Botany Program (CBCS)

1st Semester Syllabus

Course Code: BBOTCCRC101

Title:

Phycology and Microbiology

Syllabus:

Unit 1: Introduction to microbial world Microbial nutrition, growth and metabolism. Economic importance of viruses with reference to vaccine production, role in research, medicine and diagnostics, as causal organisms of plant diseases. Economic importance of bacteria with reference to their role in agriculture and industry (fermentation and medicine). (7 lectures)

Unit 2: Viruses Discovery, physiochemical and biological characteristics; classification (Baltimore), general structure with special reference to viroids and prions; replication (general account), DNA virus (T4-phage), lytic and lysogenic cycle; RNA virus (TMV). (7 lectures)

Unit 3: Bacteria Discovery, general characteristics; Types-archaebacteria, eubacteria, wall-less forms (mycoplasma and spheroplasts); Cell structure; Nutritional types; vegetative and Reproductive structure - asexual and recombination (conjugation, transformation and transduction). (7 lectures)

Unit 4: Algae General characteristics; Ecology and distribution; range of thallus organization; Cell structure and components; cell wall, pigment system, reserve food (of only groups represented in the syllabus), flagella; methods of reproduction; Classification; criteria, system of Fritsch, and evolutionary classification of Lee (only upto groups); Significant contributions of important phycologists (F.E. Fritsch, G.M. Smith, R.N. Singh, T.V. Desikachary, H.D. Kumar, M.O.P.
Iyengar). Role of algae in the environment, agriculture, biotechnology and industry. (11 lectures)

Unit 5: Cyanophyta and Xanthophyta Ecology and occurrence; Range of thallus organization; Cell structure; Reproduction, Morphology and life-cycle of *Nostoc* and Vaucheria. (8 lectures)

Unit 6: Chlorophyta and Charophyta General characteristics; Occurrence; Range of thallus organization; Cell structure; Reproduction. Morphology and life-cycles

of *Chlamydomonas, Volvox, Oedogonium, Chara*. Evolutionary significance of Prochloron. (8 lectures)
Unit 7: Phaeophyta and Rhodophyta Characteristics; Occurrence; Range of thallus organization; Cell structure; Reproduction. Morphology and life-cycles of Ectocarpus, Fucus and Polysiphonia. (12 lectures)

Practical
Microbiology
1. Electron micrographs/Models of viruses – T-Phage and TMV, Line drawings/ Photographs of Lytic and Lysogenic Cycle.
2. Types of Bacteria to be observed from temporary/permanent slides/photographs. Electron micrographs of bacteria, binary fission, endospore, conjugation, root Nodule.
3. Gram staining.
4. Study od bacteria from curd and root nodule.

Phycology
Study of vegetative and reproductive structures of Nostoc, Chlamydomonas (electron micrographs), *Volvox, Oedogonium, Chara, Vaucheria, Ectocarpu*s and *Polysiphonia*, through electron micrographs, temporary preparations and permanent slides.

Botany Program (CBCS)

2nd Semester Syllabus

Course Code: BBOTCCRC201

Title:

Plant Ecology and Taxonomy

Syllabus:

Unit 1: Introduction (2 Lectures)
Unit 2: 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 3: Plant communities (6 Lectures) Characters; Ecotone and edge effect; Succession; Processes and types.
Unit 4: Ecosystem (8 Lectures) Structure; energy flow trophic organisation; Food chains and food webs, Ecological pyramids production and productivity; Biogeochemical cycling; Cycling of carbon, nitrogen and Phosphorous
Unit 5: Phytogeography (4 Lectures) Principle biogeographical zones; Endemism
Unit 6 Introduction to plant taxonomy (2 Lectures) Identification, Classification, Nomenclature.
Unit 7 Identification (4 Lectures) Functions of Herbarium, important herbaria and botanical gardens of the world and India; Documentation: Flora, Keys: single access and multi-access.
Unit 8 Taxonomic evidences from palynology, cytology, phytochemistry and molecular data. (6 Lectures)
Unit 9 Taxonomic hierarchy (2 Lectures) Ranks, categories and taxonomic groups
Unit 10 Botanical nomenclature (6 Lectures) Principles and rules (ICN); ranks and names; binominal system, typification, author citation, valid publication, rejection of names, principle of priority and its limitations.
Unit 11 Classification (6 Lectures) Types of classification-artificial, natural and phylogenetic. Bentham and Hooker (upto series), Engler and Prantl (upto series).
Unit 12 Biometrics, numerical taxonomy and cladistics (4 Lectures) Characters; variations; OTUs, character weighting and coding; cluster analysis; phenograms, cladograms (definitions and differences)
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Practical

1. Determination of pH, and analysis of two soil / water samples for carbonates, chlorides, nitrates, sulphates, organic matter by rapid kit 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 law

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):Malvaceae - *Sida / Abutilon*; Asteraceae - *Vernonia / Ageratum, Eclipta / Tridax*;
Solanaceae -*Solanum nigrum, Withania*; Lamiaceae - *Leucas, Ocimum*; Liliaceae - *Lilium / Allium.*
8. Mounting of a properly dried and pressed specimen of any wild plant with herbarium label (to be submitted with record book).

