

MANONMANIAM SUNDARANAR UNIVERSITY TIRUNELVELI - 12
UG COURSES-AFFILIATED COLLEGES
B.Sc. BOTANY
(CHOICE BASED CREDIT SYSTEM)
(With effect from the academic year 2020-2021 onwards)

Course Structure for B.Sc Botany Major (with effect from the academic year 2020 to 2021 onwards)							
Sem.	Part	Sub. No.	Subject Status	Subject Title	Course Paper	Hrs./ Week	Credits
I	I	1	Language	Tamil / Other Languages	1	6	4
	II	2	Language	Communicative English	1	6	4
	III	3	Core I	Algae and Bryophytes	1	4	4
	III	4	Major Practical I	Algae and Bryophytes - Practical	1	2	2
	III	5	Add on Major (Mandatory)	Professional English for Life Sciences - I	1	4	4
	III	6	Allied I	Plant Diversity and Medicinal Botany	1	4	3
	III	7	Allied Practical I	Plant Diversity and Medicinal Botany - Practical	1	2	2
	IV	8	Common	Environmental Studies	1	2	2
				Sub Total		8	30
II	I	9	Language	Tamil / Other Languages	1	6	4
	II	10	Language	English	1	6	4
	III	11	Core III	Plant Anatomy and MicroTechniques	1	4	4
	III	12	Major Practical II	Plant Anatomy and MicroTechniques - Practical	1	2	2
	III	13	Add on Major (Mandatory)	Professional English for Life Sciences II	1	4	4
	III	14	Allied II	Embryology, Plant Anatomy, Physiology and Biotechnology	1	4	3
	III	15	Allied Practical II	Embryology, Plant Anatomy, Physiology and Biotechnology - Practical	1	2	2
	IV	16	Common	Value Based Education / சமூகஒழுக்கங்களும் பண்பாட்டு விழுமியங்களும் / Social Harmony	1	2	2
			Sub Total		8	30	25

COURSE OBJECTIVES

- To introduce the students of Botany to current trends and practices in Biology of plants.
- To restructure syllabus in a job oriented manner.
- To prepare the students of Botany of this university well equipped to meet the demands of various competitive examinations.
- To inculcate the temperament of research in the students of UG course of this branch.

ELIGIBILITY FOR ADMISSION

Those who have passed Higher Secondary Examination with Biology/ Botany as one subject in Part III are eligible for admission to B.Sc., BOTANY COURSE.

Question paper will consist of (both major and allied)

Part-A: 1-10 Questions (objective type from each unit)	(10x1=10 marks)
Part-B: 11-15 Questions (Internal choice from each unit)	(5x5=25 marks)
Part-C: 16-20 Questions (Internal choice from each unit)	(5x8=40 marks)

MSU/ 2020-2021/ UG-Colleges/Part-III (B.Sc.Botany) /Semester - I/ Core - I

ALGAE AND BRYOPHYTES

(4 hrs/week)

UNIT-I **12Hrs**
General characters and classification of Algae based on Fritsch (1945), life cycle patterns of Algae, systematic position, distribution, structure, reproduction and life history of *Volvox* and *Caulerpa*.

UNIT-II **12Hrs**
Systematic position, distribution, structure, reproduction and life history of *Chara*, *Sargassum* and *Gracilaria*.

UNIT-III **12Hrs**
Seaweed cultivation – *Gracilaria*; Methods of extraction and uses of agar-agar and carrageenin; Economic importance of Algae.

UNIT -IV **12Hrs**
Morphology, mass culture and nutritive importance of *Spirulina*; Morphology, mass culture and economic importance of *Nostoc*.

UNIT-V **12Hrs**
General characters and classification of Bryophytes by Rothmaler (1951); systematic position, distribution, structure, reproduction and life history of *Marchantia*.

REFERENCES:

- 1 Dubey R.C. 1993 A text book of bio-technology S.Chand & comp.Ltd., New Delhi.
- 2 Fritsch F.E. 1972 The structure and reproduction of Algae Vol. I & II
- 3 Kamat N.D 1982 Topics in algae, Sai Kraipa Prakashan Aurangabad.
- 4 KumarH.D& Singh H.N 1982 A Text book of Algae East West Press pvt. Ltd New Delhi.
- 5 Pandey S.N 1977 Text book of Botany Vol I - Vikas publishing house j Pvt. Ltd., &TrivediP.S New Delhi.
- 6 Parihar N.S 1967 Bryophyta-Central Book Depot Publications in Botany, Allahabad.
- 7 Sharma O.P 1986 Text Book of Algae. Tata Me Graw- Hill Publications. New Delhi,
- 8 VashistaB.R 1997 The Algae, S. Chand & Co, New Delhi.
- 9 Venkatraman 1969 The cultivation of Algae-Indian council of Agricultural Research - New Delhi.
- 10 Watson E.V 1974 Structure and life cycle of Bryophytes- B.I. Publications New Delhi.

ALGAE AND BRYOPHYTES - PRACTICAL

1. Study of Morphology of the Algae and Bryophytes prescribed in the syllabus.
2. Make suitable micro preparations of the following:
 - a. *Caulerpa* - Rhizome
 - b. *Sargassum* - Stipe, leaf
 - c. *Gracilaria* - Thallus with cystocarp
 - d. *Marchantia* - Thallus.
3. Observe and identify the microslides
 - a. *Volvox* - Vegetative colony, colony with daughter colonies and sex organs.
 - b. *Chara* - Sex organs
 - c. *Sargassum* - Male and female conceptacles
 - d. *Gracilaria* - Thallus with cystocarp.
 - e. *Marchantia* -- V.S of Gemma cup, V.S of Antheridiophore,
 - f. V.S of Archegoniophore, V.S of Sporophyte
 - g. Algal Slides/Tablet - *Spirulina*, *Nostoc*; BGA-fertilizer (packet);
4. Field trip of minimum one day.

Semester 1 / III

PLANT DIVERSITY AND MEDICINAL BOTANY

4hrs/week

UNIT -1

General characters and economic importance of Algae - Distribution, Structure and Life History of Volvox; General characters and economic importance of Fungi - Distribution, Structure and Life History of Polyporus.

UNIT-II

General characters and classification of Lichens; Structure and Reproduction of Usnea. General characters of Bryophytes; Structure, Reproduction and Life History of Funaria.

UNIT - III

General characters of Pteridophytes; Structure, Reproduction and Life History of Lycopodium. General characteristics of Gymnosperms; Structure, Reproduction and Life History of Pinus,

UNIT-IV

Bentham and Hooker's system of classification; Critical study of the following families: Rutaceae, Asclepiadaceae, Euphorbiaceae and Poaceae.

UNIT - V

Study of the following plants with reference to the morphology of the useful parts and their medicinal importance: *Aloe vera*, *Piper nigrum*, *Phyllanthus amarus*, *Coleus amboinicus* and *Catharanthus roseus*,.

REFERENCES:

1. Chapman, V.J & Chapman, 1960 The Algae ,
D.J.Elbs and Macmillian
2. Chamberlain C.J. 1986 Gymnosperm, structure and Evolution
CBS Publishers and Distributors, Delhi
3. Chopra, R.N. and Kumar, P.K. 1988 Biology of Bryophytes, Wiley Eastern
Ltd., New Delhi
4. Kokate, C.F. Purohit, A.P . and 2004 Pharmacognosy, NiraliPrakashan,
Gohale, S.R. New Delhi
5. Pandey, B.P. 1997 Taxonomy of Angiosperms, S.Chand
and company Ltd., New Delhi
6. Rashid, A. 1976 An Introduction toPteriodophytes, Vikas
Publishing House, New Delhi
7. Vashista, B.R 1990 .Botany for Degree Students, Fungi
S.Chand and Co., Ltd., New Delhi

PLANT DIVERSITY AND MEDICINAL BOTANY - PRACTICAL

1. Assign the given plant to its family, giving reasons.
2. Dissect out and draw the floral parts of the plants belong to the families prescribed in the syllabus.
3. Make suitable micropreparations of Lycopodium stem, Pinus needle.
4. Identify and record the medicinal values and morphology of the useful parts of the plants prescribed in the syllabus.
5. Observe and identify the following specimens: Polyporus, Funaria, Lycopodium and Pinus -male and female cone.
6. Identify the slides showing mature anther, ovule, dicot embryo, Volvox. Nostoc, Yeast, Lycopodium - cone L.S and Funaria -capsule L.S.

PLANT ANATOMY AND MICRO TECHNIQUES
(4 hrs/wcek)

UNIT-I

12Hrs

Meristems - Characteristics of meristematic tissues - Types, functions and Theories of meristems. Structure and functions of simple and permanent tissues - parenchyma, collenchyma, sclerenchyma, xylem and phloem.

UNIT-II

12Hrs

Structure of dicot stem and root, structure of monocot stem and root, structure of dicot and monocot leaves.

UNIT-III

12Hrs

Normal secondary thickening in dicot stem and root, anomalous secondary growth in the stem of *Boerhaavia* and *Dracaena*.

