B.Sc. Syllabus (2020-21)
Ist Semester

Theory

Course Code	Course Title	Course Credit	Contact Hours	Marks
BOT CC 111	Biodiversity (Microbes, Algae, Fungi and Archegoniate)	4	60	100

Unit 1: Microbes **(10 Lectures)**

Viruses – Discovery, general structure, replication (general account), DNA virus (T-phage); Lytic and lysogenic cycle, RNA virus (TMV); Economic importance; Bacteria – Discovery, General characteristics and cell structure; Reproduction – vegetative, asexual and recombination (conjugation, transformation and transduction); Economic importance.

Unit 2: Algae **(12 Lectures)**

General characteristics; Ecology and distribution; Range of thallus organization and reproduction; Classification of algae; Morphology and life-cycles of the following: *Nostoc, Chlamydomonas, Oedogonium, Vaucheria, Fucus, Polysiphonia.* Economic importance of algae

Unit 3: Fungi **(12 Lectures)**

Introduction- General characteristics, ecology and significance, range of thallus organization, cell wall composition , nutrition, reproduction and classification; True Fungi- General characteristics, ecology and significance, life cycle of *Rhizopus* (Zygomycota) *Penicillium, Alternaria* (Ascomycota), *Puccinia, Agaricus* (Basidiomycota); Symbiotic Associations-Lichens:
General account, reproduction and significance; Mycorrhiza: ectomycorrhiza and endomycorrhiza and their significance

Unit 4: Bryophytes **(12 Lectures)**
Unifying features of archegoniates, Transition to land habit, Alternation of generations.

General characteristics, adaptations to land habit, Classification, Range of thallus organization. Classification (up to family), morphology, anatomy and reproduction of *Marchantia* and *Funaria.* (Developmental details not to be included). Ecology and economic importance of bryophytes with special mention of *Sphagnum.*

Unit 5: Pteridophytes & Gymnosperms **(14 Lectures)**
General characteristics, classification, Early land plants *(Cooksonia* and *Rhynia).* Classification (up to family), morphology, anatomy and reproduction of *Selaginella, Equisetum* and *Pteris.* (Developmental details not to be included). Heterospory and seed habit, stelar evolution. Ecological and economical importance of Pteridophytes.
General characteristics, classification. Classification (up to family), morphology, anatomy and reproduction of *Cycas* and *Pinus.* (Developmental details not to be included). Ecological and economical importance.

B.Sc. Syllabus (2020-21)
I[st] Semester
Practical

Course Code	Course Title	Course Credit	Contact Hours	Marks
BOT CC 112	Biodiversity (Microbes, Algae, Fungi and Archegoniate)	2	60	100

1. EMs/Models of viruses – T-Phage and TMV, Line drawing/Photograph of Lytic and Lysogenic Cycle.
2. Types of Bacteria from temporary/permanent slides/photographs; EM bacterium; Binary Fission; Conjugation; Structure of root nodule.
3. Gram staining
4. Study of vegetative and reproductive structures of *Nostoc, Chlamydomonas* (electron micrographs), *Oedogonium, Vaucheria, Fucus* and Polysiphonia* through temporary preparations and permanent slides. (* *Fucus* - Specimen and permanent slides)
5. *Rhizopus and Penicillium:* Asexual stage from temporary mounts and sexual structures through permanent slides.
6. *Alternaria:* Specimens/photographs and tease mounts.
7. *Puccinia:* Herbarium specimens of Black Stem Rust of Wheat and infected Barberry leaves; section/tease mounts of spores on Wheat and permanent slides of both the hosts.
8. *Agaricus:* Specimens of button stage and full grown mushroom; Sectioning of gills of *Agaricus.*
9. Lichens: Study of growth forms of lichens (crustose, foliose and fruticose)
10. Mycorrhiza: ecto mycorrhiza and endo mycorrhiza (Photographs)
11. ***Marchantia-*** morphology of thallus, w.m. rhizoids and scales, v.s. thallus through gemma cup, w.m. gemmae (all temporary slides), v.s. antheridiophore, archegoniophore, l.s. sporophyte (all permanent slides).
12. ***Funaria-*** morphology, w.m. leaf, rhizoids, operculum, peristome, annulus, spores (temporary slides); permanent slides showing antheridial and archegonial heads, l.s. capsule and protonema.
13. ***Selaginella-*** morphology, w.m. leaf with ligule, t.s. stem, w.m. strobilus, w.m. microsporophyll and megasporophyll (temporary slides), l.s. strobilus (permanent slide).
14. ***Equisetum-*** morphology, t.s. internode, l.s. strobilus, t.s. strobilus, w.m. sporangiophore, w.m. spores (wet and dry)(temporary slides); t.s rhizome (permanent slide).
15. ***Pteris-*** morphology, t.s. rachis, v.s. sporophyll, w.m. sporangium, w.m. spores (temporary slides), t.s. rhizome, w.m. prothallus with sex organs and young sporophyte (permanent slide).
16. ***Cycas-*** morphology (coralloid roots, bulbil, leaf), t.s. coralloid root, t.s. rachis, v.s. leaflet, v.s. microsporophyll, w.m. spores (temporary slides), l.s. ovule, t.s. root (permanent slide).
17. ***Pinus-*** morphology (long and dwarf shoots, w.m. dwarf shoot, male and female), w.m. dwarf shoot, t.s. needle, t.s. stem, , l.s./t.s. male cone, w.m. microsporophyll, w.m. microspores (temporary slides), l.s. female cone, t.l.s. & r.l.s. stem (permanent slide).

