Proposed syllabus and Structure

For

B. Sc. with Botany

Submitted

to

University Grants Commission
New Delhi

Under

Choice Based Credit System
## Details of Courses Under Undergraduate Program (B.Sc.)

<table>
<thead>
<tr>
<th>Course</th>
<th>*Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Theory+ Practical</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>I. Core Course</strong></td>
<td>12X4= 48</td>
</tr>
<tr>
<td>(12 Papers)</td>
<td></td>
</tr>
<tr>
<td>04 Courses from each of the</td>
<td></td>
</tr>
<tr>
<td>03 disciplines of choice</td>
<td></td>
</tr>
<tr>
<td><strong>Core Course Practical / Tutorial</strong></td>
<td>12X2=24</td>
</tr>
<tr>
<td>(12 Practical/ Tutorials*)</td>
<td></td>
</tr>
<tr>
<td>04 Courses from each of the</td>
<td></td>
</tr>
<tr>
<td>03 Disciplines of choice</td>
<td></td>
</tr>
<tr>
<td><strong>II. Elective Course</strong></td>
<td>6x4=24</td>
</tr>
<tr>
<td>(6 Papers)</td>
<td></td>
</tr>
<tr>
<td>Two papers from each discipline of choice</td>
<td></td>
</tr>
<tr>
<td>including paper of interdisciplinary nature.</td>
<td></td>
</tr>
<tr>
<td><strong>Elective Course Practical / Tutorials</strong></td>
<td>6 X 2=12</td>
</tr>
<tr>
<td>(6 Practical / Tutorials*)</td>
<td></td>
</tr>
<tr>
<td>Two Papers from each discipline of choice</td>
<td></td>
</tr>
<tr>
<td>including paper of interdisciplinary nature</td>
<td></td>
</tr>
<tr>
<td>• Optional Dissertation or project work in place of one Discipline elective paper (6 credits) in 6th Semester</td>
<td></td>
</tr>
</tbody>
</table>
III. Ability Enhancement Courses

1. Ability Enhancement Compulsory
   2 X 2=4
   2X2=4
   (2 Papers of 2 credits each)
   Environmental Science
   English/MIL Communication

2. Skill Enhancement Course
   4 X 2=8
   4 X 2=8
   (Skill Based)
   (4 Papers of 2 credits each)

   Total credit= 120

Institute should evolve a system/policy about ECA/ General Interest/Hobby/Sports/NCC/NSS/related courses on its own.

*wherever there is practical there will be no tutorials and vice-versa
### Proposed scheme for choice based credit system in B. Sc. with Botany

<table>
<thead>
<tr>
<th>DISCIPLINE</th>
<th>CORE COURSE (12)</th>
<th>Ability Enhancement Compulsory Course (AECC) (2)</th>
<th>Skill Enhancement Course (SEC) (2)</th>
<th>Discipline Specific Elective DSE (6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Discipline-1 Botany Paper I: Biodiversity (Microbes, Algae, Fungi and Archegoniate)</td>
<td>(English/MIL Communication)/ Environmental Science</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>DSC- 2 Paper I</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>DSC- 3 Paper I</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>Discipline-1 Botany Paper II: Plant Ecology and Taxonomy</td>
<td>Environmental Science /(English/MIL Communication)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>DSC- 2 Paper II</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>DSC- 3 Paper II</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>III</td>
<td>Discipline-1 Botany Paper III: Plant Anatomy and Embryology</td>
<td></td>
<td>SEC-1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>DSC- 2 Paper III</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>DSC- 3 Paper III</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IV</td>
<td>Discipline-1 Botany</td>
<td></td>
<td>SEC -2</td>
<td></td>
</tr>
<tr>
<td>Paper IV: Plant Physiology and Metabolism</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>------------------------------------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DSC- Discipline 2 Paper IV</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DSC- Discipline 3 Paper IV</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| V | SEC -3 | DSE-Botany Paper I |
|----------------------------------------|-------------------|
| | | DSE-Discipline 2 Paper I |
| | | DSE-Discipline 3 Paper I |

