

flor

C.P. 4

79-

Chaudhary Bansi Lal University, Bhiwani

(A State University established under Haryana Act No. 25 of 2014)

1b
2



Syllabus and Examination Scheme

For

B.Sc. BOTANY
(SEMESTER I to VI)

2

Atyada

78 - G.P.S

SCHEME OF EXAMINATION
B.Sc. (PASS COURSE) BOTANY Semester I-IV

Semester I

| Paper No. | Paper Code | Name of Paper | Credits | Contact hours per week | Max Marks | Internal Assessment | Total |
|-----------|------------|--|---------|------------------------|-----------|---------------------|-------|
| Paper I | 20UBOT101 | Diversity of Microbes | 2 | 2 | 40 | 10 | 50 |
| Paper II | 20UBOT102 | Diversity of Archegoniates & Gymnosperms | 2 | 2 | 40 | 10 | 50 |
| Paper III | 20UBOT103 | Botany Lab I | 2 | 4 | 50 | --- | 50 |
| | | | 6 | 8 | 130 | 20 | 150 |

Semester II

| Paper No. | Paper Code | Name of Paper | Credit | Contact hours per week | Max marks | Internal Assessment | Total |
|-----------|------------|--------------------------|--------|------------------------|-----------|---------------------|-------|
| Paper I | 20UBOT201 | Ecology & Phytogeography | 2 | 2 | 40 | 10 | 50 |
| Paper II | 20UBOT202 | Plant Systematics | 2 | 2 | 40 | 10 | 50 |
| Paper III | 20UBOT203 | Botany Lab II | 2 | 4 | 50 | --- | 50 |
| | | | 6 | 8 | 130 | 20 | 150 |

Semester III


| Paper No. | Paper Code | Name of Paper | Credit | Contact hours per week | Max marks | Internal Assessment | Total |
|-----------|------------|------------------|--------|------------------------|-----------|---------------------|-------|
| Paper I | 20UBOT301 | Plant Anatomy | 2 | 2 | 40 | 10 | 50 |
| Paper II | 20UBOT302 | Plant Embryology | 2 | 2 | 40 | 10 | 50 |
| Paper III | 20UBOT303 | Botany Lab III | 2 | 4 | 50 | --- | 50 |
| | | | 6 | 8 | 130 | 20 | 150 |


Semester IV

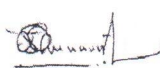
| Paper No. | Paper Code | Name of Paper | Credit | Contact hours per week | Max marks | Internal Assessment | Total |
|-----------|------------|------------------|--------|------------------------|-----------|---------------------|-------|
| Paper I | 20UBOT401 | Plant Physiology | 2 | 2 | 40 | 10 | 50 |
| Paper II | 20UBOT402 | Plant Metabolism | 2 | 2 | 40 | 10 | 50 |
| Paper III | 20UBOT403 | Botany Lab IV | 2 | 4 | 50 | --- | 50 |
| | | | 6 | 8 | 130 | 20 | 150 |



Prof. Lalita Gupta


Dr. Monika Miglani



Dr. Amita

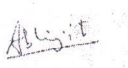

Dr. Poonam



Dr. Sunder Singh Arya

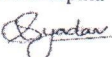

Sh. Mohan Lal


Ms. Deepika


Dr. K.D. Sharma


Mr. Abhijit Das


Mrs. Monika


Ms. Sudha

77

B.Sc. (PASS COURSE) BOTANY Semester V-VI

Semester V

| Paper No. | Paper Code | Name of Paper | Credit | Contact hours per week | Max marks | Internal Assessment | Total |
|-----------|-------------|---------------|--------|------------------------|-----------|---------------------|-------|
| Paper I | 20UBOTDSE5A | DSE I | 2 | 2 | 40 | 10 | 50 |
| Paper II | 20UBOTDSE5B | DSE II | 2 | 2 | 40 | 10 | 50 |
| Paper III | 20UBOTDSE5P | Botany Lab V | 2 | 4 | 50 | --- | 50 |
| | | | 6 | 8 | 130 | 20 | 150 |

Semester VI

| Paper No. | Paper Code | Name of Paper | Credit | Contact hours per week | Max marks | Internal Assessment | Total |
|-----------|-------------|---------------|--------|------------------------|-----------|---------------------|-------|
| Paper I | 20UBOTDSE6A | DSE I | 2 | 2 | 40 | 10 | 50 |
| Paper II | 20UBOTDSE6B | DSE II | 2 | 2 | 40 | 10 | 50 |
| Paper III | 20UBOTDSE6P | Botany Lab VI | 2 | 4 | 50 | --- | 50 |
| | | | 6 | 8 | 130 | 20 | 150 |

INTERNAL ASSESSMENT: - Internal Assessment for Practical Paper comprises of


- (i) Attendance 05
(ii) Seminar/Presentation/Report 05
Total 10

Discipline Specific Elective Course Offered by Department of Botany

| Semester | 6 th semester |
|---|---|
| <p><u>Choose any one group of papers from given three)</u></p> <p>UBOT501A Economic Botany & Biotechnology -I } UBOT501B Economic Botany & Biotechnology -II } UBOT502A Analytical techniques in Plant Science -I } UBOT502B Analytical techniques in Plant Science -II } UBOT503A Genetics & Plant Breeding -I } UBOT503B Genetics & Plant Breeding -II }</p> | <p><u>(choose any one group of papers from given three)</u></p> <p>20UBOT601A Cell & Molecular Biology -I } 20UBOT601B Cell & Molecular Biology -II } 20UBOT602A Environmental Biology -I } 20UBOT602B Environmental Biology -II } 20UBOT603A Biodiversity & Human Welfare -I } 20UBOT603B Biodiversity & Human Welfare -II }</p> |


Prof. Lalita Gupta


Dr. Monika Miglani



Dr. Amita


Dr. Poonam


Sh. MohanLal


Ms. Deepika


Dr. K.D. Sharma


Dr. Sunder SinghArya


Mr. Abhijit Das


Mrs. Monika


Ms. Sudha

76


CR-7


B.Sc. (PASS COURSE) BOTANY Semester IV –VI


Skill Enhancement Course Offered by Department of Botany


| SEMESTER-IV | | | | | | |
|-------------|-----------------------------|--------|------------------------|-----------|---------------------|-------|
| Paper Code | Name of Paper | Credit | Contact hours per week | Max marks | Internal Assessment | Total |
| 20SECB404 | Nursery & Gardening | 3 | 3 | 40 | 10 | 50 |
| SEMESTER-V | | | | | | |
| 20SECB504 | Herbal Technology | 3 | 3 | 40 | 10 | 50 |
| SEMESTER-VI | | | | | | |
| 20SECB604 | Mushroom Culture Technology | 3 | 3 | 40 | 10 | 50 |