Essential Readings

1. Kumar, H.D. (1999). Introductory Phycology. Affiliated East-West. Press Pvt. Ltd. Delhi. 2nd edition.
2. Alexopoulos, C.J., Mims, C.W., Blackwell, M. (1996). Introductory Mycology, John Wiley and Sons (Asia), Singapore. 4th edition.
3. Vashishta, P.C., Sinha, A.K., Kumar, A., (2010). Pteridophyta, S. Chand. Delhi, India.
4. Bhatnagar, S.P. and Moitra, A. (1996). Gymnosperms. New Age International (P) Ltd Publishers, New Delhi, India.
5. Parihar, N.S. (1991). An introduction to Embryophyta. Vol. I. Bryophyta. Central Book Depot, Allahabad.

Additional Readings

1. Tortora, G.J., Funke, B.R., Case, C.L. (2010). Microbiology: An Introduction, Pearson Benjamin Cummings, U.S.A. 10th edition.

2. Sethi, I.K. and Walia, S.K. (2011). Text book of Fungi & Their Allies, MacMillan Publishers Pvt. Ltd., Delhi.

3. Raven, P.H., Johnson, G.B., Losos, J.B., Singer, S.R., (2005). Biology. Tata McGraw Hill, Delhi, India.

4**.** Lack and Evans (2014) :Bios Instant Notes: Plant Biology. Taylor & Francis, New York.

5. Madigan (2008): Brock Biology of Microorganisms. Pearson International Edition, Benjamin Cummings, U.S.A.

6. Dwivedi, Lalit Kumar (2014). Handbook of Botany. DBS Imprints, New Delhi.

7. Bhattacharya (2016) Textbook of Botany. Medtech .

8. Mauseth (2011) Botany: An Introduction to Plant Biology. Jones & Barlett Publishers.

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B.Sc. Syllabus (2020-21)
IInd Semester
Theory

Unit 1 : (a) Introduction **(2 Lectures)**

Course Code	Course Title	Course Credit	Contact Hours	Marks
BOT CC 211	**Plant Ecology and Taxonomy**	4	60	100

(b) Ecological factors **(10 Lectures)**

Soil: Origin, formation, composition, soil profile. Water: States of water in the environment, precipitation types. Light and temperature: Variation Optimal and limiting factors; Shelford law of tolerance. Adaptation of hydrophytes and xerophytes.

Unit 2 : (a) Plant communities and Ecosystem **(14 Lectures)**

Characters; Ecotone and edge effect; Succession; Processes and types.Structure; energy flow trophic organisation; Food chains and food webs, Ecological pyramids production and productivity; Biogeochemical cycling; Cycling of carbon, nitrogen and Phosphorous

(b) Phytogeography **(4 Lectures)**

Principle biogeographical zones; Endemism

Unit 3 : Botanical Nomenclature **(6 Lectures)**

(a) Principles and rules (ICN); ranks and names; binominal system, typification, author citation, valid publication, rejection of names, principle of priority and its limitations.

(b) Taxonamic evidences from palynology, cytology, phytochemistry and molecular data.

Unit 4 : Classification and Identification

(a) Types of classification-artificial, natural and phylogenetic. Bentham and Hooker (upto series), Engler and Prantl (upto series**)** **(6 Lectures)**

(b) Functions of herbarium, important herbaria and Botanical gardens of the India and world. **(2 Lectures)**

Unit 5 : Morphological, Floral characters and Economics importance of following families : **(12 Lectures)**

Ranunculaceae, Brassicaceae, Malvaceae, Fabaceae, Asteraceae, Euphorbiaceae, Poaceae.

B.Sc. Syllabus (2020-21)
IInd Semester

Practical

Course Code	Course Title	Course Credit	Contact Hours	Marks
BOT CC 212	**Plant Ecology and Taxonomy**	2	60	100

1. Study of instruments used to measure microclimatic variables: Soil thermometer, maximum and minimum thermometer, anemometer, psychrometer/hygrometer, rain gauge and lux meter.