UNIT-IV

12Hrs

Nodal anatomy: Types of nodes – unilocular, trilocular and multilocular; leaf traces and leaf gaps; epidermal tissue system: stomatal types, hair, trichomes and glands.

UNIT-V

12Hrs

Microscopy: Principle and working of simple and compound light microscopes and electron microscope (TEM only). Micro techniques - simple staining, double staining and preparation of permanent slides – Maceration

REFERENCES :

1. Cutter, 1978 - Plant Anatomy, Edward Arnold publishers, London,
2. Eames, A.J 1991-Morphofogy of Angiosperms. Mc Graw Hill Pub.,New Delhi.
3. Esau,K.1953-PlantAnatomy,Wileypub.co.Newyork.
4. Fahn, A. 1987- Plant Anatomy ,Maxwell House New York.
5. Johensen,D.A 1940 -Plant Microtechnique. Mc Graw Hill Book Company Inc. New york.
6. Pandey B.P 1982-Plant Anatomy -S. Chand & company Ltd., New Delhi.
7. Vashista, B.R 1997 -The plant Anatomy R. Chand & co. New Delhi.

PLANT ANATOMY AND MICRO TECHNIQUES - PRACTICAL

1. To observe and identify the following slides showing
 - a. Meristems - shoot apex and root apex
 - b. Simple tissues
 - c. Xylem elements
2. Primary structure of stem, root and leaves of dicot and monocot plant.
3. Normal secondary thickening in dicot stem and root.
4. Anomalous secondary growth in *Boerhaavia* and *Dracaena*.
5. Maceration technique (Xylem elements only)
6. Demonstration: Preparation of double stained permanent slides.

Semester II/IV

EMBRYOLOGY, PLANT ANATOMY, PHYSIOLOGY AND BIOTECHNOLOGY

4hrs/week

UNIT -1

Structure and development of microsporangium; Structure, types and development of megasporangium; Development of male and female gametophyte; Double fertilization, Endosperm - types. Structure of dicot embryo.

UNIT -11

Meristem - Structure and classification. Simple tissues, complex tissues; Primary structure of Dicot and Monocot stem and root; Structure of leaf; Normal secondary thickening in dicot stem.

UNIT - III

Absorption of water - diffusion, osmosis, imbibition, mechanism of absorption of water; Ascent of sap - (cohesion theory only); Transpiration - Types, Mechanism of stomatal transpiration (Starch - sugar hypothesis); Photosynthesis - importance of photosynthesis, Mechanism of Photosynthesis - Light and dark reaction (Calvin cycle).

UNIT - IV

Nostoc - Morphology, Use as Biofertilizer and Mass cultivation; Structure, multiplication (budding and fission) and Mass culture of Yeast.

UNIT - V

Tissue Culture - Scope and importance - totipotency. Nutrient media (M.S medium) Callus and Meristem Culture; Applications of plant tissue culture.

REFERENCES:

1. Bojwani, S.S and Bhatnagar,S.P. 1987 The Embryology of Angiosperms, VikasPublications, New Delhi
2. Dubey, R.C. 2002 A text Book of Biotechnology, S.Chand and Co; New Delhi
3. Jain, V.K. 2001 Fundamentals of Plant Physiology , S.Chand and Co; New Delhi
4. Pandey, B.P. 2002 Plant Anatomy, S.Chand and Co; Ram Nagar, New Delhi
5. Pandey, K.K. Sinha, B.K. 1988 Plant Physiology, Vikas Publications, New Delhi

Allied Practical-II

PRACTICAL – II

**EMBRYOLOGY, PLANT ANATOMY, PHYSIOLOGY AND BIOTECHNOLOGY-
PRACTICAL**

1. Dissect out young embryo from *Tridax* flower bud.
2. Make suitable micro-preparations of dicot and monocot stem, root and leaf.
3. Demonstrate the physiology experimental set up - Potato osmoscope, Ganong's light screen, Bell jar experiment.
4. Identify the Photograph/Slide/Specimen/setup -(i) *Nostoc* (ii) Yeast (iii) Callus culture, (iv) Meristem culture.
5. Maintain a record note book for external and internal evaluation.

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Sem.	Part	Sub. No.	Subject Status	Subject	Course Paper	Hrs./ Week	Credit
III	I	17	Language	Tamil	1	6	4
	II	18	Language	English	1	6	4
	III	19	Core III	Fungi, Plant Pathology and Lichenology	1	4	4
	III	20	Major Practical III	Fungi, Plant Pathology and Lichenology - Practical	1	2	2
	III	21	Allied - II Paper I		1	4	2
	III	22	Allied Practical II	Practical	1	2	2
	III	23	Skill Based	Mushroom Culture Technology - I(A) Organic Farming - I(B)	1	4	2
	IV	24	Non-Major Elective I	Gardening and Garden Management - I(A) Herbal Medicine - I(B)	1	2	2
	IV		Common	Yoga	-	-	2
				Sub Total	8	30	24
IV	I	25	Language	Tamil	1	6	4
	II	26	Language	English	1	6	4
	III	27	Core IV	Pteridophytes, Gymnosperms and Paleobotany	1	4	4
	III	28	Major Practical IV	Pteridophytes, Gymnosperms and Paleobotany - Practical	1	2	2
	III	29	Allied II - Paper II		1	4	2
	III	30	Allied Practical II	Practical	1	2	2
	IV	31	Skill Based Common	Floriculture - I(A) Preservation of Fruits and Vegetables - I(B)	1	4	2
	IV	32	Non-Major Elective II	Food and Nutrition - II(A) Botany for Competitive Examination - II(B)	1	2	2
	IV		Common	Computers for Digital Era	-	-	2
	V	33	Extension Activities	NCC / NSS / YRC / YWF	-	-	1
				Sub Total	8	30	25

Sem.	Part	Sub. No.	Subject Status	Subject	Course Paper	Hrs./ Week	Credit
V	III	34	Core V	Cell Biology and Embryology of Angiosperms	1	5	4
	III	35	Core VI	Morphology and Taxonomy of Angiosperms	1	5	4
	III	36	Core VII	Biochemistry and Bioinformatics	1	5	4
	III	37	Elective - I	Plant Ecology and Phytogeography - I(A)	1	5	3
				Marine Biotechnology - I(B)			
	III	38	Major Practical - V	Cell Biology, Embryology, Morphology and Taxonomy of Angiosperms - Practical	1	2+2	3
	III	39	Major Practical VI	Biochemistry, Bioinformatics and Elective - I Practical	1	2+2	3
	IV	40	Skill Based Common	Personality Development	1	2	2
				Effective Communication			
				Youth Leadership			
			Sub Total	7	30	23	
VI	III	41	Core VIII	Genetics, Evolution and Biostatistics	1	5	4
	III	42	Core IX	Plant Physiology	1	5	4
	III	43	Core X	Microbiology	1	4	3
	III	44	Elective I	Horticulture and Plant Breeding - I(A)	1	4	2
				Forestry - I(B)			
	III	45	Elective II	Plant Biotechnology and Genetic Engineering - II(A)	1	4	2
				Environmental Biotechnology - II(B)			
	III	46	Major Practical VII	Genetics, Evolution, Biostatistics and Elective - I Practical	1	2+1	3
	III	47	Major Practical VIII	Plant Physiology - Practical	1	2	2
	III	48	Major Practical IX	Microbiology and Elective II - Practical	1	2+1	2
				Sub Total	8	30	22

MSU/ 2020 - 2021 UG – Colleges/Part – III (B.Sc.Botany)
SEMESTER -III
CORE PAPER – III: FUNGI, PLANT PATHOLOGY AND LICHENOLOGY
(4 hrs/week)

Objectives:

- To know the structure and economic importance of Fungi
- To identify the symptoms of Plant pathogens
- To know the structure and importance of Lichens

UNIT – I

12 Hours

General classification and characters of Fungi proposed by Alexopoulous and Mims (1979). Occurrence, systematic position, structure, reproduction and life cycle of *Albugo* and *Aspergillus*.

UNIT – II

12 Hours

Occurrence, systematic position, structure, reproduction and life cycle of *Peziza* and *Puccinia*. Economic importance of Fungi-Role of Fungi in medicine, industry, agriculture, food and food products.

UNIT – III

12 Hours

Study of the following plant diseases with special reference to the symptoms, etiology, dissemination and control measures: Tikka disease of ground nut, Red rot of sugar cane, paddy blast.

UNIT – IV

12 Hours

Study of the following plant diseases with special reference to the symptoms, etiology, dissemination and control measures: Citrus canker, Bunchy top of Banana and Tobacco Mosaic virus.

UNIT – V

12 Hours

Lichens: General account - Classification – Structure – Reproduction – Economic importance of Lichens. Type study: *Usnea*.

