P.G AND RESEARCH DEPARTMENT
OF
BOTANY

PG SYLLABUS

Effect from the Academic Year 2019-2020

J.J.COLLEGE OF ARTS AND SCIENCE
(*AUTONOMOUS*)
(Reaccredited at 'A' Grade by NAAC)
PUDUKKOTTAI – 622 422

M.Sc. BOTANY

Programme Objectives:

- To enhance skills in handling scientific instruments, planning and executing Botanical research
- To promote creative and novel ideas in biological concepts
- To provide confidence among the students in train them to face IFS, CSIR-NET, SET, GATE, ICMR-NET, ICAR-NET etc.
- To focus on research and teaching opportunities
- To understand deep knowledge on plant biology applications and conservational strategies
- To provide Entrepreneurship skill development through plant science
- To promote career and job opportunities in both government and private sectors

J.J.COLLEGE OF ARTS AND SCIENCE (AUTONOMOUS), PUDUKKOTTAI
POST GRADUATE AND RESEARCH DEPARTMENT OF BOTANY
CBCS PATTERN – M.Sc. BOTANY REVISED SYLLABUS
(2019-2020 onwards)- (Revised Course Structure)

Sem.	Course Code	Course	Course Title	Hours/ Week	Credit	Internal	External	Marks
I	P1R1BOCC1	CC1	Plant Diversity I (Phycology, Lichenology and Bryology)	6	5	25	75	100
	P1R1BOCC2	CC2	Plant Diversity II (Pteridophytes, Gymnosperms and Palaeobotany)	6	5	25	75	100
	P1R1BOCC3	CC3	Microbiology and Plant Pathology	6	5	25	75	100
	P1R1BOCC4P	CC4P	Practical- I (CC1, CC2 and CC3)	6	5	40	60	100
	P1R1BOEC1	EC1	To be selected from given list	6	3	25	75	100
			Total	**30**	**23**	**140**	**360**	**500**
II	P2R1BOCC5	CC5	Anatomy, Embryology of Angiosperms and Microtechniques	6	5	25	75	100
	P2R1BOCC6	CC6	Taxonomy of Angiosperms and Economic Botany	6	5	25	75	100
	P2R1BOCC7	CC7	Cell Biology and Molecular Genetics	6	5	25	75	100
	P2R1BOCC8P	CC8P	Practical-II (CC5,CC6 and CC7)	6	5	40	60	100
	P2R1BOEC2	EC2	To be selected from given list	6	3	25	75	100
			Total	**30**	**23**	**140**	**360**	**500**
III	P3R1BOCC9	CC9	Plant Ecology, Conservation Biology, Phytogeography and Forestry	5	5	25	75	100
	P3R1BOCC10	CC10	Plant Breeding and Horticulture	5	5	25	75	100
	P3R1BOCC11	CC11	Biochemistry and Plant Physiology	5	5	25	75	100
	P3R1BOCC12	CC12	Plant Biotechnology	5	5	25	75	100
	P3R1BOCC13P	CC13P	Practical – III (CC9, CC10, CC11 and CC12)	5	5	40	60	100
	P3R1BOEC3	EC3	To be selected from given list	5	3	25	75	100
			Total	**30**	**28**	**165**	**435**	**600**
IV	P4R1BOCC14	CC14	Bio-instrumentation	6	5	25	75	100
	P4R1BOCC15PW	CC15	Project Work	18	8	-	-	100
	P4R1BOEC4	EC4	To be selected from given list	6	3	25	75	100
			Total	**30**	**16**	**50**	**150**	**300**
			Grand Total		**90**			**1900**

J.J.COLLEGE OF ARTS AND SCIENCE (AUTONOMOUS), PUDUKKOTTAI
POST GRADUATE AND RESEARCH DEPARTMENT OF BOTANY
CBCS PATTERN – M.Sc. BOTANY SYLLABUS
(2019-2020 onwards)

	Sl.No.	Code	Subject Title – Core Course
Semester-I	1.	P1R1BOCC1	Plant Diversity I (Phycology, Lichenology and Bryology)
	2.	P1R1BOCC2	Plant Diversity II (Pteridophytes, Gymnosperms and Palaeobotany)
	3.	P1R1BOCC3	Microbiology and Plant Pathology
	4.	P1R1BOCC4P	Practical- I (CC1, CC2 and CC3)
Semester-II	5.	P2R1BOCC5	Anatomy, Embryology and Microtechniques
	6.	P2R1BOCC6	Taxonomy of Angiosperms and Economic Botany
	7.	P2R1BOCC7	Cell Biology and Molecular Genetics
	8.	P2R1BOCC8P	Practical-II (CC5,CC6 and CC7)
Semester-III	9.	P3R1BOCC9	Plant Ecology, Conservation Biology, Phytogeography and Forestry
	10.	P3R1BOCC10	Plant Breeding and Horticulture
	11.	P3R1BOCC11	Biochemistry and Plant Physiology
	12.	P3R1BOCC12	Plant Biotechnology
	13.	P3R1BOCC13P	Practical – III (CC9, CC10, CC11 and CC12)
Sem. IV	14.	P4R1BOCC14	Bio-instrumentation and Biophysics
	15.	P4R1BOCC15PW	Project Work

List of Elective Courses offered

Sl. No.	Subject Title
1.	Biofertilizers and Mushroom Technology
2.	Ethno-botany and Pharmacognosy
3.	Research Methodology
4.	Recyclic Technology
5.	Food Processing Technology
6.	Nursery Technology
7.	Herbal Recipes and Remedies
8.	Organic, Indoor and Terrace Gardening

M.Sc. BOTANY

Programme Outcomes:

- The students would have acquired skills in handling of instruments.
- They would understand the creative ideas and biological facts in Botany.
- They would learn the entrepreneurship skills in the field of bio fertilizers, mushroom cultivation, nursery technology and vermi-compost.
- The graduates could understand the concept in biological resource conservation.
- They could understand the environmental basic concepts of Taxonomy and Ecology.
- They could have about different types of nutrition which are applied in the growth of plants.
- The students would learn the economic values of medicinal plants in agriculture and traditional medicines.
- The students could have full confidence to face higher education competitive examinations.
- They could join the private seed and fertilizer companies.

SEMESTER I

PLANT DIVERSITY I (PHYCOLOGY, LICHENOLOGY AND BRYOLOGY)

Course Code: P1R1BOCC1 **Marks: 25+75=100**
Hours/Week: 6 **Total Hrs: 72**
Credit: 5
Objectives:

- To have comprehensive knowledge on lower plants
- To understand the diversity, reproduction and economic importance of lower plants
- To understand the evolutionary significance of lower plants
- To understand the structure of the microbes and their economic values in day to day life
- To know about the diversification in micro-plants

Unit - I: Phycology -General aspect (14 Hours)

Light and electron microscopic structure of prokaryotic and eukaryotic algae, pigments, reserve foods, cell wall, flagella, chloroplast, pyrenoid and their biological importance. Detailed study about thallus organization, cell structure, reproduction (asexual and sexual) and life cycle.

Unit - II: Phycology - General aspect (14 Hours)

Classification of algae by Fritsch (1935) - Brief study on Chlorophyceae, Xanthophyceae, Chrysophyceae, Bacillariophyceae, Cryptophyceae, Dinophyceae, Chloromonadineae, Euglenineae, Phaeophyceae, Rhodophyceae, Myxophyceae.

Unit - III: Phycology - Lab Technology and Economic importance (14 Hours)

Ecological significance of algae - Isolation and culture of algae from different fresh water algae (Chu-10 medium and Pringsheims) and marine algae (Guillard's F/2 Medium) - SCP-Economic importance of algae.

Unit - IV: Lichenology (14 Hours)

General features, distribution, thallus organization and reproduction; classifications of lichens by Miller (1984) –Structure and life cycle of *Parmelia* and *Usnea* - Economic importance of Lichens.

Unit - V: Bryology (14 Hours)

General features, range of vegetative structure, evolution of gametophytes and sporophytes, reproduction (excluding developmental stages); classification (Watson, 1964) economic and ecological importance. Diagnostic characters of Liverworts, Hornworts – Life histories of *Marchantia, Porella, Anthoceros* and *Polytrichum.*

Unit - VI: Latest Learning (2 Hours)

Latest development related to the Course during the semester concerned
(CIA purpose only not for question setting)

Course Outcomes:

- The Students would have explained the importance of lower plants like Algae, Fungi, Lichens and Bryophytes.
- They could describe the distribution and occurrence of lower plants.
- The graduates could start consultancy services to the farmers on various algal culture and value added products from algae.

Text Books:

1. Vashista B.R, Sinha A.K & Singh V.P (2004) – Algae – S.Chand & Company Ltd. New Delhi.
2. Sharma,O.P.(1986) - Text book of Algae - Tata McGraw-Hill, New Delhi.
3. Kumar, H.D & Singh H.N. (1982) - A text book on Algae - Affiliates East - West Press, Madras.
4. Vashista B.R & Sinha (2004) – Fungi – S.Chand & Company Ltd. New Delhi.
5. Vashista B.R & Sinha (2004) – Bryophyta – S.Chand& Company Ltd. New Delhi.
6. Chojnacka, K, Wieczorek, P.P., Schroeder, G. and Michalak, I (Eds.) 2018. Algae Biomass: Characteristics and Applications. Springer.

References:

1. Bold, H.C & M.J. Wyne (1978) - Introduction to Algae - structure & reproduction – Prentice Hall, New Jersey.
2. Fritsch, F.E (1935) - The structure & reproduction of the Algae (2 vols.) – Cambridge University Press, England.
3. Prescott, G.W. (1969) - The Algae: A Review - Nelson.
4. Hale, Jr.M.E. (1983) - Biology of Lichens - Edward Arnold, Maryland.
5. PremPuri, 1973 - Bryophytes - A Broad Perspective, Atma Ram & sons, New Delhi.
6. Smith,G.M. Cryptogamic Botany Vol. II
7. Verdoon,F R. Manual of Bryology
8. Waston, E. V. The Structure and Life of Bryophytes

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SEMESTER I

PLANT DIVERSITY – II (PTERIDOPHYTES, GYMNOSPERMS AND PALAEOBOTANY)

Course Code: P1R1BOCC2 **Marks: 25+75=100**
Hours/Week: 6 **Total Hrs: 72**
Credit: 5

Objectives:

To impart the knowledge about

- The occurrence, distribution, structure and life history of Pteridophytes and Gymnosperms
- Evolutionary trends in Pteridophytes
- Geological time scale and types of fossil preservation
- Land plants of the past

Unit - I: Pteridophytes – General aspects (14 Hours)

Pteridophytes – Introduction – Vascular cryptogams – General features and origin of Pteridophytes, Habit and Habitat of Pteridophytes – Lifecycles – Evolution of Sporophyte and gametophytes-Classification of Pteridophytes (Sporne, K.R. 1956) – Economic Importance of Pteridophytes.

