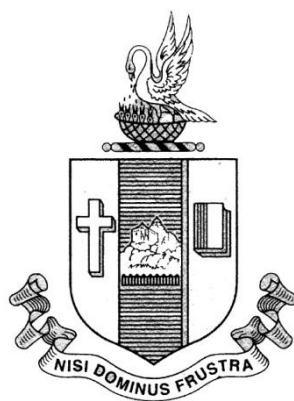


# ***B.Sc. BOTANY***

# **SYLLABUS**



**P.G. Department of Botany**

**Bishop Heber College (Autonomous)**

(Nationally Reaccredited with A+ Grade by NAAC)

Tiruchirappalli – 620 017.





**ANGIOSPERM MORPHOLOGY AND TAXONOMY**

Semester

I

CORE PAPER I

Course Code

U14BY101

**THEORY****Unit I**

**Angiosperm Morphology:** Plant Habits, Root and its modification, stem and its modification, leaf structure and its modifications, Phyllotaxy. Inflorescence types – Racemose, Cymose and special types.

**Unit II**

Floral morphology, flower types, aestivation, Types of anthers and arrangement, Gynoecium – types and placentation. Classification of fruits, Description of simple, aggregate and multiple fruits.

**Unit III**

**Taxonomy:** Importance of Taxonomy, Binomial nomenclature, Bentham and Hooker's classification, merits and demerits, Hutchinson's classification – Merits and demerits. Herbarium Techniques.

**Unit IV**

A detailed study of the following families with their economic importance. Annonaceae, Capparidaceae, Sterculiaceae, Rutaceae, Fabaceae, Caesalpineaceae, Mimosaceae, Cucurbitaceae, Apiaceae.

**Unit V**

Rubiaceae, Asteraceae, Apocynaceae, Asclepiadaceae, Solanaceae, Lamiaceae, Verbinaceae, Euphorbiaceae, Amaranthaceae, Orchidaceae, Liliaceae and Poaceae.

**PRACTICAL**

1. Morphology: Specimen for spotter: Modification of root, stem, leaves. Inflorescence, flowers and fruits.
2. Taxonomy: Dissection of floral parts of plants belonging to the families mentioned in the syllabus with floral formula and floral diagram.
3. Binomials and Morphology of the useful parts of the economic products belonging to the families studied.
4. Field visit, Maintenance of field note book and preparation and submission of Field note and 20 herbarium sheets.

**REFERENCES****Taxonomy**

1. Lawrence, G.I.M.(1953): Taxonomy of Vascular Plants. Oxford & IBH Publishers, New Delhi.
2. Narayanaswamy, R.V. & Rao, K.N. (1976). Outlines of Botany. S.Viswanathan Printers & Publishers, Chennai.
3. Pandey, B.P.(1997). Taxonomy of Angiosperms. S.Chand & Co., (P) Ltd., New Delhi.
4. Sharma, O.P. (2000). Plant Taxonomy. Tata McGraw Hill Publishing Co., New Delhi.
5. Vashista, P.C. (1997). Taxonomy of Angiosperms. S.Chand & Co., New Delhi.

**Economic Botany**

1. Ashok Bendre and Ashok Kumar. (1999). Economic Botany. Rastogi Publications, Meerut, India
2. Pandey, B.P. (1999). Economic Botany. S. Chand and Co. New Delhi.
3. Verma, V. (1974). A Text Book of Economic Botany. Emkay Publications, New Delhi.
4. Sambamurthy, V.S. & Subrahmanyam, N.S (1989). A text book of Economic Botany

**PLANT ANATOMY AND EMBRYOLOGY**

Semester

II

CORE PAPER II

Course Code

U14BY202

**THEORY****Unit I : ANATOMY**

Plant tissues- Classification, Origin, structure, Theories and functions of Meristematic, Permanent and Secretary tissues.

**Unit II : TISSUE SYSTEMS**

Epidermal System- Epidermis, Stomata and trichomes. Fundamental Tissue System- Cortex, Endodermis, Pericycle and Pith. Vascular System- Stele. Nodal Anatomy

**Unit III**

Primary structure of monocot and dicot Root, Stem and Leaf. Normal secondary thickening in dicot stem and root. Annual rings. Heartwood and sapwood. Anomalous secondary thickening in **Dracaena**, **Aristolochia**, and **Boerhaavia**,

**Unit IV : EMBRYOLOGY**

Structure of Flower. Structure and development of Anther, Microsporogenesis and Microgametogenesis. Structure of Pistil, Types of Ovules, Megagametogenesis and Female gametophyte Development (**Polygonum** Type).

**Unit V :**

Types of Pollination. Double fertilization, Post Fertilization Changes. Endosperm and embryo Development- Dicot (**Capsella**) and monocot (**Luzulla**). Apomixis and Polyembryony.

**PRACTICAL: (U14BY2P1)****Anatomy**

Preparation of transverse section of the following plant parts to observe and record the internal structure. Monocot and Dicot root, stem and leaf (Primary Structure). Normal secondary thickening in Dicot stem and root. Anomalous secondary thickening in **Dracaena**, **Aristolochia**, and **Boerhaavia** stems.

**Embryology**

T.S. of Anther. L.S. of ovule, embryo sac. Embryo dissection and Pollinium mounting

**REFERENCES****Anatomy**

1. Esau, K. (1965). Vascular Differentiation in Plants. Holt, Rinehart & Winston. N.Y.
2. Vashista, P.C. (1977) : A Text Book of Plant Anatomy, S. Nagin & Co., Jalandhar.
3. Krishnamurthy, K.V. (1987): Wood, Tetrahedron Publications, Trichy, India.
4. Singh, V., Pandey, P.C. & Jain, D. K. (1982). Anatomy of seed plants. Rastogi Publications, Meerut, India.
5. Pandey, B.P. (1989). Plant Anatomy. S. Chand & Co., New Delhi.
6. Esau, K. (1964). Anatomy of seed plants, John Wiley & Sons, N.Y.

**Embryology**

1. Maheswari, P. (1985). An introduction to the Embryology of Angiosperms Tata McGraw Hill Publishing Co., Ltd., New Delhi.
2. Muneeswaran, A. (1990). Angiosperm Embryology. Titan Books, Madurai, India.
3. Bhojwani, S.S. & Bhatnagar, S.P. (2002). The Embryology of Angiosperms (4<sup>th</sup> Edn.) Vikas Publishing House (P) Ltd., UBS Publisher's Distributions, New Delhi.
4. Annie Regland. (2000). Developmental Botany (Embryology of Angiosperms). Saras Publications, Nagercoil, Tamilnadu, India.

