

**MANONMANIAM SUNDARANAR UNIVERSITY
TIRUNELVELI**

UG COURSES – AFFILIATED COLLEGES

B.Sc. Plant Biology & Plant Biotechnology

(Choice Based Credit System)

(with effect from the academic year 2016-2017 onwards)

(44th SCAA meeting held on 30.05.2016)

V	I	33	Core - 7	Morphology and Taxonomy of Angiosperms	4	4	25	75	100	30	40
	II	34	Core – 8	Biochemistry & Biophysics	4	4	25	75	100	30	40
	III	35	Elective – 1 (Select any one)	A)Biotechnology & Genetic Engineering B) Biodiversity & Climate Change	5	5	25	75	100	30	40
		36	Elective – 2 (Select any one)	A)Horticulture and Plant Breeding B) Forestry	5	5	25	75	100	30	40
		37	Practical -5	Core – 7 Practical	3	-	Practical exams in the even semester				
		38	Practical – 6	Core -8 Practical	3	-	Practical exams in the even semester				
		39	Practical – 7	Elective 1 & 2 (Practical)	2	-	Practical exams in the even semester				
	IV	40	Skill Based subject (Common)	Personality Development/ Effective Communication / Youth Leadership	4	4	25	75	100	30	40
				Subtotal	30	22					

VI	I	41	Core - 9	Plant Physiology	6	4	25	75	100	30	40
	II	42	Core – 10	Genetics, Evolution & Biostatistics	6	4	25	75	100	30	40
	III	43	Core - 11	Plant Ecology & Phytogeography	5	4	25	75	100	30	40
		44	Elective - 3	A) Marine Biotechnology B) Environmental Biotechnology	5	5	25	75	100	30	40
		45	Practical -5	Morphology of Angiosperms, Taxonomy, Elective I & II	3	4	50	50	100	20	40
		46	Practical -6	Biochemistry, Biophysics, Plant Ecology and Phytogeography	3	4	50	50	100	20	40
		47	Practical - 7	Plant Physiology, Genetics, Evolution and Biostatistics and Elective - III	2	4	50	50	100	20	40
					Subtotal	30	29				

MORPHOLOGY AND TAXONOMY OF ANGIOSPERMS

Unit I

Morphology – Modification of Root, Stem and Leaf. Leaf - Simple, Compound; Phyllotaxy; Inflorescence- Types; Flower - Floral parts; Fruits –Types.

Unit II

Principles of Taxonomic Hierarchy (Order, Family, Genus and Species Level). Systems of Classification (with merits and demerits) - Natural- Bentham and Hooker system, Phylogenetic – Engler and Prantl System; Binomial Nomenclature - ICBN, Dichotomous Key, Preparation, Maintenance and Significance of Herbarium.

Unit III

Critical study of the following Families and their Economic importance: Annonaceae, Sterculiaceae, Rutaceae, Caesalpiniaceae, Cucurbitaceae, Apiaceae, Rubiaceae, Sapotaceae.

Unit IV

Convolvulaceae, Asclepiadaceae, Apocynaceae, Lamiaceae, Euphorbiaceae, Amaranthaceae, Liliaceae, Cannaceae and Poaceae.

Unit V

Binomial, Family, Useful Part and Uses of the Following Plant Products: Fibres- Jute, Cotton and Hemp; Timber- Teak, Rosewood and Neem; Resin - Camphor and Canada balsam ; Cosmetics – *Aloe*, Sandalwood and Turmeric; Beverages – Tea, Coffee and *Cocoa*; Oil – Coconut oil, *Eucalyptus* oil and *Pongamia* oil; Fruits & Vegetables- Banana, Jackfruit, Pineapple; Medicinal plants - *Adhatoda*, Clove and *Acorus calamus*.

Practical

1. Morphological identification of plant parts and their modifications.
2. Technical description of plant parts with reference to the families prescribed in the syllabus.
3. Dissection of floral parts of plant belongs to the families prescribed in the syllabus.
4. Field trips (minimum of 2 days) to places under the guidance of teachers to study plants in their natural habitat and submit a report.
5. Preparation of dichotomous key.
6. Identify and comment on the useful plant parts and plant products prescribed in the syllabus.
7. Preparation and submission of 10 herbarium and photographs of any four rare/endangered plants belong to the families prescribed in the syllabus.