<p>| VI | SEC -4 | DSE-Botany Paper II |
|----------------------------------------|-------------------|
| | | DSE-Discipline 2 Paper II |
| | | DSE-Discipline 3 Paper II |</p>
<table>
<thead>
<tr>
<th>SEMESTER</th>
<th>COURSE OPTED</th>
<th>COURSE NAME</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Ability Enhancement Compulsory Course-I</td>
<td>English/MIL communications/ Environmental Science</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Core course - Botany Paper I</td>
<td>Biodiversity (Microbes, Algae, Fungi and Archeogniate)</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Core Course - Paper I Practical/Tutorial</td>
<td>Biodiversity (Microbes, Algae, Fungi and Archeogniate) Lab</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Discipline- 2 Paper I</td>
<td>DSC- 2 Paper I</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Discipline- 2 Paper I Practical</td>
<td>DSC- 2 Paper I Practical</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Discipline - 3 Paper I</td>
<td>DSC- 3 Paper I</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Discipline - 3 Paper I Practical</td>
<td>DSC- 2 Paper I Practical</td>
<td>2</td>
</tr>
<tr>
<td>II</td>
<td>Ability Enhancement Compulsory Course-II</td>
<td>English/MIL communications/ Environmental Science</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Core course-Botany Paper II</td>
<td>Plant Ecology and Taxonomy</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Core Course- Botany Paper II Practical/Tutorial</td>
<td>Plant Ecology and Taxonomy Lab</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Discipline - 2 Paper II</td>
<td>DSC- 2 Paper 2</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Discipline -2 Paper II Practical</td>
<td>DSC- 2 Paper 2 Practical</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Discipline - 3 Paper II</td>
<td>DSC- 3 Paper 2</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Discipline - 3 Paper II Practical</td>
<td>DSC- 3 Paper 2 Practical</td>
<td>2</td>
</tr>
<tr>
<td>III</td>
<td>Core course- Botany Paper III</td>
<td>Plant Anatomy and Embryology</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Core Course- Botany Paper III Practical/Tutorial</td>
<td>Plant Anatomy and Embryology Practical</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Discipline - 2 Paper III</td>
<td>DSC- 2 Paper III</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Discipline - 2 Paper III Practical</td>
<td>DSC- 2 Paper III Practical</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Discipline - 3 Paper III</td>
<td>DSC- 3 Paper III</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Discipline - 3 Paper III Practical</td>
<td>DSC- 3 Paper III Practical</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Skill Enhancement Course -1</td>
<td>SEC-1</td>
<td>2</td>
</tr>
<tr>
<td>IV</td>
<td>Core course- Botany Paper IV</td>
<td>Plant Physiology and Metabolism</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Course- Botany Paper IV Practical</td>
<td>Plant Physiology and Metabolism Practical</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Discipline - 2 Paper IV</td>
<td>DSC- 2 Paper IV Theory</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Discipline - 2 Paper IV Practical</td>
<td>DSC- 2 Paper IV Practical</td>
<td>2</td>
</tr>
<tr>
<td>Discipline - 3 Paper IV</td>
<td>DSC- 3 Paper IV Theory</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>----------------------------------</td>
<td>-----------------------</td>
<td>----</td>
<td></td>
</tr>
<tr>
<td>Discipline - 3 Paper IV Practical</td>
<td>DSC- 3 Paper IV</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Skill Enhancement Course -2</td>
<td>SEC -2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>V</td>
<td>Skill Enhancement Course -3</td>
<td>SEC -3</td>
<td>2</td>
</tr>
<tr>
<td>Discipline Specific Elective –Botany Paper I</td>
<td>DSE-Botany Paper I</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Discipline Specific Elective –Botany Paper I Practical</td>
<td>DSE-Botany Paper I Practical</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Discipline Specific Elective –Discipline 2 Paper I</td>
<td>DSE-Discipline 2 Paper I</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Discipline Specific Elective –Discipline 2 Paper I Practical</td>
<td>DSE-Discipline 2 Paper I Practical</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Discipline Specific Elective –Discipline 3 Paper I</td>
<td>DSE- Discipline 3 Paper I</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Discipline Specific Elective –Discipline 3 Paper I Practical</td>
<td>DSE-Discipline 2 Paper I Practical</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>VI</td>
<td>Skill Enhancement Course -4</td>
<td>SEC -4</td>
<td>2</td>
</tr>
<tr>
<td>Discipline Specific Elective –Botany Paper II</td>
<td>DSE-Botany Paper II</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Discipline Specific Elective –Botany Paper II Practical</td>
<td>DSE-Botany Paper II Practical</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Discipline Specific Elective –Discipline 2 Paper II</td>
<td>DSE-Discipline 2 Paper II</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Discipline Specific Elective –Discipline 2 Paper II Practical</td>
<td>DSE-Discipline 3 Paper II Practical</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Discipline Specific Elective –Discipline 3 Paper II</td>
<td>DSE- Discipline 3 Paper II</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Discipline Specific Elective –Discipline 3 Paper II Practical</td>
<td>DSE- Discipline 3 Paper II Practical</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