Unit - II: Pteridophytes and their evolution (14 Hours)

Range of Morphology, structure, Reproduction and Evolution of gametophytes and sporophytes of following families Isoetaceae, Equisetaceae, Ophioglossaceae, Osmundaceae, Gleicheniaceae, Pteridaceae, and Azollaceae. Stelar evolution of Pteridophytes. Heterospory and origin of Seed habit. Apogamy and Apospory. Alternation of generation

Unit - III: Gymnosperms – General aspects (14 Hours)

Concept of pro-gymnosperms, classification of gymnosperms (K.R. Sporne, 1967) – A general account on the morphology, distribution, anatomy and reproduction of the major groups of gymnosperms: Pteridospermales, Bennetitales Pentoxylales and Cordaittales.

Unit - IV: Gymnosperms (14 Hours)

A general account on the morphology, distribution, anatomy and reproduction of major groups of gymnosperms: Cycadales, Coniferales, Ginkoales, and Gnetales – economic importance of gymnosperms.

Unit - V: Palaeobotany (14 Hours)

Geological time scale – fossilization and Fossil types: Compressions, incrustation, casts, molds, petrifactions, coal balls and compactions, carbon dating –Role of fossil in oil exploration.

Unit - VI: Latest Learning **(2 Hours)**

Latest development related to the Course during the semester concerned (CIA purpose only not for question setting)

Course Outcomes:

- The students would learn about the structure and reproduction of certain selected species of Pteridophytes and Gymnosperms.
- They could know the few representatives of fossil forms.
- After completion of this course students could get employment in Botanical Survey of India.

Text books:

1. Vashishta.P.C.(2004)- Pteridophyta -S.Chand& Co. Ltd, New Delhi
2. Parihar,N.S -The Biology and Morphology of Pteridophytes, Central Book Depot, Allahabad.
3. Rashid.A. (1986) - An Introduction to Pteridophyta, Vani Educational Books, New Delhi.
4. Sporne K.R. (1972) – The morphology of Gymnosperm - BII Publications, Madras.
5. Vashita P.C. (1990) – Gymnosperms – S. Chand & Co. Ltd., India.
6. M.P.Arora 1990. Evolutionary biology, Himalaya Publication House, Delhi. C.I.A. Arnold – An Introduction to Paleobotany.
7. Neale, D. B., Wheeler, N. C. (2019). The Conifers: Genomes, Variation and Evolution. Springer. https://www.springer.com/gp/book/9783319468068

References:

1. Smith,G.M (1955) - Cryptogamic Botany Vol. II, Tata Mcgraw Hill Publishing Co., Ltd., New Delhi.
2. Sporne K.R, 1972. Pteridophytes.
3. SundaraRajan,S. - Introduction to Pteridophyta - New age International Publishers Ltd., Wiley Eastern Ltd., Madras.
4. Sharma, O.P. (1990) – Text Book of Pteridophyta, , Macmillan Indian Ltd., India
5. Chamberlain. C. – Gymnosperm structure & evolution, Univ. Chicago Press.
6. M.Kimura, 1983-The natural theory of molecular evolution, Cambridge University Press, Cambridge.
7. W.R.Atchlay and D.S. Woodnuff 1981. Evolution and speciation, Cambridge University

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SEMESTER I

MICROBIOLOGY AND PLANT PATHOLOGY

Course Code: P1R1BOCC3 **Marks: 25+75=100**
Hours/Week: 6 **Total Hrs: 72**
Credit: 5

Objectives:

- To acquire knowledge on sub-microscopic organisms and their classifications
- To study the plant pathogen's life cycle, symptoms and control measures
- To understand the basic concepts, methods, scopes, characteristics, diseases and economic importance of microbes
- To learn about the pathogenic micro organisms and their mode of entry

Unit - I: Mycology (14 Hours)

General features, distribution, mode of nutrition, cell structure, fruiting bodies, heterothallism, heterokaryosis, parasexuality, physiological races, classification (Alexopoulos and Mims, 1979); Salient features and Life cycle pattern of Phycomycetes, Ascomycetes, Basidiomycetes and Deuteromycetes- General account on Mycorrhiza. Economic importance of Fungi.

Unit - II: Bacteriology (14 Hours)

General characters – Outline of Bergey's (1984-1991) classification – Ultra structure, nutrition, growth, reproduction of Eubacteria, Archaebacteria, Cyanobacteria and Actinobacteria. and economic importance of bacteria.

Unit - III: Virology (14 Hours)

History and scope of microbiology – Five kingdom concept by Whittaker (1969) - Salient features, Classification and ultra structure of virus. Isolation and purification of viruses – replication, transmission and economic importance of viruses.

Unit - IV: Plant Pathology General Aspects (14 Hours)

Scope and importance of plant pathology – Koch's postulates – Classification of plant diseases - organisms and causal factor for plant diseases – Definitions of symptomology, Etiology, Epidemic diseases – Host pathogen interaction – Mycotoxins – Aflatoxins.

Unit - V: Plant Pathology – Common Plant Diseases (14 Hours)

Casual organism, Symptoms and Control measures of following plants diseases - little leaf of Brinjal, Rice blight, Tikka disease, Wilt of cotton and Ring rot of potato.

Unit - VI: Latest Learning (2 Hours)

Latest development related to the Course during the semester concerned
(CIA purpose only not for question setting)

Course Outcomes:

- The student would have understood epidemiology of plant diseases and epidemic plant disease.
- They could study pathogenicity, defense mechanisms of host plants pathogen
- They could undertake the study of bacterial, viral and fungal disease of plants
- They could get employment in National Institute of Plant Health Management

Text Books:

1. Dubey, R.C and Maheswari D.K., (2007). A text Book of Microbiology. S.Chand and CO. Ltd. New Delhi.
2. Pelezar J Chen ECS and Krieg R., (2016). Microbiology. Tata McGraw Hill, New Delhi.
3. Pandey B.P. (2005). A text book of Plant Pathology, Pathogen and Plant Diseases. S.Chand and Co. Ltd. New Delhi.
4. Prescott (2000). Microbiology.
5. Cruezer, W. and A. Cruezer (1990). A Textbook of Industrial Microbiology.
6. Dubey, R.C. and D.K. Maheshwari (2010). A Textbook of Microbiology. S. Chand and Co. Pvt. Ltd. New Delhi.
7. Paul Beales , John Elphinstone , Adrian Fox , Charles Lane , Derek McCann , Tim Lacey , Julian Little , Kerry Maguire and Alice Turnbull (2019). Plant Diseases and Bio security. Oxford University Press.

References:

1. Martin Alexander Introduction to Soil Microbiology (1997). Wiley Eastern, New Delhi.
2. Ketchum Microbiology (1984). John Wiley & Son.
3. Frazier NC Food Microbiology (1978). Tata McGraw Hill, New Delhi.

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SEMESTER I

PRACTICAL I – PLANT DIVERSITY I & II

(ALGAE, FUNGI, LICHEN, BRYOPHYTES, PTERIDOPHYTES, GYMNOSPERMS PALAEOBOTANY, MICROBIOLOGY AND PLANT PATHOLOGY)

Course Code: P1R1BOCC3 **Marks: 40+60=100**
Hours/Week: 6 **Total Hrs: 72**
Credit: 5
Objectives:

- To learn identification of lower and primitive groups of plants
- To study the vegetative and reproductive organs of sub-microscopic plants
- To learn the identification and description of specimens belonging to higher cryptogams
- To learn slide preparation techniques of stelar plants
- To understand the fossil plants by means of permanent slides
- To identify the plant diseases and causal organisms

Algae:

Microscopic observation of permanent slides/ specimens of algae discussed in the syllabus. Sectioning of available algal specimens included in the syllabus. Identification of algal types in the algal mixture (only microscopic types).

Fungi:

Microscopic observation of permanent slides of fungal genera included in the syllabus. Sectioning of different plants infected by fungal strains included in the theory syllabus.

Lichen:

Morphological features and Microscopic observations of anatomical structure of *Usnea*.

Bryophytes:

Morphological and anatomical study of representatives of the following: *Marchantia, Porella, Anthoceros* and *Polytrichum*

Pteridophytes:

A study of the morphology, anatomy of the vegetative and reproductive parts of the sporophytes and gametophytes (wherever available) of living genera included in the syllabus and analysis of permanent slides of *Lycopodium, Selaginella, Marselia, Azolla* and *Equisetum*

Gymnosperms:

A study of the morphology, anatomy of the vegetative and reproductive parts of *Cycas, Pinus, Gnetum.*

Palaeobotany:

Observation of Permanent slides of fossil forms as follows: *Lepidodendron, Calamostachys, Stigmaria, Horneophyton* and *Annularia* (T.S.)

Microbiology:

Isolation of microbes from soil and water – serial dilution and plating technique
Isolation of *Rhizobium* from root-nodules of legumes
Gram staining of bacteria found in curd
Microbial analysis of milk by methylene blue reduction test

Plant Pathology:

Little leaf of Brinjal, Tikka disease, Wilt of cotton, Ring rot of potato, Citrus Canker

Course outcomes:

- The students will be able to understand the structure and reproduction of certain selected algae, fungi and bryophytes.
- They could learn about the importance of the plant diversity.
- They can settle as lower plant taxonomist.
- The students can understand morphology and internal structure of some selected species of Pteridophyte and Gymnosperms.
- They may have knowledge about the fossils structures internally.
- The students can get employment in Botanical Survey of India as a taxonomist in lower plants.

