B.Sc., BOTANY, III Year, CBCS Syllabus

Telangana State Council of Higher Education, Govt. of Telangana B.Sc., CBCS Common Core Syllabi for all Universities in Telangana

PROPOSED SCHEME FOR CHOICE BASED CREDIT SYSTEM IN B.Sc. BOTANY.

<table>
<thead>
<tr>
<th>Code</th>
<th>Course Title</th>
<th>Course Type</th>
<th>HPW</th>
<th>Credits</th>
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<tr>
<td>BS 501</td>
<td>SEC-III: Nursery and Gardening</td>
<td>SEC-3</td>
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<td>BS 502</td>
<td>GE-I: Economic Botany</td>
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<td>DSE-1E</td>
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<tr>
<td></td>
<td>Elective-B: Horticulture</td>
<td>DSE-2E</td>
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<tr>
<td>BS 601</td>
<td>SEC-IV: Mushroom Culture Technology</td>
<td>SEC-4</td>
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<td>BS 602</td>
<td>GE-II: Biodiversity and Human Welfare</td>
<td>GE-2</td>
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<td>Elective-D: Seed Technology</td>
<td>DSE-4E</td>
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B.Sc. Botany- III Year
Semester-V : Paper-V
Cell Biology and Genetics

Credits-3

DSC-1E (3 hrs/week) Core 45 hours

Theory Syllabus

Unit - I:
1. Principles of Microscopy: Light Microscope and Electron Microscope. (2 h)
2. Plant cell envelopes: Ultra structure of cell wall, molecular organization of cell membranes. (3 h)
3. Nucleus: Ultra structure, Nucleic acids - Structure of DNA, types and functions of RNA. (4 h)
4. Chromosomes: Morphology, organization of DNA in a chromosome, Euchromatin and Heterochromatin, Karyotype. Special types of chromosomes: Lampbrush and Polytene chromosomes. (3 h)
5. Extra nuclear genome: Mitochondrial DNA and Plastid DNA, Plasmids. (3 h)

Unit - II:
6. Cell division: Cell and its regulation; mitosis, meiosis and their significance (3 h)
7. Mendelism: Laws of inheritance. Genetic interactions - Epistasis, Complementary, Supplementary and inhibitory genes. (5 h)
8. Linkage: A brief account and theories of Linkage. Crossing over: Mechanism and theories of crossing over. (4 h)
9. Genetic maps: Construction of genetic maps with Two point and Three point test cross data. (3 h)

Unit - III:
10. Mutations: Chromosomal aberrations - structural and numerical changes; Gene mutations, Transposable elements. (4 h)
12. Mechanism of transcription in Prokaryotes and Eukaryotes. (4 h)
13. Regulation of gene expression in prokaryotes (Lac and Trp. Operons ). (2 h)
References:

B.Sc Botany- III Year  
Semester-V : Paper-V

Cell Biology and Genetics  

DSC-1E (2 hrs/week)  

Practical Syllabus  

Credits-1  

30 hours

1. Demonstration of cytochemical methods: Fixation of plant material and nuclear staining for mitotic and meiotic studies. (4 h)
2. Study of various stages of mitosis using cytological preparation of Onion root tips. (4 h)
3. Study of various stages of meiosis using cytological preparation of Onion flower buds. (2 h)
4. Solving genetic problems related to monohybrid, dihybrid ratio incomplete dominance and interaction of genes (minimum of six problems in each topic). (8 h)
5. Construction of linkage maps; two and three point test cross. (4 h)
   Chloroplast, Mitochondria, Nucleus, Ribosomes, Endoplasmic reticulum, and Golgi complex. (4 h)
7. Study of Special types of Chromosomes (Polytene chromosome and Lampbrush chromosomes-Permanent slide) (4 h)
Practical Model Question Paper

Time : 2 1/2 hrs  

Max. marks : 25

1. Prepare a cytological slide of given material A and identify & describe any two stages with well labeled diagrams. (8 marks)
2. Solve genetic problems B related to dihybrid ratio or incomplete dominance (6 marks)
3. Solve the genetic problem C related to interaction of genes. (5 Marks)
4. Slides
   C-Cell organelles
   D-Chromosomes (Polytene Chromosome) (2x2=4 marks)
5. Record (2 marks)
B.Sc (CBCS) Botany-III Year
Semester-V: Elective-I
Ecology & Biodiversity