References:

1. Datta S. C. Systematic Botany, 4th Ed, Wiley Estern Ltd., New Delhi, 1988.
2. Eames A. J. Morphology of Angiosperms - McGraw Hill, New York.
3. Jain. S. K. 1981. Glimpses of Indian Economic Botany. Oxford.
4. Jeffrey C .J. and A.Churchil - An introduction to Taxonomy – London.
5. Lawrence - Taxonomy of Vascular Plants - Oxford & I B H, New Delhi.
6. Naik V.N., Taxonomy of Angiosperms, 1991. Tata McGraw-Hill Pub.Co. Ltd., New Delhi.
7. Pandey, S. N, and S.P. Misra (2008)-Taxonomy of Angiosperms.
8. Radford A B, W C Dickison, J M Massey & C R Bell, Vascular Plant Systematics, 1974, Harper & Row Publishers, New York.
10. Singh V. & Jain - Taxonomy of Angiosperms - Rastrogi Pub., Meerut.
11. Singh G.1999. Plant systematics: Theory and Practice. Oxford and IBH, pvt. Ltd. New Delhi.
12. Sivarajan V. V - Introduction to Principles of taxonomy - Oxford &I B H New Delhi.
13. Takhtajan - Flowering Plants - Edinburg, Oliver & Boyd.
14. Venkateswaralu, V. - Morphology of Angiosperms - Chand & Co.

BIOCHEMISTRY & BIOPHYSICS

Unit I

Biomolecules: Carbohydrates- structure, Occurrence, and Biological Importance of Monosaccharides – Glucose and fructose; Disaccharides – Sucrose and Lactose; Polysaccharides – Starch and Cellulose.

Unit II

Aminoacids – Classification, Essential & Non-Essential Aminoacids – Sources, Structure, Chemical Reactions & Properties. Proteins – Classification, Properties– Solubility, Denaturation, Renaturation, Structural Organization of Proteins -Primary, Secondary, Tertiary and Quaternary Structure and Properties of Proteins, Monomeric and Oligomeric Proteins (Myoglobin and Hemoglobin), Conjugated Proteins – Glycoproteins and Lipoproteins.

Unit III

Lipids– Definition, Classification, Structure, Properties & Biological Significance; Fatty Acids - Saturated and Unsaturated Fatty acids; Simple Lipids - Fats & Oil; Compound Lipids - Phospholipids – Lecithin, Cephalin, Sphingomyelins; Derived Lipids –Ergosterol, Terpenes – Carotenoids, Rubber; Enzymes: General Classification, Nomenclature, Mechanism of Enzyme Action; Enzyme Inhibitors-Competitive, Non-Competitive; Enzyme Immobilization; Application of enzymes in Industry and Medicine.

Unit IV

Techniques in Biochemistry- pH metry, Colorimetry, Centrifugation and Chromatography – Paper Chromatography, Thin Layer Chromatography and Ion Exchange Chromatography.

Unit V

Bioinformatics – An Overview, Definition & History; Scope and Application of Bioinformatics ; Major Biological Databases – Nucleic Acid Sequence Databases – EMBL, Genbank; Protein Sequence Database – SWISS-PROT; Databases Similarity Search Tools – BLASTA, FASTA; Database Retrieval Tools – ENTREZ - Locus Link - Pubmed (Publishers on Medicine).

PRACTICALS

1. Preparation of Buffer.
2. Titration of Weak Acid – Acetic Acid against Strong Base
3. Determination of Complementary Color.
4. Verification of Beer's Law.

5. Estimation of Starch in Plant Tissues by Colorimetry-Lugol's Iodine Method.
6. Estimation of Sugar in Plant Tissues by Colorimetry – Anthrone Reagent Method.
7. Separation of Dyes from a mixture by Circular Paper Chromatography.
8. Qualitative Tests (Demonstration Only) for Carbohydrates and Proteins.
9. Spotters:
 - a. Instruments: pH meter, Electrodes of pH meter, Colorimeter, Centrifuge, Chromatogram.
 - b. Chemicals: Chemical Structure to be given for Glucose, Fructose, Sucrose, Cellulose, Starch, Protein (Primary and Secondary Structure).
 - c. Models / Charts:
 - Lock and Key Model of Enzyme Action
 - Induced Fit Model of Enzyme Action.
 - Enzyme inhibition – Competitive and Non-Competitive.
10. Maintain the Record Note for External and Internal Evaluation.

References

1. Conn & Stumph – Outlines of Biochemistry
2. Denise R. Ferrier, 2014. Lippincott's Illustrated Reviews: Biochemistry Published by Wolters Kluwer (India) Pvt. Ltd, New Delhi.
3. Ghosal, S. and Srivastava, A.K. 2015. Fundamentals of Bioanalytical Techniques and Instrumentation, PHI Learning Pvt. Ltd., New Delhi.
4. Jain J.L. Sanjay Jain & Nitin Jain 2005. Fundamentals of Biochemistry. S. Chand & Company Ltd, New Delhi.
5. Lehninger A.L. 1987. Biochemistry, CBS Publishers, New Delhi.
6. Nelson, D.L. and Cox, M.M. 1993. Principles of Biochemistry. MacMillan Worth Publications.
7. Plumme, D.T. 1988. An Introduction to Practical Biochemistry, Tata McGraw- Hill Publishing Company, New Delhi.
8. Sadasivam.S & Manickam, A. 1996. Biochemical Methods. New Age International (P) Ltd. New Delhi.
9. Vasudevan D.M. 2007. Textbook of Biochemistry for Medical Students. Jaypee Brothers Medical Publishers (P) Ltd.

