



**Dr. B. R. AMBEDKAR UNIVERSITY-SRIKAKULAM**  
**B.Sc. BOTANY SYLLABUS**  
**STRUCTURE UNDER CHOICE BASED CREDITS SYSTEM**  
**REVIEWED SYLLUBUS w.e.f. 2016-17**

**Structure of Syllabus**

<i>Year</i>	<i>Semester</i>	<i>Paper</i>	<i>Title</i>	<i>Hours</i>	<i>Marks</i>	<i>Credits</i>
<b>I</b>	<b>I</b>	<b>I</b>	Microbial Diversity , Algae and Fungi	<b>4</b>	<b>100</b>	<b>03</b>
			Practical –I	<b>2</b>	<b>50</b>	<b>02</b>
	<b>II</b>	<b>II</b>	Diversity Of Archaeogoniates & Anatomy	<b>4</b>	<b>100</b>	<b>03</b>
			Practical –II	<b>2</b>	<b>50</b>	<b>02</b>

# **I B.Sc. - SEMESTER- I: BOTANY SYLLABUS**

w.e.f. 2015-16 (Revised in April, 2016)

## **Paper- I: Microbial Diversity, Algae and Fungi**

Total hours of teaching 60hrs @ 4 hrs per week

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

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- Archaeobacteria, Mycoplasma, Chlamydia, Actinomycetes, Rickettsias and Cyanobacteria.

### **UNIT- II: VIRUSES**

**(12hrs)**

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).
3. Study of Tobacco Mosaic, Bhendi Vein clearing and Papaya leaf curl diseases.

### **UNIT III: BACTERIA**

**(12hrs)**

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**

**(12hrs)**

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**

**(12hrs)**

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. Prescott, L. Harley, J. and Klein, D. (2005) Microbiology, 6th edition, Tata Mc Graw- Hill Co. New Delhi.
4. 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 & Sons., Inc., N.Y., Chichester, Berisbane, Toronto, Singapore.
8. Webster, J (1999) : Introduction to Fungi(2nd edition) Cambridge University Press.

**\*\*Student Activities like Seminars, Assignments, Fieldwork, Study Projects, Models etc. are Part of Curriculum for all units in all papers.**

## I B.Sc. – SEMESTER –I: BOTANY PRACTICAL SYLLABUS

### Paper-I: 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 (Demonstration).
  3. Study of viruses and bacteria using electron photo micrographs (TMV, Bacteriophage, HIV, Cocci, Bacillus, Spirillum bacteria).
  4. Gram staining technique.
  5. Study of Plant disease symptoms caused by Bacteria (Citrus canker, leaf blight of rice, Angular leaf spot of Cotton) and viruses (TMV, Bhendi 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 and Scytonema*.
    - b) Algae: *Oedogonium, Ectocarpus, Polysiphonia*,
    - 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 anatomy of different thalli.
  9. Field Visit.
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**B.Sc. - SEMESTER –I**  
**BOTANY PRACTICAL PAPER –I**  
***Paper-1 P: Microbial Diversity, Algae and Fungi***

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Time: 3hrs.

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:

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50 Marks  
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**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.

# **I B.Sc. - SEMESTER- II: BOTANY THEORY SYLLABUS**

## **Paper –II: Diversity of Archaeogniates & Plant Anatomy**

Total hours of teaching 60hrs @ 4 hrs per week

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### **UNIT – I: BRYOPHYTES**

**(12hrs)**

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**

**(12hrs)**

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

### **UNIT – III: GYMNOSPERMS**

**(12hrs)**

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

### **UNIT –I V: Tissues and Tissue systems**

**(12hrs)**

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**

**(12hrs)**

1. Anomalous secondary growth in *Achyranthes*, *Boerhaavia* and *Dracaena*.
2. Study of local timbers of economic importance-Teak, Rosewood, Red sanders and Arjun (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. & Collier- MacMillan Ltd., London.
10. Coulter, J.M.& 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 & Winston,  
N.Y., Chicago, San Fransisco, Toronto, London.
13. Eames, A.J., & 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-II: Diversity of Archaeogoniates & Plant Anatomy**  
Total hours of laboratory Exercises 30 hrs @ 2 per week

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1. Morphology (vegetative and reproductive structures) , anatomy of the following :  
*Marchantia, Funaria, 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**

### **II P: Diversity of Archaeogniates & plant Anatomy**

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- |   |    |               |
|---|----|---------------|
| 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      |