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SEMESTER II

ANATOMY, EMBRYOLOGY OF ANGIOSPERMS AND MICRO-TECHNIQUES

Course Code: P2R1BOCC5 **Marks: 25+75=100**
Hours/Week: 6 **Total Hrs: 72**
Credit: 5

Objectives:

- To know all about the primary tissues and anatomical features of plants
- To acquire knowledge about the embryology of Angiosperms
- To understand the primary, secondary and anomalous, anatomical structure of plant parts
- To know the various types of pollination mechanism

Unit - I: Anatomy (14 Hours)

Meristems – Types (shoot and root). Procambium - Cambium, Vascular cambium - origin, types, structure and etiology. Complex tissues - Secondary xylem - ontogeny, arrangement of vessels in secondary. Xylem, Growth rings. Secondary phloem - structure and function and ontogeny. Periderm formation- lenticels. Anomalous secondary thickening in dicot and monocot stems. *Aristolochia, Boerhaavia* and *Dracaena.* Secondary structure and vascular differentiation of root.

Unit - II: Wood Anatomy (14 Hours)

Shoot and root transition – Ontogeny of Dorsi-ventral and Isobilateral leaf. Nodal anatomy-uni, tri and multilacunar nodes. Structure, identification, classification and uses of woods – physical, chemical and mechanical properties of wood – defects in wood – natural defects – knots – reaction wood – compression and tension wood - wood preservation.

Unit - III: Embryology (14 Hours)

Microsporogenesis, compatibility, Megasporangium, Megasporogenesis and female gametophyte, pollen stigma, Sexual Incompatibility, nutrition of embryo-sac, endosperm types, Apomixis, agamospory and apospory – polyembryony and apomixis in plant improvement.

Unit - IV: Micro-techniques (14 Hours)

Light microscopy – optical principle, resolution, magnification, aberration. Phase contrast microscopy – Dark field illumination. Electron microscope (TEM&SEM) – Principle and preparation techniques. Special techniques– Maceration, Squashes, Smears, Whole mount and clearing techniques.

Unit - V: Staining and Fixation (14 Hours)

Micro techniques – Fixation and fixatives, dehydration, clearing, infiltration, embedding, block making and sectioning. Microtome – Types –Principles and operating mechanisms, Stains and Staining techniques, Camera Lucida – Types, Principles and their uses. Micrometry.

Unit - VI: Latest Learning (2 Hours)

Latest development related to the Course during the semester concerned (CIA purpose only, not for question setting)

Course Outcomes:

- By the end of this course, the students would be able to:
- Classify the meristematic and permanent tissues based on origin and position.
- Compare the different theories of tissues.
- Explain the types of ovules.
- Understand double staining technique.
- Get employment in Biodiversity Conservation Centres and Artificial Pollination Centres.

Text Books:

1. Easu K Plant Anatomy, Wiley Eastern Ltd, New Delhi.
2. Kollmann Wood Science and Technology, Vol I &II.
3. Bhojwani SS and Bhatnagar SP, The Embryology of Angiosperms, Vikas publishing house Pvt. Ltd., New Delhi
4. Pattel LR, Bhalachander BL and Jeeraji H An introduction to microtechnique, S. Chand & S. Chand & Co. Pvt. Ltd., New Delhi.
5. Crang, R., Lyons-Sobaski, S., Wise, R. (2018). Plant Anatomy. Springer. https://www.springer.com/gp/book/9783319772080.

References:

1. Gutter G Plant Anatomy, Edward Arnold Publications Ltd., London
2. FahnA Plant Anatomy, Pergoman press, Oxford.
3. Maheswari P An introduction to the Embryology of Angiosperms, Tata McGraw Hill Publishing Co, Ltd., New Delhi
4. John E. Sass. Botanical Microtechniques, Oxford & IBH Publishing Co.
5. Krishnamurthy K.K. Methods in Plant Histochemistry.

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SEMESTER II

TAXONOMY OF ANGIOSPERMS AND ECONOMIC BOTANY

Course code: P2R1BOCC6 **Marks: 25+75=100**
Hours/Week: 6 **Total Hrs: 72**
Credit: 5

Objectives:

- To know about the classification and nomenclature
- To learn about plant identification and description
- To understand the molecular taxonomy
- To be aware of the selected families and their characters
- To know about the economic importance of the selected plants

Unit - I: Taxonomic History and Classification (14 Hours)

Taxonomy and its importance. Systems of Classification: Linnaeus, Bentham and Hooker, Takhtajan, Bessy dicta, APG I, II, III systems –Merits and demerits. International Code of Botanical Nomenclature, Botanical Gardens and Botanical survey of India

Unit - II: Plant Identification and Taxonomic Evidence (14 Hours)

Taxonomy in relation to Anatomy, Embryology, Palynology, Ecology, Paleobotany, Cytology, Phytochemistry. Chemotaxonomy and Numerical Taxonomy. Taxonomic keys, written description. Taxonomic tools – Herbaria, Virtual herbarium and data information, e-floras, revisions, monographs and botanical gardens. Taxonomic evidence: palynology, anatomy, embryology.

Unit - III: Molecular taxonomy (14 Hours)

Biosystematics - Aim and scope. Phenotypic Plasticity. Turreson's work. Modern trends in Taxonomy- Computerized Systematics- collecting data, converting and documenting characters of plants in computers - Molecular taxonomy- DNA Fingerprinting and Barcoding in plants.

Unit - IV: Detail account of selected families and their economic importance (14 Hours)

Menispermaceae, Capparaceae, Caryophyllaceae, Convolvulaceae, Acanthaceae, Lamiaceae, Hydrocharitaceae, Commelinaceae, Cyperaceae and Poaceae.

Unit - V: Economic Botany (14 Hours)

Study of botanical name, family and morphology of the useful parts and utility of the following- Cereals and millet – Rice, Wheat and Ragi. Legumes – soybean, cluster bean, horse gram and ground nut. Sugar yielding plants – sugar cane and sweet potato. Spices and condiments – turmeric, Cinnamum, pepper, Nutmeg. Fibre – cotton and coir. Dye – Indigo and

henna. Rubber – para rubber. Gum – gum Arabica. Resin – Asafoetida. Oil – Coconut, Sesame and palm oil. Medicinal - Neem and Ocimum. Food additives and colors – Saffron.

Unit - VI: Latest Learning **(2 Hours)**

Latest development related to the Course during the semester concerned (CIA purpose only, not for question setting)

Course Outcomes:

- The students could understand various angiosperm plant habits.
- They would know about the concepts of plant taxonomy and classification of angiosperms.
- The graduates could prepare the Herbarium.
- They could identify the binominal of plants under natural environment.
- They could get employment in BSI.

Text Books:

1. Sharma, O.P. (1996). Plant Taxonomy. McGraw-Hill publishing Company limited, New Delhi.
2. Jeffrey, C. (1982). An Introduction to Plant Taxonomy, Second edition, Cambridge university press, Cambridge, UK.
3. Crawford, D.J. (2003). Plant Molecular Systematic. Cambridge UniversityPress, Cambridge, UK.
4. Pandey, S.N. & Chandha, A. (1999). Economic Botany. Vikas Publishing House, New Delhi.
5. Besse, P. (Ed) (2014). Molecular Plant Taxonomy. Springer. https://www.springer.com/gp/book/9781627037662
6. Annie Ragland, V Kumaresan (2018). Morphology of Angiosperms, Taxonomy and Economic Botany. Saras Publication.

References:

1. Lawrence, G.H.M. (1955). The Taxonomy of vascular plants (Vol. 1-4). Central Book department, Allahabad.
2. ICN (2012). International Code of Nomenclature for Algae, Fungi and Plants. Melbourne Code, XVIII International Botanical Congress, Melbourne.
3. Jain,S.K., 1981, Glimpses of Indian Ethnobotany, Oxford & IBH Publ.Co., NewDelhi.
4. Hillis, DM., Moritz, C & Mable, BK (eds) 1996, Molecular Systematics,Sinaver Associates, Sunderland,USA

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SEMESTER II

CELL BIOLOGYAND MOLECULAR GENETICS

Course Code: P2R1BOCC7 **Marks: 25+75=100**
Hours/Week: 6 **Total Hrs: 72**
Credit: 5

Objectives:

- To learn about the structure and function of eukaryotic plant cells
- To acquire knowledge on molecular level of organelles
- To understand the basic ideas on cell cycle
- To learn about the basic interactions of the organelles

Unit - I: Cell theory (14 Hours)

Cell as a basic unit - classification - cell types - cell theory - organization of plant and animal cells - comparison of microbial, plant and animal cells. An overview of prokaryotic and eukaryotic cells, cell size and shape, Mycoplasma, Phages and Viriods.

Unit - II: Composition of Cell (14 Hours)

Cell organelles - Plasma membranes (Structure, models, functions, pumps and receptors) - Plasmodesmata. Ultra structure of organelles: plastids, mitochondria, ribosome, ER and golgi body. Nucleus - Nuclear Envelope, Nucleolus - Chromosomes (types).

Unit - III: Organelle Genome and DNA (14 Hours)

Semi-autonomous nature of mitochondria and chloroplast, chloroplast DNA, Peroxisomes assembly. Cell division (mitosis, meiosis) – Cell cycle. DNA – Denaturation and renaturation, C- Value paradox, Circular and super helical DNA, Gene amplification – PCR, DNA finger printing – DNA replication – Polymerases, Primers and Mechanism – Molecular methods of DNA replication (Prokaryotes).

Unit - IV: Gene Expression and Regulation (14 Hours)

RNA- Types – Molecular organization- Genetic code – Gene expression – transcription mechanism in prokaryotes and post transcription processing – enzyme system in transcription – transcription process in eukaryotes, Translation – initiation, elongation, termination and post translational process – Gene regulation in prokaryotes and eukaryotes.

Unit - V: Genetics (14 Hours)

Brief account on Mendelian genetics, gene interactions – linkage and crossing over, gene mapping, Sex linkage - Sex linked inheritance, Sex determination in plants. Cytoplasmic inheritance – male sterility. Polyploidy – types and their origin. Mutation – Biochemical basis of mutation, induction of mutations, mutagenic agents – physical and chemical mutagens. An outline on population genetics (Hardey Weinberg's Law).