Botany Program (CBCS)

3rd Semester Syllabus

Course Code: BBOTCCRC301

Title:

Plant Anatomy and Embryology

Syllabus:

Unit 1: Meristematic and permanent tissues (8 Lectures) Root and shoot apical meristems; Simple and complex tissues.
Unit 2: Organs (4 Lectures) Structure of dicot and monocot root stem and leaf.
Unit 3: Secondary Growth (8 Lectures) Vascular cambium – structure and function, seasonal activity. Secondary growth in root and stem, Wood (heartwood and sapwood).
U nit 4: Adaptive and protective systems (8 Lectures) Epidermis, cuticle, stomata; General account of adaptations in xerophytes and hydrophytes.
Unit 5: 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 6: Pollination and fertilization (8 Lectures) Pollination mechanisms and adaptations; Double fertilization; Seed-structure appendages and dispersal mechanisms.
Unit 7: Embryo and endosperm (8 Lectures)

Endosperm types, structure and functions; Dicot and monocot embryo; Embryoendosperm relationship.
Unit 8: Apomixis and polyembryony (8 Lectures) Definition, types and practical applications.

Practical
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.

Course Code: BBOTSERT304

Title:

Biofertilizers

Syllabus:

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 biodegradable municipal, agricultural and Industrial wastes – biocompost making methods, types and method of vermicomposting – field Application.
(6 Lectures)

Botany Program (CBCS)

4th Semester Syllabus

Course Code: BBOTCCRC401

Title:

Plant Physiology and Metabolism

Syllabus:

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

U nit 2: 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 3: Translocation in phloem (6 Lectures) Composition of phloem sap, girdling experiment; Pressure flow model; Phloem loading and unloading.
Unit 4: 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; C3, C4 and CAM pathways of carbon fixation; Photorespiration.
Unit 5: Respiration (6 Lectures) Glycolysis, anaerobic respiration, TCA cycle; Oxidative phosphorylation, Glyoxylate, Oxidative Pentose Phosphate Pathway.
Unit 6: Enzymes (4 Lectures) Structure and properties; Mechanism of enzyme catalysis and enzyme inhibition.
Unit 7: Nitrogen metabolism (4 Lectures) Biological nitrogen fixation; Nitrate and ammonia assimilation.
Unit 8: Plant growth regulators (6 Lectures) Discovery and physiological roles of auxins, gibberellins, cytokinins, ABA, ethylene.
Unit 9: 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.

Practical
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 O2 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.

Course Code: BBOTSERT404

Title:

Herbal Technology

Syllabus:

Unit 1: Herbal medicines: history and scope - definition of medical terms - role of medicinal plants in Siddha systems of medicine; cultivation - harvesting - processing - storage - marketing and utilization of medicinal plants. (6 Lectures)
Unit 2: Pharmacognosy - systematic position m edicinal uses of the following herbs in curing various ailments; Tulsi, Ginger, Fenugreek, Indian Goose berry and Ashoka. (6 Lectures)
Unit 3: Phytochemistry - active principles and methods of their testing - identification and utilization of the medicinal herbs; *Catharanthus roseus* (cardiotonic), *Withania somnifera* (drugs acting on nervous system), *Clerodendron phlomoides* (anti-rheumatic) and *Centella asiatica* (memory booster). (6 Lectures)
Unit 4: Analytical pharmacognosy: Drug adulteration - types, methods of drug evaluation - Biological testing of herbal drugs - Phytochemical screening tests for secondary metabolites (alkaloids, flavonoids, steroids, triterpenoids, phenolic compounds) (8 Lectures)
Unit 5: Medicinal plant banks micro propagation of important species (*Withania somnifera*, neem and tulsi- Herbal foods-future of pharmacognosy) (4 Lectures)

Botany Program (CBCS)

5th Semester Syllabus

Course Code: BBOTDSRC1

Title:

