REVISED IN MARCH 2016 (03-05-2016)

B.Sc., BOTANY SEMESTER-WISE SYLLABUS AND MODEL QUESTION PAPERS OF THEORY AND PRACTICALS

(AS PER CBCS AND SEMESTER SYSTEM)

AP STATE COUNCIL OF HIGHER EDUCATION
CBCS - PATTERN FOR BOTANY

Structure of the Course – B.Sc Botany

Year	Semester	Paper	Title	Marks	Credits
I	**I**	**I**	Microbial Diversity , Algae and Fungi	**100**	**03**
			Practical -I	**50**	**02**
	II	**II**	Diversity Of Archaegoniates & Anatomy	**100**	**03**
			Practical -II	**50**	**02**
II	**III**	**III**	Plant taxonomy &Embryology	**100**	**03**
			Practical -III	**50**	**02**
	IV	**IV**	Plant physiology & Metabolism	**100**	**03**
			Practical -IV	**50**	**02**
III	**V**	**V**	Cell Biology, Genetics &Plant breeding	**100**	**03**
			Practical -V	**50**	**02**
		VI	Plant Ecology & Phytogeography	**100**	**03**
			Practical -VI	**50**	**02**
	*Any one paper from A, B and C can be selected **VI** **Any one cluster from I or II can be selected	**VII A***	Organic Farming and Sustainable agriculture	**100**	**03**
			Practical –VII A	**50**	**02**
		VII B*	Nursery, Gardening and Floriculture	**100**	**03**
			Practical –VII B	**50**	**02**
		VII C*	Plant tissue culture and its Biotechnological applications.	**100**	**03**
			Practical –VII C	**50**	**02**
		VIII (I)**	**Cluster Elective-I** **Plant Resource Utilization** I. Plant diversity and Human Welfare II. Ethno botany and Medicinal plants III. Pharmacognosy and Phytochemistry Practical – VIII: 1 Practical – VIII: 2 Project work – VIII: 3	 **100** **100** **100** **50** **50** **50**	 **03** **03** **03** **02** **02** **02**
		VIII (II)**	**Cluster Elective-II** I. Biological instrumentation and Methodology II. Mushroom culture and Technology	 **100** **100**	 **03** **03**

			III. Project Work preferably either in an Institute or Industry. Practical – VIII: 1 Practical – VIII: 2 Project work – VIII: 3	**100** **50** **50** **50**	**03** **02** **02** **02**

I B.Sc - SEMESTER- I: BOTANY SYLLABUS
Paper-DSC IA : Microbial Diversity, Algae and Fungi
Total hours of teaching 60 hrs @ 4 hrs per week

UNIT- I: MICROBIAL WORLD (Origin and Evolution of Life, Microbial Diversity (12 hrs)

1. Discovery of microorganisms, origin of life, spontaneous, biogenesis, Pasteur experiments, germ theory of disease.
2. Classification of microorganisms – R.H. Whittaker's five kingdom concept, Carl Woese's - Domain system.
3. Brief account of special groups of bacteria- Archaebacteria, Mycoplasma, Chlamydia, Actinomycetes, Rickettsias and Cyanobacteria.

UNIT- II: VIRUSES (12 hrs)

1. Viruses- Discovery, general account, structure& replication of –T4 Phage (Lytic, Lysogenic) and TMV, Viroids, Prions.
2. Plant diseases caused by viruses– Symptoms, transmission and control measures (Brief account only).
4. Study of Tobacco Mosaic, Bhendi (Lady's finger) Vein clearing and Papaya leaf curl diseases.

UNIT III: BACTERIA (12 hrs)

1. Bacteria: Discovery, General characteristics, cell structure and nutrition.
2. Reproduction- Asexual and bacterial recombination (Conjugation, Transformation, Transduction).
3. Economic importance of Bacteria.

UNIT –IV Algae (12 hrs)

1. General account - thallus organization and reproduction in Algae.
2. Fritsch classification of Algae (up to classes only) and economic importance.
3. Structure, reproduction and life history of *Oedogonium, Ectocarpus* and *Polysiphonia.*

UNIT V: FUNGI (12 hrs)

1. General characteristics and outline classification (Ainsworth).
2. Structure, reproduction and life history of *Rhizopus* (Zygomycota), *Penicillium* (Ascomycota), and *Puccinia* (Basidiomycota).
3. Lichens-structure and reproduction; ecological and economic importance.

Suggested activity: Seminar, Quiz, debate, collection of diseased plant parts – studying symptoms and identification of pathogen, collection and study of fresh and marine Algae available in local area.

Books for Reference

1. Oladele Ogunseitan (2008) Microbial Diversity: Form and Function in Prokaryotes Wiley- Blackwell.
2. Pelczar, M.J. (2001) Microbiology, 5th edition, Tata Mc Graw-Hill Co, New Delhi.
3. Presscott, L. Harley, J. and Klein, D. (2005) Microbiology, 6th edition, Tata Mc Graw- Hill Co., New Delhi.
5. Fritsch F.E. (1935 The Structure & Reproduction of Algae 1945): Cambridge University Press Cambridge, U.K., Vol. I, Vol. II.
5. Smith, G.M (1955) : Cryptogamic Botany(Vol. I Algae, Fungi, & Lichens) McGraw-Hill Book Co., New York.
6. Ian Morris (1967): An Introduction to the Algae, Hutchinson, London.
7. Alexopoulos, C.J.., Mims, C.W. & Blackwell, M. (1996): Introductory Mycology John Wiley and Sons., Inc., N.Y., Chicester, Berisbane, Toronto, Singapore.
8. Webster, J (1999) : Introduction to Fungi (2nd edition), Cambridge University Press.

I B.Sc – SEMESTER –I: BOTANY PRACTICAL SYLLABUS
Paper-DSC IA: Microbial Diversity, Algae and Fungi
Total hours of laboratory Exercises 30 hrs @ 2 per week

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1. Knowledge of Equipment used in Microbiology: Spirit lamp, Inoculation loop, Hot-air oven, Autoclave/Pressure cooker, Laminar air flow chamber and Incubator.
2. Preparation of liquid and solid media for culturing of microbes [(Luria Bertanie (LB) medium)] (Demonstration).
3. Study of viruses and bacteria using electron photo micrographs (TMV, Bacteriophage, HIV, Cocci, *Bacillus*, *Spirillum* bacteria).
4. Gram staining technique.
5. Study olant disease symptoms caused by Bacteria (*Citrus* canker, leaf blight of rice, Angular leaf spot of Cotton) and viruses (TMV, Bhendi (Lady's finger) vein clearing and Leaf curl of Papaya), Fungi (Late blight of potato, Red rot of Sugarcane and Paddy blast).
6. Study of vegetative and reproductive structures of the following :
   a) **Cyanobacteria:** *Nostoc*, *Rivularia* and *Scytonema*.
   b) Algae: *Oedogonium, Ectocarpus, Polysiphonia, Chara*
   c) Fungi: *Rhizopus, Penicillium and Puccinia.*
7. Study of plant material infected by Fungi (Rot of tomatoes, blue and green moulds of *Citrus* fruits and wheat rust (Section cutting of diseased parts of Wheat and Barberry - identification of different spores).
8. Lichens: Morphology and of anatomy of different thalli.
9. Field Visit.

B.Sc - SEMESTER –I
BOTANY PRACTICAL PAPER –I
Paper-1 P: Microbial Diversity, Algae and Fungi

Time: 3 hrs. Max. Marks: 50

1. Identify giving reasons two of the given **Algal mixture" A**". Leave your preparation for evaluation. Draw labeled diagrams. (Slide--1mark, Diagrams--1mark, Identification--1mark)

   3x 2 = 6 Marks

2. Make suitable stained preparation of the **material "B"** to bring out the details of internal structure--identify giving reasons. Draw labeled diagrams and leave your preparations for evaluation.
   (Slide - 4 marks, diagrams - 3 marks, Identification - 3marks)

   10 Marks

3. Perform Gram staining of the given Bacterial culture 9 Marks

4. Write critical notes and Identify D, E, F, G and H (5X3) = 15 Marks

5. Record (submission is compulsory) 10 Marks

Total: 50 Marks

Key:

A. Algal material
B. Fungi material
C. Bacterial culture
D. One of the instruments of Micro biology laboratory.
E. Whole specimen or a permanent slide of Algae.
F. Whole specimen or a permanent slide of Fungi.
G. Whole specimen or a permanent slide of Plant disease studied.
H. Whole specimen or a permanent slide of Lichens.

Domain Skills Expected to Achieve: Ability to operate compound microscope, preparing slides, recognizing plant diseases caused by Viruses based on disease symptoms, recognizing different forms of bacteria under microscope/photographs based on morphology and be able to draw their outline structures, performing Gram staining procedure, recognizing different Algae from diverse habitats, recognizing different Fungi based on spore morphology; plant diseases caused by Fungi.

I B. Sc - SEMESTER- II: BOTANY THEORY SYLLABUS
Paper –DSC IB : Diversity of Archaegoniates & Plant Anatomy
Total hours of teaching 60 hrs @ 4 hrs per week

UNIT – I: BRYOPHYTES

(12 hrs)

1. Bryophytes: General characters, Classification (up to classes)
2. Structure, reproduction and Life history of *Marchantia,* and *Funaria*
3. Evolution of Sporophyte in Bryophytes.

UNIT - II: PTERIDOPHYTES

(12 hrs)

1**.** Pteridophytes**:** General characters, classification (up to Classes)
2. Structure, reproduction and life history of *Lycopodium, Selaginella,* and *Pteris vitata*
3. Heterospory and seed habit.
4. Evolution of stele in Pteridophytes.