Biotechnology and Genetic engineering

Unit1

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.

Unit 11

Types of tissue culture- Callus culture, apical meristem culture; Protoplast isolation, fusion, selection of hybrids and regeneration; Cybrids – production and applications, Artificial seed production – advantages and disadvantages.

Unit 111

Techniques of genetic engineering: Isolation of specific genes, enzymes used in gene cloning, Cloning Vectors - Plasmids, Cosmids, Phagemids; cDNA Libraries; Agrobacterium mediated gene transfer in plants; Ti plasmids.

Unit 1V

Methods of direct gene transfer: PEG stimulated, Microinjection and Macro infection, Electroporation, Ultrasonification, Liposome mediated Particle bombardment gun method, GM plants - Bt Brinjal, Bt Cotton, Golden rice. Bioethical issues.

Unit V

Hybridization techniques: Southern, Northern and Western Blotting, Identification of recombinants using selective medium and reporter genes, Colony hybridization.

Practicals:

Spotters/Photographs

- i. Callus culture from Carrot Explant.
- ii. Protoplast Isolation.
- iii. Plasmids – Ti plasmids
- iv. Gene cloning in E. Coli.
- v. Agrobacterium mediated gene transfer.
- vi. Blotting Techniques.
- vii. Colony Hybridization technique.
- viii. Transgenic Plants prescribed in the syllabus.

BIODIVERSITY AND CLIMATE CHANGE

Subject Code: JMPB5B

5hrs/week

Unit I

Types- Genetic, species and ecosystem diversity; global biodiversity.Plant diversity- crop plants and their relatives, trees and forests.Genetic Diversity- Plant genetic resources, mega-centres of origin of genetic diversity.World's major plant gene banks.

Unit II

Endangered flora- their identification and documentation- Red Data Book.Conservation strategies; *In situ* approach, biosphere reserves, reserve forests, parks and sanctuaries.*Ex situ* approach: Gene bank, seed bank and cryopreservation. International organizations in conservation- IUCN, IBPGR, WWF, UNEP and FAO.

Unit III

Components of the atmosphere, the greenhouse gases and green house effect, global warming and climate change, consequences and evidence of climate change. Greenhouse gas emissions and the causes- electricity generation, transport. Burning fossil fuels, deforestation.

Unit IV

CO₂capture and storage methods: Geological storage, Ocean storage, Mineral storage and Leakage. CO₂ reuse mechanisms- CO₂- Methanol, CO₂- hydrocarbons and CO₂.CO hydrocarbons. CCS projects.

Unit V

Climate change adaptation and mitigation: Strategies for emission reduction- Alternative energy sources and Energy efficiency and conservation. Kyoto protocol, Bali Action Plan- IET, CDMs and JI.Carbon credits and carbon economics, carbon footprints; UNFCC and IPCC, climate change conference- Copenhagen and Mexico.

Practicals

Prepare maps showing forest types in India and Tamil Nadu.

Collect and study the remote sensing images showing forest vegetation in India and Tamil Nadu.

Photographs of three local endangered plants.

HORTICULTURE & PLANT BREEDING

UNIT - I

Scope and Branches of Horticulture –Nursery– Preparation and Layout; Seed Bed; Transplantation; Organic manures; Fertilizers; Irrigation; Plant Protection Measures; Growth Regulators in Horticulture.

Unit – II

Garden and Gardening- Vegetative Propagation – Cuttage – Stem, Leaf and Root Cuttings; Layerage – Simple, Compound and Air Layering; Graftage–Tongueand Approach Grafting; Budding – “T” Budding and Patch Budding; Advantagesand Disadvantages of Vegetative Propagation;Garden Components – Hedge, Edge, Flower Beds, Arches, Rockery, Lawn, Topiary, Bonsai,Water Garden; Types of Gardens - Indoor Garden – Hanging Baskets, Terrarium, Bottle Garden; Kitchen Garden – Establishment of Kitchen Garden and its importance.

UNIT - III

Production technology - Cultivation of Vegetables - Brinjal, Tomato and Onion; Cultivationof Fruits - Banana, Mango and Apple; Cultivation of Plantation Crops - Tea, Cardamom and Coffee; Cultivation of Medicinal Plants - Periwinkle, Sarpagandha and Pepper.