PRACTICALS

1. Micro preparation and identification of *Peziza*, *Puccinia* and *Lichen* thallus

2. Spotters:

- i. Slides – *Albugo*-conidia, *Aspergillus* – conidia, *Peziza* -V.S. of apothecium, *Puccinia*- uredosorus and Teleutosorus, Lichen – V.S. of apothecium.
- ii. Disease infected leaves showing *Albugo*, *Puccinia*, *Usnea* – Habit.
- iii. Observe and identify the following Plant diseases.
 - a. Tikka disease of Ground nut
 - b. Red rot of Sugarcane
 - c. Paddy Blast
 - d. Citrus canker
 - e. Bunchy Top of Banana
 - f. Tobacco Mosaic Virus – disease

3. To maintain a record for external valuation.

REFERENCES

1. Alexopolous, C.J, Mims, C.W and Blackwell, M. 1996. Introductory Mycology, John Wiley and Sons, Newyork.
2. Dube, H.C. 2005. An Introduction to Fungi.Vikas Publishing House,New Delhi.
3. Mehrotta, R.S. 2000. Plant Pathology.Tata Mc Graw Hill Publishing Co.New Delhi.
4. Rangaswamy, G. 1992. Diseases of Crop Plants in India. Prentice Hall of India, New Delhi.
5. Sharma, O.P. 1986. Text Book of Fungi. Tata Mc Graw Hill Publishing Co., Ltd., New Delhi.
6. Sing, R.S.1991. Plant diseases Oxford IBH, New Delhi.
7. The Biology of Lichens: Hale, M.E; Edward Arnold, Mayland 1983.
8. Vashista, B.R. 1990. Botany for Degree students – Fungi. S.Chand and Co., New Delhi
9. Vashista P.C; 1998. Plant Pathology – Pradeep Publication, Jalandhar.

MSU/2020 - 2021 UG – Colleges/Part-III (B.Sc. Botany)
SEMESTER-III
SKILL BASED SUBJECT – I(A) - MUSHROOM CULTURE TECHNOLOGY
(4hrs/week)

Objective:

- The subject enables the students
- To understand, appreciate, and develop self-confidence for involving self-employment.
- To identify the edible and poisonous mushroom.
- To learn the economic factors associated with mushroom cultivation.
- To gain knowledge on post harvesting procedures and preparation of recipes.

UNIT – I **13 Hours**

Introduction, Nutritional and medicinal value of Edible mushrooms, poisonous mushroom, Structure and Life cycle of Edible Mushroom - *Pleurotus* species. *Agaricus bisporus*, *Volvariella volvacea*. Prospects of mushroom cultivation in small scale industry.

UNIT – II **14 Hours**

Mushroom Cultivation Technology - Infrastructure, substrates (locally available), Polythene bag, vessels, Inoculation hook, inoculation loop, mushroom unit (thatched house), water sprayer. Pure culture- Preparation of Medium (PDA and Oat Meal Agar Medium, Sterilization methods, Preparation of Test Tube slants to store mother culture. Culturing of *Pleurotus* mycelium on Petri plates, preparation of mother spawn in Saline bottle and Polypropylene Bag and their multiplication

UNIT-III **11 Hours**

Factors affecting the Mushroom bed preparation, spawn running and harvesting of Mushrooms - Button mushroom (*Agaricus bisporus*). Oyster mushroom (*Pleurotus* sp.) and Paddy Straw Mushroom (*Volvariella* sp.)

UNIT – IV **11 Hours**

Post Harvesting Technology - Farm Design and protection of Mushrooms from Pests and Diseases. Nutritional Value - Proteins, Amino acids, Mineral elements. Carbohydrates, Fibre content and Vitamins. Significance of Mushrooms.

UNIT– V **10 Hours**

Storage and Food Preparation - Short term storage (Refrigeration - up to 24 hours), Long term storage (Canning, Pickles, Papads), Drying, storage in salt solutions. Value added Food preparation: Types of Food prepared from Mushroom: Soup, cutlet, omelette, samosa. pickles, curry.

PRACTICALS

- Demonstration
- Identification of edible mushrooms
- Cultivation of Paddy Straw Mushroom
- Preparation of recipes
- Maintain an Observation Notebook

REFERENCES

1. Bahl, N. (1984-1988). Hand book of Mushrooms, II Edition, Vol. I & Vol. II.
2. Marimuthu, T., Krishnamoorthy, A.S., Sivaprakasam, K. and Jayarajan, R. (1991). Oyster Mushrooms, Department of Plant Pathology, Tamil Nadu Agricultural University, Coimbatore.
3. Swaminathan, M. (1990). Food and Nutrition. Bappco. The Bangalore Printing and Publishing Co. Ltd., No. 88, Mysore Road, Bangalore - 560018.
4. Tewari, P and Kapoor, S.C., (1998). Mushroom cultivation. Mittal Publications, Delhi.

MSU / 2020 - 2021 UG – Colleges / Part - III (B.Sc. Botany)
SEMESTER - III
SKILL BASED SUBJECT – I(B):ORGANIC FARMING
(4hrs / week)

Objectives:

- To enable the students to understand the role of organic manures in the improvement of soil fertility.
- To become aware of the importance of Biofertilizers, Green leaf manure, etc.,
- To learn the significance of Vermicompost and Panchagavya.

Unit – I

15 Hours

Soil types based on texture, Formation of soil, Properties - Physical and Chemical, Soil profile, Fertility of soil, Water retentivity, Reclamation of acidic and alkaline soil.

Unit – II

13 Hours

Organic manure: Farmyard manure, Green leaf manure, Piggery wastes, Poultry wastes and Fishery wastes.

Unit – III

10 Hours

Humus formation, Composting methods, Advantages of composting, Mulching and its advantages.

Unit – IV

12 Hours

Biofertilizers - Importance of biofertilizers, Rhizobium - Importance, mass production and application; *Azolla* - Importance, mass production and application.

Unit – V

10 Hours

Vermicomposting - Importance, Production of vermicompost-pit method and heap method and Application of vermicompost. Panchagavya - Importance, preparation and application of Panchagavya.

PRACTICAL:

1. Determination of pH of garden soil.
2. Identification of the following plants: *Pongamia*, *Calotropis*, *Rhizobium* and *Azolla*.
3. Visit to concerned stations having these practices to study the methods of preparation of Panchagavya, Vermicompost.

REFERENCES:

1. Dubey. R.C., 2006, A Text Book of Biotechnology. S.Chand and Company Ltd., New Delhi.
2. John Jothi Prakash. E., 2006, Outlines of Biotechnology, Emkay Publications, New Delhi.
3. Mark Coyone., 2004, Soil microbiology - An Exploratory Approach, Delmar Publishers, Singapore.
4. Miller, C.E. and Turk, L.M., 2002, Fundamentals of soil Science, Biotech Books, Delhi.

MSU / 2020 - 2021 UG – Colleges / Part - III (B.Sc. Botany)
SEMESTER - III
NON - MAJOR ELECTIVE – I(A):GARDENING AND GARDEN MANAGEMENT
(2hrs/week)

Objectives:

- Enable the students to gain knowledge about crop production, plant propagation, plant breeding, genetic engineering, preparation of soil biochemistry and simultaneously can work in various fields including floral design, garden centers, teaching, fruit and vegetable production, arboriculture and landscape construction.

Unit –I

06Hours

Garden:Types – Formal & Informal Garden – English Garden, Mogul Garden, Principles of Ornamental Gardening, Advantage & disadvantages of Formal and Informal Garden.

Unit –II

06Hours

Propagation Techniques:Soft Wood Cutting, Simple and Air Layering. Pruning Garden Implements – Digger, Pruning shears, Garden Rake, Patch budding, Whip Grafting.

Unit –III

06Hours

Components of Ornamental Gardens:Hedges, Edges, Flower Beds, Arches, Rockery, Lawn and Topiary

Unit –IV

06Hours

Kitchen Garden: Compost Pits, Layout, Various features of Kitchen Garden, Preparation of Vermicompost and Panchakaviyas.

Unit –V

06Hours

Indoor Gardening:Principles and Maintenance, Hanging baskets, Tetrariumand Bonsai

REFERENCE:

- 1). Fundamentals of Horticulture and Plant breeding. V. Kumaresan& N. Arumugam, Saras.
- 2). Horticultural updates; Krispa Shankar, MohdTalha Ansari Md. Ramjan, ThejangulieAngamiVikashkumar, B.N Hazarika, New Vishal Publications.

MSU / 2020 - 2021 UG – Colleges / Part - III (B.Sc. Botany)
SEMESTER - III
NON - MAJOR ELECTIVE – I(B): HERBAL MEDICINE
(2hrs/week)

Objectives:

- To develop skill in identification of medicinal plants.
- To enable the students to understand the medicinal value of some medicinal plants.
- To learn the cultivation and storage methods of medicinal plants.
- To enable the students to understand the conservation methods of medicinal plants.

Unit – I

8 Hours

Traditional systems of medicine - Siddha, Ayurveda and Homoeopathy. Ethnomedicine with reference to Tamil Nadu. Classification of medicinal plants on the basis of morphology and pharmacology.

Unit – II

7 Hours

Study of the following medicinal plants with special reference to Botanical name, Family, morphology, morphology of the useful part and medicinal uses of *Ginger, Vetiver, Vembu, Kattalai, Saffron, Kattunelli* and *Kasakasa*.