2. Determination of pH, and analysis of two soil samples for carbonates, chlorides, nitrates, sulphates, organic matter and base deficiency by rapid field test.

3. Comparison of bulk density, porosity and rate of infiltration of water in soil of three habitats.

4. (a) Study of morphological adaptations of hydrophytes and xerophytes (four each).
   (b) Study of biotic interactions of the following: Stem parasite *(Cuscuta)*, Root parasite (Orobanche), Epiphytes, Predation (Insectivorous plants)

5. Determination of minimal quadrat size for the study of herbaceous vegetation in the college campus by species area curve method. (species to be listed)

6. Quantitative analysis of herbaceous vegetation in the college campus for frequency and comparison with Raunkiaer's frequency distribution.

7. Study of vegetative and floral characters of the following families (Description, V.S. flower, section of ovary, floral diagram/s, floral formula/e and systematic position according to Bentham & Hooker's system of classification) : Ranunulaceae, Brassicaceae, Malvaceae, Fabaceae, Asteraceae, Euphorbiaceae, Poaceae.

8. Mounting of a properly dried and pressed specimen of any wild plant with herbarium label (to be submitted in the record book).

Essential Readings

1. Sharma, P.D. (2010) Ecology and Environment. Rastogi Publications, Meerut, India. 8th edition.
2. Dikshit, A. Siddiqui, M.O. and Pathak, A 2016 Taxonomy of Angiosperm Basic concept, Molecular aspects and Future prospects, by Studerra Press, New Delhi.
3. Sharma, O.P. Plant Taxonomy 2009 Tata Mc Graw Hill, New Delhi.

Additional Readings

1. Kormondy, E.J. (1996). Concepts of Ecology. Prentice Hall, U.S.A. 4th edition.
2. Simpson, M.G. (2006). *Plant Systematics.* Elsevier Academic Press, San Diego, CA, U.S.A.
3. Singh, G. (2012). *Plant Systematics:* Theory and Practice. Oxford & IBH Pvt. Ltd., New Delhi. 3rd edition.
4. Singh, M.P. & Abb S.G.(2016). Essentials of Plant Taxonomy and Ecology, Bio Green Books, New Delhi.
5. Dwivedi, Lalit Kumar (2014). Handbook of Botany. DBS Imprints, New Delhi.
6. Bhattacharya (2016).Textbook of Botany. Scientific International Publishers, New Delhi.

B.Sc. Syllabus (2020-21)

III[rd] Semester

Theory

Course Code	Course Title	Course Credit	Contact Hours	Marks
BOT CC 311	**Plant Anatomy and Embryology**	4	60	100

Unit 1: (a) Organs **(4 Lectures)**

Structure of dicot and monocot root, stem and leaf.

(b) Meristematic and permanent tissues **(8 Lectures)**

Root and shoot apical meristems; Simple and complex tissues.

Unit 2: (a) Secondary Growth **(8 Lectures)**

Vascular cambium – structure and function, seasonal activity. Secondary growth in root and stem, Wood (heartwood and sapwood).

(b) Adaptive and protective systems **(8 Lectures)**

Epidermis, cuticle, stomata; General account of adaptations in xerophytes and hydrophytes

Unit 3: Structural organization of flower **(8 Lectures)**

Structure of anther and pollen; Structure and types of ovules; Types of embryo sacs, organization and ultrastructure of mature embryo sac.

Unit 4:.(a) Pollination and fertilization **(8 Lectures)**

Pollination mechanisms and adaptations; Double fertilization; Seed-structure appendages and dispersal mechanisms.

(b) Embryo and endosperm **(8 Lectures)**

Endosperm types, structure and functions; Dicot and monocot embryo; Embryo-endosperm relationship.

Unit 5: Apomixis and polyembryony **(8 Lectures)**

Definition, types and practical applications.

B.Sc. Syllabus (2020-21)

III[rd] Semester

Practical

Course Code	Course Title	Course Credit	Contact Hours	Marks
BOT CC 312	**Plant Anatomy and Embryology - Lab.**	2	60	100