UNIT – III: GYMNOSPERMS

(12 hrs)

1. Gymnosperms: General characters, classification (up to classes)
2. Morphology, anatomy**,** reproduction and life history of *Pinus and Ginkgo biloba*
3. Economic importance with reference to wood, essential oils and medicines

UNIT –I V: Tissues and Tissue systems **(12 hrs)**

1. Meristems - Root and Shoot apical meristems and their histological organization.
2. Tissues – Meristematic and permanent tissues (simple, complex, secretory)
3. Tissue systems**–**Epidermal, ground and vascular.

UNIT – V**. Secondary growth** **(12 hrs)**

1. Anomalous secondary growth in *Achyranthes, Boerhaavia* and *Dracaena.*
2. Study of local timbers of economic importance – Teak (*Tectona grandis*), Rosewood (*Dalbergia sissoo*), Red sanders (*Pterocarpus santalinus*) and Arjun (*Terminalia arjuna*) (Tella maddi).

Suggested activity: Collection of *Marsilea* sporocarp, *Pinus* needles, male and female cones, study of *Pinus* pollen grains, collection of locally available economically useful timbers.

Books for Reference

1. Cavers, Frank ( ): The inter-relationships of the Bryophytes New Phytologist, Indian Reprint.
2. Smith, G.M. (1955): Cryptogamic Botany Vol. II. (2nd Edition) (Bryophytes & Pteridophytes) Tata McGraw Hill Publishing Co., New Delhi.
3. Parihar, N.S. ( ): An Introduction to embryophyta – Vol.II. Bryophyta Central Book Depot, Allahabad.
4. Watson, E.V. (1968): British Mosses & Liverworts Cambridge University Press, U.K
5. Eames, A.J. (1936): Morphology of Vascular Plants (Lower Groups) McGraw Hill, N.Y.
6. Parihar, N.S. (19): An Introduction to Embryophyta Vol. II Pteridophyta Central Book Depot., Allahabad.
7. Smith, G.M. (1955): Cryptogamic Botany Vol.II (2nd Edn.,) (Bryophytes & Pteridophytes) Tata McGraw Hill Publishing Co., New Delhi.
8. Sporne, K.R. (1970): The Morphology of Pteridophytes (The Structure of Ferns and Allied Plants) Hutchinson University Library, London
9. Bierhorst D.W. (1971): Morphology of Vascular Plants, The MacMillan Co., N.Y. and Collier- MacMillan Ltd., London.
10. Coulter, J.M. and C.J. Chamberlain (1964): Morphology of Gymnosperms Central Book Depot, Allahabad.
11. Sporne K.R. (1971): The Morphology of Gymnosperms (The Structure and Evolution of Primitive seed Plants) Hutchinson University Library, London.
12. Esau, K. (1965): Vascular Differentiation in Plants. Holt, Rinehart and Winston, N.Y., Chicago, San Francisco, Toronto, London.
13. Eames, A.J., and Mc Daniels, L.H. (1979) : An Introduction to Plant anatomy Tata-McGraw - Hill Publishing Co., (P) Ltd. Bombay, New Delhi.
14. Esau. K. (1980): Plant Anatomy, (2nd Edition) Wiley Eastern Ltd., New Delhi.

I B.Sc SEMESTER -II
BOTANY PRACTICAL SYLLABUS
Paper-DSC IB: Diversity of Archaegoniates & Plant Anatomy
Total hours of laboratory Exercises 30 hrs @ 2 per week

1. Morphology (vegetative and reproductive structures), anatomy of the following :
   Marchantia, Funaria, Selaginella, Lycopodium and *Pinus.*
2. Anatomy:
   a) Demonstration of double staining technique.
   b) Tissue organization in root and shoot apices using permanent slides
   c) Preparation of double staining slides
   d) Anomalous secondary structure of *Achyranthes, Boerhavia* and *Dracaena.*
   e) Anatomical study of wood in T.S., T.L.S. and R.L.S.
3. Field visits to local timber depots.

I B.Sc., SEMESTER –II: BOTANY PRACTICAL MODEL PAPER II
IIP: Diversity of Archaegoniates & plant Anatomy

1. Section cutting of material **-A** = 9 Marks
   (Slide 3 marks, diagrams-3 marks, Identification-3 marks)

2. Section cutting of material **-B** = 9 Marks
   (Slide 3 marks, diagrams-3 marks, Identification-3 marks)

3. Section cutting of material **-C** = 10 Marks
   (Slide 4 marks, diagrams-3 marks, Identification-3 marks)

4. Identification of spotters -D, E, and F 3x4 =12 marks

5. Record (submission compulsory) = 10 marks

Total : 50 Marks

Key:

A. Bryophyta/ Pteridophyta material
B. Gymnosperm material.
C. Anatomy material.
D. Whole specimen or permanent slide of Bryophyta/ Pteridophyta
E. Whole specimen or permanent slide of Gymnosperm.
F. Whole specimen or permanent slide of wood.

Domain Skills Expected to Achieve: Ability to take free hand sections, recognize and draw diagrams of different tissues, tissue systems, differentiating between xylem and phloem, recognizing different anatomical types of thalli, steles and wood, identification of Gymnospermic plants based on morphology and anatomy, identifying, features of anomalous secondary growth.

II B. Sc - SEMESTER –III: BOTANY THEORY PAPER –III
(Paper-DSC IIA : Plant Taxonomy and Embryology)
Total hours of teaching 60 hrs @ 4 hrs per week

UNIT – I: INTRODUCTION TO PLANT TAXONOMY (12 hrs)

1. Fundamental components of taxonomy (identification, nomenclature, classification)
2. Taxonomic resources: Herbarium- functions & important herbaria, Botanical gardens, Flora, Keys- single access and multi-access.
3. Botanical Nomenclature- Principles and rules of ICBN (ranks and names; principle of priority, binomial system; type method, author citation, valid-publication).

UNIT – II: CLASSIFICATION (12 hrs)

1. Types of classification- Artificial, Natural and Phylogenetic.
2. Bentham & Hooker's system of classification- merits and demerits.
3. Engler and Prantle's system of classification- merits and demerits
4. Phylogeny – origin and evolution of Angiosperms

UNIT –III: SYSTEMATIC TAXONOMY-I (12 hrs)

1. Systematic study and economic importance of the following families: Annonaceae, Brassicaceae, Rutaceae, Curcurbitaceae, and Apiaceae.

UNIT –IV: SYSTEMATIC TAXONOMY-II (12 hrs)

1. Systematic study and economic importance of plants belonging to the following families: Asteraceae, Asclepiadaceae, Lamiaceae, Euphorbiaceae, Arecaceae, and Poaceae.

UNIT – V: EMBRYOLOGY (12 hrs)

1. Anther structure, microsporogenesis and development of male gametophyte.
2. Ovule structure and types; Megasporogenesis, development of Monosporic, Bisporic and Tetrasporic types (*Peperomia, Drusa, Adoxa*) of embryo sacs.
3. Pollination and Fertilization (outlines) Endosperm development and types.
4. Development of Dicot and Monocot embryos, Polyembryony.

Suggested activity: Collection of locally available plants of medicinal importance, observing pollen grains in honey, Aero-palynology - collection of pollen from air using glycerin strips in different seasons.

Books for Reference

1. Porter, C.L. ( ): Taxonomy of flowering Plants, Eurasia Publishing House, New Delhi.
2. Lawrence, G.H.M. (1953): Taxonomy of Vascular Plants, Oxford & IBH Publishers, New Delhi, Calcutta.
3. Jefferey, C. (1968) : An Introduction to Plant Taxonomy J.A. Churchill, London.
4. Mathur, R.C. (1970) : Systematic Botany (Angiosperms) Agra Book Stores- Lucknow, Ajmer, Allahabad, Delhi.
5. Maheswari, P (1963) : Recent Advances in the Embryology of Angiosperms (Ed.,) International Society of Plant Morphologists- University of Delhi.
6. Swamy, B.G.L. and Krishnamoorthy. K.V. (1980): From flower to fruit Tata McGraw Hill Publishing Co., Ltd., New Delhi.
6. Maheswari, P.(1985): An Introduction to the Embryology of Angiosperms Tata McGraw Hill Publishing Co., Ltd., New Delhi.
8. Bhojwani, S.S. and Bhatnagar, S.P. (2000) : The Embryology of Angiosperms (4th Edition) Vikas Publishing House(P) Ltd., UBS Publisher's Distributors, New Delhi.

II B.Sc - SEMESTER-III
BOTANY PRACTICAL – DSC IIA
Plant Taxonomy and Embryology
Total hours of laboratory Exercises 30 hrs @ 2 per week

Suggested Laboratory Exercises

1. Systematic study of locally available plants belonging to the families prescribed in theory syllabus.
2. Demonstration of herbarium techniques
3. Structure of pollen grains using whole mounts [*Catharanthus, Hibiscus, Acacia*, Grass (*Typha, Cyperus*)].
4. Demonstration of pollen viability test using *in - vitro* germination (*Catharanthus*).
5. Study of ovule types and developmental stages of embryo sac using permanent slides /Photographs.
   Demonstration of polyembryony in *Citrus*.
6. Structure of endosperm (nuclear and cellular); Developmental stages of dicot and monocot Embryos using permanent slides /Photographs
7. Isolation and mounting of embryo (using *Symopsis / Senna* / *Crotalaria*)
8. Field visits
9. Preparation and submission of 30 herbarium specimens for evaluation during practical Examination.

II B.Sc., BOTANY- SEMESTER -III
PRACTICAL MODEL PAPER III Plant Taxonomy and Embryology

1. Describe the given Plant specimens (A and B) in technical terms. Draw neat labeled diagrams of twig with inflorescence, L.S. of Flower, T.s. of Ovary and floral Diagram. Give floral formula. Identify the family.

