

UG- Semester-III
BOTUG-301C ANGIOSPERM TAXONOMY
(Credits:Theory-3, Practical-2)
THEORY Lectures:48

Unit-1:

Lecture- 08

- Aim and objectives of plant taxonomy, history and concept of different classificatory system with particular reference to Bentham and Hooker and Takhtajans system of classification, brief idea on phenetic, phyletic, cladistics and APG.

Unit-2:

Lecture- 08

- Principles and rules of binomial nomenclature, ICN rules and recommendations, type concept and its applications, rules of priority and its limitations, valid and effective publication; concept of species, genus and family.

Unit-3:

Lecture-08

- Botanical survey of India, Organization, publication and activities, herbaria collection, Preservation, documentation, filing system; Botanical gardens-types its role in biodiversity conservation, teaching and research.

Unit-4:

Lecture-08

- Taxonomy and computer, changing trends in taxonomy- role of anatomy, palynology, cytology, phytochemistry, numerical taxonomy, and molecular taxonomy in plant classification; biosystematics

Unit-5:

Lecture: 08

- Affinity, phylogeny, economic importance, comparative studies of the following families- Magnoliaceae, Fabaceae, Caesalpiniaceae, Mimosaceae, Rubiaceae, Solanaceae, Cucurbitaceae, Lamiaceae,

Unit-6:

Lecture: 08

- Affinity, phylogeny, economic importance, comparative studies of the following families- Acanthaceae, Asteraceae, Amaranthaceae, Arecaceae, Poaceae, Musaceae, Zingiberaceae, Orchidaceae.

Suggested Readings:

- George, H.M. Lawrence(2012), Taxonomy of Vascular Plants.
- Mitra.J.N., Mitra. D., Chowdhuri, S.K (2018). Studies in Botany(Vol. one) Moulik Library 18-B
- Singh Gurucharan (2010) Plant Systematics - Theory & Practice.
- Vasistha, P.C., Taxonomy of Angiosperms.

BOTUG-302C CELL AND MOLECULAR BIOLOGY

(Credits:Theory-3, Practical-2)

THEORY Lectures:48

Unit-1 : Introduction to cell biology

Lecture-08

- Introduction to cell, cellular organelles (structure & function) –Nucleus, Chloroplast, Mitochondria, Endoplasmic Reticulum, Golgi Apparatus, Peroxisomes, Cilia and & Flagella.

Unit-2: Membrane structure and function:

Lecture-06

- Membrane structure, physiology, membrane pump and membrane trafficking.

Unit-3:Cell Signaling:

Lecture-06

- Secondary messenger, signaling mechanism, signal transductions, signal protein.

Unit-4:Chromosome & Cell cycle:

Lecture-10

- Structure and organization of chromosome, special types of chromosome and their significance, cell cycle (special emphasis on cell reproduction), cell proliferation

Unit-5: Structure and function of nucleic acid and protein:

Lecture -10

- Structure and function of DNA, RNA and protein, DNA replication, transcription and translation, genetic code & its properties, regulation of gene expression in prokaryotes (Lac Operon concept).

Unit-6: Mutation:

Lecture-08

- Definition and concept of mutation, mutagens, mechanism of action of physical & chemical mutagens, deletion, insertion, translocation, substitution mutation, chemical mutagenesis (tautomerization, alkylation, deamination, base analogues).

Suggested Readings:

- Gupta P.K. Cell and Molecular Biology (2017) Fifth edition - Rastogi Publications.
- Singh S P & B.S. Tomar (2015) Cell Biology –,Rastogi Publications
- David Freielder (2007), *Molecular Biology*-, Narosa Publishing House.
- David Freielder (2009) *Microbial genetics*- Narosa Publishing House.
- Power CB (2010). Cell Biology – Himalay Publishing House

BOTUG-303C REPRODUCTIVE BIOLOGY & EVOLUTION

(Credits: Theory-3, Practical-2)

THEORY Lectures: 48

Unit-1: Introduction

Lecture-08

- Structure of anther and pollen- microsporogenesis and development of male gametophyte, pollen morphology and NPC system.
- Structure and types of ovules, megasporogenesis and development of female gametophyte, Types of embryo sacs, organization and ultrastructure of mature embryo sac.

