) Ltd. New Delhi, India.
3. Pelzer, M.J., Chan, E.C.S and Krieg, N.R. 1983. Microbiology, Tata McGraw Hill Publishing House, New Delhi.
4. Pandey, P.B. 2014. College Botany- 1: Including Algae, Fungi, Lichens, Bacteria, Viruses, Plant Pathology, Industrial Microbiology and Bryophyta. Chand Publishing, New Delhi.
5. Aziz, F and Rasheed, R. 2019. A Course Book of Algae. Publisher: University of Sulaimani. ISBN: 978-9922-20-391-1.
6. Chapman, V.J and Chapman, D.J. 1960. The Algae, ELBS & MacMillan, London.

Sachin Kumar

Course outcome

COs	PO1	PO2	PO3	PO4	PO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3
CO3	2	3	3	3	3	1	3	3	3	3
CO4	3	3	3	2	3	2	3	3	3	3
CO5	3	2	3	2	2	2	2	1	2	2

Section-A	Twenty multiple choice question (Four Question from each unit)	10×1=20marks
Section-B	Five Question (Two Question from each unit – Either or type)	5×5=25 marks
Section-C	Three Question (Out of five one question from each unit)	3×10=30marks

Dr. S. Srinivasan

Theory Hours : - 4	Course code:
Practical Hours :	Credit:3
Exam Hours : 3	Marks:100

- To introduce students to the scientific study of fruit crops.
- To teach classification, propagation, cultivation, and post-harvest management of major fruit crops.
- To understand the climatic and soil requirements for successful fruit production.

Definition, History and scope of Pomology.Importance of fruit crops in economy and nutrition.Area and production of major fruit crops (state-wise, national, and international).Nutritional values of fruits.Export value of fruits in India.

Classification of fruit crops (temperate, tropical, subtropical). Cultivation and harvesting of fruit crops- Mango, Banana, Papaya, Guava, Orange.

Symptoms, causative organism and control measures of Anthracnose in Mango, Downy mildew of Graphs, Bunchy top of banana, Leaf curl of papaya, Fruit canker of Guava and Citrus canker.

Training and pruning techniques. Irrigation systems (drip, sprinkler, basin). Types and methods of Manures and fertilizers application in fruit production. Environmental factors involved in pest and disease spreading. Weed, pest, and disease management.

Flowering and fruiting physiology. Fruit thinning, use of growth regulators. Maturity indices, harvesting techniques. Post-harvest handling, grading, packaging, and storage. Preservation of fruits by physical and chemical methods.

1. Rangaswami, G and Mahadevan, A. 1999. Diseases of Crop Plants in India (4th edition). Prentice Hall of India Pvt. Ltd., New Delhi.
2. Kumar, N. 1997. Introduction to Horticulture, Rajalakshmi Publications, Nagercoil.
3. Butts, E. and Stensson, K. 2012. Sheridan Nurseries: One hundred years of People, Plans, and Plants. Dundurn Group Ltd.
4. Hartman, H.T and Kester, D.E. 1989. Plant propagation. Printice Hall Ltd., New Delhi.
5. Agarwala, V.P. 1990. Forests in India, Environmental and Protection Frontiers. Oxford & IBH Publishing Co. New Delhi.
6. Chundawat, B.S. and Gautham, S.K. 1996. Text book of Agro forestry. Oxford and IBH publisher, New Delhi.

Debra L. Swan

COs	PO1	PO2	PO3	PO4	PO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3
CO3	2	3	3	3	3	1	3	3	3	3
CO4	3	3	3	2	3	2	3	3	3	3
CO5	3	2	3	2	2	2	2	1	2	2

Course outcomes Section-A	Twenty multiple choice question (Four Question from each unit)	10×1=20marks
Section-B	Five Question (Two Question from each unit –Either or type)	5×5=25 marks
Section-C	Three Question (Out of five one question from each unit)	3×10=30marks

Dr. Chaitanya Kumar

**DISCIPLINE SPECIFIC ELECTIVE-II (DSE-II)-
B. FORENSIC BOTANY**

U23B4E5:4

Theory Hours : - 4	Course code:
Practical Hours :	Credit:3
Exam Hours : 3	Marks:100

Learning Objectives	
C1	The provide basic knowledge about the application of Botany to Forensic investigations and legal disputes.
C2	To provide students with knowledge of palynology, dendrology, plant anatomy, pharmacognosy, molecular biology and toxic compounds from plants that could serve as leads in crime spots.
C3	To learn classification of plants from forensic point of view.
C4	To understand forensic importance of different parts of plants.
C5	To develop and identify main morphological and anatomical features of plants, which could be useful for forensic investigations.
Course outcomes: On completion of this course, the students will be able to: CO	Programme Outcomes
1. Recognize morphological and anatomical features of plants, which could be useful for forensic investigations.	K1
2. Summarize the forensic importance of different parts of plants.	K2
3. Apply techniques for the collection and preserve of botanical evidences of crime.	K3
4. Analyze and decipher the significance of classic and DNA based	K4

Dr. Anand Kumar

forensic botany cases.	
5. Interpret and deduce new methods for the detection of plant poisons used in crime.	K5 & K6

UNIT-I

General plant classification schemes, Sub specialization of forensic botany- plant morphology, plant anatomy, plant systematic, palynology, plant ecology, limnology, Plant architecture- roots, stems, flowers, leaves. Practical plant classification schemes: vegetables and herbs, fruits bearing trees and plants, landscaping plants: trees, shrubs and vines, grasses, plant cell structure and functions.

UNIT-II

Various types of woods, timbers, seeds and leaves and their forensic importance, Identification and matching of various types of wood, timber varieties, seeds and leaves. Types of fibers – forensic aspects of fiber examinations, Identification and comparison of man-made and natural fibres. Various types of planktons and diatoms and their forensic importance. Study and identification of pollen grains, Identification of starch grains, powder and stains of spices etc. Paper and Paper Pulp identification.

UNIT-III

Various types of poisonous plants: *Abrus precatorius*, *Aconitum napellus*, *Anacardium occidentale*, *Argemone mexicana*, *Cannabis sativa*, *Claviceps purpuria*, *Croton tiglium*, *Atropa belladonna*, *Gloriosa superba*, *Jatropha curcas*, *Lathyrus sativus*, *Nerium indicum*, *Nicotiana tabacum*, *Strychnos nux vomica*, *Thevetia nerifolia*. Types of plants yielding drugs of abuse – opium, cannabis, coco, tobacco, datura, *Psilocybin* mushrooms.

UNIT-IV

Collection and preservation of botanical evidences: Botanical samples, outdoor crime scene consideration.