1. Study of meristems through permanent slides and photographs.
2. Tissues (parenchyma, collenchyma and sclerenchyma); Macerated xylary elements, Phloem (Permanent slides, photographs)
3. Stem: Monocot: *Zea mays;* Dicot: *Helianthus;* Secondary: *Helianthus* (only Permanent slides).
4. Root: Monocot: *Zea mays;* Dicot: *Helianthus;* Secondary: *Helianthus* (only Permanent slides).
5. Leaf: Dicot and Monocot leaf (only Permanent slides).
6. Adaptive anatomy: Xerophyte *(Nerium* leaf); Hydrophyte *(Hydrilla* stem).
7. Structure of anther (young and mature), tapetum (amoeboid and secretory) (Permanent slides).
8. Types of ovules: anatropous, orthotropous, circinotropous, amphitropous/ campylotropous.
9. Female gametophyte: *Polygonum* (monosporic) type of Embryo sac Development (Permanent slides/photographs).
10. Ultrastructure of mature egg apparatus cells through electron micrographs.
11. Pollination types and seed dispersal mechanisms (including appendages, aril, caruncle) (Photographs and specimens).
12. Dissection of embryo/endosperm from developing seeds.
13. Calculation of percentage of germinated pollen in a given medium.

Essential Readings

1. Bhojwani, S.S. & Bhatnagar, S.P. (2011). Embryology of Angiosperms. Vikas Publication House Pvt. Ltd. New Delhi. 5th edition.
2. Tayal, M.S., Plant Anatomy 2010 Rastogi Publication, Meerut.
3. Ranjan, Prema Kumari, Plant Anatomy 2015, Bio-Green Books, New Delhi.

Additional Readings

1. Mauseth, J.D. (1988). Plant Anatomy. The Benjamin/Cummings Publisher, USA.
2. Gangulee,Das and Dutta, College Botany, 2010, Central Book Depot Calcutta.
3. Sinha, Pushpa (2016): Plant Anatomy and Embryology, Bio Green Books, New Delhi.
4. Singh, Gyan Deep (2009): A to Z Botany. Bio Green Books, New Delhi.

B.Sc. Syllabus (2020-21)
III[rd] Semester

Theory
Skill Enhancement Course

Course Code	Course Title	Course Credit	Contact Hours	Marks
BOT SE 311	**Nursery and Gardening**	2	30	100

Unit 1: Nursery: definition, objectives and scope and building up of infrastructure for nursery, planning and seasonal activities - Planting - direct seeding and transplants.

(4 Lectures)

Unit 2: Seed: Structure and types - Seed dormancy; causes and methods of breaking dormancy - Seed storage: Seed banks, factors affecting seed viability, genetic erosion - Seed production technology - seed testing and certification. **(6 Lectures)**

Unit 3 :Vegetative propagation: air-layering, cutting, selection of cutting, collecting season, treatment of cutting, rooting medium and planting of cuttings - Hardening of plants - green house - mist chamber, shed root, shade house and glass house. **(6Lectures)**

Unit 4: Gardening: definition, objectives and scope - different types of gardening - landscape and home gardening - parks and its components - plant materials and design - computer applications in landscaping - Gardening operations: soil laying, manuring, watering, management of pests and diseases and harvesting.

(8 Lectures)

Unit 5: Sowing/raising of seeds and seedlings - Transplanting of seedlings - Study of cultivation of different vegetables: cabbage, brinjal, lady's finger, onion, garlic, tomatoes, and carrots - Storage and marketing procedures. **(6 Lectures)**

Essential Readings

1. Saini, R.S., Kaushik, N., Kaushik, R.A. Godara N.R. (2012) Practical – Nursery production. Publisher Agrobios – Jodhpur.
2. Woodrow,G. Marsha (2017): Gardening in India. Bio Green Books, New Delhi.

Additional Readings

1. Misra Sanyat and Misra R.L.– (2013) Commercial Ornamental bulb Science West Villey Publishing house New Delhi
2 Das, P.C. (2006) Manures and Fertilizers, Kalyani Publishers New Delhi
3 Krishnakumar, V. & P.(2017): Organic Farming in Plantation Crops. Bio Green Books, New Delhi.

4 Swaminathan, C. (2017): Vrikshayurvedic Farming: The Traditional Indian Agriculture. Bio Green Books, New Delhi.

B.Sc. Syllabus (2020-21)
IVth Semester

Theory

Course Code	Course Title	Course Credit	Contact Hours	Marks
BOT CC 411	**Plant Physiology and Metabolism**	4	60	100

Unit 1: (a) Plant-water relations **(8 Lectures)**
Importance of water, water potential and its components; Transpiration and its significance; Factors affecting transpiration; Root pressure and guttation.

(b) Mineral nutrition **(8 Lectures)**

Essential elements, macro and micronutrients; Criteria of essentiality of elements; Role of essential elements; Transport of ions across cell membrane, active and passive transport, carriers, channels and pumps.

Unit 2: Translocation in phloem **(6 Lectures)**
Composition of phloem sap, girdling experiment; Pressure flow model; Phloem loading and unloading.

