

**DEPARTMENT OF BOTANY**  
**Telangana University**  
**Dichpally, Nizamabad-503322**

(A State University Established under the Act No. 28 of 2006, A.P.  
Recognized by UGC under 2(f) and 12 (B) of UGC Act 1956)

Accredited by NAAC 'B' Grade, CGPA: 2.61



**B. Sc. (CBCS) Botany**  
**Course Structure and Syllabus**

**w.e.f. 2016-2017**

**Dr. Ahmed Abdul Haleem Khan**  
Chairperson, Board of Studies  
Dept. of Botany, T.U.

**Dr. M. Aruna**  
Head  
Dept. of Botany, T.U.

**B. Sc. (CBCS) Botany**  
**Semester: I - VI**  
**Course Structure**

Paper	Paper Title	No. of Instruction Hours	Max. Marks	No. of Credits
<b>B. Sc. I yr</b> w.e.f. 2016-2017				
<b>Semester – I</b>				
I	Microbial diversity of Lower Plants	60 Theory (@4 per week)	80UE+20IE	4
		45 Practicals (@2 per week)	50	1
<b>Semester – II</b>				
II	Bryophytes, Pteridophytes, Gymnosperms and Paleobotany	60 Theory (@4 per week)	80UE+20IE	4
		45 Practicals (@2 per week)	50	1
<b>B. Sc. II yr</b> w.e.f. 2017-2018				
<b>Semester – III</b>				
III	Taxonomy of Angiosperms and Medicinal Botany	60 Theory (@4 per week)	80UE+20IE	4
		45 Practicals (@2 per week)	50	1
<b>Semester – IV</b>				
IV	Plant Anatomy, Embryology and Palynology	60 Theory (@4 per week)	80UE+20IE	4
		45 Practicals (@2 per week)	50	1
<b>B. Sc. III yr</b> w.e.f. 2018-2019				
<b>Semester – V</b>				
V	Cell Biology and Genetics	45 Theory (@3 per week)	80UE+20IE	3
		45 Practicals (@2 per week)	50	1
VI & VII	Elective: I – Ecology & Biodiversity / Elective: II – Horticulture	45 Theory (@3 per week)	80UE+20IE	3
		45 Practicals (@2 per week)	50	1
<b>Semester – VI</b>				
VIII	Plant Physiology	45 Theory (@3 per week)	80UE+20IE	3
		45 Practicals (@2 per week)	50	1
IX & X	Elective: I – Tissue Culture & Biotechnology / Elective: II – Seed Technology	45 Theory (@3 per week)	80UE+20IE	3
		45 Practicals (@2 per week)	50	1

**B. Sc. (CBCS) Botany- I year**  
**Semester-I - Paper-I**  
**Microbial Diversity of Lower Plants**

**Theory Syllabus**

**Credits- 4**  
**(60 hours)**

**UNIT - I**

1. Brief account of Archaeobacteria, Actinomycetes. (4h)
2. Cyanobacteria: General characters, cell structure, thallus organisation and their significance as biofertilizers with special reference to *Oscillatoria*, *Nostoc* and *Anabaena* (6h)
3. Lichens: Structure and reproduction; ecological and economic importance. (5h)

**UNIT- II**

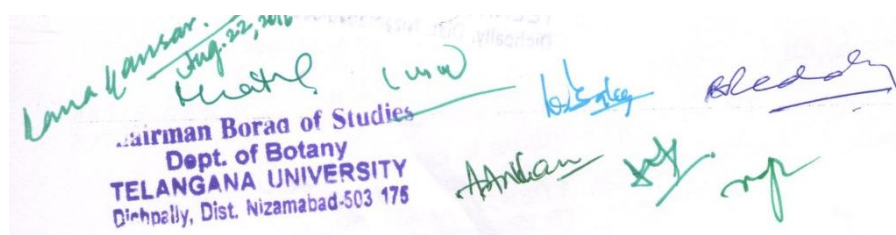
4. Viruses: Structure, replication and transmission; plant diseases caused by viruses and their control with reference to Tobacco Mosaic and Rice Tungro. (7h)
5. Bacteria: Structure, nutrition, reproduction and economic importance. An outline of plant diseases of important crop plants caused by bacteria and their control with reference to Angular leaf spot of cotton and Bacterial blight of Rice.
6. General account of Mycoplasma with reference to Little leaf of brinjal and Papaya leaf curl (8h)