| Total Credits                      |                         | 120 |
Details of Courses

Core Courses – Botany

1. Biodiversity (Microbes, Algae, Fungi and Archegoniate)
2. Plant Ecology and Taxonomy
3. Plant Anatomy and Embryology
4. Plant Physiology and Metabolism

Discipline Specific Electives- Botany (Any two)

1. Economic Botany and Biotechnology
2. Cell and Molecular Biology
3. Analytical Techniques in Plant Sciences
4. Bioinformatics
5. Research Methodology
6. Dissertation

Ability Enhancement Compulsory Courses

1. Environmental Science
2. English/MIL Communication

Skill Enhancement Courses (Any four)

Botany

1. Biofertilizers
2. Herbal Technology
3. Nursery and Gardening
4. Floriculture
5. Medicinal Botany
6. Plant Diversity and Human Welfare
7. Ethnobotany
8. Mushroom Culture Technology
9. Intellectual Property Right
Core Courses
Semester I

Core Course: Botany Paper I
Biodiversity (Microbes, Algae, Fungi and Archegoniate)

Credits: Theory-4, Practicals-2

Theory
Lectures: 60

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: Introduction to Archegoniate (2 Lectures)
Unifying features of archegoniates, Transition to land habit, Alternation of generations.

Unit 5: Bryophytes (10 Lectures)
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 6: Pteridophytes (8 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.

Unit 4: Gymnosperms (6 Lectures)
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.

Practical

5. EMs/Models of viruses – T-Phage and TMV, Line drawing/Photograph of Lytic and Lysogenic Cycle.
6. Types of Bacteria from temporary/permanent slides/photographs; EM bacterium; Binary Fission; Conjugation; Structure of root nodule.
7. Gram staining
8. 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)
9. Rhizopus and Penicillium: Asexual stage from temporary mounts and sexual structures through permanent slides.
10. Alternaria: Specimens/photographs and tease mounts.
11. 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.
12. Agaricus: Specimens of button stage and full grown mushroom; Sectioning of gills of Agaricus.
13. Lichens: Study of growth forms of lichens (crustose, foliose and fruticose)
14. Mycorrhiza: ecto mycorrhiza and endo mycorrhiza (Photographs)
15. 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).
16. Funaria- morphology, w.m. leaf, rhizoids, operculum, peristome, annulus, spores (temporary slides); permanent slides showing antheridal and archegonial heads, l.s. capsule and protonema.
17. 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).
18. Equisetum- morphology, t.s. internode, l.s. strobilus, t.s. strobilus, w.m. sporangioaphore, w.m. spores (wet and dry)(temporary slides); t.s rhizome (permanent slide).
19. 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).
microsporophyll, w.m. spores (temporary slides), l.s. ovule, t.s. root (permanent slide).

21. *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).

**Suggested Readings**

Semester II

Core Course Botany –Paper II
Plant Ecology and Taxonomy

(Credits: Theory-4, Practicals-2)

THEORY
Lectures: 60

Unit 1: Introduction (2 Lectures)

Unit 2: Ecological factors (10 Lectures)

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).

**Practical**

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 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):Brassicaceae - *Brassica, Alyssum / Iberis*; Asteraceae - *Sonchus/Launaea, Vernonia/Ageratum, Eclipta/Tridax*; Solanaceae - *Solanum nigrum, Withania*; Lamiaceae - *Salvia, Ocimum*; Liliaceae - *Asphodelus / Lilium / Allium*.
8. Mounting of a properly dried and pressed specimen of any wild plant with herbarium label (to be submitted in the record book).