Unit 3: (a) Photosynthesis **(12 Lectures)**

Photosynthetic Pigments (Chl a, b, xanthophylls, carotene); Photosystem I and II, reaction center, antenna molecules; Electron transport and mechanism of ATP synthesis; C_3, C_4 and CAM pathways of carbon fixation; Photorespiration.

(b) Respiration **(6 Lectures)**
Glycolysis, anaerobic respiration, TCA cycle; Oxidative phosphorylation, Glyoxylate, Oxidative Pentose Phosphate Pathway.

Unit 4: (a) Enzymes **(4 Lectures)**
Structure and properties; Mechanism of enzyme catalysis and enzyme inhibition

(b) Nitrogen metabolism **(4 Lectures)**
Biological nitrogen fixation; Nitrate and ammonia assimilation.

Unit 5: (a)Plant growth regulators (6 Lectures)
Discovery and physiological roles of auxins, gibberellins, cytokinins, ABA, ethylene.

(b) Plant response to light and temperature **(6 Lectures)**
Photoperiodism (SDP, LDP, Day neutral plants); Phytochrome (discovery and structure), red and far red light responses on photomorphogenesis; Vernalization.

B.Sc. Syllabus (2020-21)
IVth Semester
Practical

Course Code	Course Title	Course Credit	Contact Hours	Marks
BOT CC 412	**Plant Physiology and Metabolism Lab**	2	60	100

1. Determination of osmotic potential of plant cell sap by plasmolytic method.
2. To study the effect of two environmental factors (light and wind) on transpiration by excised twig.
3. Calculation of stomatal index and stomatal frequency of a mesophyte and a xerophyte.
4. Demonstration of Hill reaction.
5. Demonstrate the activity of catalase and study the effect of pH and enzyme concentration.
6. To study the effect of light intensity and bicarbonate concentration on O_2 evolution in photosynthesis.
7. Comparison of the rate of respiration in any two parts of a plant.
8. Separation of amino acids by paper chromatography.

Demonstration experiments (any four)

1. Bolting.
2. Effect of auxins on rooting.
3. Suction due to transpiration.
4. R.Q.
5. Respiration in roots.

Essential Readings

1. Verma, V. Plant Physiology, 2015 Ane Books Pvt. Ltd. New Delhi.
2. Yadav, Seema, 2010 Plant Physiology Bio-Green Books, New Delhi.

Additional Readings

1. Taiz, L., Zeiger, E., (2010). Plant Physiology. Sinauer Associates Inc., U.S.A. 5th Edition.
2. Hopkins, W.G., Huner, N.P., (2009). Introduction to Plant Physiology. John Wiley & Sons, U.S.A. 4th Edition.
3. Bajracharya, D., (1999). Experiments in Plant Physiology- A Laboratory Manual. Narosa Publishing House, New Delhi.
4. Jain (2000).Fundamentals of Plant Physiology. S. Chand Publisher, New Delhi.
5. Pandey, Parmila (2016):Textbook of Plant Physiology. Daya Publishers, New Delhi.
6. Pessarakli (2016): Handbook of Photosynthesis. 3/Ed. Taylor & Francis.
7. Sinha , Pushpa (2016).Plant Anatomy and Physiology. Bio Green Books, New Delhi.

B.Sc. Syllabus (2020-21)
IVth Semester
Theory

Course Code	Course Title	Course Credit	Contact Hours	Marks
BOT SE 411	**Biofertilizers**	2	30	100

Unit 1 :General account about the microbes used as biofertilizer – Rhizobium – isolation, identification, mass multiplication, carrier based inoculants, Actinorrhizal symbiosis.

(4 Lectures)

Unit 2: *Azospirillum:* isolation and mass multiplication – carrier based inoculant, associative effect of different microorganisms. *Azotobacter:* classification, characteristics – crop response to *Azotobacter* inoculum, maintenance and mass multiplication. **(8 Lectures)**

Unit 3 :Cyanobacteria (blue green algae), *Azolla* and *Anabaena azollae* association, nitrogen fixation, factors affecting growth, blue green algae and *Azolla* in rice cultivation. **(4 Lectures)**

Unit 4: Mycorrhizal association, types of mycorrhizal association, taxonomy, occurrence and distribution, phosphorus nutrition, growth and yield – colonization of VAM – isolation and inoculum production of VAM, and its influence on growth and yield of crop plants. **(8 Lectures)**

Unit 5: Organic farming – Green manuring and organic fertilizers, Recycling of bio-degradable municipal, agricultural and Industrial wastes – biocompost making methods, types and method of vermicomposting – field Application. **(6 Lectures)**

Essential Readings

1. Lakhsman, H.C. and Channabasara, A. (2014) Biofertilizers and Biopesticides Pointer Publisher Jaipur.
2. Deshmukh, A.M. (2003). Biofertilizer and Biopesticides A B D Publisher Jaipur.

