



M. Sc., BOTANY
SYLLABUS
(WITH EFFECTIVE FROM 2018-2019)

M.Sc. BOTANY PROGRAMME – Course Structure under CBCS Pattern

(For the candidates admitted from the academic year 2018-2019 onwards)

S. No.	Sem.	Course Code	Paper	Hrs/Week	Credit	Exam Hrs.	Marks		
							Internal	External	Total
Semester I									
1	I	18PBT1	Core Course I - Plant Diversity – I (Algae, Fungi and Bryophyte)	7	5	3	25	75	100
2	I	18PBT2	Core Course II – Plant Diversity - II (Pteridophytes, Gymnosperms and Paleobotany)	7	5	3	25	75	100
3	I	18PBTE1 (OR)	Elective Course I - Ecology, Phytogeography and Conservation	7	5	3	25	75	100
	I	18PBTE1	Elective Course I - Biodiversity and Climate Change	7	5	3	25	75	100
Semester II									
4	II	18PBT3P	Core Course III - Practical - I	6	5	3	40	60	100
5	II	18PBT4P	Core Course IV - Practical – II	6	5	3	40	60	100
6	II	18PBT5	Core Course V - Taxonomy of Angiosperms and Economic Botany	6	5	3	25	75	100
7	II	18PBT6	Core Course VI - Anatomy, Embryology and Histochemistry	6	5	3	25	75	100
8	II	18PBTE2 (OR)	Elective Course II - Horticulture and Gardening	7	5	3	25	75	100
	II	18PBTE2	Elective Course II – Forestry and Wood science	7	5	3	25	75	100
9	II	18PBTE1	Extra Disciplinary course – paper I – Medical Botany	5	5	3	25	75	100
Semester III									
10	III	18PBT7	Core Course VII – Cell and Molecular Biology	6	5	3	25	75	100
11	III	18PBT8	Core Course VIII - Genetics and Plant Breeding	6	5	3	25	75	100
12	III	18PBT9	Core Course IX –General Microbiology	6	5	3	25	75	100
13	III	18PBTE3 (OR)	Elective Course III – Intellectual Property Rights	6	5	3	25	75	100
	III	18PBTE3	Elective Course III – Phytochemistry	6	5	3	25	75	100
Semester IV									
14	IV	18PBT10	Core Course X – Plant Physiology, Biochemistry and Biophysics	6	5	3	25	75	100
15	IV	18PBT11	Core Course XI –Biotechnology and Genetic Engineering	6	5	3	25	75	100
16	IV	18PBT12	Core Course XII - Research methodology, Biostatistics and Bioinformatics	6	5	3	25	75	100
17	IV	18PBT13P	Core Course XIII – Practical III	4	5	4	40	60	100
18	IV	18PBT14	PW I - Project	12	5	3	25	75	100
Total				120	90				1800

Program outcome:

- Postgraduate students can grasp the knowledge on diversity and their role in environment. They can understand internal organization of cells, tissues and functions of life forms.
- Students can also acquire knowledge on the applied sciences like horticulture and gardening and microbes.
- Students can pursue either an academic career in institutions as lecturers and professors or a scientific career in various scientific positions such as Plant Scientists, Weed Scientists etc.
- They can also go and work as researchers and as administrators.
- They have also the option in Botanical Survey of India and other Government departments by competitive examinations such as UPSC, TNPSC etc.

Program Specific Outcome:

- Students will have the capability to demonstrate proficiency in the experimental techniques and methods of analysis appropriate for botany.
- Students will be able to explain how organisms function at that level of the gene, genome, cell, tissue, organ and organ –system. Drawing upon this knowledge, they will be able to give specific examples of the physiological adaptations, development, reproduction and behavior of different forms of life.
- Students will be able to identify the major groups of organisms with an emphasis on plants and be able to classify them within a phylogenetic framework. Students will be able to compare and contrast the characteristics of plants, algae and fungi that differentiate them from each other and from other forms of life.
- Students will have excellent research skills (field, laboratory, plant growth facilities and library).
- Students can be able to know Communications skills to discuss and analyze problems using oral and written communication skills.
- Students will acquire the knowledge about the cultivation of medicinal and aromatic plants

Semester I

CORE COURSE I – PLANT DIVERSITY – I
(Algae, Fungi and Bryophytes)

Course Code : 18PBT1 ♦ Hrs / week : 7 ♦ Credit : 5 ♦ Marks : 25 + 75 = 100

Objectives:

- To understand the major groups of cryptogamic plants and their characteristics.
- To trace their interrelationships and study their evolutionary trends.

Course outcomes:

- Students acquire knowledge about Ultra - structure of Prokaryotic and Eukaryotic cells and their composition.
- Imparting knowledge on diversity of algal species.
- Students can able to know general features distribution and mode of nutrition of fungi.
- They understood the importance lichen as a indicator of pollution.
- Students knew about evolution gametophyte and sporophyte.

UNIT - I Structure and life cycle of algae

Introduction and General characteristics of algae. Contributions of Indian algologist : Prof. M. O. P. Iyengar. Habitat, thallus organization, cell structure, reproduction and patterns of life cycles in algae. Evolution of sex in algae. Classification of algae (Fritsch, 1835). Algal blooms.

UNIT - II Economic importance & diversity of algal species

Economic importance of algae: Algal biofertilizers - Role of algae in industry (Alginic acid, Agar, Carrageenan, Food & Feed). Bio - fuels from Algae: Bio diesel, ethanol. Fossil Algae (A brief account only). Comparative account on Salient characteristics, structure and reproduction of Cyanophyceae, Chlorophyceae, Phaeophyceae, Rhodophyceae.

UNIT - III General Topics in fungi

General Characteristics of Fungi. Classification of Fungi (Alexopolous and Mims, 1961) Occurrence and distribution of fungi. Modifications of mycelium. Mode of nutrition in fungi. Reproduction – Vegetative, asexual and sexual reproduction. Homothallism & Heterothallism in fungi.

UNIT - IV Morphology & reproduction of fungal species

Structure, reproduction and economic importance of Phycomycetes, Ascomycetes, Basidiomycetes and Deuteromycetes. Contributions of Indian mycologist : Dr. C. V. Subramanian. Fossil fungi. Lichens- general characters, occurrence, distribution, types, reproduction and Economic importance.

UNIT - V Structure & life cycle of Bryophytes

Introduction and Salient features of Bryophytes. Distribution and Ecology. Classification of bryophytes (Rothmaler, 1951). Comparative structure and evolution of sporophytes and gametophytes. Alteration of generations in Bryophytes. Spore Dispersal Mechanisms. Economic importance of Bryophytes. Contributions of Indian bryologist: Dr. Shivram

Kashyap. General characteristics, structure and reproduction of Marchantiales, Anthocerotales, Polytrichales, Funariales.

Text Books:

- Singh, Pande and Jain. 1998. A text book of Botany, Rastogi Publication, Meerut.
- Venkataraman, et al., 1974, Algae-Form & Function. Today and Tomorrow, Pub. Co.
- Prem Puri, 1973. Bryophytes - a broad perspective. Atma Ram & Sons, New Delhi.

Reference:

- Delevoryas, T., 1977, Plant Diversification. Holt, Rinehart & Wintson, New York.
- Chapman, V.J. & Chapman, D.J. The Algae. ELBS & MacMillan, London
- Srivastava, H.N., 1999, Fungi. Pradeep Publications, Jalandhar
- Hale, Jr. M.E., 1983, Biology of Lichens. Edward Arnold, Mayland.
- Alexopoulos, C. J. and Mims, C. W. (1979). Introductory Mycology. Wiley Eastern Ltd., NY
- Bessey, E. A. 1979. Morphology and Taxonomy of Fungi. Vikas Pub, New Delhi.
- Bold, H. C. 1980. Morphology of Plants and Fungi. Harper and Row Publishing Inc., NY
- Burnet, J. H. 1971. The Fundamentals of Mycology. ELBS Publications, London.
- Mehrotra, R. S and Aneja, K. R. 1990. An Introduction of Mycology. Wiley Eastern, New Delhi.
- Vashishta, B. R. and Sinha, A. K. (2007). Botany for Degree Students - Fungi. S. Chand, New Delhi.
- Cavers F. 1911. The interrelationship of Bryophytes. New Phytologist.

E-Books:

- https://www.schandpublishing.com/books/higher-education/commerce-management/public-finance/9789352710805/#.Wwz_pUiFPIU
- <https://www.abebooks.com/book-search/title/introduction-to-the-algae-structure-and-reproduction/>
- https://books.google.co.in/books?id=YsJs9eiNKdAC&pg=PA138&lpg=PA138&dq=Bold,+H.C.+%26+Wynne,+M.J.+1985.+Introduction+to+the+Algae.+Prentice+Hall+of+India,+New+Delhi.&source=bl&ots=04B4qBMbX_&sig=h2T109eo9zFlj4Pc1YvPU5wFiyw&hl=en&sa=X&ved=0ahUKEwiJh5TbsarbAhWHL08KHZH8A3oQ6AEIQzAG#v=onepage&q=Bold%2C%20H.C.%20%26%20Wynne%2C%20M.J.%201985.%20Introduction%20to%20the%20Algae.%20Prentice%20Hall%20of%20India%2C%20New%20Delhi.&f=false

Mapping with programme outcomes					
COs	PO1	PO2	PO3	PO4	PO5
C01	S	M	S	M	S
C02	S	S	S	M	S
C03	S	S	S	M	S
C04	S	S	M	S	S
C05	S	S	S	S	S

*S- STRONG, M- MEDIUM, L- LOW

Semester I

CORE COURSE II – PLANT DIVERSITY – II
(Pteridophytes, Gymnosperms and Paleobotany)

Course Code : 18PBT2 ♦ Hrs / week : 7 ♦ Credit : 5 ♦ Marks : 25 + 75 = 100

Objectives:

- To understand the major groups of lower vascular plants and their characteristics.
- To trace their interrelationships and study their evolutionary trends.