**PLANT DIVERSITY- I  
(THALLOPHYTES AND BRYOPHYTES)**

Semester  
Course Code

III  
U14BY303

CORE PAPER III

**THEORY**

**Unit I : ALGAE** : General Characters, Classification (F.E. Fritsch), Thallus Organization, Life Cycles and Economic Importance of Algae.

**Unit II** : Structure, Reproduction and Life Cycles of the Following (Development not required) *Oscillatoria*, *Volvox*, *Navicula*, *Dictyota*, *Gracillaria*

**Unit III : FUNGI** : Habit, Habitat, Nutrition, Thallus organization and Reproduction, Classification (Ainsworth), and Economic Importance of Fungi. General Account of Lichens- Structure and Reproduction in *Usnea*.

**Unit IV** : Structure, Reproduction and Life Cycles of the Following (Development not required) *Phytophthora*, *Mucor*, *Peziza*, *Polyporus*, *Cercospora*.

**Unit V : BRYOPHYTE** General Characters, and Classification (Rothmaler) of Bryophytes. Structure, Reproduction and Life cycle of the Following (Development not required) *Riccia*, *Anthoceros*, *Funaria*.

**PRACTICAL**

**Algae** A detailed study of genera included in the Theory.

**Fungi** A detailed study of the genera included in the Theory. Methods of Isolation and Culture of Fungi (Demo only).

**Bryophytes** A detailed study of the genera included in the Theory.

**REFERENCES**

**Algae**

1. Fritsch, F.E. (1965). The Structure & Reproduction of Algae (1945): Cambridge University press, Cambridge, U.K.
2. Kumar, H.D. & Sing, H. N. (1976): A Text book of Algae. Affiliated East West press Pvt. Ltd., New Delhi, Madras.
3. Kumaresan, V. (1997). Algae & Bryophytes. Saras Publications, Nagercoil, India.
4. Pandey, B.P. (2002). A Text book of Botany – Algae. S.Chand & Co., (P) Ltd., New Delhi
5. Sharma, O.P. (1990). Text book of Algae. Tata McGraw Hill Publishing Co., Ltd., New Delhi
6. Smith, G.M. (1938). Cryptogamic Botany (Vol.1 Algae, Fungi, & Liches). McGraw Hill Book Co., New York.
7. Singh, V. (1992). Text book of Botany. 1<sup>st</sup> Meerut, Rastogi.
8. Vashista, B.R. (1988). Botany for degree students – Algae. S.Chand & Co., (P) Ltd., New Delhi
9. Venkateswarlu, V. (1970). A Text Book of Algae. Maruthi Book Depot, Guntur, Hyderabad, India

**FUNGI**

1. Vashista, B.R. (1982). Botany for Degree Students – Fungi. S.Chand & Co., New Delhi
2. Alexopoulos, C.J. and Delavoryas, T. (1987). Morphology of Plants & Fungi. Harper & Row, Publishers,
3. Mims, C.W. & Blackwell, M. (1996). Introductory Mycology. John Wiley & Sons, N.Y.
4. Srivastava, J.O. Introduction to Fungi (2<sup>nd</sup> Edn.) S.Nagin & Co., Meerut India
5. Sharma, O.P. (1992). Test Book of Fungi. Tata McGraw-Hill Publishing C., New Delhi

**BRYOPHYTES**

1. Chopra, G.L. (1968). A class Book of Bryophyta. Hari Singh & Bros., Jullunder.
2. Kumra, P.K. (1988). Biology of Bryophytes. Wiley Easter Ltd., New Delhi.
3. Parihar, N.S. (1965). An introduction to Embrophyta –Vol.II. Bryophyta. Central Book Depot, Allahabad.
4. Srivastava, N.N. (1996). Bryophyta. Pradeep Prakashan, Meerut, India.

**SBEC – I MUSHROOM TECHNOLOGY**

Semester

III

SBEC I

Course Code

U14BYPS1

**Aims and objectives**

- This syllabus is designed to impart sufficient academic and practical experience to the learners and motivate them to become self employed in the mushroom venture.

**THEORY****Unit I**

Introduction; Morphology; Types of mushrooms; Identification of edible and poisonous Mushrooms, nutrient values

**Unit II**

Life cycle of Mushrooms, Economic value of various Mushrooms, Mushrooms cultivation on small scale industry.

**Unit III**

Selection of varieties for compost beds, mushroom, spawn types and production.

**Unit IV**

Spawn running and management; pest and disease management (insects, nematodes, mites, virus, bacteria, fungi); harvesting technique.

**Unit V**

Post harvesting technology (cleaning, freezing, freeze drying, packing and marketing)

Mushroom recipies (pickle / soup / Briyani / Paccra )

**PRACTICAL**

1. Identification of edible and poisonous mushrooms
2. Microscopical observation of mushrooms
3. Isolation, purification and spawn preparation
4. Construction of mushrooms cultivation sheds
5. Cultivation of mushrooms – tropical and temperate types
6. Determination of nutritional value of mushrooms
7. Identification of antimicrobial components (flavanoids)

**REFERENCE**

1. Hand book of mushroom cultivation. 1999. TNAU Publication.
2. Bahl, N. 2002. Hand book on mushrooms. IV edition. Oxford and IBH publishing Co., Pvt. Ltd., New Delhi.
3. Singh, 2005. Modern mushroom cultivation. International book distributors, Dehradun.
4. Sharma, V.P., 2006, Diseases and Pests of Mushrooms, MIS. IBD Publishers and Distributors, New Delhi.

**BOOK FOR REFERENCE**

1. Dey, S.C.(2010), Mushroom growing, Agrobios(India), Jodhpur.
2. Handbook of Edible Mushroom Today and Tomorrows printers & publishers (1980).
3. Kapoor, J.N.(2001), Mushroom cultivation, KrishiBhavan, NewDelhi.
4. Parthiban, Malathi and BalaMohan, Mushroom culture(Tamil).
5. Pathak, V.N., Yadav N. and Gaur M.(2010), Mushroom production and processing Technology Agrobios (India), Jodhpur.
6. Sharma, O.P.(2003), Textbook of Fungi, Tata McGrawHill Publishing Co., New Delhi.