DSE-1E (3 hrs./week) Credits-3
(45 hours)

Theory Syllabus

UNIT - I
1. Concept and components of Ecosystem. Energy flow, food chains, food webs, ecological pyramids, Biogeochemical cycles - Carbon Cycle (4h)
2. Definition of Environment: Atmosphere (Troposphere, Stratosphere, Mesosphere, Ionosphere), Hydrosphere, Lithosphere & Biosphere. (3h)
3. Plants and environment: Ecological factors - Climatic (Light and Temperature) and biotic. Ecological adaptations of plants. (5h)

UNIT - II
5. Population ecology: Natality, Mortality, Growth curves, Ecotypes & Ecads. (4h)
6. Community ecology: Frequency, density cover, Life forms & Biological spectrum. (4h)
7. Community Dynamics: Succession - Serial stages, Modification of physical environment, Climax formation with reference to Hydrosere and Xerosere. (4h)
8. Production ecology: Concepts of productivity - Primary and Secondary Productivity. (4h)

UNIT - III
10. Biodiversity- Levels, threats and value (3h)
11. Hot spots of India - North Eastern Himalayas, Western Ghats; Endemism. IUCN categories, RED data book (3h)
12. Principles of conservation – In situ and Ex situ. Role of organizations in the conservation of Biodiversity - WWF and NBPGR. (3h)
References:

Practical Syllabus 30 hours

1. Study of plant communities by Quadrat Method (8h)
2. Estimation of carbonates and bicarbonates in the given water sample. (4h)
3. Determination of soil texture (composition of clay, sand silt etc.) and pH. (2h)
5. Value of biodiversity (8h)
   a) Medicinal value: *Catharanthus, Tinospora and Emblica*
   b) Timber Value: *Acacia, Tectona and Azadirachta*
   c) Aesthetic Value: *Mangifera, Ficus, Ocimun*
   d) Assessment of local biodiversity.
1. Calculate the frequency and density of the given Quadrat  
2. Estimate the amount of Carbonates/Bicarbonates present in the  
given water sample.  
3. Comment on the specimens A, B & C  
4. Identify the given slides D & E (Hydrophytes & Xerophytes)  
5. Biodiversity: Identification and Biodiversity value (Medicinal/Timber/Aesthetic).  
5. Record
UNIT - I
1. Definition, branches, scope and economic importance of horticultural crops (4h)
2. Classification of horticultural crops based on - Climatic requirements, Season of growth, (6h)
3. Manures: Definition, importance of manures FYM (compost), oil cakes, green manure, Organic manures and vermi-compost. (5h)

UNIT - II
4. Natural Propagation: By seeds, Vegetative Structures like Bulbs, Tubers, Corms, Rhizomes, Root stock, runners, Offsets and suckers. (4h)
5. Artificial Propagation: Cutting, Layering, Grafting and Budding (4h)
6. Application of the following plant growth regulators in horticulture - Auxins, Gibberellins, Cytokinins, Ethylene and Brassinosteroids. (4h)
7. Green house technology - definition, types, layout, construction, irrigation systems, care and attention, hardening of plants. (4h)

UNIT - III
8. Adaphic and environmental parameters for horticultural crops, Selection of site, planning, training, pruning and Cropping system; Garden implements and their uses. (5h)
9. Management: Nutrition, Water, Pest and Weed Management. (4h)
10. Bonsai and Landscaping techniques. (5h)
References:

Horticulture

Practical Syllabus

(30 hours)

1. Garden tools and implements. (2h)
2. Identification and economic values of any two of tropical and subtropical vegetable, fruit, flower and ornamental crops. (2h)
3. Propagation practices by seed, Vegetative propagation (Rhizome, bulb, corm), cutting, layering, budding, grafting with two examples. (6h)
4. Seed propagation- seed treatments, sowing and seedling production. (4h)
5. Nursery practices, transplanting, field preparation, sowing/planting, use of herbicides, top dressing of fertilizers and use of growth regulators. (4h)
6. Nursery containers, media, potting and repotting of plants, hardening of plants in nursery, shade regulation in nursery, plant protection in nursery plants (Demonstration) (4h)
7. Packing nursery plants for local and long distance markets. (Demonstration) (2h)
8. Making of organic-compost. (6h)
**Horticulture**