Unit-2: Pollination and Fertilization

Lecture-08

- Pollination - Types, mechanisms and adaptations, double fertilization.

Unit-3: Post fertilisation events:**Lecture-08**

- Endosperm - Types, structure and functions.
- Development of dicot and monocot embryo.

Unit-4: Apomixis and Polyembryony**Lecture-08**

- Definition, types and practical applications.

Unit-5: Evolution**Lecture-08**

- Evidences, theories and mechanism of evolution, origin of new species
- Population , gene frequencies; gene pool; genetic drift; The Hardy- Weinberg Law, changes in gene frequencies in populations.
- Micro and macroevolution

Unit- 6 Variation, speciation and polymorphism**Lecture-08**

- Variations: Causes and consequences of variations and polymorphism.
- Isolation mechanism and speciation,

Suggested Readings:**Embryology of Angiosperm :**

- Singh, V.,Pande, P. C. and Jain, D. K., (1997). Embryology of Angiosperms, Rastogi Publications, Meerut.
- Ganguly, A. K. and Kumar, N.C., (2008). Developmental and Experimental Embryology of Angiosperms. Emkay Publications, Delhi.
- Bhojwani, S. S. and Bhatnagar, S. P., (2009). The Embryology of Angiosperms, Vikas Publishing House Pvt. Ltd., New Delhi.
- Maheswari P, (1971). An Introduction to the Embryology of Angiosperms. Tata McGraw Hill Publishing Co., Ltd., New Delhi.
- Pandey, B. P., (1995). Embryology of Angiosperms. S Chand & Co. New Delhi.

Evolution:

- Stewart W.N. and Rothwell G.W. (2005). Paleobotany and the Evolution of Plants. 2nd Edn. Cambridge University Press.
- Verma P.S and Agarwal V.K. (2006) Cell Biology, Genetics, Molecular Biology, Evolution, Ecology. S.Chand and Company, New Delhi.

BOTUG-304C Practical :**(Credits -6)****A. ANGIOSPERM TAXONOMY****Credit-2****B. CELL AND MOLECULAR BIOLOGY****Credit-2****C. REPRODUCTIVE BIOLOGY****Credit-2****A. ANGIOSPERM TAXONOMY****Credit: 2**

- Description and identification (upto genus) of specimens from members of locally available dicotyledonous and monocotyledonous families included in the theory syllabus.
- Preparation of herbarium of common angiospermic plants (at least ten) and must be submitted in the examination.
- Field study to get an idea about the flora and to prepare field report to be submitted in the examination.

B. CELL AND MOLECULAR BIOLOGY

Credit: 2

- To study the effect of chemical mutagen on chromosome behaviour in plants.
- Preparation of standard curve for protein
- Extraction and estimation of total nuclear DNA content in plant material.
- Separation of protein from plant materials by SDS-PAGE.

C. REPRODUCTIVE BIOLOGY

- Structure of anther (young and mature), tapetum (amoeboid and secretory) (permanent slides/photographs/specimen).
- Study of pollen grains by acetolysis.
- Types of ovules: anatropous, orthotropous, circinotropous, amphitropous/ campylotropous.
- Female gametophyte: *Polygonum* (monosporic) type of embryo sac development (permanent slides/photographs/specimens).
- Ultrastructure of mature egg apparatus cells.
- Pollination types and seed dispersal mechanisms (including appendages, aril, caruncle) (permanent slides /photographs /specimens).
- Dissection of embryo from developing seeds.

➤ **Practicals should be supported by practical record, field report, slides/specimens/ herbarium**

BOTUG-305GE CYTOGENETICS & PLANT ANATOMY (Credits:Theory-3, Practical-1) THEORY Lectures:48

Cytogenetics :

Lectures-33

Unit-1: Eukaryotic cell:

- Structure and function of cell wall, plasma membrane, structure and function of nucleus, mitochondria and chloroplast, chromosome structure and types.

Unit-2: Inheritance Pattern:

- Mendelian inheritance, cytoplasmic inheritance, allelic and non-allelic interactions, linkage & crossing over and their significance.