   2x 10 = 20 Marks

   (Description- vegetative - 2 marks, floral – 4 marks; diagrams-3 marks, Identification -1 marks)

2. Derive the plant specimens C and D to their respective families - 2x4 = 08 marks

3. Identification of spotters - D, E ,and F (Embryology) 3x4 =12 marks

4. Record & Herbarium (submission compulsory) 10 marks

Total : 50 Marks

Domain Skills Expected to Achieve: Understanding taxonomic principles and plant diversity, plant classification and Indian Flora, evolutionary trends, Ability to take vertical section of Flower, study its morphology, take transverse section of ovary and draw diagrams, Study of pollen morphology and identifying different ovule types.

II B. Sc - SEMESTER- IV THEORY: BOTANY SYLLABUS
PAPER – DSC IIB: Plant Physiology and Metabolism
Total hours of teaching 60 hrs @ 4 hrs per week

UNIT – I: Plant – Water relations (12 hrs)

1. Physical properties of water, Importance of water to plant life.
2. Diffusion, imbibition and osmosis; concept & components of water potential.
3. Absorption and transport of water and ascent of sap.
4. Transpiration –Definition, types of transpiration, structure and mechanism of opening and closing mechanism of stomata.

UNIT –II: Mineral nutrition & Enzymes (12hrs)

1. Mineral Nutrition**:** Essential elements (macro and micronutrients) and their role in plant metabolism, deficiency symptoms.
2. Mineral ion uptake (active and passive transport).
3. Nitrogen metabolism- biological nitrogen fixation in *Rhizobium*, Outlines of protein synthesis (transcription and translation).
4. Enzymes**:** General characteristics, mechanism of enzyme action and factors regulating enzyme action.

UNIT –III: PHOTOSYNTHESIS (12 hrs)

1. Photosynthesis: Photosynthetic pigments, photosynthetic light reactions, photo-phosphorylation, carbon assimilation pathways: C_3, C_4, and CAM (brief account)
2. Photorespiration and its significance.
3. Translocation of organic solutes: mechanism of phloem transport, source-sink relationships.

UNIT – IV: PLANT METABOLISM (12 hrs)

1. Respiration: Glycolysis, anaerobic respiration, TCA cycle, electron transport system. Mechanism of oxidative phosphorylation.
2. Lipid Metabolism**:** Types of lipids, Beta-oxidation.

UNIT –V: GROWTH AND DEVELOPMENT (12hrs)

1. Growth and development: definition, phases and kinetics of growth.
2. Physiological effects of phytohormones - Auxins, Gibberellins, Cytokinins, ABA, Ethylene and Brassinosteroids.
3. Physiology of flowering - photoperiodism, role of phytochrome in flowering; Vernalization.
4. Physiology of Senescence and Ageing.

Suggested activity: Seminars, Quiz, Debate, Question and answer sessions, Observing animations of protein biosynthesis in You-Tube.

Books for Reference

1. Steward. F.C (1964): Plants at Work (A summary of Plant Physiology) Addison-Wesley Publishing Co., Inc. Reading, Massachusetts, Palo Alto, London.
2. Devlin, R.M. (1969) : Plant Physiology, Holt, Rinehart & Winston and Affiliated East West Press (P) Ltd., New Delhi.
3. Noggle, R. and Fritz (1989): Introductory Plant Physiology Prentice Hall of India.
4. Lawlor. D.W. (1989): Photosynthesis, metabolism, Control and Physiology ELBS/Longmans - London.
5. Mayer, Anderson and Bonning (1965): Introduction to Plant Physiology D. Van Nostrand Publishing Co., N.Y.
6. Mukherjee, S. A.K. Ghosh (1998): Plant Physiology, Tata McGraw Hill Publishers (P) Ltd., New Delhi.
7. Salisbury, F.B and C.W. Ross (1999): Plant Physiology CBS Publishers and Printers, New Delhi.
7. Plummer, D.(1989): Biochemistry–the Chemistry of life, McGraw Hill Book Co., London, N.Y., New Delhi, Paris, Singapore, Tokyo.
9. Day, P.M. and Harborne, J.B. (Eds.,) (2000): Plant Biochemistry. . Harcourt Asia (P) Ltd., India and Academic Press, Singapore.

II B. Sc SEMESTRE- IV. – BOTANY PRACTICAL SYLLABUS
PAPER- DSC IIB - Plant Physiology and Metabolism)
Total hours of laboratory Exercises 30 hrs @ 2 per week

Suggested Laboratory Exercises:

1. Osmosis – by potato osmoscope experiment
2. Determination of osmotic potential of plant cell sap by plasmolytic method using leaves of *Rhoeo / Tradescantia*.
3. Structure of stomata (dicot and monocot)
4. Determination of rate of transpiration using cobalt chloride method.
5. Demonstration of transpiration by Ganongs' photometer
6. Demonstration of ascent of sap/Transpiration pull.
6. Effect of Temperature on membrane permeability by colorimetric method.
7. Study of mineral deficiency symptoms using plant material/photographs.
8. Separation of chloroplast pigments using paper chromatography technique.
9. Rate of photosynthesis under varying CO_2 concentrations.
10. Effect of light intensity on oxygen evolution in photosynthesis using Wilmott' bubbler.

II B. Sc – SEMESTRE- IV. BOTANY PRACTICAL MODEL PAPER
(PAPER- IV - Plant Physiology and Metabolism)

1. Perform the Experiments A & B. Give the aim, principle, procedure and observation. Tabulate the results if any. Draw labeled diagram. 2 x 15 = 30 marks

2. Give the protocol of the experiments C & D 2 x 5 = 10 marks

3. Record & Viva 10 marks

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50 marks

Domain Skills Expected to Achieve: Ability to prepare laboratory reagents accurately in required molarity, setting up of laboratory equipment to conduct experiments, ability to operate instruments like colorimeter, writing up inferences, recognizing mineral deficiency symptoms in live plants/photographs.

III B. Sc - SEMESTER- V: BOTANY SYLLABUS
THEORY PAPER – V
Paper DSC IIIA: Cell Biology, Genetics and Plant Breeding
Total hours of teaching 60 hrs @ 3 hrs per week

UNIT – I Cell Biology: (12 hrs)

1. Cell, the unit of life- Cell theory, Prokaryotic and eukaryotic cells; Eukaryotic cell components.
2. Ultra structure and functions of cell wall and cell membranes.
3. Chromosomes**:** morphology, organization of DNA in a chromosome (nucleosome model), Euchromatin and heterochromatin.

UNIT – II Genetic Material: (12 hrs)

1. DNA as the genetic material: Griffith's and Avery's transformation experiment, Hershey – Chase bacteriophage experiment.
2. DNA structure (Watson & Crick model) and replication of DNA (semi-conservative)
3. Types of RNA (mRNA, tRNA, rRNA), their structure and function.

UNIT – III Mendelian Inheritance: (12 hrs)

1. Mendel's laws of Inheritance (Mono- and Di- hybrid crosses); backcross and test cross.
2. Chromosome theory of Inheritance.
3. Linkage: concept, complete and incomplete linkage, coupling and repulsion; linkage maps based on two and three factor crosses.
4. Crossing Over: concept & significance.

UNIT – IV Plant Breeding: (12 hrs)

1. Introduction and Objectives of plant breeding.
2. Methods of crop improvement: Procedure, advantages and limitations of Introduction, Selection, and Hybridization (outlines only).

UNIT – V Breeding, Crop Improvement and Biotechnology: (12 hrs)

1. Role of mutations in crop improvement.
2. Role of somaclonal variations in crop improvement.
3. Molecular breeding – use of DNA markers in plant breeding and crop improvement (RAPD, RFLP).

Suggested activity: Seminar, Debate, Quiz, observation of live cells and nucleus in Onion peels, observation of Meiotic nuclei in Maize pollen. Solving Problems related to Genetics.

Books for Reference

1. Old, R.W. and Primrose S.B. 1994, Principles of Gene Manipulation Blackwell Science, London 2. Grierson, D. and Convey S.N. 1989, Plant Molecular Biology, Blackie Publishers, New York.
2. Lea, P.J. and Leegood R.C. 1999, Plant Biochemistry and Molecular Biology, John Wiley and Sons, London.
3. Power C.B. 1984, Cell Biology, Himalaya Publishing Co. Mumbai
4. De Robertis and De Robertis, 1998, Cell and Molecular Biology, K.M. Verghese and Company.
5. Sinnott, E.W., L.C. Dunn & J. Dobshansky (1958): Principles of Genetics (5th Edition) McGraw Hill Publishing Co., N.Y. Toronto, London.
6. Winchester, A.M. (1958): Genetics (3rd Edition) Oxford and IBH Publishing House, Calcutta, Bombay, New Delhi.
7. Singleton, R. (1963): Elementary Genetics, D. Van Nostrand Co., Ltd., Inc., N.Y. and Affiliated East West Press (P) Ltd., New Delhi.
8. Strickberger, M.W. (1976): Genetics (2nd Edition) MacMillan Publishing Co., Inc., N.Y., London
9. Watson, J.D. (1977): Molecular Biology of the Gene, W.A. Benjamin, Inc., Menlo Park-California, Reading - Massachusetts, London, Amsterdam, Don Mills, Ontario, Sydney.
10. Gardner, E.J and Snusted, D.P. (1984): Principles of Genetics (7th edition) John Wiley and Sons, N.Y. Chichester, Brisbane, Toronto, Singapore.
11. Lewin, B. (1985) Genes VII, Wiley Eastern Ltd., New Delhi, Bombay, Calcutta, Madras, Hyderabad.
12. Allard R.W (1999): The Principles of Plant Breeding, John & Wiley and Sons.
13. Poelman J.M: Breeding Field Crops, Springer.
14. George Acquaah (2012): Principles of Plant Genetics & Breeding: Wiley-Blackwell.

