

BOTANY HONOURS SYLLABUS

Course	Title	<i>Total Credits</i>
B0T-UG-CT-101	Biology of Cryptogams	04
B0T-UG-ET-102	Zoology – I	04
B0T-UG-CC-103	English-I	04
B0T-UG-CT-201	Diversity & development of Seed plants	04
B0T-UG-ET-202	Zoology –II	04
B0T-UG-CC-203	Chemistry-I	04
B0T-UG-CT-301	Systematics of Angiosperms and Phytogeography	04
B0T-UG-ET-302	Zoology-III	04
B0T-UG-CC-303	Chemistry-II	02
B0T-UG-CT-401	Embryology, Economic Botany & Ethnobotany	04
B0T-UG-ET-402	Chemistry-III	04
B0T-UG-CC-403	GFC Environment	04
B0T-UG-CT-501	Microbiology & Plant Pathology	04
B0T-UG-CT-502	Physiology & Ecology	04
B0T-UG-CC-503	Eastern Himalayan Studies	04
B0T-UG-CT-601	Cell Biology, Genetics & Evolution	04
B0T-UG-CT-602	Plant Genetic Resources, Plant Breeding, Biometrics	04
B0T-UG-CT-603	Biochemistry, Molecular Biology and Biotechnology	04

SEMESTER I B0T-UG-CT-101: BIOLOGY OF CRYPTOGRAMS

Unit I: PHYCOLOGY

General characteristics; Outline of Fritsch's classification; Salient features of Cyanophyceae, Chlorophyceae, Bacillariophyceae, Phaeophyceae and Rhodophyceae. Evolution of sex in algae; Economic importance of algae. Important features of life cycles of *Nostoc*, *Oedogonium*, *Chara*, *Ectocarpus* and *Polysiphonia*.

Unit II: MYCOLOGY AND LICHENS

General characteristics; Outline of Gwyne Vaughan's & Ainsworth's classification; Salient features of different classes (Phycomycetes, Ascomycetes, Basidiomycetes and Deuteromycetes); Important features of life cycles of *Phytophthora*, *Puccinia*, *Agaricus* and *Alternaria*; Economic importance of fungi.

Lichens: General account of lichens with reference to economic importance and production.

Unit III: BRYOLOGY AND PTERIDOLOGY

General characteristics; Classification and salient features of different classes;; Evolution of sporophytes; Life cycle of *Marchantia*, *Anthoceros* and *Funaria*.

Pteridophytes: General characteristics; Classification and salient features of different classes; Evolution of stele; Heterospory and seed habit; Life cycles of *Rhynia*, *Lycopodium*, *Equisetum* and *Marsilea*.

Unit IV: PRACTICAL

1. Study of vegetative and reproductive parts with the help of temporary slide preparations of *Oedogonium* and *Ectocarpus*.
2. Study of vegetative and reproductive parts with the help of temporary slide preparations of *Puccinia* and *Agaricus*.
3. Study of vegetative and reproductive parts with the help of permanent slide preparations of *Marchantia* and *Funaria*.
4. Study of vegetative and reproductive parts with the help of permanent slide preparations of *Lycopodium*, *Equisetum*.

Text Books

1. Vashishta, B.R., A.K. Singh and V.P. Singh: *Algae*, (S.C. Chand Co. Pvt. Ltd.)
2. Ganguly, H.C. & Kar, A.K.: *College Botany*, Vol. II, (New Central Book Agency).
3. Alexopoulos, C.J., Mims, C.G. and Blackwell: *Introductory Mycology*, (Wiley Eastern)
4. Agrios, G.M. : *Plant Pathology*, (Academic Press)
5. Vashishta, B.R. (2000) : *Fungi*, (S. Chand & Co), New Delhi.
6. Pelczar, M.J., Chan, P.C.S. and Krieg, N.R.: *Microbiology*, (McGraw Hill)
7. Dubey, R.C. & Maheshwari, D.K.: *A text book of Microbiology*, (S. Chand)
8. Vashishta, B.R.: *Bryophyta* (S.Chand)
9. Ganguly, H.C. & Kar, A.K. (1980): *College Botany*, Vol.II, (Tata McGrawHill, New Delhi)
10. Vashista, P.C. : *Pteridophyta*, (S.C. Chand)