Unit - VI: Latest Learning **(2 Hours)**

Latest development related to the Course during the semester concerned (CIA purpose only, not for question setting)

Course Outcomes:

- The students would have understood the basic concepts of molecular biology and genetic engineering.
- They could understand the cell organells and their functions.
- They also would understand the mitosis and meiosis and their importance.
- They could be employment in biology instrumentation labs and Molecular Biology Research Centre.

Text Books:

1. Verma P.S and V.K. Agarwal- S. Genetics- Chand & Co., Pvt. Ltd., New Delhi (2009).
2. Gardner, Simmons and Snustad. Principles of Genetics-John Wiley and Son (Asia) Pvt, Ltd. (2006).
3. De Robertis, E.D.P. and De Robertis, E.M.F. (2006). Cell and Molecular Biology. VIII Edition. Lippincott.
4. Gupta, P.K. (2015) - A Text Book of Cell & Molecular Biology, Rastogi Publications.
5. Varshney, R. K. (Ed), Pandey, M. K. (Ed), Chitikineni, A. (Ed) (2018). Plant Genetics and Molecular Biology. Springer.
6. Yamaguchi, N. (Ed) (2018). Plant Transcription Factors. Springer.

References:

1. Gardner, E.J. and Shusted, D.P. Principles of Genetics 7th Edn. John Wiley &Sons, N.Y.,
2. Chichester, Brisbane, Toronto, Singapore (1984).
3. Gupta, P.K, Genetics, Rastogi Publishers, Meerut, India (2000).
4. Rost, T.L. Gifford, Jr. & Ernest, M. (1977) – Mechanism and control of cell division – Academic Press, N.Y.

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SEMESTER II

Practical – II

(ANATOMY, EMBRYOLOGY AND MICRO-TECHNIQUES; ANGIOSPERM TAXONOMY AND ECONOMIC BOTANY; CELL AND MOLECULAR GENETICS)

Course Code :P2R1BOCC8P **Marks : 40+60=100**
Hours/Week :6 **Total Hrs: 72**
Credit :5

Objectives:

- To observe internal organization of plant body
- To understand primary, secondary and anomalous structure of plant parts
- To observe the pollen morphology and types of pollens
- To identify the plants under natural environment
- To get knowledge on preparation of Herbarium
- To learn about to draw floral diagrams

Taxonomy

- Examination of flowers polypetalae, gamopetalae, monochlamydeous, dichlamydeous and monocotyledonous flowers analysis.
- Study of plants belonging to the families given in the theory syllabus.

Anatomy

- Dissection of shoot apex in *Hydrilla* and whole mount
- Demonstration of primary pit-fields in Onion epidermal peel
- TS and LS of phloem stained with aniline blue or Lacmoid blue or Coumassie brilliant blue.
- Identification of different types of stomata – monocot and dicot types

Economic Botany

Cereals and millet – Rice, Wheat and Ragi. Legumes – soybean, cluster bean and ground nut - sugar cane. Spices and condiments – turmeric, Cinnamum, pepper – cotton and coir. Dye – Indigo and henna. Rubber – para rubber. Gum – gum Arabica. Resin – Asafoetida. Oil – Coconut, Sesame and palm oil. Medicinal - Neem and Ocimum. Food additives and colors – Saffron.

Embryology

- Dissection of endosperm haustoria – Cucurbitaceae – *Cucumis*.
- Dissection of embryo – *Tridax* / *Crotalaria*.

Ethnobotany

- Field study (local & outside) – submission of field reports with photographs of ethnobotanical importance.

Cell and molecular biology

- Squash and smear techniques – onion root tip and Rheo flower buds.
- DNA isolation from Coconut endosperm and Onion bulb.

Genetics

- Working out the problems in genetics and drawing of genetic charts.
- Determination Rh+ Factors.

Course Outcomes:

- The students could perform double staining permanent slide mounting.
- The students would understand the various components of stem and wood during their secondary growth.
- The graduates would have been enlightened about the mechanism of pollination and basic structure of the embryo.
- They would know the concepts of plant taxonomy and classification of angiosperms.
- They could prepare the herbarium.
- They would identify the binominal of plants under natural environment.
- They could get employment in BSI.

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SEMESTER III

PLANT ECOLOGY, CONSERVATION BIOLOGY, PHYTOGEOGRAPHY AND FORESTRY

Course Code :P3R1BOCC9 **Max Marks: 25+75=100**
Hours/Week: 5 **Total Hrs: 60**
Credit :5
Objectives:

- To gain advanced knowledge about plants and their environment
- To study the various plant ecosystems and their impact on society
- To understand the effective measures in biodiversity conservation programmes
- To learn the plant geography distribution in Indian Vegetation

Unit - I: Plant Ecology – General Aspects (12 Hours)

Ecology - Concepts and dynamics of ecosystems, types of ecosystem, food web, food chain and energy flow tropic level, ecological pyramids, productivity and bio-geochemical cycles (N,P, C, S). Ecological amplitude of a species and adaptation – Ecads, ecotypes, ecospecies and ecological niche, Raunkiaer's (1934) life forms.

Unit - II: Plant Ecology- Pollution (12 Hours)

Environmental pollution – air, water, soil, thermal, noise and radiation. Effect and control measures of air, water and soil pollution. Causes and consequences of Green house effect and Ozone depletion. Sources and characteristics of wastes (Sugar mills and Distilleries) and Non-degradable plastics Effect of waste on receiving bodies and its treatment.

Unit - III: Conservation of Biodiversity (12 Hours)

Conservation - Significance of conservation – RET plants IUCN red list 2018. Current practices in conservation, habitat or ecosystem approaches, social approaches – Chipco movement, *In-situ*, (National parks, Sanctuaries, Sacred groves) and *Ex-situ* (Cryopreservation, Gene Banks, Zoo, Botanical gardens Seed Banks, Pollen Banks, Tissue culture and biotechnological strategies), eco-restoration, environmental education and environmental Act.

Unit - IV: Phytogeography (12 Hours)

Phytogeography - Types of forests, range, dispersal and migration barriers, continental drift hypothesis – age and area hypothesis, endemism, peninsular, and inland floras. Introduction to Remote Sensing and its uses.

Unit - V: Forestry (10 Hours)

Introduction to various types of forests in world and in India. Forest products: Major and Minor products with special reference to Tamil Nadu. Importance of forests on environment. Non Timber Forest Products (NTFP).

Unit - VI: Latest Learning (2 Hours)

Latest development related to the Course during the semester concerned (CIA purpose only, not for question setting)

Course Outcomes:

- The students would learn basic knowledge about environment issues.
- They would learn acquired knowledge about the role of man in protecting the environment.
- They could understand the biodiversity conservation and participation in conservation activities.
- The students could get employment in pollution Board and Environment and forest conservation department.

Text Books:

1. Odum, E.P. (1975) – Ecology (2nd Edn.,) – Oxford & IBH Publishing Co., New Delhi
2. Sharma P.D (2005) – Ecology and Environment –Rastogi Publications, Meerut, India
3. Agrawal, K.C. (1987) – Environmental biology – Agro – botanical Publications, India.
4. Schulze, E., Beck, E., Buchmann, N., Clemens, S., Müller-Hohenstein, K., Scherer-Lorenzen, M. (2019). Plant Ecology. Springer. https://www.springer.com/gp/book/9783662562314

References:

1. Cain, S.A. (1944) – Foundation of Plant Geography – Harper & Brothers, N.Y.
2. Frankel, O.H., A.H.D. Brown and Burdon J.J. 1995. The conservation of Plant Diversity, Cambridge University Press, Cambridg,e UK.
3. Heywood V.H. 1995. Global biodiversity Assessment, UNEP. Cambridge University Press, Cambridge, UK.
4. K.V.Krishnamurthy 2003, An Advanced Text Book on Biodiversity. Oxford and IBH Book Company, New Delhi.
5. Virchow D Conservation of genetic resources, Springer Verlag, Berlin.

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SEMESTER III
PLANT BREEDING AND HORTICULTURE

Course Code: P3R1BOCC10 **Marks: 25+75=100**
Hours/Week: 5 **Total Hrs: 60**
Credit: 5
Objectives:

- To study the basic principles and breeding techniques in horticulture crops
- To learn about the as various vegetative propagation techniques
- To understand the concept of garden making
- To learn about landscaping techniques and their implication

Unit- I: Plant Breeding (12 Hours)

Origin of crop plant - scope of plant breeding – Basic principles in plant breeding and conventional and nonconventional methods Selection of characters - selection methods: mass selection, pure line selection and clonal selection – Self and cross breeding techniques.

Unit- II: Polyploidy and Mutation in Plant Breeding (12 Hours)

Inbreeding depression and heterosis: genetic basis and application in plant breeding. Steps in the production of single cross, double cross, three-way cross. Polyploids: induced polyploidy in plant breeding; role of auto and allopolyploids. Mutation and crop improvement. Mutation breeding - gamma garden - detailed account on seed certification.

Unit – III: Horticulture General (12 Hours)

Importance of Horticulture - Brief history, classification of horticultural crops. Plant propagation methods – cutting, layering, and grafting, budding, stock and scion relationship - Essentials of Nursery Management: garden soil - physical and chemical properties of soil, organic matter, compost making - water quality and irrigation.

Unit - IV: Nursery Maintenance and Gardening (12 Hours)

Green house, mist chamber, shed root and shade house. Seed collection - storage, and quality checking. Seed pretreatment – physical and chemical methods, sterilization of seed, seed sowing, watering, fertilizing, mulching. Preparation of seed beds. Horticultural production systems, orchard, vegetable farming, floriculture; Ornamental Gardening; Landscape Horticulture; Amenity Horticulture: trees, shrubs, turf culture.

Unit -V: Landscape Gardening (10 Hours)

Types of Garden - Components of beauty in the landscape – Principles of layout of garden – Lawn making- Landscape garden designing: Formal and Informal gardening - Garden features - Walls, Fencing, Steps, Garden drives and paths, Hedges, Edges, Arches, Pergola, Flower beds, Topiary, Borders. Establishment of garden and Green houses.