Course outcomes:

- Students can able to understand about external, internal and development of reproductive structures in Pteridophytes.
- They gain the knowledge on the Lifecycle of Pteridophytes.
- Students get knowledge on general features distribution and economic importance of Gymnosperms.
- Acquiring knowledge on life cycle of gymnosperms
- Understanding fossils and their types

UNIT - I General topics in Pteridophytes

Introduction and general characters. Classification (Parihar, 1996). Types of stele in pteridophytes, leaf trace and leaf gap. Telome theory. Origin of pteridophytes - Theories of algal origin and theories of Bryophytral origin. Sporangium development – eusporangiate type and leptosporangiate type.

UNIT - II Morphology & reproduction of Pteridophytes

Heterospory and origin of seed habit. Economic importance. Morphology, anatomy and reproduction of the following Psilopsida, Lycopsida, Sphenopsida and Pteropsida.

UNIT - III General features of Gymnosperms

General characteristic features. Distribution of Gymnosperms. Classification of Gymnosperms (K.R. Sporne). Development and trends of evolution of male gametophyte and female gametophyte. Economic importance.

UNIT - IV Vegetative & reproductive structures in Gymnosperms

A comparative account of vegetative and reproductive structure of Coniferales, Gingoales, Gnetales, Taxales and Welwitschiales.

UNIT - V Techniques in Paleobotany

A general account on Geological Time Scale. Techniques for paleobotanical study. Fossil types: Compressions, incrustation, casts, molds, petrifications, coalballs and compactions. Contributions of Birbal sahani. Study of organ genera: Cordaites, Lepidocarpan, Lyginopteris, Sphenophyllum, Calamostachys.

Text Books:

- Vasista PC, Sinha AK and Anilkimar. 2005. Botany for degree students, Gymnosperms, S Chand, New Delhi.

- Pandey BP. 1998. A Text Book of Botany Vol. II. S Chand, New Delhi.

Reference:

- Pandey, S.N., S.P. Misra and P.S. Trivedi. 2002. A Textbook of Botany. Volume II. Vikas Publishing House Pvt Ltd, New Delhi.
- Rashid.A. 2007. An Introduction to Pteridophyta - Vikas publications, New Delhi.
- Johri, RM, Lata S, Tyagi K (2005), A text book of Gymnosperms, Dominate Pub and Distributor, New Delhi
- Sporne, K.R. (1975). The Morphology of Pteridophytes, Hutchinson and Co., London.
- Sporne, K.R. (1967). The morphology of gymnosperms, Hutchinson and Co., London.

E-Books:

- https://www.schandpublishing.com/books/higher-education/commerce-management/public-finance/9789352710805/#.Wwz_pUiFPIU
- <https://www.abebooks.com/book-search/title/introduction-to-the-algae-structure-and-reproduction/>
- <https://www.schandpublishing.com/books/higher-education/biology/college-botany-volume-ii/9788121906012/#.W0LrB9IzbIU>

Mapping with programme outcomes					
COs	P01	P02	P03	P04	P05
C01	S	S	S	S	S
C02	S	S	S	M	S
C03	S	S	M	M	S
C04	S	S	M	S	S
C05	S	M	S	M	S

*S- STRONG, M- MEDIUM, L- LOW

Semester I

**ELECTIVE COURSE I – ECOLOGY, PHYTOGEOGRAPHY AND
CONSERVATION BIOLOGY**

Course Code : 18PBTE1 ♦ Hrs / week : 7 ♦ Credit : 5 ♦ Marks : 25 + 75 = 100

Objectives:

- To understand the basic concepts of ecosystem and biodiversity.
- To study the principle of sustainable utilization and management of bioresources.

Course outcomes:

- Understanding the ecological relationships between organisms and their environment.
- Gaining knowledge on types of vegetation
- Acquiring knowledge on climate change
- Students can able to understand the Principles of Phytogeography
- Imparting skills to conserve the ecosystem

UNIT – I Ecosystem & Structure

History and Scope of Ecology. Ecosystem - structure and function. Factors affecting environment – Abiotic- Edaphic, Climatic, Topographic. Biotic – Alleopathy. Energetics: Productivity, Food chains, Food webs and Tropic levels, Ecological pyramids. Ecosystem – types – aquatic, terrestrial, desert and forest ecosystem. Estuarine and mangrove ecosystem – adaptations.

UNIT - II Vegetation analysis

Vegetation – types – list and count quadrat methods - density abundance frequency, Ecological niche, ecotone, edge effect. Ecological succession – Seral and Climax communities – Hydrosere, Xerosere.

UNIT – III Environment & climate change

Biogeochemical cycle – water cycle, carbon cycle, Phosphorous cycle and nitrogen cycle. Greenhouse effect, global warming, global climatic changes and the consequences. Climate change conferences – role of UNFCCC and IPCC. Paris 2015 COP2. Environmental Impact Assessment (EIA).

UNIT – IV Principles of Phytogeography

Phytogeography: Geographical history, continental drift, land bridges, and shifting of poles. Phytogeography of the Western Ghats. Concepts of phytogeography: Endemism, hotspots and hottest hotspots, plant introductions and explorations, invasions and exotic species

UNIT – V Approaches on Conservation

Conservation: approaches – in situ and ex situ conservation. Biodiversity, its importance, assessment, loss and world organisation for conservation of biodiversity, biodiversity act (2002), Red List categories of IUCN, means and ways for conservation.

Text Books:

- Anathakrishnan, T.N. (1982)-Bioresource Ecology-Oxford & IBH Publ.Co.,Inc.,Belmont.
- Ambasht, R.S. (1974) - A text book of plant ecology (3rd Edn.) Students' Friends. & Co., Varanasi, India.
- Agarwal, K.C. (1987) - Environmental biology- Agro-botanical publications, India.
- Chawla, S. 2011. A text book of Environment & Ecology. Tata Mc Graw-Hill, New Delhi.
- Sharma P.D, 2009. Ecology and Environment, Rastogi Publications, Meerut.

Reference:

- Odum, E.P., 1970. Fundamentals of Ecology, 3rd edn, W.B. Saunders Ltd., UK.
- Melchias G 2001 Biodiversity and Conservation. Science Publishers Inc, NH USA.
- Krishnamurthy K.V. 2003. An advanced text book on Biodiversity Principle and Practice. Oxford and IBH Publishing Co., New Delhi.
- Billings, W.B.(1965)- Plants and the ecosystem – Wardsworth Publ.Co.,Inc., Belmont.
- Conard, H.S. Plant Ecology - Iowa state Press., Iowa.
- Odum E.P. Gray, W. Barrelet 2004. Fundamentals of Ecology. 15th edition. Thomas Asia Pvt. Ltd.

E-Books:

- http://rastogipublications.com/index.php?route=product/product&product_id=216&search=ecology&category_id=20
- <https://www.schandpublishing.com/books/higher-education/biology/a-textbook-plant-ecologyincluding-ethnobotany-soil-science/9788121905480/#.W0LsiNizbIU>

Mapping with programme outcomes					
COs	P01	P02	P03	P04	P05
C01	S	S	S	S	S
C02	S	S	M	S	S
C03	M	M	S	S	S
C04	S	M	M	S	S
C05	S	M	M	S	S

*S- STRONG, M- MEDIUM, L- LOW

Semester I

ELECTIVE COURSE I – BIODIVERSITY AND CLIMATE CHANGE

Course Code : 18PBTE1 ♦ Hrs / week : 7 ♦ Credit : 5 ♦ Marks : 25 + 75 = 100

Objectives:

- To understand the emerging trends of low-carbon economy.
- To elucidate the strategies of protecting the bioresources.

Course outcomes:

- Students are able to articulate why society strives to conserve biodiversity.
- They can identify key threats to biodiversity.
- They evaluated which management options are likely to be effective for conserving biodiversity in different settings.
- Adding knowledge about carbon sequestration
- Students can able to develop appropriate policy options for conserving biodiversity in different settings.

UNIT – I Types of Biodiversity

Biodiversity Types – Genetic, species and ecosystem diversity; global biodiversity. Genetic Diversity - Plant genetic resources, mega-centres of origin of genetic diversity. World's major plant gene banks.

UNIT – II Conservation approach

Conservation – Sacred groves, endangered flora, fauna and their identification. Red Data Book. Conservation strategies: *in-situ* approach, biosphere reserves, reserve forests, parks and sanctuaries. *ex-situ* approach: collection garden and cryopreservation. International organizations in conservation – IUCN, IBPGR, WWF, UNEP, and FAO.

UNIT – III Climate change

Climate change : Components of the atmosphere, the greenhouse gases & greenhouse effect, global warming and climate change, consequences and evidence of climate change. Greenhouse gas emissions and the causes – electricity generation, transport. Burning fossil fuels, deforestation.

UNIT - IV Carbon Sequestration

CO₂ capture and storage methods: Geological storage, Ocean storage, Mineral storage & Leakage. CO₂ reuse mechanisms - single step methods: CO₂ → methanol, CO₂ → hydrocarbons and CO₂ → CO → hydrocarbons. CCS projects.

UNIT - V Strategies in energy conservation

Climate change adaptation and mitigation: strategies for emission reduction - Alternative energy sources and Energy efficiency and conservation. Kyoto protocol, Bali Action Plan – IET and, CDMs. Carbon credits and carbon economics; UNFCCC & IPCC, climate change conference - Copenhagen & Mexico – attempt towards legally binding protocol.

Text Book(s):

- Melchias G 2001. Biodiversity and Conservation. Science Publishers, NH USA
- Krishnamurthy KV 2003. Advanced Textbook on Biodiversity. Oxford & IBH, New Delhi IUCN 1985.
- The World Conservation Strategy. IUCN, Switzerland

References:

- Melchias G 2001. Biodiversity and Conservation. Science Publishers, NH USA
- Krishnamurthy KV 2003. Advanced Textbook on Biodiversity. Oxford & IBH, New Delhi IUCN 1985.
- The World Conservation Strategy. IUCN, Switzerland.