**Suggested Readings**

Semester III

Core Course Botany – Paper III
Plant Anatomy and Embryology

(Credits: Theory-4, Practicals-2)

THEORY
Lectures: 60

Unit 1: Meristematic and permanent tissues
Root and shoot apical meristems; Simple and complex tissues.

Unit 2: Organs
Structure of dicot and monocot root stem and leaf.

Unit 3: Secondary Growth

Unit 4: Adaptive and protective systems
Epidermis, cuticle, stomata; General account of adaptations in xerophytes and hydrophytes.

Unit 5: Structural organization of flower
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
Pollination mechanisms and adaptations; Double fertilization; Seed-structure appendages and dispersal mechanisms.

Unit 7: Embryo and endosperm
Endosperm types, structure and functions; Dicot and monocot embryo; Embryo-endosperm relationship.

Unit 8: Apomixis and polyembryony
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)
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.
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.

**Suggested Readings**

Core Course Botany –Paper IV  
Plant Physiology and Metabolism  
(Credits: Theory-4, Practicals-2)

THEORY  
Lectures: 60

Unit 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.

Unit 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.

**Suggested Readings**

Discipline Centric Elective Courses

Two (2) be selected from each of the three disciplines

 Discipline Centric Elective Botany
Cell and Molecular Biology

(Credits: Theory-4, Practicals-2)

THEORY
Lectures: 60

Unit 1: Techniques in Biology
(8 Lectures)

Principles of microscopy; Light Microscopy; Phase contrast microscopy; Fluorescence microscopy; Confocal microscopy; Sample Preparation for light microscopy; Electron microscopy (EM)- Scanning EM and Scanning Transmission EM (STEM); Sample Preparation for electron microscopy; X-ray diffraction analysis.

Unit 2: Cell as a unit of Life
(2 Lectures)

The Cell Theory; Prokaryotic and eukaryotic cells; Cell size and shape; Eukaryotic Cell components.

Unit 3: Cell Organelles
(20 Lectures)

Mitochondria: Structure, marker enzymes, composition; Semiautonomous nature; Symbiont hypothesis; Proteins synthesized within mitochondria; mitochondrial DNA.

Chloroplast Structure, marker enzymes, composition; semiautonomous nature, chloroplast DNA.

ER, Golgi body & Lysosomes: Structures and roles.

Peroxisomes and Glyoxisomes: Structures, composition, functions in animals and plants and biogenesis.

Nucleus: Nuclear Envelope- structure of nuclear pore complex; chromatin; molecular organization, DNA packaging in eukaryotes, euchromatin and heterochromatin, nucleolus and ribosome structure (brief).

Unit 4: Cell Membrane and Cell Wall
(6 Lectures)

The functions of membranes; Models of membrane structure; The fluidity of membranes; Membrane proteins and their functions; Carbohydrates in the membrane; Faces of the membranes; Selective permeability of the membranes; Cell wall.

Unit 5: Cell Cycle
(6 Lectures)
Overview of Cell cycle, Mitosis and Meiosis; Molecular controls.

**Unit 6: Genetic material**

DNA: Miescher to Watson and Crick- historic perspective, Griffith’s and Avery’s transformation experiments, Hershey-Chase bacteriophage experiment, DNA structure, types of DNA, types of genetic material.

DNA replication (Prokaryotes and eukaryotes): bidirectional replication, semi–conservative, semi discontinuous RNA priming, Ø (theta) mode of replication, replication of linear, ds-DNA, replicating the 5’ end of linear chromosome including replication enzymes.

**Unit 7: Transcription (Prokaryotes and Eukaryotes)**

Types of structures of RNA (mRNA, tRNA, rRNA), RNA polymerase- various types; Translation (Prokaryotes and eukaryotes), genetic code.

**Unit 8: Regulation of gene expression**

Prokaryotes:Lac operon and Tryptophan operon ; and in Eukaryotes.