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Total : 50 Marks  
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#### **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.
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**STRUCTURE UNDER CHOICE BASED CREDITS SYSTEM**  
**REVIEWED SYLLUBUS w.e.f. 2016-17**

**Structure of Syllabus**

<i>Year</i>	<i>Semester</i>	<i>Paper</i>	<i>Title</i>	<i>Hours</i>	<i>Marks</i>	<i>Credits</i>
<b>II</b>	<b>III</b>	<b>III</b>	Plant taxonomy & Embryology	<b>4</b>	<b>100</b>	<b>03</b>
			Practical –III	<b>2</b>	<b>50</b>	<b>02</b>
	<b>IV</b>	<b>IV</b>	Plant physiology & Metabolism	<b>4</b>	<b>100</b>	<b>03</b>
			Practical –IV	<b>2</b>	<b>50</b>	<b>02</b>

## **II B.Sc. - SEMESTER –III: BOTANY THEORY PAPER –III**

### **Paper-III: Plant Taxonomy and Embryology)**

Total hours of teaching 60hrs @ 4 hrs per week

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#### **UNIT – I: INTRODUCTION TO PLANT TAXONOMY**

**(12hrs)**

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 & Prantle's system of classification- merits and demerits
4. Phylogeny – origin and evolution of Angiosperms

#### **UNIT –III: SYSTEMATIC TAXONOMY-I**

**(12hrs)**

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

#### **UNIT –IV: SYSTEMATIC TAXONOMY-II**

**(12hrs)**

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

#### **UNIT – V: EMBRYOLOGY**

**(12hrs)**

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 (out lines) 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.

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### **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. & Krishnamoorthy. K.V.(1980):From flower to fruit Tata McGraw Hill Publishing Co., Ltd., New Delhi.
1. Maheswari, P.(1985):An Introduction to the Embryology of Angiosperms Tata McGraw Hill Publishing Co.,Ltd., New Delhi.
8. Bhojwani, S.S. & Bhatnagar, S.P. (2000) : The Embryology of Angiosperms (4th Edition) Vikas Publishing House(P)Ltd., UBS Publisher's Distributors, New Delhi.

## II B.Sc. BOTANY - SEMESTER-III

### Paper-III: PRACTICAL

#### Plant Taxonomy and Embryology

Total hours of laboratory Exercises 30hrs @ 2 per week

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#### ***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).
  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.
  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. Study of local flora and submission of Field Note Book.
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**II B.Sc., BOTANY- SEMESTER -III**  
**PRACTICAL MODEL PAPER III    Plant Taxonomy and Embryology**

1. Describe the given Plant specimens (A & 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 & 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

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Total : 50 Marks  
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## **II B.Sc. BOTANY, SEMESTER- IV, Paper-IV: THEORY SYLLABUS**

### **PAPER –IV: Plant Physiology and Metabolism**

Total hours of teaching 60hrs @ 4 hrs per week

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#### **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 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<sub>3</sub>, C<sub>4</sub>, 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 & Affiliated East West Press (P) Ltd., New Delhi .
3. Noggle, R.& Fritz (1989):Introductory Plant Physiology Prentice Hall of India.
4. Lawlor.D.W. (1989): Photosynthesis, metabolism, Control & Physiology ELBS/Longmans-London.
5. Mayer, Anderson & 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 & C.W. Ross (1999): Plant Physiology CBS Publishers and Printers, New Delhi.
2. Plummer, D.(1989) Biochemistry–the Chemistry of life ,McGraw Hill Book Co., London, N.Y. New Delhi, Paris, Singapore, Tokyo.
9. Day, P.M.& Harborne, J.B. (Eds.,) (2000): Plant Biochemistry. . Harcourt Asia (P) Ltd., India & Academic Press, Singapore.



## **II B.Sc. BOTANY SEMESTRE- IV, Paper–IV: PRACTICAL SYLLABUS**

### **PAPER-IV: Plant Physiology and Metabolism**

Total hours of laboratory Exercises 30 hrs @ 2 per week

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#### **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 & 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  $\text{CO}_2$  concentrations.
10. Effect of light intensity on oxygen evolution in photosynthesis using Wilmott' bubbler.