UNIT-V

Analysis of samples, DNA analysis, plant DNA typing, Classic forensic botany cases: Case histories by using Plant anatomy and systematic, Palynology, Plant ecology, Limnology, Plant Molecular Biology and DNA, Drug enforcement and DNA.

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/TRB/NET/UGC-CSIR/GATE/TNPSC/other to be solved (To be discussed during the Tutorial hour)
Skills acquired from this Course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferable Skill
Recommended Texts	- Coyle, H.M. 2005. Forensic Botany: Principles and Applications to Criminal Casework. CRC Press. - James, S.H., Nordby J.J., Bell, S. 2015. Forensic Science: An Introduction to Scientific and Investigative Techniques. CRC Press; 4 edition.

	3. <u>David W. Hall, Dr. Jason H. Byrd</u>. 2012. Forensic Botany. Wiley-Blackwell; United Kingdom. 4. Jane H Bock, David Norris. 2015. Forensic Plant Science. Elsevier. 5. <u>Patricia E. J. Wiltshire</u>. 2012. Forensic Ecology, Botany, and Palynology: Some Aspects of Their Role in Criminal Investigation. <u>Criminal and Environmental Soil Forensics</u> pp 129–149
Reference Books	1. Hall, D.W and Byrd, J. 2012. Forensic Botany: a practical guide. Wiley-Blackwell, 1edition. 2. Bock, J.H and Norris, D.O. 2016. Forensic Plant Science, Academic Press. 3. Nicholas Marquez Grant, John Wiley. 2012. Forensic Ecology Handbook. Wiley Backwell. 4. <u>David W. Hall, Jason Byrd</u>. 2012. Forensic Botany: A Practical Guide. Wiley-Blackwell. 5. Heather Miller Coyle. 2007. Forensic Botany: Principles and Applications to Criminal Casework is packed with details — David M. Jarzen, Florida Museum of Natural History, University of Florida, in AASP Newsletter, Vol. 40, No. 2.
Web Resources	1. https://www.kobo.com/us/en/ebook/forensic-botany 2. https://www.worldcat.org/title/forensic-botany-a-practical-guide/oclc/796086574 3. https://www.buecher.de/shop/pflanzenoekologie/forensic-botany-ebook-pdf/hall-david-w--byrd-jason/products_products/detail/prod_id/37354547/ 4. https://www.crcpress.com/Forensic-Botany-Principles-and-Applications-to-Criminal-Casework/Miller-Coyle/p/book/9780849315299 5. http://docshare02.docshare.tips/files/25818/258183613.pdf

Mapping with Programme Outcomes:

Cos	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	1	3	2	1	2	2	2	1
CO2	3	3	2	1	1	3	2	3	1	3
CO3	2	1	2	3	1	2	1	3	1	2
CO4	3	3	3	3	2	1	3	3	2	1
CO5	3	3	2	3	2	3	1	2	2	3

S-Strong (3)

M-Medium (2)

L-Low (1)

Byrd Jason H

Theory Hours : - 2
Practical Hours :
Exam Hours : 3

Course code:
Credit:2
Marks:100

Objectives:

- To know the seed borne microbes and diseases.
- To know the methods of seed health testing.
- To learn the process of seed borne disease development.
- To know the quarantine for seed and organization for plant protection at various levels.

Unit I :History of Seed Pathology-Importance in agriculture -losses caused by seed borne diseases. Seed health testing for fungi, bacteria and viruses: Principles and methods.

Unit II: Seed borne fungi, bacteria and viruses and diseases caused by fungi: blast of paddy, red rot of sugarcane; bacterial Blight of paddy, black arm of cotton; viruses: leaf roll of potato, bean, Mosaic virus.

Unit III:Seed infection and establishment avenues, factors and its establishment location in seed -Epiphytotics due to seed borne inoculums.

Unit IV :Controls of seed-borne diseases physical, chemical and biological treatment; post- entry control. Storage fungi and mode of seed deterioration. Mycotoxins, plant variety protection act, legal protection of crop varieties and seed legislation in developing countries.

Unit V:Seed Quarantine, history and importance, principles and regulations of plant quarantine in India. Seed certification history, scheme, eligibility procedure (Organization, Economic Co-operation and Development) Changing concepts, Applying quarantine provisions for seed.

Bilgrami, K.S. and Dubey, H.C., (1980).

2. A text book of modern Plant Pathology, Vikas Publishing House, New Delhi.

3. Mehrotra, R.S., (1980). Plant Pathology, Tata McGraw Hill Publishing Company Limited New Delhi. Major E

4.Nair, L.N. 2007. Topics in Mycology and Pathology, New Central Book agency, Kolkata.

COs	PO1	PO2	PO3	PO4	PO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3
CO3	2	3	3	3	3	1	3	3	3	3
CO4	3	3	3	2	3	2	3	3	3	3
CO5	3	2	3	2	2	2	2	1	2	2

Section-A	Twenty multiple choice question (Four Question from each unit)	10×1=20marks
Section-B	Five Question (Two Question from each unit –Either or type)	5×5=25 marks
Section-C	Three Question (Out of five one question from each unit)	3×10=30marks

Signature

AEC-I- ADDITIONAL ELECTIVE COURSE
INTERNSHIP/INDUSTRIAL TRAINING

INT

SEMESTER V	SUMMER INTERNSHIP	H/W	C
CORE – XIII		-	2

The students have the option to select any organization, whether government or private, such as industries, research and development organizations, scientific companies, etc., in consultation with the staff coordinator and the Head of the Department. They are required to undergo training for a period of two weeks during the vacation before the commencement of Semester VI and obtain a certificate of attendance from the employer of the chosen organization. Additionally, students must maintain a work diary and prepare a report detailing the training they underwent, which must be submitted accordingly for evaluation. This course is categorized as Part IV.

Dr. S. S. Srinivasan

ECOLOGY, PHYTOGEOGRAPHY AND BIOSTATISTICS

Theory Hours : - 5
Practical Hours :3
Exam Hours : 3

Course code:
Credit:5
Marks:100

Objective:

1. To know the outlines of Biotechnology.
2. To comprehend the advances made in the field of plant biotechnology.
3. To understand gene regulation and chloroplast and mitochondria genome organization
4. To know in detail on various types of vegetation

Unit I-Ecology

General ecology- approaches to the study of ecology, autecology- synecology, plant environment- climatic, edaphic and biotic factors (interference on habitat by animals- grazing and browsing by humans- deforestation, agriculture), allelopathy.

Unit – II

Ecosystem concept – components abiotic –biotic autotrophic producers & heterotrophic consumers, biomass – ecological pyramids, productivity – primary, secondary & gross: food chain – food web & energy flow – pond ecosystem.