Prof. Lalita Gupta



Dr. Monika Miglani

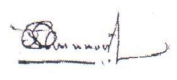

Dr. Amita



Dr. Poonam



Sh. Mohan Lal



Ms. Deepika


Dr. K.D. Sharma


Dr. Sunder Singh Arya


Mr. Abhijit Das


Mrs. Monika


Ms. Sudha

78
CP. 8

Syllabus I
Paper I-20UBOT101-Diversity of Microbes

Max Marks: 40

Internal Assessment: 10

Time: 3 hours

Objective:-This course is intended to provide the basic understanding of microorganisms, algae, fungi. It also covers the classification, life history & their economic importance.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Unit1: Diversity of Microbes-I (Bacteria)

Biology of Bacteria-Discovery, General characteristics and cell structure, Reproduction modes- vegetative, asexual and recombination (conjugation, transformation and transduction), Economic importance of bacteria, Life cycle and economic importance of Citrus canker (*Xanthomonas citri*), Crown gall (*Agrobacterium tumefaciens*), Bacterial leaf blight (BLB) (*Xanthomonas oryzae*).

Unit2: Diversity of Microbes-II (Virus)

Discovery, General characters, Nature (Biological status) of viruses, replication & reproduction: Lytic and lysogenic cycle, Structure: DNA virus (T-phage), RNA virus (TMV), transmission of plant viral diseases, Economic importance of Viruses.

Unit3: Algae

General characteristics, Classification upto class level (Smith 1955), Economic importance of algae, Important features and life-history of *Nostoc* (Cyanophyceae), *Volvox*, *Oedogonium* (Chlorophyceae), *Vaucheria* (Xanthophyceae), *Ectocarpus* (Phaeophyceae) and *Polysiphonia* (Rhodophyceae).

Unit 4: Fungi

General characteristics, Classification upto classes (Ainsworth), life cycle of *Rhizopus* (Zygomycota), *Penicillium* (Ascomycota), *Puccinia* (Basidiomycota), *Collectotrichum* (Deutromycotina), Lichens & Mycorrhiza: general account, types and significance, Economic importance of Fungi. **Suggested Readings:-**

1. Kumar, H.D., 1999. Introductory Phycology. Affiliated East-West Press, Pvt. Ltd., Delhi. 2nd edition.
2. Tortora, G.J., Funke, B.R., Case, C.L., 2010. Microbiology: An Introduction. Pearson Benjamin Cummings, U.S.A. 10th edition.
3. Sethi, I.K. and Walia, S.K., 2011. Text book of Fungi & Their Allies, MacMillan Publishers, Pvt. Ltd., Delhi.
4. Alexopoulos, C.J., Mims, C.W., Blackwell, M., 1996. Introductory Mycology, John Wiley and Sons (Asia), Singapore. 4th edition.

Prof. Lalita Gupta



Sh. Mohan Lal

Dr. Monika Miglani



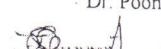
Ms. Deepika

Dr. Amita



Dr. K.D. Sharma

Dr. Poonam



Dr. Sunder Singh Arya

Mr. Abhijit Das

Mrs. Monika

Ms. Sudha

94

Paper II-20UBOT102-Diversity of Archegoniates & Gymnosperms

Max Marks: 40
Internal Assessment: 10
Time: 3 hour

Objective:-The course provides information about the diversity of Archegoniates and Gymnospermic Plants. It also covers the general classification along with Economic importance of these groups.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Unit 1: Introduction to Archegoniate (Bryophytes)

General characteristics, Classification (upto class), Alternation of generation and economic importance of Bryophyta. Morphology, anatomy and reproduction of Marchantia, Anthoceros and Funaria (Developmental details not to be included), Economic importance of Bryophytes with special reference of Sphagnum.

Unit 2: Pteridophytes-I

General characteristics, classification upto classes (Smith 1955, Bold 1959), General account of fossils & types, Fossil Pteridophytes (Rhynia, Lyginopteris).
Stelar system and its evolution, Heterospory and seed habit, Apogamy and apospory, Economic importance of Pteridophytes.

Unit 3: Pteridophytes-II

Structure and reproduction of Selaginella, Equisetum and Pteris.

Unit 4: Gymnosperms

General characters, Classification up to classes (Pelger and Melchior 1954), Morphology, anatomy and reproduction of Cycas and Pinus (Developmental details not to be included), Economic importance of gymnosperms.

Suggested Readings:-

1. Raven, P.H., Johnson, G.B., Losos, J.B., Singer, S.R., 2005. Biology. Tata McGraw Hill, Delhi, India.
2. Vashishta, P.C., Sinha, A.K., Kumar, A., 2010. Pteridophyta, S. Chand., Delhi, India.
3. Bhatnagar, S.P., Moitra, A., 1996. Gymnosperms. New Age International (P) Ltd., Publishers, New Delhi, India.
4. Parihar, N.S., 1991. An introduction to Embryophyta. Vol. I. Bryophyta. Central Book Depot, Allahabad.

(Handwritten signatures)

73-

C.P. 10

Paper III-20UBOT103-Botany Lab-I(Diversity of Microbes + Diversity of Archegoniates& Gymnosperms)

Max Marks: 50

Time: 4 hours

1. Study of Bacteria from slides/charts/ models.
2. Study of Viruses (TMV & Bacteriophages) from charts/ models.
3. *Study of Morphological & reproductive characters of algal members:*Oscillatoria, Volvox, Oedogonium, Vaucheria, Ectocarpus and Polysiphonia .
4. *Study of Morphological& reproductive characters of fungal members:*Rhizopus, Penicillium , Puccinia, Collectotrichum .
5. *Lichens-* Study of growth forms of lichens (crustose, foliose and fruticose)
6. *Mycorrhiza-* ectomycorrhiza and endomycorrhiza (Photographs and slides)
7. *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).
8. *Funaria-* morphology, W.M. leaf, rhizoids, operculum, peristome, annulus, spores (temporary slides); permanent slides showing antheridial and archegonial heads, L.S. capsule and protonema.
9. *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).
10. *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).
11. *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).
12. *Cycas-* morphology (coralloid roots, bulbil, leaf), T.S. coralloid root, T.S. rachis, V.S. leaflet, V.S. of microsporophyll, W.M. spores (temporary slides), L.S. ovule, T.S. root (permanent slide).
13. *Pinus-* morphology (long and dwarf shoots, W.M. of 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).

