SYLLABUS

MANONMANIAM SUNDARANAR UNIVERISTY, TIRUNELVELI-12

PG - COURSES – AFFILIATED COLLEGES

Course Structure for

M.Sc. Botany

(Choice Based Credit System)

(with effect from the academic year 2017- 2018 onwards)

Semester-IV				
Part	**Subject Status**	**Subject Title**	**Subject Code**	**Credit**
III	Core - 20	Plant Physiology	PBOM41	4
	Core - 21	Plant Ecology and Conservation Biology	PBOM42	4
	Core - 22	Applied Biotechnology	PBOM43	4
	Core – 23 Practical - 7	Plant Physiology and Applied Biotechnology	PBOL41	2
	Core – 24 Practical - 8	Plant Ecology and Conservation Biology	PBOL42	2
	Elective - 1	Medicinal Botany and Dietetics	PBOE41	3
	Core - 25	Project	PBOP41	8

Plant Physiology

Prerequisite: Basic knowledge gained in undergraduate programme

Objectives:

- To develop understanding in the mechanisms of functioning of plant cells.
- To acquire basic knowledge in physiological processes
- To acquire knowledge on impact of environmental factors on physiological process

Outcome:

- Gain knowledge in functioning of cells
- Gain knowledge in crossroads of cell metabolisms
- Acquire knowledge in stress factors and their role in physiological processes

Plant Physiology

UNIT –I

Water and Plant relations: Cell water relations, mechanism of water uptake - Concept of Apoplast and Symplast. Absorption and transport of solutes (Passive and Active).Translocation of organic solutes. Phloem loading and unloading. Importance of macro and micronutrients. Transpiration - Mechanism of stomatal movement - starch-sugar interconversion theory and K+ ion transport and stomatal regulation.

UNIT - II

Photosynthesis - Photosynthetic pigments - Light harvesting complexes PS I and PS II.Photo oxidation of water. Mechanisms of electron and proton flow through photosynthetic transport chain - Z Scheme. Photo phosphorylation and mechanism of ATP synthesis. C3, C4 and CAM pathways. Photorespiration and its significance.

UNIT - III

Plant Respiration: Glycolysis, Citric acid cycle and Mitochondrial electron transport - Oxidative phosphorylation and terminal oxidation - Beta oxidation - Glyoxylate Cycle. Nitrogen metabolism - Biological nitrogen - Mechanisms of Nitrate uptake and reduction - ammonia assimilation.

UNIT - IV

Physiological role and mechanism of action of cytokinins, ethylene and abscissic acid. Growth retardants - Morphactins and Brassinosteroids. Photoperiodism and Vernalizations - flower induction and development. Phytochrome - structure, properties and physiological role.Senescence and Abscission - physiological and biochemical changes.

UNIT - V

Stress physiology - classification of stress - biotic and abiotic stress factors. Stress effects - morphological, biochemical, physiological changes associated with stress due to salinity, water, radiation, heavy metals, drought. Heat shock proteins - Stress resistance mechanisms.

Text Books.

1. R.G.S. Bidwell, Plant physiology Academic Press, New York, 1980.
2. S.C. Datt, Plant physiology central Book Depot. Allahabad – 48, 1989.
3. . R.M. Devlin, Plant physiology Reinhold Publishers corp. Newyork, 1990.
4. Govindji, Photosynthesis. A.P. Newyork, 1982.
5. F.B Salisbury, and C. Ross, "Plant Physiology", John Wiley & sons New Delhi, 2000.
6. R.K. Sinha, Modern Plant physiology. Narosa publishing House New Delhi, 2004.
7. V.Verma, A text Book of plant physiology. Ane Books, New Delhi, 2007.
8. . G.R. Noggle, and G.J. Fritz, Introductory plant physiology. PHI learning Pvt. Ltd
9. New Delhi, 2010.
10. W.P. Jacob, Plant Hormones and plant Development, 1979.

Practicals

1. Determination of water potential by gravimetric method.
2. Measurement of photosynthesis - Hill activity (Time course).
3. Estimation of photosynthetic pigments with reference to age (Two stages).
4. To determine the Chl a / Chl b ratio in C3 and C4 plants.
5. Estimation of Proline in normal and stressed leaves.
6. Effect of pH, temperature and detergents on membrane permeability.
7. Extraction and separation of seed proteins.
8. Estimation of anthocyanins using colorimeter/Spectrophotometer.

Plant Ecology and Conservation Biology

Prerequisite:
Basic knowledge in Environmental science gained from undergraduate programme

Objectives:

- To gain advanced knowledge about plants and their environment
- To acquire knowledge about environmental issues
- To understand and implement effective measures in biodiversity conservation programmes

Outcome:

- Acquisition of knowledge about environmental science
- Acquisition knowledge about the role of man in protecting the environment
- Acquisition knowledge about biodiversity conservation and participation in conservation activities.