Unit-III Phytogeography

Phytogeography-Approaches to Phytogeography – Climate of India & its climatic zones, Botanical regions (provinces) of India – Vegetational types of Tamil Nadu: Evergreen, deciduous, scrub & Mangrove, Continuous and discontinuous distribution. Endemism. *In situ* and *ex situ* conservation. Application of remote sensing in conservation.

Unit- IV BIOSTATISTICS

Biostatistics: Definition and scope. Sampling techniques: sample, population, random and non-random sampling techniques. Data- Types of data. Presentation of data- Graphical methods: Histogram, bar and pie diagrams.

Unit-V

Measures of central tendency- mean, median and mode. Measures of dispersion – range variance, standard deviation and standard error. Chi square analysis. Correlation and its types: probability distribution – normal binomial and poisson distribution

BOOKS

ECOLOGY

1. Agrawal, K.C. (1987). *Environmental Biology*. Agro Botanical Publisher, India.
2. Arumugam, N. (1994). *Concepts of Ecology* (Environmental Biology). Saras Publications, Nagercoil, Tamilnadu.
3. Chandrasekaran, P. (1996). *Chutruchoozhal Maasupadu* (Environmental Pollution) T.K. Printers, Pudukkottai, Tamilnadu.
4. Kumar, H.D. (1992). *Modern Concepts of Ecology* (7th Edn.). Vikas Publishing Co., New Delhi.
5. Odum, E.P. (1971). *Fundamentals of Ecology* (2nd Edn.). Saunders & Co., Philadelphia & Natraj Publishers, Dehradun.
6. Sharma, P.D. (2000). *Ecology & Environment*. Rastogi Publications, Meerut, India.

PHYTOGEOGRAPHY

1. Cain, S.A. (1944). *Foundations of Plant Geography*. Harper & Brothers, N.Y.
2. Good, R. (1997). *The Geography of flowering Plants* (2nd Edn.). Longmans, Green & Co., Inc., London & Allied Science Publishers, New Delhi.
3. Mani, M.S. (1974). *Ecology & Biogeography of India*. Dr. W. Junk Publishers, The Hague.

BIOSTATISTICS

1. Nageswara Rao, G. (1983). *Statistics for Agricultural Science*. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.

2. Olive, J.D. (1995). *Basic Statistics – A Primer for the Biomedical Sciences*. John Wiley and Sons, New Delhi.

Course Outcomes:-

Students could be able to

1. Describe the different techniques use in tissue culture.
2. Explain general feature, types of the varies plasmid are used in vector.
3. Understand the steps, techniques and involved in Genetic Engineering.
4. Realize the role of Agro bacterium in plant genetic engineering.
5. Discuss the various vegetational types of Tamil Nadu - Evergreen, Deciduous, Scrub& Mangrove.
6. Distriguish gene regulation in prokaryotes and Eukaryotes
7. Analyse the various techniques – initiation elongation termination, transcription and translation.
8. Learn the genome organization of chloroplast and mitochondria.
9. Identify the types of distribution, endemism and conservation.

COs	PO1	PO2	PO3	PO4	PO5	PO1	PÖ2	PO3	PO4	PO5
CO1	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3
CO3	2	3	3	3	3	1	3	3	3	3
CO4	3	3	3	2	3	2	3	3	3	3
CO5	3	2	3	2	2	2	2	1	2	2

U.G Question pattern (SEM: 75 mark +CIA:25 mark =Total:100 marks)

Section-A	Twenty multiple choice question (Four Question from each unit)	10×1=20marks
Section-B	Five Question (Two Question from each unit –Either or type)	5×5=25 marks
Section-C	Three Question (Out of five one question from each unit)	3×10=30marks

Dr. S. S. Srinivasan

Course code:
Credit:5
Marks:100

Objectives

To enable the students

1. To understand the metabolic activities of plants
2. To understand the role of plant growth regulators in plants growth.
3. To understand the role of enzymes in various metabolic activities of plants.
4. To know the outline of Biotechnology.
5. To understand the application of Genetic Engineering.

Unit I –Plant Physiology

Plant - Water relationship: structure and properties and significance of water - osmotic and non-osmotic uptake of water. Ascent of sap-cohesion theory: root pressure, transpiration, physiology of stomatal action, Translocation of solutes and assimilates. Mass flow, Membrane permeability mineral uptake: Passive and active. Role of major and Minor elements, mineral deficiency symptoms.

Unit-II Photosynthesis: Absorption spectrum, Action spectrum, role of pigments, enhancement effect, photosystems I & II, Photophosphorylation, Carbon Assimilation: Calvin cycle, Hatch & Slack pathway, CAM pathway, photorespiration.

Respiration: Aerobic and anaerobic. Glycolysis, Krebs's Cycle and oxidative phosphorylation, energetics of respiration.

Unit III - Biochemistry

Enzymes - Nature and properties. Mechanism of enzyme action-factors affecting Enzyme action, substrate concentration – inhibitors, cofactors. Structure, classification and functions of carbohydrates, lipids and Proteins. Secondary metabolites – alkaloids, flavonoids, terpenoids and anthocyanins.

Unit IV scope and importance of biotechnology. Basic of genetic engineering foreign DNA preparation , insertion of DNA into vectors. Enzymes of genetic engineering : restriction endonucleases & ligases gene cloning vectors plasmids (pBR322) and cosmids (PLFR5).

Unit V – selection of recombinants – using antibiotic markers , ratio labeling replica plating
Transgenic plants for herbicide resistant – applications of genetic engineering.

Biological nitrogen fixation – mechanism, use of Azotobacter, anabaena and Rhizobium as Biofertilizer organisms.

BOOKS:

PLANT PHYSIOLOGY

1. Devlin, R.M. (1969). *Plant Physiology*. Holt, Rinehart & Winston & Affiliated East West Press (P) Ltd., New Delhi.
2. Dulsy Fatima, R.P. et. al., (1994). *Elements of Biochemistry*. Saras Publications, Nagercoil, Tamilnadu.
3. Jain, V.K. (1990). *Fundamentals of Plant Physiology*. S. Chand & Co., New Delhi.
4. Noggle, R. and Fritz (1989). *Introductory Plant Physiology*. Prentice Hall of India.
5. Pandey, S.N. (1991). *Plant Physiology*. Vikas Publishing House (P) Ltd., New Delhi.
6. Periyasamy, K. (1978). *Cell IyakkaViyal* (Cell Physiology). Tamilnadu text Book Society, Chennai.
7. Salisbury, F.B. and Ross, C.W. (1999). *Plant Physiology*. CBS Publishers and Printers, New Delhi.
8. Saraswathy and Rangamannar (1973). *ThaavaraValarchithaiMartram* (Metabolism & Biosynthesis). Tamilnadu Text Book society, Chennai.