Syadar

M. Syadar

f

h

Semester II

Paper I-20UBOT201-Ecology & Phytogeography

Max Marks: 40

**Internal Assessment:
10Time: 3 hours**

Objective:-This course includes basic concepts of Ecology, Phytogeography and Biogeochemical cycles.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Unit1: Introduction to Ecology and related Factors

Soil:Formation,composition,soilprofile, Precipitation, Types of water and water cycle, Lightandtemperature,Shelford’s law of Tolerance in brief.

Unit 2: Ecologicaladaptations

Ecological adaptation of hydrophytes, halophytes andxerophytes.

Unit 3:Plantcommunities and Phytogeography

Population Ecology: Basic concept and Characteristics, Biotic potential and growth curve,Community ecology: Concepts, qualitative and quantitative characteristics (including biological spectrum), Phytogeographical regions of India.

Unit4:Ecosystem and biogeochemical cycles

Ecosystem: Structure and function (Trophic level, food chain, food web and ecological pyramids),Ecological efficiencies,Biogeochemical cycling: Carbon, Nitrogen and Phosphorous Cycle,Succession: Process and types.

Suggested Readings:-

1. Kormondy, E.J.,1996. Concepts of Ecology. Prentice Hall, U.S.A. 4thedition.
2. Sharma, P.D., 2010. Ecology and Environment. Rastogi Publications, Meerut, India. 8thedition.
3. Odum, E.P., Barrett, G.W., 2005. Fundamental of Ecology. Belmont, CA: Thomson Brooks/Cole. 5th edition.
4. Mishra and Kumar, 2017. Concepts of Environmental Science. Rajesh publications, Delhi, India.

Byadar
Byadar
f
h

-71-

Paper II-20UBOT202-Plant Systematics

Max Marks: 40

Internal Assessment: 10

Time: 3 hours

Objective:- This course deals with basic concepts of taxonomy, nomenclature & classification of Angiospermic plants.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Unit 1: Introduction to Plant Taxonomy

Identification, Classification, Nomenclature, Role of modern tools (Chemotaxonomy, cytotaxonomy and Numerical taxonomy) in relation to taxonomy, Functions of Herbarium, Important herbarium and botanical gardens of India and the world, Taxonomic literature: Flora, Monographs and Journals.

Unit 2: Botanical Nomenclature and Classification

Principles and rules (ICBN), Ranks and names, Binominal system, Typification, Author citation, valid publication, Rejection of names, principle of priority and its limitations, Types of classification- Artificial, Natural and Phylogenetic, Bentham and Hooker's Classification (upto order), Engler and Prantl Classification (upto order).

Unit 3: Biology and Diversity of Angiosperms-I

Types of inflorescence, Diagnostic features and economic importance of the following families: Ranunculaceae, Brassicaceae, Malvaceae, Euphorbiaceae, Fabaceae, Apiaceae.

Unit 4: Biology and Diversity of Angiosperms-II

Diagnostic features and economic importance of the following families: Asclepiadaceae, Lamiaceae, Asteraceae, Solanaceae, Cucurbitaceae, Liliaceae and Poaceae.

Suggested Readings:-

1. Stace, C.A., 1989. Plant Taxonomy and Biosystematics. Edward Arnold, London. 2nd edition.
2. Radford, A.E., 1986. Fundamentals of Plant Systematics. Harper and Row, New York.
3. Simpson, M.G., 2006. Plant Systematics. Elsevier Academic Press, San Diego, CA, U.S.A.
5. Singh, G., 2012. Plant Systematics: Theory and Practice. Oxford & IBH Pvt. Ltd., New Delhi.

Myadav

Myadav

[Signature]

[Signature]

Paper III-20UBOT203-Botany Lab-II
(Ecology & Phytogeography + Plant Taxonomy)

Max Marks: 50

Time: 4 hours

1. Determination of pH, and analysis of two soil samples for carbonates, chlorides, nitrates, sulphates, organic matter and base deficiency by rapid field test.
2. Comparison of bulk density, porosity and rate of infiltration of water in soil of three habitats.
3. Study of morphological adaptations of hydrophytes and xerophytes (four each).
4. Study of biotic interactions of the following: Stem parasite (*Cuscuta*), Root parasite (Orobanche), Epiphytes, Predation (Insectivorous plants)
5. Study of vegetative and floral characters of the following families: *Ranunculaceae*, *Brassicaceae*, *Malvaceae*, *Euphorbiaceae*, *Fabaceae*, *Cucurbitaceae*, *Apiaceae*, *Asclepiadaceae*, *Lamiaceae*, *Solanaceae*, *Asteraceae*, *Liliaceae* and *Poaceae*
6. Description, V.S. flower, T.S. of ovary, floral diagram/s, floral formula/e and systematic position according to Bentham & Hooker's system of classification.
7. Mounting of a properly dried and pressed specimen of any wild plant with herbarium label to be submitted in the record book.
8. Describe/Compare the given flower A and B in semi-technical language giving V.S. of flower, T.S. of ovary(ies), floral diagrams, floral formulae and systematic position according to Bentham & Hooker's system of classification.
9. Identify the important characters for inflorescence & placentation.
10. Field visit and collection records.

Syadav

M. Syadav

2

2

Semester III
Paper I-20UBOT301-Plant Anatomy

Max Marks: 40

Internal Assessment: 10

Time: 3 hours

Objective:-This course would deal with concepts of plant tissue system, structure formed by Secondary growth, anatomy of leaf & root system of plant.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Unit1: Tissues system in Plants

Shoot apical meristems, Meristematic and permanent tissue (Simple, complex and secretory tissue), Tissue system (Epidermal, ground and vascular), Modification of Root and Stem.

Unit 2: Secondary Growth

Vascular cambium-structure and function, Primary Structure of monocot stem, Secondary growth in dicot stem, Wood (heartwood and sapwood), Abnormal Secondary growth in Dracaena and Boerhaavia.

Unit 3: Leaf and protective systems in plants

Types of leaves (Simple and compound), Phyllotaxy, Epidermal appendages and their morphological Types, Anatomy of monocot and dicot leaf, Stomatal apparatus and their morphological types, Leaf abscission, Venation, Function of Leaf

Unit 4: Root system & its modification

Root apical meristem, Structure of monocot and dicot root, Secondary growth in dicot root, Structural modification of roots.

Suggested Readings:-

1. Mauseth, J.D., 2008. Plant Anatomy. Publisher: The Blackburn Press.
2. Cutter, E.G., 1978. Plant Anatomy Part-I, Cells and Tissues, Edward Arnold, London. 2nd edition.
3. Esau, K., 1977. Anatomy of Seed Plants, John Wiley & Sons, New York. 2nd edition.