III B. Sc - BOTANY SYLLABUS SEMESTER- V

Practical Paper DSC IIIA: CELL BIOLOGY, GENETICS AND PLANT BREEDING

Total hours of teaching 30 hrs @ 2 hrs per week

Suggested Laboratory Exercises

1. Study of the structure of cell organelles through photomicrographs.
2. Study of structure of plant cell through temporary mounts.
3. Study of various stages of mitosis using cytological preparation of onion root tips.
4. Study of DNA packing by micrographs.
5. Study of effect of temperature and organic solvent on permeability of cell membrane.
6. Numerical problems solving Mendel's Laws of inheritance.
7. Chromosome mapping using 3-point test cross data.
8. Hybridization techniques – emasculation, bagging (for demonstration only).
9. Field visit to a plant breeding research station.
10. Calorimetric estimation of DNA by diphenylamine method.

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III B. Sc – SEMESTRE- V. BOTANY PRACTICAL MODEL PAPER (PAPER-V - CELL BIOLOGY, GENETICS AND PLANT BREEDING)

1. Perform the Experiment **A** .Perform squash on onion root tip, prepare the slide, identify at least one division stage. Write the procedure and draw the diagram of reported stage. 1 x 15 = 15marks

2. Give the experimental protocol of the experiments **B** 1 x 10 = 10 marks

3. Solving numerical problems on Mendelian in heritance **C, D** 2x 7 1/2 =15 marks

4. Record & Viva = 10 marks

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50 marks

A-Onion root squash technique
B- Estimation of DNA by diphenylamine method
C&D Numerical problems on Mendelian Inheritance.

Domain Skills Expected to Achieve: To operate compound microscope in high power field under oil immersion, preparation of temporary mounts of slides, squash technique, study and recognition of various stages of Mitosis and Meiosis, solving numerical problems of Mendelian Inheritance.

III B. Sc - SEMESTER- VI: BOTANY THEORY SYLLABUS
PAPER – DSC IIIB: PLANT ECOLOGY & PHYTOGEOGRAPHY
Total hours of teaching 60 hrs @ 3 hrs per week

UNIT – I. Elements of Ecology (12 hrs)

1. Ecology: definition, branches and significance of ecology.
2. Climatic Factors: Light, Temperature, precipitation.
3. Edaphic Factor: Origin, formation, composition and soil profile.
4. Biotic Factor: Interactions between plants and animals.

UNIT– II. Ecosystem Ecology (12 hrs)

1. Ecosystem: Concept and components, energy flow, Food chain, Food web, Ecological pyramids.
2. Productivity of ecosystem-Primary, Secondary and Net productivity.
3. Biogeochemical cycles- Carbon, Nitrogen and Phosphorous.

UNIT – II Population &Community Ecology (12 hrs)

1. Population -definition, characteristics and importance, outlines –ecotypes.
2. Plant communities- characters of a community, outlines – Frequency, density, cover, life forms, competition.
3. Interaction between plants growing in a community.

UNIT – IV Phytogeography (12 hrs)

1. Principles of Phytogeography, Distribution (wides, endemic, discontinuous species)
2. Phytogeographic regions of India.
3. Phytogeographic regions of World.
4. Endemism – types and causes.

UNIT- V: Plant Biodiversity and its importance (12 hrs)

1. Definition, levels of biodiversity-genetic, species and ecosystem.
2. Biodiversity hotspots- Criteria, Biodiversity hotspots of India.
3. Loss of biodiversity – causes and conservation (*In-situ* and *ex-situ* methods).
4. Seed banks - conservation of genetic resources and their importance

Suggested activity : Collection of different soils, studying their texture, observing polluted water bodies, student study projects, debates on man's activity on ecosystem and biodiversity conservation methods, visiting a nearest natural vegetation area. Visit to NGO, working in the field of biodiversity and report writing; to study Honey Bees and plants yielding honey.

Books for Reference

1. Daubenmire, R.F. ( ): Plants & Environment (2nd Edn.,) John Wiley & Sons., New York
2. Puri, .G.S. (1960): Indian Forest Ecology (Vol. I and II) Oxford Book Co., New Delhi and Calcutta.
3. Billings, W.B. (1965): Plants and the Ecosystem Wadsworth Publishing Co., Inc., Belmont.
4. Misra, R. (1968): The Ecology work Book Oxford and INH Publishing Co., Calcutta
5. Odum E.P. (1971): Fundamentals of Ecology (2nd Edn.,) Saunders and Co., Philadelphia and Natraj Publishers, Dehradun.
6. Odum E.P. (1975): Ecology By Holt, Rinert and Winston.
7. Oosting, H.G. (1978): Plants and Ecosystem Wadworth Belmont.
8. Kochhar, P.L. (1975): Plant Ecology. (9th Edn.,) New Delhi, Bombay, Calcutta-226 pp.,
9. Kumar, H.D. (1992): Modern Concepts of Ecology (7th Edn.,) Vikas Publishing Co., New Delhi.
10. Kumar H.D. (2000): Biodiversity & Sustainable Conservation Oxford and IBH Publishing Co Ltd. New Delhi.
11. Newman, E.I. (2000): Applied Ecology Blackwell Scientific Publisher, U.K.
12. Chapman, J.L&M.J. Reiss (1992): ecology (Principles and Applications). Cambridge University Press, U.K.
13. Cain, S.A. (1944): Foundations of Plant Geography Harper & Brothers, N.Y.
14. Mani, M.S (1974): Ecology & Biogeography of India Dr. W. Junk Publishers, The Haque
15. Good, R. (1997): The Geography of flowering Plants (2nd Edn.) Longmans, Green and Co., Inc., London & Allied Science Publishers, New Delhi

III B. Sc - SEMESTER- VI: BOTANY PRACTICAL
PAPER – DSC IIIB: PLANT ECOLOGY & PHYTOGEOGRAPHY
Total hours of teaching 30 hrs @ 3 hrs per week

1. Study of instruments used to measure microclimatic variables; soil thermometer, maximum and minimum thermometer, anemometer, psychrometer, rain gauze, and lux meter.
2. Permeability (percolation; total capacity as well as rate of movement) of different soil samples.
3. Determination of soil pH.
4. Study of morphological and anatomical adaptations of hydrophytes and xerophytes (4 each).
5. Determination of minimal quadrat size for the study of herbaceous vegetation in the college campus by species area curve method.
6. Study of Phytoplankton and macrophytes from water bodies.
7. Study of species diversity index of vegetation.
8. Estimation of Primary Productivity of an ecosystem
9. To study field vegetation with respect to stratification, canopy cover and composition.
10. Study of plants included in agro forestry and social forestry.
11. To locate the hotspots, phyto geographical regions and distribution of endemic plants in the map of India.
12. The following practical should be conducted in the Field/lab with the help of photo-graphs, herbarium, Floras, Red data book- Study of endangered plants species, critically endangered plants species, vulnerable plant species and monotypic endemic genera of India.

III B. Sc - SEMESTER- VI: BOTANY PRACTICAL MODEL PAPER
PAPER – VI: PLANT ECOLOGY & PHYTOGEOGRAPHY

1. Study Project under supervision	=	15 Marks
2. Record & Viva-Voce	=	10 Marks
3. Experiment **A**	=	10 Marks
4. Anatomical adaptations of **B** (Section cutting)	=	10 Marks
5. Spotters **C&D** (2x2 1/2)	=	5 Marks
	Total =	50 Marks

1. Study Project of a surrounding Ecosystem (terrestrial or aquatic) (plant diversity, animal diversity, human activity, pollution levels, restoration efforts under supervision.
2. Presentation of the project work in Q and A session.
3. **A** - determination of soil porosity/PH/percolation/retaining capacity.
4. **B** - Xerophyte/Hydrophyte anatomical adaptations.
5. **C and D** - anemometer/rain gauze/lux meter.

Domain Skills Expected to Achieve: Interpreting plant morphology and anatomy, understanding of plant diversity in terms of structure, function and environmental relationships, ability to operate different instruments to measure climatic conditions, soil PH, vegetation analysis technique etc.

B.Sc - BOTANY

PAPER-- SEMESTER-

THEORY MODEL PAPER

(*Botany Model Paper*)

Time: 3 Hours **Max. Marks:75**

SECTION-A (Short Answer Questions)

(Instructions to the paper setter: Set minimum ONE question from each unit, max Eight from all.)

Answer any five of the following question **5x5=25M**

1.
2.
3.
4.
5.
6.
7.
8.

SECTION-B (Essay Questions)

(Instructions to the paper setter: Set minimum two questions from each unit, either or internal choice)

Answer All of the following questions **5x10=50M**

9. a)
Or from unit I
b)

10.a)
Or from unit II
b)

11.a)
Or from unit III
b)

12.a)
Or from unit IV
b)

13.a)
Or from unit V
b)

INTERNAL EXAMS **- 25Marks**

15 marks for unit tests, **5** marks for assignments and remaining **5** marks for seminar etc.

III B. Sc - BOTANY SYLLABUS SEMESTER- VI THEORY [ELECTIVE -1]
PAPER – VII/i (Optional)
Paper VII/i - ORGANIC FARMING & SUSTAINABLE AGRICULTURE

Total hours of teaching 60hrs @ 3hrs per week

Unit - I: Concept of organic farming: (12hrs)

1. Introduction: Farming, organic farming, concept and development of organic farming.
2. Principles of organic farming, types of organic farming, biodynamic farming.

3. Benefits of organic farming, need for organic farming, conventional farming v/s organic farming

4. Scope of organic farming; Andhra Pradesh, National and International status.

5. Agencies and institutions related to organic agriculture.

6. Requirements for organic farming, farm components for an organic farm.

Unit - II: Organic plant nutrient management: (12hrs)

1. Organic farming systems, soil tillage, land preparation and mulching.
2. Choice of varieties.
3. Propagation-seed, planting materials and seed treatments, water management
4. Green manuring, composting- principles, stages, types and factors, composting methods, Vermi composting
5. Bulky organic manures, concentrated organic manures, organic preparations, organic amendments and sludges.
6. Bio-fertilizers- types, methods of application, advantages and disadvantages, standards for organic inputs- fertilizers

Unit-III: Organic plant protection: (12hrs)

1. Plant protection- cultural, mechanical, botanical pesticides, control agents
2. Weed management
3. Standards for organic inputs- plant protection.