UNIT- I

Aim and scope of Ecology - Methods of studying plant community. Ecosystem: Types of ecosystem: Terrestrial - Cropland and Aquatic ecosystems - fresh water, marine, estuarine and mangroves with special reference to trophic structures.

UNIT – II.

Succession - causes, patterns of succession - xeroseres and hydroseres. Energy resources: utilization - Renewable and Non-renewable energy resources. Environmental Laws and Education.

UNIT - III

Environmental pollution - Causes, consequences and control of pollution on Global environment. Global Warming. Soil erosion, conservation and Disaster management - Floods, Earth quake, Cyclones, Tsunami and Landslides.

UNIT - IV

Biodiversity - definition, scope and constraints, Levels of biodiversity (genetic, species and ecosystem), measures of biodiversity, values and use of biodiversity, loss of biodiversity, threats to biodiversity. Endemism and Red Data Book. Phytogeography: Dispersal and migration barriers hypothesis, Continental drift hypothesis, Land - Bridges hypothesis, Age and Area hypothesis.

UNIT - V

Conservation Biology: current practices in conservation - Ecosystem approaches - Species based approaches–Social approaches - Chipko Movement. In situ conservation (Protected area, Biosphere Reserves, National Parks, Sanctuaries) and ex situ conservation (Botanical Gardens, Cryopreservation, Gene Banks, Seed Banks, DNA Banks. Role of organizations in Biodiversity management – IUCN and BSI.

Text Books

1. S. Ignacimuthu, Environmental studies. MJP Publishers, India. 2013.
2. K.C. Agrawal, Environmental Biology. Agro-botanical Publications, India, 1987.

References

1. R. S. Ambasht, A Textbook of Plant Ecology. 3rd ed. Students' Friends Co. Varanasi, India,1974.
2. W. B. Billings, Plants and the Ecosystem. Wardsworth Publishing Co. Inc., Belmont, 1965.
3. K. A. Kershaw, "Quantitative and Dynamic Plant Ecology", Edward Arnold Publishers Ltd., London, 1973.
4. E. J. Kormandy, Concepts of Ecology. 2nd ed. Prentice Hall of India Pvt. Ltd., New Delhi, 1978.
5. Krishnan Kannan, "Fundamentals of Environmental Pollution". S. Chand and Co. Ltd., New Delhi, 1997.
6. J. Levitt, Responses of Plants to Environmental Stresses. Acad. Press, New York. 1980.
7. E. P. Odum, Ecology. 2nd ed. Oxford & IBH Publications, New Delhi, 1975.
8. P. C. Vashista, A Textbook of Plant Ecology. Vishal Publications, Jullunder, 1974.
9. O. H.Frankel, Brown, A. H. D. and Burdon, J. J. The Conservation of Plant Diversity. Cambridge University Press, London, 1995.
10. V. H. Heywood, Global Biodiversity Assessment. UNEP, Cambridge University Press, London. 1995.

Practicals

1. Vegetation Analysis (Quadrats and line transects) - Raunkaier's frequency diagram dominance and density in a given area and Shannon-Weaver's measures of species diversity index.
2. Water analysis - Dissolved oxygen - salinity and Alkalinity - Carbonate and bicarbonate.
3. Chemical Oxygen Demand (COD) of given water samples.
4. Estimation of oxidized organic matter in the soil by Walkley- Black method.
5. Study of the following:

I. Interpretations of the following:

1. Ecosystem types.
2. Different seric stages.
3. Environmental pollution impact study.
4. Endemism.
5. Conservation of Biodiversity

Applied Biotechnology

Prerequisite:

Basic knowledge on biotechnology and its applications gained during undergraduate programme.

Objectives:

- To train the students in advanced level of biotechnological principles and techniques.
- To understand the process, development of tissue culture through micropropagation and impact of transgenic plants.
- To develop the skill in pollution abatement through Biofuel production

Outcome:

- Gain knowledge in tissue culture and micropropagation in crop improvement programme.
- Acquire knowledge in the transgenic molecular pharming.
- Acquire knowledge in bioremedial measures in pollution control and biofuel production.

UNIT-I

Biotechnology - scope and potentialities. Tissue Culture: Single cell and suspension culture, Production of haploids, detection and identification, and uses of haploids. Micropropagation - virus elimination, secondary metabolite production, encapsulated seeds - Application of plant tissue culture in agriculture and crop improvement.