UNIT – III

6 Hours

Study of the following plants with reference to habit, morphology of the useful part and uses:
1) *Hemidesmus indicus* 2) *Justicia adhatoda* 3) *Acalypha indica* 4) *Andrographis paniculata* 5) *Gymnema Sylvestre* 6) *Catharanthus roseus* and 7) *Piper nigrum*.

UNIT – IV

5 Hours

Cultivation and methods of storage of *Aloe* and *Catharanthus roseus*. Trading of medicinal plants. Conservation of medicinal plants: *Insitu* and *Exsitu* methods.

UNIT – V

4 Hours

Extraction methods and medicinal uses of following volatile oils: Jasmine oil, Sandal wood oil, Clove oil and Lemon grass oil.

PRACTICAL:

1. To identify and to study the medicinal value and the morphology of the useful parts in the plants specified in the syllabus.
2. To identify oils and their medicinal values specified in the syllabus.
3. To maintain a record note book for external evaluation.

REFERENCES:

1. Gala, D.R. Dhiren Gala & Sanjay Gala. 2000. Nature cure for common diseases, Navneet Publications Ltd., Mumbai.
2. John Jothi Prakash.E. 2003, Medicinal and Aromatic plants. JPR publications, Neyyoor.
3. John Jothi Prakash.E. 2004, Medicinal Botany and Pharmacognosy. JPR publications, Neyyoor.
4. Vaidya Bhagwandush, B. 1999, Herbal cure. Jain publishers, New Delhi.
5. Yoganasimhan. 2000, Medicinal plants of India, Cyber media, Bangalore.

MSU / 2020 - 2021 UG – Colleges / Part - III (B.Sc. Botany)
SEMESTER - IV
CORE PAPER –IV:PTERIDOPHYTES, GYMNOSPERMS AND PALEOBOTANY
(4 hrs / week)

Objectives:

- To understand the structural organization and developmental study of Pteridophytes and Gymnosperms.
- To learn about evolutionary trends, students aware of the Preservation of Plant life of the Geological Period.

UNIT – I

12 Hours

Pteridophytes: General characteristics and Classification of Pteridophytes (Sporne 1966), *Psilotum* and *Lycopodium*: Distribution, Systematic Position, Structure, Reproduction and Life History (Need not study the development of gametophyte, sex organ and sporophyte).

UNIT – II

12 Hours

Selaginella, *Adiantum*: Occurrence, Systematic Position, Structure, Reproduction and Life Cycle (Need not study the development of gametophytes, Sex organ and Sporophyte) Stellar Evolution in Pteridophytes.

UNIT – III

13 Hours

Gymnosperms: General characteristics and Classification of Gymnosperms (David Bierhorst 1971), *Pinus*: Distribution, Systematic Position, Structure, Reproduction and Lifecycle.

UNIT – IV

14 Hours

Gnetum: Occurrence, Systematic Position, Structure, Reproduction and Life Cycle of *Gnetum*. (Need not study the Development of Sex Organs and Sporophyte). Economic Importance of Gymnosperms.

UNIT – V

10 Hours

Paleobotany: Geological Time Scale, Methods of Fossilization; Brief Study of *Rhynia*, *Lepidodendron* and *Lyginopteris*.

PRACTICALS

To make suitable micro preparations of the following.

Stem T.S - *Lycopodium*, *Selaginella* and *Adiantum* rachis

T.S: *Pinus* stem and needle, *Gnetum* stem and leaf

To observe and Identify specimens and Microslides.

Psilotum: Habit, Stem - T.S and Synangium, *Lycopodium* cone L.S.

Selaginella: Rhizome T.S.

Adiantum: Habit.

Pinus: L.S and Specimen - Male and Female cone

Gnetum: L.S and Specimen - Male, Female cone and ovule

Paleobotany: Stem T.S – *Rhynia*, *Lepidodendron* and *Lyginopteris*

To maintain a Record for external valuation

REFERENCES

1. Chamberlain, C.J. 2000. Gymnosperms. CBS Publishers and Distributors, New Delhi.
2. Chester A. Arnold. 2017. An Introduction to Paleobotany. Mc Graw Hill Co. Ltd. New Delhi.
3. Pandey, S.N-1995. A text Book of Peridophyta Vikas Publishing House, Ghaisibad.
4. Parihar, N.S. 1967. An Introduction to Embryophyta Vol.II- Pteridophyta Central Book Depot. Allahabad.
5. Rashid, A 1976. An Introduction to Pteridophyta Vikas Publishing House Ghaisibad.
6. Shukla, A.C. and Misra, P. 1982. Essentials of Paleobotany, Vikas Publishing House Pvt.Ltd Ghaisibad.
7. Sing, V, Pande, P.C. and Jain, D.K. 2002. A text Book of Botany – Vol:4. Pteridophyta, Gymnosperms and Paleobotany. Rastogi Publications. Shivaji Road Meerut-230002.
8. Smith, G.M 1955. Cryptogamic Botany Vol: III Mc Graw Hill Co Ltd. New Delhi.
9. Vashista P.C. 1971. Botany for Degree Students Gymnosperms. Chand and Co New Delhi.
10. Vashista. P.C.1971. Botany for Degree student - Pteridophytes. Chand and Co New Delhi.

MSU / 2020 - 2021 UG – Colleges / Part - III (B.Sc. Botany)
SEMESTER – IV
SKILL BASED SUBJECT – I(A): FLORICULTURE
(4hrs/week)

Objectives:

- The course provides thorough knowledge about the commercial cultivation of flowers and different value added products prepared from it.
- It highlights the potential of these studies to become an entrepreneur.

UNIT – I **14 Hours**
Floriculture and its importance, cultivation of Jasmine, Rose, Chrysanthemum and Tulip.

UNIT – II **16 Hours**
Commercial production and cultivation techniques of Polyanthus, Marigold and Gerbera.

UNIT – III **17 Hours**
Cultivation techniques of *Anthurium*, Orchids and *Heliconia*, cut flower production, importance of cut flower production, package & export.

UNIT – IV **15 Hours**
Importance of flowers in perfumery, Extraction of Jasmine oil and Rose oil.

UNIT – V **13 Hours**
Introduction, General principals of flower arrangement, Western and Japanese flower arrangement, Dry flower decoration.

REFERENCES:

1. Kumar, N.1997. Introduction to Horticulture, Rajalakshmi Publication, Nagarcoil.
2. Kumaresan, V. 2009. Horticulture, Saras Publication, Nagarcoil.
3. Randhawa, G.S. 1973. Ornamental Horticulture in India. Today and Tomorrow Printers and Publishers, New Delhi.
4. Vishnu Swarap, 1997. Garden flowers, National Book Trust, India.

**MSU / 2020 - 2021 UG – Colleges / Part - III (B.Sc. Botany)
SEMESTER – IV**

**SKILL BASED SUBJECT – I(B): PRESERVATION OF FRUITS AND VEGETABLES
(4hrs/week)**

Objectives:

- Inspire regarding the principles of preservation of fruits and vegetables.
- Know the nutritive values, importance and factors affecting storage.
- Understand methods of preservation of fruits and vegetables and preservation recipes.

UNIT – I **11 Hours**

Nutritive values of fruits and vegetables; factors affecting storage; spoilage - microbial, enzymatic and insects.

UNIT – II **13 Hours**

Importance and Methods of Preservation -Refrigeration, Freezing, Canning, Drying and Dehydration, Chemical preservatives.

UNIT – III **13 Hours**

Methods of preparation of Fruit Juice- Orange, Squashes- grape and Pine apple; Jam - Tomato and Mixed Fruit, Jellies- Guava.

UNIT – IV **11 Hours**

Preparation of Chutney- Mango, Sauce –Tomato, Pickles- Lime, Mango and Garlic, Ketchup- Tomato. Drying of fruits: Banana, Mango, Grapes and Fig.

UNIT – V **12 Hours**

Canning of Mango, Banana, Tomato, Carrot, Bean and Mushrooms.

REFERENCES:

1. Alex.V and Ramani.2009. Food Chemistry, MPJ Publishers, Chennai.
2. Cruess W.V.1948. Commercial Fruits and Vegetables Products, McGraw Hill BookCompany Inc, New York.
3. Girdhari Lal, G.S. Siddappa and G.L.Tandon, 1986, Preservation of Fruits andVegetables,Indian Council of Agricultural Research, New Delhi.
4. Kumar, N.1997. Introduction to Horticulture, Rajalakshmi Publication, Nagercoil.
5. Kumaresan,V. 2009.Horticulture, Saras Publication, Nagercoil.
6. Usha Rani, C.K. and R. Mary Christi. 2010. Preservation of Fruits andVegetables, SheenGrafix, Nagercoil.

MSU / 2020 - 2021 UG – Colleges / Part - III (B.Sc. Botany)
SEMESTER – IV
NON – MAJOR ELECTIVE – II(A): FOOD AND NUTRITION
(2hrs/week)

Objectives

Preamble: Facilitates understanding of the principles of food and nutrition. It provides the student to understand the nutritive values, importance, factors affecting storage and methods of preservation of food which make the students aware of application of different plants in various industries.