Зависимости

BIOCHEMISTRY

1. Day, P.M. and Harborne, J.B. (2000). *Plant Biochemistry*. Harcourt Asia (P) Ltd., India & Academic Press, Singapore.
2. Jain, J.L. (1998). *Fundamentals of Biochemistry*. S. Chand & Co., New Delhi.
3. Jayaraman, J. (1981). *Laboratory Manual of Biochemistry*. Wiley Eastern Ltd., New Delhi.
4. Lehninger, A.L. (1984). *Biochemistry* (2nd Edition). Kalyani Publishers, Ludhiana, New Delhi.
5. Plummer, D.T. (1988). *An Introduction to Practical Biochemistry* (3rd Edn.,). Tata McGraw Hill Publishing Co., Ltd., New Delhi.
6. Srivastava, H.S. (1990). *Elements of Biochemistry*. Rastogi Publications, Meerut, India.
7. Stryer, L. (1989). *Biochemistry*. W.H. Freeman & Co., New York, San Francisco.
8. Wilson, K. and Walker, J. (1994). *Principles and Techniques of Practical Biochemistry* (4th Edition). Cambridge University Press, U.K

PLANT BIOTECHNOLOGY

- Gupta, P.K. (1994). *Elements of Biotechnology*. Restogi Publications, Meerut.
- Ignacimuthu, S. (1997). *Plant Biotechnology*. Oxford & IBM Publishing Co., New Delhi.
- Kalyan Kumar De. (1997). *Plant Tissue culture*. New central Book Agency, Calcutta.
- Kumar, H.D. (1991). *A Textbook on Biotechnology*. East west press, New Delhi.
- Parihar, P. (2014). *A Textbook of Biotechnology*. Argobios Publications, Jodhpur

Course outcome

Students could be able to

1. Understand the plant – Water relationship with various physiological activities and theories.
2. Explain the Translocation of solutes by means of various theory role and deficiency symptoms of minerals.
3. Know the types of spectrum and the role of pigments in photosynthesis.
4. Describe the photosynthesis by different pathways and cycles.
5. Learn the respiration by means of various cycles and its types.
6. Identify the various plant growth hormones, its chemical nature, physiological effects and functions.
7. Recognize the fundamentals concepts of plants biotechnology and genetic engineering.

COs	PO1	PO2	PO3	PO4	PO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3
CO3	2	3	3	3	3	1	3	3	3	3
CO4	3	3	3	2	3	2	3	3	3	3
CO5	3	2	3	2	2	2	2	1	2	2

U.G Question pattern (SEM: 75 mark +CIA: 25 mark =Total: 100 marks)

Section-A	Twenty multiple choice question (Four Question from each unit)	10×1=20marks
Section-B	Five Question (Two Question from each unit –Either or type)	5×5=25 marks
Section-C	Three Question (Out of five one question from each unit)	3×10=30marks

By Laxminidhar

CC-XV-PRACTICAL

(PLANT BIOTECHNOLOGY, PHYTOGEOGRAPHY AND BIOSTATISTICS , PLANT PHYSIOLOGY, BIOCHEMISTRY AND ECOLOGY)

Theory Hours : -
Practical Hours :6
Exam Hours : 3

Course code:
Credit:3
Marks:100

Objective:

1. To study about the cell and molecular biology to know about the cell structure, cell division like mitosis and meiosis
2. To study about the plant physiology and train for experiments and know about the physiological apparatus.
3. To study the plant ecology and types of plants like hydrophytes, xerophytes and mesophytes.
4. To learn about the vegetation and conservation of plants and study about aquatic ecosystem

PLANT BIOTECHNOLOGY

1. To prepare a basal media for tissue culture

For demonstration only

1. Working principle of Autoclave, Hot air oven
2. Photographs- pBR 322, Ti-plasmid; cosmids, phagemids

PHYTOGEOGRAPHY

1. Study of forest types through photographs

BIOSTATISTICS

1. Simple experiments to determine the Mean , Median , Mode. Illustration of graphic representation of data using simple analysis.

PLANT PHYSIOLOGY AND BIOCHEMISTRY

To be performed by each student

1. Colorimetric estimation of sugars
2. Gravimetric estimation of Starch
3. Determination of osmotic pressure of onion/Rheo leaf.
4. Effect of light intensity on transpiration using Ganong's potometer.
5. Determination of stomatal frequency and estimation of transpiration rate.
6. Determination of absorption and transpiration ratio in plants.
7. Measurement of respiration rate using germinating seeds and flowerbuds with simple respiroscope.
8. Separation of plant pigments by paper chromatography.
9. Determination of photosynthetic rate in water plants under different CO₂ concentrations.
10. Measurement of oxygen evolution under different colours using Wilmott's bubbler.

PLANT ECOLOGY

1. Study of morphological and anatomical features of hydrophytes and xerophytes.
2. Study of morphological features of epiphytes, parasites and halophytes.
3. Study of vegetation by the quadrat and line transect method.
4. Estimation of frequency, density & Dominance.

Course Outcomes:-

Students could be able to

1. To prepare the basal media for tissue culture.
2. Determine the osmotic pressure, the light density of transpiration, stomatal frequency, transpiration rate, absorption and transpiration ratios and photosynthetic rate in water plants under different carbon dioxide concentrations.
3. Measure the respiration rate using germinating seeds and flower buds – and oxygen evolution under different colors using respiroscope and Wilmott's bubbler.

B. S. Mishra

4. To understand the morphological and anatomical adaptations of hydrophytes and xerophytes
5. Equip the students to understand the vegetation by the quadrat and line transects method.

COs	PO1	PO2	PO3	PO4	PO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3
CO3	2	3	3	3	3	1	3	3	3	3
CO4	3	3	3	2	3	2	3	3	3	3
CO5	3	2	3	2	2	2	2	1	2	2

U.G Question Paper Pattern (SEM: 60 Mark+CIA: 40Marks=Total: 100 marks)

Signature

1. MEDICINAL BOTANY AND HUMAN WELFARE

Theory Hours : - 5

Practical Hours :

Exam Hours : 3

Course code:

Credit:4

Marks:100

Objectives:

1. Understand the importance of medicinal plant wealth of India and the role of medicinal plants in health care.
2. To know the medicinally useful plants, herbal medicine preparation for common diseases.
3. To know the detection methods to identify the drug adulteration.

Unit-I

Indian system of medicine- Siddha, Ayurvedha, Unani, Homeopathy and Yoga. Export value of medicinal plants in India. Medicinal uses of non flowering plants. Importance and relevance of herbal drugs in Indian systems of medicine.