E-Books:

<https://www.amazon.in/Textbook-Biodiversity-K-V-Krishnamurthy/dp/1578083257>

http://www.ebooks-for-all.com/bookmarks/detail/Climate-Change/onecat/Electronic-books+Environment-and-nature/0/all_items.html

https://books.google.com/books?id=4Bs1J0TmhJcC&printsec=frontcover&redir_esc=y&hl=en#v=onepage&q&f=false

Mapping with programme outcomes					
COs	PO1	PO2	PO3	PO4	PO5
C01	S	M	S	S	S
C02	S	M	S	S	S
C03	S	S	S	S	S
C04	S	S	M	S	S
C05	S	S	S	S	S

*S- STRONG, M- MEDIUM, L- LOW

Semester I & II

CORE COURSE III - PRACTICAL I – PLANT DIVERSITY I & II
(Algae, Fungi, Lichen, Bryophytes, Pteridophytes, Gymnosperms and Paleobotany)

Course Code : 18PBT3P ♦ Hrs / week : 6 ♦ Credit : 5 ♦ Marks : 40 + 60 = 100

Objectives:

- To understand the micro slide preparation methods.
- To understand the dissection procedure of diversity.

Course outcomes:

- Experiencing in handling specimens and preservation of algae, fungi etc.
- Imparting knowledge on identification characters of algae and fungi
- Acquiring knowledge on diversity of pteridophyte and gymnosperms.
- Understanding symbiotic relationship of algae and fungi in lichen
- Acquiring knowledge on fossil evidence for studying primitive plants.

Algae

- Microscopic observation of algal types and their slides included in the syllabus
- Transverse Section of the algal specimens mentioned in the syllabus
- Identification of algal types in the algal mixture (only microscopic types).

Fungi

- Microscopic observation of slides of the genera included in the syllabus.
- Section cutting of different plants infected by fungal strains included in the theory syllabus.

Lichen

- Observation of different thalli of Lichens.
- Microscopic observations of slides of *Usnea*.

Bryophytes

Morphological and anatomical study of representatives of the following: Marchantiales, Jungermanniales, Anthoceretales, Funariales and Polytrichales.

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 their slides.

Gymnosperms

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 their slides.

Paleobotany

Analysis of slides of fossil forms given in the syllabus.

Field visit to the sea shores in Tamil Nadu for one or two days to collect the algal specimens. Submit the field notebook.

Mapping with programme outcomes					
C0s	P01	P02	P03	P04	P05
C01	S	S	S	S	S
C02	S	S	S	S	M
C03	S	M	M	S	S
C04	S	S	S	S	S
C05	S	S	S	S	S

*S- STRONG, M- MEDIUM, L- LOW

Semester I & II

CORE COURSE IV - PRACTICAL II – TAXONOMY OF ANGIOSPERMS AND ECONOMIC BOTANY, ANATOMY, EMBRYOLOGY AND HISTOCHEMISTRY

Course Code : 18PBT4P ♦ Hrs / week : 7 ♦ Credit : 5 ♦ Marks : 40 + 60 = 100

Course outcomes:

- Experiencing in handling specimens and preservation of Angiosperms.
- Imparting knowledge on identification characters of Angiosperms.
- Acquiring knowledge on developing taxonomy keys for plant identification.
- Understanding microbiology techniques for culturing process.
- Acquiring knowledge plant disease control and prevention methods.

TAXONOMY OF ANGIOSPERMS

- Botanical identification of the plants by Gamble flora
- Key Preparation.
- Study the plants belonging to the following families with minimum two examples.
- Training in dissection, observation, identification and sketching of floral parts of plants belonging to the families mentioned in the syllabus along with floral diagrams and floral formula.
- Field study of flora. Submission of 25 herbarium specimens.

ECONOMIC BOTANY:

- Find botanical name, family, useful part and uses of Economic plants included in the syllabus.

NATIONAL LEVEL BOTANICAL TOUR FOR THREE TO FIVE DAYS AND SUBMIT THE FIELD NOTE BOOK WITH ALL DETAILS

ANATOMY:

- Anatomy of Monocot and Dicot Root, Stem and Leaf.
- Secondary growth of Root and Stem.
- Nodal Anatomy– Uni, Tri & Multilacunar node.
- Identification of different types of stomata
- Anamalous secondary growth in Dicot stem Aristalochia & Nyctanthus
- Anamalous secondary growth in Monocot stem- Dracaena

EMBRYOLOGY:

- Slides showing developmental stages of Anther, Embryo sac, Endosperm and Embryo.
- Dissection of Endosperm Haustoria – Cucumis (Cucurbitaceae)
- Embryo & Pollinia dissection. Dissection of Embryo – Tridax.

- Methods of testing pollen viability using - (a). Alexander's stain (b). Acid - test.

HISTOCHEMISTRY:

- Detect and localize the following: Starch, (PARS reaction), Proteins (Coomassie brilliant blue staining) Lipids (Sudan Black method), secondary metabolites - alkaloids, terpenoids, phenolics (by Kokate *et al.*, method).

Mapping with programme outcomes					
COs	P01	P02	P03	P04	P05
C01	S	M	S	S	S
C02	S	S	M	S	M
C03	S	S	S	M	S
C04	S	S	S	S	S
C05	S	M	S	S	S

*S- STRONG, M- MEDIUM, L- LOW

Semester II
CORE COURSE V – TAXONOMY OF ANGIOSPERMS AND ECONOMIC BOTANY

Course Code : 18PBT5 ♦ Hrs / week : 6 ♦ Credit : 5 ♦ Marks : 25 + 75 = 100

Objectives:

- To understand the relevance of molecular techniques in plant systematics.
- To study the classical taxonomy with reference to different parameters

Course outcomes:

- Students can able to recognize the major groups of vascular plants and their phylogenetic relationships.
- They gaining proficiency in the use of keys and identification manuals for identifying any unknown plants to species level.
- Acquiring knowledge on angiospermic families
- They explored the uses of plants as medicine by traditional indigenous approaches.
- Imparting knowledge about economic importance of plants

UNIT – I Principles of Taxonomy

Systems of classification: Artificial system: Linnaeus: Natural system: Bentham & Hooker: Phylogenetic system: Engler and Prantl, Hutchinson, Takhtajan and APG system. International Code of Nomenclature for algae, fungi, and plants. Types and typification – Principles of priority and their limitation– problems in nomenclature, Herbarium and its potential role in teaching and research. Preparation of key, Floras, Monographs – Botanical Gardens

UNIT – II Applied Taxonomy

Chemotaxonomy – micromolecules- primary and secondary metabolites. Macromolecules: protein, Nucleic acids and polysaccharides. Numerical Taxonomy – cladistics. Biosystematics Taxonomy relation to anatomy, embryology, palynology, ecology, cytology and serology. Molecular taxonomy – RFLP (in brief).

UNIT – III Salient features of angiospermic families

Study of diagnostic features of the following families: Magnoliaceae, Mesnipermaeae, Brassicaceae, Portulacaceae, Sterculiaceae, Caryophyllaceae, Meliaceae, Rhamnaceae, Vitaceae, Sapindaceae, Combretaceae, Lythraceae and Aizoaceae.

UNIT – IV Salient features of angiospermic families

Study of diagnostic features of Rubiaceae, Polygonaceae, Gentianaceae, Boraginaceae, Bignoniaceae, Podostemaceae, Loranthaceae, Orchidaceae, Liliaceae, Commelinaceae, Musaceae, Arecaceae, Cyperaceae.

UNIT – V Economic Botany

Binomial, useful part and Economic importance --Cereals - Wheat, Rice, Maize; Legumes;, Black gram, Red gram, Chick pea; Fruits: Grapes, Citrus, Mango; Spices and Condiments: Cardamom, Clove; Beverages: Tea, Coffee and Cocoa; Fibres: Cotton, Jute; Timber - Teak, Rosewood and Sal; Vegetable Oil - Sun flower, Peanut, Palm Oil.

Text Books:

- Davis, P.H. & Heywood, V.M 1963, Principles of Angiosperm Taxonomy, Oliver & Boyd.
- Harborne, J.B. & Turner, B.L, 1984, Plant Chemosystematics, Acad. Press, London.
- Heywood, V.K & Moore, D.M., 1984, Current Concepts in Plant Taxonomy, AP, London.
- Lawrence, G.H.M., 1955, The Taxonomy of Vascular Plants, Central Book Depot, MacMillan, New York.

Reference:

- Burkill, I.H., 1965, Chapters of the history of Botany in India, Government of India Press, Nasik, The Manager of Publications.
- Grant, W.F., 1984, Plant Biosystematics, Acad Press Inc., Canada.
- Young DA and Seiyler DS (eds.) Phytochemical and angiosperm phylogeny. Praeger publications. NY.
- Heywood, V.H., 1967, Plant Taxonomy. English Language Book Society, London.
- Hillis, DM., Moritz, C & Mable, BK (eds) 1996, Molecular Systematics, Sinauer Associates, Sunderland, USA.
- Jeffrey, C., 1982, Introduction of Plant Taxonomy, Cambridge Uni. Press, Cambridge.
- Jain, S.K., 1981, Glimpses of Indian Ethnobotany, Oxford & IBH Publ. Co., New Delhi.