UNIT – I

06 Hours

Food: Major Classes of Food – Carbohydrates, Proteins, Fats and Oils, Vitamins, Minerals – Energy value of food. Balanced Diet – Functions and deficiency Symptoms – Causes and Prevention.

UNIT – II

06 Hours

Plants as Source of Food: Nutritive Value of Cereals and Millets (Rice, Wheat, Maize, Sorghum, and Ragi); Pulses (Bengal gram, Black gram, Green gram, Red gram and Peas); Nuts and Oil seeds (Ground nuts, Sesame, Coconut, Soyabeans, Sunflower); Fruits and Vegetables (Mango, Banana, Guava, Pomegranate, Grapes, Cucumber, Brinjal, Ladies finger, Tomato, Carrot)

UNIT – III

06 Hours

Food Preservation: Importance of Preservation, Methods of Preservation. Low and High Temperatures, Uses of Oil and Spices, Use of Salt and Sugar. Preparation of Jam, Jelly, Pickles and Squashes.

UNIT – IV

06 Hours

Food Additives: Definition and Types; Food Poisoning - Salmonellosis, Botulism; Food Adulteration - Harmful Effects, Simple Physical Tests for Detection of Food Adulterants

UNIT – V

06 Hours

Fermentation types, classification and uses, Typhoid Fermentations and beverages.

REFERENCES:

1. Basics of Food & Nutrition Mrs. Neeta baijal, Dr. Lalita Sharma Star publications.
2. Hand book of Food and Nutrition Dr. M Swaminathan Bappco.

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SEMESTER – IV

NON-MAJOR ELECTIVE – II(B): BOTANY FOR COMPETITIVE EXAMINATION

(2hrs / week)

Objectives:

- The basic Principles of Botany to the students which are vital role for facing competitive examinations.

UNIT – I

06 Hours

Basics of the Plant Kingdom: Brief Classification of Plant Kingdom; Diagnostic features of Algae, Fungi, Bryophyta, Pteridophyta, Gymnosperms, Bacteria, Viruses, Economic importance of these groups.

UNIT – II

06 Hours

Basics of Angiosperm Taxonomy: A brief account of Natural systems of classification (Bentham and Hooker's system) and Phylogenetic system of classification (Engler and Prantl's system) Binomial Nomenclature. A Brief account of the following Families and their Economic Importance – Fabaceae, Cucurbitaceae, Poaceae.

UNIT – III

06 Hours

Medicinal Importance: *Zingiberofficinale*, *Vetiveriazizanioides*, *Ocimum sanctum*, *Azadirachtaindica*, *solanumtrilobatum*, *Phyllanthusemblica*, *Andrographispaniculata* and *Acalypha indica*.

UNIT – IV

06 Hours

Basics of Plant physiology: Basics of Absorption of Water, Transpiration, Photosynthesis, Respiration, Protein synthesis.

UNIT – V

06 Hours

Cell Organelles: Tissues and Tissue systems; An Introduction to Genetics - Mendelism, Monohybrid cross and Dihybrid Cross. **Genetic Engineering:** Enzymes used in Gene Cloning experiments. An introduction to Plant Tissue culture; Biofertilizers.

REFERENCES

1. Bhattacharya, Hait, Ghosh 2014. A Text Book of Botany-(Volume:2),
2. New Central Book Agency (P) Ltd, Kolkata.
3. Pandey S.N, Misra, S.P, Trivedi, P.S- 2012. A Text Book of Botany – Vikas Publishing House Pvt Ltd, Noida
4. Soni, N.K and Vandana soni-2010 Fundamentals of Botany (Volume 1,2,3) Tata Mc Graw Hill Education Private Limited, New Delhi
5. Wallis, T.E. 2005 Text Book of Pharmacognosy C B S Publishers, New Delhi.
6. Yoganarasimhan.2000 Medicinal Plants of India Cyber media, Bangalore.

MSU / 2020 - 2021 UG – Colleges / Part - III (B.Sc. Botany)
SEMESTER – V
CORE PAPER – V:CELL BIOLOGY AND EMBRYOLOGY OF ANGIOSPERMS
(5 Hrs/Week)

Objectives:

- The structure of prokaryotic and eukaryotic cells including cell organelles and their function, and cell division.
- The complete details about the flower, sporogenesis, pollination, development of gametophytes, fertilization, embryogeny and other post-fertilization events, and apomixis.

UNIT – I **15 Hours**
Structure of Prokaryotic and Eukaryotic cells, Cell cycle, Amitosis, Mitosis, and Meiosis

UNIT – II **15 Hours**
Ultrastructure of cell organelles and function: Nucleus, Chloroplast, Mitochondria, Endoplasmic reticulum, Golgi complex, and Ribosomes

UNIT – III **15 Hours**
Morphological nature of Flower, Anther types and Structure, Microsporogenesis, Pollengrain structure, Ovule types, Megasporogenesis and Male Gametophyte Development, Female Gametophyte Development and its types

UNIT – IV **15 Hours**
Pollination, Pollen-pistil Interaction, Self-incompatibility, Double Fertilization, Post fertilization changes, Endosperm Development and types, Embryogeny in Dicots and Monocots and Structure of Dicot and Monocot embryos

UNIT – V **15 Hours**
Seed and Fruit Development, Parthenocarpy, Polyembryony, Apomixis, Basic concepts of Apogamy and Apospory, Agamospermy and Parthenogenesis

PRACTICAL:

Cell Biology

1. Study of Mitosis in the Onion root tip
2. Electro-micrographs of Cell organelles and Non-living Inclusions

Embryology of Angiosperms

1. Dissect and display the parts of a flower
2. Identification of anther types with the slides and photographs
3. Identification of ovules types with the slides and photographs
4. Dissect out anyone stage of embryo
5. Developmental stages of embryo photographs
6. Endosperm specimens

REFERENCES:

1. Batgina T.B., 2002. Embryology of Flowering Plants.Terminology and Concepts. Vol. 1.Generative Organs of Flower.Oxford & IBH.
2. Batgina T.B., 2005. Embryology of Flowering Plants.Terminology and Concepts. Vol. 2.Seed.CRC Press.
3. Batgina T.B.2009. Embryology of Flowering Plants.Terminology and Concepts.Vol 3. Reproductive Systems.CRC Press.
4. Bhojwani S.S., Bhatnagar S.P., Dantu P.K., 2018. The Embryology of Angiosperms.6th Ed. Vikas Publishing House Pvt. Ltd.
5. Gerald Karp. 2013. Cell Biology. 7th ed. Wiley.
6. Janet Iwasa and Wallace Marshall. 2018. Karp's Cell Biology. 8th Global Ed. John Wiley& Sons.
7. Johri B.M., 2011. Embryology of Angiosperms. Springer Softcover Reprint of the Original 1984.1sted.
8. Maheswari, P. (Panchanan). 2015. An Introduction to the Embryology of Angiosperms. Scholar Select.
9. VirendraBatra. 2009. Plant Cell Biology. Oxford Book Company.
10. William V. Dashek., Marcia Harrison. 2006. Plant Cell Biology. 1st ed. CRC Press.

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SEMESTER – V
CORE PAPER – VI: MORPHOLOGY AND TAXONOMY OF ANGIOSPERMS
(5hrs / week)

Objectives:

- Understand the principles of systematics.
- Describe the distinctive features of selected families.
- Identify and preserve the plant species.
- Know the economic value of the plants in the cited families

UNIT – I

15 Hours

Modifications: Root, stem and leaf; Phyllotaxy - types; Inflorescence: Racemose, Cymose, Mixed and Special types. Description of floral parts; Fruit - types.

UNIT – II

15 Hours

Systems of classification of plants: Natural - Bentham and Hooker system Phylogenetic – Engler and Prantl's system - (with merits and demerits); APG - IV system of classification (outline only); Plant Nomenclature – Binomial Nomenclature and author citation, ICBN; Herbarium - techniques and importance.

UNIT – III

15 Hours

Detailed study of the following families and their economic importance: Nymphaeaceae, Anonaceae, Rutaceae, Caesalpiniaceae, Cucurbitaceae and Apiaceae.

UNIT – IV

15 Hours

Rubiaceae, Sapotaceae, Convolvulaceae, Asclepiadaceae and Lamiaceae.

UNIT – V

15 Hours

Amaranthaceae, Euphorbiaceae, Liliaceae, Arecaceae and Poaceae.

PRACTICAL:

1. Morphological identification of plant parts and their modifications.
2. Technical description of plant parts and dissection of floral parts of plants with reference to the families prescribed in the syllabus.
3. Field trips (minimum 2 days) to places under the guidance of teachers to study plants in their natural habitat and submit a report.
4. Identify and comment on the useful plant parts or plants prescribed in the syllabus.
5. Preparation and submission of 10 herbarium sheets.