Unit-II

Pharmaconosy-Aim, scope and branches. Phytochemicals- reserve materials, secretory materials and excretory materials. Chemical components and pharmaceutical uses of *Withania somnifera*, *Azadirachta indica*, *Ocimum sanctum*, *Syzygium aromaticum* and *Piper nigrum*.

Unit-III

Cultivation and marketing of medicinal plants- *Aloe vera*, *Cassia senna*, *Catheranthus roseus*, *Gloriosa superba*, *Curcuma longa* and *Zingiber officinalis*.

Unit-IV

Adulteration and substitution of crude drugs- methods, types and identification of adulteration. Classification of crude drugs. Medicinal plants used to treat, Heart disease, Respiratory disorders, Skin diseases, Nervous disorders and Eye and ear diseases. Rejuvenating herbs.

Unit-V

Medicinal plants and its parts used to prepare- Herbal decoction, Herbal infusion, Herbal tincture, Herbal tea, Herbal oil (pain oil and hair oil), Herbal salves, Herbal poultice, Herbal compresses, Herbal salad and Herbal soup.

BOOKS-

1. Somasundaram, S. 1997. Medicinal botany (Maruthuvar Thavaraviyal) – (Tamil Medium Book).
2. Wallis, T.E. 1967. Text Books of Pharmacognosy. J. & A. Churchill Ltd., London,
3. Jains, S.K.. 1996. Medicinal Plants. Deep Publications, New Delhi.
4. Srivastava, A.K. 2006, Medicinal Plants, International Book Distributors, Dehradun.
5. Chopra, R.N., Chopra, I.C., Handa, K.L., and Kapur L.D., 1994, Indigenous drugs of India.
6. Chopra, R.N., Badhuvar R.L and Gosh, G. 1965. Poisonous plants in India.
7. Miller, L and Miller, B. 2017. Ayurveda & Aromatherapy: The Earth Essential Guide to Ancient Wisdom and Modern Healing. *Motilal Banarsidass, Fourth edition*.
8. Patri, F and Silano, V. 2002. Plants in cosmetics: Plants and plant preparations used as ingredients for cosmetic products - Volume 1. ISBN 978-92-871-8474-0, pp 218.

COs	PO1	PO2	PO3	PO4	PO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3
CO3	2	3	3	3	3	1	3	3	3	3
CO4	3	3	3	2	3	2	3	3	3	3
CO5	3	2	3	2	2	2	2	1	2	2

Section-A	Twenty multiple choice question (Four Question from each unit)	10×1=20marks
Section-B	Five Question (Two Question from each unit –Either or type)	5×5=25 marks
Section-C	Three Question (Out of five one question from each unit)	3×10=30marks

24.01.2018

DISCIPLINE SPECIFIC ELECTIVE-III (DSE-III)

2. FORESTRY

Theory Hours : - 5 Practical Hours : Exam Hours : 3		Course code: Credit:4 Marks:100
3. FORESTRY Learning Objectives		
C1	To study the distribution pattern, composition and diversity of forest ecosystem	
C2	To understand the method of forest management principles and conservation.	
C3	To enable them to meaningfully contribute in the forest conservation.	
C4	To raise student awareness of the need to create a sustainable way of living and the current global issues with forestry caused by human interference.	
C5	To provide a platform to appreciate biodiversity and the importance.	
Course outcomes: On completion of this course, the students will be able to: CO		Programme Outcomes
1. Relate to the basic concepts related to forest distribution, degradation, protection, management and resource utilization.		K1
2. Understand complex interactions of humans and forest ecosystems in a global context.		K2
3. Demonstrate skills for ecological measurements and interpretation of forest ecology management.		K3
4. Examine and decipher the factors influencing forest vegetation, forest degradation and methods of wood preservation		K4
5. Develop new strategies and apply the knowledge gained for problem-solving analysis in the conservation and management of forest ecosystems.		K5 & K6

B. S. Srinivasulu

UNIT-I SILVICULTURE:

Forests - definition. Forest types of India and Tamil Nadu -Classification of forests. Role of forests. Factors of locality - climatic - edaphic - topographic - biotic - interaction of forest with the environment. Silviculture - objectives - scope - general principles. Regeneration - natural and artificial. Nursery techniques - containerized seedling production - techniques and methods. Vegetative and clonal propagation techniques and methods - macro and micro propagation techniques.

UNIT-II FOREST MENSURATION AND MANAGEMENT:

Forest Mensuration - Definition and objectives. Measurement of diameter, girth, height, crown and volume of trees - methods and principles - tree stem form - form factor. Volume estimation of stand - age - basal area determinations Stem and Stump Analysis. Forest inventory - sampling techniques and methods - measurement of crops - sample plots. Yield calculation - CAI and MAI - volume, yield and stand tables preparation.

UNIT-III FOREST UTILIZATION AND WOOD TECHNOLOGY:

Logging - extraction of timber - felling rules and methods - conversion methods - conversion season. Forest products - Timber - timber, fuel, pulp, paper, rayon and match. Wood Composites - plywood, particle board, fiber boards, MDF, hardboard, insulation boards - production technology. Non timber forest products (NTFP) - collection - processing and storage of NTFP - fibres and flosses - bamboos and canes - katha and bidi leaves - essential oils and oil seeds - gums and resins - tans and dyes - drugs - insecticides - lac and shellac - tassar silk - role of tribal co-operative societies.

UNIT-IV FOREST BIOLOGY

Forest ecology - definition - biotic and abiotic components - forest ecosystem - forest community - concepts - succession - primary productivity - nutrient cycling. Composition of forest types in India - classification of India's forests - species composition - association and diversity. Restoration ecology - global warming - green house effects - ozone layer depletion - acid rain - role of trees in environmental conservation. Biodiversity - Definition, origin, types - factors endangering biodiversity - biodiversity hotspots - endemism - Red Data Book. Biodiversity assessments - principles and methods.

UNIT-V AGRO FORESTRY AND SOCIAL FORESTRY:

Agro forestry - definition, concept and objectives. Classification of agro forestry systems - primary systems and subsystems - inheritance effects. Tree-crop interactions - above and below ground - competition for space, water, light and nutrients. Microclimatic modifications - nutrient cycling and soil fertility improvement - Allelopathy and allelochemicals. - Ecological aspects of agro forestry - benefits and limitations of agro forestry. Agro forestry practices for different agro-climatic zones of Tamil Nadu. Agro forestry practices for wasteland reclamation. Social forestry - objectives and scope and necessity - its components and implementation in local and national levels - social attitudes and community participation. JFM - principles, objectives and methodology - choice of species for agro forestry and social forestry. Urban Forestry - definition and scope - benefits - choice of tree species - planting techniques and management.