E-Books:

- http://rastogipublications.com/index.php?route=product/product&product_id=108&search=taxonomy
- <https://www.schandpublishing.com/books/higher-education/biology/a-textbook-botany-angiosperms/9788121904049/#.W0LtwdIzbIU>
- http://rastogipublications.com/index.php?route=product/product&product_id=110&search=economic+botany&category_id=20
- <https://www.schandpublishing.com/books/higher-education/biology/economic-botany/9788121903417/#.W0LucNIzbIU>

Mapping with programme outcomes					
COs	PO1	PO2	PO3	PO4	PO5
C01	M	M	S	S	S
C02	M	S	S	S	S
C03	S	M	S	M	S
C04	S	M	S	M	S
C05	M	S	S	S	S

*S- STRONG, M- MEDIUM, L- LOW

Semester II

CORE COURSE VI – ANATOMY, EMBRYOLOGY AND HISTOCHEMISTRY

Course Code : 18PBT6 ♦ Hrs / week : 6 ♦ Credit : 5 ♦ Marks : 25 + 75 = 100

Objectives:

- To understand the basic principles of differentiation of cell types.
- To know the process of growth and development embryo in plant.
- To localize the chemical components in plant tissues.

Course outcomes:

- Students are able to understand meristematic tissue.
- They can differentiate primary and secondary meristem and their function.
- They gaining knowledge about anatomical characteristics
- They can able to differentiate dicot and monocot embryo.
- Acquiring knowledge about histochemistry

UNIT - I Origin & development of tissues

Apical meristems. Shoot apex and root apex organization, quiescent centre. Structural diversity and phylogenetic trends of specialization of xylem and phloem. Cambium - origin - cellular structure, cell division, storied and non-storied types. Cambium in budding and grafting - wound healing role. Trichomes, periderm and lenticels.

UNIT – II Vascular differentiation

Anatomical characteristics and vascular differentiation in primary and secondary structure of root and stem in Dicot and Monocot. Origin of lateral roots – Root - stem transition - Anatomy of Dicot and Monocot leaves. Anatomy of nodes and petioles. Leaf abscission, stomatal types, vascularization of flower and seedling.

UNIT – III Structure & development of Micro & Megasporangium

Microsporangium - Microsporogenesis, Microspores - arrangement - morphology - ultrastructure - Microgametogenesis - Nemece phenomenon – pollen - stigma - Incompatibility - Methods to overcome incompatibility - Megasporangium - Megagametogenesis - Female gametophyte – Monosporic, Bisporic, Tetrasporic and special types - Nutrition of embryo sac and fertilization

UNIT - IV Development of Embryo and seed

Endosperm - Types - Endosperm haustoria - Cytology and physiology of endosperms, functions of endosperms - Embryo development in Dicot and Monocot, Nutrition of embryo - Polyembryony - Causes, Apomixis - Causes, Apospory - Their role in plant improvement programmes and seed development.

UNIT – V Localization of chemicals in tissues

Scope of Histochemistry and cytochemistry in Biology. Tissue processing techniques for electron microscopy. Detection and localization of primary metabolites- Carbohydrates (PARS reaction), Proteins (Coomassie brilliant blue staining) Lipids (Sudan Black method). Detection and localization of secondary metabolites - alkaloids, terpenoids, phenolics. Enzyme histochemistry - General design and applications.

Text Books:

- Fahn.A. (1989) Plant Anatomy. Maxwell, Macmillan, Singapore.
- Bhojwani, S.S., (1981) Embryology, of Angiosperms, Vikar & Bhatnagar, New Delhi

Reference:

- Clowes, F.A.L., (1961) Apical Meristems. Blackwell Scientific, Oxford.
- Cutter, E.G., (1978) Plant Anatomy. Edward Arnold Ltd., London.
- Esau, K., (1953) Plant Anatomy. Jon Willey & Sons Inc, New York.
- Maheshwari, P.,(1988) An Introduction to the Embryology of Angiosperms, McGraw-Hill.
- Raghavan, V., (1976) Experimental Embryogenesis in Vascular Plant, Academic press.
- Kierman, J.A. 1999. Histological and Histochemical Methods. Butterworth Publ. London.
- Pearse, A.G.E. 1960. Histochemistry. Vol.I & Vol.II, J&A. Churchill, London.
- Ruzin, Z.E. 1999. Plant Microtechnique and Microscopy. Oxford Press, New York.
- Krishnamoorthy, K.V. 1990. Histochemical methods.

E-Books:

- https://www.abebbooks.co.uk/servlet/BookDetailsPL?bi=20569837712&searchurl=t n%3Dhandbook%2Bof%2Bthe%2Bbritish%2Bflora%26sortby%3D17%26an%3Db entham%2Bg&cm_sp=snippet-_-srp1-_-title1
- <https://trove.nla.gov.au/work/16054012>
- https://books.google.co.in/books/about/A_Text_Book_Ofbotany_Plant_Anatomy_and _E.html?id=uMOglvnKUpQC&redir_esc=y

Mapping with programme outcomes					
COs	P01	P02	P03	P04	P05
C01	S	L	S	S	S
C02	S	M	S	S	S
C03	M	M	S	S	S
C04	S	S	S	S	S
C05	S	S	M	S	S

*S- STRONG, M- MEDIUM, L- LOW

Semester II

ELECTIVE COURSE II – FORESTRY AND WOOD SCIENCE

Course Code : 18PBTE2 ♦ Hrs / week : 7 ♦ Credit : 5 ♦ Marks : 25 + 75 = 100

Objectives:

- To prepare students for careers in the forest services and wood products industry.
- To educate students to provide technical expertise to the wood industries.

Course outcomes:

- Students learn the forest types and their utilization
- They can able to get the information about forest resources and utilization
- They know about nature and properties of wood
- Adding knowledge on how to manage wood
- They knew about the commercial value of timber, fuel wood, pulp and paper making, match –stick wood, plywood and economic importance of pulp and wood species.

UNIT - I Conservation strategies

Types of Forest in India; Forest influences and protection; Rare and endangered species; Conservation strategies; Exotics and its significance; Silvicultural principles and practices; Genetic Engineering and its application in forestry; Remote sensing and GIS in forestry.

UNIT - II Forest Resources and utilization

Forest Resources and utilization; Forest products; Forest laws and policies, people and Forest; Social and community forestry; Forest industries; Role of social forestry in cottage industry; Role of forestry in Indian economy. Biomass conversion strategies - energy plantations.

UNIT - III Nature of wood

Nature and properties of wood: physical, chemical, mechanical and anatomy of wood. Durability of wood. Pycnoxylic and manoxylic wood; dendrochronology; Wood seasoning and preservation.

UNIT – IV Management of wood

Defects and abnormalities of wood. Wood deterioration- fungi, insects and other agents; Wood protection. Chemical processing of wood.

UNIT - V Wood products

Composite wood: adhesives-manufacture, properties, uses, manufacture and uses of plywood, fiber boards and particle boards. Present status of composite wood, paper and rayon industries. wood substitution.

Text Books:

- De Vere Burton L., 2000, Introduction to Forestry Science, Delmar publishers, N Y.
- J.L. Bowyer, R. Shmulsky and J.G. 2007. Haygreen. Forest Products and Wood Science: An Introduction, Blackwell Publishing Professional.
- Franz F. P. Kollmann, Wilfred A. Jr. Cote. 2012. Principles of Wood Science and Technology: I Solid Wood, Springer.

Reference:

- Negi, S.S., 1994, India's Forests, Forestry and Wildlife, Indus Publishing Com., New Delhi.
- Jha, L.K., 1996. Forestry for rural development, APH Publishing Corporation, New Delhi.

E-Books:

- <https://www.takealot.com/forest-products-and-wood-science-ebook/PLID37370116>

Mapping with programme outcomes					
COs	P01	P02	P03	P04	P05
C01	S	S	S	S	S
C02	S	S	S	S	S
C03	S	M	M	M	S
C04	S	S	S	S	S
C05	S	M	S	S	S

*S- STRONG, M- MEDIUM, L- LOW

Semester II

ELECTIVE COURSE II – HORTICULTURE AND GARDENING

Course Code : 18PBTE2 ♦ Hrs / week : 7 ♦ Credit : 5 ♦ Marks : 25 + 75 = 100

Objectives:

- To understand the methods of plant propagation
- To know the state of art in landscape designing and its aesthetic values.

Course outcomes:

- Students are able to learn the propagation methods
- Acquiring knowledge about cultivable crops
- Gaining knowledge on storage and preservation of fruits and vegetables
- Experiencing on design the gardens
- They will expertise in landscaping

UNIT – I Methods of propagation

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

UNIT – II Cultivation of crops

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

UNIT – III Storage & Preservation

Storage of fruits and vegetables – preservation of fruits and vegetables nursery – micro propagation – Hardening and translation – Germ palm maintenance of sweet potato.

UNIT – IV Garden design

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 Landscaping

Indoor gardening – house plant, light, humidity, watering, designing Bonsai plants, watering, pruning, dwarfing. Landscaping – principles, types of park. Elements and principles of flower design.

Text Book(s):

- Kumar N., 1990, Introduction to Horticulture, Rohini agencies, Nagercoil.
- Prasad, 2005, Principles of Horticulture, International Book Dept., Deharadun.

Reference:

- Chauhan, D.V.S., 1968, Vegetable production in India, Ram Prasad, Agra.
- Edmund J.B. Senn T.L Andrews F.S & Halforce R.G., 1990, Funamentals of Horticulture 14th Edn., Tata McGraw Hill Co. Pvt., London.

- Gopaldaswami Iyengar K.S., 1970, Complete Gardening in India, Kalyan Press, Bangalore.

E-Books:

- https://www.amazon.in/Horticulture-Green-World-Gail-Lang-ebook/dp/B00EOEHY7K/ref=sr_1_7?s=digital-text&ie=UTF8&qid=1531113481&sr=1-7&keywords=horticulture
- https://www.amazon.in/Gardening-Beginners-Perennial-Vegetables-Horticulture-ebook/dp/B01GF3UI9S/ref=sr_1_3?s=digital-text&ie=UTF8&qid=1531113444&sr=1-3&keywords=horticulture

Mapping with programme outcomes					
COs	P01	P02	P03	P04	P05
C01	M	S	M	S	S
C02	S	S	S	S	S
C03	S	S	S	M	S
C04	S	S	S	M	S
C05	S	M	S	S	M

*S- STRONG, M- MEDIUM, L- LOW

Semester II

EXTRA DISCIPLINARY PAPER I – MEDICAL BOTANY

Course Code : 18PBTE11 ♦ Hrs / week : 5 ♦ Credit : 5 ♦ Marks : 25 + 75 = 100

Objectives:

- To study the different systems of Indian medicines and the bioactive principles.
- To know the ethnopharmacological importance of medicinal plants.