Maintain a record book for external valuation

REFERENCES:

1. Ashok Bendre and Ashok Kumar (1984) –A Text Book of Practical Botany – Vol. II. Rastogi Publications, Shivaji Road, Meerut.
2. Davis P. H. and Heywood V.H. (1993) – Principles of Angiosperms Taxonomy
3. Lawrence, G.H.M (1953) – Taxonomy of Vascular Plants, Oxford & IBH Publishes, NewDelhi.
4. Mathews, K.M, (1987 – 90) –Flora of Tamil Nadu and Carnatic (1 –4 Vols.) Rapinat
5. Meerut. Naik, V. N. 2000. Taxonomy of Angiosperms. Tata McGraw – Hill Publishing Company Limited. New Delhi.
6. Narayanaswamy, R.V &Rao, K. N (1976) – Outlines of Botany, S. Viswanathan Printers & Publishers, Madras.
7. Singh, G. 2005. Plant Systematics – Theory and Practice.Oxford& IBH, New Delhi.
8. Singh, V & Singh, D.K (1983) – Taxonomy of Angiosperms, Rastogi Publications,
9. Vashista, P.C (1997) – Taxonomy of Angiosperms, S. Chand & Co., (P) Ltd., New Delhi.
10. Verma, V (1974) – A Text Book of Economic Botany, Emkay Publications, New Delhi.

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MSU / 2020 - 2021 UG – Colleges / Part - III (B.Sc. Botany)
SEMESTER – V
CORE PAPER – VII: BIOCHEMISTRY AND BIOINFORMATICS
(5hrs / week)

Objectives:

- To enable the students to understand
- The fundamentals of Biochemistry and Bioinformatics.
- The structure of various biomolecules.
- To develop skill in detection and estimation of biomolecules in plant tissue.
- To develop skill in e-mail and internet, Library Information system and Virtual Reality.
- To become aware of the importance of computer applications in life sciences.

UNIT – I **15 Hours**

Brief account of atom. Bonds - Ionic, Covalent and Hydrogen bonds. Principles and uses of pH meter, Colorimeter, Centrifuge and Chromatography.

UNIT – II **14 Hours**

Carbohydrates: Basic structure and properties of Monosaccharides - Glucose and Fructose
Disaccharides - Sucrose and Maltose. Polysaccharides - Cellulose and Starch.

UNIT – III **15 Hours**

Proteins: Primary, Secondary and Tertiary structure and properties of proteins. Lipids: Classification, Basic structure and properties of lipids.

UNIT – IV **15 Hours**

Enzymes: Classification, Nomenclature, Mechanism of enzyme action - Lock and Key hypothesis, Role of enzymes in food industry.

UNIT – V **18 Hours**

Introduction to Bioinformatics, Basic components of computer, Internet and Browsing websites. Virtual library, Online literature, Nucleic acid sequence data bases, Protein sequence data bases and Enzyme data bases.

PRACTICAL:

1. Measurement of pH of a solution using pH meter.
2. Determination of complementary colour.
3. Verification of Beer's Law.
4. Estimation of starch in plant tissues by colorimetry.
5. Estimation of proteins in plant tissues by colorimetry.
6. Separation of dyes from a mixture by Circular paper chromatography.

Spotters:

Instruments: pH meter, Colorimeter, Centrifuge, Keyboard, CPU and Pen drive.

Chemicals: Glucose, Sucrose, Starch.

Charts: Mechanism of Enzyme action - Lock and key model & Induced fit model.

To maintain a record notebook for external evaluation.

REFERENCES:

1. Conn. E.J. and Stumpf. P.K., 1987, outlines of Biochemistry, Wiley Eastern Ltd., Bombay.
2. Jain. J.L., 2001, Fundamentals of Biochemistry, S.Chand and Co., New Delhi.
3. Lehninger. A.L., 1987, Biochemistry, CBS Publishers, New Delhi.
4. Stryer, L., 1986, Biochemistry, CBS Publishers, New Delhi.
5. Attwood. T.K. and Parry. S., 1999, Introduction to Bioinformatics, Addison Wesley Longman Ltd.

MSU / 2020 - 2021 UG – Colleges / Part - III (B.Sc. Botany)
SEMESTER – V
Elective - I(A): PLANT ECOLOGY AND PHYTOGEOGRAPHY
(5hrs/week)

Preamble: To enable the students to understand biotic and abiotic factors in our ecosystem, to study the need of various ecosystems and vegetation. This course will enable the students to understand how environment influence the life of different organisms and vice versa.

UNIT – I **14 Hours**

Vegetation: Biotic and abiotic factors and their influence on vegetation, a brief account of microbes, plants, animals, soil, wind, light, temperature, rainfall and fire. Biogeochemical cycles – Nitrogen and Carbon.

UNIT – II **16Hours**

Ecosystem: Concept, processes and component: Types of ecosystems – Aquatic and Forest: Ecological Classification of Plants: Morphological, anatomical and physiological adaptations of plants with special reference to Hydrophytes and Xerophytes

UNIT – III **17Hours**

Autecology and Synecology: Definition (Species, Population, Community); Vegetation – Units of vegetation – Formation, Association, Consociation; Society – development of vegetation; Migration – ecesis, colonization; Methods of study of vegetation – Quadrat

UNIT – IV **15Hours**

Biomonitoring and Biodegradation: Xenobiotics using microbe, Types of Bioremediation – in situ and ex situ, phytoremediation, Biosensors and Bioindicators.

UNIT – V **13 Hours**

Phytogeography: Principles, continental drift and endemism. Vegetation in Tamil Nadu, Remote Sensing Climate and climatic regions of India

PRACTICAL:

1. Analysis of herbaceous vegetation by using quadrat and line transect method to find out frequency, density, abundance and interpret the vegetation in terms of Raunkiaer's frequency formula.
2. Morphological and anatomical adaptations of hydrophytes and xerophytes (each 2)
Hydrophytes: Hydrilla, Nymphaea; Xerophytes: Nerium, Casuarina
3. Continental drift, Remote sensing, Vegetation in Tamil Nadu.
4. Maintain a Record note book.

REFERENCE:

1. A Text book of plant Ecology. 15th Edition R.S. Ambasth & N.K. Ambasth. C.B.S Publishers & distributors Pvt. Ltd.
2. Daubenmier, R.F. (1970), Plants and Environmental. A text book of Plant Autoecology, Wiley Eastern Private Limited
3. Daubenmier, R.F. (1970), Plant Communities, Wiley Eastern Private Limited.
4. Odum, E. (2008). Ecology, Oxford and IBH Publisher.
5. Plant Ecology, E.D Schulze E. Beck, K. Muller – Hohenstein, Springer.
6. Sharma P.D (2010) Ecology and Environment, (8th Ed.) Rastogi Publications, Meerut.
7. Kormondy, E.J. (1996). Concepts of Ecology, Prentice Hall, U.S.A 4th edition.
8. Singh, J.S, Singh, S.P. and Gupta, S. (2006). Ecology Environment and Resource Conservation. Anaamaya Publications, New Delhi.
9. Wilkinson D.M (2007), Fundamental Processes in Ecology. An Earth System Approach Oxford.

MSU / 2020 - 2021 UG – Colleges / Part - III (B.Sc. Botany)
SEMESTER – V
ELECTIVE PAPER- I(B): MARINE BIOTECHNOLOGY
(5hrs / week)

Objectives:

- To enable the students to have a broad knowledge about the marine environment.
- Phytoplanktons and their importance in the sea.
- Economic importance of organisms in the marine environment.
- Value of SCP and mass cultivation of algae.
- Pollution aspects and conservation methods.

UNIT – I

13 Hours

Physical and Chemical properties of sea water, zonation, characteristics and adaptation of planktonic, benthic and pelagic life.

UNIT – II

16 Hours

Phytoplankton: characteristics, different groups, methods of floatation, algal bloom, toxins, Red tide, factors regulating phytoplankton, production and measurement, methods of collection and preservation.

UNIT – III

13 Hours

Marine flora and its potential role in research, antibiotics, vitamins, confectionaries, food, dyes and agar agar.

UNIT – IV

15 Hours

Laboratory and mass culture of algae, single cell protein - Spirulina, sea weed cultivation.

UNIT – V

18 Hours

Marine pollution: pollution due to heavy metals, radioactive wastes, thermal and oils, possible remedies - oil eating bacteria - GMO, conservation of coastal ecosystem with special reference to coral reefs and mangroves.

PRACTICAL:

1. Determination of pH.
2. Determination of acidity.
3. Determination of alkalinity.
4. Determination of salinity.
5. Measurement of dissolved O₂ content.
6. Collection and identification of phytoplanktons.

To maintain a record note book for external evaluation.

Reference:

1. Clark, R.B.2001, Marine Pollution, published by Oxford University Press, USA.
2. Sharma, B.K. and Kaur.H.1994, water pollution, Krishna Prakashasn Media, Meerut, U.P.
3. Sharma, B.K. and Kaur.H.1994, Thermal and radioactive pollution. Krishna Prakashasn Media, Meerut, U.P.

MSU / 2020 - 2021 UG – Colleges / Part – III (B.Sc. Botany)
SEMESTER - VI
CORE PAPER– VIII: GENETICS, EVOLUTION AND BIOSTATISTICS
(5 hrs / week)

Objectives:

- To learn the pattern of inheritance.
- To understand the mechanism of gene action.
- To learn the concept of Biostatistics.
- To become aware of the importance of statistical tools in life sciences.