Unit - VI: Latest Learning (2 Hours)

Latest development related to the Course during the semester concerned

(CIA purpose only, not for question setting)

Course Outcomes:

- The students could know various methods of selection in plant breeding.
- They could assert the mutation and level of ploidy.
- The graduate could have learn the landscape designing methods.
- The students could get employment in agriculture and horticulture centres and plant breeding centre.
- They could be an entrepreneur in the field of ornamental plant propagation.

Text Books:

1. Gardener Basic Horticulture. Mac Millan, New York
2. A hand book on Horticulture , H.D Kumar.
3. Sundarajan JS, Muthuswamy JK, Shanmugavelu G and Balakrishnan R *A guide on horticulture*. Thiruvenkadam Printers, Coimbatore.
4. Debashis Mandal, Amritesh C. Shukla, Mohammed Wasim Siddiqui(2018). Sustainable Horticulture, Volume 1- 3. Apple Academic Press.

References:

1. Gardener Basic Horticulture. Mac Millan, New York.
2. Randawa Ornamental horticulture in India. Today & Tomorrow Publications, New Delhi. Introduction to Horticulture. TMH Publication.
3. Chaturvedi AN Technology of forest nurseries.
4. Khanna Bandhu Publications, Dehra Dun. Katoch CD Forest Nursery Handbook, Periodical Experts Book Agency, New Delhi.
5. Siyag PR Afforestation Manual. Tree Craft Communications, Jaipur.

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SEMESTER III
BIOCHEMISTRY AND PLANT PHYSIOLOGY

Course Code: P3R1BOCC11 **Marks: 25+75=100**
Hours/Week: 5 **Total Hrs: 60**
Credit: 5

Objectives:

- To gain knowledge about plant bio molecules
- To understand different pathways occurring in a cell
- To get an advanced integral knowledge and understanding of topics in Biophysics and Biochemistry
- To acquire basic knowledge about physiological process

Unit-I: Biochemistry General Aspect (12 Hours)

Structure of atoms, molecules and chemical bonds. Stabilizing interactions – Vander waals, electrostatic, hydrogen bonding, hydrophobic interaction. Water – structure, properties, ionization of water. Acid and bases. pH concept – buffer solutions –Types of Solutions- Percentage, PPM, Molarity, Molality and Normality.

Unit- II: Biochemistry (12 Hours)

Carbohydrate: Classification, Stereo isomerism – optical isomerism - structure of mono, di and oligo polysaccharides. Lipids; Classification – simple lipids – compound, structural, derived and lipids. Amino acids: structure – classification – function – chemistry and biosynthesis of amino acids. Protein: classification – importance - Primary structure of protein– protein biosynthesis, Enzymes: General characters – nomenclature – classification – coenzymes and isoenzymes. Nucleic acids; physical and chemical properties of nucleic acids and synthesis.

Unit- III: Plant Physiology - Transport (12 Hours)

Plant water relations –water transport process, diffusion, osmosis, water potential, chemical potential, absorption of water – Ascent of sap. Transpiration and its significance – factors affecting, mechanism of stomatal movement. Mineral Nutrition: Nutrient uptake and role of cell membrane, ion pump and carrier, salt stress on crop production.

Unit - IV: Plant Physiology – Photosynthesis and Respiration (12 Hours)

Photosynthesis: Ultra structure of photosynthetic apparatus , photochemical reactions, electron transport pathway in chloroplast membrane, photophosphorylations, C_4 carbon cycle, crassulacean acid metabolism, photorespiration. Respiration: Glycolysis, TCA cycle and electron transport in mitochondria, oxidative phosphorylation, pentose phosphate pathway – cyanide resistant respiration.

Unit - V: Nitrogen metabolism and Plant Growth Regulators (10 Hours)

Nitrogen metabolism: Biological nitrogen fixation, reduction of nitrogen into ammonia, nif genes, regulation of nitrate reductase and nitrogenase, nitrate and ammonium assimilation. Growth and development: Physiological role and mode of action of plant growth regulators – auxins, cytokinins, gibberellins, abscisic acid and ethylene.

Unit - VI: Latest Learning (2 Hours)

Latest development related to the Course during the semester concerned (CIA purpose only, not for question setting)

Course Outcomes:

- The students would have learn analytical and presentation skill on bio-molecular level.
- They understand and appreciate the plant world.
- They would know about the basic principles of plant function, metabolism, secondary products, cell physiology and principles of growth and development.
- Students could employment in plant growth centres, plant tissue culture and grafting centre.

Text books:

1. Freifelder, D, Essentials of modern biochemistry-Jones & Barlett (1985).
2. Lehninger, A.L, Biochemistry - Worth Publishers (1985).
3. Veerakumari. L., Biochemistry – M.J.P, Publishers, Chennai (2004).
4. Jain, V. K. Fundamentals of plant physiology, 5th Edition.S. Chand & Company LTD., New Delhi (2010).
5. Bhatla, S. C., A. Lal, M. (2018). Plant Physiology, Development and Metabolism. Springer. https://www.springer.com/gp/book/9789811320224

References:

1. Taiz and Zeiger, Plant physiology, Sunderland: Sinauer Associates.
2. Salisbury FB Ross CW Plant Physiology, CPS Publishers and Printers, New Delhi Gill PS Plant Physiology, S. Chand & Co., New Delhi
3. Nobel, PS Introduction to Biophysical Plant Physiology. W. H. Freeman and Company,San Francico (1970).

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SEMESTER III

PLANT BIOTECHNOLOGY

Course Code: P3R1BOCC12 **Marks: 25+75=100**
Hours/Week: 5 **Total Hrs: 60**
Credit: 5

Objectives:

- To understand the scope and importance application of biotechnology
- To know about the vectors and their mechanisms
- To have basic ideas on plant genome organization
- To gain the principles of r-DNA technology

Unit - I: Plant tissue culture I (12 Hours)

History - Scope and importance - laboratory organization – types of nutrient media - growth regulators (Auxins, Cytokinin and Gibberellins) - sterilization techniques – Explant collection, preparation - totipotency - Direct and Indirect organogenesis. Somatic embryogenesis – Hardening and acclimatization.

Unit - II: Plant tissue culture II (12 Hours)

Haploid production; Ovule - Pollen cultures. Isolation, fusion and culture of Protoplast - Somatic hybridization. Somaclonal variation - applications and limitations – Screening procedures. Synthetic seeds - Cryopreservation and *ex situ* conservation of germplasm.

Unit - III: Secondary metabolite production (12 Hours)

Commercial production of secondary metabolites – control mechanisms – alkaloids - biodegradable plastics, therapeutic proteins, lysosomal enzymes. Immobilized cells, biotransformations, applications, and limitations. Production of therapeutic antibodies and edible vaccine from plants.

Unit - IV: Herbal biotechnology and genetic diversity (12 Hours)

Identification, cultivation and harvesting of herbal plants. Production of herbal products from medicinal plants. Role of plant tissue culture in forestry. Conservation of Biodiversity - Plant genome organization - Selection of molecular markers (RAPD, SNP and SSR).

Unit - V: Agricultural biotechnology (10 Hours)

Ti- and Ri- plasmid – Reporter genes, promoters. Gene transfer methods (Virus-mediated, Direct gene transfer through protoplasts, Particle bombardment), Chloroplast transformation - Transgene stability - Genetic engineering of crop plant for insect resistance, fungus resistance, virus resistance, stress resistance. Management of transgenic plants.

Unit – VI: Latest Learning (2 Hours)

Latest development related to the Course during the semester concerned (CIA purpose only, not for question setting)

Course Outcomes:

- The students would have understood importance of applications of biotechnology day to day life.
- They could learn the methods of vectors in plant genome.
- The graduates would gain the uses of r-DNA technology.
- The students could get employment in biotechnology research laboratory .

Text Books:

1. Satyanarayanan, U. 2010. Biotechnology, Books and allied (p) Ltd.,
2. Bhojwani, and Razdan, M.K, 2009. Tissue Culture Theory and Practice.
3. Chawla, H.S. Biotechnology in crop improvement. International Book distributing Company (2007).
4. Guptha, P.K. Elements of Biotechnology. Rastogi and Co. Meerut, (2006).
5. Abdin, M. Z. (Ed), Kiran, U. (Ed), Kamaluddin, M. (Ed), Ali, A. (Ed) (2017). Plant Biotechnology: Principles and Applications. Springer. https://www.springer.com/gp/book/9789811029592
6. Oksman-Caldentey Kirsi-Marja Et.al (2018). Plant Biotechnology and Transgenic Plants. Crc Press.

References:

1. Fu, T-J., Singh, G and Curtis, W.R. (Eds). 1999. Plant Cell and Tissue Culture for the Production of Food ingredients. Kluwer Academic/Plenum Press.
2. Hammond, J., McGarvey, P. and Yusibov, V. (Eds.). 2000. Plant Biotechnology. Springer Verlag.
3. Henry, R.J. 1997. Practical Application of plant Molecular biology. Chapman and hall.
4. Paul Christou and Harry Klee. 2004. Hand Book of Plant Biotechnology. Vol I& II. John Wiley & Sons. Ltd.