**NURSERY TECHNOLOGY**

Semester III NMEC I  
 Course Code U14BYPE1

**THEORY****Unit I**

Introduction, Methods of Propagation-Sexual Propagation, Vegetative Propagation, Cuttings, Layering, Grafting, Budding.

**UNIT II**

Tissue culture – Methods of Plant multiplication *in vitro*. Basic parameters for propagation *in vitro*.

**UNIT III**

Nursery Structures – Store House, Potting and Packing Shed, Nursery Bed, Mist Chamber, Manures, compost, vermicompost.

**UNIT IV**

Green houses for tropical countries – Management, Pot culture, Pot mixture

**UNIT V**

Harvesting, Packing, Storage and Marketing of Nursery Stock

**PRACTICAL**

1. Layering-Jasmine, Mussaenda, Ixora
2. Cutting – Crotons, Hibiscus, Bougainvillea
3. Grafting – Mango, Citrus
4. Vermicomposting.

**REFERENCES**

1. Edmond Musser and Andres (1957). Fundamentals of Horticulture. McGraw Hill Book Co.,
2. Gardener(1996). Basic Horticulture. Mac Millan N.Y
3. Kumar N (1997). Introduction to Horticulture. Rajalakshmi Publications Nagercoil, India
4. Lex Lauries and Victor H (1979). Rice. Floriculture – fundamentals and practices,.Mc.Graw Hill publishers N.Y
5. Manibhushan Rao,K(1991). Text Book of Horticulture. Macmillon India Ltd.
6. Mukherjee D(1977). Gardening in India. Oxford IBH Publishing Co., New Delhi.
7. Randhawa (1997). Ornamental Horticulture in India. Today and Tomorrow Publishers New Delhi.
8. Sandhu M.K(1989). Plant Propagation. Wiley Easter Ltd., New Delhi.
9. Sundararajan, J.S., Muthuswamy, J., Shanmugavelu, K.G. and Balakrishnan, R. A Guide to Horticulture. Thiruvankadam Printers, Coimbatore.

**PLANT DIVERSITY II  
(PTERIDOPHYTES, GYMNOSPERMS AND PALEOBOTANY).**

Semester IV  
Course Code U14BY404

CORE PAPER IV

**THEORY**

**Unit I : PTERIDOPHYTES**

General characters of Pteridophytes, Classification (Sporne), Stelar evolution, Apospory, Apogamy, Heterospory and Seed habit.

**Unit II**

Morphology and Reproduction and life history of the following ***Lycopodium***, ***Equisetum***, ***Adiantum*** and ***Marsilea***. (Development not required).

**Unit III : GYMNOSPERMS**

General characters of Gymnosperms, Classification (Sporne), Economic Importance (Food, medicine and timber). Morphology, structure, reproduction and life history of *Cycas*.

**Unit IV**

Morphology, Structure, reproduction and life history of ***Pinus and Gnetum***

**Unit V : PALEOBOTANY**

Fossils and Methods of fossilization. Geological time scale – An elementary knowledge of computation of age of fossils – Radio carbon dating. A brief study of the following fossil forms - ***Rhynia***, ***Lepidodendron***, ***Lepidocarpon***, ***Calamites*** and ***Willamsonia***. (Stem).

**PRACTICAL**

**PTERIDOPHYTES**

A study of the morphology, anatomy and structure of the vegetative and reproductive parts of the sporophytes and gametophytes of the genera included in the Theory.

**GYMNOSPERMS**

A study of the morphology, anatomy and structure of the vegetative and reproductive parts of the sporophytes and gametophytes of the genera included in the Theory.

**PALEOBOTANY**

Fossil Specimens included in the Theory.



## REFERENCES

### Pteridophytes

1. Parihar, N.S. (1965): An introduction to Embryophyta Vol. 1 Pteridophyta. Central Book Depot. Allahabad.
2. Smith, G.M. (1956): Cryptogamic Botany Vol. II. (2<sup>nd</sup> Edn.), (Bryophytes & Pteridophytes). McGraw Hill Book Co., N.Y.
3. Sporne, K. R. (1970): The Morphology of pterdophytes. (The structure of Ferns and Allied Plants). Hutchinson University Library, London.
4. Sharma, O. P. (1990): Text Book of Pteridophyta. Macmillan India Ltd., Delhi.
5. Vashista, P.C. (1977). Botany for Degree Students - Pteridophyta. S. Chand & Co., Delhi.

### Gymnosperms

1. Coulter, J. M. & C. J. Chamberlain. (1964): Morphology of Gymnosperms. Central Book Depot, Allahabad.
2. Sporne, K. R. (1971). The Morphology of Gymnosperms. (The structure and Evolution of Primitive seed Plants). Hutchinson University Library, London.
3. Vashista, P.C. (1996). Botany for Degree Students Gymnosperms (2<sup>nd</sup> Edn.) S. Chand & Co., New Delhi.
4. Sharma, O.P. (1997). Gymnosperms. Pragati Prakashan, Meerut, India.

### Paleobotany

5. Arnold, C.A. (1947). An Introduction to Paleobotany. McGraw Hill Book Co., N.Y.
6. Delavoryas, T. (1962). Morphology and Evolution of Fossil Plants. Holt, Rinehart & Winston. N.Y.
7. Shukla, A.C. & Misra, S. P. (1975). Essentials of Paleobotany. Vikas Publishing House (P) Ltd., Delhi, Bombay, Kanpur.
8. Venkatachala, B. S., Shukla, M. & Sharma, M. (1992). Plant Fossils – a Link with the past (A Birbal Sahni Birth Centenary Tribute). Birbal Sahni Institute of Paleobotany, Lucknow, India.

**SBEC – II PLANT WEALTH FOR HUMAN LIFE**

Semester IV SBEC II  
 Course code U14BYPS2

**Unit I : Flowers**

1. Bouquet
2. Garlands and Strings
3. Regular and festival decorations
4. Hair designs

**Unit II : Vegetables and Fruits**

1. Pickle (Lime / Mango / Ginger )
2. Juice (Lemon / Sweet lime )/ squash (Graph / Orange )
3. Drying (Direct & treated)
4. Vegetable, pith & grain carving

**Unit III : Fibers**

1. Baskets & pans
2. Ropes & chords
3. Brushes & brooms
4. Mats & Carpets

**Unit IV : Roots & Seeds**

1. Medicinal oils / Application
2. Fans / Window chops (Vetyiveria )
3. Sprouted seeds ('Sundal' & 'Sathumavu')
4. Cosmetics, Face packs & Skin cars

**Unit V : Phyto wastes to wealth**

1. Shels and rinds (Useful & ornamental articles )
2. Waste/used papers and wood (recycling)
3. Leaves (cups & plates)
4. Phyto jewellery (ear drops, studs, bangles / necklace)

(Details about the cultivation / procuring, processing uses and sales of these based on the availability will be dealt with the support of the field experts and field visits)

**Reference**

1. Pandey, B.P. 2007. **Economic botany**. S. Chand and Co. New Delhi
2. Samba Murty, A.V.S. And Subramaniyan, N.S. 1989. **A Text book of economic botany**. Wiley Eastern Ltd. New Delhi.
3. Siddappa, G.S. and Tandon, G.L. 1998. **Preservation of fruits and vegetables**. ICAR, New Delhi.