UNIT – IV

Nature and Scope of Plant Breeding; Objectives; Selection Methods – Pure Line and Mass Selection. Hybridization and Hybridization Techniques – Emasculation – Bagging, Crossing, Labelling and Harvesting of Hybrid Seeds and Raising F₁Generation.

UNIT V

Plant Breeding: Production of New Varieties; Breeding for Disease Resistance, Mutation Breeding – Physical and Chemical Mutagens; Procedure and Practices of Mutation Breeding.

Practical

Demonstration/Photograph

1. Preparation of Nursery and Seed Bed.
2. Vegetative Propagation – Stem, Leaf and Root Cuttings; Air Layering, Budding and Grafting Techniques.
3. Designing Kitchen Garden and Ornamental Garden.
4. Garden Components – Rockery, Hanging Basket, Topiary, Bonsai and Water Garden.
5. Plant Breeding: Emasculation and Bagging methods.
6. Visit to Public Gardens, Agricultural and Horticultural Research and Plant Breeding Centres.
7. Maintain a Record Notebook for Internal and External Evaluation.

REFERENCES

1. Bhattacharya. S K. Vistas in Horticulture, Gene Tech Books., New Delhi.
2. Bose, T.K. and Mukherjee, D. 1982. Gardening in India, Oxford and IBH Publishing Co., New Delhi.
3. Chatopadhyaya, S. K. Commercial Floriculture. Gene Tech Books, New Delhi.
4. Chaudhury, Vegetables –Narosa Pub., NewDelhi.
5. Chaudhary, R.C. 1984. Plant Breeding Published by Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
6. Chaudhary, H.K. 2000. . Plant Breeding Published by Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi. Gelhot. D. Organic Farming JV Publi. House., Jodhpur.
7. Kumar N. 2010. An introduction to Horticulture, Narosa Pub., New Delhi.
8. Mandal R. C. Weed control, J V Publi. House.,Jodhpur
9. ManibhusanRao, 2005. Horticulture, Macmillan India Ltd., New Delhi.
10. Mohanan, K.V. 2010. Essentials of Plant breeding. PHI Learning Pvt. Ltd., New Delhi.
11. Sharma, J.K. 1984. Principles and Practices of Plant Breeding, Tata McGraw Hill Publishing Co. Ltd., New Delhi.
12. Singh, B.D. 1999. Textbook of Plant Breeding , Kalyani Publishers, New Delhi.
13. Trivedi, P. Home Gardening, Narosa Pub., New Delhi.

Elective –II (B)

FORESTRY

UNIT-1

Forest – Definition – Scope – Classification - Importance/Functions of forest. Forest as a Balanced Eco system, Types and Distribution of Forest with reference to India(Champion and Seths- Classification)

UNIT II

Forest Degradation- Damage caused by Fire, Climatic Factors and Injuries by Insects, Plants, Animals and Diseases, activities of Man including Encroachment and Shifting Cultivation; Measures to Protect the Forest Damage caused by various Factors.

UNIT III

Forest Management and Conservation – Regeneration- Tending Operations, Sustainable Utilization of Forest Resources - Forest Organization, Role of Remote Sensing in Forest Management.

UNIT IV

Agroforestry – Objectives- Advantages and Disadvantages- Energy Plantation; Recreational Forestry- Role of Botanical Gardens, Zoos, National Parks and Sanctuaries in Conservation of Wild life.

UNIT V

Forest Utilization – 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.

DEMONSTRATION

1. Identify and find out the uses of wood samples of common timbers.
2. Prepare maps showing forest types in India and Tamilnadu.
3. Prepare photographs of different forest types and nature of forest degradation.
4. Study of commonly used forest products.

REFERENCES

1. Benu Singh, 2010. A modern book on Forestry and horticulture, Vista Interanational Publications, India.
2. Jerram, M. R. K. 1983. A Book on Forest Management; Periodical Expert Book Agency, Delhi.
3. Johnston, D.R., Grayson, AJ and Bradley, R T 1978. Forest planning, Natraj Publishers, Dehradun.
4. Nagi, S. S. 1980. Indian Journal of Forestry Series I to X.
5. Pathi G S. 1982; Forestry in India. Published by R P S Book distributors, Dehradun.
6. Richard P Tucker, 2011. A Forest History of India. Sage Publications, India.
7. Sharma L C. 1980. Forest economic planning and management. Bishen Singh publications, Dehradun.
8. Tribhavan Mehta, 1981, A Hand book of forest utilization. International Book Distributers, Dehradun.

PLANT PHYSIOLOGY

UNIT I

Water Relations of Plants – Imbibition, Diffusion and Osmosis ; Water Potential- Definition, Components, Measurement and Relation of Water Potential; Absorption of Water – Mechanism and Factors affecting Water Absorption; Transpiration - Definition, Types, Significance and Mechanism of Stomatal Transpiration.