**II B.Sc. – SEMESTER- 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

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# **Dr. B. R. AMBEDKAR UNIVERSITY-SRIKAKULAM**

## **III B.Sc. (BOTANY) SYLLABUS**

### **STRUCTURE UNDER CHOICE BASED CREDITS SYSTEM**

**REVIEWED SYLLABUS w.e.f. 2016-17**

#### **SEMESTER-V**

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#### **UNIT - I: CELL BIOLOGY**

**(14 hrs)**

1. Plant cell envelopes: Ultra structure of cell wall, molecular organization of cell membranes.
2. Nucleus: Ultrastructure,
3. Nucleic acids - Structure and replication of DNA, types and functions of RNA

#### **UNIT –II: CHROMOSOMES AND CELL DIVISION**

**(12hrs)**

1. **Chromosomes:** Morphology, Organization of DNA in a chromosome, Euchromatin and Heterochromatin, Karyotype.
2. **Special types of chromosomes:** Polytene, Lampbrush and B-Chromosomes
3. **Cell division:** Cell cycle and its regulation, **Mitosis, Meiosis** and their Significance.

#### **UNIT - III: ECOSYSTEM**

**(12 hrs)**

1. **Ecosystem:** Concept and components of Ecosystem, energy flow, food chains, food webs, ecological pyramids, biogeochemical cycles: Carbon, Nitrogen, Phosphorus.
2. **Plants and environment:** Ecological factors - Climatic (light and temperature), Edaphic and biotic, Ecological adaptations of plants.

#### **UNIT – IV: POPULATION AND COMMUNITY ECOLOGY**

**(12hrs)**

1. **Population Ecology:** population density – Natality- mortality- survivorship curves – age distribution and pyramids - growth curves –population dispersal ecotypes, ecads
2. **Community ecology:** Introduction – plant community qualitative characters (Physiognomy- Phenology –stratification – abundance – life forms) Quantitative - characters (Density Frequency, cover and basal area)
3. Plant succession (Hydrosere, Xerosere)

#### **UNIT – V: Production ecology**

**(10 hrs)**

1. **Production ecology:** Concepts of productivity, GPP, NPP, CR (Community Respiration) and secondary production, P/R ratio and Ecosystems.
2. **Pollution and their control:** Air, Water, Soil
3. Social forestry

**Suggested readings:**

Bharucha,E.2005. Textbook of environmental Studies for Undergraduate Courses. Universities Press (India) Private Limited, Hyderabad.

Chennarayappa, Cell Biology, University Press, Hyderabad.

Chennarayappa, Molecular Biology, University Press, Hyderabad.

Fukui,K. and S. Nakayama.1996. Plant Chromosomes: Laboratory Methods.CRC Press, Boca Raton, Florida.

Harris, N. and K.J.Oparka.1994. Plant Cell Biology: A Practical Approach. IRL Press at University Press, Oxford. UK.

Khitoliya, R.K.2007. Environmental Pollution – Management and Control for Sustainable Development.S. Chand &Company Ltd., New Delhi.

Kormondye, E. 1989. Concepts of Ecology(3<sup>rd</sup> Ed.). Printice Hall of India, New Delhi.

Odum,E.P.1983. Basics of Ecology.Saunders' International Students Edition, Philadelphia.

Sharma .P.D., Ecology and Environment., Rastogi publications Meerut.

Sharma.A. k. and A.Sharma.1999.plant Chromosomes: Analysis, Manipulation and Engineering. Haewood Academic PUBLishers, Australia.

Singh,H.R.2005. Environmental Biology .S. Chand & Company Ltd., New Delhi.

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**III B. Sc - BOTANY**  
**PAPER- III Part –A SEMESTER –V**  
**Model Question Paper**  
*(Paper –III-A T: Cell Biology and Ecology)*

**Time: 3 Hours**

**Max. Marks:75**

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**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=25Marks

- 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=50Marks

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**  
**PAPER – III Part - B SEMESTER-V**  
**(Paper –III-B T: Genetics, Biodiversity & Conservation)**  
**Total hours of teaching 60 hrs @ 4 hrs per week**

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**UNIT – I: GENETICS**

**(12 hrs)**

1. Introduction to Genetics and history
2. Mendelism: Laws of inheritance. Gene interactions - Epistasis, Complementary, Supplementary, Inhibitory genes.

**UNIT –II: LINKAGE AND CROSSING OVER – MUTATIONS**

**(14 hrs)**

1. Linkage and crossing over: A brief account, construction of genetic maps - 2 point and 3 point test cross data.
2. Mutations:-Type of Mutations-Mutagens - Chromosomal aberrations - structural and numerical changes, gene mutation, transposable elements.