**UNIT-III**

7. General characters, structure, reproduction and classification of algae (Fritsch) and thallus organization in algae. (3h)
8. Structure and reproduction of the following: (5h)  
Chlorophyceae- *Volvox*, *Oedogonium* and *Chara*.  
Phaeophyceae- *Ectocarpus* (2h)  
Rhodophyceae- *Polysiphonia*. (3h)
9. Economic importance of algae in Agriculture and Industry. (2h)

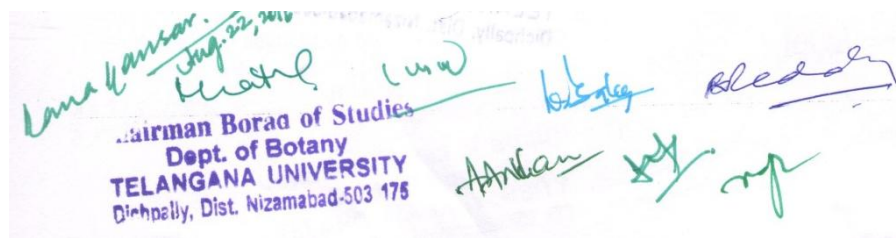
**UNIT-IV**

10. General characters and classification of fungi (Ainsworth). (3h)
11. Structure and reproduction of the following: (10h)  
(a) Mastigomycotina- *Albugo*  
(b) Zygomycotina- *Mucor*  
(c) Ascomycotina- *Saccharomyces* and *Penicillium*.  
(d) Basidiomycotina- *Puccinia*  
(e) Deuteromycotina- *Cercospora*.
12. Economic importance of fungi in relation to mycorrhizae and mushrooms. General account of mushroom cultivation (2h)



## References:

1. Alexopolous, J. and W. M. Charles. 1988. Introduction to Mycology. Wiley Eastern, New Delhi.
2. Mckane, L. and K. Judy. 1996. Microbiology – Essentials and Applications. McGraw Hill, New York.
3. Pandey, B. P. 2001. College Botany, Vol. I: Algae, Fungi, Lichens, Bacteria, Viruses, Plant Pathology, Industrial Microbiology and Bryophyta. S. Chand & Company Ltd, New Delhi.
4. Pandey, B. P. 2007. Botany for Degree Students: Diversity of Microbes, Cryptogams, Cell Biology and Genetics. S. Chand & Company Ltd, New Delhi.
5. Sambamurthy, A. V. S. S. 2006. A Textbook of Plant Pathology. I. K. International Pvt. Ltd., New Delhi.
6. Sambamurthy, A. V. S. S. 2006. A Textbook of Algae. I. K. International Pvt. Ltd., New Delhi.
7. Sharma, O. P. 1992. Textbook of Thallophyta. McGraw Hill Publishing Co., New Delhi.
8. Thakur, A. K. and S. K. Bassi. 2008. A Textbook of Botany: Diversity of Microbes and Cryptogams. S. Chand & Company Ltd, New Delhi.
9. Vashishta, B. R., A. K. Sinha and V. P. Singh. 2008. Botany for Degree Students: Algae. S. Chand & Company Ltd, New Delhi.
10. Vashishta, B. R. 1990. Botany for Degree Students: Fungi, S. Chand & Company Ltd, New Delhi.