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SEMESTER III

PRACTICAL –III

(PLANT ECOLOGY, CONSERVATION BIOLOGY, PHYTOGEOGRAPHY AND FORESTRY; PLANT BREEDING, HORTICULTURE AND LANDSCAPE DESIGNING; BIOCHEMISTRY AND PLANT PHYSIOLOGY; PLANT BIOTECHNOLOGY)

Course Code: P3R1BOCC13P **Marks: 40+60=100**
Hours/Week: 5 **Total Hrs: 60**
Credit: 5
Objectives:

- To perform double stained permanent slide mounting
- To have a practical exposure on violating the DNA from plant materials
- To perform the experiments on photosynthesis, respiration and growth of plants
- To identify amount of sugar total lipids, free amino acids and total proteins
- To acquire practical knowledge an evaluation the ecological diversity
- To learn preparation of plant tissue culture medium and culturing of plant tissue is it

Plant Breeding, Horticulture and Landscape design

1. Charts display: mass selection, pure line selection, backcross breeding and double cross in Maize
2. Study of different kinds of plant propagation
3. Basic propagation techniques - Cutting, Layering, grafting micro grafting

Plant Ecology, Conservation Biology, Phytogeography and Forestry

1. Analysis of vegetation by quadrat / line transect method Estimation of primary production in the given water sample by the light – dark bottle method
2. Estimation of carbonate, bicarbonate and chloride content in water samples

Plant Physiology Experiments

1. Estimation of water potential in different tissues
2. Estimation of Chlorophyll a, Chlorophyll b and total chlorophyll by Arnon method
3. Determination of carotenoids
4. Estimation of titrable and total acidity
5. Estimation of proteins by Lowry's method
6. Determination of Ascorbic acid content (Titrimetric method)

Biochemistry Experiments

1. Extraction and estimation of starch
2. Extraction and estimation of lipids
3. Determination of reducing sugars in fruits (grapes)
4. Estimation of aminoacids by paper chromatography

Plant Biotechnology

1. Preparation of MS medium
2. Plant tissue culture techniques – Direct and Indirect organogenesis (Leaf, Node and Internodes explants)
3. Isolation of total gemomic DNA from plant tissue.
4. Agarose gel electrtophoresis
5. Spotters related to PCR.

Course Outcomes:

- The students could have learnt procedure for isolation the genomic DNA.
- They would understand the estimation procedure for the certain phytochemical content of the plant.
- They could perform the experiments in plant physiology.
- After completion of this course the labs, plant tissue culture labs and plant growth centre.
- The student could acquire knowledge and species and genus diversity of plant ecology.
- Graduates would learn the basic principles, producers and application for certain bio instruments.
- They could get employment in environment forest department, plant tissue laboratory and biotechnology research centres.

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SEMESTER IV

BIO- PHYSICS AND BIO-INSTRUMENTATION

Course Code: P4R1BOCC14 **Marks: 25+75=100**
Hours/Week: 6 **Total Hrs: 72**
Credit: 5

Objectives:

- To learn the basic principles, producer and application of biological instruments
- To initiate the students into research activities
- To acquire basic knowledge about the handling methods of biological instruments
- To understand the principles and applications of pH and Centrifugation
- To get knowledge on Chromatography techniques

Unit - I: Biophysics (14 Hours)

Bioenergetics, laws of thermodynamics, entropy, enthalpy, ATP bioenergetics. Photobiology – dual nature of light, characteristics of solar radiation, solar energy, absorption spectra in molecules, energy status and de-excitation of atoms.

Unit - II: Microscopy (14 Hours)

Microscopy: Light, Dark and phase contrast microscope – Brief account on Scanning Electron Microscope (SEM) and Transmission Electron Microscope (TEM). Sample preparation for electron microscopic study.

Unit - III: pH and Centrifugation (14 Hours)

pH and pH meter : Sorensen's pH scale – Electrolytic dissociation of water – Acid and Bases – Buffers – Phosphate and Tris Buffers. pH meter – Calomel electrode, Glass electrode and combined electrode – Factors affecting pH measurement – Applications. Properties of Centrifugation – Principle – Types of Centrifuges – Types of centrifugation.

Unit - IV: Chromatography (14 Hours)

Chromatography - Basic principles and Application - Paper Chromatography- Thin layer chromatography – Gas Chromatography– High performance liquid chromatography- Gas Chromatography with Mass spectrum.

Unit - V: Bio-Instrumentation- Spectroscopy and Electrophoresis (14 Hours)

Spectroscopy – Colorimeter – UV-Vis spectroscopy – Flame photometry. – Atomic absorption- spectroscopy, FTIR – NMR and ESR. Electrophoresis – Polyacrylamide Gel Electrophoresis – Agarose Gel Electrophoresis – Immuno electrophoresis- Gel documentation system. Blotting technique.

Unit - VI: Latest Learning **(2 Hours)**

Latest development related to the Course during the semester concerned (CIA purpose only, not for question setting)

Course Outcomes:

- The students would have understood the principles, procedures and application of certain instruments.
- They would understand data collection and handling methods.
- They could get employment in instrumentation laboratory at research industries.

Text Books:

1. N. Gurumani. Research methodology for biological Science, MJP, Publishers, Tripliicane, Chennai (2011).
2. P.Palanivelu, An introduction to Analytical Biochemistry a practical and theoretical manual.
3. Salmah B. Karman and S. Zaleha M. Diah (2016). Principal And Techniques Of Bioinstrumentation. Intelliz Press.

References:

1. Gupta, S.P, Metrology of Study and Scientific work Research, Narosa Publishing House.Life Science Book House, Madurai (1990).
2. Jayaraman, J., Statistical Methods-Sultan Chand & Sons (1985).
3. Plummer, D.T., An Introduction to Practical Biochemistry, Tata McGraw-Hill Publishing Co. Ltd., New Delhi (1978).
4. Clark, J.N, Hand book of Basic Microtechnique, McGraw Hill Book Co., London, (1964).

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SEMESTER XXX

BIOFERTILIZERS AND MUSHROOM TECHNOLOGY

Course Code: XXX **Marks: 25+75=100**
Hours/Week: 6 **Total Hrs: 72**
Credit: 3

Objectives:

- To know about the microbes which are used as Bio-fertilizers
- To have knowledge on technologies for production of Bio-inoculum
- To understand the role of micro-plants in agriculture
- To gain the basic knowledge on mushroom culture and their economic values
- To understand the values of value added products from mushrooms

Unit - I: General aspect and Symbiotic Nitrogen Fixers (14 Hours)

Introduction, Scope, Importance and Classification of Biofertilizers – Microbes used as bio-fertilizer – Isolation, Identification, Field application and Large scale production of following Symbiotic fertilizers - *Rhizobium, Anabaena, Azolla*

Unit - II: Non-Symbiotic Nitrogen and Phosphate Fixers (14 Hours)

Isolation, Identification and large scale production and field application of *Azospirillium, Azotobacter, Clostridium* and *Klebseilla.* Phosphate solubilizers: Isolation, characterization, mass inoculums production, field application of *Bacillus firmus* and *Pseudomonas*- Phosphate solubilization mechanism.

Unit - III: Mycorrhizal Biofertilizers (14 Hours)

Introduction, Scope and general account on mycorrhizae – Classification - Method of collection and isolation (Wed sieving and decanting method) – Culture of mycorrhizae in Modified Melin-Norkrans (MMN) - Field application of Ecto and Endo mycorrhizae.

Unit - IV: Mushroom Technology – General aspects (14 Hours)

General introduction, Scope and importance of Mushroom cultivation – Identification of edible and poisonous mushroom - Importance and nutritive value of mushroom- Brief account a value added products of Mushrooms.

Unit - V: Mushroom Technology – Cultivation Methods (14 Hours)

Isolation and culture of spores - culture media preparation, mother spawn preparation, multiplication of spawn, inoculation techniques, bed preparation, casing and cropping. Cultivation of Button mushroom *(Agaricus bisporus),* Milky mushroom *(Calocybe indica),* Oyster mushroom *(Pleurotus sajor-caju),* Paddy straw mushroom *(Volvariella volvacea).*

Unit - VI: Latest Learning **(2 Hours)**

Latest development related to the Course during the semester concerned (CIA purpose only, not for question setting)

Corse Outcomes:

- The students would have acquired sufficient, academic, practical experiences in the biofertilizer and mushroom culture.
- They could understand the basic information on biofertilizers and mushroom.
- They would entrepreneurial skills in the production of mushrooms.

Text Books:

1. Kannaiyan S, 2003. Biotechnology of Biofertilizers, CHIPS, Texas.
2. http://www.fnca.mext.go.jp/english/bf/bfm/pdf/4_4_Phosphate_Solubilizers0403.pdf
3. Free e-Book: http://www.fnca.mext.go.jp/english/bf/bfm/pdf/Biofertilizer_Manual.pdf
4. Mushroom Production and Processing Technology. Pathak, V.N and Yadav, N. (2000). Agrobios, Jodhpur.
5. Giri, B. (Ed), Prasad, R. (Ed), Wu, Q. (Ed), Varma, A. (Ed) (2019). Biofertilizers for Sustainable Agriculture and Environment. Springer. https://www.springer.com/gp/book/9783030189327.

References:

1. Mushroom Cultivation. Tripathi, C.P. (2005). Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
2. The Complete technology book on biofertilizers and organic farming. NIIR, New Delhi.
3. Somani, L.L., P. Shilpkar and D. Shilpkar. 2011. Biofertilizers commercial production technology and Quality control. Agrotech Publishers Academy, Udaipur.
4. The complete technology book on Vermiculture and vermicompost. NIIR, New Delhi.
5. Handbook of cultivation, Processing and packing, published by Engineers India Research Institute, 4449, Nai Sarah, Main Road, Delhi 110006.
6. Tewari, Pankaj Kapoor S.C. 1988. Mushroom cultivation. Mittal Publicatiion, New Delhi.
7. Nita Bhahi 1984-1988. Hand book of Mushrooms, II editioin, Vol-1 and II.

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SEMESTER XXX

ETHNOBOTANY AND PHARMACOGNOSY

Course Code: XXX **Marks: 25+75=100**
Hours/Week: 6 **Total Hrs: 72**
Credit: 3
Objectives:

- To understand the uses of the plant resources
- To be aware of values of such resources
- To enlighten the students about economic again because of plant resources
- To learn traditional health care products
- To know about naturopathy treatment and its effectiveness

Unit - I: Ethnobotany – History and Development (14 Hours)

Introduction, history and scope of Ethnobotany Tribes of India – current cultivation, collection of medicinal plants parts and processing of Herbal drugs. Traditional Indian system of Medicine – Ayurveda, Siddha, Unani and Naturopathy. Utilization of medicinal and various systems of medicines aromatic plants in India.

Unit - II: Ethnobotanical method of study (14 Hours)

Ethnobotanical techniques. Anthropological field methods, linguistic and other symbiotic analysis, plant collection and taxonomy. Archaeobotanical methods of information systems. Traditional botanical knowledge and substances of wild plant resources – the documentation and interpretation. Collection of ethnoboanical evidence, the dynamics and distribution of traditional botanical knowledge.