Gyadav

M. Gyadav

[Signature]

[Signature]

Paper II-20UBOT302-Plant Embryology

Max Marks: 40

Internal Assessment: 10

Time: 3 hours

Objective:- This course will provide the whole understanding of structural organization of flower & palynology. It also deals with fertilization, embryo & endosperm development & fruit dispersal.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Unit 1: Structural organization of flowers

Floral parts & their functions, Structure & development of anther and pollen grain; Structure and types of ovules, Types of embryo sacs, organization and ultrastructure of mature embryo sac, Types of Placentation.

Unit 2: Pollination

Brief account of Palynology, Pollination mechanisms and adaptations, pollen pistil interaction, self-incompatibility, Pollen storage and its significance, Pollen germination, Significance of self and cross pollination.

Unit 3: Fertilization and fruit dispersal

Double fertilization, Seed structure (monocot and Dicot), Endospermic & non-endospermic seeds, Types of Fruit and their dispersal mechanism, Seed Dormancy: mechanism, factor affecting dormancy, methods to overcome dormancy.

Unit 4: Biology of embryo and endosperm

Endosperm: Structure, types and functions, Dicot and monocot embryo, Polyembryony, Seed germination (Epigeal and hypogeal), Apomixis.

Suggested Readings:-

1. Bhojwani, S.S. & Bhatnagar, S.P., 2011. Embryology of Angiosperms. Vikas Publication, House, Pvt. Ltd. New Delhi. 5th edition.
2. Sharma., H.P., 2009. Plant Embryology: Classical and Experimental. Alpha Science Internaitonal.

[Handwritten signatures]

**Paper III-20UBOT303-Botany Lab-III
(Plant Anatomy + Plant Embryology)**

Max Marks: 50

Time: 4 hours

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. To study morphology and anatomy of Dicot and Monocot leaf (Temporary & Permanent slides).
6. To study types of leaves and their collection.
7. Adaptive anatomy: Xerophyte (*Nerium* leaf); Hydrophyte (*Hydrilla* stem).
8. Structure of anther (young and mature), tapetum (amoeboid and secretory) (Permanent slides).
9. Section cutting and preparation of temporary slides(double mount) for root, stem and leaf of different plants.
10. Dissect out the globular/heart-shaped embryo from the plant materials.
11. Types of ovules: anatropous, orthotropous, circinotropous, amphitropous/campylotropous.
12. Female gametophyte: *Polygonum*(monosporic) type of Embryo sac Development (Permanent slides/photographs).
13. Ultrastructure of mature egg apparatus cells through electron micrographs.
14. Pollination types and seed dispersal mechanisms (including appendages, aril, caruncle) (Photographs and specimens).
15. To study pollen germination and viability.

Agadav

Agadav

Agadav

Agadav

Semester IV
Paper I-20UBOT401-Plant Physiology

Max Marks: 40

Internal Assessment: 10

Time: 3 hours

Objective:- This course would deal with the study of plant physiology especially with plant-water relation, mineral nutrition, photosynthesis & respiration.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Unit 1: Plant-water relations

Importance of water, water potential and its components; Imbibition, Diffusion, Osmosis, Absorption and transport of water (Transpiration pull theory), Root pressure and guttation, Transpiration and its significance; Factors affecting transpiration

Unit 2: Mineral nutrition

Essential macro and microelements and their role, Criteria of essentiality of elements; Role of essentiality of elements; Deficiency symptoms, Transport of ions across cell membrane, active and passive transport, Transport of organic substance: girdling experiment, Pressure flow model, Phloem loading and unloading.

Unit 3: Photosynthesis

Photosynthetic Pigments (Chl a, Chl b, xanthophyll, carotene); reaction center, antenna molecules action spectra, enhancement effect, Photosystem I and II, Factors affecting Photosynthesis, Electron transport and mechanism of ATP synthesis, C₃, C₄ and CAM pathways of carbon fixation, Photorespiration.

Unit 4: Respiration

Aerobic and anaerobic respiration, Glycolysis (EMP), TCA cycle; Oxidative phosphorylation, Oxidative Pentose Phosphate Pathway, Respiratory Quotient, ATP as energy currency of cell.

Suggested 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.

Signature
Signature
Signature
Signature

Paper II-20UBOT402-Plant Metabolism

Max Marks: 40
Internal Assessment: 10
Time: 3 hours

Objective:- This course would deal with the Biochemistry of various biomolecules & their metabolic pathways. It also deals with the plant growth regulators & their significance in generating plant responses to different environmental conditions.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Unit 1: Enzymes

Discovery and nomenclature, Classification, Structure and properties; Mechanism of enzyme catalysis and enzyme inhibition.

Unit 2: Lipid metabolism and Nitrogen fixation

Lipid Classification, Saturated and unsaturated fatty acid, Lipid biosynthesis and β -oxidation, Glyoxylate cycle, Biological nitrogen fixation, Nitrate and ammonia assimilation.

Unit 3: Plant growth regulators

Discovery, physiological roles and mechanism of auxin, gibberellin, cytokinin, ABA and ethylene.

Unit 4: Plant growth & development

Definitions; phases of growth and development; the concept of photoperiodism; physiology of flowering; florigen concept; fruit ripening; Photoperiodism (SDP, LDP, Day neutral plants), Phytochrome (discovery and structure), red and far red light responses on photomorphogenesis, Vernalization, Physiology of senescence.

Suggested Readings:-

1. Lehninger, A., 2017. Principles of Biochemistry. W. H. Freeman & Co. Ltd. 7th edition.
2. Voet, D. and J.G., Voet., 2008. Biochemistry. John Wiley & Sons 3rd edition.
3. Jain, J.L., N. Jain and S. Jain. 2016. Fundamentals of Biochemistry. S. Chand & Co. Ltd., 7th edition.

**Paper III-20UBOT403-Botany Lab-IV
(Plant Physiology+Plant Metabolism)**

Max Marks: 50

Time: 4 hours

1. Determination of osmotic potential of plant cell sap by plasmolysis method.
2. To demonstrate the process of Imbibition by Plaster of Paris method.
3. To demonstrate Ascent of Sap.
4. To demonstrate Aerobic respiration.
5. To demonstrate Anaerobic respiration by Kuhne's tube.
6. To study and compare Cuticular and Stomatal transpiration by leaves.
7. Evolution of oxygen during photosynthesis by Wilmott's bubbler.
8. To study rate of transpiration by Ganong's photometer.
9. To study the effect to two environmental factors (light and wind) on transpiration by excised twig.
10. Calculation of stomatal index and stomatal frequency of a mesophyte and a xerophyte.
11. Demonstration of Hill's reaction.
12. Demonstrate the activity of catalase and study the effect of pH and enzyme concentration.
13. To study the effect of light intensity and bicarbonate concentration on O₂ evolution in photosynthesis.
14. To study phototropism and geotropism.
15. Biochemical test for carbohydrates, proteins, lipids and starch.
16. Separation of pigments by paper chromatography.