**Practical**

1. To study prokaryotic cells (bacteria), viruses, eukaryotic cells with the help of light and electron micrographs.
2. Study of the photomicrographs of cell organelles
3. To study the structure of plant cell through temporary mounts.
4. To study the structure of animal cells by temporary mounts-squamous epithelial cell and nerve cell.
5. Preparation of temporary mounts of striated muscle fiber
6. To prepare temporary stained preparation of mitochondria from striated muscle cells
7. Study of mitosis and meiosis (temporary mounts and permanent slides).
8. Study the effect of temperature, organic solvent on semi permeable membrane.
9. Demonstration of dialysis of starch and simple sugar.
10. Study of plasmolysis and deplasmolysis on Rhoeo leaf.
11. Measure the cell size (either length or breadth/diameter) by micrometry.
12. Study the structure of nuclear pore complex by photograph (from Gerald Karp)Study of special chromosomes (polytene & lampbrush) either by slides or photographs.
13. Study DNA packaging by micrographs.
14. Preparation of the karyotype and ideogram from given photograph of somatic metaphase chromosome.
Suggested Readings

Discipline Specific Elective Botany
Economic Botany and Biotechnology

(Credits: Theory-4, Practicals-2)

THEORY
Lectures: 60

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.

Suggested Readings

Discipline Centric Elective Botany

Genetics and Plant Breeding

(Credits: Theory-4, Practical-2)

THEORY
Lectures: 60

Unit 1: Heredity (20 Lectures)
1. Brief life history of Mendel
2. Terminologies
3. Laws of Inheritance
5. Chi Square
6. Pedigree Analysis
8. Multiple allelism
9. Pleiotropism

Unit 2: Sex-determination and Sex-linked Inheritance (4 Lectures)

Unit 3: Linkage and Crossing over (8 Lectures)
Linkage: concept & history, complete & incomplete linkage, bridges experiment, coupling & repulsion, recombination frequency, linkage maps based on two and three factor crosses.
Crossing over: concept and significance, cytological proof of crossing over.

Unit 4: Mutations and Chromosomal Aberrations (4 Lectures)
Types of mutations, effects of physical & chemical mutagens. Numerical chromosomal changes: Euploidy, Polyploidy and Aneuploidy; Structural chromosomal changes: Deletions, Duplications, Inversions & Translocations.

Unit 5: Plant Breeding (4 lectures)

Unit 6: Methods of crop improvement (8 lectures)
Introduction: Centres of origin and domestication of crop plants, plant genetic resources; Acclimatization; Selection methods: For self pollinated, cross pollinated and vegetatively propagated plants; Hybridization: For self, cross and vegetatively propagated plants – Procedure, advantages and limitations.

Unit 7: Quantitative inheritance (4 lectures)
Concept, mechanism, examples. Monogenic vs polygenic Inheritance.

**Unit 8: Inbreeding depression and heterosis**  (4 lectures)
History, genetic basis of inbreeding depression and heterosis; Applications.

**Unit 9: Crop improvement and breeding**  (4 lectures)
Role of mutations; Polyploidy; Distant hybridization and role of biotechnology in crop improvement.

**Practical**

1. Mendel’s laws through seed ratios. Laboratory exercises in probability and chi-square.
2. Chromosome mapping using point test cross data.
3. Pedigree analysis for dominant and recessive autosomal and sex linked traits.
5. Study of aneuploidy: Down’s, Klinefelter’s and Turner’s syndromes through photographs.
6. Photographs/Permanent Slides showing Translocation Ring, Laggards and Inversion Bridge.
7. Hybridization techniques - Emasculation, Bagging (For demonstration only).
8. Induction of polyploidy conditions in plants (For demonstration only).

**Suggested Readings**

Discipline Specific Elective Botany

Analytical Techniques in Plant Sciences

(Credits: Theory-4, Practicals-2)

THEORY
Lectures: 60

Unit 1: Imaging and related techniques  (15 Lectures)

Principles of microscopy; Light microscopy; Fluorescence microscopy; Confocal microscopy; Use of fluorochromes: (a) Flow cytometry (FACS); (b) Applications of fluorescence microscopy: Chromosome banding, FISH, chromosome painting; Transmission and Scanning electron microscopy – sample preparation for electron microscopy, cryofixation, negative staining, shadow casting, freeze fracture, freeze etching.