Unit-3: Cell division-

- Mitosis and Meiosis and their significance, structure and function of DNA and RNA & replications of DNA, regulation of gene expression in prokaryotic (Lac operon)

Unit-4: Mutation:

- Spontaneous and induced mutation, numerical and structural changes of chromosome, role of polyploidy in evolution of new species

Anatomy

Lectures-15

Unit-5: Tissue and Tissue system

- Tissue organization of root and shoot apices, types of tissues, classification, tissue system

Unit-6 Anatomy and Secondary growth

- Primary and secondary structure of root and stem, anatomy of monocot and dicot leaf, anomalous secondary growth in stem.

Suggested Reading :

Cytogenetics :

- Sharma, A. K. and A. Sharma (1999). Plant Chromosomes: Analysis, Manipulation and Engineering. Harward Academic Publishers, Australia.
- Shukla, R. S. and P. S. Chandel (2007). Cytogenetics, Evolution, Biostatistics and Plant Breeding. S.Chand & Company Ltd., New Delhi.
- Singh, H. R. (2005). Environmental Biology. S. Chand & Company Ltd., New Delhi.
- Snustad, D. P. and M. J. Simmons (2000). Principles of Genetics. John Wiley & Sons, Inc., U S A.
- Verma, P. S. and V. K. Agrawal (2004). Cell Biology, Genetics, Molecular Biology, Evolution and Ecology. S. Chand & Company Ltd., New Delhi

Plant anatomy:

- Roy P (2010) Plant Anatomy, New Central Book Agency.
- Pandey B.P.(2001). Plant Anatomy. S. Chand and Company Ltd., New Delhi.
- Easu, K. (1996). Anatomy of Seed Plants. First wiley Reprint, New Delhi.
- Fahn, A. (1985). Plant anatomy, Pergaon Press, Headington Hill Hall, Oxford.

BOTUG-306GE PRACTICAL: CYTOGENETICS & PLANT ANATOMY (Credits:-1)

Cytogenetics

- Study of various stages of mitosis in plant materials.
- Study of meiosis in plant materials.
- Study of gene interaction
- Study of few polyploid (plants or photographs) plant species.

Anatomy

- T. S of root, stem and leaf.
- Studies of anomalous secondary growth by permanent preparation (differentially stained slides) of the following specimens : *Amaranthus*, *Boerhaavia*, *Mirabilis*, *Dracaena*

➤ **Practicals should be supported by practical record and slides**

BOTUG-307SEC HORTICULTURE AND NURSERY MANAGEMENT

(Credits:Theory-1, Practical-1)

Theory Lectures: 20

Unit-1

Lectures-10

- Horticulture: Definition, history ,development , scope and significance, different branches of horticulture
- Plant propagation – Conventional (sexual and vegetative) –
 - Sexual propagation - seed viability, seed dormancy- types and methods of overcoming seed dormancy
 - Artificial vegetative propagation- types, transplanting techniques,–Irrigation and shade regulation.
- Fertilizers – chemical, organic biofertilizer and vermi-compost,
- Potting and repotting.

Unit–2

Lectures: 10

- Nursery management,
- Gardening –Indoor & Outdoor gardening, Floriculture, Ornamental plants, Medicinal plants.
- Management of Horticultural plants, planting, handling, storing, fumigation, preservation and processing of horticultural produces.
- Marketing Strategies.

Suggested readings:

- Swamy, G. S. K. Auxilia ,J(2017). Fundamentals of Horticulture – ICAR eCourse
- Kumar N (1997). Introduction to Horticulture. Rajalakshmi Publications, 28/5 – 693, Vepamoodu Junction, Nagercoil. Pp: 15.47- 15.50.
- International Labour Organization. (1989). Tree nurseries. An illustrated technical guide and training manual.
- Landis, TD, Tinus RW, McDonald SE and Barnett JP (1994). Nursery Planning, Development and Management. vol. 1.
- Michael Pollan. (2003) Second Nature: A Gardener's Education. Published August 12th by Grove Press.

Practicals:

- Preparation of nursery bed and bed managemet.
- Preparation of potting mixture – Potting and repotting.
- Cutting, layering, grafting and anatomical studies of rooting .
- Effect of PGRs and fertilizers in horticultural plant growth.
- Demonstration of vermicomposting.

➤ **Practicals should be supported by practical record and report on nursery visit**