Project report (topics)

1. Mineral deficiency
2. Plant growth regulators.
3. Plant responses to light (SDP, LDP & Day neutral).
4. Biological nitrogen fixation.
5. C₃ & C₄ plants.



Semester V
Paper I-20UBOT501A-Economic Botany & Biotechnology-I

Max Marks: 40

Internal Assessment: 10

Time: 3 hours

Objective:- This course provides information about the origin of agriculture & its economic importance. It also deals with the principles and methods of plant tissue culture.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Unit 1: Origin of Cultivated Plants

Origin of agriculture, Concept of centers of origin, their importance with reference to Vavilov's work, Plant Introduction

Food plants: Origin, morphology and uses of cereals (rice, wheat and maize), Sugarcane.

Unit 2: Economic importance of pulses & medicinal plants

General account of pulses with special reference to Gram and soybean, Rubber yielding plant (*Hevea brasiliensis*)

Medicinal plants: Morphology and uses of Cinchona, Rauwolfia, Atropa, Opium, Cannabis, Azadirachta, Withania.

Unit 3: Plant tissue culture-I

Concept of totipotency, Aspect of Plant Tissue Culture: laboratory aseptic condition, Tissue culture media (composition and preparation), Culture of plant material, Explant culture (callus formation, organogenesis), cell suspension culture, single cell culture, meristem culture, micropropagation & somaclonal variation.

Unit 4:

Plant tissue culture-II

Protoplast culture, Protoplast Fusion and somatic hybridization, Cytoplasmic hybrids and cybrids, Production of haploids (Anther culture, Pollen culture and ovule culture), Use of hybrids, Embryo culture, Somatic embryogenesis and artificial seeds.

Suggested Readings:-

1. Pandey, B.P., 1999. Economic Botany. S. Chand & Company.
2. Glick, B.R., Pasternak, J.J., 2003. Molecular Biotechnology-Principles and Applications of recombinant DNA. ASM Press, Washington.






Paper II-20UBOT501B-Economic Botany & Biotechnology-II

Max Marks: 40

Internal Assessment: 10

Time: 3 hours

Objective:-This course deals with the economic importance the spices, beverages, oil & fiber yielding plants. It also deals with various recombinant DNA technologies and their use to improve our crops.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Unit 1: Economic importance of Spices & Beverages

General account with special reference to clove, turmeric, black pepper, coriander, ferula (Botanical name, family, part used, morphology and uses), Comparative study of spices and condiments; Tea, Coffee (morphology, processing, uses).

Unit 2: Economic importance of Oils & fibre yielding plants

General description with special reference to groundnut, mustard; Cotton, jute (Botanical name, family, part used morphology, cultivation and uses).

Unit 3: Recombinant DNA Techniques I

General account of recombinant DNA Technology, Enzymes useful in molecular cloning: Restriction endonuclease, DNA ligase, polynucleotide kinase, klenow enzyme, reverse transcriptase, alkaline phosphatase, DNA polymerase-I, Sources of foreign DNA, Overview of Cloning Vectors (Plasmid, Cosmid, Phasmid and Bacteriophage), PCR and its application, Brief account of DNA fingerprinting.

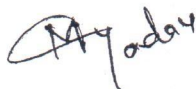
Unit 4: Recombinant DNA Techniques II

Gene Transfer Techniques: Physical, Chemical and Biological methods, Selectable and scorable markers, Applications of recombinant DNA technology- Agriculture, Medicine, Concept of Transgenic Plants for crop improvement: Resistance to herbicide, insecticides, virus and other disease (Bt. Cotton, Flavrsavyr, Golden rice).

Suggested Readings:-

1. Kocher, 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.






**Paper III-20UBOT501P-Botany Lab-V
(Economic Botany & Biotechnology)**

Max Marks: 50

Time: 4 hours

1. Study of economically important plants: Wheat, Gram, Soybean, Black pepper, Clove, Tea, Cotton, Groundnut through specimens.
2. Familiarization with basic equipment in tissue culture.
3. Study through photographs: Explant culture, Protoplast culture, Anther culture, Pollen culture, Ovule culture, endosperm and embryo culture, somatic embryogenesis, Micropropagation.
4. Study of molecular techniques: SAGE and PAGE.
5. Project report on economic botany
6. Preparation of PDA media/ MS media.
7. Preparation of slants.
8. To study sterilization techniques adopted in tissue culture labs.
9. Lab visit.

Sydney

J

M. Yadav

J

Paper I-20UBOT502A-Analytical Techniques in Plant Sciences-I

Max Marks: 40

Internal Assessment: 10

Time: 3 hours

Objective:-This course would deals with the various techniques used in plant sciences like microscopy, centrifugation & auto-radiography.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Unit 1:Microscopy

General account and Principle : Microscopy, Light microscopy, Fluorescence microscopy, Confocal microscopy, Use of fluorochromes: (a) Flow cytometry (FACS); (b) Applications of fluorescence microscopy

Unit 2: Microscopic Techniques

Transmission and Scanning electron microscopy sample preparation for electron microscopy, cryofixation, Gram's Staining, negative staining, Capsule and Endospore staining, shadow casting, freeze fracture, freeze etching.

Unit 3: Centrifugation

General account of Differential and density gradient centrifugation, sucrose density gradient, CsCl₂ gradient, analytical centrifugation, ultra centrifugation, marker enzymes.

Unit 4: Analytical Techniques-I

Auto-radiography, pulse chase experiment.radioactive isotopes and half-life of isotopes; autoradiography. Nature and types of radiation, introduction to preparation of labelling biological sample, detection and measurement of radiation,

Suggested Readings:-

1. Plummer, D.T., 2006. An Introduction to Practical Biochemistry.Tata McGraw-Hill Publishing, Co. Ltd., New Delhi.3rdedition.
2. Ruzin, S.E., 1999. Plant Microtechnique and Microscopy, Oxford University Press, New York., U.S.A.

59

Paper II-20UBOT502B-Analytical Techniques in Plant Sciences-II

Max Marks: 40

Internal Assessment: 10

Time: 3 hours

Objective:-This course deal with various techniques of spectroscopy, chromatography & also about different electrophoresis techniques.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Unit 1: Spectroscopy

General account , Principle, Mechanism and application of following techniques in biological research. Fluorescence, UV-visible spectroscopy, Infa-red spectroscopy, Atomic absorption spectroscopy

Unit 2: Spectroscopic Techniques

General account of NMR and ESR spectroscopy; Mass spectrometry (LC-MS, GC-MS), X-ray diffraction, X-ray crystallography.