**MUSHROOM CULTIVATION**

Semester IV NMEC II  
Course Code U14BYPE2

**THEORY****Unit I**

Introduction-Types of Mushroom-Identification of edible and poisonous Mushroom. Nutritive values life cycle of common edible mushroom.

**Unit II**

Scenario of Mushroom cultivation – Prospects and Scope of Mushroom Cultivation.

**Unit III**

Cultivation methods for different types of Edible mushroom  
Paddy straw mushroom (*Volvariella* Sp.)  
Button mushroom (*Agaricus* Sp.)  
Oyster mushroom (*Pleurotus* Sp.)

**Unit IV**

Cultivation, Pure Culture  
Preparation of Spawn and Compost and Spawn Running  
Cropping and its maintenance  
Harvesting and Marketing

**Unit V**

Protection and Management  
Disease & Pests of Mushroom and their control measures

**PRACTICAL**

1. Setting up of Cultivation room
2. Preparation of Spawn, Spawning & Spawn running
3. Preparation of Compost
4. Harvest and Packing methods

**REFERENCE**

1. Manibhushan Rao,K(1999). Text Book of Horticulture. Macmillon India Ltd.
2. Sharma, O. P (1982). Test Book of Fungi. Tata McGraw-Hill Publishing C., New Delhi

**PLANT PHYSIOLOGY, BIO CHEMISTRY AND BIOPHYSIS**

Semester V  
Course Code U14BY505

CORE PAPER V

**THEORY****Unit I**

**Plant Physiology:** Water –Physical and Chemical properties and its role in plants. Osmotic and non - osmotic uptake of water. Ascent of sap-cohesion Theory: root pressure. Transpiration, physiology of Stomatal action. Translocation of solutes and assimilates, Mass flow. Mineral nutrition of plants. Mineral uptake: Passive and Active. Role of major and minor elements, mineral deficiency symptoms. Hydroponics.

**Unit II**

**Photosynthesis:** Radiant energy and its role in photosynthesis. Absorption spectrum, action, role of pigments, Emerson's enrichment effect, photosystems I and II, photoelectron transport, photophosphorylation, products of light reaction and their utilization.

Carbon Assimilation: Calvin cycle, Hatch and Slack pathway, CAM pathway and photorespiration.

**Unit III**

**Respiration:** Respiratory substrates. Aerobic and anaerobic. Glycolysis, Krebs Cycle and Oxidative phosphorylation.

**Nitrogen Metabolism:** Nitrogen fixation, Nitrogen assimilation and nitrogen cycle Enzymes –Nature. Properties and mechanism of action.

**Unit IV**

**Plant Growth:** Growth regulatory substances, auxins, kinins, gibberellins and their functions. Role of hormones in flowering, senescence and abscission. Photoperiodism, photochrome-vernillation.

Seed dormancy – factors, breaking of seed dormancy, seed viability and seed germinability.

**Unit V**

**Biochemistry and Biophysics:** Definition of pH and its determination and buffers. Chromatography and centrifugation- principles, types and applications. A brief account of carbohydrates, Lipids. Proteins structure, types and functions. Elementary account of Flavonoids, Terpenoids and Alkaloids. Laws of Thermodynamics, entropy and free energy- Redox couples – ATP Bio energetic.

## PRACTICAL

### For demonstration

1. Colorimeter.
2. Measurement of pH.
3. Centrifuge.

### Experiments to be performed by each students

1. Estimation of sugars (Colorimetric).
2. Estimation of lipids (Gravimetric).
3. Effect of light intensity on transpiration using Ganong's photometer.
4. Determination of stomatal frequency and index using cobalt chloride paper.
5. Comparison of stomatal and cuticular transpiration.
6. Determination of absorption and transpiration ratio in plants.
7. Separation of plant pigments by paper chromatography.
8. Determination of photosynthetic rate in water plants under different CO<sub>2</sub> concentrations.
9. Measurement of O<sub>2</sub> evolution under different color lights using Wilmott's bubbler.
10. Qualitative test for phytochemicals – Starch, sugar, protein, lipids, flavonoids and terpenoids.

## REFERENCES

### Plant physiology

1. Devlin, R.M. (1969). **Plant Physiology**. Holt, Rinechart & Winston & Affiliated East. West press (p) Ltd., New Delhi.
2. Jain, V.K. (1997). **Fundamentals of plant physiology**. S. Chand and Co., New Delhi.
3. Noggle, R. and Fritz. (1986). **Introductory plant physiology**. Prentice Hall of India.
4. Pandey, S.N. (2005). **Plant physiology**. Vikas publishing House (P) Ltd., New Delhi.
5. Srivastava, H.N(1998). **Plant physiology**, Pradeep Publications, Jalandhar, India.
6. Verma, S.K(1995). **A text book of plant physiology**. S. Chand and Co., New Delhi.

### Biochemistry

1. N. Arumugam, (1993) **Biochemistry**. Saras publications, Nagarcoil, Tamilnadu.
2. Harbone, J.B(1997). ( 5 eds). **Plant Biochemistry**. Harcourt Asia (P) Ltd., India and Academic Press - Singapore.
3. Jayaraman, J.(1981). **Laboratory Manual of Bio Chemistry**. Wiley Eastern Ltd., New Delhi.
4. Srivastava, H.N(1999). **Elements of Biochemistry**. Rastogi Publications, Meerut, India.
5. Trehan, K(1987). **Biochemistry**. Wiley Eastern Ltd., New Delhi.