Economic Botany and Biotechnology

Syllabus:

Unit 1: Origin of Cultivated Plants (4 Lectures) Concept of centres of origin, their importance with reference to Vavilov's work
Unit 2: Cereals (4 Lectures) Wheat -Origin, morphology, uses
Unit 3: Legumes (6 Lectures) General account with special reference to Gram and soybean
Unit 4: Spices (6 Lectures) General account with special reference to clove and black pepper (Botanical name, family, part used, morphology and uses)
Unit 5: Beverages (4 Lectures) Tea (morphology, processing, uses)
Unit 6: Oils and Fats (4 Lectures) General description with special reference to groundnut
Unit 7: Fibre Yielding Plants (4 Lectures) General description with special reference to Cotton (Botanical name, family, part used, morphology and uses)
Unit 8: Introduction to biotechnology (2 lecture)
Unit 9: Plant tissue culture (8 Lectures) Micropropagation ; haploid production through androgenesis and gynogenesis; brief account of embryo & endosperm culture with their applications
Unit 10: 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.

Practical
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.

Course Code: BBOTSERT504

itle:

Ethnobotany

Syllabus:

Unit 1: Ethnobotany Introduction, concept, scope and objectives; Ethnobotany as an interdisciplinary science. The relevance of ethnobotany in the present context; Major and minor ethnic groups or Tribals of India, and their life styles. Plants used by the tribals: a) Food plants b) intoxicants and beverages c) Resins and oils and miscellaneous uses. (6 Lectures)
Unit 2: Methodology of Ethnobotanical studies a) Field work b) Herbarium c) Ancient Literature d) Archaeological findings e) temples and sacred places. (6 Lectures)
Unit 3: Role of ethnobotany in modern Medicine Medico-ethnobotanical sources in India;Significance of the following plants in ethno botanical practices (along with their habitat and morphology) a) *Azadiractha indica* b) *Ocimum sanctum* c) *Vitex negundo.* d) *Gloriosa superba* e) *Tribulus terrestris* f) *Pongamia pinnata* g) *Cassia auriculata* h) *Indigofera tinctoria*. Role of ethnobotany in modern medicine with special example *Rauvolfia sepentina*, *Trichopus zeylanicus*, *Artemisia,Withania.* Role of ethnic groups in conservation of plant genetic resources. Endangered taxa and forest management (participatory forest management). (10 Lectures)
Unit 4: Ethnobotany and legal aspects Ethnobotany as a tool to protect interests of ethnic groups. Sharing of wealth concept with few examples from India. Biopiracy, Intellectual Property Rights and Traditional Knowledge. (8 Lectures)

Botany Program (CBCS)

6th Semester Syllabus

Course Code: BBOTDSRC3

Title:

Genetics and Plant Breeding

Syllabus:

Unit 1: Mendelian genetics and its extension (8 lectures)
Principles of inheritance; Chromosome theory of inheritance; Autosomes and sex chromosomes; Probability; Incomplete dominance and codominance; Multiple alleles, Lethal alleles, Epistasis, Pleiotropy.

Unit 2: Extrachromosomal Inheritance (6 lectures) Chloroplast mutation: Variegation in Four o'clock plant; Mitochondrial mutations in yeast; Maternal effects-shell coiling in snail.
Unit 3: Linkage, crossing over (6 lectures) Linkage and crossing over-Cytological and molecular basis of crossing over; Recombination frequency, two factor and three factor crosses; Interference and coincidence.

Unit 4: Variation in chromosome number and structure (8 lectures) Deletion, Duplication, Inversion, Translocation, Euploidy and Aneuploidy.
Unit 5: Gene mutations (4 lectures) Types of mutations; Molecular basis of mutations; Mutagens – physical and chemical (Base analogs, deaminating, alkylating and intercalating agents).
Unit 6. Population Genetics (4 lectures) Basic idea, Hardy-Weinberg Law.

Unit 7. Plant Breeding (8 lectures) Introduction and objectives; Centres of origin and domestication of crop plants, plant genetic resources; Acclimatization; Selection methods; Hybridization: Procedure, advantages and limitations.

Unit 8: Crop improvement and breeding (6 lectures) Role of mutations; Polyploidy; role of biotechnology in crop improvement.

Practical

1. Idea about pretreatment, fixation, staining and smear preparation.

2. Mitosis through temporary squash preparation with special reference to root of *Allium sp*.
3. Mendalian and Non-Mendalian inheritance through seed ratios.

Course Code: BBOTSERT604

Title:

Nursery and Gardening

Syllabus:

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)