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)

Questions related to the above topics, from various competitive examinations UPSC/TRB/NET/UGC-CSIR/GATE/TNPSC/other to be solved (To be discussed during the Tutorial hour)

Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Texts	1. Manikandan, K and S. Prabhu. 2013. Indian forestry, a breakthrough approach to forest service. Jain Bros. 2. Roger Sands. 2013. Forestry in a global context, CAB international. 3. Balakathiresan. S. 1986. Essentials of Forest Management. Natraj Publishers, Dehradun. 4. Agarwala, V.P. 1990. Forests in India, Environmental and Protection Frontiers. Oxford & IBH Publishing Co. New Delhi. 5. Chundawat, B.S. and Gautham, S.K. 1996. Text book of Agro forestry. Oxford and IBH publisher, New Delhi. 6. Singhi, G.B. 1987. Forest Ecology of India, Publisher: Rawat. 7. Ramprakash. 1986. Forest management. IBD Publishers, Dehra Dun. 8. Tiwari, K.M. 1983. Social forestry in India. Nataraj Publishers, Dehra Dun. 9. Mehta, T. 1981. A handbook of forest utilization. Periodical Expert Book Agency, New Delhi. 10. Nair, N.C and Henry, A.N. 1983. Flora of Tamilnadu, India. Series: 1, Analysis, Vol.1. BSI, Coimbatore, India.
Reference Books	1. Donald L. Grebner, Jacek P. Siry and Pete Bettinger. 2012. Introduction to forestry and Natural resources Academic press 2. West, P.W. 2015. Tree and forest measurement, Springer international publishing Switzerland. 3. Kollmann, F.F.P and Cote, W.A. 1988. Wood science and Technology. Vol. I & II Springer Verlag, New York. 4. Agarwala, V.P. 1990. Forests in India, Environmental and Protection Frontiers. Oxford IBH Publishing Co., New Delhi. 5. Belcher, B.M. 1998. A production-to-consumption systems approach: Lessons from the bamboo and rattan sectors in Asia. In: Wollenberg, E and A. Ingles (Eds.). Income from the forest: methods for the development and conservation of forest products for local communities. Center for International Forestry Research (CIFOR), Bogor, Indonesia. 6. Chomitz, K.M., with P. Buys, G. De Luca, T.S. Thomas, and S. Wertz Kanounnikoff. 2007. Incentives and constraints shape forest outcomes. In: At loggerheads? Agricultural expansion, poverty reduction and environment in tropical forests. The World Bank, Washington, DC. 7. Rao, K.R. and Juneja, K.B.S. 1992. Field identification of 50 important timbers of India. ICFRE Publi. Dehradun 123 p.
Web resources	1. http://www.wds.worldbank.org/external/default/WDSPContentServer/WDSP/IB/2006/10/19/000112742_20061019150049/Rendered/PDF/367890Loggerheads0Report.pdf. 2. https://www.britannica.com/science/forestry 3. https://en.wikipedia.org/wiki/Forestry. 4. https://www.biologydiscussion.com/forest/essay-forest-importance-major-products-and-its-conservation/25119 5. https://academic.oup.com 6. https://www.cbd.int/development/doc. 7. https://www.sciencedirect.com/topics/agriculture-and-biological-science-forest-product.

Signature

MappingwithProgrammeOutcomes:

COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	3	3	3	2	3	3	2
CO2	3	3	3	3	2	3	1	1	3	1
CO3	3	3	3	2	3	3	3	3	3	3
CO4	3	2	3	1	2	3	1	2	3	1
CO5	3	2	1	3	1	1	2	3	1	2

S-Strong (3) M-Medium (2) L-Low(1)

Dr. Chaitanya S. Patil

DISCIPLINE SPECIFIC ELECTIVE-IV (DSE-IV)

1. BIONANOTECHNOLOGY

Theory Hours : - 4 Practical Hours : Exam Hours : 3		Course code: Credit:3 Marks:100
Learning Objectives		
C1	To provide students with comprehensive knowledge of basics in nanotechnology.	
C2	To enable the students understand and appreciate the various applications of nanoparticles.	
C3	To give perspective to researchers and students who are interested in nanoscale physical and biological systems and their applications in medicine.	
C4	To introduce the concepts in nanomaterials and their use with biocomponents to synthesize and interact with larger systems.	
C5	To impart knowledge on the most recent molecular diagnostic and therapeutic tools used to treat various diseases.	
Course outcomes: On completion of this course, the students will be able to: CO	Programme Outcomes *	
1. Relate to the essential features of biology and nanotechnology that are converging to create the new area of bionanotechnology	K1	
2. Explain the synthesis of nanomaterials and their applications.	K2	
3. Apply the knowledge gained to develop nanomaterials	K3	
4. Compare the advantages and disadvantages of nanoparticles in health, medicine and environment.	K4	
5. Construct various types of nanomaterial for application and evaluate the impact on environment.	K5 & K6	

B. S. K. K. K.

UNIT-I INTRODUCTION TO NANOTECHNOLOGY:

History, Concepts, Prospects and Challenges. Scope of nanotechnology in Indian and global perspectives. Definition - Nanoscience, Nanotechnology. Classification based on the dimensionality- basic understanding of 1D, 2D and 3D nanostructures. Overview of nanoparticles, nanoclusters - nanotubes, nanowires and nanodots. Biotemplates – DNA to build nanocubes and hinges – smart glue, DNA as wire template.

UNIT-II SYNTHESIS OF NANOPARTICLES:

Synthesis of nanoparticles - Top down and bottom up approach. Methods of synthesis: Physical, Chemical reduction – reducing agents, capping agents, stabilizing of nanoparticles and Biological – Novel synthetic methods using plant extracts, bacteria and fungi.

UNIT-III FOREST UTILIZATION AND WOOD TECHNOLOGY:

PROPERTIES & CHARACTERIZATION OF NANOPARTICLES:

Nano size effects - optical, electrical, mechanical, magnetic and catalytic activity. Characterization of nanoparticles using UV-Visible spectroscopy, SEM, TEM, Atomic force microscopy, Scanning tunnel microscopy, NMR, X-ray Crystallography and Photoluminescence.

UNIT-IV NANOCARRIERS:

Introduction. Nanocarriers for drug delivery (DDS) – Polymeric nanotubes and solid lipid nanoparticles (SLN) as carriers, controlled release, site specific targeting. Magnetic nanoparticles as drug carriers and its applications.