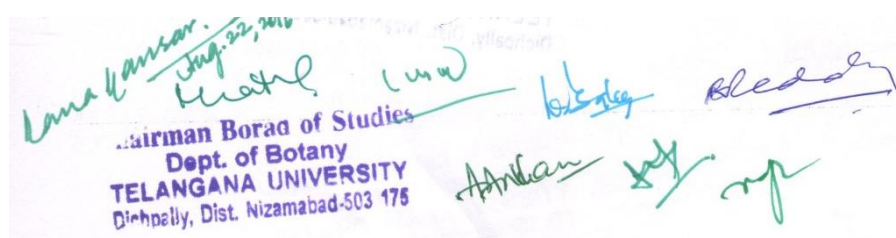


**B. Sc. (CBCS) Botany-I year  
Semester-I - Paper-I  
Microbial Diversity of Lower Plants**

**Practical Syllabus**

**(45 hours)**

1. Study of viruses and bacteria using electron micrographs (photographs). (3h)
2. Gram staining of Bacteria. (3h)
3. Study of symptoms of plant diseases caused by viruses, bacteria, Mycoplasma and fungi:  
Viruses: Tobacco mosaic  
Bacteria: Angular leaf spot of cotton and Rice tungro.  
Mycoplasma: Little leaf of Brinjal and Leaf curl of papaya (3h)  
Fungi: White rust on Crucifers, Rust on wheat & Tikka disease of Groundnut. (6h)
4. Vegetative and reproductive structures of the following taxa:  
Algae: *Oscillatoria*, *Nostoc*, *Volvox*, *Oedogonium*, *Chara*, *Ectocarpus*  
and *Polysiphonia*. (6 h)  
Fungi: *Albugo*, *Mucor*, *Saccharomyces*, *Penicillium*, *Puccinia* and *Cercospora* (6h)
5. Section cutting of diseased material infected by Fungi and identification of pathogens as per theory syllabus. White rust of Crucifers, Rust on wheat & Tikka disease of Groundnut (9h)
6. Lichens: Different types of thalli and their external morphology (3 h).
7. Examination of important microbial, fungal and algal products:  
Biofertilizers, protein capsules, antibiotics, mushrooms, Agar-agar etc. (3h)
8. Field visits to places of algal / microbial / fungal interest (e.g. Mushroom cultivation, water bodies). (3h)



**B. Sc. (CBCS) Botany- I year**  
**Semester-II - Paper-II**  
**Bryophytes, Pteridophytes, Gymnosperms and Paleobotany**

**Theory Syllabus**

**Credits- 4**  
**(60 hours)**

**UNIT-I**

1. Bryophytes: General characters and classification. (3h)
2. Structure, reproduction, life cycle and systematic position of *Marchantia*, *Anthoceros* and *Polytrichum*. (Development stages are not required). (10h)
3. Evolution of Sporophyte in Bryophytes. (2h)

**UNIT-II**

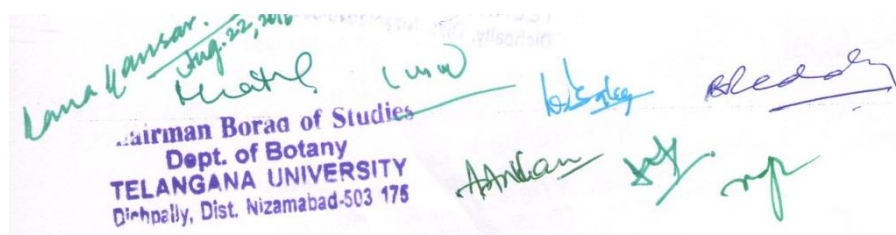
4. Pteridophytes: General characters and classification (Sporne's) (3h)
5. Structure, reproduction, life cycle and systematic position of *Rhynia*, *Lycopodium*, *Equisetum* and *Marsilea*. (10h)
6. Stelar evolution, heterospory and seed habit in Pteridophytes. (2h)

**UNIT-III**

7. Gymnosperms: General characters, structure, reproduction and classification (Sporne's). (4h)
8. Distribution and economic importance of Gymnosperms. (3h)
9. Morphology of vegetative and reproductive parts, systematic position and life cycle of *Pinus* and *Gnetum* . (8 h)

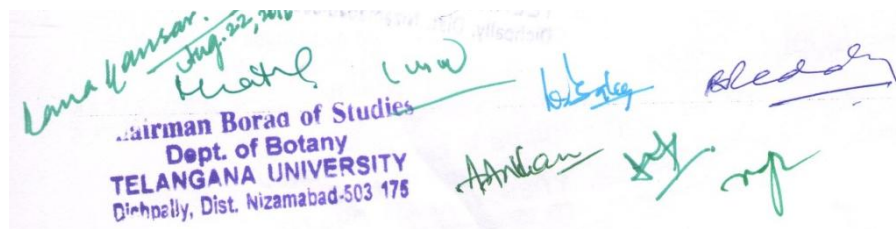
**UNIT-IV.**

10. Palaeobotany: Introduction, Fossils and fossilization ; Importance of fossils. (8 h)
11. Geological time scale; (4 h)
12. Bennettitales: General account. (3 h)