Unit 2: Cell fractionation  (8 Lectures)
Centrifugation: Differential and density gradient centrifugation, sucrose density gradient, CsCl₂ gradient, analytical centrifugation, ultracentrifugation, marker enzymes.

Unit 3: Radioisotopes
Use in biological research, auto-radiography, pulse chase experiment.  (4 Lectures)

Unit 4: Spectrophotometry
Principle and its application in biological research.  (4 Lectures)

Unit 5: Chromatography  (8 Lectures)
Principle; Paper chromatography; Column chromatography, TLC, GLC, HPLC, Ion-exchange chromatography; Molecular sieve chromatography; Affinity chromatography.

Unit 6: Characterization of proteins and nucleic acids  (6 Lectures)
Mass spectrometry; X-ray diffraction; X-ray crystallography; Characterization of proteins and nucleic acids; Electrophoresis: AGE, PAGE, SDS-PAGE

Unit 7: Biostatistics  (15 Lectures)
Statistics, data, population, samples, parameters; Representation of Data: Tabular, Graphical; Measures of central tendency: Arithmetic mean, mode, median; Measures of dispersion: Range, mean deviation, variation, standard deviation; Chi-square test for goodness of fit.
Practicals

1. Study of Blotting techniques: Southern, Northern and Western, DNA fingerprinting, DNA sequencing, PCR through photographs.

2. Demonstration of ELISA.

3. To separate nitrogenous bases by paper chromatography.

4. To separate sugars by thin layer chromatography.

5. Isolation of chloroplasts by differential centrifugation.

6. To separate chloroplast pigments by column chromatography.

7. To estimate protein concentration through Lowry’s methods.

8. To separate proteins using PAGE.

9. To separate DNA (marker) using AGE.

10. Study of different microscopic techniques using photographs/micrographs (freeze fracture, freeze etching, negative staining, positive staining, fluorescence and FISH).

11. Preparation of permanent slides (double staining).

Suggested Readings


Discipline Centric Elective Botany

Bioinformatics

(Credits: Theory-4, Practicals-2)

THEORY
Lectures: 60

Unit 1: Introduction to Bioinformatics (5 Lectures)
Introduction, Branches of Bioinformatics, Aim, Scope and Research areas of Bioinformatics.

Unit 2: Databases in Bioinformatics (5 Lectures)
Introduction, Biological Databases, Classification format of Biological Databases, Biological Database Retrieval System.

Unit 3: Biological Sequence Databases (25 Lectures)
National Center for Biotechnology Information (NCBI): Tools and Databases of NCBI, Database Retrieval Tool, Sequence Submission to NCBI, Basic local alignment search tool (BLAST), Nucleotide Database, Protein Database, Gene Expression Database.
EMBL Nucleotide Sequence Database (EMBL-Bank): Introduction, Sequence Retrieval, Sequence Submission to EMBL, Sequence analysis tools.
DNA Data Bank of Japan (DDBJ): Introduction, Resources at DDBJ, Data Submission at DDBJ.
Protein Information Resource (PIR): About PIR, Resources of PIR, Databases of PIR, Data Retrieval in PIR.
Swiss-Prot: Introduction and Salient Features.

Unit 4: Sequence Alignments (10 Lectures)
Introduction, Concept of Alignment, Multiple Sequence Alignment (MSA), MSA by CLUSTALW, Scoring Matrices, Percent Accepted Mutation (PAM), Blocks of Amino Acid Substitution Matrix (BLOSUM).

Unit 5: Molecular Phylogeny (8 Lectures)
Methods of Phylogeny, Software for Phylogenetic Analyses, Consistency of Molecular Phylogenetic Prediction.

Unit 6: Applications of Bioinformatics (7 Lectures)
Structural Bioinformatics in Drug Discovery, Quantitative structure-activity relationship (QSAR) techniques in Drug Design, Microbial genome applications, Crop improvement.

Practical

11. Nucleic acid and protein databases.
12. Sequence retrieval from databases.
13. Sequence alignment.
14. Sequence homology and Gene annotation.