**UNIT – III: GENE CONCEPT AND EXPRESSION-GENETIC CODE**

**(12hrs)**

1. Gene expression: Organization of gene, transcription, translation, mechanism and regulation of gene expression in prokaryotes (Lac. and Trp. Operons )
2. Extra nuclear genome: Plasmids, Mitochondrial and plastid DNA.
3. Genetic Code

**UNIT – IV: BIODIVERSITY**

**(12hrs)**

1. Biodiversity: Concepts, convention on Biodiversity - Earth Summit. Types of Biodiversity. Levels, threats and value of Biodiversity. Hot spots of India - Endemism, North Eastern Himalayas, Western Ghats, Agro Biodiversity, Vavilov centers of crop plants.

**UNIT – V : PRINCIPLES OF CONSERVATION**

**(10hrs)**

1. Principles of conservation : In-situ, Ex-situ conservation; IUCN threat - categories RED data book – threatened and endangered plants of India. Role of organization in the conservation of Biodiversity - IUCN, UNEP, WWF, NBPGR, NBD.

**Suggested readings:**

Kothari,A.1997. Understanding Biodiversity: Life, Sustainability and Equity: Tracts for the Times.11. Orient Longman Ltd., New Delhi.

Mishra,D.D.2008. Fundamental Concepts in Environmental Studies.S. Chand & Company Ltd., New Delhi

Pandey, B .P.2007. Botany for Degree Students: Diversity of Microbes, Croptograms, Cell Biology and Genetics. S. Chand & Company Ltd., New Delhi.

Shukla,R.S. and P.S.Chandel.2007. Cytogenetics , Evolution, Biostatistics and Plant Breeding. S. Chand & Company Ltd., New Delhi.

Singh,H.R.2005. Enivronmental Biology .S. Chand & Company Ltd., New Delhi.

Snustad, D. P. and M.J. Simmons.2000. Principles of Genetics. Joha Wiley & Sons, Inc.USA.

Strickberger, M. W. 1990. Genetics (3<sup>rd</sup> Ed.). Macmillan Publishing Company.

Verma, P.S. and V.K. Agrawal. 2006. Genetics.S.Chand& Company Ltd., New Delhi.

**III B. Sc - BOTANY**  
**Theory Model Question Paper**  
**PAPER – III Part –B SEMESTER-V**  
*(Paper –III-B T: Genetics, Biodiversity & Conservation)*

**Time: 3 Hours**

**Max. Marks:75**

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**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=25Marks

- 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=50Marks

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 PRACTICAL SYLLABUS**  
***Practical – III Part - A&B: Cell Biology, Genetics, Ecology and Biodiversity***  
(Total Hours 48 @ 3 h / Week in 16 Sessions)

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***Suggested Laboratory Exercises:***

1. Study of various stages of mitosis using cytological preparation of Onion root tips
2. Study of various stages of meiosis using cytological preparation of Onion flower buds
3. Study of polytene chromosomes using cytological preparation of salivary glands from *Chironomus* / prepared slides / photographs
4. Study on the ultra structure of cell organelles using electron microphotographs
5. Solving genetic problems related to Monohybrid,(two) Dihybrid ratio(two) and interaction of genes (six) (minimum of eight problems).
6. Construction of linkage maps; two point test cross (three problems)
7. Knowledge of ecological instruments: Working principles and applications of Hygrometer, rain gauge, anemometer, altimeter, light meter, wet and dry bulb thermometer (with the help of Equipment / diagrams/ photographs).
8. Determination of soil texture (composition of clay, sand, silt etc. by sieve method.) and pH.
9. Study of morphological and anatomical characteristics of plant communities using locally available plant species: Hydrophytes (*Eichhornia Root, Hydrilla Stem, Nymphaea Petiole*), Xerophytes (*Casuarina Anatomy, and Opuntia, Euphorbia antiquorum Morphology*) and Halophytes (*Rhizophora, and Aegiceras- Root*).
10. Detailed study on flora of a local fresh water or aquaculture pond.
11. Geographical spotting of certain endemic and endangered plant species of AP.
12. Minimum of two field visits to local areas of ecological / conservation of biodiversity\ importance (Sacred grove / Reserved forest / Botanical garden / Zoo Park / Lake etc.).