Reference Books

1. Fritsch, F.E. : *Structure and reproduction of Algae*.
2. Smith, G.M.: *Cryptogamic Botany*, Vol. I ,(McGraw Hill).
3. Lee, Robert E. : *Phycology*, (Cambridge University Press)
4. Webster, J.: *Introduction to Fungi*, (Cambridge University Press)
5. Bold, H.C., Alexopoulos, C.G. and Delevoryas, T.: *Morphology of plants and Fungi*, (Harper and Row Publishers)
6. Burnett, J.H. : *Fundamental of Mycology*
7. Mandahar, C.L. : *Introduction to plant viruses*, (S. Chand & Co)
8. Mehrotra, R.S. & Aneja, K.R. : *An Introduction to Mycology*, (New Age International)
9. Atlas, R.M.: *Principles of Microbiology* (McGraw Hill)
10. Schlegel, H.G. : *General Microbiology*, (Cambridge University Press)

SEMESTER -II

BOT-UG-CT-201

DIVERSITY AND DEVELOPMENT OF SEED PLANTS

Unit I: GYMNOSPERMS

Gymnosperms: Classification of gymnosperms, salient features of different classes. Structure, reproduction and life cycles of *Cycas*, *Pinus*, and *Gnetum*; Fossil formation and fossil types; Geological time scale; General account of dominant Jurassic flora.

Unit II: SEED PLANTS AND ANGIOSPERM MORPHOLOGY

Angiosperms Morphology: Leaf: Morphology and phyllotaxy. Flower: Type and structure. Morphology of stamen and carpel; Pollination, Double fertilization; Inflorescence; Types and examples. Fruits and seeds: General concepts, type and dispersal. **Seed Plants**: Characteristics of seed plants with fruits (Angiosperm) and without fruits (Gymnosperms). Angiosperm: Origin and evolution. Some examples of primitive angiosperms

Unit III: PLANT ANATOMY

Tissue system; Meristem, Types and theories, permanent tissue; Structure of Monocot and Dicot stem, root and leaves; root-stem transition; Secondary growth – normal and anomalous.

Unit IV: PRACTICAL

1. Gymnosperms: Morphological identification of megasporophyll and microsporophyll of *Cycas*, male and female cone of *Pinus*. T.S. of *Cycas* leaflet and *Pinus* needle; L.S. of ovule of *Gnetum*(from permanent slides).
2. Morphological study of essential and accessory floral parts: aestivation, placentation, cohesion and adhesion of floral parts.
3. Anatomy: Anatomical studies following double staining method of the following materials: Stem-cucurbit and maize; Root-grass and orchid; Leaf- *Nerium*.

Text Books

1. Ganguly, H.C. & Kar, A.K. : *College Botany*, Vol.II, (New Central Book Agency)
2. Vashishta, P.C. (1990): *Gymnosperm*, (S.C. Chand)
3. Karkar, R.K. and Karkar, R.: *The Gymnosperms*
4. Esau, K.(1990): *Plant Anatomy*, (Wiley Eastern, New Delhi)

5. Ganguly, H.C., Das, K.S. and Dutta, C.T.: *College Botany*, Vol.I, (New Central Book Agency)
6. Naik, V.N.: *Taxonomy of Angiosperms*, (Tata McGraw Hill, New Delhi)
7. Lawrance, G.H.M.: *Taxonomy of Vasclar Plants*,(Oxford & IBH)
8. Eames, A. J. : *Morphology of the Angiosperm*
9. Maheswari, P.(1999): *An Introduction to Embryology of Angiosperms*, (Tata McGraw Hill, New Delhi)
10. Raghavan, V.: *Embryogenesis in Angiosperms: A Developmental and experimental study*.

Reference Books

1. Sporne, K.R.(1961): *The Morphology of Gymnosperms*,(Hutchinson University Library, London)
2. Bhatanagar, S.P. and Moitra, A : *Gymnosperm*, (New Age International)
3. Chamberlain, C.J.: *Gymnosperms: Structure and evolution*, (CBS publishers and distributors)
4. Stewart, W.N. & Rothwell, G.W.: *Paleobotany and evolution of plants*, (Cambridge University Press)
5. Erdtman, G.: *Pollen Morphology and Plant Taxonomy*, (Ielden:E.G. Brill)
6. Nair, P.K.K.: *Pollen Morphology of Angiosperms*, (Scholar Publications)
7. Fahn, A.(1992): *Plant Anatomy*, (Pergamon Press, New York)
8. Jones, S.B. & Luchsinger, A.B: *Plant Systematics*, (McGraw Hill)
9. Jefferey, C.: *An Introduction to Plant Taxonomy*, (Allied Publishers Pvt. Ltd)
10. Radford, A.B. : *Fundamentals of Plant Systematics*, (Harper & Row)