### Biophysics

1. Achermaan, K(1987). **Biophysical sciences**. Prentice hall of India Ltd.,
2. Annie and Arumugam. N(2000). **Biochemistry and Biophysics**. Saras publications, Nagarcoil, Tamilnadu.
3. Epstein, H.T(1963). **Elementary Biophysics**. Addison Wesley Publishers.
4. Narayanan, P (2000). **Essentials of Biophysics**. New Age International Publishers (P) Ltd., New Delhi.

**CELL BIOLOGY, GENETICS AND EVOLUTION**

Semester V  
Course Code U14BY506

CORE PAPER VI

**THEORY****Unit I : CELL BIOLOGY**

Ultra structure of plant cell, Cell Wall-primary and secondary, Plasma membrane, Cytoplasm, Cell Organelles, Endoplasmic Reticulum, Golgi complex, Mitochondria, Plastids, Ribosomes ( 70S and 80S ).

**Unit II**

Nucleus - Components - nuclear membrane, nuclear pore, nucleoplasm, nucleolus, Chromosomes - Types, Euchromatin and Heterochromatin, solenoid model. Giant Chromosomes, Lampbrush, Polytene. Cell division- Mitosis and Meiosis.

**Unit III : GENETICS**

Mendel's Laws of inheritance. Monohybrid, dihybrid ratios, Test cross, Incomplete dominance, Co-dominance, Lethal factors, Complementary factors, Epistasis- Dominant and Recessive. Polygenic inheritance in Wheat (Kernal Colour), Man (Skin Colour). Multiple alleles, Blood Group in man. Rh factor.

**Unit IV**

Linkage, Crossing over, cytological proof for crossing over, Linkage Mapping, Sex linkage in *Drosophila* (Bar eye), in human (Colour blindness). Cytoplasmic inheritance, Sex determination in *Drosophila* and Human, Neurospora Genetics,

**Unit V : EVOLUTION**

Theories of Lamarck, Charles Darwin, Modern Synthetic Theory - Sources of Variation, Isolating mechanism.

**PRACTICAL****CELL BIOLOGY**

A study of cell structure of plants and its organelles using electron micrographs from standard publications. Study of Mitosis and Meiosis using squash and smear techniques.

**GENETICS**

Problems on simple monohybrid and dihybrid ratios. Simple problems on interaction of factors included in Theory.

## REFERENCES

### Cell Biology

1. De Robertis, E.D.P. and De Robertis, E.M.F. (1987) Cell and Molecular Biology (7<sup>th</sup> Ed.), Holt-Saunders International Editions, Philadelphia and Tokyo.
2. Gupta, P.K. (1988) A text book of Cytology, Genetics and Evolution. Emkay Publication. Rastogi.
3. Verma, P.S. and V.K. Agarwal, (1998) Concept of Molecular Biology, S.Chand and Co. Ltd, New Delhi.
4. David Freifelder (2000) Molecular Biology, (2<sup>nd</sup> Ed.), Narosa Publishing House, New Delhi.
5. Karvita B. Ahluwalia, (2000) Genetics, New Age International pvt. Ltd., Publishers, Chennai.
6. Periasamy, (2000) An Introduction to Cytology , Genetics and Evolution, Emkay Publication.
7. P.S. Verma and V.K. Agarwal, (2005) Cell Biology, Genetics, Molecular Biology, Evolution & Ecology, S. Chand and Co. Ltd., New Delhi.

### Genetics

1. Dyansagar, V.R. (1990) Cytology and Genetics. Tata McGraw Hill Publishing Co., Ltd., New Delhi.
2. Gupta, P.K. (1988) Cytology and Genetics – A Text Book for University students 5<sup>th</sup> Edn., Rastogi Publishers Meerut, Rastogi, India.
3. Meyyan, R.P. (1999) Genetics and Evolution, Saras Publication, Nagarcoil , India.
4. Sinha. U. and Sinha, S. (1976) Cytogenetics, Plant Breeding and Evolution, Vikas Publishing House, New Delhi.
5. Sinnott, E.W., L.C. Dunn and Dobshansky. T. (1958) Principles of Genetics (5<sup>th</sup> Edn.) McGraw Hill Publishing Co., New Delhi.
6. Strickberger, Monroe.W. (2000) Genetics, Prentice Hall, New Delhi.
7. Elrod Susan.L. (2010) Genetics 4<sup>th</sup> Edn., Tata McGraw Hill, New Delhi.

### Evolution

1. Savage Jay.M. (1969) Evolution (2<sup>nd</sup> Edn.) Amarind publishing Co Pvt., Ltd., New Delhi.
2. Shukla, R.s. and P.S.Chandel (1980) Cytogenetics, Evolution and Plant Breeding, S.Chand and Co., New Delhi.
3. Verma P.S. and V. K. Agarwal. (1998) Concept of Evolution, S.Chand and Co., New Delhi.
4. Strickberger, Monroe.W. (1994) Evolution, CBS, New Delhi.
5. Moore Ruth, (2000) Evolution, Time World Press, Kulkutta.
6. Barton Nicholas.H., Briggs Derek E.G. & Eisen Jonathan. A. (2008) Evolution, Cold Spring Harbor laboratory Press, U.S.A

**BIostatistics, Computer Application and Bioinformatics**

Semester V  
Course Code U14BY5:1

ELECTIVE : I

**THEORY****Unit I : BIostatistics**

Definition and Scope. Population and Sample, Sampling techniques- Random sampling. Frequency Distribution- Discrete and Continuous. Statistical table, Graphical Representation of Data. Central Tendency- mean, median and mode.

**Unit II**

Measure of dispersion- Absolute and Relative, Mean Deviation, Standard Deviation and Standard error. Probability- Binomial, Poisson and Normal. Test of Significance- Chi Square test for goodness of fit.

**Unit III : Computer Application in Botany**

History of Computers, Types of Computers, Basic Computer Concepts, Parts of a computer – input (Keyboard, Mouse) and output devices (Monitors, Printers) Computer Memory (RAM, ROM), Storage devices (Floppy Disc, Compact Disc, Hard Disc) Central Processing Unit, Software, Hardware.

**Unit IV**

Computer Network (LAN, WAN), Data – Representation, Number Systems-binary, arithmetic, Operating System- Windows. Word Processing Software MS Office- Word, Excel and Power point.

**Unit V : Bioinformatics**

Definition and scope. Role of Internet in Bioinformatics. Biological database(Primary) Nucleotide sequence database(EMBL and NCBI). Protein sequence database(PIR, Swiss-prot). Bioinformatics role in Human genome project and *Arabidopsis thaliana*.