<table>
<thead>
<tr>
<th>Practical Model Paper</th>
<th>Max. marks : 25</th>
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<tbody>
<tr>
<td>1. Major Experiment A</td>
<td>(8marks)</td>
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<tr>
<td>Air Layering</td>
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<td>(OR)</td>
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<td>Grafting</td>
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<td>2. Minor Experiment B</td>
<td>(6marks)</td>
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<tr>
<td>Identification, Nutritive and economic value of vegetable or fruit.</td>
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<td>(OR)</td>
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<td>Making of organic compost-Flow chart.</td>
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<td>3. Spotters</td>
<td>(3x3=9marks)</td>
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<td>C. Vegetative propagative organ</td>
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<td>D. Horticulture- Garden tools</td>
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<td>E. Types of Bonsai / Growth hormones</td>
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<td>4. Record</td>
<td>(2marks)</td>
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Theory Syllabus

Unit-I:

1. **Cultivated Plants**: Concept of origin, their importance.
2. **Vegetables**: Nutritional and Commercial values of Root crops, leafy and fruit vegetables.
3. **Cereals**: Rice, Wheat and maize - Origin, morphology and uses.
4. **Pulses**: General account with special reference to Gram and Soybean.
5. **Millet**: Nutrient significance of Sorghum, Finger millet, Pearl millet, Foxtail millet.

Unit-II:

6. **Spices**: General account with special reference to clove and black pepper.
7. **Fruits and Nuts**: Commercial and nutritional value of South Indian fruits. Cashew nut, Almond and Walnut.
8. **Beverages**: Tea & Coffee - morphology, processing, uses.
10. **Fiber Yielding Plants**: General description with special reference to Cotton (Botanical name, family, part used, morphology and uses).

Suggested Readings

B.Sc. III Year  
Semester-V  
Skill Enhancement Course  
SEC-3 (2 hrs/week)  
(Credits 2) Lectures: 30

Nursery and Gardening

Unit-I
1. Nursery: definition, objectives and scope and building up of infrastructure for nursery, planning and seasonal activities - Planting - direct seeding and transplants. (4h)
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. (6h)
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. (6h)

Unit-II
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. (8h)
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. (6h)

Suggested Readings
DSC-1F (3hrs./week) Core

Credits-3

Theory Syllabus

(45 hours)

UNIT - I
1. Plant-Water Relations: Importance of water to plant life, physical properties of water, diffusion, imbibition, osmosis; water, osmotic and pressure potentials; absorption, transport of water, Ascent of sap; Transpiration; Stomatal structure and movements. (7h)
2. Mineral Nutrition: Essential macro and micro mineral nutrients and their role; symptoms of mineral deficiency. (3h)
3. Translocation of organic substances: Mechanism of phloem transport. (2h)
4. Enzymes: Nomenclature, Characteristics, Classification, Mechanism and regulation of enzyme action, factors regulating enzyme activity. (3h)

UNIT - II
5. Photosynthetic pigments, absorption and action spectra; Red drop and Emerson enhancement effect; concept of two photosystems; mechanism of photosynthetic electron transport and evolution of oxygen; Factors effecting Photosynthesis, Photophosphorylation. (6h)
6. Carbon assimilation pathways: C3, C4 and CAM. (4h)
7. Nitrogen Metabolism: Biological nitrogen fixation, nitrate reduction, ammonia assimilation, (GS-GOGAT, transamination) (4h)

UNIT - III
8. Respiration: Aerobic and Anaerobic; Glycolysis, Krebs cycle; electron transport system, mechanism of oxidative phosphorylation, pentose phosphate pathway. (5h)
9. Growth and Development: Physiological effects of phytohormones–Auxins, gibberellins, cytokinins, ABA, ethylene and Brassinosteroids (5h)
10. Physiology of flowering and photoperiodism. Role of Phytochrome in flowering. (3h)
11. Stress physiology: Concept of water, salt and temperature stresses and plant responses. (3h)
References:
Plant Physiology
Practical Syllabus