SEMESTER -III

BOT-UG-CT-301

SYSTEMATICS OF ANGIOSPERMS AND PHYTOGEOGRAPHY

Unit I: TAXONOMIC HIERARCHY AND ANGIOSPERM PHYLOGENY

Taxonomic category; taxonomic groups; concepts of species, genus and family. Botanical nomenclature: Principles and rules; ranks and names; type method; principle of priority and its limitations. Major contributions of cytology, phytochemistry, palynology, numerical taxonomy.

Unit II: ANGIOSPERMS SYSTEMATIC

Natural, Artificial and Phylogenetic; Salient feature of Bentham and Hooker's system, Engler and Prantl's system and Cronquist's system. Major contributions of cytology, phytochemistry, palynology, numerical taxonomy. diagnostic features and systematic position of: Ranunculaceae, Malvaceae, Apiaceae, Rubiaceae, Lamiaceae, Euphorbiaceae, Asteraceae, Commelinaceae, Araceae, Poaceae and Orchidaceae.

Unit III: PHYTOGEOGRAPHY

Phytogeographical regions of India. Characteristics of Sunderbans, Eastern and Western Himalayan regions. Endemism and Barriers to plant distribution. GIS and its application.

Unit IV: PRATICAL

1. Systematics of angiosperms: Study of the morphology of locally available plants of the following families included in theoretical syllabus including floral formula, floral diagram and their identification up to genus by following any published keys:

2. Spot Identification upto species, mentioning families of all locally available plants included under the theoretical syllabus.
3. There should be one local and one outside Sikkim botanical excursion.
4. Submission of field reports with digital photographs and description of at least 20 wild angiosperms of Sikkim.

Text Books

1. Ganguly, H.C and Kar, A.K.: *College Botany*, Vol.II, (New Central Book Agency)
2. Naik, V.N.: *Taxonomy of Angiosperms*, (Tata McGraw Hill)
3. Lawrance, G.H.M.: *Taxonomy of Vasclar Plants*, (Oxford & IBH)
4. Jefferey, C.: *An Introduction to Plant Taxonomy*, (Allied Publishers Pvt. Ltd)
5. Radford, A.B. : *Fundamentals of Plant Systematics*, (Harper & Row)
6. Mani, M.S. : *Bio-geography of Indi*, (Springer Verlag)
7. Botkin and Keller : *Environmental Planet*, (John Wiley)

Reference Books

1. Jones, S.B. & Luchsinger, A.B: *Plant Systematics*, (McGraw Hill)
2. Datta, S. C.: *Systematic Botany*, (Wiley Eastern)
3. Mitra, J. N.(1990): *An Introduction to Systematic Botany & Ecology*, (Mont Library, Kolkata)
4. Rendle, A.B.: *Taxonomy*, Vol. I and II., The classification of flowering plants, (Cambridge University Press)
5. Eames, A. J. : *Morphology of the Angiosperm*
6. Verma, P.S. & Agarwal, V.K.: *Concept of Ecology*, (S. Chand and Sons Co.)

SEMESTER –IV

BOT-UG-CT-401

EMBRYOLOGY, ECONOMIC BOTANY, ETHNOBOTANY

Unit I: INTRODUCTION TO EMBRYOLOGY

Flower: Evolution, concept of flower as a modified determinate shoot. Pollen/spore morphology and its role in taxonomy. Microsporogenesis and microgametogenesis and megagametogenesis (monosporic, bisporic and tetrasporic types); pollen-pistil interaction; development, structure and function of endosperm; types of haustoria; embryogeny-different types, function of suspensor and synergid; polyembryony; apomixis.

Unit II: ECONOMIC BOTANY

Plants for man: cereals, pulses, fibres, and oils, spices, condiments, beverages, timber, fruit, aromatic and medicinal plants, ornamental plants (scientific names and families of at least three plants of each category and the parts used); origin of cultivated plants & domestication of crop plants with case studies (millets rice, finger millets, jute, mustard, potato..