**No Practical for this paper.**



## REFERENCES

### Biostatistics

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2. Manoharan, M.(1992). Statistical Methods, theory and Practice, Palani paramount, Palani.
3. Misra, B.N.& M.K. Misra. (1989). Introductory Practical Bio-Statistics. Darbari Udyog Gananganagar, N-24 Parganas, West Bengal, India.
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### Computer Application

1. Richmond, I. (1985). Programming in BASIC. John Wiley & Sons N.Y.
2. Bly, R.W (1984). The Puffin Dictionary of Computer Words. Puffin Books, U.K.
3. Bryant, T.N. and J.W.T (1989). Wimpenny. Computers in Microbiology. A practical approach. Practical Approach Series. (Published in the Practical Approach Series. Editors, D. Rickwood and B.D. Hames.) Oxford University Press. Oxford, N.Y.
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5. Utpal Mallik (2014). Computers in the Biology Class room (a study guide for teachers).
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7. David W. Mound. (2001). Bioinformatics: Sequence and Genome analysis. Gold Spring Harbour Laboratory Press, New York.
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**MOLECULAR BIOLOGY AND GENE TECHNOLOGY.**

Semester  
Course Code

V  
U14BY5:2

ELECTIVE II

**THEORY****Unit I : MOLECULAR BIOLOGY**

Components and Organisation of Nucleic acids. DNA Structure- A, B and Z forms of DNA, Different forms of RNA, Denaturation and Renaturation of DNA, DNA replication model and Proof for semi conservative model. Properties of DNA and RNA Polymerases.

**Unit II**

Gene expression: Central dogma, Transcription, Post Transcription modifications. Translation- Mechanism of chain Initiation, Elongation and Post Translation modifications.

**Unit III**

Gene Organisation in Prokaryotes and Eukaryotes, Operon concept, Gene regulation in prokaryotes ( lac-operon) and eukaryotes (Co-operative and on-off regulation), types- inducible, repressible.

**Unit IV**

**Genetic Engineering:** Restriction endonucleases, Prokaryotic and eukaryotic cloning vectors, genomic and c-DNA libraries – Gene cloning strategies – Screening of recombinants – expression of cloned genes.

**Unit V**

Methods of Gene transfer – *Agrobacterium* mediated, Micro injection, Electroporation, Biolistics and Shot gun. Brief account of Nucleic acid hybridization – Southern, Northern and Western blotting. Applications of PCR, RFLP and RAPD, DNA Finger Printing and Gene Amplification.

**No Practical for this paper.**

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1. Alberts, B., Bray, D., Lewis, J., Raff, M., Roberts, K. and Watson, I.D(2002). Molecular Biology of Cell. Garland Publishing Co., Inc., New York., USA.
2. Atherlay, A. G., Girton , J.R. and McDonald, J.F(1999). The Science of Genetics,. Saunders College Publishing. Fort Worth, USA.
3. Freifelder, D (1998). Essentials of Molecular Biology- 3<sup>rd</sup> edition Narosa Publications House. New Delhi
4. Gupta, P.K (1999). A text Book of Cell And Molecular Biology. Rastogi Publications. Meerut, India.
5. V.L. Chopra and Anwar Nasim (1990). (4<sup>th</sup> Ed.). Genetic engineering and Biotechnology. Concepts, Methods and Application.
6. Rastogi, S.C. (2010). Cell and Molecular biology, Rastogi publications, Meerut, India.

**SBEC III HORTICULTURE AND NURSERY TECHNOLOGY**

Semester V  
Course code U14BYPS3

SBEC III

**Unit I**

Introduction – Scope and division of Horticulture. Types of Gardens – Indoor gardens, public garden, kitchen garden. Garden implements and accessories. Factors influencing gardening, climate.

**Unit II**

Nursery structures, nursery beds, mist chamber, green house and shade house. Establishment of seedlings.

**Unit III**

Methods of propagation. Cutting, layering, Grafting, Budding, budding, pruning

**Unit IV**

Topiary, Hydroponics, Bonsai and lawn.

**Unit V**

Composting, Vermicomposting, Hormones application, pest and disease Management

- Ficadorium
- Bambusetum
- Herbal garden
- Rockery
- Bonsai
- Topiary
- Lawn making, establishment of seedlings

**Field Visit** – Nursery and rose and Jasmine Cultivation (submission of Field report)

**Reference**

1. Kumar, N. 1990. **Introduction to Horticulture**. Rohini Agencies, Nagarcoil
2. Prasad, 2005. **Principles of Horticulture**. International book distributors.
3. Edmund, J.B., Senn, T.L., Andrews, F.S. and Halforce, R.G. 1990. **Fundamental of Horticulture**. Tata McGraw Hill, London.

**GENERAL GEOLOGY, ECOLOGY AND PHYTOGEOGRAPHY.**

Semester VI CORE PAPER VII  
 Course Code U14BY607

**THEORY****Unit I : GEOLOGY**

Scope, subdivisions and importance of Geology, Solar system, origin and age of earth. Land distribution (Continental drift), Interior of the earth. Soil, soil erosion and soil types of India. Elementary knowledge of ground water and surface water systems.

**Unit II : ECOLOGY**

Scope and importance of ecology. Approaches to the study of ecology – autecology and synecology, Plant Environmental factors- Climatic, Edaphic, Biotic and Topographic factors.

**Unit III**

Development of vegetation – Migration, ecesis and colonization. Methods of studying vegetation – quadrat and transect. Determination of Density, Frequency, Abundance and Verification of Raunkier's Law - Plant succession, Hydrosere and Xerosere.

**Unit IV**

Ecological classification of plants – Morphological and anatomical features of plants and their correlation to their respective habitats – Hydrophytes, Xerophytes, Mesophytes, Epiphytes and Halophytes.

**Unit V : PHYTOGEOGRAPHY**

Definition and importance, Types of distribution of plants(continuous and discontinuous) climate of India and its climatic zones. Forest types of India. Vegetational types of Tamilnadu – Evergreen, deciduous, scrub and mangrove.

**PRACTICAL**

Morphology and anatomy of Hydrophytes and Xerophytes. Study of vegetation- quadrat and line transect methods. Estimation of density, abundance, frequency and dominance. Determination of water and soil pH. Capillarity and Retentivity of soil. Study of Ecosystems -Pond, Grassland , Agricultural land and Scrub vegetation.