Additional Readings

1. Das, P.C. (2006) Manures and Fertilizers, Kalyani Publishers New Delhi
2. Kassem Alef and Paolog Nannipieri (1995)Methods in Applied Soil Microbiology and Biochemistry, Academic Press London.
3. Aggarwal, Ashok & K.(2017): Mycorrhizal Fungi. Boi Green Books, New Delhi.
4. Krishnakumar, V. & P.(2017): Organic Farming in Plantation Crops. Bio Green Books, New Delhi.
5. Mohandas, Sukhada (2016): Arbuscular Mycorrhizal Fungi in Fruit crop production. Bio Green Books, New Delhi.
6. Huang Bing (2006): Plant Environment Interactions 3rd Edi. Taylor & Francis.

B.Sc. Syllabus (2020-21)

Vth Semester

Theory

Course Code	Course Title	Course Credit	Contact Hours	Marks
BOT EC 511	**Cell and Molecular Biology**	4	60	100

Unit 1

Techniques in Biology:- Principles of microscopy; Different types of microscope

Cell as a unit of Life:- Cell Theory, Prokaryotic and Eukaryotic cell organization.

(8 Lectures)

Cell Wall and Cell Membrane:-The Structure and function, Models of membrane structure; The fluidity of membranes; Membrane proteins and their functions; Selective permeability of the membranes. **(8 Lectures)**

Unit 2

Chloroplast and Mitochondria: Ultra structure, genome organization and biogenesis.

Other cell organelles: Structure and function of, Golgi apparatus, Endoplasmic reticulum, Centrosome, Lysosomes, Ribosome etc. **(8 Lectures)**

Nucleus: Nuclear Envelope, Nucleolus - structure and function, nucleosome model.

(6 Lectures)

Unit 3

Cell Cycle: Overview of Cell cycle, Mitosis and Meiosis; role of cyclins in cell division, Apoptosis.

(8 Lectures)

Unit 4

Genetic material: DNA as genetic material: Experiment of Griffith, O. T. Avery, Hershey and Chase. DNA : Discovery of double helix, structure of DNA, Different types, Topology, DNA as part of Chromosomes.

(8 Lectures)

DNA Replication Different types of Protein and Enzyme involve
(6Lectures)

Unit 5

Gene Expression: Transcription and Translation in Prokaryotes, Types of RNA, genetic code.
Regulation of gene expression in Prokaryotes: Lac operon and Tryptophan operon.

(8 Lectures)

B.Sc. Syllabus (2020-21)
Vth Semester

Practical

Course Code	Course Title	Course Credit	Contact Hours	Marks
BOT EC 512	**Cell and Molecular Biology**	2	60	100

1. Study of the photomicrographs of cell organelles
2. To study the structure of plant cell through temporary mounts.
3. Study of mitosis and meiosis (temporary mounts and permanent slides).
4. Study of plasmolysis and deplasmolysis on *Rhoeo* leaf.
5. Demonstration of DNA extraction from bacteria and its visualization in gel electophoresis

Essential Readings

1. Karp, G. 2010. Cell and Molecular Biology: Concepts and Experiments. 6th Edition. John Wiley & Sons. Inc.
2. Khanna, Pragya Cell and Molecular Biology, 2008. I.K. International Publishing House Pvt. Ltd. New Delhi.
3. Verma, P.S. & Agrawal, V.K., 2016 Cell Biology (Cytology,Biomolecules and Molecular Botany), S.Chand Publishing New Delhi.
4. Bendre, Ashok & Pande, P.C.,1996-97, Introductory Botany, Prakash Kumar Rastogi for Rastogi, Gangotri Shivaji Road Meerut.
5. Karp, G.:Cell Biology 7TH Edition2013. Wiley Publisher, London, U.K.
6. Rathoure, A.K. & Shrivastava, M.: Cell Biology and Genetics. 2015. Daya Publishing House, New Delhi.
7. Singh, B.S.& Singh, M.P.: Cytogenetics, 2015. SSPH Publications, New Delhi.