UNIT-V APPLICATIONS OF NANOPARTICLES:

Textiles, Food industry - nutraceutical, Medicine - antimicrobial activity, wound healing and dressing; Environment – green manufacturing. Agriculture - nanofertilizers and nanopesticides. Smart biosensors – Components and its application.

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/TRB/NET/UGC – CSIR/GATE/TNPSC/other to be solved (To be discussed during the Tutorial hour)
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferable Skill
Recommended Texts	1. Charles, P. Poole, Jr. & Frank J. Owens. 2003. Introduction to Nanotechnology, A John Wiley & Sons, INC., Publication. 2. George, K. Knopf & Amarjeet S. Bassi. 2006. Smart Biosensors. CRC Press. 3. Pradeep, T. 2007. Nano: The Essentials, Understanding Nanoscience and 4. Sulabha, K. Kulkarni. 2007. Nanotechnology: Principles and Practices. Capital 5. Christof, M. Niemayer, Chad A. Mirkin. 2004. Nanobiotechnology: Concepts, applications and perspectives, Wiley VCH publishers. 6. Jain, K.K. 2001. Nanobiotechnology: Molecular Diagnosis, Taylor Francis Group. 7. Sharma P.K. 2008. Understanding Nanotechnology. Vista International Publishing House, Delhi. 8. Viswanathan B. 2009. Nano Materials. Narosa Publishing House, New Delhi.
Reference Books	1. Claudio Nicolini. 2009. Nanotechnology Nanosciences, Pon Stanford Pub. Pvt. Ltd,

	- Robert, A and Ferias, Jr. 1999. Nanomedicine, Volume I: Basic capabilities, Landes Bioscience. - Barbara Panessa-Warren. 2006 Understanding cell-nanoparticle interactions making nanoparticles more biocompatible. Brookhaven National Laboratory. - European Commission, SCENIHR. 2006. Potential risks associated with engineered and adventitious products of nanotechnologies, European Union. - Gysell Mortimer, 2011. The interaction of synthetic nanoparticles with biological systems PhD Thesis, School of Biomedical Sciences, Univ.of Queensland. - Murty, B.S., Shankar, P., Raj, B., Rath, B.B., Murday, J. 2013. Textbook of Nanoscience and Nanotechnology. Springer Publication. - Prashant Kesharwani. 2019. Nanotechnology-Based Targeted Drug Delivery Systems for Lung Cancer. Academic Press. An imprint of Elsevier.
Web resources	https://onlinelibrary.wiley.com/doi/book/10.1002/3527602453 https://www.elsevier.com/books/nanobiotechnology/ghosh/978-0-12-822878-4 https://www.routledge.com/Nanobiotechnology-Concepts-and-Applications-in-Health-Agriculture-and/Tomar-Jyoti-Kaushik/p/book/9781774635179 https://www.nanowerk.com/nanotechnology/periodicals/ebook_a.php https://phys.org/news/2014-10-endless-possibilities-bio-nanotechnology.html https://www.ncbi.nlm.nih.gov/pmc/articles/PMC419715/ https://phys.org/news/2014-10-endless-possibilities-bio-nanotechnology.html http://www.particle-works.com/applications/controlled-drug-release/Applications

MappingwithProgrammeOutcomes:

COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	2	1	2	1
CO3	3	3	3	2	3	3	3	2	3	2
CO4	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3

S-Strong (3)

M-Medium (2)

L-Low(1)

Prashant Kesharwani

DISCIPLINE SPECIFIC ELECTIVE-IV (DSE-IV)
BIO-ANALYTICAL TECHNIQUES

Theory Hours : - 4					Course code:		
Practical Hours :					Credit:3		
Exam Hours : 3					Marks:100		
Title of the Course	BIO-ANALYTICAL TECHNIQUES						
Paper Number	Elective-I						
Category	Elective	Year	III	Credits	3	CourseCode	
		Semester	V				
InstructionalHours perweek		Lecture		Tutorial		LabPractice	Total
		3		1		-	4
Pre-requisite		To impart expertise about analysis and research.					
Learning Objectives							
C1	To understand the principle, operation and maintenance of various tools/equipment in the laboratory.						
C2	Perform experiments using the laboratory instruments, formulate experiments for project work and evaluate critically the acquisition of data.						
C3	To equip students to collect, analyze and evaluate data generated by their own inquiries in a scientific manner.						
C4	To give an exposure to various forms of field research and data analysis techniques.						
C5	To provide an overview on modern equipments that they would help students gain confidences to instantly commence research careers and/or start entrepreneurial ventures.						
Course outcomes: On completion of this course, the students will be able to:CO		Programme Outcomes					
1. Relate to the various biological techniques and its importance.		K1					
2. Explain the principles of Light microscopy, compound microscopy, Fluorescence microscopy and electron microscopy.		K2					
3. Apply suitable strategies in data collections and disseminating		K3& K6					

research findings.	
4. Compare and contrast the significance of different types of chromatography techniques.	K4
5. Develop methodologies for extraction and analysis of biochemical compounds.	K5

UNIT- I MICROSCOPY:

Principles of microscopy; Light microscopy; compound microscopy, bright field microscope, dark field microscope, phase-contrast microscope, Fluorescence microscopy; Transmission and Scanning electron microscopy. Microscopic measurements-micrometry, Microscopy drawing: Camera Lucida.

UNIT-II CHROMATOGRAPHIC PRINCIPLES AND APPLICATIONS:

Principle; Paper chromatography, Thin Layer Chromatography (TLC), Column chromatography, Gas chromatography – Mass spectrometry (GCMS), High Performance Liquid Chromatography (HPLC).

UNIT- III ELECTROPHORESIS AND PH METER:

Basic principle, construction and operation of pH meter. Polyacrylamide gel electrophoresis (PAGE), Agarose Gel Electrophoresis.

UNIT- IV SPECTROPHOTOMETRY AND CENTRIFUGATION TECHNIQUE:

Principle and law of absorption, construction, operation and uses of colorimeter and UV-Visible spectrophotometer, Principles, methods of centrifugation, types of centrifuge and applications.

UNIT-V BIOSTATISTICS:

Data collection methods, population, samples, parameters; Representation of Data: Tabular, Graphical– Histogram – frequency curve – Bar diagram–measures of central tendency – Mean, Median and Mode; Standard deviation, Standard error, Chi-square test and goodness of fit –t-test.

