5. Darnel J, Lodish, Hand Baltimore D, 1991. Cell and molecular biology. Lea and Fibiger, Washington.
6. De Robertis E D P, Robertis E M P, 1991. Cell and molecular biology. Scientific American books.
7. Dobzhansky B, 1961. Genetics and origin of species. Columbia University Press, New York.
8. Gardner E J, Snustad D P, 1984. Principles of Genetics. John wiley, NewYork.
9. Gerald Karp, 2006. Cell Biology. McGraw Hill company.
10. Gupta P K. Genetics. Rastogi Publications.
11. Lewin B, 1999. Genes. Oxford University Press, NewYork.
12. Lewis W H, 1980. Polyploidy. Plenum Press, NewYork.
13. Roy S C, Kalayan Kumar De, 1997. Cell biology. New central Boos, Calcutta.
14. Sandhya Mitra, 1998. Elements of Molecular biology. Macmillan, India Ltd.
15. Sharma A K, Sharma A, 1980. Chromosome technique: Theory and practice. Aditya Books, NewYork.
16. Veer Bala Rastogi, 2008. Fundamentals of Molecular Biology. Ane Books Pvt. Ltd.
17. Wayne M Becker, Lewis J Kleinsmith, Jeff Hardin, 2004. The World of Cell. Pearson Education.
18. Waseem Ahammede (faridi), 2013. Genetics and Genomics. Pearson.

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Core course 11 Code: BO6CRT11

ANGIOSPERM MORPHOLOGY, TAXONOMY AND ECONOMIC BOTANY

(Theory 72 hrs; Practical 45 hrs; Credits 3 + 1)

Objectives:

- Acquaint with the aims, objectives and significance of taxonomy.
- Identify the common species of plants growing in Kerala and their systematic position.
- Develop inductive and deductive reasoning ability.
- Acquaint with the basic technique in the preparation of herbarium.
- Familiarizing with the plants having immense economic importance.

ANGIOSPERM MORPHOLOGY

Module 1: Leaf, Inflorescence and Fruit morphology (13 hrs)

Leaf Morphology: types, venation, phyllotaxy. Morphology of flower: flower as modified shoot; detailed structure of flowers - floral parts - their arrangement, relative position - symmetry, aestivation and placentation types - cohesion and adhesion. Floral diagram and floral formula. Inflorescence: racemose types - simple raceme, corymb, umbel, spike, spadix, head and catkin; cymose types - simple cyme; monochasial - scorpoid and helicoid, dichasial and polychasial; special type - cyathium, hypanthodium, verticillaster, thyrsus and panicle. Fruits: simple - fleshy, dry - dehiscent, schizocarpic, indehiscent, aggregate, multiple (sorosis and syconus).

TAXONOMY

Module 2: Principles of Plant systematics (12 hrs)

Aim, scope, significance and components of taxonomy. Types of classification - artificial (brief account), natural – Bentham and Hooker (Detailed account) and Phylogenetic (Brief account). Angiosperm phylogeny group system (introduction only). Plant nomenclature - binomial, ICBN/ICN principles - rule of priority and author citation. Interdiciplinary approach in taxonomy -

Cytotaxonomy and Chemotaxonomy. Herbarium technique – importance of herbarium; preparation of herbarium and their preservation. Important herbaria in India, BSI.

Module 3: Detailed study of families (30 hrs)

Study the following families of Bentham and Hooker's System with special reference to their vegetative and floral characters; special attention should be given to common and economically important plants within the families: Annonaceae, Nymphaeaceae, Malvaceae, Rutaceae, Anacardiaceae, Leguminosae (Mimosaceae, Caesalpiniaceae and Fabaceae), Combretaceae, Myrtaceae, Cucurbitaceae, Umbelliferae (Apiaceae), Rubiaceae, Compositae (Asteraceae), Sapotaceae, Apocynaceae, Asclepiadaceae, Solanaceae, Convolvulaceae, Scrophulariaceae, Acanthaceae, Verbenaceae, Labiatae (Lamiaceae), Amaranthaceae, Euphorbiaceae, Orchidaceae, Palmae (Arecaceae), Graminae (Poaceae).

ECONOMIC BOTANY AND ETHNOBOTANY (Theory 9 hrs; Practical 9 hrs)

Module 4: Economic botany (12 hrs)

Study the following groups of plants with special reference to the botanical name, family and morphology of the useful part and uses: Cereals - Rice, Wheat; Millets Ragi; Pulses - Green gram, Bengal gram, Black gram; Sugar yielding plants – Sugarcane; Fruits - Apple, Pineapple, Orange, Mango and Banana; Vegetables - Bittergourd, Ladies finger, Carrot and Cabbage; Tuber crops - Tapioca; Beverages - Tea, Coffee; Oil yielding plants - Ground nut, Coconut, Gingelly; Spices – Cardamom, Pepper, Cloves, Ginger; Timber yielding plants - Teak wood and Rose wood; Fibre yielding plants - Coir, Jute, Cotton; Rubber yielding plants - Para rubber; Gums and Resins - White damer, Gum Arabic, Asafoetida; Insecticide yielding Plants - Tobacco and Neem.