Unit- IV: Organic crop production practices: (12hrs)

1. Organic crop production methods- rice, coconut.
2. Organic crop production methods- vegetables- okra, amaranthus, cucurbits.
3. Livestock component in organic farming.
4. Sustainable Agriculture-Apiculture, Mushroom cultivation.

Unit- V: Organic Certification (12hrs)

1. Farm economy: Basic concept of economics- demand &supply, economic viability of a farm.

2. Basic production principles, reducing expenses, ways to increase returns, cost of production system. Benefit/ cost ratio, marketing, imports and exports.
3. Policies and incentives of organic production.
4. Farm inspection and certification.
5. Terrace farming.

Books for Reference:

1. Palaniappan SP &Anandurai K. 1999. Organic Farming–Theory and Practice. Scientific Publishers, Jodhpur
2. Joshi, M. 2014. New Vistas of Organic Farming 2nd Ed. Scientific Publishers, Jodhpur.
3. Farming system : Theory and Practice - S.A.Solaimalai
4. Organic Farming: Theory and Practice- S.P.Palaniappan and K.A. Annadurai
5. A hand book of Organic Farming by A.K.Sharma

Suggested Activities: Preparation of Vermicompost in small scale, observing sewage sludge disposal mechanisms in urban/semi urban areas, studying the usage, of green manures, neem oil, neem cake, pongamia oil in organic farming, livestock component in various farming methods, visiting an Apiculture center, drawing various terrace farming models

SEMESTER –VI Practical
Paper-VII/i : Organic Farming and Sustainable Agriculture
Total hours of teaching 30 hrs @ 2 hrs per week

1. Study of different bio pesticides, weedicides, inorganic and organic fertilizers
2. Deficiency symptoms of nutrient deficiency symptoms (photographs)
3. Soil testing, liming, and fertilizing
4. Preparation of enriched Farm Yard Manure.
5. Study of composting methods.
6. Preparation of vermicompost.

7. Study of recycling of farm waste.

8. Study of methods of green manuring.

9. Study of steps in mushroom cultivation

10. Visit to urban waste recycling unit.

11. Study project report under supervision of lecturer – farm manure preparation/vermi-compost// /waste management// green manures/ mushroom cultivation / nutrient requirements of vegetables

Expected domain skills to be achieved: Performing Soil analysis, soil enrichment methods, composting procedure, recycling of wastes, use of waste materials in mushroom cultivation, understanding nutrient requirement of various crops, identifying various methods of keeping soil health

PRACTICAL MODEL PAPER

Paper-VII/1P: Organic Farming and Sustainable Agriculture

Q1. Project report (A) - 15 marks

Viva-voce on study project -05 marks

Q2. Identify and write notes on B, C, D, and E (4x5) -20 marks

B- inorganic manures/bio-weedicides/bio-pesticides (photograph/ specimen)

C- Compost preparation method (photograph/instrument)

D- Green manure type (plant specimen/photograph)

E- Waste recycling method (photograph/live specimen/institute/organization)

Q4. Field report - 05 marks

Q5. Record - 05 marks

TOTAL: 50 marks

III B. Sc - BOTANY SYLLABUS SEMESTER- VI (ELECTIVE-2)
PAPER – VII/ii (Optional)
Theory Paper VII/ii -T: Nursery, Gardening and Floriculture.
Total hours of teaching 60hrs @ 3hrs per week

Unit I: Nursery: **(12 hrs.)**

1. Definition, objectives, scope and building up of infrastructure for nursery.
2. Planning and seasonal activities - Planting - direct seeding and transplants.
3. Nursery Management and Routine Garden Operations.

Unit III: Gardening **(12 hrs.)**

1. Definition, objectives and scope - different types of gardening.
2. Landscape and home gardening - parks and its components, plant materials and design .
3. Computer applications in landscaping.
4. Gardening operations: soil laying, manuring, watering.
5. Landscaping Places of Public Importance: Landscaping highways and Educational Institutions)
6. Some Famous gardens of India.

Unit III: Propagation methods (12 **hrs.)**

1 Sowing/raising of seeds and seedlings, transplanting of seedlings. 2.Air-layering, cutting, selection of cutting ,propagule collecting season, treatment of cutting rooting medium and planting of cuttings - Hardening of plants.
3. Propagation of ornamental plants by rhizomes, corms tubers, bulbs and bulbils.
4. .Green house - mist chamber, shed root, shade house and glass house for propagation.

Unit IV: Floriculture: **(12 hrs.)**

1. Ornamental Plants: Flowering annuals; herbaceous, perennials; Divine vines; Shade and ornamental trees.
2. Ornamental bulbous and foliage plants; Cacti and succulents.
3. Ornamentals-palms.
4. Cultivation of plants in pots; Indoor gardening; Bonsai.

Unit V: Commercial Floriculture **(12 hrs.)**

1. Factors affecting flower production; Production and packaging of cut flowers; Flower arrangements; Methods to prolong vase life of flowers
2. Cultivation of Important cut flowers (Carnation, Aster, Dahlia, Gerbera, Anthuriams, Gladiolous, Marigold, Rose, Lilium)
3. Management of pests, diseases and harvesting.
4. Methods of harvesting.

Books for Reference:

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. institution)

4.Randhawa, G.S. and Mukhopadhyay, A. 1986. Floriculture in India. Allied Publishers.

Suggested Activities: Raising a nursery, managing it, studying and drawing various land scaping designs, practicing layering methods, using shade nets to protect horticultural crops, practicing indoor gardening techniques, visiting florists and recording their methods of prolonging vase life of commercial cut flowers.

III B. Sc - BOTANY SYLLABUS SEMESTER- VI (Elective-II)
Practical Syllabus VII/ii-Nursery, Gardening and Floriculture
Total hours of teaching 30hrs @ 2hrs per week

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1. Tools, implements and containers used for propagation and nursery techniques.
2. Propagation by cutting, layering, budding and grafting
3. Seed propagation- preparation of portable trays, seed treatments, sowing and seedling production.
4. Identification and description of annuals, herbaceous perennials, climbers, creepers, foliage and flowering shrubs, trees, palms, ferns, ornamental grasses; cacti and succulents..
5. Planning and designing of gardens, functional uses of plants in the landscape
6. Preparation of land for lawn and planting.
7. Identification of commercially important flower crops and their varieties.
8. Propagation practices in flower crops, sowing of seeds and raising of seedlings of annuals.
9. Use of chemicals and other compounds for prolonging the vase life of cut flowers.
10. Grading, packing and marketing of cut flowers.
11. Visit to commercial nurseries and commercial tissue culture laboratory
12. Study project under supervision of lecturer – nursery/ornamental flowers/ plants/lawn designing/ landscape designing

Expected domain skills to be achieved: Ability to use a variety of garden tools and implements, proficiency in layering and grafting techniques (cleft grafting and bud grafting), land scape drawings using computers, raising of healthy nurseries of flowering plants, managing vase life of cut flowers etc.

PRACTICAL MODEL PAPER

Paper-VII/ii P: Nursery, Gardening and Floriculture

Q1. Project report (A)	**- 15 marks**
Viva-voce on study project	**-05 marks**
Q2. Identify and write notes on B, C, D, and E (4x5)	**-20 marks**
B- Tool/instrument/container used in nursery	
C-Seed propagation technique	
D- Plant used in lawn (plant specimen/photograph)	
E-ornamental flower (photograph/live specimen)	
Q4. Field report	**- 05 marks**
Q5. Record	**- 05 marks**
	50 marks

III B. Sc - BOTANY SYLLABUS SEMESTER- VI (Elective 3)
PAPER – VII-iii (Optional)
Theory Paper VII/iii -T: Plant tissue culture and its biotechnological applications
Total hours of teaching 60hrs @ 3hrs per week

Unit I: PLANT TISSUE CULTURE – 1 (12hrs)

1. History of plant tissue culture research - basic principles of plant tissue callus culture, meristem culture, organ culture, Totipotency of cells, differentiation and dedifferentiation.
2. Methodology - sterilization (physical and chemical methods), culture media, Murashige and Skoog's (MS medium), phytohormones, medium for micro-propagation/clonal propagation of ornamental and horticulturally important plants.
3. Callus subculture maintenance, growth measurements, morphogenesis in callus culture – organogenesis, somatic embryogenesis.

UNIT-II: Plant Tissue culture -2 (12hrs)

1. Endosperm culture – Embryo culture -culture requirements – applications, embryo rescue technique.
2. Production of secondary metabolites.
3. Cryopreservation; Germ plasm conservation.

Unit III: Recombinant DNA technology (12**hrs)**

1. Restriction Endonucleases (history, types I-IV, biological role and application); concepts of restriction mapping.
2. Cloning Vectors: Prokaryotic(pUC 18, pBR322,Ti plasmid and Lambda phage, Eukaryotic Vectors (YAC and briefly PAC)
3. Gene cloning (Bacterial Transformation and selection of recombinant clones, PCR mediated gene cloning)
4. Construction of genomic and cDNA libraries, screening DNA libraries to obtain gene of interest by complementation technique, colony hybridization.

Unit IV: Methods of gene transfer (12hrs)

1. Methods of gene transfer- Agrobacterium-mediated, direct gene transfer by Electroporation, Microinjection, Micro projectile bombardment.

2. Selection of transgenics– selectable marker and reporter genes (Luciferase, GUS, GFP).

Unit V: Applications of Biotechnology (12 hrs)

1. Applications of Plant Genetic Engineering – crop improvement, herbicide resistance, insect resistance, virus resistance.