UNIT II

Ascent of Sap –Definition, Path of Ascent of Sap, Mechanism- Transpiration Pull and Cohesion of Water Theory. Mineral nutrition - Macro and Micro Nutrients-Absorption of Mineral Salts – Mechanism; Translocation of Organic Solutes - Mechanism of Phloem Transport.

UNIT III

Mechanism of Light and Dark Reactions - Photosynthetic Electron Transport Chain and Photophosphorylation- Carbon Assimilation: C₃, C₄ and CAM Pathways- Photorespiration and its Significance. Respiration: Glycolysis and TCA cycle – Oxidative Phosphorylation.

UNIT IV

Growth and Development –Growth Curves-Phases; Physiological Effect and Practical Application of the Following Phytohormones: Auxin, Gibberellic acid, Cytokinin, Ethylene, Abscisic acid. Photoperiodism and Vernalization.

UNIT V

Seed Dormancy- Causes and Methods of Breaking Dormancy. Stress Physiology - Classification– Biotic and Abiotic, Stress Factors- Response of Plants to Salt, Drought, Frost, Heat.

PRACTICALS

1. Water Potential by Gravimetric Method.
2. Water Potential by Falling Drop Method.
3. Osmotic Potential by Plasmolytic Method.
4. Quantitative Estimation of Total Chlorophyll Content in Leaves.
5. Quantitative Estimation of Carotenoid Content in Flowers.
6. Rate of Photosynthesis in Different Concentrations of Bi-Carbonate – Bubble Method.

7. Measurement of Stomatal Index.
8. Effect of Temperature on Permeability of Plasma Membrane.
9. Separation of Chlorophyll Pigments by Ascending Paper Chromatography.

DEMONSTRATION:

1. Tissue Tension
2. Suction due to Transpiration
3. Ganong's Photometer
4. Fermentation
5. Arc Auxanometer
6. Clinostat
7. Phototropism

Spotters

1. Absorption Spectrum of Chlorophylls
2. Growth curve.

REFERENCES:

1. Devlin and Withan (1986), Plant physiology, CBS Publishers and distributors., Delhi.
2. De Robertis, E.D.P, De. Robertis ,D.M.P (1980) Cell and Molecular Biology, Saunders college; Philadelphia.
3. Frank .B, Salisbury F.B. And Cleon W Ross., Plant physiology, Published by Jain for CBS Publishers and distributors, BholaNath Nagar, Delhi.
4. Jain, V.K. (2006) Fundamental of Plant physiology, S.Chand & Company Ltd., New Delhi.
5. Noggle and Fritz (2002) Introductory plant physiology, Prentice Hall of India, Pvt.Ltd., New Delhi.
6. Pandey, K.K. and Sinha, B.K. (1988) Plant physiology, Vikas Publications, New Delhi.
7. Subhash Chandra Datta, (1994) Plant Physiology, Wiley Eastern Ltd., New Age International Ltd, New Delhi.
8. Taiz&Zeiger (2006) Modern Plant Physiology, Sinauer Publishers.
9. Verma, P.S and Agarwal, V.K. (2004) Cell biology, S. Chand and company ltd., New Delhi.

GENETICS, EVOLUTION AND BIOSTATISTICS

Subject code: JMPB62

6hrs/week

Unit-I

Monohybrid and dihybrid cross, test cross, back cross, Mendel's laws, Deviation from Mendelian ratio – incomplete dominance, lethal factor, complementary factor, supplementary factor, duplicate and inhibitory. Polygenic inheritance- Inheritance of Wheat Kernel and ear length in Maize.

Unit-II

Linkage - crossing over and recombination. Sex determination in plants. Extra nuclear inheritance - male sterility in corn; Population genetics - Hardy – Weinberg's principles, factors affecting.

Unit-III

Watson and Crick model of DNA, DNA as genetic material, DNA replication, Genetic code, Gene regulation in prokaryotes, Operon Concept, *Lac* Operon.

Unit-IV

Origin of life – chemosynthetic theory – evidences (any five). Evolution: Evolutionary theories of Lamarck, Darwin, De Vries, Modern synthetic theory of evolution. Speciation – concept of species- Allopatric and Sympatric; Isolation mechanisms.

Unit-V:

Collection and interpretation of data. Measures of central tendencies: Mean, Mode and Median. Measures of dispersion: Standard Deviation, Chi-square test.

Practicals :

1. Simple genetic problems in monohybrid crosses, incomplete dominance and lethal genes.
2. Simple problems on dihybrid ratio and interaction of factors.
3. Using available data, calculate the Mean and Standard deviation.
4. Spotters:
 - Linkage and Crossing over
 - DNA model/ Photograph
5. Spotters pertaining to the syllabus- Evolution (Origin of life, Speciation).
5. To maintain an observation note book for external valuation.