UNIT – I

16 Hours

Mendel's laws of heredity with reference to Monohybrid and Dihybrid crosses. Test cross - Monohybrid and Dihybrid. Incomplete dominance - Monohybrid and Dihybrid. Lethal gene action in Maize and Mice.

UNIT – II

14 Hours

Interaction of genes; Supplementary genes, Complementary genes and Duplicate factors. Polygenic inheritance with reference to ear length in corn.

UNIT – III

15 Hours

Molecular structure of DNA, Replication of DNA - Semi conservative method, Proof for DNA as genetic material, Genetic code, Sex determination in plants.

UNIT – V

13 Hours

Evolutionary theories - Lamarckism, Darwinism, Mutation theory of Devries, Speciation.

UNIT – V

17 Hours

Collection and interpretation of data, Mean, Median, Mode, Standard deviation & Chi-square test.

PRACTICAL:

1. To work out simple genetic problem in Monohybrid, Dihybrid, Incomplete dominance, Lethal genes and Interaction of genes.
2. Using available data to find out the Mean and Standard deviation and to draw frequency curve / histogram.
3. To work out simple Chi-square problems.
4. To record variation: Intra / Inter specific.
5. Spotters: Models and Charts: DNA structure, Replication of DNA, use and disuse theory of Lamarck, Natural selection theory - Struggle for existence.

To maintain a record note book for external evaluation.

REFERENCES:

1. Gupta. P.K., 1991, Genetics, Rastogi Publications, Meerut.
2. Gupta. P.K., 2004, Cell and Molecular Biology, Rastogi Publications, Meerut.
3. John Jothi Prakash. E. and David Paulraj M., 2007, Genetics and Biostatistics, JPR Publications, Neyyor.
4. Verma. P.S. and Agarwal. V.L., 1991, Genetics, S.Chand and Co., NewDelhi.

MSU / 2020 - 2021 UG – Colleges / Part – III (B.Sc. Botany)
SEMESTER - VI
CORE PAPER -IX:PLANT PHYSIOLOGY
(5hrs / week)

Objectives:

- Understand the various functions of the plants.
- Know the mechanisms of the various activities.
- Relates the role of phytohormones on growth and development of plants.

UNIT – I

17 Hours

Water Relations: Imbibition, Diffusion, Osmosis and Plasmolysis; Water Potential- Definition, Components, Absorption of Water –Mechanism and Factors affecting Water Absorption; Transpiration- Definition, Types, Significance and Mechanism of Stomatal Transpiration- steps and theories, Guttation

UNIT – II

17 Hours

Ascent of Sap –Definition, Path of Ascent of Sap, Mechanism- Transpiration Pull and Cohesion Theory; Mineral nutrition: Macro and Micro nutrients - Absorption of Mineral Salts – Mechanism; Translocation of Organic Solutes: Mechanism - Munch's Mass flow hypothesis.

UNIT – III

17 Hours

Photosynthesis: Light and Dark Reactions - Photosynthetic Electron Transport Chain and Photophosphorylation (Cyclic and Non cyclic); Carbon Assimilation - C₃, and C₄ Pathways and its Significance; Respiration: Types, Glycolysis, Krebs's cycle and Oxidative Phosphorylation.

UNIT – IV

12 Hours

Growth Curve and phases of growth; Phytohormones: Physiological Effects and Practical applications - Auxin, Gibberellic acid, Cytokinin, Ethylene and Abscisic acid;

UNIT – V

12 Hours

Seed dormancy: Causes and Methods of breaking seed dormancy; Photoperiodism and Vernalization.

PRACTICAL:

1. Water Potential by Falling Drop Method.
2. Osmotic Potential by Plasmolytic Method.
3. Rate of Photosynthesis in Different Concentrations of Bi-Carbonate – Bubble Method.
4. Determination of Respiratory Quotient (R.Q) using Ganong's Respirometer.
5. Effect of Temperature on Permeability of Plasma Membrane.
6. Separation of Chlorophyll Pigments by Ascending Paper Chromatography.

DEMONSTRATION:

1. Tissue Tension; 2. Suction due to Transpiration; 3. Fermentation; 4. Arc Auxanometer; 5. Clinostat; 6. Phototropism

Spotters

1. Absorption Spectrum of Chlorophylls
2. Growth curve.
3. Growth hormone

Maintain a record note book for external valuation

REFERENCES:

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

MSU / 2020 - 2021 UG – Colleges / Part – III (B.Sc. Botany)
SEMESTER - VI
CORE PAPER- X: MICROBIOLOGY
(4 Hrs / Week)

Objectives:

- The paper aims to impart knowledge of bacteriology and virology including classification, structure, multiplication, transmission, foodborne pathogens, waterborne pathogens and microbial control.
- The paper aims to give the students broad theoretical knowledge in industrial microbiology and agricultural microbiology.

UNIT – I

12 Hours

Characteristic Features of Archaea, Bergey's Classification of Bacteria, Characteristic Features, Morphology, Cellular Structure, Metabolism, Growth and Reproduction, Bacterial Culture, and Staining. Characteristic Features of Actinomycetes, Rickettsia, and Mycoplasma, Characteristic Features of Cyanobacteria

UNIT – II

12 Hours

Baltimore Classification of Viruses, Characteristic Features of Viruses, Structure, Replication, and Transmission. ICTV Classification of Bacteriophages, Structure, and Replication. Detailed Study of CaMV and Coronavirus. Virus Related Agents: Viroids, Virusoids, and Prions

UNIT – III

12 Hours

Microbial Production of Acetic Acid, Amylase, Ethanol, Glutamic Acid, Insulin, Penicillin, and Vitamin B12, Vaccines Types, and Vaccination

UNIT – IV

12 Hours

Fermented Foods: Beer, Bread, Cheese, Yogurt, and Wine, Microbial Spoilage of Foods and Preservation Methods, Food Poisoning by Bacteria, Viruses and Protozoa and Prevention, Agents for Microbial Control

UNIT – V

12 Hours

Microbial Aerosols, Microflora of Soil and Water, Bacteriological Air and Water Analyses, Role of Microbes in Improving Soil Fertility, Role of Microbes in Biological Nitrogen Fixation, Microbial Phosphorus Solubilization.

PRACTICAL

1. Sterilization by Moist Heat – Autoclave/ Pressure Cooker
2. Sterilization by Dry Heat - Hot Air Oven
3. Preparation of Nutrient Agar Medium
4. Preparation of Serial Dilutions
5. Plating Methods: Pour Plate, Spread Plate, and Streak Plate
6. Isolation of microbes from soil and water
7. Simple Staining
8. Gram's Staining
9. Hanging Drop Method to Test Bacterial Motility
10. Methylene Blue Reduction Test to Determine the Quality of milk Sample

Identification of Lab-ware and Equipment

1. Autoclave
2. Pressure Cooker
3. Hot Air Oven
4. Incubator
5. Cavity Slide
6. Micropipette
7. Inoculation Loop
8. L-rod
9. Petri plate
10. Nutrient Agar Plate
11. Nutrient Agar Slant
12. Microscopic Images of Bacteria, Cyanobacteria, Fungi, and Viruses
13. Spoiled Foods and Preserved Foods

REFERENCE

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3. Baveja C.P. 2021. Textbook of Microbiology. 6th Ed. Arya Publications
4. Dubey R.C and Maheshwari D.K. 2010. Textbook of Microbiology. S.Chand and Company Ltd.
5. L E Casida, J.R. 2019. Industrial Microbiology. 2nd Ed. New Age International Publishers.
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9. William C Frazier and Dennis C Westhoff. 2017. Food Microbiology. McGraw Hill Education.

MSU / 2020 - 2021 UG – Colleges / Part – III (B.Sc. Botany)
SEMESTER - VI
ELECTIVE PAPER - I(A): HORTICULTURE & PLANT BREEDING
(4hrs/week)

Objectives:

- Develop skills in horticultural practices and techniques.
- Learn to construct kitchen garden and ornamental gardens.
- Gain a knowledge of the techniques of producing desirable plants through hybridization

UNIT – I

12 Hours

Scope, importance and divisions of horticulture; Gardening: Definition and objectives – different types of gardening – Formal, informal and kitchen garden.

UNIT – II

14 Hours

Propagation methods: Cutting – root, stem and leaf; Layering – ground and air layering, grafting – tongue and approach grafting; Budding – T budding and Patch budding; Vegetative propagules - bulb, sucker, corm. Seed Propagation: Preparation of Nursery beds, Transplantation – steps and Methods.

UNIT – III

12 Hours

Garden components: Lawn, Hedges, Edges, Rockery, Topiary, water garden, Bonsai and Hanging basket. Garden implements - spade, water can, pruning scissors, digging fork

UNIT – IV

11 Hours

Nature, Scope and Objectives of Plant Breeding; Plant introduction - selection methods (pure line and mass), Hybridization techniques, Heterosis breeding, Interspecific and intergeneric hybridization.