Course outcomes:

- Students are able to know about history and relevance of herbal drugs in Indian system of medicine.
- Acquiring knowledge on remedial plants
- They understood the techniques for drug evaluation (Chemical, Physical and Biological), Phytochemical investigations, standardization and quality control of herbal drugs
- Students know the technique of medicinal gardening
- Imparting knowledge on Cultivation practices, and preparation and marketing of herbal preparations.

UNIT - I Ayush & Phytodrugs

History of medical botany. Indian systems of medicine: AYUSH: Ayurveda, Unani Siddah, Homeopathy; Classification of medicinal plants based upon the plant parts and phytoconstituents; Root drugs - Aconitum napellus, Bark drugs- Cinchona officinalis, Stem drugs- Aristolochia indica, Leaf drugs-Digitalis purpurea, Flower drugs-Syzygium aromaticum, Fruit drugs- Papaver somniferum, Seed drugs- Strynox nux-vomica, Whole plant - Cannabis sativa, Unorganized drugs - Aloe vera.

UNIT - II Remedial plants

Remedial plants for Cancer, Common diseases of nervous system, circulatory system, respiratory system, urinary system and reproductive system; Psycho active plants; Allergens: types - aero-allergens, pollen, spore allergens, ingessant allergens, skin allergens, drug allergy, phytotherapy for allergic symptoms.

UNIT - III Pharmacognosy

Pharmacognosy - Collection and Processing of medicinal plants; Guidelines for harvesting, processing and marketing of medicinal plants; Preparation of crude drugs; Drug adulteration; Methods of drugs evaluation - Morphological characters, organoleptic methods, anatomical features, chemical and biological.

UNIT - IV Cultivation of Medicinal plants

Herbal garden and Cultivation Herbal gardens - Introduction and scope, Principles and process involved; Plant growing methods, propagation techniques; Cultivation of medicinal plants: Dioscorea floribunda and Papaver somniferum.

UNIT - V Preparation of herbal medicine

Traditional health care system and Ethnobotany Local traditional health care system; Herbal home remedies of South India; Indigenous knowledge system on medicinal plants; Herbal formularies: Infusions and decoctions, oil extractions, ointments, lotions, washes, suppositories.

Text Books:

- James Green, 2000 Herbal Medicine-Maker's Handbook, Crossing Press, U.S.
- Weiss, Rudolf Fritz 2000 Herbal Medicine, 2nd Edition Thieme Medical Publishers.
- Somasundaram, S. 1997. Maruthuva Thavaraiyal, Ilangovan Padhippagam, Palayamkottai.
- Kokate CK, Purokit AP and Gokahale, 2006. Pharmacognosy, Nirali Prakashan.

References:

- Jain, S.K. 1981. Glimpses of Ethnobotany. Oxford & IBH, New Delhi.
- Kumar, N.C. 1993. An Introduction to Medical Botany, Emkay Publications, New Delhi.
- Roseline, A. 2011. Pharmacognosy. MJP publishers, Chennai.
- Nadkarani, 1981. Materia medica, Popular Prakasam Publication, New Delhi.
- Harborne, J.B. 1998. Phytochemical methods. Springer (India) Ltd., New Delhi.
- Maheshwari, J.K. 2000. Ethnobotany and medicinal plants of Indian subcontinent, Scientific publishers, India.

Online Resources:

- <http://www.gallowglass.org/jadwiga/herbs/preparations.html>
- <http://shawnacohen.tripod.com/thetribaltraditions/id51.html>
- <http://www.vasundharaorissa.org/Research%20Report%20s/GlobalisationAndMedicinalplantsOfOrissa.pdf>
- http://www.emea.europa.eu/docs/en_GB/document_library/Scientific_guideline/2009/09/WC500003393.pdf
- <http://www.bookganga.com/eBooks/Books?AID=5600445540161494332>

Mapping with programme outcomes					
COs	PO1	PO2	PO3	PO4	PO5
C01	S	S	S	M	S
C02	S	S	S	S	S
C03	M	M	S	S	S
C04	S	S	M	M	S
C05	S	M	S	S	S

*S- STRONG, M- MEDIUM, L- LOW

Semester III

CORE COURSE VII – CELL AND MOLECULAR BIOLOGY

Course Code : 18PBT7 ♦ Hrs / week : 6 ♦ Credit : 5 ♦ Marks : 25 + 75 = 100

Objectives:

- To understand the structural organization and function of different cell organelles.
- To study the basic principles of the central dogma of life

Course outcomes:

- Students are able to learn about cell organelles
- Acquiring knowledge on cell division
- They gain the knowledge on the organization of genes and chromosomes
- Imparting knowledge about genome
- They can able to know about genetic tools

UNIT – I Structure of cell organelles

Structural organization and composition of cell membrane and functions. Structure, function and interrelationships of mitochondria, chloroplast, peroxisomes and glyoxysomes. Genetic systems in mitochondria and chloroplast. Nucleus: Ultra structure of nuclear membrane, chemical composition, function.

UNIT - II Cell division

Cell division and Cell cycle: Mitosis and Meiosis, their regulation, steps in cell cycle, regulation and control of cell cycle. Chromosomes- morphology, fine structure- telomere- types: lamp brush, polytene, isochromosome, heterochromatin and euchromatin, chromosome identification, - banding technique- chromosome aberrations- gene structure- transposons.

UNIT – III Genetic material

Scope of molecular biology – Nucleic Acids – Base pairing and variations in base composition – Types of DNA, Chargaff's rule – DNA size – fragility – hydrophobic interactions – denaturation, Circular and superhelical DNA – Topoisomerase – special base sequence – Repeated sequence – Single stranded DNA – DNA methylation, structure of RNA.

UNIT – IV Multiplication of genome

Gene concept – fine structure – split gene – exons and introns. Gene function DNA replication – DNA Polymerase, Ligase, Helicase – Termination of DNA replication – Mismatch repair – Transcription in Prokaryotes – RNA polymerase – classes of RNA molecules – Transcription in Eukaryotes – splicing mechanisms – Reverse transcriptions. Translation, overlapping genes.

UNIT – V Genetic tools

Types of vectors – Plasmid, PBR322 and its derivatives – gene markers, phage and cosmid vectors, artificial chromosome vectors : BAC & YAC, shuttle vectors and expression vectors.

Text Books:

- Satyanarayana U. 2007. Biotechnology. Books and allied (P) Ltd
- Verma P.S and Agarwal V.K. 2006. Cell Biology, Genetics, Molecular Biology, Evolution and Ecology. S. Chand & Company Ltd
- Lewin B. 2008. Genes IX. Jones and Bartlett publishers

References:

- Darnell J, Lodish H and Baltimore D 1986. Molecular Cell Biology. Scientific American Books.
- Watson JD, Hopkins NH, Roberts JW et al.1987. Molecular Biology of the Gene (4th ed.) The Benjamin/Cummings Publishing Company, Inc
- Alberts B, Bray D, Lewis J et al . 1989. Molecular Biology of the Cell. Garland publishing Inc
- Pasupuleti M. 2006. Molecular Biotechnology. MJP Publishers
- Hartl DL and Jones EW. 2000. Genetics – Analysis of Genes and Genomes (5th ed.) Jones and Barlett Publishers.
- Tamarin RH. 1999. Principles of Genetics (6th ed.)WCB McGraw-Hill
- Karp G. 1998. Cell and Molecular Biology (2nd ed.) John Wiley and Sons, Inc
- Lodish H, Berk A, Matsudaira P et al 2004. Molecular Cell Biology (5th ed.) W.H. Freeman and Company, New York.
- Becker MW, Kleinsmith LJ and Hardin J. 2007. The world of the Cell (6th ed.) Tata McGraw Hill Publications.
- Raven PH, Johnson GB, Losos JB and Singer SR.2006. Biology (7th ed.) Tata McGraw Hill Publications

E-books:

- www.journals.elsevier.com/journal-of-molecular-biology/
- www.springer.com › Home › Life Sciences › Cell Biology

Mapping with programme outcomes					
COs	PO1	PO2	PO3	PO4	PO5
C01	S	S	S	S	S
C02	S	S	S	S	S
C03	S	M	M	S	S
C04	M	S	M	S	S
C05	S	M	M	S	S

*S- STRONG, M- MEDIUM, L- LOW

Semester III

CORE COURSE VIII – GENETICS AND PLANT BREEDING

Course Code : 18PBT8 ♦ Hrs / week : 6 ♦ Credit : 5 ♦ Marks : 25 + 75 = 100

Objectives:

- To understand the principle and the hereditary mechanisms.
- To study the structure and functions of genetic materials.
- To study the importance of plant breeding in food production.
- To understand the methodology of plant breeding.

Course outcomes:

- Students learn about Mendelian principles
- They will know about gene mapping methods & Extra chromosomal inheritance
- They will be familiarized about Evolution & Emergence of evolutionary thoughts
- Students will gain knowledge on molecular mapping.
- Students are able to know in detail about breeding systems

UNIT - I Mendelian Genetics

Mendelian Genetics: Mendel's experiments, Monohybrid and Dihybrid cross, Back cross, genetic ratios, Mendelian inheritance, Law of segregation, Independent Assortment.

UNIT - II Linkage & Crossing over

Linkage and Crossing over, Chiasma frequency – gene mapping, tetrad analysis. Sex determination in plants, sex linkage – dominant and recessive sex linked genes – holandric genes. Sex linked diseases – haemophilia, colour blindness – Pedigree chart.