Unit III: ETHNOBOTANY

Ethnobotany and its significance in Eastern Himalayass; wild edible plants consumed by the ethnic people of Sikkim Himalayas; folk-medicine of the Sikkim Himalayas. Indian system of medicine (Ayurveda, Unani, Siddha, Homeopathy); Ethnomedicine of Eastern Himalayan communities.

Unit IV: PRACTICAL

1. Dissection of dicot and monocot embryos.

2. Identification of economically important plant products- their binomials, families and morphology of the parts used.
3. Submission of digital photographs with description of 5 wild medicinal plants and 5 wild edible plants of Sikkim Himalayas.
4. Qualitative chemical tests for:
 - a) Tannin (*Camellia sinensis*)
 - b) Alkaloid (*Catharanthus roseus*)

Text Books:

1. Maheswari, P.(1999): *An Introduction to Embryology of Angiosperms*, (Tata McGraw Hill, New Delhi)
2. Bhojwani, S.S. & Bhatnagar, S.D. (1996): *The Embryology of Angiosperms*, (Vikas publishing house)
3. Wallis, T.E.: *Text Book of Pharmacognosy*, (CBS Publishers & Distributors)
4. Ali, M: *Pharmacognosy*
5. Agner, H.H., & Hikino, & Farnsworth, N: *Economic & Medicinal plant research*, Vol.1-3, (Academic Press)
6. Pandey, B.P. (1992). *Economic Botany*. (S. Chand and Sons Co., New Delhi).

Reference Books

1. Verma, (1998). *Text book of Economic Botany*, Embay Publishers, New Delhi.
2. Eames, A. J.: *Morphology of the Angiosperm*
3. Raghavan, V.: *Embryogenesis in Angiosperms: A Developmental and experimental study*.
4. Evans, W.C.: *Trease & Evans' Pharmacognosy*, (saunders)
5. Taylor, V.E., Brady, L.R. and Robbers, J.E.: *Pharmacognosy*, (Ind. Ed. K.M. Vergese Co.)
6. Jain. S.K. (1989). *Method and Approach in Ethnobotany*. Society of Ethnobotany, Lucknow.
7. Pal, D.C. and Jain, S.K. (1998). *Tribal Medicine*, NayaPrakash Publishers, Kolkata.

SEMESTER –V

BOT-UG-CT-501

MICROBIOLOGY AND PLANT PATHOLOGY

Unit I: INTRODUCTION OF MICROORGANISM

History of microbiology; General characteristics of bacteria and viruses. Ultra-structure of bacterial; growth and reproduction. Classification of bacteria. Salient features of Actinomycetes, Mycoplasma and Archibacteria. Viruses: General account of viruses (TMV and T4 phages); replication, lytic and lysogenic cycles.

Unit II: APPLIED MICROBIOLOGY

Application of microorganism in Food, agriculture, industry and medicine. Industrial application of microorganisms: organic acids; alcohol; food processing; milk products; antibiotics; Biopesticides, Phyoremeidation, Industrial production, alcohol, vinegar and streptomycin.

Unit III: PLANT PATHOLOGY

Terms and definitions of plant pathology. Symptoms, causal organisms, disease cycles and control measures of: brown spot, tungro and bacterial blight of rice, loose smut and rust of

wheat; late blight of potato; early blight of potato and blister blight of tea. Host-defense mechanism. Genetic screening for disease resistance in plants. Plant disease management.

Unit IV: PRACTICAL

Preparation of media: Sterilization, inoculation.

1. Isolation and culture of microorganisms from: serial dilution, streaking on agar plates/pour plate method.
2. Enumeration of microbial population by using colony counter
3. Gram staining technique.
4. Isolation of bacteria from natural habitat – root nodules/curd/any other.
5. Histopathological study of important plant diseases.