Module 5: Ethnobotany (5 hrs)

Introduction, scope and significance of ethnobotany. Study of the following plants used in daily life by tribals and village folks for food, shelter and medicine: Food - *Artocarpus heterophylla*, *Corypha*; Shelter - *Bambusa*, *Ochlandra* and *Calamus*; Medicine – *Curcuma longa*, *Trichopus zeylanicus* and *Alpinia galanga.*

PRACTICAL (45 hrs)

1. Identify the following inflorescence and fruits with reference to their morphological specialities: (a) Inflorescence - simple raceme, spike, corymb, head, simple cyme, cyathium and hypanthodium. (b) Fruits - simple - (fleshy) - berry drupe, pepo, hespiridium. Dry indehiscent - nut. Dry dehiscent - legume, capsule (loculicidal). Aggregate.
2. Preparation of floral formula and floral diagram from floral description (of families studied).
3. Identify the families mentioned in the syllabus by noting their vegetative and floral characters.
4. Students must describe the floral parts, draw the L.S., floral diagram and write the floral formula of at least one flower from each family.
5. Prepare herbarium of 25 plants with field notes.
6. Conduct field work for a period of not less than 5 days under the guidance of a teacher and submit field report.
7. Study the finished products of plants mentioned in the syllabus of economic botany with special reference to the morphology of the useful part, botanical name and family.
8. Identify and describe the ethnobotanical uses of the items mentioned in the syllabus.

REFERENCES

1. Ashok Bendra and Ashok Kumar, 1980. Economic botany, Rastogi publications, Meerut.
2. Cornquist A, 1968. The evolution and Classification of Flowering Plants.

3. Davis P H and Heywood V H, 1967. Principles of Angiosperm Taxonomy. Oliver and Boyl, Edinburgh.
4. Eames A J, 1961. Morphology of Angiosperms. Mc Graw Hill, New York.
5. Foaster A S, Giffad E M, 1962. Comparative morphology of vascular plants. Allied Pacific Pvt. Ltd. Bombay.
6. Henry and Chandra Bose, 2001. An aid to the International Code of Botanical Nomenclature. Botanical Survey of India, Coimbatore.
7. Heywood V H, 1967. Plant Taxonomy. Edward Arnold, London.
8. Hill A F, 1982. Economic Botany. Mc Graw Hill, New York.
9. Jain S K, 1981. Glimpses of Indian Ethnobotany. Oxford and IBH, New Delhi.
10. Jain S K, 1987. A Manual of Ethnobotany. Scientific Publishers, Jodhpur.
11. Jain S K, Rao R R, 1976. A hand book of field and herbarium technique. Today and tomorrow's Publishers, New Delhi.
12. Jeffery C, 1968. An Introduction to Plant Taxonomy. J and A Churchill, London.
13. Lawrence G H M, 1951. Taxonomy of Vascular Plants. Macmillan, New York.
14. Maheshwari P and Umaro Singh, 1965. Dictionary of Economic Plants in India. ICAR, New Delhi.
15. Naik V N, 1984. Taxonomy of angiosperms. Tata Mc Graw- Hill Publishing Company, New Delhi.
16. Pandey S N, Misra S P, 2008. Taxonomy of Angiosperms. Ane Books India, New Delhi.
17. Rendle A B, 1979. Classification of flowering plants, Vols. I & II. Vikas Publishing House, U.P.
18. Sambamurthy A, 2005. Taxonomy of Angiosperms. i.K. International Pvt. Ltd, New Delhi.
19. Sharma O P, 1996. Plant Taxonomy. Tata McGraw Hill, New Delhi.
20. Sreemali J L, 1979. Economic Botany. Kitab Mahal, Allahabad.
21. Singh V and Jain D K, 1989. Taxonomy of Angiosperms. Rastogi Publication, Meerut.
22. Swain T, 1963. Chemical Plant Taxonomy. Academic Press, New York.
23. Sivarajan V V, 1991. Introduction to the Principles of Plant taxonomy. Oxford IBH Publishing Co. Pvt. Ltd., New Delhi.

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Core course 12 Code: BO6CRT12
BIOTECHNOLOGY AND BIOINFORMATICS
(Theory 54 hrs; Practical 36 hrs; Credits 3 + 1)

Objectives:

- Understand the current developments in the field of Biotechnology and Bioinformatics.
- Equip the students to carry out plant tissue culture.
- Introduce the vast repositories of biological data knowledge.
- Equip to access and analyze the data available in the databases.

BIOTECHNOLOGY (36 hrs)

Module 1: Plant tissue culture (6 hrs)

Biotechnology - an overview; plant tissue culture - basic concepts, totipotency, differentiation, de-differentiation and re-differentiation. Tissue culture media: components, role of plant growth regulators in tissue culture. Preparation of MS medium; sterilization of equipments, glassware and culture medium, surface sterilization of explants.