Unit3: Chromatography

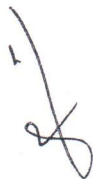

General account & Principle: Paper chromatography, Column chromatography, TLC, GLC, HPLC, Ion- exchange chromatography; Molecular sieve chromatography; Affinity chromatography.

Unit 4: Analytical Techniques-II

Characterization of proteins and nucleic acids; Electrophoresis: AGE, PAGE, SDS-PAGE

Suggested Readings:-

1. Ausubel, F., Brent, R., Kingston, R.E., Moore, D.D., Seidman, J.G., Smith, J.A., Struhl, K., 1995. Short Protocols in Molecular Biology. John Wiley & Sons. 3rd edition.
2. Wilson, K., Walker, J., 2018. Principles and Techniques of Biochemistry and Molecular Biology. Cambridge University Press, 8th edition.


**Paper III-20UBOT502P-Botany Lab-VI
(Analytical Techniques in Plant Sciences)**

**Max Marks: 50
Time: 4 hours**

1. Study of different microscopic techniques using photographs/micrographs
2. Preparation of permanent slides (double staining).
3. To separate nitrogenous bases by paper chromatography.
4. Isolation of chloroplasts by differential centrifugation
5. To separate sugars by thin layer chromatography.
6. To separate chloroplast pigments by column chromatography
7. To estimate protein concentration through Bradford's or Lowry's methods.
8. To separate proteins/amino acids using PAGE.
9. To separate DNA (marker) using SAGE.

Syadar

f

Agadav

h

57-

C.P. 26

Paper I-20UBOT503A-Genetics and Plant Breeding-I

Max Marks: 40
Internal Assessment: 10
Time: 3 hours

Objective:-This course would deal with the mechanism of heredity, sex-determination, sex-linked inheritance & mutation. It also deal with process of linkage & crossing over.

Note: There shall be nine questions in a(11. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Unit1: Heredity

Brief life history of Mendel, Terminologies, Laws of Inheritance, Gene interaction ,Cytoplasmic Inheritance: Shell Coiling in Snail, Kappa particles in Paramecium, leaf variegation in Mirabilis jalapa, Male sterility, Multiple allelism, Pleiotropism, Chromosomal theory of Inheritance.

Unit2: Sex-determination and Sex-linked Inheritance

Sex chromosomes and sex determination in monoecious and dioecious plants, factors affecting sex determination(Environmental, Chromosomal, Genic), Genic balance theory.

Unit3: Linkage and Crossing over

Linkage: concept & history complete & incomplete linkage, Bridge's experiment, coupling & repulsion, recombination frequency, linkage maps based on two and three factor crosses. Crossing over: concept and significance, cytological proof of crossing over.

Unit4: Mutations and Chromosomal Aberrations

Types of mutations, effects of physical & chemical mutagens, Numerical chromosomal changes: Euploidy, Polyploidy and Aneuploidy, Structural chromosomal changes: Deletions, Duplications, Inversions & Translocations.

Suggested Readings:-

1. Gardner, E.J., Simmons M.J., Snustad, D.P., 2008. Principles of Genetics. Wiley-India. 8th edition.
2. Snustad, D.P. and Simmons, M.J., 2010. Principles of Genetics, John Wiley & Sons Inc. India. 5th edition.
3. Chaudhari, H.K., 1984. Elementary Principles of Plant Breeding. Oxford-IBH. 2nd edition.
4. Acquaah, G., 2007. Principles of Plant Genetics & Breeding. Black well Publishing.

C.R-29

56

Paper II-20UBOT503B-Genetics and Plant Breeding-II

Max Marks: 40

Internal Assessment: 10

Time: 3 hours

Objective:- This paper deals with the various mechanism of inheritance. It also deal with the methods of plant breeding and crop improvement.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Unit 1: Plant Breeding

Introduction and objectives, Breeding systems: modes of reproduction in crop plants, important achievements and undesirable consequences of plant breeding.

Unit 2: Methods of crop improvement

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 3: Quantitative inheritance & Inbreeding depression and heterosis

Concept, mechanism and examples of Monogenic and polygenic Inheritance, History, genetic basis of inbreeding depression and heterosis, Applications.

Unit 4: Crop improvement and breeding

Role of mutations, Polyploidy, Distant hybridization and biotechnology in crop improvement.

Suggested Readings:-

1. Klug, W.S., Cummings, M.R., Spencer, C., Palladino, M., 2011. Concepts of Genetics. Benjamin Cummings. 10th edition.
2. Griffiths, A.J.F., Wessler., S.R., Carroll, S.B., Doebley, J., 2010. Introduction to Genetic Analysis. W. H., Freeman and Co., U.S.A. 10th edition.
3. Pierce, B.A., 2011. Genetics: A Conceptual Approach, Macmillan Higher Education Learning. 4th edition.
4. Singh, B.D., 2005. Plant Breeding: Principles and Methods. Kalyani Publishers, 7th edition.

Paper III-20UBOT503P-Botany Lab-V
(Genetics and Plant Breeding)

Max Marks: 50
Time: 4 hours

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.
4. Incomplete dominance and gene interaction through seed ratios (9:7, 9:6:1, 13:3, 15:1, 12:3:1, 9:3:4).
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).

Syeda

f

M. Talav

h

Semester VI
Paper I-20UBOT601A-Cell and Molecular Biology-I

Max Marks: 40
Internal Assessment: 10
Time: 3 hours

Objective:-This course is intends to provide the information about basic unit of life, cell. It also deals with cellular structure & organelles.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Unit 1: Cell and Cell Cycle

Cell Theory, Prokaryotic and eukaryotic cells, Cell size and shape, Overview of Cell cycle, Mitosis and Meiosis, Molecular controls, CDK's.

Unit2: Cell Organelles -I

Brief account of Mitochondria: Structure, composition, semi-autonomous nature, Symbiont hypothesis, , mitochondrial DNA. Chloroplast Structure & function, chloroplast DNA, Endoplasmic Reticulum, Brief account of Golgi body & Lysosomes: Structures and roles, Vacuoles.

Unit 3: Cell Organelles -II

Peroxisomes and Glyoxisomes: Structures, composition, functions in animals and plantscell , Structure and Composition of Nucleus, nuclear pore complex, euchromatin and heterochromatin, nucleolus and ribosome structure (brief). Chromosome structure, Karyotype and special type of chromosome, DNA packaging in eukaryotes.

Unit4: Cell Membrane and Cell Wall

Models of membrane structure(Sandwich, Robertson unit membrane, fluid mosaic), Membrane proteins and their functions, Carbohydrates in the membrane, Faces of the membranes, Selective permeability of the membranes, Functions of membranes, Cell wall-structure and function, Cellular connections: Gap junctions, Plasmodesmata.