PLANT ECOLOGY AND PHYTOGEOGRAPHY

UNIT – I

Biotic and abiotic factors and their influence on vegetation- a brief account of microbes, plants, animals, soil, wind, light, temperature, rainfall and fire. Bio geo chemical cycles (Nitrogen and Carbon).

UNIT – II

Ecosystem- Concept, processes and components. Food chain and food web, ecological pyramids. Types of ecosystems – Pond and grass land. Ecological Classification of Plants, Morphological, anatomical and physiological adaptations of plants with special reference to Hydrophytes and Xerophytes.

UNIT – III

Autecology and Synecology- Vegetation – Units of vegetation- Formation, Association, Consociation, Society-development of vegetation, Migration-ecesis, colonization, Methods of study of vegetation- Quadrat and transect; Plant Succession: Definition, Hydroxere and Xeroxere.

UNIT – IV

Biomonitoring-Biodegradation of Xenobiotics using microbe, Types of Bioremediation: *in situ* and *ex situ*, Phytoremediation, Biosensors and Bioindicators , Bioleaching.

UNIT – V

Phytogeography – Principles, continental drift, endemism. Vegetations of India- Evergreen forest, Deciduous forest, Mangrove forest in detail -Forest types in Tamil Nadu. Remote Sensing and its uses.

Practicals

1. Analysis of herbaceous vegetation - by using quadrat / line transect method to find out frequency, density, abundance and interpret the vegetations in terms of Raunkaier's frequency formula.
2. Estimation of dissolved oxygen content in the given water sample.
3. Estimation of primary production in the given water sample by the light-dark bottle method.
4. Morphological adaptations of hydrophytes and xerophytes (each 6).
5. Study of anatomical adaptations of hydrophytes and xerophytes and correlate to their particular habitat.
Hydrophytes: Nymphaea, Hydrilla
Xerophytes: Nerium, Casuarina.
6. Morphological adaptations of Halophytes-Vivipary and Pneumatophore.
7. Permeability (Percolation, Total capacity as well as rate of movement) of different soil samples.
8. A study of plant distribution maps - endemic distribution and continental drift.
9. Map of Vegetation types of India.
10. Study of satellite maps.
11. Maintain an observation note book for external valuation.

MARINE BIOTECHNOLOGY

UNIT I

Classification of Marine Environment – Horizontal and Vertical ; Physical Properties- Temperature, Light, Transparency, Turbidity, Tides and Waves. Acoustic Properties of Sea Water, Chemical Properties: Dissolved Oxygen, pH (Oceanic Acidification), Nutrients, Calcification and its Biological and Non Biological impact, Trace elements (Nature & Composition of Seawater) Zonation: Types and lives in different zones; Oceanography interrelationship.

UNIT II

Phytoplankton – Different groups, Algal Bloom, Toxins, Red tide, Biological Pump, Iron Fertilization, CLAW and Anti-Claw hypothesis, Global Pattern of Thermal Adaptation in Marine Phytoplankton.

UNIT III

Mariculture, Sea Ranching, Marine Natural Products – Marine Organisms: an Alternative Source of Potentially Valuable Natural Products; Pharmaceuticals from Marine Organisms - Anti-cancer, Diagnostic and Therapeutic.

UNIT IV

Industries Based on Seaweed Products; Marine Flora and its Potential Role in Research; Antibiotics, Vitamins, Bio adhesives and Thermostable Enzymes, Confectionaries, Food Dyes, Biopolymers and Agar Agar.

UNIT V

Marine Pollution - Heavy Metals and Radioactive Wastes, Marine Microorganisms, GMO capable of degrading and detoxing Chlorinated Hydrocarbons and other Pollutants; Biofouling Organisms – Problems due to Biofouling – Antifouling Paints - Biotechnological approach to Control Biofouling.

Practicals

Demonstration

1. Qualitative and Quantitative Analysis of Phytoplanktons.
2. Estimation of Salinity and
3. Estimation of pH (Acidity) of marine water.

Photographs

1. Algal Bloom
2. Heavy Metal Pollution.

Spotters

1. Pharmaceuticals from Marine organisms – Any two
2. Marine Products – Agar-Agar, Gelidium.

References :

1. Clark, R. B. 2001. Marine pollution, Published by Oxford University Press, USA.
2. Eric Hyatt, D. 1992. Biological Populations as Indicators of Environmental Change. Published by Environmental Protection Agency, US.
3. Frank J. Millero, 2005. Chemical Oceanography.
4. Goldberg, E.D. 1976. The Health of the Oceans Published by UNESCO Press, Virginia.
5. Kenneth A. Chandler, 1985. Marine and Offshore Corrosion Published by Butterworths, University of Michigan.
6. Sharma, B.K. and Kaur, H. 1994. Thermal and Radioactive Pollution, Krishna Prakashan Media, Meerut.