(30 hours)

1. Determination of osmotic potential of vacuolar sap by Plasmolytic method using leaves of *Rheodiscolor* / *Tradescantia*. (4h)
2. Determination of rate of transpiration using Cobalt chloride method (2h)
3. Determination of stomatal frequency using leaf epidermal peelings / impressions (4h)
4. Determination of catalase activity using potato tubers by titration method (4h)
5. Separation of chloroplast pigments using paper chromatography technique (8h)
6. Estimation of protein by Biurette method (4h)
7. Mineral deficiency- Detail study of Micronutrients and Macro nutrients (2h)
8. Identification of C₃, C₄ and CAM plants (2h)
B.Sc (CBCS) Botany: III Year  
Semester-VI - Paper-VI  
Plant Physiology  
Practical Model paper  

Time: 2\frac{1}{2} \text{ hrs}  
Max. marks: 25  

I. Major Experiment:  
2. Determination of Catalase activity – Potato, tubers by titration method.  

II. Minor Experiment:  
1. Determination of Stomatal frequency using leaf epidermal peel/impressions.  
2. Determination of Rate of transpiration by Cobalt chloride method.  

III. Identify and Comment on: A, B & C  
1. Micronutrient Deficiency  
2. Macronutrients Deficiency  
3. C3, C4 and CAM plants.  

IV. Record  
(2 marks)
Tissue Culture and Biotechnology

DSE-1F (3 hrs./week)  Theory Syllabus  Credits-3

(45 hours)

UNIT - I
1. Tissue culture: Introduction, sterilization procedures, explants, culture media - composition and preparation; Micropropagation. (4h)
2. Organ culture: Vegetative Organs-Root, Shoot, Leaf culture
   Reproductive Organs-Anther, Ovary, Ovule, Embryo culture
3. Callus culture, Cell and Protoplast culture

UNIT- II
5. Applications of tissue culture: Production of pathogen free plants and somaclonal variants, production of stress resistance plants, secondary metabolites and synthetic seeds. (6h)
6. Induction of hairy roots and its applications in production of secondary metabolites. (2h)
7. Biotechnology: Introduction, history, scope and applications. (3h)
8. rDNA technology: Basic aspect of of gene cloning, Enzymes used in gene cloning-Restiction enzymes, Ligases, Polymerases. (4h)

UNIT- III
9. Gene cloning-Vectors – cloning vehicles (Plasmid , Cosmids, Bacteriophages , & Phasmids) application of r DNA technology. (5h)
11. Method of gene transfer in plants (Agrobacterium and Microprojectile) (4h)
12. Production of transgenic plants and application of transgenic in crop improvement:
   Bt-cotton and Brinjal. (2h)
References:
4. (India) Private Limited, Hyderabad.
10. Private Limited, Hyderabad..
Major Experiments
1. Isolation of plant DNA. (Tomato) (4h)
2. Production of synthetic seeds /Encapsulation of embryo (2h)
3. Preparation of plant tissue culture medium. (4h)

Minor Experiments
4. Callus induction (2h)
5. Demonstration of Micropropagation/ multiple shoots (4h)
6. Anther culture (2h)
7. PCR –Demonstration (2h)
8. Study of biotechnology products: Samples of antibiotics and vaccines (4h)
9. Photographs of Gene transfer methods. (2h)
10. Instruments used in Biotechnology lab- Autoclave, Laminar air flow, Hot air oven and Incubator. (4h)
B.Sc (CBCS) Botany-III Year
Semester-VI : Elective III
Tissue Culture and Biotechnology

Time: 2 ½ hrs

Max. marks : 25

Practical Model Paper

1. Major Experiment (9 marks)
   Isolation of DNA
   (OR)
   Production of synthetic seeds /Encapsulation of embryo

2. Minor Experiment (5 marks)
   Callus/ Micropropagation/Multiple shoots

3. Spotters (3x3=9 marks)
   A. Vaccines
   B. Antibiotics
   C. Gene transfer methods/ instruments

4. Record (2 marks)
B.Sc (CBCS) BOTANY: III YEAR
Semester-VI : Elective IV
Seed Technology

DSE- 1F (3 hrs./week) Credits-3

Theory Syllabus (45 hours)