## References:

1. Watson, E. V. 1974. The structure and life of Bryophytes, B. I. Publications, New Delhi.
2. Pandey, B. P. 2006. College Botany, Vol. II: Pteridophyta, Gymnosperms and Paleobotany. S. Chand & Company Ltd, New Delhi.
3. Sporne, K. R. 1965. Morphology of Gymnosperms. Hutchinson Co., Ltd., London.
4. Vashishta, P. C., A. K. Sinha and Anil Kumar. 2006. Botany - Pteridophyta (Vascular Cryptogams). S. Chand & Company Ltd, New Delhi.
5. Pandey, B. P. 2001. College Botany, Vol. I: Algae, Fungi, Lichens, Bacteria, Viruses, Plant Pathology, Industrial Microbiology and Bryophyta. S. Chand & Company Ltd, New Delhi.
6. Pandey, B. P. 2007. Botany for Degree Students: Diversity of Microbes, Cryptogams, Cell Biology and Genetics. S. Chand & Company Ltd, New Delhi.
7. Thakur, A. K. and S. K. Bassi. 2008. A Textbook of Botany: Diversity of Microbes and Cryptogams. S. Chand & Company Ltd, New Delhi.
8. Vashishta, B. R., A. K. Sinha and Adarsha Kumar. 2008. Botany for Degree Students: Bryophyta. S. Chand & Company Ltd, New Delhi.
9. Vashishta, P. C., A. K. Sinha and Anil Kumar. 2006. Botany for Degree Students: Gymnosperms. Chand & Company Ltd, New Delhi.

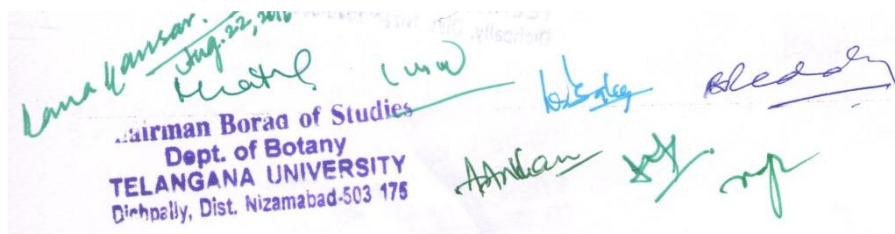


**B. Sc. (CBCS) Botany- I year**  
**Semester-II - Paper-II**  
**Bryophytes, Pteridophytes, Gymnosperms and Paleobotany**

(45 hours)

**Practical Syllabus**

1. Study of Morphology (vegetative and reproductive structures) and anatomy of the following  
Bryophytes: *Marchantia*, *Anthoceros* and *Polytrichum*. (9 h)
2. Study of Morphology (vegetative and reproductive structures) and anatomy of the following  
Pteridophytes: *Lycopodium*, *Equisetum* and *Marsilea*. (9 h)
3. Study of Anatomical features of *Lycopodium* stem, *Equisetum* stem and *Marsilea* petiole & rhizome by preparing double stained permanent mounts. (12h)
4. Study of Morphology (vegetative and reproductive structures) of the following taxa:  
Gymnosperms: *Pinus* and *Gnetum*. (6 h)
5. Study of Anatomical features of *Pinus* needle and *Gnetum* stem by preparing double stained permanent mounts. (6h)
6. Fossil forms using permanent slides / photographs: *Rhynia* and *Cycadeoidea*. (3h)