**REFERENCES**

1. Ambasht, R.S. (1974). Text Book of Plant Ecology (3<sup>rd</sup> Edition) Students & Friends Co., Varanasi.
2. Odum, E.P. (1975). Ecology Holt, Rinert & Winston.
3. Kochhar, P.L (1975). Plant Ecology (9<sup>th</sup> Edition) S.Nagi & Co, Jullandhar.
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**PHYTOGEOGRAPHY**

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2. Mani, M.S. (1974). Ecology & Biogeography of India. Dr. W. Junk Publishers, The Haque.
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**GENERAL GEOLOGY**

1. Krishnan, M.S. (1968). Geology of India and Burma. Higginbothams, Madras.
2. Mukarjee, P. K.(1996). Text Book of Geology. The World Press Pvt. Ltd., College Street, Calcutta.
3. Ramachandra Rao(1976). Out line of Geological Prospecting. Prasavanga University of Mysore.

**PLANT BREEDING, PLANT PATHOLOGY, PLANT PROTECTION AND  
ORGANIC FARMING**

Semester VI  
Course Code U14BY608

CORE PAPER VIII

**THEORY**

**Unit I : PLANT BREEDING**

Basic principles of selection methods – Mass and Pure and Clonal methods. Selfing and crossing. Induction of mutation - types and effects. Polyploidy in breeding and crop improvement.

**Unit II**

Heterosis - causes and effects. Anther and Embryo culture, Breeding for disease and drought resistance. Plant breeding achievements in India with reference to Rice, Wheat and Sugarcane.

**Unit III : PLANT PATHOLOGY**

A brief study of the following plant diseases- their causal organisms, entry of pathogen, disease development, symptoms, prevention and control measures. Little leaf of Brinjal, TMV, Citrus Canker, Red rot of Sugarcane.

**Unit IV : PLANT PROTECTION**

Methods of plant protection - prevention, control and eradication. Methods of control- cultural practices and Quarantine methods. Methods of application of fungicides and pesticides. Integrated Pest Management, Seed Protection and Soil treatment.

**Unit V : ORGANIC FARMING**

Concept and importance. Bio-fertilizers, Mycorrhiza - Symbiotic, nonsymbiotic. Green manure, composting, vermicomposting and Bio-pesticides.

**PRACTICAL**

**PLANT PROPAGATION**

Different types of cutting, layering, grafting and budding. Treatment of cuttings with hormones for induction of rooting. Nursery bed preparation. Simple hybridization techniques.

**Organic Farming:** composting, vermicomposting and Bio-pesticides.

## REFERENCES

### Plant breeding

1. Allard, (1960). Principles of Plant breeding. John Wiley Publications, N.Y
2. Baudai, M.M. (1974). Practical Plant Breeding. Oxford IBH Publications, New Delhi
3. Chaudhary, R.C.(1991). Introduction to Plant Breeding. Oxford IBH Publishing Ltd., New Delhi
4. Agarwal, R.I. (1998). Fundamentals of Plant Breeding and Hybrid Seed Production. Oxford IBH Publications, New Delhi.
5. Chopra, V.I. (1998). Plant breeding – Theory & Practices (2<sup>nd</sup> Edn.) Oxford IBH Publishing Co., (P) Ltd., New Delhi 416pp
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8. Sandhu, M.K. (1989). Plant Propagation Wiley Easter Ltd., New Delhi
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### HORTICULTURE

1. Edmond Musser and Andres (1974).Fundamentals of Horticulture. McGraw Hill Book Co., Gardener. Basic Horticulture. Mac Millan N.Y
2. Naik(1963). South Indian Fruits and their culture. Varadhachary and Co., Madras
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4. Sundararajan, J.S., Muthuswamy, J., Shanmugavelu, K.G. and Balakrishnan, R. A Guide to Horticulture. Thiruvankadam Printers, Coimbatore.

### PLANT PROTECTION

1. Chatterjee, P.B (1997). Plant Protection Techniques. Bharathi Bhawan, Patna, India.
2. Chattopadhyay, S.B(1989). Principles and Procedures of Plant Protection (3<sup>rd</sup> Ed.),. Oxford and IBH Publishing Co. (P) Ltd., New Delhi.
3. Joshi, N.C(1992). Plant Protection in India. Allied Publishers Ltd., New Delhi.

**GENERAL MICROBIOLOGY**

Semester VI  
Course Code U14BY609

CORE PAPER IX

**THEORY****Unit I : INTRODUCTION**

Historical outline of Microbiology, Scope, Characterization and Classification of Microorganisms. Morphology, Cell Structure, Growth, Nutrition, Reproduction and Economic Importance of Bacteria, Virus, Yeast and Cyanobacteria.

**Unit II : METHODS IN MICROBIOLOGY**

Basic Principles of microscopy- Light and Fluorescence microscopes, TEM and SEM. Micrometry, Staining, Sterilization methods, Culture media and Pure culture methods.

**Unit III : FOOD AND DAIRY MICROBIOLOGY**

Microorganisms in milk, preservation of milk, pasteurization, sterilization, and dehydration. Bacteriological standard and grading of milk (Methylene Blue reduction test). Dairy Products – Fermented milk, Curd, butter, Ghee and Cheese. A brief account of food spoilage, food poisoning and food preservation.

**Unit IV : MEDICAL MICROBIOLOGY**

A brief study of the following

*Salmonella typhi*, *Vibrio cholerae*, Hepatitis B, Rhinovirus, Mycosis-superficial. *Entamoeba histolytica*, *Plasmodium malariae*

**Unit V : ENVIRONMENTAL MICROBIOLOGY**

Role of microorganisms in biogeochemical cycle- Nitrogen and Carbon. Biofertilizers- identification, isolation, mass culture and commercial production of *Rhizobium*, *Azospirillum* and Mycorrhiza. Biodegradation and Recycling of Solid wastes and Bioleaching.

**PRACTICAL**

Measurement of Microorganisms using Micrometer. Isolation of Microorganisms from Soil, Food, Vegetables, Air and plants. Gram staining of bacteria. Antibiotic assay. Culture Methods. General Instruments.

**REFERENCES**

- Schlegel, H.G.(1986). General Microbiology (2<sup>nd</sup> Edn.) Prentice Hall of India(P) Ltd., NewDelhi.
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- Agrios George. N (2005). Plant Pathology. 5<sup>th</sup> Ed.Burigton, cima publishing.
- Pandey. B.P. (2010). Plant pathology and Plant diseases. New Delhi, Schand.
- Mehrota, R.S. (1991). Plant pathology, New York MC graw Hill.