Unit - III: Conservation of Medicinal Plants (14 Hours)

Ethnobotany and conservation of plants with special reference to India - mythology and conservation of ecosystems, conservation of selected plant species: sacred groves, forestry and unique ecosystems and their ethnobiolgical values, plants and animals in art, tradition and ethnography: Ethnobotanical field methods.

Unit - IV: Pharmacognosy – Introduction and Classification (14 Hours)

History- Definition and scope of Pharmacognosy Definition of drug, classification, natural drugs – Morphological classification, chemical classification and Chemo taxonomical classification.

Unit - V: Drug preparation and Marketing (14 Hours)

Collection and preparation of natural drug for market – Macroscopic characters – Therapeutically and Pharmaceutical use of the drugs, *Feronia - Nux-vomica, Vinca, Oscimum* and Neem. Phytochemically compounds used in non-medicinal application, phytochemistry and pharmacology of traditional medicine.

Unit - VI: Latest Learning (2 Hours)

Latest development related to the Course during the semester concerned (CIA purpose only, not for question setting)

Course Outcomes:

- The students could have learnt the basic knowledge on traditional plant based medicinal system.
- They would understand the valuable herbal products and their preparation methods.
- They graduates could acquire knowledge on drug marketing.
- The students could get employment in herbal companies.

Text Books:

1. Kokate, C.K., Purohit, A.P., and Gokahale, Phamacognosy, Nirali Prakasan, 2002.

2. Dubey, R.C. A Text book of Biotechnology (2006).

3. Natesh, S. 2001. The changing scenario of herbal drugs: Role of Botanists. Phytomorphology. (Golden Jubilee Issue)., Pp.75-97.

4. Jonne Bernes – Herbal Medicines, Pharmaceutical Press, London.

5. Sushil Kumar – Medicinal Plants in Skin care, CIMAP, Lucknow.

6.Albuquerque, U. P. (Ed), de Lucena, R. F. P. (Ed), Cruz da Cunha, L. V. F. (Ed), Alves, R. R. N. (Ed) (2019). Methods and Techniques in Ethnobiology and Ethnoecology. Springer.

References:

1. Peter B. Kaufman et al., Natural Products from plants. CRC Press (1999).

2. Tyler, V.E., Brady, L.R. and Robbers, J.E, Pharmacognosy. 9th ed. Lea and Fibiger, Philadelphia (1981).

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SEMESTER XXX

RESEARCH METHODOLOGY AND BIOSTATISTICS

Course Code: XXXX **Marks: 25+75=100**
Hours/Week: 5 **Total Hrs: 60**
Credit: 3

Objectives:

- To impart scientific, statistical and analytical knowledge among the learners
- To carry out research work effectively
- To get knowledge to prepare research documents for publication
- To select the appropriate publish for the research findings
- To write research proposal and apply that to the sponsoring agencies
- To make use of socio-research networks

Unit- I: **(12 Hours)**

Methods of research in Biological sciences- Objectives – thrust areas and research priorities in Biological Science to meet global competency- Origin of the research problem - Collection of information: Internet –library – index card preparation. Articles – Original, review and short communication – Preparation and publication.

Unit- II: **(12 Hours)**

Thesis writing - Proof correction – symbols used for correction- Standards of journals: national and international – online and printed – paid and unpaid – peer reviewed journal – SCI journals – impact factor- h-index. Search engines: Elsiever, Springer, Pubmed, google scholar, Academic journals, online digital library - Preparation for Oral and poster presentation – communication skills for effective presentation - preparation of Power Point presentations.

Unit- III: **(12 Hours)**

Social network for research community: Research gate, Research Pages, Frontiers Research Network, Elsevier Lab. Writing proposal and reports – Research grant for sponsoring agencies – (DBT, UGC, DST, CSIR and ICMR). Research ethics – Intellectual property Rights – Overcome the difficulties in biological research.

Unit- IV: **(12 Hours)**

Introduction to Biostatistics: Definitions, applications of Bio-statistics – Role of Bio-statistics. Measures of Central Tendency: Arithmetic Mean – Median – Mode Measures of Dispersion: Standard Deviation and Coefficient of Variation (Related problems, direct methods only)

Unit- V: **(10 Hours)**

Null hypothesis, alternative hypothesis, level of significance (Basic Definitions). Testing of hypothesis: One sample and two samples mean – F-test – ANOVA: one way and two way classification, Chi – Square goodness of fit and independent attributes (Related problems)

Unit - VI: Latest Learning **(2 Hours)**

Latest development related to the Course during the semester concerned

(CIA purpose only, not for question setting)

Course Outcomes:

- The students could have known the state of art of research in botany.
- They would plan and carry out short term research project.
- Graduate could present the collected data on research articles, thesis and seminar presentation.
- They could understand the value of and need for socially relevant researches.
- Calculate and apply measure of location and measure of dispersion.
- Perform test of hypothesis as well as calculate confidence interval for a population parameter.

Text Books:

1. Gurumani N Research Methodology for Biological Sciences, MJP Publishers, Chennai
2. Ramakrishnan P Biostatistics, Saras Publication, Nagercoil Arora PN and Malhon PK Biostatistics, Imalaya Publishing House, Mumbai.
3. Palanichami S and Manoharan M Statistical methods for biologists, Paramount publications.
4. "Biostatistics" – P.N. Arora and P.K. Malhan, Himalaya Publication House, 2006.
5. "Statistical and Numerical Methods" – P.R. Vittal and V. Malini.

References:

1. Connor & Peter Woodford, Writing Scientific Paper in English Pitman, Medical Pub. Co.Ltd., England, 1979.
2. Khan, I.A., and Khannum, A., Fundamentals of Biostatistics, Vikas Pub., Hyderabad, 1994.
3. Kothari, C.R., Research Methodolgy – Methods and Techniques, Wiley Eastern Ltd., New Delhi, 1991.
4. Sree Ramulu, V.S., Thesis Writing, Oxford & IBH Pub., New Delhi, 1988.
5. Zar, J.H. Biostatistics Analysis, Prentice Hall International, England Cliffs, New Jersy, 1984.

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SEMESTERXXX

RECYCLIC TECHNOLOGY

Course Code: XXX **Marks: 25+75=100**
Hours/Week: 6 **Total Hrs: 72**
Credit: 3

Objectives:

- To understand the basic knowledge on recyclic process of waste materials
- To know about the utilization of by products from organic waste
- To study the reuses of glass and ceramics
- To acquire knowledge on the plastics are bio hazards to fertile land
- To get idea on recycling on e-Waste

Unit - I: **(14 Hours)**

Biological Materials: Definition and Introduction. Waste management concept. Vegetable waste: Types of vegetable waste recycling: Composting, Vermicomposting and Biogas technology. Animal wastes recycling: Waste materials from meat, Poultry and Fish industries, Nutritive value of meat by-products, utility of blood, skin, bone and organs. Utilization of poultry by-products. Recycling of meat and poultry by-products: edible and non-edible. Utilization of fish by-products: final products, treatments, physiochemical characters and uses.

Unit - II: **(14 Hours)**

Plastics: Introduction to plastic waste, sources of plastic waste. Recycling of plastics: primary, secondary, tertiary and quaternary recycling. Biodegradation of plastics. Biodegradable polymers. Plastics and environment.

Unit - III: **(14 Hours)**

Glass and Ceramics: Introduction to glass and ceramics. Types of glass wastes. Recycling of glass. Types and recycling of Ceramics. Concept of reuse as an alternative to disposal. Harmfulness of Glass and Ceramics, control and prevention methods.

Unit - IV: **(14 Hours)**

e-Wastes: Introduction, health hazards caused by exposure e-waste. Methods of recycling techniques, Pyrolysis method, Hydrometallurgical method, Mechanical recycling, Air classification method. The separation of waste PCBs by dissolving bromine epoxy resin using organic solvent (DMSO).Recycling of metals from waste PCB by various methods. Reuse of recovered materials from waste PCBs.

Unit - V: **(14 Hours)**

Current Recycle Technology: Road construction used by plastic, Useful conversion methods of Biological waste, reuse methods of glass, Awareness create to the people, Making House decorative material prepared by all kinds of waste (Plastic, Glass, Ceramics and e-Waste).

Unit - VI: Latest Learning **(2 Hours)**

Latest development related to the Course during the semester concerned (CIA purpose only, not for question setting)

Course Outcomes:

- The students could have understood basic knowledge on recyclic process and application of waste materials.
- They would know about the various steps in recyclic process of plastic and production of degradable plastics.
- Graduates could learn the concept and topper of glarier and ceramics recycling.
- After completion of this course the student could in become an entrepreneur.
- They would understand awareness about the recyclic process of waste materials.

Text Books:

1. http://nzic.org.nz/ChemProcesses/environment/14E.pdf
2. http://www.g.eng.cam.ac.uk/impee/topics/RecyclePlastics/files/Recycling%20Plastic%20v3%20PDF.pdf
3. http://plasticisrubbish.com/2013/03/20/recycling-plastic2
4. https://web.anl.gov/PCS/acsfuel/preprint%20archive/Files/Volumes/Vol42-4.pdf

References:

1. R.J.Ehrig (Ed.), “Plastics Recycling –Products and Processes” Hanser Publication, Munich
2. Anthony L. Andrady (Ed.), “ Plastics and the Environment:, Wiley Interscience, New York
3. R.J.Brandrup, “Recycling and recovery of Plastics”, Hanser Publications, Munich (1996).
4. N.Mustafa, “Plastics Waste Management’s, Disposal Recycling and Reuse, marcel Dekker, New York (1993).

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SEMESTER XXX
ELECTIVE COURSE
FOOD PROCESSING TECHNOLOGY

Course Code: XXX **Marks: 25+75=100**
Hours/Week: 6 **Total Hrs: 72**
Credit: 3
Objectives:

- To understand the basic knowledge on food preservation
- To study the Principle and technologies of food processing and preservation
- To know about the diet therapy
- To get clear idea on food adulteration
- To study the physical process for food preservation
- To acquire knowledge on Food laws and Food safety and standards acts

Unit - I: **(14 Hours)**

Concept of food and nutrients, physiochemical properties and principles of food, colloidal - Emulsions – Foams. Concept of different food groups. Energy value of food and its determination, energy expenditure – energy utilization in cells and energy balance.