Suggested Readings

Discipline Specific Elective Botany

Research Methodology

(Credits: Theory-4, Practicals-2)

THEORY
Lectures: 60

Unit 1: Basic concepts of research (10 Lectures)
Research-definition and types of research (Descriptive vs analytical; applied vs fundamental; quantitative vs qualitative; conceptual vs empirical). Research methods vs methodology. Literature-review and its consolidation; Library research; field research; laboratory research.

Unit 2: General laboratory practices (12 Lectures)

Unit 3: Data collection and documentation of observations (6 Lectures)
Maintaining a laboratory record; Tabulation and generation of graphs. Imaging of tissues specimens and application of scale bars. The art of field photography.

Unit 4: Overview of Biological Problems (6 Lectures)
History; Key biology research areas, Model organisms in biology (A Brief overview): Genetics, Physiology, Biochemistry, Molecular Biology, Cell Biology, Genomics, Proteomics-Transcriptional regulatory network.

Unit 5: Methods to study plant cell/tissue structure (6 Lectures)
Whole mounts, peel mounts, squash preparations, clearing, maceration and sectioning; Tissue preparation: living vs fixed, physical vs chemical fixation, coagulating fixatives, non-coagulant fixatives; tissue dehydration using graded solvent series; Paraffin and plastic infiltration; Preparation of thin and ultrathin sections.

Unit 6: Plant microtechniques (12 Lectures)
Staining procedures, classification and chemistry of stains. Staining equipment. Reactive
dyes and fluorochromes (including genetically engineered protein labeling with GFP and other tags). Cytogenetic techniques with squashed plant materials.

**Unit 7: The art of scientific writing and its presentation**  
(8 Lectures)

Numbers, units, abbreviations and nomenclature used in scientific writing. Writing references. Powerpoint presentation. Poster presentation. Scientific writing and ethics, Introduction to copyright-academic misconduct/plagiarism.

**Practical**

1. Experiments based on chemical calculations.
2. Plant microtechnique experiments.
3. The art of imaging of samples through microphotography and field photography.
4. Poster presentation on defined topics.
5. Technical writing on topics assigned.

**Suggested Readings**

Skill Enhancement Courses
Skill Enhancement Course

Biofertilizers

(Credits 2)

Lectures: 30

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

(4 Lectures)


(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)


(8 Lectures)


(6 Lectures)

Suggested Readings

Skill Enhancement Course

Herbal Technology

(Credits 2)

Lectures: 30

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 medicinal 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)

Suggested Readings


Skill Enhancement Course  
Nursery and Gardening

(Credits 2)

Lectures: 30

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. (6 Lectures)

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)

Suggested Readings

Skill Enhancement Course

Floriculture

(Credits 2)

Lectures: 30

Unit 1: Introduction: History of gardening; Importance and scope of floriculture and landscape gardening. (2 Lectures)

Unit 2: Nursery Management and Routine Garden Operations: Sexual and vegetative methods of propagation; Soil sterilization; Seed sowing; Pricking; Planting and transplanting; Shading; Stopping or pinching; Defoliation; Wintering; Mulching; Topiary; Role of plant growth regulators. (8 Lectures)

Unit 3: Ornamental Plants: Flowering annuals; Herbaceous perennials; Divine vines; Shade and ornamental trees; Ornamental bulbous and foliage plants; Cacti and succulents; Palms and Cycads; Ferns and Selaginellas; Cultivation of plants in pots; Indoor gardening; Bonsai. (4 Lectures)

Unit 4: Principles of Garden Designs: English, Italian, French, Persian, Mughal and Japanese gardens; Features of a garden (Garden wall, Fencing, Steps, Hedge, Edging, Lawn, Flower beds, Shrubbery, Borders, Water garden. Some Famous gardens of India. (4 Lectures)

Unit 5: Landscaping Places of Public Importance: Landscaping highways and Educational institutions. (4 Lectures)

Unit 6: Commercial Floriculture: Factors affecting flower production; Production and packaging of cut flowers; Flower arrangements; Methods to prolong vase life; Cultivation of Important cut flowers (Carnation, Aster, Chrysanthemum, Dahlia, Gerbera, Gladiolous, Marigold, Rose, Lilium, Orchids). (6 Lectures)