Suggested Readings:-

1. Karp, G., 2013. Cell and Molecular Biology: Concepts and Experiments. John Wiley & Sons Inc. 7th edition.
2. Becker, W.M., Kleinsmith, L.J., Hardin., J. and Bertoni, G.P., 2009. The World of the Cell. Pearson Benjamin Cummings Publishing, San Francisco. 7th edition.

Semester VI**Paper I-20UBOT601A-Cell and Molecular Biology-I****Max Marks: 40****Internal Assessment: 10****Time: 3 hours**

Objective:-This course is intended to provide the information about basic unit of life, cell. It also deals with cellular structure & organelles.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Unit 1: Cell and Cell Cycle

Cell Theory, Prokaryotic and eukaryotic cells, Cell size and shape, Overview of Cell cycle, Mitosis and Meiosis, Molecular controls, CDK's.

Unit2: Cell Organelles -I

Brief account of Mitochondria: Structure, composition, semi-autonomous nature, Symbiont hypothesis, , mitochondrial DNA.

Chloroplast Structure & function, chloroplast DNA, Endoplasmic Reticulum, Brief account of Golgi body & Lysosomes: Structures and roles, Vacuoles.

Unit 3: Cell Organelles -II

Peroxisomes and Glyoxisomes: Structures, composition, functions in animals and plants cell , Structure and Composition of Nucleus, nuclear pore complex, euchromatin and heterochromatin, nucleolus and ribosome structure (brief). Chromosome structure, Karyotype and special type of chromosome, DNA packaging in eukaryotes.

Unit4: Cell Membrane and Cell Wall

Models of membrane structure (Sandwich, Robertson unit membrane, fluid mosaic), Membrane proteins and their functions, Carbohydrates in the membrane, Faces of the membranes, Selective permeability of the membranes, Functions of membranes, Cell wall- structure and function, Cellular connections: Gap junctions, Plasmodesmata.

Suggested Readings:-

1. Karp, G., 2013. Cell and Molecular Biology: Concepts and Experiments. John Wiley & Sons Inc. 7th edition.
2. Becker, W.M., Kleinsmith, L.J., Hardin, J. and Bertoni, G.P., 2009. The World of the Cell. Pearson Benjamin Cummings Publishing, San Francisco. 7th edition.






Paper II-20UBOT601B-Cell and Molecular Biology-II

Max Marks: 40

Internal Assessment: 10

Time: 3 hours

Objective:-This course provides the information about genetic material. It also deals with the mechanism of molecular biology process as like replication, transcription & translation.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Unit 1: Genetic material-I

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

Unit 2: Genetic material-II

DNA-replication (Prokaryotes and eukaryotes): bidirectional replication, semi-conservative, semi discontinuous RNA priming, θ (theta) mode of replication, Brief account of replication of linear, ds- DNA, replicating the 5' end of linear chromosome including replication enzymes, DNA Repair.

Unit 3: Transcription (Prokaryotes and Eukaryotes)

Types of structures of RNA (mRNA, tRNA, rRNA), Monocistronic & Polycistronic RNA, RNA polymerase- various types, Transcription: initiation, elongation and termination (Prokaryotes and eukaryotes), genetic code.

Unit 4: Translation & Gene Regulation

Translation: initiation, elongation and termination (in prokaryotes and eukaryotes), Post translational modifications.

Prokaryotes: Lac operon & Tryptophan operon and in Eukaryotic gene regulation (in general)

Suggested Readings:-

1. DeRobertis, E.D.P. and DeRobertis, E.M.F. 2006. Cell and Molecular Biology. Lippincott Williams and Wilkins, Philadelphia. 8th edition.
2. Cooper, G.M. and Hausman, R.E., 2009. The Cell: A Molecular Approach. ASM Press & Sunderland, Washington, D.C. 5th edition

-51-

Paper III-20UBOT601P-Botany Lab-V
(Cell Biology and Molecular Biology)

Max Marks: 50
Time: 4 hours

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. Study of mitosis and meiosis (temporary mounts and permanent slides).
5. Study the effect of temperature, organic solvent on semi permeable membrane.
6. Demonstration of dialysis of starch and simple sugar.
7. Study of plasmolysis and deplasmolysis on Rhoeo leaf.
8. Measure the cell size (either length or breadth/diameter) by micrometry.
9. Study the structure of nuclear pore complex by photograph (from Gerald Karp).
10. Study of special chromosomes (polytene & lampbrush) either by slides or photographs.
11. Study DNA packaging by micrographs.
12. Preparation of the karyotype and ideogram from given photograph of somatic metaphase chromosome.

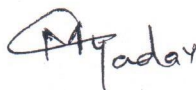


-50-

**Paper III-20UBOT602P-Botany Lab-VI
(Environmental Biology)**

Max Marks: 50**Time: 4 hours**

1. Study of Electro conductivity and pH of the soil.
2. Study of soil profile.
3. Determination of organic matter from soil.
4. Isolation and culture of bacteria from soil.
5. Effect of environmental factors on seed- germination to determine significance of temp, moisture/humidity, heavy metals.
6. Study of some ecological instruments used in air and water pollution studies.
7. Water Analysis- hardness (Temporary and permanent), BOD and COD



Paper I-20UBOT603A-Biodiversity and Human Welfare-I

Max Marks: 40
Internal Assessment: 10
Time: 3 hours

Objective:-This course intends to give details about the concept of biodiversity, various principles & mythologies to evaluate. It also explains the significance of biodiversity in human welfare.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Unit 1: Plant Biodiversity

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.

Unit 2: Effects on Biodiversity

Precautionary principle, Methodologies for valuation, Uses of plants and microbes, Loss of diversity (genetic, species, ecosystem, agro biodiversity), Projected scenario for biodiversity loss.

Unit 3: Human Welfare-I

Role of plants in relation to Human Welfare such as-a) Importance of forestry their utilization and commercial aspects b) Avenue trees c) Ornamental plants of India.

Unit 4: Cultivation and uses of spices

Morphological description, brief idea of cultivation and economic uses of the following Spices-coriander, ferula, ginger, turmeric, cloves.

Suggested Readings:-

1. Kocchar, S.L., 1998. Economic Botany in Tropics, MacMillan India Ltd., New Delhi. 2nd edition,
2. Sambammurthy, A.V.S.S., and Subramanyam, N.S., 1989. A Textbook of Economic Botany, Wiley Eastern Ltd., New Delhi.
3. Sharma, O.P., 1996. Hills Economic Botany (Late Dr. A.F. Hill adapted by O.P. Sharma), Tata McGraw Hill Co. Ltd., New Delhi.