Unit - II: **(14 Hours)**

Food additives, antioxidants, preservatives, stabilizers, bleaching and maturing agent. Sweeteners, anti caking agents coloring and flavoring substance Food adulteration: Types of adulterants- methods of Detection. Dietary fiber- Definition, types of fiber in plant foods, sources, composition, role of dietary fiber and resistant starch in nutrition.

Unit - III: **(14 Hours)**

Therapeutic diets – Principles and Objectives of diet therapy. Review of hospital diets- Regular diet, liquid diet, light diet, soft diet, pre and postoperative diet. Diet planning and use of exchange list in nutrient calculation. Drugs- Introduction, Classification, biotransformation and excretion of drugs, routes of drug administration.

Unit - IV: **(14 Hours)**

Physical principles in food processing – thermal processing, refrigeration, freezing, dehydration, ionizing radiation. Chemical principles in food processing – preservation/ processing by sugar, salt, curing, smoking, acid and chemical. Equipments for novel food processes Food packaging equipment- fillers, closures, sealers, wrappers, aseptic packaging equipment and palletizers.

Unit - V: **(14 Hours)**

Food Quality assurance – Quality assurance programme – Quality plan, documentation of records, product and specifications process control, corrective action, and total quality process. Quality parameters- physical, chemical, functional, microbial; Rapid diagnostic methods of food quality – instruments and kits, ISO – 9000 serious, Food laws and Food safety and standards acts.

Unit - VI: Latest Learning **(2 Hours)**

Latest development related to the Course during the semester concerned (CIA purpose only, not for question setting).

Course Outcomes:

- The students could have understood the basic knowledge on food preservation.
- They would know the Principle and technologies of food processing and preservation.
- They would understand the diet therapy.
- They could get clear idea on food adulteration.
- They could understand physical process for food preservation.
- They would know about the Food laws and Food safety and standards acts.

Text Books:

1. Khader,V. Text book of Food science and Technology. Published by India Council of Agricultural Research, NewDelhi 110012, 2001
2. Manay, N.S, Shadaksharaswamy, M., Foods- Facts and Principles, New Age International Publishers, New Delhi, 2004.
3. Reddy Y.S, Newer concept and applications for food industry. Gene tech Books, New Delhi 110002, 2006

References:

1. Begum, R. A text book of foods, Nutrition and Dietetics. Second revised edition, Sterling Publishers (P) Ltd, New Delhi, 1991.
2. Joshi, S. A Nutrition and dietetics. Third edition, Tata McGraw Hill education pvt ltd, New Delhi, 2010
3. Manual Mudambi, S. R., Rajagopal M. V., Fundamentals of food and Nutritions, 2nd edition, Wiley Eastern Ltd, New Delhi 1990.
4. Swaminathan, M. Essential of food and Nutrition, Vol.I. Bangalore Printing and Publishing Co. Ltd Bangalore.
5. Singh, R.P. Introduction to Food Engineering 3rd edition. Academic Press, London. 2004.

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SEMESTER XXX
ELECTIVE COURSE
NURSERY TECHNOLOGY

Course Code :XXX **Marks: 25+75=100**
Hours/Week: 6 **Total Hrs: 72**
Credit :3

Objectives:

- To understand the basic knowledge on Importance and scope of horticulture
- To study about the Fruit crops and their importance
- To know about the Principles and methods of designing a flower garden
- To get clear idea on food adulteration
- To study the Garden design

Unit - I: **(14 Hours)**

Importance and scope of horticulture – Divisions of horticulture – climate, soil, nutritional needs – water irrigation – plant propagation method- cutting, layering, grafting, budding, stock-scion relationship. Frame work of marketing management-concept of marketing, management and analysis of marketing.

Unit - II: **(14 Hours)**

Fruit crops – Induction of flowering, flower thinning fruit setting, fruit developments – cultivation of important fruit crops – Mango, lime, and Guava – Veritable crops: classification, cultivation of important vegetable crops: Tomato, Brinjal and Dolichos lablab.

Unit - III: **(14 Hours)**

Storage of fruits and vegetables – preservation of fruits and vegetables nursery – micro propagation – Hardening and translation – Germ palm maintenance of sweet potato. Propagation of bulb plants: Scaling, Scooping, Bulbils, Division, Cutting

Unit - IV: **(14 Hours)**

Principles and methods of designing a flower garden badges, sedges, fence, tress, climbers – rookeries, terrace garden lawn making and maintenance, water garden – cultivation of water plants

Unit - V: **(14 Hours)**

Garden design- scope, Objectives, types of garden, features, and ornamentation, Indoor gardening – house plant, light, humidity, watering, designing Bonsai plants, watering, pruning, dwarfing. Landscaping – principles, types of park. Elements and principles of flower design.

Unit -VI: Latest Learning **(2 Hours)**

Latest development related to the Course during the semester concerned (CIA purpose only, not for question setting)

Course Outcomes:

- The student could have gained knowledge on conservation of wildflowers, wildlife, forests and wilderness areas.
- They could understand the various types of vegetative propagation.
- They would learn the techniques in nursery preparation.
- They would promote these interests to the local society.
- They could gain knowledge on designing of Gardens.

Text Books:

1. Manibushan Rao. K. (1991). Text book of horticulture. McMillan publication. References Kumar. N. (1986). Introduction to horticulture.
2. Rajalakshmi publication Subbha Roa, N.S,1997. Biofertilizers in Agriculture and Forestry. India Book House Limited. Trivedy . P.P. 1987.
3. Home gardening. ECA Publication. New Delhi. Philip Kotler, Marketing Management, Millennium edition, New Delhi, Prentice Hall of India.
4. Bose T K and Mukerjee D 1987, Gardening in India, Oxford Book House
5. Manibhushan Rao 1991. Text book of Horticulture, Macmillan Publications.

References:

1. Randhawa GS and Mukhopadhyay A. 2004.Floriculture in India.Allied Publishers Pvt. Limited.
2. Swarup Vishnu. 2003. Garden Flowers. National Book Trust
3. Hartmann HT, Kester DE, Davies FT and Geneve RL. 2002. Plant Propagation – Principles and
4. Practices. Prentice Hall India Ltd.
5. Royal Horticultural Society's Encyclopedia of Gardening.

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SEMESTER XXX
ELECTIVE COURSE
HERBAL RECIPES AND REMEDIES

Course Code :XXX **Marks: 25+75=100**
Hours/Week: 6 **Total Hrs: 72**
Credit :3

Objectives:

- To study about the herbals
- To understand the herbs as a food supplement
- To know about the herbal variety rice and their uses
- To gain basic knowledge on Snacks preparation
- To understand about the herbal Cookies and cakes

Unit - I: **(14 Hours)**

Herbalism history, Traditional use of herbal medicine. Health herbal House cleaning and non-toxic home care preparation. Herbal Soup Preparation -Mushroom, Mudakkathan (*Cardiospermum halicacabu*), Thuthuvalai (*Solanum trilobatum* L.), Kurinja keerai (*Gymnema sylvestre* R. Br.), Pepper (Piper nigrum. L.), Garlic (*Allium sativum* L.) Tomato (*Lycopersicon esculentum*), Kovakkai (*Coccinia grandis*,),Manathakkali (*Solanum nigrum* L.*)* Neem flower (*Azadirachta indica*) Mode of Preparation and remedies.

Unit - II: **(14 Hours)**

Beneficial use of herbs as a food supplement, Nutritional value of Herbs, Herbal Paste (Mooligai thovayal) - pirandai *Cissus quadrangularis* (Linn.), Puthina (*Mentha arvensis* L.), Kothamalli (*Coriandrum sativum* L.), Karugapillai *Murraya koenigii* (L.), Nellikkai (*Phyllanthus emblica* L.), Vallarai *(Centella asiatica),* Ginger (*Zingiber officinale* Rosc.)

Unit - III: **(14 Hours)**

Variety Rice - Mint, corriandum, curry leaves, Toor dal, Ginger, Pepper, carrot, Greens. Ingredients and Mode of Preparation methods. Varagu arisi (Kodo millet) pongal, Thinai (Foxtail millet) Briyani, Samai Arisi (Little millet) Pulao, Kuthirai vali(Barnyard millet) Idiyappm.

Unit - IV: **(14 Hours)**

Snacks - Ragi mixture and kozhukattai, vegetables cutlets, wheat, Pearl milet (Kambu) Paniyaram, Ground nut Mittai, cereals rotti, Bengal gram karashev, Mushroom samosa, Keerai vadai, Aloe vera juice, citron (Narthangai) Juice.

Unit - V: **(14 Hours)**

Cookies and cakes – History of cookies, Peanut butter Raisin brown cookies, corn flake cookies, wheat cakes, Omla candy, lemongrass and ginger candy, Ginger bread cookies. Mint chocolate.

Unit - VI: Latest Learning **(2 Hours)**

Latest development related to the Course during the semester concerned (CIA purpose only, not for question setting)

Course Outcomes:

- The student could have understood knowledge on the herbalism.
- They could understand the herbs as a food supplement.
- They would learn the herbal variety rice and their uses.
- They could gain basic knowledge on Snacks preparation.
- They could understand about the herbal Cookies and cakes.

Text Books:

1. Herbal Medicine for Beginners: Your Guide to Healing Common Ailments with 35 Medicinal Herbs, 2018. Katja Swift, Ryn Midura
2. Encyclopedia of Herbal Medicine: 550 Herbs and Remedies for Common oilments, 2016. Andrew Chevallier.
3. Herbal Bioactives and Food Fortification: Extraction and Formulation, 2015. D. Suresh Kumar
4. Herbs for Stress and Anxiety, 2018. Rosemary Gladstar

References:

1. Rosemary Gladstar's Herbal Recipes for Vibrant Health: 175 Teas, Tonics, Oils, Salves, Tinctures, and Other Natural Remedies for the Entire Family, Publisher: Storey Publishing, LLC; 2008, Reprint edition.
2. The Essential Guide to Home Herbal Remedies: Easy Recipes Using Medicinal Herbs to Treat More Than 125 Conditions from Sunburns to Sore Throats P, Robert Rose; 1 edition 2014.

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