UNIT – V

11 Hours

Mutation Breeding: Procedure and practices, Mutagens, Polyploidy breeding and its applications. Breeding for disease resistance.

PRACTICALS:

- i. Vegetative methods of propagation.
 - a. Cutting-Stem and Leaf cutting
 - b. Layering-Simple and air layering.
 - c. Grafting - Tongue grafting.
 - d. Budding - T-budding.
- ii. Garden components -Rockery, hanging baskets, and topiary.
- iii. Garden implements - spade, water can, pruning scissors, digging fork
- iv. Designing Kitchen Garden.
- v. Plant Breeding: Emasculation and Bagging methods.

Maintain a record note book for external valuation.

References:

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. Naya Prakash, Calcutta.
3. Chopra, V.L. (1989). Plant Breeding. Oxford IBH, New Delhi.
4. Kumar, N. (1997). Introduction to Horticulture. Rajalakshmi Publication, India.
Manibhushan Rao, K. (1991). Text Book of Horticulture. MacMillan Publications, New Delhi.
5. Mukherjee, D. (1972). Gardening in India. Oxford & IBH Publishing Co., Kolkatta, Mumbai, New Delhi.
6. Roy Choudhry, N. and Mishra, H.P. (2001). Text book on Floriculture and Landscaping. Raja Info Tech Enterprise, India.
7. Sharma, J.R. (1994). Principles and Practice of Plant Breeding. Tata McGraw Hill, New Delhi.

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SEMESTER - VI
ELECTIVE PAPER - I(B): FORESTRY
(4hrs/week)

Objectives:

1. To aware the knowledge of Forest
2. To learn about forest, forest Products and utilization and valuable Forest Products.

UNIT – I

12 Hours

Forests - Introduction, physiography, vegetation, Forest types, Role of forests-distribution and classification. (Champion and Seth's Classification) Forest as balanced ecosystem, status of Indian Forests-Indian Forest policy.

UNIT – II

10 Hours

Forest degradation – Damage caused by fire, climatic factors, and injuries by insects, plants, animals and diseases, activities of man including encroachment and shifting cultivation.

UNIT – III

12 Hours

Forest management and Conservation-Regeneration Tending Operations – Sustainable utilization forest resources – Forest organizations. Role of remote Sensing in Forest management.

UNIT – IV

12 Hours

Agro Forestry – objectives – advantages and disadvantages. Recreational forestry – role of botanical gardens, zoos, National Parks and sanctuaries.

UNIT – V

12 Hours

Forest utilization – Harvesting, conservation, storage and Disposal of wood in Forest; major and minor Forest Products; Forest based Industries_ Paper and pulp industry; resin tapping and turpentine manufacture; Forest education in India.

PRACTICAL

1. Identify and find out the uses of wood samples of common timbers
2. Prepare maps showing forest types in India and Tamil Nadu.
3. Collect and study the remote sensing images showing forest vegetation in India and Tamil Nadu.
4. Prepare Photographs of different forest types.
5. Study the commonly used important forest Products.

To maintain a Record for external valuation.

REFERENCES

1. Agarwal – Forest in India
2. Bore, N.C – Manual of Indian Forest Botany
3. DWivedi, A.P – Forestry in India.
4. Sagreiya, K.P – Forest and Forestry
5. TribhawanMetha- A Hand book of Forest utilization.

**MSU / 2020 - 2021 UG – Colleges / Part – III (B.Sc. Botany)
SEMESTER - VI**

**Elective Paper- II(A): PLANT BIOTECHNOLOGY AND GENETIC ENGINEERING
(4hrs/week)**

Objectives:

This paper helps the students to understand the totipotency of the cells and the tissue culture techniques, to learn the fundamental principles in gene cloning, various methods of gene transfer, screening and the use of vectors in gene transfer technology for the desired characteristics.

UNIT – I

14 Hours

Tissue culture: Introduction, definition, history, scope and importance of plant tissue culture, Totipotency of cells, Tissue culture laboratory - organization and requirements, sterilization techniques, Nutrient media-composition and preparation. Apical meristem culture, callus culture, Embryo culture, Anther culture.

UNIT – II

15 Hours

Protoplast culture: Protoplast isolation, culture and fusion, selection of hybrids and regeneration. Cybrids- production and applications. Artificial Seed - production, advantages and disadvantages. Tissue culture application including micropropagation, androgenesis, production of virus free plants, Secondary metabolite production, germplasm conservation, cryopreservation and usages.

UNIT – III

15 Hours

Enzymes and Vectors for Genetic Manipulations: Restriction endonuclease - types, biological role, mechanism and usage in cloning; Restriction Mapping - linear and circular; Ligase enzymes. Cloning vectors -basic sequence of any vector; types of bacterial vector - Ti plasmid, pBR 322, BAC; Viral vector - Lambda page, phagemid, cosmid and Yeast vector.

UNIT – IV

16 Hours

Gene Cloning and Methods of Gene transfer: Basic concept of Gene cloning, advantages of gene cloning, bacterial transformation methods and selection of recombinant clones using various strategies, PCR-mediated gene cloning; Gene Construct; Plant transformation vector, T-DNA and viral vector, Agrobacterium-mediated Transformation protocols, molecular mechanism of T-DNA transfer, direct gene transfer method by Electroporation, Microinjection, Microprojectile bombardment.

UNIT – V

15 Hours

Major concerns and Applications of Transgenic Technology: Transgenic technology and sustainable agriculture, Biosafety concerns with transgenic technology. Applications as Pest resistant (BT-cotton); herbicide resistant plants (Roundup Ready Soybean); Transgenic crops with improved quality traits in major crops (FlavrSavr tomato, Golden rice); Improved horticultural varieties (Moondust carnations); Role of transgenics in bioremediation (Superbug)

PRACTICAL: Spotters/ Photographs

1. Callus culture from Carrot explant, apical meristem culture, embryo culture and anther culture
 2. Protoplast Isolation
 3. Plasmids-Ti plasmids
 4. Gene cloning in E. coli
 5. Agrobacterium mediated gene transfer
 6. Direct gene transfer by electroporation, microinjection, microprojectile bombardment
 7. Transgenic plants prescribed in the syllabus.
- To maintain a record

REFERENCES

1. Bhojwani, S.S. and Razdan, M.K., (1996). Plant Tissue Culture: Theory and Practice. Elsevier Science Amsterdam. The Netherlands.
2. Chrispeels, M.J. and S Adava, D.E. (1994). Plants, Genes and Agriculture. Jones & Barlett Publishers.
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5. Slater A., N.W.Scott and M.R. Fowler (2008). Plant Biotechnology. Second Edition. Oxford.
6. Snustad, D.P. and Simmons, M.J. (2010). Principles of Genetics. John Wiley and Sons, U.K.
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SEMESTER - VI
ELECTIVE PAPER- II(B): ENVIRONMENTAL BIOTECHNOLOGY
(4hrs / week)

Objectives:

- To enable the students to understand and how to tackling environmental problems.
- To enable the students to understand the morphological, anatomical and physiological adaptations of hydrophytes, xerophytes and halophytes.
- To develop skills in identification of different forest types of Tamil Nadu.

UNIT – I

13 Hours

Aims and scope of environmental biotechnology. Environmental spheres - Hydrosphere, Geosphere, Biosphere and Anthrosphere. Pollution measurement - Biotechnological methods for measurement of pollution. Role of Biosensors in pollution monitoring.

UNIT – II

14 Hours

Biofuels: Biogas - production of biogas, uses of biogas, Hydrogen production - microbial production of hydrogen, uses of hydrogen Petroleum plants: *Calotropisprocera*, *Euphorbia tirucalli*, *Jatropha curcas*.

UNIT – III

10 Hours

Sewage treatment - Primary, secondary and tertiary treatment, water recycling, soil conservation and restoration. Sustainable agricultural management.

UNIT – IV

12 Hours

Solid waste treatment and disposal, Biodegradation of hydrocarbons, pesticides and herbicides. Bioremediation: Types of Bioremediation, Genetically Engineered microorganisms in Bioremediation. Phytoremediation, Biosensors.

UNIT – V

11 Hours

Greenhouse effect, Global warming, Ozone depletion and Acid rain - Causes, effects and control measures. Remote sensing and its applications in ecology.

PRACTICAL:

Photographs / model: Biogas plant, Biosensor, Sewage treatment, Acid rain, and Greenhouse effect.

Spotters: Petro plants, *Calotropisprocera*, *Euphorbia tirucalli* and *Jatropha curcas*

To maintain a record note book for external evaluation.

REFERENCES

1. Mishra. D.D.2008. Fundamental concepts in Environmental Studies. S. Chand and Company Ltd., New Delhi.
2. Saha. T.K. 2008. Ecology and Environmental Biology. Books and Allied (P) Ltd., Kolkatta.
3. Shukla. R.S., and Chandel. P.S. 2007. A text book of plant Ecology,S. Chand and Company Ltd., New Delhi.
4. Singh. H.R. Environmental Biology. S. Chand and Company Ltd, New Delhi.
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