UNIT – II

Outline of Genetic engineering - transposons as vectors - gene cloning - cloning in eukaryotes. Promoters and terminators - Agrobacterium derived promoters - 35S promoters of CaMV, inducible and tissue specific promoters. Importance of promoters. Amplification of genes by PCR. Gene transfer methods in plants - vectors - Ti and Ri plasmids of Agrobacterium.

UNIT - III

Transgenic plants resistant to Pest, Insects and Herbicides - Transgenic plants with improved quality traits - Flavr Savr tomato, Golden rice. Improved varieties in Floriculture. Transgenic plants for molecular pharming. Biodegradable plastics.

UNIT - IV

Biomining – Bioleaching, Biorecovery of metals. Biosensors - Bioremediation methods - In situ and ex situ bioremediation - Enzyme technology - large scale production of fungal enzymes -extraction and purification methods involved - application of fungal enzymes in different industries.

UNIT – V

Bio-fuels from all kinds of plants. Biotechnology and healthcare - Gene therapy

- types, methods and applications. Genetically engineered Humulin. Production of antibodies, vaccines and monoclonal antibodies - applications.

Text books:

1. R.C. Dubey, Text Book of Biotechnology. S. Chand and Company Ltd., 2006.
2. U.Satyanarayana, Biotechnology. Books and Allied (P) Ltd, Kolkata, 2008.

Reference Books

1. H.S. Chawla, Introduction to Biotechnology. Oxford and IBH Publishing CompanyPvt. Ltd., New Delhi, 2002.
2. M.K. Razdan, An Introduction to Plant Tissue Culture. Oxford and IBH PublishingCompany Pvt. Ltd., New Delhi, 2003.
3. H.K. Das, Text book of Biotechnology. Wiley Dream tech India Pvt. Ltd., Delhi, 2005.
4. Slater, N.W. Scott and M.R. Flower, Plant Biotechnology: The genetic manipulation of plants. Second edition, Oxford University Press, 2010.
5. V. Kumar "Biodiesel from Algae" LAP Lambert Academic Publishing, 2012
6. R. Henrikson, Algae Microfarms: for home, school, community and urban gardens, rooftop, mobile and vertical farms and living buildings, CreateSpace Independent Publishing Platform, ISBN-13: 978-1483968261, 2013.
7. B.D. Singh , A.K. Singh, "Marker Assisted Plant Breeding" , Springer; First edition, ISBN-13: 978-8132237259, 2015.
8. B.D.Singh, Biotechnology: Expanding Horizons, Kalyani publishers; 4th edition, ISBN-13: 978-93272229822014.
9. M. J. Korenberg, Microarray Data Analysis: Methods and Applications (Methods in Molecular Biology) Humana Press; ISBN-13: 978-1627039093, 2014

Practicals

1. Preparation of MS medium.
2. Demonstration of in vitro sterilization and inoculation methods using leaf and nodal explants of Tobacco, Datura, Brassica.
3. Study of Anther, Embryo and Endosperm culture, Micropropagation, Somatic embryogenesis and artificial seeds
4. Study of methods of gene transfer. Isolation of Plasmid DNA, Restriction digestion and gel electrophoresis of plasmid DNA, Agrobacterium - mediated, direct gene transfer by electroporation, microinjection, microprojectile bombardment.
5. Study of steps of genetic engineering for production of Bt cotton, Golden rice.
6. Production of biofuels from algae, Mass cultivation of algae, Spirulina- SCP production.
7. Compulsory visit to institution(s) related in the field of Biotechnology

Plant Physiology and Applied Biotechnology

Plant Physiology Practicals:

1. Determination of water potential by gravimetric method.
2. Measurement of photosynthesis - Hill activity (Time course).
3. Estimation of photosynthetic pigments with reference to age (Two stages).
4. To determine the Chl a / Chl b ratio in C3 and C4 plants.
5. Estimation of Proline in normal and stressed leaves.
6. Effect of pH, temperature and detergents on membrane permeability.
7. Extraction and separation of seed proteins.
8. Estimation of anthocyanins - Colorimeter/Spectrophotometer.