**B. Sc. (CBCS) BOTANY- II YEAR**  
**Semester-III - Paper-III**  
**Taxonomy of Angiosperms and Medicinal Botany**

**Theory syllabus**

**Credits-4**  
**(60 hours)**

**UNIT - I**

1. Introduction: Principles of plant systematics, Types of classification: Artificial, Natural and Phylogenetic; Systems of classification: Salient features and comparative account of Bentham & Hooker and Engler & Prantle. An introduction to Angiosperm Phylogeny Group (APG). (7h)
2. Current concepts in Angiosperm Taxonomy: Embryology in relation to taxonomy, Cytotaxonomy, Chemotaxonomy and Numerical Taxonomy. (4h)
3. Nomenclature and Taxonomic resources: An introduction to ICBN, Vienna code - a brief account. Herbarium: Concept, techniques and applications. (4h)

**UNIT-II**

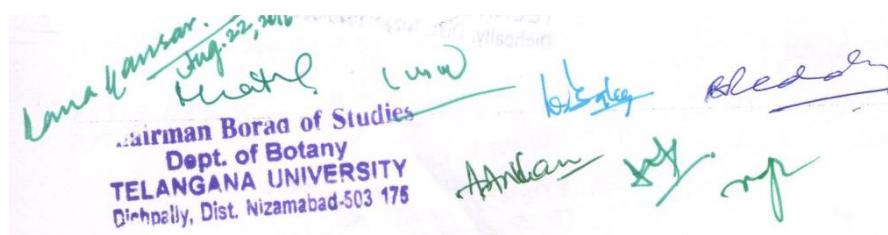
4. Systematic study and economic importance of plants belonging to the following families:  
Polypetalae : Annonaceae, Capparidaceae, Rutaceae, Fabaceae (Faboideae/papilionoideae, Caesalpinioideae, Mimosoideae), Cucurbitaceae
5. Gamopetalae: Apiaceae, Asteraceae, Asclepiadaceae, Lamiaceae
6. Monochalmydeae: Amaranthaceae, Euphorbiaceae, Monocotyledons: Orchidaceae and Poaceae. (15h)

**UNIT - III**

7. Ethnomedicine: Scope, interdisciplinary nature, distinction of Ethnomedicine from Folklore medicine. (3h)
8. Outlines of Ayurveda, Siddha, Unani and Homeopathic systems of traditional medicine. Role of AYUSH, NMPB, CIMAP and CDRI. (5h)
9. Plants in primary health care: Common medicinal plants – Tippateega (*Tinospora cordifolia*), tulasi (*Ocimum sanctum*), pippallu (*Piper longum*), Karakaya (*Terminalia chebula*), Kalabanda (*Aloe vera*), Turmeric (*Curcuma longa*). Evaluation of crude drugs. (7h)

**UNIT-IV**

10. Traditional medicine vs Modern medicine: Study of selected plant examples used in traditional medicine as resource (active principles, structure, usage and pharmacological action of modern medicine: Aswagandha (*Withania somnifera*), Sarpagandha (*Rauwolfia serpentina*), Nela usiri (*Phyllanthus amarus*), Amla (*Phyllanthus emblica*) and Brahmi (*Bacopa monnieri*). (8h)
11. Pharmacognosy: Introduction and scope. Adulteration of plant crude drugs and methods of identification - some examples. Indian Pharmacopoeia. (4h)
12. Plant crude drugs: Types, methods of collection, processing and storage practices. (3h)