Additional Readings

8. De Robertis, E.D.P. and De Robertis, E.M.F. 2006. Cell and Molecular Biology. 8th edition. Lippincott Williams and Wilkins, Philadelphia.
9. Cooper, G.M. and Hausman, R.E. 2009. The Cell: A Molecular Approach. 5th edition. ASM Press & Sunderland, Washington, D.C.; Sinauer Associates, MA.
10. Becker, W.M., Kleinsmith, L.J., Hardin. J. and Bertoni, G. P. 2009. The World of the Cell. 7th edition. Pearson Benjamin Cummings Publishing, San Francisco.
11. Kamal, Rao,G.P. and Modi D.R. 2010, Concepts of Microbiology, Internation Book Distributing Co. Lucknow.
12. Hyde, 2016: Genetics and Molecular Biology: With fundamentals of Biostatics (Pb). Mcgraw Hill, New Delhi.
13. Alberts, 2014: Molecular Biology of the Cell. Garland Science. Taylor & Francis Group, New York.
14. Singh, R.J. 2016 : Plant Cytogenetics.CRC Press, Taylor & Francis Group, New York

B.Sc. Syllabus (2020-21)
Vth Semester

Theory

Course Code	Course Title	Course Credit	Contact Hours	Marks
BOT SE 511	**Mushroom Culture Technology**	2	30	100

Unit 1: Introduction, history. Nutritional and medicinal value of edible mushrooms; Poisonous mushrooms. Types of edible mushrooms available in India - *Volvariella volvacea, Pleurotus citrinopileatus, Agaricus bisporus.* **(5 Lectures)**

Unit 2: Cultivation Technology : Infrastructure: substrates (locally available) Polythene bag, vessels, Inoculation hook, inoculation loop, low cost stove, sieves, culture rack, mushroom unit (Thatched house) water sprayer, tray, small polythene bag. **(6 Lectures)**

Unit 3: Pure culture: Medium, sterilization, preparation of spawn, multiplication. Mushroom bed preparation - paddy straw, sugarcane trash, maize straw, banana leaves. Factors affecting the mushroom bed preparation - Low cost technology, Composting technology in mushroom production. **(6 Lectures)**

Unit 4: Storage and nutrition : Short-term storage (Refrigeration - upto 24 hours) Long term Storage (canning, pickels, papads), drying, storage in saltsolutions. Nutrition - Proteins - amino acids, mineral elements nutrition - Carbohydrates, Crude fibre content - Vitamins.
(8 Lectures)

Unit 5: Food Preparation: Types of foods prepared from mushroom. Research Centres - National level and Regional level. Cost benef it ratio - Marketing in India and abroad, Export Value.
(5 Lectures)

Essential Readings

1. Pathak, . V.N Yadav N and Gour, (2004) M Mushroom production and processesing Technology. Agrobios Jhodhpur
2. Sharma B.C and Sharma N.P (2013) Mushroom cultivation and users. Agrobios Jhodhpur

Additional Readings

1. Tiwari, Pankaj Kapoor, S.C., (1988). Mushroom cultivation, Mittal Publications, Delhi.
2. Nita Bahl (1984-1988) Hand book of Mushrooms, II Edition, Vol. I & Vol. I
3. Vyas, D.,2016, Mushroom krishikaran evam vyavasikaran Pub.Krishna computer and Printer, Sagar.
4. Vyas, D. (2017). Mushroom utpadanvki Naveentam Takniki. Daya Publication New Delhi
5. Borkar, S.G.& Patil, N. (2016). Mushroom: A Nutritive Food and its Cultivation. Bio Green Books, New Delhi.

B.Sc. Syllabus (2020-21)
VIth Semester

Theory

Course Code	Course Title	Course Credit	Contact Hours	Marks
BOT EC 611	**Economic Botany and Biotechnology**	4	60	100

Unit 1: (a) Origin of Cultivated Plants **(4 Lectures)**
Concept of centres of origin, their importance with reference to Vavilov's work
(b) : Cereals & Legumes **(10 Lectures)**
Wheat -Origin, morphology, uses
General account with special reference to Gram and soybean
Unit 2 (a) : Spices **(6Lectures)**
General account with special reference to clove and black pepper (Botanical name, family, part used, morphology and uses)

(b) : Beverages **(4 Lectures)**
Tea (morphology, processing, uses)

Unit 3: (a) Oils and Fats **(4 Lectures)**

General description with special reference to groundnut

(b) Fibre Yielding Plants
(4 Lectures)

General description with special reference to Cotton (Botanical name, family, part used, morphology and uses)
Unit 4: Introduction to biotechnology & Plant tissue culture **(10 lecture)**
Micropropagation ; haploid production through androgenesis and gynogenesis; brief account of embryo & endo sperm culture with their applications

Unit 5: Recombinant DNA Techniques **(18 Lectures)**

Blotting techniques: Northern, Southern and Western Blotting, DNA Fingerprinting; Molecular DNA markers i.e. RAPD, RFLP, SNPs; DNA sequencing, PCR and Reverse Transcriptase-PCR. Hybridoma and monoclonal antibodies, ELISA and Immunodetection. Molecular diagnosis of human disease, Human gene Therapy.