Applied Biotechnology Practicals:

1. Preparation of MS medium.
2. Demonstration of in vitro sterilization and inoculation methods using leaf and nodal explants of Tobacco, Datura, Brassica.
3. Study of Anther, Embryo and Endosperm culture, Micropropagation, Somatic embryogenesis and artificial seeds
4. Study of methods of gene transfer. Isolation of Plasmid DNA, Restriction digestion and gel electrophoresis of plasmid DNA, Agrobacterium - mediated, direct gene transfer by electroporation, microinjection, microprojectile bombardment.
5. Study of steps of genetic engineering for production of Bt cotton, Golden rice
6. Production of biofuels from algae, Mass cultivation of algae, Spirulina- SCP production.
7. Compulsory visit to institution(s) related in the field of Biotechnology

Plant Ecology and Conservation Biology Practicals

1. Vegetation Analysis (Quadrats and Line transects) - Raunkaier's frequency diagram dominance and density in a given area and Shannon-Weaver's measures of species diversity index.
2. Water analysis - Dissolved oxygen - salinity and Alkalinity - Carbonate and bicarbonate.
3. Chemical Oxygen Demand (COD) of given water samples.
4. Estimation of oxidized organic matter in the soil by Walkley- Black method.
5. Study of the following:

I. Interpretations of the following:

1. Ecosystem types.
2. Different seric stages.
3. Environmental pollution impact study.
4. Endemism.
5. Conservation of Biodiversity

Medicinal Botany and Dietetics

Prerequisite:

Basic knowledge on Medicinal plants and its applications gained during undergraduate course.

Objectives:

- To promote good health by teaching the students about diet and nutrition.
- To educate the science of nutrition in preventing development of disease.
- To educate on the nutritional standards and specifications for the healthy person and patient to ensure and prevent mortality due to malnourishment.

Outcome:

- Gain knowledge about nutritive diet for different age groups
- Acquire knowledge about healthy food for normal person and patient
- Acquire knowledge in dietetics to prevent mortality due to malnourishment.

Medicinal Botany:-

Unit –I

Study of the following plants with reference to their Habitat, Habit, Systematic position, Morphology of their useful parts and uses of: Tinospora cordifolia (Root), Acorus calamus (Rhizome), Tylophora asthmatica (leaf), Terminalia chebula (fruit), Plantago ovata (seed) and Holarrhena antidysenterica (bark).

Unit - II

Source, properties and medicinal uses of some phyto oils resources -Olive oil, Castor oil, Neem oil, Mentha oil and Lavender oil.

Unit - III

Dietetics- Therapeutic value of Indian plant foods- a) rice b) wheat; c) green gram, black gram, soya bean d) lemon, banana, Guava, e) Ginger, Turmeric, Coriander, Garlic, Cumin and Clove.

Unit – IV

Plant nutraceuticals- definition and sources. Study of plant foods (food as medicine) in the treatment of some selected diseases – anorexia, arthritis, constipation, diarrhoea, diabetes, psoriasis, hypertension and memory loss.

Unit- V

Plant foods as Antioxidants - Definition - types, PUFA, Probiotics, Prebiotics, Dietary fibers, Omega-3 fatty acids. Cosmeceuticals – Definition, Retinoic acid.

Text books:

1. S.G. Joshi, “Medicinal plants”, Oxford and IBH Company Private Ltd.,New Delhi, 2000.
2. J.L. Raymond,“Krause’s Food, Nutrition and Diet therapy”Saunders

publishers, 2003.

References

1. K. K. Purohit and Gokhale, "Pharmacognacy",Nirali Publications, 1999.
2. A.K. Srivatsava, "Medicinal plants", International Book Distributors, Dehradun,2006.
3. S.N. Yoganarashimman, "Medicinal Plants India", Vol.2 TamilNadu, Inderline Publishing Private Ltd., Bangalore,DehraDun and Michigan, 2000.
4. S.K. Bhattachariya, Handbook on medicinal plants, pointer publishers Jaipur, 2004.
5. A.Farooqi and B.S. Sreeramu, Cultivation of medicinal and aromatic Crops, Universities Press, 2001.
6. R. T.Lagua and V.S.Claudio, "Nutrition and diet therapy Reference dictionary"4th edition,Jones &Barlett Learning, 1995.
7. B.Thomas and J.Bishop, "Manual of Dietetic Practice"Edited by Jone Gandy, 4th edition, Wiley Blackwell Publishing,Oxford, UK, 2007.
8. B.Srilakshmi, "Dietetics", New Age International publishers, 2007.
9. D.A.Vattem and V. Maitin, "Functional foods, Nutraceuticals and Natural Products DEStech Publications, INC, 2016.
10. John Shi "Functional Food Ingredients and Nutraceuticals Processing Technology", CRC Taylor and Francis Publishers, 2006

.

M.Sc. Botany Project

Prerequisite:

The students should be able to understand and interpret the literature in their areas of research.

Objectives:

- To provide training in scientific skills.
- To prepare students for professional training programmes or entry level jobs in any area of Botany

Outcome:

- At the end of the project, students should have increased:

✓ their capacity to think critically;
✓ their ability to design, analyse and execute an experiment;
✓ their confidence and ability in communication skills (in writing and oral).
✓ in acquiring the literature collection methods, and interpreting the data of their scientific experiments etc.