UNIT - III Differentiation in genes

Gene pool, allele and genotype frequency. Hardy-Weinberg law and its applications, estimation of allele and genotype frequency of dominant genes, codominant genes, sex-linked genes and multiple alleles. Genetic equilibrium, genetic polymorphism.

UNIT - IV Methods in molecular mapping

Molecular mapping methods; RFLP, Chromosome walking and chromosome jumping; Cytoplasmic inheritance; Predetermination - Virus like inclusions and infective particles, milk factor, kappa particles, plastid inheritance, maternal inheritance.

UNIT - V Principles of plant breeding

Principles involved in Plant Breeding and its importance in green revolution with reference to wheat, rice, sugarcane, maize and cotton. Methods of crop improvement: Selection (pure line, mass and clonal), hybridization, introduction and acclimatization- heterosis – causes and effects. Polyploidy in Plant Breeding.

Text Books:

- Verma, P.S. & V.K. Agarwal, 2003, Genetics. S. Chand, New Delhi-55.

Reference:

- Gardner E J, Simmons M J, Snustad D P (1991). Principles of Genetics (III Edn). John Wiley and Sons Inc. 8th Edn., New York.
- Snustad D P, Simmons M J (2000). Principles of Genetics (III Edn). John Wiley and Sons.
- Strickberger (2005). Genetics (III Edn). Prentice Hall of India Pvt. Ltd.
- William S Klug, Michael R Cummings (1994). Concepts of Genetics. Prentice Hall.
- Robert J Brooker (2009). Genetics: Analysis and principles (III Edn). McGraw Hill.
- Daniel L Hartl, Elizabeth W Jones (2009). Genetics: Analysis of genes and genomes (VII Edn). Jones and Bartlett publishers.
- D Peter Snustad and Michael J Simmons (2010). Principles of genetics. John Wiley & Sons.

E-Books:

- <https://onlinelibrary.wiley.com/doi/book/10.1002/9781118313718>
- <https://www.springer.com/in/book/9783642879302>
- https://trove.nla.gov.au/work/16054012?q&sort=holdings+desc&_id=1527503199193&versionId=23683670
- <https://www.amazon.com/Chromosome-Atlas-Flowering...Darlington/dp/B0014B1YJA>

Mapping with programme outcomes					
COs	PO1	PO2	PO3	PO4	PO5
C01	M	S	S	M	M
C02	M	M	S	S	M
C03	S	S	S	S	M
C04	S	S	M	S	M
C05	M	S	S	S	M

*S- STRONG, M- MEDIUM, L- LOW

Semester III

CORE COURSE IX – GENERAL MICROBIOLOGY

Course Code : 18PBT9 ♦ Hrs / week : 6 ♦ Credit : 5 ♦ Marks : 25 + 75 = 100

Objectives:

- To enable the students to understand the basic concepts in microbial diversity, metabolism and genetics.
- To deal with microbial products and pathogenesis. It also introduces the students to some key aspects of virology.

Course outcomes:

- Students are able to know the basics of microorganisms
- Experiencing in laboratory techniques
- They can be able to expertise in handling various instruments and equipments in laboratory
- They will be expert in application of microbes in agriculture and industry
- Imparting knowledge in the field of medical microbiology

UNIT - I Fundamentals of microbes

Scope, branches of Microbiology. Whittaker's five kingdom concept (1969). Prokaryotic and Eukaryotic microbes. General features of virus, classification, ultrastructure, replication, economic importance, Virions and Prions, Phytoplasma (including Mycoplasma). Bergey's system of Bacterial classification (1984-1991). Bacteria : General account, ultrastructure, nutrition, growth and reproduction.

UNIT - II Techniques in Microbiology

Microbiological Techniques I: Sterilization: Dry Heat, Moist Heat, Filtration, Tyndallization, Pasteurization, Radiation, Antimicrobial Chemicals- classification - mode of action - antibiotic resistance - tests for antibiosis.

UNIT - III Techniques in Microbiology

Microbiological Techniques II: Cultural techniques: pure culture techniques, types of media - media preparation - preservation of cultures - aerobic and anaerobic culture techniques - growth of bacteria: batch and synchronous culture - factors influencing growth - growth curve. Methods to study microbial morphology - wet mount and hanging drop method. Staining techniques - Gram's acid fast, spore and capsule staining.

UNIT - IV Industrial & Agricultural Microbiology

Industrial application of microorganisms, Alcohol, Food Processing, Milk products, Antibiotics and Biopesticides, Biofertilizers. Roles of microbes in agriculture- role in Nitrogen fixation. Biodegradation of cellulose, lignin and petroleum wastes and heavy metal waste.

UNIT - V Medical Microbiology

General account of immune systems - innate and acquired immunity - Antigen and antibody (types, structure and interactions). Detection of antibody (immuno electrophoresis, ELISA and RIA). Immunohistochemistry - Major and minor Blood groups - ABO and Rh incompatibility.

Text Books:

- Prescott et al., 2009 7e, Microbiology. Wm. C. Brown Publishers.
- Kuby J, 2000, Immunology, 4th edition, W H Freeman

Reference:

- Pelczar et al. 1998, Microbiology - Concepts & Applications. Tata McGraw Hill New Delhi.
- Adams MR and Moss MO, 2008, Food Microbiology. Royal Soc. Chem., Cambridge, UK.
- Dickinson M. 2003. Molecular Plant Pathology. BIOS Scientific Publishers, London.
- Janeway and Travers, Immunobiology, 3rd edition Garland Pub. Inc. NY.
- Nandini Shetty 1996, Immunology - An introductory Text Book, New Age Intl (P) Ltd.
- Roitt et al., 1998, Immunology 5th edition, Mosby International Ltd. London. UK.

E-Books:

- http://rastogipublications.com/index.php?route=product/product&product_id=69&search=microbiology
- <https://www.schandpublishing.com/books/higher-education/biology/a-textbook-microbiology/9788121926201/#.W0LwytIzbIU>

Mapping with programme outcomes					
COs	PO1	PO2	PO3	PO4	PO5
C01	S	S	S	S	S
C02	M	S	S	S	S
C03	M	S	S	S	S
C04	M	S	S	S	S
C05	S	S	S	S	S

*S- STRONG, M- MEDIUM, L- LOW

Semester III

ELECTIVE COURSE- III – INTELLECTUAL PROPERTY RIGHTS

Course Code : 18PBTE3 ♦ Hrs / week : 6 ♦ Credit : 5 ♦ Marks : 25 + 75 = 100

Objectives:

- To understand the basics of the intellectual property rights.
- To compare and contrast the different forms of intellectual property protection in terms of their key differences and similarities.
- To analyze the effects of intellectual property rights on society as a whole.

Course outcomes:

- Students are able to demonstrate a capacity to identify, apply and assess ownership rights and marketing protection under intellectual property law as applicable to information, ideas, new products and product marketing
- They can able to understand current and emerging issues relating to the copy right and trade mark
- Gaining knowledge on geographical indications
- Imparting knowledge on protection of plant varieties and farmers right
- Students are able to Expertise in intellectual property rights

UNIT – I Introduction to intellectual property right and Patent

Concept and kinds. IPR in India and world: Genesis and scope, some important examples. IPR and WTO (TRIPS, WIPO). Patent: Objectives, Rights, Patent Act 1970 and its amendments. Procedure of obtaining patents, Infringement.

UNIT – II Copyrights, Trademarks

Copyright: Introduction, Works protected under copyright law, Rights, Transfer of Copyright, Infringement. Trade marks - Objectives, Types, Rights; Trade secrets: objectives and types.

UNIT – III Geographical Indications

Objectives, Justification, International Position, Multilateral Treaties, National Level, Indian Position. Bio-Prospecting and Bio-Piracy, Traditional Knowledge on the International Arena, at WTO, at National level, Traditional Knowledge Digital Library.

UNIT – IV Protection of Plant Varieties:

Plant Varieties Protection-Objectives, Justification, International Position, Plant varieties protection in India. Rights of farmers, Breeders and Researchers. National gene bank, Benefit sharing. Protection of Plant Varieties and Farmers' Rights Act, 2001.

UNIT – V Biotechnology and Intellectual Property Rights.

Patenting Biotech Inventions: Objective, Applications, Concept of Novelty, Concept of inventive step, Microorganisms, Moral Issues in Patenting Biotechnological inventions

REFERENCE:

- N.K. Acharya: Textbook on intellectual property rights, Asia Law House (2001).
- Manjula Guru & M.B. Rao, Understanding Trips: Managing Knowledge in Developing Countries, Sage Publications (2003).
- P. Ganguli, Intellectual Property Rights: Unleashing the Knowledge Economy, Tata McGraw-Hill (2001).
- Arthur Raphael Miller, Micheal H.Davis; Intellectual Property: Patents, Trademarks and Copyright in a Nutshell, West Group Publishers (2000).
- Jayashree Watal, Intellectual property rights in the WTO and developing countries, Oxford University Press, Oxford.

E-Books:

- <https://www.amazon.in/Intellectual-Property-Rights-Neeraj-Pandey/dp/812034989X>

Mapping with programme outcomes					
COs	PO1	PO2	PO3	PO4	PO5
C01	S	6	M	M	S
C02	M	M	M	M	S
C03	M	S	S	M	S
C04	S	S	S	M	S
C05	S	S	S	M	S

*S- STRONG, M- MEDIUM, L- LOW

Semester III

ELECTIVE COURSE- III – PHYTOCHEMISTRY

Course Code : 18PBTE3 ♦ Hrs / week : 6 ♦ Credit : 5 ♦ Marks : 25 + 75 = 100

Objectives:

- To understand the basics of chemical components in the plant tissues.
- To understand therapeutic potential of active principles in plants
- To learn the techniques of isolation, identification and extraction of phytochemicals

Course outcomes:

- Students can able to identify the phytochemicals in plant tissues
- They learn the techniques of extraction and found out the correct drug for treating several human diseases.
- Experiencing the characterization of phytochemicals
- Students will have the ability to standardize the market crud drug.
- Students will have the job opportunities in validation of phytochemicals in pharma industries

Unit - I Introduction to phytochemistry

Scope of phytochemistry, plants as source of chemical compounds, primary and secondary metabolites. Important source of carbohydrates, proteins, lipids, phenolics, flavonoids, pigments, alkaloids, volatile oils, terpenes, resins.