**BIOTECHNOLOGY**

Semester  
Course Code

VI  
U14BY6:1

ELECTIVE III

**THEORY****Unit I**

**Introduction:** Definition, Scope and importance of Biotechnology, Isolation, Sequencing and Synthesis of Genes. Nano technology – Definition, Scope, Principals and application.

**Unit II**

**Agricultural Biotechnology:** Laboratory requirements of plant tissue culture, preparation of culture media and methods of culturing plant tissues- Micropropagation, somatic embryogenesis and somoclonal variations. Protoplast isolation and fusion. GM foods.

**Unit III**

**Immune Biotechnology :** Basic knowledge on body's defence mechanism – Antigen antibody reaction. Monoclonal antibodies. Production of Insulin, penicillin, Anti rabies vaccine. ELISA for disease detection.

**Unit IV**

**Industrial and Environmental Biotechnology:** Microorganisms used in Industrial Processes- production of Lactic acid and Alcohol. Immobilized enzymes. Liquid waste treatment – Domestic and Industrial effluent. Biogas production.

**Unit V**

**Biotechnology and Intellectual property:** Intellectual property Rights (IPR) - Patents, Trade Secrets, Copyrights and Trademarks. Plant Genetic Resources. GATT, WTO and TRIPs. Patenting of Biological materials. Human cloning and their ethical issues.

**No Practical for this paper**

**REFERENCES**

1. Chawla, H.S. (2000). **Introduction to plant Biotechnology**. Oxford IBH Publishing co., New Delhi.
2. Dubey, R.C. (1999) **A text book of Biotechnology**. S. Chand and Co., New Delhi.
3. Gupta P.K. (1996). **A Text book of cell and molecular biology**. Rastogi and Co., Meerut, India.
4. Kalyan Kumar, De. (1992). **Plant tissue culture**. New Central Book Agency (P) Ltd., Calcutta
5. Kumar, H.D. (1990). **Biotechnology in Agriculture**. Vikas Publishing House., (P) ltd.,
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7. Ramawat, K.G. (2000). **Plant Biotechnology**. S. Chand & Co., New Delhi.



**ALLIED BOTANY – PAPER I**

Semester I  
Course Code U08BYY11

ALLIED BOTANY I

**Unit I**

**Plant Diversity:** Structure, reproduction and life cycle of *Chlamydomonos*, *Penicillium*, *Riccia*, *Lycopodium* and *Cycas*.

**Unit II**

**Morphology:** Leaf shape, Phyllotaxy, inflorescence – Recemose, Cymose and Special types, Terminologies in flower description.

**Unit III**

**Taxonomy:** Nomenclature (Binomial), Systems of Classification (Bentham and Hooker), Study of following families – Annonaceae, Cucurbitaceae, Apocynaceae, Lamiaceae, Euphorbiaceae and Poaceae.

**Unit IV**

**Anatomy:** Tissue (Meristematic and Permanent), primary structure of Dicot and Monocot Leaf, Stem and Root. Normal secondary growth in dicot stem and root.

**Unit V**

**Embryology:** Structure of Flower, Structure of Anther, Microsporogenesis, Types of Pollination, Fertilization and development of Dicot Embryo.

**ALLIED BOTANY – PAPER II**

Semester II  
Course Code U08BYY22

ALLIED BOTANY II

**Unit I**

**Plant Propagation:** Cutting, layering, Grafting, Budding, Micropropagation, induction of rooting and Flowering.

**Unit II**

**Plant pathology:** Detailed study of the following plant diseases, symptoms, causal agents and control measures of white rust, citrus canker and tobacco Mosaic disease.

**Plant protection:** prevention, control and Eradication, plant Quarantine, Biological control, pesticide (Malathion), Fungicide (Bordeaux mixture) and the methods of application.

**Unit III**

**Ecology:** Climatic, Edaphic and Biotic factors, plant Adaptations – Xerophytes (Opuntia), Hydrophytes (Eichornia), and Halophytes (Rhizophora). Vegetational types of Tamilnadu.

**Unit IV**

**Plant physiology:** Absorption of water and salts. Role of mineral elements. Nitrogen cycle. Transpiration.

**Unit V**

Photosynthesis, Light and Dark Reactions – C<sub>3</sub> and C<sub>4</sub> Cycles, Respiration – aerobic, anaerobic, Krebs cycle and oxidative phosphorylation.

## Practical

### Plant bio-diversity

1. **Algae**- Chlamydomonos
2. **Fungi** - Penecillium
3. **Bryophyte** - Riccia – habit, thallus and Capsule.
4. **Pteridophyte** - Lycopodium – habit, stem ,
5. **Gymnosperm**  
Cycas – corolloid root – entire, Cycas – corolloid root - t. s.,  
Cycas – rachis – t. s., Cycas – microsporophyll, Microsporophyll – t. s.,  
Cycas – mega sporophyll
6. **Taxonomy**  
Annonaceae – *Polyalthia longifollia*  
Cucurbitaceae – *Coccinia indica*  
Apocyanacea – *Vinca rosea*  
Lamiaceae – *Leucas aspera*  
Euphorbiaceae – *Euphorbia heterophylla*  
Poaceae – *Chloris barbata*
7. **Anatomy**  
T. s of monocot root  
T. s of monocot stem  
T. s of dicot stem  
T. s of dicot leaf  
T. s of monocot leaf
8. **Embryology**  
T. s of mature anther  
ovule l. s  
fertilization  
globular – embryo  
cordata embryo
9. **Economic botany**
10. **Plant propagation**  
Air layering, Wedge grafting, Cleft grafting
11. **Plant protection**  
Knapsac spraying, Cyanomag foot pump duster
12. **Plant pathology**  
White rust diseases, Citrus canker, Tobacco mosaic diseases

### REFERENCES

1. Chattopadhyya, S.B (1991). **Principales and Procedures of Plant protection** (3<sup>rd</sup> E.d., ) Oxford and IBH Publishing Cossec2 (P) Ltd., New Delhi.
2. Edmond Musser and Andres (1957). **Fundamentals of Horticulture**. McGraw Hill Book Co.,
3. Fuller, H.J. and Tippto, O (1967). **College Botany**. Henry Holt and Co.
4. Gangully, A.K(1971). **General Botany**. The New Book Stall Calcutta. Vol I & II.
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