2. Genetic modification – transgenic plants for pest resistant (Bt-cotton); herbicide resistance (Round Up Ready soybean); improved agronomic traits - flavrSavr tomato, Golden rice); Improved horticultural varieties (Moon dust carnations)

Books for Reference:

1. Pullaiah. T. and M.V.Subba Rao. 2009. Plant Tissue culture. Scientific Publishers, New Delhi.
2. Bhojwani, S.S. and Razdan, M.K., (1996). Plant Tissue Culture: Theory and Practice. Elsevier Science Amsterdam. The Netherlands.
3. Glick, B.R., Pasternak, J.J. (2003). Molecular Biotechnology- Principles and Applications ofrecombinant DNA. ASM Press, Washington.
4. Bhojwani, S.S. and Bhatnagar, S.P. (2011). The Embryology of Angiosperms. VikasPublicationHouse Pvt. Ltd., New Delhi. 5th edition.
5. Snustad, D.P. and Simmons, M.J. (2010). Principles of Genetics. John Wiley and Sons, U.K. 5th edition.
6. Stewart, C.N. Jr. (2008). Plant Biotechnology & Genetics: Principles, Techniques and Applications. John Wiley & Sons Inc. U.S.A.

Suggested Activities: In vitro initiation of callus on artificial medium, seminars on utilization of rDNA technology, debates on applications of Biotechnology (whether it is a boon or bane to the society) studying growth patterns, vegetative characteristics of Bt.cotton and identifying the features of its pest resistance

III B. Sc - BOTANY SYLLABUS SEMESTER- VI (Elective-3)
PAPER – VII/iii (Optional)
Practical Paper VII/iii -Plant Tissue Culture &Plant Biotechnology
Total hours of teaching 30hrs @ 2hrs per week

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1. (a) Preparation of MS medium.
   (b) Demonstration of in vitro sterilization methods and inoculation methods using leaf and nodal explants of Tobacco/ Datura/ Brassica etc.
2. Study of embryo and culture, micro propagation of Banana, somatic embryogenesis, artificial seeds through photographs.
3. Construction of restriction map of circular and linear DNA from the data provided.
4. Study of methods of gene transfer through photographs: Agrobacterium-mediated, direct gene transfer by electroporation, microinjection, and micro projectile bombardment.
5. Different steps involved in genetic engineering for production of Bt. cotton, Golden rice, Flavr Savr tomato through photographs.
7. Isolation of plasmid DNA.

8. Restriction digestion and gel electrophoresis of plasmid DNA (optional)

9. Field visit to a lab involved in tissue culture

10. Study project under supervision of lecturer – tissue culture/ genetic engineering

Expected domain skills to be achieved: Ability to prepare artificial nutrient media, preparing independently, applying various sterilization procedures for media, glassware and biological materials, in vitro propagation of Banana callus, morphogenesis, clonal propagation methods, isolation of plasmid DNA individually and as a group.

PRACTICAL MODEL PAPER

Paper-VII/iii P: Plant Tissue Culture &Plant Biotechnology

Q1. Project report (A) **- 15 marks**

Viva-voce on study project **-05 marks**

Q2. Identify and write notes on B, C and D (3x4) **-12 marks**

B- Tool/instrument/container used in sterilization

C- Tool/instrument/container used in gene transfer

D- GM crops (Photographs)

Q3. Construct restriction map of circular and/ or linear DNA from the data provided – 08 marks

Q4. Field report **- 05 marks**

Q5. Record **- 05 marks**

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50 marks

CLUSTER ELECTIVES (Group –A)

III B.Sc.: BOTANY SYLLABUS SEMESTER- VIII THEORY [CLUSTER ELECTIVE -1] PAPER – VIII/I (Elective-I)

Paper VIII/I -Theory: PLANT DIVERSITY AND HUMAN WELFARE

Total hours of teaching 60hrs @ 3hrs per week

Unit- I: Plant diversity and its scope: **(12hrs)**

i. Genetic diversity, Species diversity, Plant diversity at the ecosystem level, Agro biodiversity and cultivated plant taxa, wild taxa.

ii. Values and uses of biodiversity: Ethical and aesthetic values, iii. Methodologies for valuation, Uses of plants.

Unit -II: Loss of biodiversity: **(12hrs)**

i. Loss of genetic diversity, Loss of species diversity, Loss of ecosystem diversity, Loss of agro biodiversity, projected scenario for biodiversity loss

ii. 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.

Unit-III: Contemporary practices in resource management: **(12hrs)**

i. Environmental Impact Assessment (EIA), Geographical Information System GIS, Participatory resource appraisal, Ecological footprint with emphasis on carbon footprint, Resource accounting;

ii. Solid and liquid waste management

Unit -IV: Conservation of biodiversity (12hrs)

i. Conservation of genetic diversity, species diversity and ecosystem diversity, *In situ* and *ex situ* conservation,

ii. Social approaches to conservation, Biodiversity awareness programmes, Sustainable development.

Unit- V: Role of plants in relation to Human Welfare (12hrs)

i. Importance of forestry, their utilization and commercial aspects- a) Avenue trees, b) ornamental plants of India. c) Alcoholic beverages through ages.

ii. Fruits and nuts: Important fruit crops their commercial importance.
Wood, fiber and their uses.

Suggested Readings:

1. Krishnamurthy, K.V. (2004). An Advanced Text Book of Biodiversity - Principles and Practices. Oxford and IBH Publications Co. Pvt. Ltd. New Delhi.
2. Singh, J. S., Singh, S.P. and Gupta, S. (2006). Ecology, Environment and Resource Conservation. Anamaya Publications, New Delhi.
3. Rogers, P.P., Jalal, K.F. and Boyd, J.A. (2008). An Introduction to Sustainable Development. Prentice Hall of India Private Limited, New Delhi.

Suggested activities: Study of flora and its diversity in the college campus or local area,enumerating wild and exotic species(*Parthenium*,Water hyacinth etc.)

Project work on any one of the International organizations striving for preservation of biodiversity, study of conservation efforts of local people, and civic bodies, study of locally available fruits in different seasons, enumerating the avenue plantations and their diversity in your town/city

Practicals:

1) Study of plant diversity (flowering plants).

2) Study of exotic species- Identification and morphological characteristics.

3) Identification of forest trees through bark, wood, flowers, leaves and fruits.

4) Maceration, Study of wood (Tracheary elements, fibres).

5) Methods of preservation and canning of fruits.

6) Visit to the local ecosystem to study the plants.

7) Write up on the conservation efforts of International organizations.

8) Study of Solid and Liquid waste management systems in rural/urban areas.

Domain skills expected to achieve: Identification of exotic plant species, identification of forest trees based on the characteristics of bark, flowers and fruits, understanding the preservation methods of fresh and dry fruits, understanding the methods of safe disposal of biodegradable and non-biodegradable wastes

SCHEME OF PRACTICAL EXAMINATION

PRACTICAL- VIII/I Elective (MODEL QUESTION PAPER)

PLANT DIVERSITY AND HUMAN WELFARE

Time: 3hrs Max. Marks: 50

I. Assign the plants **A, B and C** to their respective families, giving reasons, family name and classification-2 marks, important diagrams- 3 marks.

15 marks

II. Give the protocol of **D** **10 marks**

III. Comment on specimens **E, F and G** **3x3 = 9 marks**

IV. Report on Field visit **6 marks**

To study sources of firewood (10 plants), timber-yielding trees (10trees) and bamboos.

V. Viva-Voce **5 marks**

VI. Practical Record **5 marks**

KEY

A-Cultivated Plant
B- Wild Plant
C –Exotic plant
D- Preservation and canning of fruits, solid and liquid waste management systems in rural/urban areas
E. Bark/wood/fruit yielding plant
F. Nuts/ Alcoholic beverage plant
G. wood /Fibre yielding plant

III B. Sc - BOTANY SYLLABUS

SEMESTER- VIII THEORY [CLUSTER ELECTIVE -2]

Paper VIII/II -Theory: ETHNOBOTANY AND MEDICINAL BOTANY
Total hours of teaching 60hrs @ 3hrs per week

Unit –I: **Ethnobotany** **(12hrs)**

i. Introduction, concept, scope and objectives; Ethnobotany as an interdisciplinary science. The relevance of ethnobotany in the present context
ii. Major and minor ethnic groups or Tribals of India, and their life styles.
iii. Plants used by the tribal populations: a) Food plants, b) intoxicants and beverages, c) Resins and oils and miscellaneous uses.

Unit -II: **Role of ethnobotany in modern Medicine**: **(12hrs)**

i. Role of ethnobotany in modern medicine with special example *Rauvolfia sepentina*, *Trichopus zeylanicus*, *Artemisia annua, Withania somnifera.*
ii. Medico-ethnobotanical sources in India
iii. Significance of the following plants in ethno botanical practices (along with their habitat and morphology)
a) *Azadirachta indica*, b*) Ocimum sanctum*, c) *Vitex negundo*, d) *Gloriosa superba*, e) *Tribulus terrestris,* f) *Phyllanthus niruri ,* g) *Cassia auriculata,* h) *Indigofera tinctoria ,* i) *Senna auriculata* j).*Curcuma longa*.

iv. Role of ethnic groups in the conservation of plant genetic resources.

Unit-III: Ethnobotany as a tool to protect interests of ethnic groups (12hrs)

i. Sharing of wealth concept with few examples from India.
ii. Biopiracy, Intellectual Property Rights and Traditional Knowledge.

Unit -IV: History, Scope and Importance of Medicinal Plants. indigenous Medicinal Sciences (12hrs)

i. Definition and Scope-**Ayurveda**: History, origin, panchamahabhutas, saptadhatu and tridosha concepts, Rasayana, plants used in ayurvedic treatments.
ii. **Siddha**: Origin of Siddha medicinal systems, Basis of Siddha system, plants used in Siddha medicine.
iii. **Unani**: History, concept: Umoor-e- tabiya, tumors treatments/ therapy, polyherbal formulations (in brief).