III B.Sc Practical Model Question paper  
Botany practical paper –III Part – A & B at the end of V Semester  
***(Cell Biology, Genetics, Ecology and Biodiversity)***

Time: **3h**

Maximum Marks: **50**

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- |   |          |
|---|----------|
| 1. Identify the Material ‘A’ by application of the squash technique   | 10 Marks |
| 2. Solve the ‘B’ Genetic Problem with the given data and explain in detail  | 8 Marks  |
| 3. Make suitable stained preparation of the material ‘C’ and identify the material with the help of the labeled diagram giving reasons: | 8 Marks  |
| 4. Conduct ‘D’ Minor Ecology Experiment:  | 5 Marks  |
| 5 Critical notes on ‘E,F,G’ spotters of scientific interest: (3x3)  | 9 Marks  |
| 6. Field Notes and Record (submissions is Compulsory)   | 10 Marks |

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Total - 50 Marks  
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**Key:**

A: Root tip of Onion

B: Genetic problem

C: Ecology Material Section Cutting

D: Soil test

E: Cytology slides - Mitosis / Meiosis stages, Karyotype, Lamp brush and, Polytene Chromosomes.

F: Ecology material – Morphology/ Anatomy of any specimen studied in theory

G: Biodiversity – Any endemic plant studied.

**III B. Sc - BOTANY SYLLABUS SEMESTER- VI**  
**PAPER – VII – ELECTIVE**

**Paper VII-(C): 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**

**(12hrs)**

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 of recombinant DNA. ASM Press, Washington.
4. Bhojwani, S.S. and Bhatnagar, S.P. (2011). The Embryology of Angiosperms. Vikas Publication House 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

### PAPER – VII-(C) Elective

#### Practical Paper VII-(C): 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--s, clonal propagation methods, isolation of plasmid DNA individually and as a group.

### **PRACTICAL MODEL PAPER**

#### **Paper-VII-(C) : 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 | 8 marks    |
| Q4. Field report  | - 05 marks |
| Q5. Record  | - 05 marks |
| Total =   | 50 Marks   |
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CLUSTER ELECTIVES (Cluster-A or Cluster-B)  
**III B.Sc.: BOTANY SYLLABUS SEMESTER- VI**  
**Paper VIII, CLUSTER ELECTIVE, Cluster-A,**  
**Paper VIII-A-1 : 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

### **Paper – VIII-A-1 : Practicals: PLANT DIVERSITY AND HUMAN WELFARE**

- 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-A-1 : Cluster 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 : CLUSTER ELECTIVE -A

#### Paper VIII-A-2 : ETHNOBOTANY AND MEDICINAL BOTANY

Total hours of teaching 60hrs @ 3hrs per week

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#### 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 serpentina*, *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

## **Cluster Elective VIII-A-2: Practical:**

### **ETHNOBOTANY AND MEDICINAL BOTANY**

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-A-2 Cluster Elective : MODEL QUESTION PAPER**

#### **Paper VIII-A-2: ETHNOBOTANY AND MEDICINAL BOTANY**

**Time: 3 Hours**

**Max. Marks- 50**

- 
- |  |                    |
|--|--------------------|
| I. Identify the specimen A- Give reasons (morphological and anatomical) and draw sketches  | labeled<br>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            |
| <p>List to be prepared mentioning special features of plants used by tribal populations as Medicinal Plants &amp; Spices. Write their botanical and common names, parts used and diseases/disorders for which they are prescribed.</p> |                    |
| V. Viva-voce   | 5 marks            |
| VI. Record   | 5 marks            |

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Total      =      50 marks

#### **KEY**

A-Plants given in unit II (i)

B-Plants used in Ayurvedic preparations (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.



- D. Photographs of National parks, Biosphere reserves and Botanical gardens.
- E. Photograph of famous personalities in Ayurveda/Siddha medicine.

**III B. Sc - BOTANY SYLLABUS SEMESTER- VIII**  
**CLUSTER ELECTIVE, Paper VIII-A-3**

**Paper VIII-A-3: Pharmacognosy and Phytochemistry**

Total hours of teaching 60hrs @ 3hrs per week

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**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), *Rauwolfia serpentina* (root) and *Zinziber officinalis Catharanthus 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 products.  
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.

### VIII-A-3: Pharmacognosy and Phytochemistry: 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 plants)
7. Collection of locally available crude drugs from local vendors (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

**PRACTICAL: VIII-A-3 Cluster 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**

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**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