B.Sc. Syllabus (2020-21)

VIth Semester

Practical

Course Code	Course Title	Course Credit	Contact Hours	Marks
BOT EC 612	**Economic Botany and Biotechnology**	2	60	100

1. Study of economically important plants : Wheat, Gram, Soybean, Black pepper, Clove Tea, Cotton, Groundnut through specimens, sections and microchemical tests
2. Familiarization with basic equipments in tissue culture.
3. Study through photographs: Anther culture, somatic embryogenesis, endosperm and embryo culture; micropropagation.

4. Study of molecular techniques: PCR, Blotting techniques, AGE and PAGE.

Essential Readings

1. Kochhar, S.L. (2011). Economic Botany in the Tropics, MacMillan Publishers India Ltd., New Delhi. 4th edition.
2. Bhojwani, S.S. and Razdan, M.K., (1996). Plant Tissue Culture: Theory and Practice. Elsevier Science Amsterdam. The Netherlands.
3. Singh, Sadhana, Economic Botany of Angiosperms 2015, Biogreen Books, New Delhi.
4. Rastogi (2016): Principles of Molecular Biology**.** Scientific International Publishers, New Delhi**.**

Additional Readings

1. Glick, B.R., Pasternak, J.J. (2003). Molecular Biotechnology- Principles and Applications of recombinant DNA. ASM Press, Washington.
2. Saxena, Rupali, (2015). Economic Botany of Angiosperms, Biogreen Books, New Delhi.
3. Aneja (2014): Laboratory Manual of Microbiology and Biotechnology. Scientific International Publishers, New Delhi.

B.Sc. Syllabus (2020-21)

VIth Semester

Theory

Course Code	Course Title	Course Credit	Contact Hours	Marks
BOT SE 611	**Plant Diversity and Human Welfare**	2	30	100

Unit 1: Plant diversity and its scope: Genetic diversity, Species Diversity, Plant Diversity at the ecosystem level, agro-biodiversity and cultivated plant taxa. Values and uses of biodiversity: Ethical and aesthetic values, Precautionary principle, Methodologies for valuation, Uses of plants, Uses of microbes. **(6 Lectures)**

Unit 2: Loss of Biodiversity: Loss of genetic diversity, Loss of species diversity, Loss of ecosystem diversity, Loss of agro-biodiversity, Projected scenario for biodiversity loss. **(6 Lectures)**

Unit 3: Management of Plant Biodiversity: Organizations associated with biodiversity management - Methodology for execution - IUCN, UNEP, UNESCO, WWF, NBPGR; Biodiversity legislation and conservations, Biodiversity information management and communication. **(6 Lectures)**

Unit 4: Conservation of Biodiversity: Conservation of genetic diversity, species diversity and ecosystem diversity, *In situ* and *ex situ* conservation, Biodiversity awareness programs, Sustainable Development. **(6 Lectures)**

Unit 5: Role of plants in relation to Human Welfare: a) Importance of forestry and its utilization and commercial aspects, b) Avenue trees, c) Ornamental plants of India, d) Alcoholic beverages through ages. Fruits and nuts: Important fruit crops their commercial importance. Wood and its uses. **(6 Lectures)**

Essential Readings:

1. Krishnamurthy, K.V. (2004). An Advanced Text Book of Biodiversity- Principles and Practices. Oxford and IBH Publications Co. Pvt. Ltd. New Delhi
2. Conservation Biology: A primer from South Asia by Kamaljit S. Bawa, Richard B. Primack and Meera Anna Oommen, 2011. Universities Press (Ltd.), Hyderabad.
3. Essential of Conservation Biology by Richard B. Primack, 2002, Third Edition. Sinauer Associates, Inc, Massachusetts USA.
4. Biodiversity and Conservation by P. C. Joshi and Namita Joshi, 2004, A. P. H. Publishing Corporation, New Delhi.
5. Menta, C.(2016): Biodiversity Vol. I. ISBN Publishers, New Delhi.
6. Pullaiah, T.(2016): Biodiversity in India (Vol. 8). Bio Green Books, New Delhi.

Additional Readings:

1. Biological diversity: The coexistence of species on changing landscapes by Michael A. Huston, 1994, Cambridge University Press.
2. Principles of Conservation Biology by Gary K Meffeand C. Ronald Carroll, 1994, Sinauer Associates, Inc. Publishers, Sunderland, Massachusetts USA.

3. Conservation Biology: The Science of Scarcity and Diversity, Edited by Michael E. Soule, 1986. Sinauer Associates, Inc. Publishers, Sunderland, Massachusetts USA.
4. Biodiversity: Social and Ecological Perspectives by Vandana Shiva, 1992. Natraj Publishers, Dehra Dun.
5. Levin (2013): Encyclopedia of Biodiversity (7 Vol. Set) Elsevier Publishers.