Text Books

1. Agrios, G.M. : *Plant Pathology*, (Academic Press)
2. Mandahar, C.L. : *Introduction to plant viruses*, (S. Chand & Sons Co)
3. Ganguly, H.C. & Kar, A.K. (1980): *College Botany*, Vol.II, (Tata McGraw Hill, New Delhi)
4. Pelczar, M.J., Chan, P.C.S. and Krieg, N.R. (1993) :*Microbiology*, (Tata McGraw Hill, New Delhi)
5. Stanier, R.Y., Ingrahm, J.L., Wheelis, M.L. & Painter, P.R.: *General Microbiology*, (Macmillan Education Ltd.)
6. Dubey, R.C. & Maheshwari, D.K.: *A text book of Microbiology*, (S. Chand and Sons co)
7. Banerjee, A. & Banerjee, N.: *Introductory Microbiology*

Reference Books

1. Bold, H.C., Alexopoulous, C.G. and Delevoryas, T.: *Morphology of plants and Fungi*, (Harper and Row Publishers)
2. Mehrotra, R.S. & Aneja, K.R.(1980): *An introduction to mycology*, (New Age International)
3. Atlas, R.M.: *Principles of Microbiology*, (McGraw Hill)
4. Schlegel, H.G.: *General Microbiology*, (Cambridge, University Press)
5. Prescott, L.M., Harley, P. and Klein, A.(1933): *General Microbiology*,(ed II) (WCB McGraw Hill, England)
6. Salle, A.J.: *Fundamental principles of Microbiology*, (Tata McGraw Hill)

BOT-UG-CT-502: PHYSIOLOGY AND ECOLOGY

Unit I: INTRODUCTION TO PLANT PHYSIOLOGY

Absorption of water and minerals: Translocation of solutes, ion transport. Transpiration: Mechanism of stomatal transpiration; mineral nutrition, criterion of essentiality of mineral elements; beneficial elements; macro and micro nutrients. Growth regulators: Physiological roles and biosynthesis of auxins, cytokinins, gibberellins, ethylene and abscissic acid; Phytochrome: structure and function; Dormancy.

Unit II: PHOTOSYNTHESIS AND RESPIRATION

Photosynthesis: Dark and light reaction; cyclic and non-cyclic electron transport chain; Mechanism of photosynthesis in C₃, C₄ and CAM plants; Respiration: Glycolysis, Krebs' cycle; ATP synthesis; Photorespiration.

Unit III: ECOLOGY

Definitions: Ecological factors; ecological adaptations; community structure and development (succession). Energy flow in ecosystem; Population ecology: Growth curves and ecotypes.

Unit VI: PRACTICAL

Principle and experiment of:

- a. Measurement of leaf area and determination of rate of transpiration per unit area by weighing method.
- b. Estimation of water absorption by fatty/proteinaceous seeds.
- c. Determination of evolution of oxygen during photosynthesis.
- d. Evolution of carbondioxide during aerobic respiration and measurement of volume.

Ecology:

- a. Determination of minimum area of sampling unit (quadrat) for study of communities.
- b. Study of local flora by quadrat and determination of frequency, density and IVI.

Text Books

1. Shukla, R.S. & Chandal, P.S. : *Plant Ecology*, (S. Chand & Co)
2. Odum, E.P.: *Fundamentals of Ecology*, (Rastogi Pub)
3. Taiz, L. and Zeiger, E. (2002): *Plant Physiology*, (Sunderland: Sinauer Association)
4. Mukherjee, S & Ghosh, A.: *Plant Physiology* (Tata McGraw Hill)
5. Hopkins, W.G.: *Introduction to Plant Physiology*, (John Wiley)
6. Voet, D and Voet, J.G.: *Biochemistry*, (John Wiley)
7. De Robertis, E.D.P. and De Robertis, E.M.M.: *Cell and Molecular Biology*, (Lee & Febrigas)
8. Stickberger, M.W.: *Genetics*, (McMillan)
9. Power, C.B.: *Cell Biology*, (Himalaya Publishing House)
10. Gupta, P.K.: *Genetics*, (Rastogi Publication)

Reference Books

1. Chapman and Riss: *Ecology, Principles and application* (Cambridge University Press)
2. Mani, M.S.: *Bio-geography of Indi*, (Springer Verlag)
3. Verma, P.S. & Agarwal, V.K.: *Concept of Ecology*, (S. Chand and Sons Co.)
4. Salisbury, F.B. and Ross, C: *Plant Physiology* (1974), (CBS Pub & Dist.)
5. Goodwin, T.W. & Mercer, E.I.: *Introduction to Plant Biochemistry*, (Oxford: Pergamom)
6. Buchanan, Gruissen and Jones: *Biochemistry and Molecular Biology of Plants*,
7. Heldt, H.W.: *Plant Biochemistry & Molecular Biology*
8. Nelson, D.L., and Cox, M.N., *Lehninger's, Biochemistry*
9. Klug, W.S & Cummings, M.R.: *Concept of Genetics*, (Prentice Hall Int. Inc)

SEMESTER –VI

BOT-UG-CT-601: CELL BIOLGY, GENETICS AND EVOLUTION

Unit I: INTRODUCTION TO CELL BIOLOGY

Structure of prokaryotic and eukaryotic cells; cell wall, plasma membrane, cell organelles, chromosome organization; chromosomal aberrations (structural and numerical); Outline of mitosis and meiosis. Structure of Nucleic acids: DNA & RNA structure; DNA replication.