Unit - II Extraction, isolation and purification of phytochemicals

Selection of plant samples, processing and storage of samples for extraction. Extraction methods- infusion, decoction, digestion, maceration, percolation, solvent extraction, fluid extraction, ultrasound,.

Unit - III Characterisation and analysis of phytochemicals

Preliminary, qualitative and quantitative techniques – paper chromatography, thin layer chromatography, Column Chromatography – HPLC, GC (qualitative and quantitative) Colour reactions for amino acids, sugars, phenolics, flavonoids, alkaloids, terpenes, saponins, oils, lipids. Characterisation using spectroscopic techniques - UV/VIS, FTIR, DSC (differential scanning calorimeter),

Unit - IV Phytochemical evaluation

Evaluation of phytochemicals for bioactive potential in vivo in vitro. Evaluation of phytochemicals for antimicrobial, antioxidant, antidiabetic, anti inflammatory, anti pyretic, diuresis, and nutritional values. Toxicity study, route of administration, analysis. Ethical guidelines and clearance.

Unit - V Standardisation and validation of phytochemicals

Quality determination of herbal drugs. Role of processing methods and storage conditions on quality of drugs. Standardisation parameters- impurity limit, ash content, extractable matter, moisture content, other phytochemicals, microbial contaminants, pesticides. Validation of drug.

Text Books:

- Bourne, U.K. Kokate, Purohit C.K. and Gokhale S.B. (1983), Pharmacognosy. Nivali Prakashan Publication, Braithwaite, A and Smith F J (1996) Chromatographic Methods (5th edition) Blackie Academic & Professional London
- Harborne J.B. (1973) Phytochemical methods a guide to modern techniques of plants analysis. Chapman and Hall, London Ltd. Sadasivam. S and A. Manickam, Bio Chemical methods 2nd edition. New age International pvt New Delhi.

REFERENCE:

- Handbook of Medicinal Plants Dr. Arun K. Zingare 978-93-82664-03-1, Satyam , 2014
- Chemistry of Natural Products by K.W. Bentley
- Practical Evaluation of Phytopharmaceuticals by K.r. Brain, T.D. Turner.
- The Chemistry of Natural Products, Edited by R.H. Thomson, Springer International Edn. 1994.
- Natural Products from Plants, 1st edition, by Peter B. Kaufman, CRC Press, New York, 1998

E-Books:

- <https://www.amazon.in/Phytochemical-Techniques-N-Raaman/dp/8189422308?tag=googinhydr18418-21&tag=googinkenshoo-21&ascsubtag=57b80361-8243-4115-9b89-458bf6fd7b98>
- https://www.flipkart.com/phytochemical-methods/p/itmefxvhjvgsrmm7?gclid=EAIAIQobChMIqZWAjpOP3QIVQY6PCh19Lgw5EAYYAyABEgLvVd BwE&pid=9780412230509&lid=LSTBOK97804122305097DULQI&marketplace=FLIPKART&cmpid=content_book_8965229628_gmc_pla&tgi=sem%2C1%2CG%2C11214002%2Cg%2Csearch%2C%2C272257559753%2C1o3%2C%2C%2Cc%2C%2C%2C%2C%2C%2C%2C&s_kwid=AL%21739%213%21272257559753%21%21%21g%21295092701166%21&ef_id=WQ2IGAAAISnWVaD%3A20180828064615%3As

Mapping with programme outcomes					
COs	PO1	PO2	PO3	PO4	PO5
C01	S	S	S	S	M
C02	S	S	M	S	S
C03	S	S	S	S	S
C04	S	S	M	S	S
C05	S	S	S	S	S

*S- STRONG, M- MEDIUM, L- LOW

Semester IV

CORE COURSE X – PLANT PHYSIOLOGY AND BIOCHEMISTRY

Course Code : 18PBT10 ♦ Hrs / week : 6 ♦ Credit : 5 ♦ Marks : 25 + 75 = 100

Objectives:

- To study the recent aspects of various physiological processes in plants.
- To understand the application of physiology in agriculture.
- To fathom the chemical environment and the dynamics of the biological system.
- To elucidate the interrelationships of the various pathways.

Course outcomes:

- Students know about the mechanisms of mineral nutrition for plant growth.
- They understand the process of Photosynthesis, Nitrogen metabolism and Plant Growth hormones.
- They understand the process of Respiration
- Acquiring knowledge about carbohydrate
- They can able to know about lipid and protein

UNIT – I Relationship between plants & water

Physical properties of water. Diffusion, imbibition and osmosis; concept & components of water potential. Ascent of sap. Transpiration. Mineral Nutrition. Mineral ion uptake (active and passive transport). Stress physiology.

UNIT – II Functional Physiology

Nitrogen metabolism- biological nitrogen fixation. Growth hormone : Physiological effects of phytohormones - Auxins, Gibberellins, Cytokinins.

Photosynthesis: Photosynthetic pigments, photosynthetic light reactions, photophosphorylation, carbon assimilation pathways: C3, C4, and CAM (brief account) Photorespiration and its significance.

UNIT – III Accumulation of Carbon

Respiration: Glycolysis, anaerobic respiration, TCA cycle, electron transport system. Mechanism of oxidative phosphorylation.

UNIT – IV Biomolecules - Carbohydrates

Atomic structure; chemical bonds - Ionic bond, covalent bond, coordination bond, hydrogen bond; Radioactivity; Hydrogen ion concentration (pH), buffers. Biomolecules: Carbohydrates - properties of mono, oligo and polysaccharides.

UNIT – V Biomolecules – Lipids & Protein

Biomolecules: Lipids - structure of fatty acids and glycerol - phospholipids, glycolipids, steroids. – Biosynthesis and Oxidation of fatty acid - Glyoxalate pathway – Gluconeogenesis. Protein : Structure and properties, synthesis (transcription and translation). Enzymes: General characteristics, mechanism of enzyme action and factors regulating enzyme action.

Text Books:

- Pandey, S.N. & Sinha, 2010, Plant Physiology, Vikas Publishing, New Delhi.

Reference:

- Noggle, G.R. and Fritz, G.J. 2001, Introductory Plant Physiology, Prentice Hall, India.
- Devlin, R.M., 2000, Plant Physiology, Affiliated East West Press Pvt. Ltd.
- Epstein, E., 2000, Mineral Nutrition in Plants-Principles and Perspectives, Wiley.
- Lincoln, T and Zeiger, Plant Physiology.2010 www.plantphys.net.

E-Books :

- www.divbiolchem.org
- www.ercenzymes.com
- http://rastogipublications.com/index.php?route=product/product&product_id=113&search=plant+physiology
- <https://www.schandpublishing.com/books/higher-education/biology/fundamentals-plant-physiology/9789352533343/#.W0LymtIzbIU>

Mapping with programme outcomes					
COs	P01	P02	P03	P04	P05
C01	S	S	S	S	S
C02	S	S	S	S	S
C03	M	M	S	S	S
C04	S	S	S	S	S
C05	M	S	S	S	S

*S- STRONG, M- MEDIUM, L- LOW

Semester IV

CORE COURSE XI – PLANT BIOTECHNOLOGY AND GENETIC ENGINEERING

Course Code : 18PBT11 ♦ Hrs / week : 6 ♦ Credit : 5 ♦ Marks : 25 + 75 = 100

Objectives:

- To know the art of recombining genes and traits.
- To develop the skills in handling genetic material.
- To apply genetic concepts into manipulating living things for human welfare.
- Understanding the revolutions that unfold in biotechnology

Course outcomes:

- Students will learn the techniques in biotechnology and plant tissue culture.
- Students are able to understand how to ply tissue culture and biotechnology in agriculture
- They can able to know about the patenting and their principles
- Understanding the genetic engineering tolls
- They will Expertise in the field of cloning

UNIT - I Interdisciplinary and Multidisciplinary approach

Biotechnology as Interdisciplinary and Multidisciplinary approach - Plant Tissue Culture – Introduction - Objectives and Goals – Laboratory organisation – Nutrient medium – Sterilization Techniques – Types of Cultures (seed, embryo, Root, callus, organ, cell, protoplast and axillary bud cultures) – Cell suspension culture and Secondary metabolites - Plant Micropropagation – Somatic embryogenesis – embryogenesis - Organogenesis – Protoplast Isolation and Fusion.

UNIT - II Application of tissue culture

Application of tissue culture in agriculture – crop improvement – horticulture and forestry. Application of Biotechnology in Conservation of plant genetic resources – Gene banks – Cryopreservation – Germplasm Conservation – Application in Genetically Modified Organisms (Fruits, Vegetables, Crops and Cereals) – Transgenic plants.

UNIT - III Principles of Patenting

Intellectual Property (IPR) – Intellectual Property Rights – Intellectual Property Protection – IPR and Plant Genetic Resources – Patent Systems – Sources of patent Information – Patenting Methods – Patenting of higher plants, genes and DNA sequences – Plant Breeders Rights and Farmers Rights – A brief account on Geographical Indication (GI).

UNIT - IV Genetic engineering Tools

Tools of Genetic engineering – Restriction types of Enzymes (Exo and Endo nucleases) – Different types of enzymes used in Genetic engineering (Methylase, SI nuclease, Ligase, Alkaline Phosphatase, Reverse transcriptase, T4 kinase, Terminal transferase, adapters and Linkers) – Vectors and their types – Plasmid (pBR 322, pUC Vectors), Agrobacterium based Plasmids, Bacteriophage vectors, Cosmids, Phagemids, YAC, CaMV, Gemini Virus, Shuttle and Expression vectors.