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UP SC/TRB/NET/UGC-CSIR/GATE/TNPSC/other to be solved (To be discussed during the Tutorial hour)
Skills acquired from the course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Texts	1. Sharma, V.K. 1991. Techniques in microscopy and cell biology, Tata McGraw Hill, New Delhi. 2. Sawhney, S.K and Randhir Singh. 2000. Introductory practical biochemistry, Narosa Publishing House. 3. Asokan, P. 2001. Basics of analytical biochemistry. Chinna Publications. 4. Bajpai, P.K. 2006. Biological instrumentation and methodology. S. Chand & Company, New Delhi. 5. Veerakumari, L. 2009. Bioinstrumentation. MJP Publications. 6. Palanivelu, P. 2013. Analytical Biochemistry and Separation techniques,

	20 th century publications, Palkalai nagar, Madurai.
Reference Books	1. Rana, S.V.S. 2009. Biotechniques: Theory and Practice. Rastogi Publications. 2. Zar, J.H. 2012. Biostatistical Analysis. 4th edition. Pearson Publication. U.S.A. 3. Sundar Rao, P.S.S and Richard, J. 2011. Introduction to Biostatistics and research methods, PHI learning Private Ltd., New Delhi. 4. Johansen, D.A. 1940. Plant Micro technique, TATA McGraw Hill Book Co., Ins., New Delhi. 5. Peter Gray. 1964. Handbook of Basic Micro technique. McGraw hill publication, New York. 6. Cooper, T.G. 1991. The Tools of Bio - chemistry, John Wiley & sons, London. 7. Dey, P.M and Harborne, J.B. 2000. Plant Biochemistry Harcourt Asia Pvt. Ltd. 8. Plummer, D.T. 2003. An introduction to practical Biochemistry. 3rd Edn. Tata McGraw Hill Publishing Company Ltd. New Delhi. 9. Zar, J.H. 1984. Biostatistics Analysis, Prentice Hall International, England Cliffs, New Jersey.
Web Resources	1. https://www.kobo.com/in/en/ebook/bioinstrumentation-1 2. https://www.worldcat.org/title/bioinstrumentation/oclc/74848857 3. https://www.amazon.in/Bioinstrumentation-M-H-Fulekar-Bhawana-Pandey-ebook/dp/B01JP3M9TW 4. https://www.amazon.in/Handbook-Biomedical-Instrumentation-R-S-Khandpur-ebook/dp/B0129ZDO9W?ref=kindlecontentin50-21&tag=kindlecontentin50-21&gclid=CjwKCAiAx_DwBRAfEiwA3vwZYkqkwRb_EGf73exaWpY8D9JNpJZsOcXQCQ4pZIRzTrYH2lopaVP1xxoCIPgQAvD_BwE 5. https://www.kobo.com/us/en/ebooks/biostatistics 6. https://www.amazon.in/Biostatistics-Veer-Bala-Rastogi-ebook/dp/B07LDCPXDG

COs	PO1	PO2	PO3	PO4	PO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3
CO3	2	3	3	3	3	1	3	3	3	3
CO4	3	3	3	2	3	2	3	3	3	3
CO5	3	2	3	2	2	2	2	1	2	2

Dr. S. S. Srinivasan

**SEC-VII- SKILL ENHANCEMENT COURSE
VII- NURSERY AND LANDSCAPING**

Learning Objectives	
C1	To recognize the importance of growing plants and practice the knowledge gained by developing kitchen garden and ornamental garden.
C2	To be able to design gardens and become entrepreneur in Horticulture.
C3	To study the methods of propagation.
C4	To know about nursery structure.
C5	To learn about gardening.
Course outcomes: On completion of this course, the students will be able to:CO	Programme Outcomes
1. Recognize the basic principles and components of gardening.	K1
2. Explain about bio-aesthetic planning and conceptualize flower arrangement.	K2
3. Apply techniques for design various types of gardens according to the culture and art of bonsai.	K3 & K6
4. Compare and contrast different garden styles and landscaping patterns.	K4
5. Establish and maintain special types of gardens for outdoor and indoor landscaping.	K5 & K6

UNIT-I

Introduction, prospects and scope of nursery and landscaping.

UNIT-II

Methods of Propagation – cutting, layering, grafting, budding, Floriculture – Rose, Chrysanthemum, Jasmine – cultivation.

UNIT-III

Gardening – formal garden, informal garden, vegetable garden, landscaped layout designing – formation and maintenance of lawn.

UNIT-IV

Nursery structures – Green house – Shade house, Mist chamber – Topiary, Bonsai culture.

UNIT- V

Manures, Hydroponics- fertigation- composting – vermicomposting.

Extended Professional Component (is a part of internal component only, Not to be included in	Questions related to the above topics, from various competitive examinations UPSC/TRB/NET/UGC – CSIR/GATE/TNPSC/other to be solved (To be discussed during the Tutorial hour)
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the External Examination question paper)	
Skills acquired from this Course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Texts	. Amarnath V. 2006. Nursery and Landscaping, M/s IBD Publishers, New Delhi. . Butts, E and Stensson, K. 2012. Sheridan Nurseries: One hundred years of People, Plans, and Plants. Dundurn Group Ltd. . Russell, T. 2012. Nature Guide: Trees: The world in your hands (Nature Guides). Mukherjee D. Gardening in India, Oxford IBH publishing co, New Delhi. . Kumar, N. 1997. Introduction to Horticulture, Rajalakshmi Publications, Nagercoil. 5. Butts, E. and Stensson, K. 2012. Sheridan Nurseries: One hundred years of People, Plans, and Plants. Dundurn Group Ltd.
Reference Books	1. Edmond Musser and Andres, Fundamentals of Horticulture, McGraw Hill Book Co. New Delhi. 2. Agrawal, P.K. 1993. Hand Book of Seed Technology, Dept. of Agriculture and Cooperation, National Seed Corporation Ltd., New Delhi. 3. Janick Jules. 1979. Horticultural Science. (3rd Ed.), W.H. Freeman and Co., San Francisco, USA. 4. Singh, J. 2018. Fundamentals of Horticulture. Kalyani Publishers. 5. Sharma V. K. 1999. Encyclopaedia of Practical Horticulture, Vol I – IV, Deep And Deep Publ. Pvt. Ltd.
Web Resources	1. https://www.kopykitab.com/higher-education-ebooks/higher-education-ebooks/Agricultural-Industry-agriculture-eBooks/Nursery-And-Landscaping-by-V-Amarnath 2. https://www.amazon.in/Nursery-Landscaping-Veena-Amarnath/dp/8177542788 3. https://www.amazon.in/Gardening/b?ie=UTF8&node=1637077031 4. https://in.pinterest.com/pin/496733033900458021/?lp=true 5. https://www.gardenvisit.com/ebooks

COs	PO1	PO2	PO3	PO4	PO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3
CO3	2	3	3	3	3	1	3	3	3	3
CO4	3	3	3	2	3	2	3	3	3	3
CO5	3	2	3	2	2	2	2	1	2	2

By the way