Unit II: FUNDAMENTAL GENETICS

Mendelian laws of inheritance; Gene Interaction (Complimentary, supplementary and epistatic gene interactions); Multiple allelism with examples; Linkage & crossing over; Sex determination types; Mutation: types (structural, numerical and point), Induced mutations; Polyploidy; Extranuclear inheritance; Chromosomal structural aberrations in plants.

Unit III: EVOLUTION

Elementary knowledge of theories related to evolution of life ; types of evolution; speciation; population genetics, HW Equilibrium; Genetic drift.

Unit IV: PRACTICAL

1. Study of mitotic stages from squash preparation (root tip of onion);
2. Identification of following meiotic stages from permanent slides: diakinesis, metaphase I, anaphase I, metaphase II and anaphase II.
3. Study of Polytene and Lampbrush chromosomes (permanent slides)
4. Charts on chromosomal aberrations and diseases.

Text Books

1. Shukla, R.S. & Chandal, P.S.: Plant, (S. Chand & Co.)
2. Odum, E.P.: Fundamentals of Ecology, (Rastogi Pub)
3. Taiz, L. and Zeiger, E. (2002): Plant Physiology, (Sunderland and Sinauer Association)
4. Mukherjee, S & Ghosh, A.: Plant Physiology (Tata McGraw Hill)
5. Power, C.B.: Cell Biology, (Himalaya Publishing House)
6. Gupta, P.K.: Genetics, (Rastogi Publication)

Reference Books

1. Buchanan, Gruissen and Jones: Biochemistry and Molecular Biology of Plants.
2. Heldt, H.W.: Plant Biochemistry & Molecular Biology .
3. Nelson, D.L., and Cox. M.N., Lehninger's Biochemistry
4. Klug, W.S. & Cummings, M.R.:Concept of Genetics, (Prentice Hall Int. Inc)
5. Russell, P.J.: Genetics (Benjamin & Cummings)
6. Stickberger, M.W.: Genetics, (MacMillan)
7. Gardner, E.J., Simmons, M.J. & Snustad, D.P: Principle of Genetics, (John Wiley)
8. Lodish, H. et. al.: Molecular Cell Biology (Freeman Publication)
9. Lewin, B.: Gene VIII, (Oxford Univ. Press)

BOT-UG-CT-602

GENETIC RESOURCES, PLANT BREEDING & BIOMETRY

Unit I: PLANT GENETIC RESOURCES

Introduction to genetic resources and categorization; importance of genetic resources/germplasm; centers of origin and diversity; exchange of genetic resources; genetic resources management: collecting, maintenance, evaluation, storage and documentation; Biodiversity conservation: *In situ* and *Ex situ* Conservation.

Unit II: PLANT BREEDING

Importance of plant breeding; Principles of pure line, clonal and mass selection; Hybridization in self and cross pollinated crop-methods; Hybrid vigour, role of induced mutations in crop improvement. Deterioration of crops- reasons and preventive methods.

Unit III: BIOMETRICS

Sampling methods, collection and presentation of data; Measures of central tendency, standard deviation and standard error; co-efficient of variation; probability; test of significance; t-test and chi-square test.

Unit IV: PRACTICAL

1. Emasculation and bagging of flowers (Demonstration).
2. Hybridization
3. Biostatistics: Measurement of central tendency: mean, median, and mode; Measurement of dispersion; standard deviation and standard error; Determination of goodness of fit; Students t-test. Probability.
4. Visit to the nearest Germplasm Centre, Herbal Garden, Biodiversity Park and Botanical gardens