UNIT - V Strategies in cloning

Cloning Strategies – Basic Methods – rDNA technology – Genomic and cDNA library – Hybridization techniques – Labelling methods – Gene transfer mechanisms and Nucleotide sequencing methods – Application of genetic engineering in various fields.

Text Books:

- Old RN and Primrose S B. 2004, Principles of gene manipulation - Blackwell Sci., USA.
- Watson JD et al., 2005. Recombinant DNA. Blackwell Science Publ. USA.

Reference:

- Adrian Slater et. al., 2003, Plant Biotechnology, Oxford University press, U.K.
- Glick BJ & Pasternack JJ. 2004. Molecular biotechnology. Panima Publ. Bangalore.
- European Commission Report of a NEST High-Level Expert Group, 2005. Synthetic Biology: Applying Engineering to Biology.
- Presidential Commission for the Study of Bioethical Issues, 2010. (www.bioethics.gov)
- ETC Group, Canada, 2010. Extreme Genetic Engg - an introduction to synthetic biology.
- Young, E and Alper, H, 2010. Synthetic Biology: A Review. J Biomedicine and Biotechnology.
- Benner SA. & Sismour AM, 2005. Synthetic Biology, Nature Reviews, Genetics, 6: 533.

E. Books:

- <https://www.schandpublishing.com/books/higher-education/biology/a-textbook-biotechnology/9788121926089/>
- http://rastogipublications.com/index.php?route=product/product&product_id=57&search=biotechnology

Mapping with programme outcomes					
COs	P01	P02	P03	P04	P05
C01	S	M	S	S	S
C02	M	S	M	S	M
C03	M	M	S	S	S
C04	M	S	S	S	S
C05	M	S	M	S	S

*S- STRONG, M- MEDIUM, L- LOW

Semester IV

CORE COURSE XII – RESEARCH METHODOLOGY, BIOSTATISTICS AND BIOINFORMATICS

Course Code : 18PBT12 ♦ Hrs / week : 6 ♦ Credit : 5 ♦ Marks : 25 + 75 = 100

Objectives:

- To identify the influencing factors of research parameters.
- To test the significance, validity and reliability of the research.

Course outcomes:

- Students will have a good understanding of the scientific method and the rigors of scientific research
- They will be expert in sampling of data
- Gathering knowledge on central tendency
- Experiencing in correlation and statistical software
- They can able to know how to apply bioinformatics in research

UNIT – I Characteristics of Research

Research - definition - importance and meaning of research - characteristics of research - types of research - steps in research - identification, selection and formulation of research problem – research questions - research design - formulation of hypothesis - review of literature. Research report : types of reports - contents - styles of reporting - steps in drafting reports - editing the final draft - evaluating the final draft.

UNIT – II Techniques in Sampling of data

Sampling techniques : sampling theory - types of sampling - steps in sampling - sampling and non-sampling error - sample size - advantages and limitations of sampling. Collection of data : primary data - meaning - data collection methods - secondary data - meaning - relevances, limitations and cautions.

UNIT – III Methods of Statistics

Statistics in research - measure of central tendency - dispersion - skewness and kurtosis in research. Hypothesis - fundamentals of hypothesis testing – standard error - point and interval estimates.

UNIT – IV Methods of Statistics

Simple correlation, correlation coefficient, regression, simple linear regression, basic ideas of significance test, hypothesis testing, level of significance, 't' test, 'chi' square ANOVA.

UNIT – V Applications of Bioinformatics in Research

Scope of Bioinformatics: Sequence analysis – Homology & Analogy – National center for biotechnology & information (NCBI). Biological data bases – primary data base – Protein sequence data base – MIPS – SWISS PROT; Secondary data base – Prosites – Finger print data base; Genomics and Proteomics.

Text Books:

- Kothari, C.R. 2000. Research Methodology - Methods & Techniques. Wishwa Prakashan.
- Misra, R.P, 2000 Research Methodology - a handbook, Concept PublG Company, New Delhi.
- Gupta, S.P., 1990 Statistical Methods, Sultan Chand & Sons, New Delhi.
- Pillai and Bagavathi, 2008 Statistics, S.Chand & Company Ltd, New Delhi
- Nageswara Rao, G. 1983. Statistics for Agricultural Science Oxford & IBH, New Delhi
- Gupta, S.C, 2013. Fundamentals of statistics, Himalaya Publishers, Mumbai.

Reference:

- Hawkins, C and Sorgi, M. 2000 Research, Narosa Publishing House, New Delhi.
- Daniel, W.W., 1983, Biostatistics; A Foundation for Analysis in the Health Science, John Wiley and Sons Inc., New York.

E-Books:

- https://www.flipkart.com/research-methodology-methods-techniques-new-2018/p/itmphysawfghm7hzs?gclid=EAIaIQobChMIu5_2gaaR3AIVh4BwCh1Ufg44EAYYA SABEgKpTfD_BwE&pid=9789386649225&lid=LSTBOK9789386649225FJU4RT&marketplace=FLIPKART&cmpid=content_book_8965229628_gmc_pla&tgi=sem%2C1%2CG%2C11214002%2Cg%2Csearch%2C%2C272257559753%2C1o1%2C%2C%2C%2C%2C%2C%2C%2C%2C%2C&s_kwid=AL%21739%213%21272257559753%21%21%21g%21295092701166%21&ef_id=WQ2IGAAAISnWVaD%3A20180709053517%3As
- <https://www.schandpublishing.com/books/higher-education/sciences/bioinformatics-genomics-proteomics/9789325978553/#.W0L0qdIzbIU>
- <https://www.schandpublishing.com/books/higher-education/biology/introduction-biostatistics-a-textbook-biometry/9788121923293/#.W0L06NIzbIU>

Mapping with programme outcomes					
COs	PO1	PO2	PO3	PO4	PO5
C01	M	S	S	S	S
C02	M	M	S	S	S
C03	M	M	S	S	S
C04	M	S	S	M	S
C05	S	S	S	S	S

*S- STRONG, M- MEDIUM, L- LOW

Semester III & IV

CORE COURSE XIII - PRACTICAL III – CELL AND MOLECULAR BIOLOGY, GENETICS AND PLANT BREEDING, GENERAL MICROBIOLOGY, PLANT PHYSIOLOGY, BIOCHEMISTRY AND BIOPHYSICS, PLANT BIOTECHNOLOGY AND GENETIC ENGINEERING AND RESEARCH METHODOLOGY, BIOSTATISTICS AND BIOINFORMATICS

Course Code : 18PBT13P ♦ Hrs / week : 7 ♦ Credit : 5 ♦ Marks : 25 + 75 = 100

Course outcomes:

- Experiencing in handling laboratory equipment and apparatus.
- Acquiring knowledge on isolation of microorganisms from various sources
- Imparting knowledge on experimental work in plant physiology.
- Deep Understanding methods of qualitative and quantitatively study for biochemical compounds
- Learning plant breeding, biotechnology, statistics and bioinformatics tools.

MOLECULAR BIOLOGY:

- Isolation of Plasmid DNA from bacteria.
- Isolation of Genomic DNA.
- Estimation of DNA and RNA by Spectrophotometric method.

GENETICS: Working out the problems in genetics and drawing of genetic charts.

PLANT BREEDING:

- Charts depicting mass selection, pure line selection, backcross breeding and double cross in Maize
- Study of different kinds of plant propagation

MICROBIOLOGY:

- Preparation of Medium – Bacteria-Nutrient Agar, Fungi - PDA Medium.
- Isolation of Microbes by Serial Dilution Techniques
- Isolation of Fungi and Bacteria from air and soil
- Isolation of fungi and Bacteria from Sewage Water.
- Preparation of Spread plate, Streak plate (Simple and Quadrant) and Pour plate.
- Effect of different antibiotic sensitivity, pH and Temperature on bacterial growth.

PLANT PHYSIOLOGY :

- Determination of water potential in different tissues.
- Effect of temperature on the membrane permeability.
- Determination of Stomatal frequency.
- Determination of Rate of Transpiration by Ganong's Potometer.
- Determination of Respiratory Quotient using Ganong's Respirometer.
- Determination of Evolution O₂ during Photosynthesis.
- Determination of chlorophyll-a, chlorophyll-b and total chlorophyll by the Arnon's method.
- Determination of Carotenoids.

- Estimation of total Phenols.
- Separation of Pigments by Paper Chromatography

BIOCHEMISTRY:

- Estimation of Protein (Lowry's method), Estimation of Amino acids, Estimation of Starch, Estimation of Total lipid, Estimation of Amylase, Estimation of Protease.

PLANT BIOTECHNOLOGY AND GENETIC ENGINEERING

- Isolation of genomic DNA from plants and bacterial sources - Demonstration
- Isolation of plasmid DNA from E. coli - Demonstration

BIOSTATISTICS

- Calculation as per syllabus

BIOINFORMATICS

- NCBI
- MIPS – SWISS PROT

Visit and enhance current techniques in biological institutes available in south India

Mapping with programme outcomes					
COs	PO1	PO2	PO3	PO4	PO5
C01	S	S	S	M	S
C02	M	S	S	S	M
C03	S	S	M	S	S
C04	S	S	S	S	S
C05	S	S	S	S	M

*S- STRONG, M- MEDIUM, L- LOW

Semester IV

PW1- PROJECT

Course Code : 18PBT14 ♦ Hrs / week : 12 ♦ Credit : 5 ♦ Marks : 25 + 75 = 100

Each candidate should take up a Project Work; submit Project Report at the end of the second year. The candidate concerned will have to defend his project work in an open Viva- Voce examination.

Course outcomes:

- Students are able to get practical knowledge and they can able to expert in their field.
- They can get their job opportunities in various biological industries and research stations.