UNIT- I
1. Seed development in cultivated plants, seed quality concept, importance of genetic purity of seed. Hybrid seed production and Heterosis. (4h)
2. Principles of hybrid seed production-Cross pollination, Emasculation, role of pollinators and their management. (5h)
3. Collection and storage of pollen for artificial pollination. (3h)

UNIT-II
5. Cultural practices and harvesting of Seed: Isolation, Sowing, Cultural practices, harvesting and threshing of the following crops: a) Rice b) Cotton c) Sunflower (4h)
6. Physico and Bio-chemical changes during seed storage. (3h)
7. Seed Treatment to control seed borne disease –General account (3h)
8. Seed production technology; seed testing- Procedures of seed testing, seed testing laboratories and importance of seed testing. (4h)

UNIT-III
9. Seed viability, factors affecting seed viability and genetic erosion. (4h)
11. Seed banks- National, International and Millennium seed banks. (3h)
12. Seed certification- History, Seed certification agency, Indian minimum, general and specific seed certification standard. (4h)
References:
Major Experiment
1. Testing of seed viability using 2, 3, 5-triphenyl tetrazolium chloride (TTC). (2h)
2. Estimation of amylase activity of germinating seeds (Qualitatively). (2h)
3. Demonstration of seed dressing using fungicides to control seed borne diseases. (2h)
4. Demonstration of seed dressing using Biofertilizers (BGA) to enrich nutrient supply. (2h)

Minor Experiments
5. Emasculation, bagging of flower for hybrid seed production. (4h)
6. Dissection of Dicot embryo (bean) and Monocot embryo (maize). (4h)
7. Pollen viability test using Evan’s blue staining. (Hibiscus). (2h)
8. Harvesting and Importance of following seeds: (4h)
   a) Rice
   b) Maize
   c) Cotton
   d) Groundnut and
   e) Sunflower.
9. Methods to break Seed dormancy (2h)
10. Study visits to research institutes, seed tests and certification laboratories and places seed banks. (6h)
1. Major Experiment. (9 marks)
a) Estimation of amylase activity in germinating seeds.
   (OR)
   b) Seed viability test by triphenyl tetrazolium chloride (TTC)
2. Minor Experiment. (5 marks)
a) Dissection of Dicot / Monocot embryo
   (OR)
   b) Methods to break Seed dormancy / Seed dressing.
3. Spotters (3x3=9 marks)
   A. Emasculation / Bagging
   B. Germination of sedds.
   C. Importance of following seeds: rice, cotton and sunflower.
4. Record (2 marks)
B.Sc. III Year
Semester-VI
Plant Biodiversity and Human Welfare

GE-2E (2 hrs/week) Credits-2          Generic Elective-II          30 hours

Theory Syllabus

Unit-I:

1. **Plant diversity and its scope** - Genetic diversity, Species diversity, Plant diversity at The ecosystem level, Agro-biodiversity and cultivated plant taxa, wild taxa. Values and uses of Biodiversity: Ethical and aesthetic values, Precautionary principle, Methodologies for valuation, Uses of plants, Uses of microbes.

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,

3. **Conservation of Biodiversity**: Conservation of genetic diversity, species diversity and ecosystem diversity, *In situ* and *ex situ* conservation, Social approaches to conservation, Biodiversity awareness programmes, Sustainable development.

Unit-II:

4. **Role of plants in relation to Human Welfare**: a) Importance of forestry their utilization and commercial aspects. b) Avenue trees. c) Ornamental plants of India. d) Alcoholic beverages through ages. Wood and its uses.

5. **Fruits and nuts**: Important fruit crops their commercial importance.

6. **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.

Suggested Readings
Mushroom Culture Technology

UNIT-I
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*. (5h)

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. Pure culture: Medium, sterilization, preparation of spawn, multiplication. Mushroom bed preparation - paddy straw, sugarcane trash, maize straw, banana leaves. (10h)

3. Factors affecting the mushroom bed preparation - Low cost technology, Composting technology in mushroom production. (2h)

UNIT-II

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

Suggested Readings