Paper II-20UBOT603B-Biodiversity and Human Welfare-II

Max Marks: 40

Internal Assessment: 10

Time: 3 hours

Objective:- It course would deals with the information regarding various international organizations for managing world biodiversity & conservation practices for sustainable development.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Unit 1: Management of Plant Biodiversity

Organizations associated with biodiversity management, Brief account on Methodology for execution-IUCN, UNEP, UNESCO, WWF, NBPGR, Biodiversity legislation and conservations, Biodiversity information management and communication.

Unit 2: 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 3: Human Welfare-II

Morphological description, brief idea of cultivation and economic uses of the following Medicinal plants- Cinchona, Rauwolfia, Atropa, Opium, Cannabis, Azadirachta, Withania.

Unit 4: Cultivation of Economically important plants

Botanical description, Cultivation, processing and uses of Beverages (tea and coffee), Rubber Sugarcane, General account and sources of timber, energy plantations and bio-fuels

Suggested Readings:-

1. Simpson, B.B. and Conner-Ogorzaly, M., 1986. Economic Botany- Plants in Our World, McGraw Hill, New York.
2. Krishnamurthy, K.V., 2004. An Advanced Text Book of Biodiversity-Principles and Practices, Oxford and IBH Publications, Co.Pvt.Ltd., NewDelhi.

**Paper III-20UBOT603P-Botany Lab-VI
(Biodiversity and Human Welfare)**

Max Marks: 50

Time: 4 hours

The practical course is divided into three units:

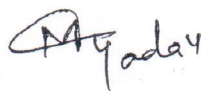
- i) Field Survey,
- ii) Scientific visits

- i) Field Survey

Prepare a list of important sources of firewood and timber in your locality. Give their local names, scientific names and families to which they belong.

- ii) Scientific visits

Students should be taken to any protected area, a recognized botanical garden or Museum (such as FRI, BSI, NBRI), to a CSIR laboratory doing research on plants and their utilization and an ICAR research institute or a field station dealing with crops.



Paper IV-20SECB404-Nursery and Gardening

Max Marks: 40
Internal Assessment: 10
Time: 3 hours

Objective:-This course is intended to enhance the skills of the students in nursery & gardening practices.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Unit 1: Nursery

Definition, objectives and scope and building up of infrastructure for nursery, planning and seasonal activities, Planting-direct seeding and transplants. Seed storage; Seed banks, factors affecting seed viability, genetic erosion.

Unit 2: 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 glasshouse.

Unit 3: 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.

Unit 4: Cultivation & storage

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.

Suggested Readings:-

1. Bose, T.K. & Mukherjee, D., 1972. Gardening in India, Oxford & IBH Publishing, Co., New Delhi.
2. Sandhu, M.K., 1989. Plant Propagation, Wile Eastern, Ltd., Bangalore, Madras.
3. Kumar, N., 1997. Introduction to Horticulture, Rajalakshmi Publications, Nagercoil.
4. Edmond Musser & Andres, Fundamentals of Horticulture, McGraw Hill Book Co., New Delhi.
5. Agrawal, P.K., 1993. Hand Book of Seed Technology, Dept. of Agriculture and Cooperation, National Seed Co. Ltd., New Delhi.
6. Janick, Jules., 1979. Horticultural Science. W.H., Freeman and Co., San Francisco, USA. 3rd edition.

45-

Paper I-20USECB504-Herbal Technology

Max Marks: 40

Internal Assessment: 10

Time: 3 hours

Objective:-This course is intends to help the students in learning various technologies of herbal plants& their utilization.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Unit1: 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. Medicinal plant banks, micro-propagation of important species (Withaniasomnifera, Azadirachtaindica, Aloe veraand Ocimum sanctum), Herbal foods-future of pharmacognosy.

Unit2: Pharmacognosy

Systematic position and medicinal uses of the following herbs in curing various ailments; Tulsi, Ginger, Turmeric, Fenugreek, Indian Gooseberry and Ashoka.

Unit3: Phytochemistry




Active principles and methods of their testing-identification and utilization of the medicinal herbs; Catharanthusroseus(cardiotonic), Withaniasomnifera(drugs acting on nervous system), Clerodendronphlomoides(anti-rheumatic) and Centellaasiatica(memory booster).

Unit4: 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)

Suggested Readings:-

1. GlossaryofIndianmedicinalplants,R.N., Chopra,S.L., NayarandI.,C., Chopra,1956. C.S.I.R, NewDelhi.
2. TheindigenousdrugsofIndia,Kanny,Lall,DeyandRajBahadur,1984. International BookDistributors.
3. Pharmacognosy, Dr. C.K.,Kokate et al., 1999. NiraliPrakashan.
4. Herbal plants and Drugs Agnes Arber, 1999. Mangal DeepPublications.
5. Ayurvedicdrugsandtheirplantsource.,V.V., SivarajanandBalachandranIndra, 1994. OxfordIBHpublishing, Co.
6. AyurvedaandAromatherapy.,Miller,LightandMiller,Bryan, 1998. Banarsidass, Delhi.
7. Principles of Ayurveda, Anne Green, 2000. Thomsons,London.1stedition.

Paper IV-20SECB604-Mushroom Culture Technology

Max Marks: 40

Internal Assessment: 10

Time: 3 hours

Objective:- This course will help in increasing the understanding of the students about the technologies related to practices of mushroom culture.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

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*.

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.

Unit 3: Storage and nutrition

Short-term storage (Refrigeration-upto 24 hours) Long term Storage (canning, pickles, papads), drying, storage in salt solutions. Nutrition, Proteins amino acids, mineral elements nutrition- Carbohydrates, Crude fibre content, Vitamins.

Unit 4: 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.

Suggested Readings:-


1. Marimuthu, T.Krishnamoorthy, A.S.,Sivaprakasam, K. and Jayarajan, R., 1991. OysterMushrooms, Department of Plant Pathology, Tamil Nadu Agricultural University,Coimbatore.
2. Swaminathan, M., 1990. Food and Nutrition, Bappco.The Bangalore Printing and Publishing, Co.Ltd.,No.88,MysoreRoad,Bangalore-560018.
3. Tewari,Pankaj Kapoor, S.C., 1988. Mushroom cultivation, Mittal Publications, Delhi.
4. Nita Bahl, 1984-1988. Handbook of Mushrooms, Vol.I&Vol.II. 2ndedition,



Prof. Lalita Gupta



Dr. Monika Miglani



Dr. Amita



Dr. Poonam



Sh. MohanLal



Ms. Deepika



Dr. K.D. Sharma




Dr. Sunder SinghArya



Mr. Abhijit Das



Mrs. Monika



Ms. Sudha