Unit -V: Conservation of endangered and endemic medicinal plants: **(12hrs)**

i. Definition: endemic and endangered medicinal plants,
ii. Red list criteria
iii. In situ conservation: Biosphere reserves, sacred groves, National Parks
iv. Ex situ conservation: Botanical Gardens.

Suggested Activities: Studying plant utilization methods by tribal/rural/migrant populations for their beverages, food,medicinal and uses, seminars on role of ethnic groups in conservation of plant genetic resources, project work on traditional knowledge about plant medicines, study of indigenous medicinal sciences and their efficacy.

Suggested Readings:

1) S.K. Jain, Manual of Ethnobotany, Scientific Publishers, Jodhpur, 1995.
2) Glimpses of Indian. Ethnobotny, Oxford and I B H, New Delhi – 1981.
3) S.K. Jain (ed.) 1989. Methods and approaches in ethnobotany. Society of ethnobotanists, Lucknow, India.
4) S.K. Jain, 1990. Contributions of Indian ethnobotny.Scientific publishers,

Jodhpur.
5) Colton C.M. 1997. Ethnobotany – Principles and applications. John Wiley and sons – Chichester
6) Rama Ro, N and A.N. Henry (1996). The Ethnobotany of Eastern Ghats in Andhra Pradesh, India.Botanical Survey of India. Howrah.
7. Trivedi P C, 2006. Medicinal Plants: Ethnobotanical Approach, Agrobios, India.
8. Purohit and Vyas, 2008. Medicinal Plant Cultivation: A Scientific Approach, 2nd edn. Agrobios, India.
9. Pal, D.C. & Jain, S.K., 1998. Tribal Medicine. Naya Prakash Publishers, Calcutta
10. Raychudhuri, S.P., 1991. (Ed.) Recent advances in Medicinal aromatic and spice crops. Vol.1, Today& Tomorrow's printers and publishers, New Delhi

Practical:

1. Ethnobotanical specimens as prescribed in theory syllabus
2. Detailed morphological and anatomical study of medicinally important part(s) of locally available plants (Minimum 8 plants) used in traditional medicine.
3. Field visits to identify and collect ethno medicinal plants used by local tribes/folklore.

Domain skills expected to achieve: Identification of various plant parts used as medicines by ethnic groups, understanding the difference between ancient wisdom and modern system of medicine, traditional medicine at the rescue of curing drug resistant maladies like malaria and viral diseases, understanding the role of spices in Indian kitchens, their therapeutic role

PRACTICAL- VIII/II Elective (MODEL QUESTION PAPER)

ETHNOBOTANY AND MEDICINAL BOTANY

Time: 3 Hours **Max. Marks- 50**

I. Identify the specimen A- Give reasons (morphological and anatomical) and draw labeled sketches 15marks

II. Identify and write about the medicinal uses of B-and C- 2x5= 10 marks.

III. Comment on D and E. 2x 4=8 marks

IV. Report on Field visit: 7 marks

List to be prepared mentioning special features of plants used by tribal populations as Medicinal Plants & Spices. Write their botanical and common names, parts used and diseases/disorders for which they are prescribed.

V. Viva-voce 5 marks

VI. Record 5 marks

Total = 50 marks

KEY

A-Plants given in unit II (i)

B-Plants used in Ayurvedic prearations (Amla in Chyavanprash, Senna in Laxatives)

C - - Do -

D. Photographs of National parks, Biosphere reserves and Botanical gardens.

E. Photograph of famous personalities in Ayurveda/Siddha medicine.

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III B. Sc - BOTANY SYLLABUS SEMESTER- VIII THEORY [CLUSTER ELECTIVE -3] PAPER – VIII/III (Elective)

Paper VIII/III -Theory: Pharmacognosy and Phytochemistry

Total hours of teaching 60hrs @ 3hrs per week

Unit-I: Pharmacognosy (12hrs)

Definition, Importance, Classification of drugs - Chemical and Pharmacological, Drug evaluation methods

Unit –II: Organoleptic and microscopic studies: (12hrs)

Organoleptic and microscopic studies with reference to nature of active principles and common adulterants of *Alstonia scholaris* (bark), *Adhatoda vasica*(leaf), *Strychnos nuxvomica* (seed), R*auwolfia serpentina*(root) and *Zinziber officinalis* C*atharanthus roseus.*

Unit-III: Secondary Metabolites: (12hrs)

i. Definition of primary and secondary metabolites and their differences, major types - terpenes, phenolics, alkaloids, terpenoids, steroids.

ii. A brief idea about extraction of alkaloids.Origin of secondary metabolites – detailed account of acetate pathway, mevalonate pathway, shikimate pathway.

UNIT-IV: Phytochemistry: (12hrs)

Biosynthesis and sources of drugs:

(i) Phenols and phenolic glycosides : structural types, biosynthesis, importance of simple phenolic compounds, tannins, anthraquinones, coumarins and furanocoumarins, flavones and related flavonoid glycosides, anthocyanins, betacyanins, stilbenes, lignins and lignans).

(ii) Steroids, sterols, saponins, withanolides, ecdysones, cucurbitacins: Biosynthesis, commercial importance.

(iii) Alkaloids: Different groups, biosynthesis, bioactivity.

(v) Volatile oils, aromatherapy.

UNIT-V: Enzymes, proteins and amino acids as drugs: **(12hrs)**

i. Vaccines, toxins and toxoids, antitoxins, immune globulins, antiserums,

ii. Vitamins, Antibiotics – chemical nature, mode of action.

iii. Pharmacological action of plant drugs – tumor inhibitors, PAF antagonists, antioxidants, phytoestrogens and others.

iv. Role of different enzyme inhibitors.

Suggested Activities: Isolation techniques of active principles from various parts of popular medicinal plants, debates on the efficacy of plant medicines and palliative cure, volatile oils from plants-extraction methods, project work on crude drugs

BOOKS FOR REFERENCE:

1. Wallis, T. E. 1946. Text book of Pharmacognosy, J & A Churchill Ltd. 2. Roseline, A. 2011. Pharmacognosy. MJP Publishers, Chennai.

2. Gurdeep Chatwal, 1980. Organic chemistry of natural productis. Vol.I.Himalaya Publishing house.

3. Kalsi, P. S. and Jagtap, S., 2012. Pharmaceutical medicinal and natural product chemistry N.K. Mehra . Narosa Publishing House Pvt. Ltd. New Delhi.

4. Agarwal, O. P. 2002. Organic chemistry–Chemistry of organic natural products. Vol. II. Goel publishing house , Meerut.
5. Harborne, J. B. 1998. Phytochemical methods –a guide to modern techniques of plant analysis 3 rd edition, Chapman and Hall
6. Datta & Mukerji, 1952. Pharmacognosy of Indian roots of Rhizome drugs. Bulletin No.1 Ministry of Health, Govt. of India.

PRACTICALS:

1. Physical and chemical tests for evaluation of unorganized drugs- Asaphoetida. Honey, Castor oil. Acacia

2. Identification of bark drugs – cinchona, cinnamom

3. Identification of fruit drugs – Cardamom, Coriander

4. Identification of root and rhizome drugs- Ginger, Garlic, Turmeric

5. Identification of whole plant – Aloes,Vinca, Punarnava

6. Herbarium of medicinal plants (minimum of 20 platns)

7. Collection of locally available crude drugs from local venders (minimum of 20)

Domain skills expected to achieve: Identification of various plant parts used as medicines, extraction of active principles from them, isolation by chromatographic techniques, learning callus culture techniques for secondary metabolite enrichment and understanding ethno-pharmacological principles

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PRACTICAL- VIII/II Elective (MODEL QUESTION PAPER)

Pharmacognosy and Phytochemistry

Time: 3hrs. Max. Marks=50

I. Identify the given crude drugs **A& B** by morphological study and chemical tests. **10 marks**

II. Perform suitable chemical test and identify the given phytochemical **C** **10 marks**

III. Comment on D and E **2x5=10 marks**

IV. Herbarium and submission of drugs **-10 marks**
IV. Viva-Voce **5 marks**
V. Practical Record **5 marks**

Total = 50 marks

KEY

A-Flower/fruit drugs

B-Rhizome/whole plant drugs

C- Tannins/ phenolics/steroids/ isoprenoids /Asaphoetida/ Honey/ Castor oil/ Acacia

D. Column Chromatography/ Gas Chromatogram/HPLC (photograph/ instrument used for chemical analysis of drugs

E. photograh/instrument used for tissue culture

B.Sc - BOTANY
SEMESTER-V/VI: THEORY MODEL PAPER
(*General Model Paper*)

Time: 3 Hours **Max. Marks:75**

SECTION-A (Short Answer Questions)

(Instructions to the paper setter: Set minimum ONE question from each unit, maximum Eight from all.)

Answer any five of the following question **5x5=25M**

1.
2.
3.
4.
5.
6.
7.
8.

SECTION-B (Essay Questions)

(Instructions to the paper setter: Set minimum two questions from each unit, either or internal choice)

Answer All of the following questions **5x10=50M**

9**. a)**

Or **from unit I**

b)

10. a)

Or **from unit II**

b)

11. a)

Or **from unit III**

b)

12. a)

Or **from unit IV**

b)

13. a)

Or **from unit V**

b)

INTERNAL EXAMS **- 25Marks**

(15 marks for unit tests, **5** marks for assignments and remaining **5** marks for seminar etc.)