## References:

- Pandey, B. P. 2007. Botany for Degree Students: Diversity of Seed Plants and their Systematics, Structure, Development and Reproduction in Flowering Plants. S. Chand & Company Ltd, New Delhi.
- Rastogi, R. R. and B. N. Mehrotra. 1993. Compendium of Indian Medicinal Plants. Vol. I & Vol. II. CSIR, Publication and Information Directorate, New Delhi.
- Sivarajan, V. V. and I. Balasubramanian. 1994. Ayurvedic Drugs and their Plant Sources. Oxford and IBH, New Delhi.
- Stace, C. A. 1989. Plant Taxonomy and Biostatistics (2<sup>nd</sup> Ed.). Edward Arnold, London.
- Singh, G. 1999. Plant Systematics: Theory and Practice. Oxford and IBH, New Delhi.
- Davis, P. H. and V. H. Heywood. 1963. Principles of Angiosperm Taxonomy. Oliver and Boyd, London.
- Heywood, V. H. 1965. Plant Taxonomy. ELBS, London.
- Heywood, V. H. and D. M. Moore (Eds). 1984. Current Concepts in Plant Taxonomy. Academic Press, London.
- Jain, S. K. and V. Mudgal. 1999. A Handbook of Ethnobotany. Bishen Singh Mahendra Pal Singh, Dehradun.
- Jeffrey, C. 1982. An Introduction to Plant Taxonomy. Cambridge University Press, Cambridge. London.
- Joshi, S. G. 2000. Medicinal Plants. Oxford and IBH, New Delhi.
- Kokate, C. and Gokeale- Pharmacognacy- Nirali Prakashan, New Delhi.
- Lad, V. 1984. Ayurveda – The Science of Self-healing. Motilal Banarasidass, New Delhi.
- Lewis, W. H. and M. P. F. Elwin Lewis. 1976. Medical Botany. Plants Affecting Man's Health. A Wiley Inter science Publication. John Wiley and Sons, New York.

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**B. Sc. (CBCS) BOTANY- II YEAR**  
**Semester-III - Paper-III**  
**Taxonomy of Angiosperms and Medicinal Botany**

**Practical syllabus**

**(45 hours)**

1. Systematic study of locally available plants belonging to the families prescribed in theory syllabus  
(Minimum of one plant representative for each family) (24h)
2. Demonstration of herbarium techniques. (3 h)
3. Identification, medicinal value & active principle present in the following plants : Tulasi (*Ocimum sanctum* ), Karakaya (*Terminalia chebula*), Kalabanda (*Aloe vera*). (6 h)
4. Ethnomedicinal value/practice of the following plants:  
Aswagandha (*Withania somnifera*), Sarpagandha (*Rauwolfia serpentina*), Amla (*Phyllanthus emblica*) and Brahmi (*Bacopa monnieri*). (6h)
5. Pharmacognosy:  
Powder analysis : Pippalu (*Piper longam*), Nela usiri (*Phyllanthus niruri*),  
Study of Organoleptic (sectional study) of the following:  
Tippateega (*Tinospora cordifolia*) and Turmeric (*Curcuma longa*). (6h)
6. Candidate has to submit at least 30 herbarium sheets



**B. Sc. (CBCS) BOTANY- II YEAR**  
**Semester-IV- Paper IV**  
**Plant Anatomy, Embryology and Palynology**

**Theory syllabus**

**Credits-4**  
**(60 hours)**

**UNIT - I:**

1. Meristems: Types, histological organization of shoot and root apices and theories. (3h)
2. Tissues and Tissue Systems: Simple, complex and special tissues. (6 h)
3. Leaf: Ontogeny, diversity of internal structure; stomata and epidermal outgrowths. (6 h)

**UNIT-II**

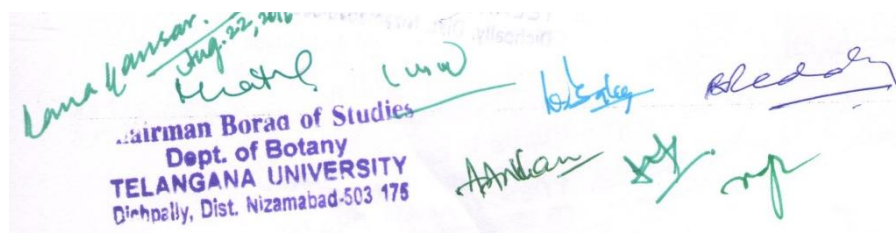
4. Stem and root anatomy: Vascular cambium - Formation and function. (3h)
5. Anomalous secondary growth of Stem - *Achyranthes*, *Boerhaavia*, *Bignonia*, *Dracaena*;  
Root- *Beta vulgaris* (5h)
6. Wood structure: General account. Study of local timbers – Teak (*Tectona grandis*),  
Rosewood, (*Dalbergia latifolia*), Red sanders, (*Pterocarpus santalinus*) Nallamaddi  
(*Terminalia tomentosa*) and Neem (*Azadirachta indica*). (7h)

**UNIT - III**

7. Introduction: History and importance of Embryology. (2h)
8. Anther structure, Microsporogenesis and development of male gametophyte. (6h)
9. Ovule structure and types; Megasporogenesis; types and development of female gametophyte. (7h)

**UNIT-IV**

10. Pollination - Types; Pollen - pistil interaction. Fertilization. (4h)
11. Endosperm - Development and types. Embryo - development and types; Polyembryony  
and Apomixis - an outline. (5h)
12. Palynology- Pollen morphology, NPC system and application of Palynology. (6h)



## References:

Bhattacharya et. al. 2007. A textbook of Palynology, Central, New Delhi.