ENVIRONMENTAL BIOTECHNOLOGY

UNIT I

Environmental Spheres – Hydrosphere, Geosphere, Biosphere and Anthrosphere. Aims and Scope of Environmental Biotechnology, Pollution Measurement – Biotechnological Methods for Measurement of Pollution, Criteria for Biomonitoring of Pollution; Molecular biology in Environmental Monitoring and Role of Biosensors in Pollution Monitoring; Biotechnological Methods for management of Metal Pollution.

UNIT II

Biofuels: Biogas – Production of Biogas, /stages of Methanogenesis, Methane production from Hydrocarbons, Uses of Biogas, Hydrogen production – Importance of Biological Production of Hydrogen, Microbial production of Hydrogen, Uses of Hydrogen Production Technology.

Petroleum Plants – *Calotropis*, *Euphorbia tirucalli*, *Jatropha curcas*

UNIT III

Sewage Treatment – Biotechnological Methods for Sewage and Waste Water Treatment - Primary, Secondary (Aerobic – Trickling filter and Activated Sludge Process; Anaerobic – Anaerobic digestion and Anaerobic Filter) and Tertiary Treatment (Ion Exchange Method); Water Recycling, Soil Conservation and Restoration; Sustainable Agricultural Management.

UNIT IV

Biodegradation and Bioremediation – Solid Waste Treatment and Disposal, Biodegradation of Hydrocarbons, Pesticides and Herbicides. Bioremediation- Types of Bioremediation: *in situ* and *ex situ*, Phytoremediation, Biosensors and Bioindicators , Bioleaching, Types of Reactions in Bioremediation, Genetically Engineered Microorganisms in Bioremediation.

UNIT V

Global Environmental Problems – Green House Effect and Global Warming, measures to Control Green House Effect. Ozone Depletion -Effects and Control Measures. Acid rains - Effect of Acid Rain – Causes, Effects and Control Measures; Remote Sensing and its Applications in Ecology.

Practical

Photographs/Model/Demonstration

1. Biosensor
2. Biogas Plant
3. Sewage Treatment
4. Acid Rain
5. Green House Effect

Spotters

Petro Plants

- i. *Calotropis*,
- ii. *Euphorbia tirucalli*,
- iii. *Jatropha curcas*

References

1. Das, H.K. 2005. Text Book of Biotechnology. Wiley Dreamtech India Pvt..Ltd., New Delhi.
1. Dubey, R.C. 2005. A Text Book of Biotechnology, S.Chand and Company, New Delhi.
2. Kumaresan, V. 2009. Biotechnology, Saras Publication, Nagercoil.
3. Mishra, D.D. 2008. Fundamental Concepts in Environmental Studies. S. Chand and Company, Ltd., New Delhi.
4. Saha, T.K. 2008. Ecology and Environmental Biology. Books and Allied (P) Ltd. Kolkotta.
5. Satyanarayana, U. 2008. Biot3echnology Books and Allied (P) Ltd, Kolkata.
6. Shukla, R.S. and Chandel, P.S. 2007. A Text Book of Plant Ecology. S. Chand and Company, Ltd., New Delhi.
7. Singh, H.R. Environmental Biology. S. Chand and Company, Ltd., New Delhi.
8. Tyler Miller Jr. G. 2004. Environmental Science: Working with the3 Earth. Thompson Asia Pvt.Ltd., Singapore.
9. Vijaya Ramesh, K. 2004. Environmental Microbiology, MJP Publishers, Chennai.

MSU/2016-17/B. Sc Plant Biology & Plant Biotech/ Semester -VI/Ppr.no.45/ Practical - 5

**Morphology of Angiosperms, Taxonomy & Economic
Botany and Elective I (Horticulture & Plant breeding / Forestry)
& Elective II (Marine Biotechnology / Environmental Biotechnology)**

Time: 3 Hours

Maximum : 75 Marks

1	Refer specimens 'A' and 'B' to their respective families giving reasons. Write the systematic position. Sketches not required.	10
2	Describe Specimen 'C' in technical terms, draw labeled sketches, dissect, display the floral parts and submit the slide for valuation.	10
3	Identify, draw labeled sketches, useful part and uses of 'D'	5
4	Prepare the Dichotomous key of A, B and C	6
5	Identify, draw labeled sketches and write notes on E, F, G, H, I and J.	24
6	Write the botanical name and family of K and L	4
7	Herbarium + Field note book	5+1
8	Record Note Book	10
	Total	75

Key and Scheme of Evaluation

Key

1. A and B specimens from the families prescribed in the syllabus.
2. C - Any specimen from the families prescribed in the syllabus.
3. D – Materials / products prescribed in the Economic Botany syllabus.
4. Dichotomous key preparation of A, B and C
5. E, F and G – Spotters pertained to Elective (Horticulture and plant breeding / Forestry) H, I and J spotters pertained to Elective II (Marine Biotechnology / Environmental Biotechnology).
6. K and L plants from the prescribed families.
7. Herbarium sheets with field notebook
8. Record note book.