Text Books

1. De Robertis, E.D.P. and De Robertis, E.M.M.: *Cell and Molecular Biology*, (Lee & Febrigas)
2. Power, C.B.: *Cell Biology*, (Himalaya Publishing House)
3. Lodish, H. et. al.: *Molecular Cell Biology*, (Freeman publication)
4. Chawdhri, H.K.: *Elementary Principles of Plant Breeding*, (Oxford and IBH)
5. Allard, R.W.: *Principles of Plant Breeding*, (John Wiley)
6. Sigh, B.D.: *Plant Breeding : Principles and Methods*, (Kalyani Publishers)

Reference Books

1. Klug, W.S & Cummings, M.R.: *Concept of Genetics*, (Prentice Hall Inc)
2. Russell, P.J.: *Genetics* (Benjamin & Cummings)
3. Stickberger, M.W.: *Genetics*, (McMillan)
4. Gardner, E.J., Simmons, M.J. & Snustad, D.P: *Principle of Genetics*, (John Wiley)
5. Gupta, P.K.: *Genetics*, (Rastogi Publication)
6. Lewin, B.: *Gene VIII*, (Oxford Univ. Press)
7. Poehlman, J.M. & Barthakur, D: *Plant Breeding*, (Oxford and IBH)
8. Bailey, N.T.J: *Statistical Methods in Biology*, (Cambridge University Press)
9. Khan, I.A and Khanum, A: *Fundamentals of Biostatistics*.

BOT-UG-CT-603

BIOCHEMISTRY, MOLECULAR BIOLOGY & BIOTECHNOLOGY

Unit I: BIOCHEMISTRY

Molecules of life: Structure, characteristics and classification of carbohydrates, lipids and Proteins. Basic concepts in metabolism of carbohydrates, lipids and proteins (schematic representation only). Enzymes: Characteristic feature of active site, cofactors & co-enzymes, allosteric regulation of enzyme activity. Mechanism of enzyme action.

Unit II: MOLECULAR BIOLOGY

Nucleic Acids: Composition of nucleic acids and synthesis of nucleotides; DNA structure; A, B and Z forms; Central Dogma; DNA replication, transcription and translation (schematic representation only); basic concepts in gene regulation - operon concept.

Unit III: BIOTECHNOLOGY

Role of biotechnology in crop improvement: Applications of Plant tissue culture (Micropropagation, virus free plantlet production, cell and protoplast culture); rDNA technology (transgenics production), Polymerase chain reaction (PCR), and molecular markers in genetic improvement of crop plants.

Unit IV: PRACTICAL

1. Calculation and preparation of different normal and molar solutions.
2. Preparation of buffers; determination of pH.
3. Estimation of soluble protein by Lowry's method.
4. Estimation of amino acids by Ninhydrin method.
5. Chemical tests to demonstrate the presence of starch, sugar, fat and protein in plant material.
6. Separation of amino acids by paper chromatography.
7. Colorimetric estimation of DNA using diphenyl amine.
8. Gel electrophoresis for detection of genomic DNA (demonstration).

Text Books:

1. Voet, D and Voet, J.G.: *Biochemistry*, (John Wiley)
2. Goodwin, T.W. & Mercer, E.I.: *Introduction to Plant Biochemistry*, (Oxford: Pergamon)
3. Buchanan, Gruissen and Jones: *Biochemistry and Molecular Biology of Plants*,
4. De Robertis, E.D.P. and De Robertis, E.M.M.: *Cell and Molecular Biology*, (Lee & Febrigas)
5. Lodish, H. et. al.: *Molecular Cell Biology*, (Freeman publication)
6. Balasubramanian, D. et al: *Concepts in Biotechnology*, (University Press)
7. Dubey, R.C. (1993): *Biotechnology*, (S. Chand and Son, New Delhi)

Reference Books

1. Heldt, H.W.: *Plant Biochemistry & Molecular Biology*
2. Nelson, D.L. and Cox, M.N., *Lehninger's, Biochemistry*
3. Power, C.B.: *Cell Biology*, (Himalaya Publishing House)
4. Lewin, B.: *Gene VIII*, (Oxford Univ. Press)
5. Razdan, M.K.: *An Introduction to Plant Tissue Culture*, (Oxford and IBH)
6. Balasubramanian, D. et al: *Concepts in Biotechnology*, (University Press)
7. Bjojwani, S.S. & Razdan, M.K.: *Plant Tissue Culture: Theory and Practice*, (Elsevier)
8. Dixon, R.A. & Gonzales, M.K.: *Plant Cell Culture: A practical approach*, (Oxford Univ. Press)