Unit 7: Diseases and Pests of Ornamental Plants. (2 Lectures)

Suggested Readings

Skill Enhancement Course

Medicinal Botany

(Credits 2)

Lectures: 30


Unit 2: Conservation of endangered and endemic medicinal plants. Definition: endemic and endangered medicinal plants, Red list criteria; In situ conservation: Biosphere reserves, sacred groves, National Parks; Ex situ conservation: Botanic Gardens, Ethnomedicinal plant Gardens. Propagation of Medicinal Plants: Objectives of the nursery, its classification, important components of a nursery, sowing, pricking, use of green house for nursery production, propagation through cuttings, layering, grafting and budding. (10 Lectures)

Unit 3: Ethnobotany and Folk medicines. Definition; Ethnobotany in India: Methods to study ethnobotany; Applications of Ethnobotany: National interacts, Palaeo-ethnobotany, folk medicines of ethnobotany, ethnomedicine, ethnoecology, ethnic communities of India. Application of natural products to certain diseases- Jaundice, cardiac, infertility, diabetics, Blood pressure and skin diseases. (10 Lectures)

Suggested Readings


Skill Enhancement Course  
Plant Diversity and Human Welfare  
(Credits 2)  
Lectures: 30

Unit 1: Plant diversity and its scope- Genetic diversity, Species diversity, Plant diversity at the ecosystem level, Agrobiodiversity 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.  
(8 Lectures)

Unit 2: Loss of Biodiversity: Loss of genetic diversity, Loss of species diversity, Loss of ecosystem diversity, Loss of agrobiodiversity, Projected scenario for biodiversity loss,  
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. 
(8 Lectures)

Unit 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.  
(8 Lectures)

Unit 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. Fruits and nuts: Important fruit crops their commercial importance. Wood and its uses.  
(6 Lectures)

Suggested Readings

Skill Enhancement Course

Ethnobotany

(Credits 2)
Lectures: 30

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 ethnomedical 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)

Suggested Readings
3) Lone et al., Palaeoethnobotony
Skill Enhancement Course  
Mushroom Culture Technology  
(Credits 2)  

Lectures: 30

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. 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.  

(12 Lectures)


(8 Lectures)


(5 Lectures)

Suggested Readings

Skill Enhancement Course

Intellectual Property Rights

(Credits 2)

Lectures: 30

Unit 1: Introduction to intellectual property right (IPR) (2 lectures)

Concept and kinds. Economic importance. IPR in India and world: Genesis and scope, some important examples. IPR and WTO (TRIPS, WIPO).

Unit 2: Patents (3 Lectures)


Unit 3: Copyrights (3 Lectures)

Introduction, Works protected under copyright law, Rights, Transfer of Copyright, Infringement.

Unit 4: Trademarks (3 Lectures)

Objectives, Types, Rights, Protection of goodwill, Infringement, Passing off, Defences, Domain name.

Unit 5: Geographical Indications (3 Lectures)

Objectives, Justification, International Position, Multilateral Treaties, National Level, Indian Position.

Unit 6: Protection of Traditional Knowledge (4 Lectures)

Objective, Concept of Traditional Knowledge, Holders, Issues concerning, Bio-Prospecting and Bio-Piracy, Alternative ways, Protectability, need for a Sui-Generis regime, Traditional Knowledge on the International Arena, at WTO, at National level, Traditional Knowledge Digital Library.

Unit 7: Industrial Designs (2 Lectures)

Objectives, Rights, Assignments, Infringements, Defences of Design Infringement

Unit 8: Protection of Plant Varieties (2 Lectures)

Plant Varieties Protection-Objectives, Justification, International Position, Plant varieties

**Unit 9: Information Technology Related Intellectual Property Rights (4 Lectures)**

Computer Software and Intellectual Property, Database and Data Protection, Protection of Semi-conductor chips, Domain Name Protection

**Unit 10: Biotechnology and Intellectual Property Rights.** (4 Lectures)

Patenting Biotech Inventions: Objective, Applications, Concept of Novelty, Concept of inventive step, Microorganisms, Moral Issues in Patenting Biotechnological inventions.

**Suggested Readings**