Scheme of Evaluation

1	A and B. Identification – 1; Systematic position – 1 reasons – 3	2 x 5 = 10
2.	C : Description – 3; Sketch – 3; Floral diagram – 1 Floral formula – 1 ; Display of floral parts – 2	10
3.	D : Genus – ½ , Species – ½ , Sketch – 1, description of the useful part 1, uses 2	5
4.	Dichotomous key preparation	6
5.	E, F, G, H, I and J : Identification – 1, diagram – 1, Notes – 2	6x4= 24
6.	K and L : Genus ½, Species ½ , family 1	2x2=4
7.	10 Herbarium specimens with field notebook	5+1
8.	Record Note book	10

MSU/2016-17/B. Sc Plant Biology & Plant Biotech/ Semester -VI/ Ppr.no.46/ Practical - 6

Biochemistry, Bioinformatics, Plant Ecology and Phytogeography

Time: 3 Hours

Maximum : 75 Marks

1	Take a lot from the given set of experiments. Write the procedure. Perform the experiment. Collect data and interpret the results.	20
2	Identify, draw labeled sketches and write notes on 'A' and 'B'	4x2=8
3	Analyse the herbaceous vegetation using quadrat / line transect method. Find out frequency, density, abundance and interpret the vegetation in terms of Raunkiaer's frequency formula.	12
4	Make suitable micro preparation of C and D in glycerin. Draw labeled sketches and write notes giving anatomical adaptations.	14
5	Comment on the morphological adaptation of 'E'	5
6	Identify, draw labeled sketches and write notes on 'F' and 'G'	2x3=6
7	Record note book	10
	Total	75

Key and Scheme of Evaluation

Key

1. Experiment prescribed in the syllabus
2. Biochemistry
 - i. Instrument
 - ii. Model / Chart
3. Quadrat / Line transect method
4. C and D (Hydrophytes / Xerophytes)
5. E. Halophytes – Vivipary / Pneumatophores
6. Phytogeography
 - F and G (Maps / Photographs)
7. Record Note Book

Scheme of Valuation

1	Biochemistry Experiment ; Requirement – 2; Procedure – 6; Tabulation – 3. Calculation and results – 5; interpretation – 4	20
2.	A – Any instrument specified in the syllabus B – Model / Chart prescribed Identification – 1, diagram -1, Notes – 2	4x2=8
3.	Vegetation Analysis– 4, frequency – 2, density – 2, abundance -2, interpretation – 2	12
4.	C and D, Identification – 1, Section – 2, diagram – 1, Notes– 3	2 x 7=14
5.	E – Identification -1, diagram – 1, notes – 3	5
6.	F and G Identification -1 , Notes - 2	2x3=6
7.	Record Note book	10

**Plant Physiology, Genetics, Evolution and Biostatistics and
Plant Biotechnology and Genetic Engineering**

Time : 3 Hours

Maximum : 75 Marks

1	Take a lot from the given set of experiments. Write the procedure; Perform the experiment; Collect data and interpret the results	20
2	Comment on the Plant Physiology Experimental set up A	5
3	Solve the given genetic problem B and C and interpret	B - 4, C - 8
4	Work out the frequency distribution, Mean and standard deviation for the data provided in D	12
5	Identify, draw diagram and write notes on E, F, G and H	4x4=16
6	Record Note book	10
	Total	75

Key and Scheme of Evaluation

Key

1. Experiment prescribed in the syllabus
2. A - Plant Physiology Experimental set up
3. B - Monohybrid cross / Incomplete dominance
4. C - Dihybrid cross / Interaction of Factors.
5. D - Work out the given biostatistics data
6. E, F, G, and H – Spotters from Plant Biotechnology and Genetic Engineering/Genetics /Evolution.
7. Record Note book.

Scheme of Evaluation

1	Plant Physiology experiment – 5, setup – 7, observation and Tabulation – 5, interpretation – 3	20
2.	Experimental set up from Plant Physiology identification -1, diagram – 1, Notes – 3	5
3.	B – Mono hybrid cross problems– 4 C – Dihybrid cross /Interaction of Factors– 8	12
4.	D – Bio statics Problem- Frequency distribution – 5, Mean – 2, Standard Deviation – 5	12
5.	E, F, G and H spotters - Identification – 1, Diagram – 1, Notes – 2	16
6.	Record Note book	10
	Total	75