CLUSTER ELECTIVES (Group –B)

III B.Sc.: BOTANY SYLLABUS SEMESTER- VIII THEORY [CLUSTER ELECTIVE -1B]

PAPER – VIII/I B (Elective)

Paper VIII/IB -Theory: Biological instrumentation and Methodology

Total hours of teaching 60hrs @ 3hrs per week

Unit -I:Imaging and related techniques: **(12hrs)**

Principles of microscopy; Light microscopy; Fluorescence microscopy; Electron Microscopy (a) Flow cytometry (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- II: pH and Centrifugation: (12 hrs)

pH meter: Principles and instrumentation, Centrifugation: Principles, types of centrifuges, types of rotors, differential and density gradient centrifugation, application. Sonication, Freeze drying.

Unit- III: Spectrophotometry: (12hrs)

Principle involved in Spectrophotometer; Spectrophotometric techniques, Instrumentation: ultraviolet and visible spectrophotometry (single anddouble beam, double wavelength spectrophotometers), Infrared spectrometers - Luminometry and densitometry – principles and their applications - Mass Spectroscopy- principlesof analysis, application in Biology.

Unit- IV: Chromatography: (12hrs)

Chromatographic techniques: Principle and applications – Column - thin layer –paper, affinity and gaschromatography - Gel filtration - Ion exchange and High performance liquid chromatography techniques– Examplesof application for each chromatographic system - Basic principles of electrophoresis.

Unit-V:Preparation of molar, molal and normal solutions, buffers, the art of scientific writing

(12hrs)

Understanding the details on the label of reagent bottles.Molarity and normality of common acids and bases.Preparation of solutions.Dilutions.Percentage solutions.Molar, molal and normal solutions. Technique of handling micropipettes; Knowledge about common toxic chemicals and safety measures in their handling.

The art of scientific writing and presentation of scientific matter.Scientific writing and ethics.Writing references.Powerpoint presentation.Poster presentation.
Introduction to copyright-academic misconduct/plagiarism in scientific writing.

Suggested Readings:

1. Bajpai, P.K. 2006. Biological Instrumentation and methodology. S. Chand & Co. Ltd.
2. K. Wilson and J. Walker Eds. 2005. Biochemistry and Molecular Biology. Cambridge University Press.
3. K. Wilson andKHGoulding. 1986. Principles and techniques of Practical Biochemistry. (3 edn) Edward Arnold, London.

4. Dawson, C. (2002). Practical research methods.UBS Publishers, New Delhi.

5. Stapleton, P., Yondeowei, A., Mukanyange, J., Houten, H. (1995). Scientific writing for agricultural research scientists – a training reference manual. West Africa Rice Development Association, Hong Kong.

6. Ruzin, S.E. (1999). Plant micro technique and microscopy. Oxford

University Press, New York, U.S.A.

Sugested activities: Preparing various laboratory reagents, operating laboratory instruments, noting instrument readings, calculating results accurately, Skills on writing scientific articles, presentation of scientific resultsthrough tables, graphs, poster presentations and practicing power point presentations.

PRACTICAL SYLLABUS

1. Microscopy – Light microscopy: principles, parts & function
2. Micrometry- principle and measurement of microscopic objects: Low power and high power.
3. Camera Lucida drawing with magnification and scale.
4. Principle and working of phase contrast microscope
5. Principle & operation of Centrifuge
6. Preparation of standard acid and alkali and their standardization.

b) Preparation of various solutions (normal, molar, and percent) and ppm/ppb by serial dilutions

7. Study of principle and working of pH meter and Measurement of pH of Milk, Pepsi, Lemon juice etc. using pH paper and pH meter
8. Study of principle of Chromatography and separation of amino acids mixture By ascending Paper Chromatography
7. Principle & operation of Colorimeter
8. Principle & operation of Spectrophotometer
9. Chromosome banding, FISH, chromosome painting
9. Principle and technique of TLC (demonstration)
10. TLC separation of Amino acids from purified samples and biological materials (demonstration)

11 PCR - The Polymerase Chain Reaction (protocol) -demonstration

13. Study visit to an institute /laboratory

Domain skills expected to achieve:

Skill in operating laboratory equipment, their upkeep, and adept at various biological techniques. Ability to prepare molar, molal, normal solutions and solutions of different dilutions.Interpreting scientific results, and ability to present results in a scientific way through graphs, photographs, poster presentations and power point presentations.

Paper VIII/IB -Theory: Biological instrumentation and Methodology

PRACTICAL MODEL PAPER

1. Perform the experiment (A). Write the protocol of the experiment - 15 marks

2. Measure the pH of given sample (B) using pH paper and pH meter. Write the procedure and observation. 10 marks

3. Identify C, D, and E. Write the principle and use of them. 3X5 -15 marks

4. Viva voce on Field visit 05 marks

5. Record 05 marks

Key

A. Amino acid separation by paper chromatography

B. Milk, Pepsi, Lemon juice etc

C. Camera Lucida/ Micrometer/phase contrast microscope

D. Colorimeter/ Spectrophotometer

E. Chromosome banding, FISH, chromosome painting

CLUSTER ELECTIVES (Group –B)

III B.Sc.: BOTANY SYLLABUS SEMESTER- VIII THEORY [CLUSTER ELECTIVE -2B]

PAPER – VIII/II B (Elective)

Paper VIII/IIB -Theory: Mushroom Culture and Technology

Total hours of teaching 60hrs @ 3hrs per week

Unit I: Introduction, history: (12hrs)

Introduction - history - scope of edible mushroom cultivation, Types of edible mushrooms available in India –*Volvariellavolvacea*, *Pleurotuscitrinopileatus*, *Agaricusbisporus.* Nutritional and medicinal value of edible mushrooms; Poisonous mushrooms.

UNIT II:Pure culture-spawn preparation: (12hrs)

Pure culture - preparation of medium (PDA and Oatmeal agar medium)sterilization - preparation of test tube slants to store mother culture – culturingof*Pleurotus* mycelium on Petriplates, preparation of mother spawn in salinebottle and polypropylene bag and their multiplication.

Unit III: Cultivation Technology: **(12hrs)**

Infrastructure: Substrates (locally available) Polythene bags, vessels, Inoculation hook, inoculation loop, low cost stove, sieves, culture rack, mushroom unit (Thatched house) water sprayer, tray, small polythene bag. 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 IV:Storage and nutrition : (12hrs)

Short-term storage (Refrigeration - up to 24 hours) Long term Storage (canning, pickels, papads), drying, storage in saltsolutions. Nutrition - Proteins - amino acids, mineral elements nutrition - Carbohydrates, Crude fibre content – Vitamins.

Unit V:FoodPreparation: (12hrs)

Types of foods prepared from mushrooms;soup,cutlet omlette,samosa,pickles and curry .ResearchCentres - 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) Oyster Mushrooms, 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, Mysore Road, Bangalore - 560018.

3. Tewari, Pankaj Kapoor, S.C., (1988). Mushroom cultivation, Mittal Publications, Delhi.

4. Nita Bahl (1984-1988) Hand book of Mushrooms, II Edition, Vol. I & Vol. II.

5.Biswas, S., M. Datta and S.V. Ngachan. 2011. Mushrooms: A Manual For Cultivation. PHI learning private Ltd., New Delhi, India.

6. Chang, S. and P.G. Miles. 2004. Mushrooms: cultivation, nutritional value, medicinal effect, and environmental impact. CRC Press. USA.

7. Miles, P.G. and S. Chang. 1997. Mushroom Biology:

Concise basics and current developments. World Scientific

Publishing Co. Pte.Ltd. Singapore.

Suggested activities: Growing spawn on laboratory prepared medium in petriplates and maintaining, preparing compost and compost beds, packing of beds, spawning, maintaining moisture, picking, blanching and packing. Collecting naturally growing mushrooms and identifying them properly,visits to mushroom houses.

PRACTRICAL SYLLABUS

1. Identification of different edible and poisonous mushrooms.

2. Microscopic and anatomical observations of different mushroom species.

3. Pure culture - preparation of medium (PDA and Oatmeal agar medium) sterilization.

4. Isolation and preparation of spawn under controlled conditions(preparation of mother spawn in saline bottle and polypropylene bag and their multiplication).

5. Types of Compost preparation and sterilization.

6. Mushroom bed preparation - paddy straw, sugarcane trash, maize straw, banana leaves/waste.

7. Inoculation and spawning of compost.

6. Incubation and harvesting of mushrooms (collection, drying and preservation).

7. Diseases of mushrooms (photographs).

8. Post-harvest technology steps (photographs).

9. Study tour to mushroom cultivation farms

11. Project work – cultivation of paddy straw/ oyster/white button mushrooms.

Domain skills expected to achieve: Identification of different edible species, skill in media and substrate preparation, isolation of pure culture for spawn, compost preparation, and practices in growing methods of different cultivated mushrooms,Postharvest handling and packing

SCHEME OF PRACTICAL EXAMINATION

PAPER – VIII/II B (Elective): Mushroom Culture and Technology

PRACTICAL- VIII/II Elective (MODEL QUESTION PAPER)

Time: 3hrs Max. Marks: 50

I. Prepare the culture medium for isolation of spawn and make the slants. Write the protocol for preparation of the medium (A)

20 marks

II.Write the protocol for preparation of compost (B)

08 marks

III. Comment on given specimens C, D and E

3x4 = 12 marks

IV. Report on Field visit 05 marks

V. Practical Record 05 marks

Total = 50 marks

KEY

A-PDA /Oatmeal agar medium

B- Paddy straw compost

C – Edible mushroom (Photograph)

D- Poisonous mushroom (Photograph)

E. Preservation technique (Photograph)

.

CLUSTER ELECTIVES (Group –B)

III B.Sc.: BOTANY SYLLABUS SEMESTER- VIII THEORY [CLUSTER ELECTIVE -3B]

PAPER – VIII/III B (Elective)

Paper VIII/IIIB - III.Internship/ Project Work preferably either in an Institute or Industry