Bhojwani, S. S. and S. P. Bhatnagar. 2000. The Embryology of Angiosperms (4th Ed.), Vikas Publishing House, Delhi.

M.R.Saxena- A textbook of Palynology.

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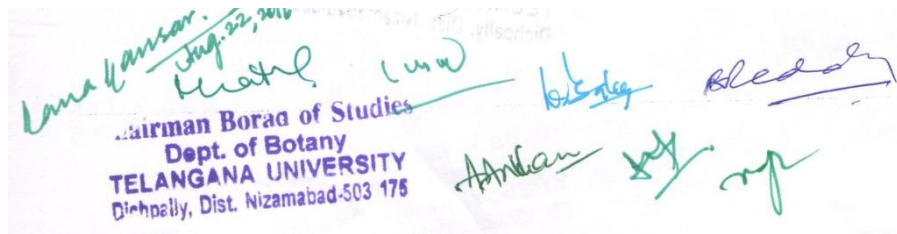
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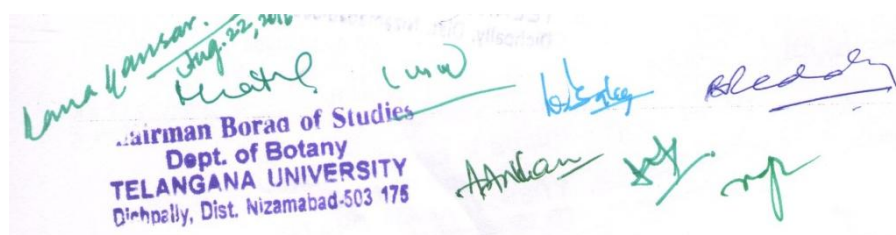
**B. Sc. (CBCS) BOTANY- II YEAR**  
**Semester-IV- Paper IV**  
**Plant Anatomy, Embryology and Palynology**

**Practical syllabus**

**(45 hours)**

**Suggested Laboratory Exercises:**

1. Demonstration of double staining technique. (3 h)
2. Tissue organization in root and shoot apices using permanent slides (3 h)
3. Preparation of double stained Permanent slides  
Primary structure: Root - *Cicer, Canna*; Stem – *Tridax, Sorghum* (6 h)  
Secondary structure: Root – *Tridax* sp.; Stem – *Pongamia*  
Anomalous secondary structure: Examples as given in theory syllabus. (6 h)
4. Stomatal types using epidermal peels. (3 h)
5. Microscopic study of wood in T.S., T.L.S. and R.L.S. (6 h)
6. Structure of anther and microsporogenesis using permanent slides. (3 h)
7. Structure of pollen grains using whole mounts - *Hibiscus, Acacia* and Grass). (3 h)
8. Pollen viability test using Evans Blue – *Hibiscus* (3 h)
9. Study of ovule types and developmental stages of embryo sac. (3 h)
10. Structure of endosperm (nuclear and cellular); Developmental stages of dicot and monocot embryos using permanent slides. (3 h)
11. Isolation and mounting of embryo (using *Cymopsis / Senna / Crotalaria*) (3 h)



**B. Sc. Botany- III Year  
Semester-V - Paper-V (Core)  
Cell Biology and Genetics**

**Theory Syllabus**

**Credits-3  
45 hours**

**Unit - I:**

1. Plant cell envelope: Ultra structure of cell wall, molecular organization of cell membranes. (4h)
2. Nucleus: Ultra structure, Nucleic acids - Structure of DNA, types and functions of RNA. (4 h)
3. Chromosomes: Morphology, organization of DNA in a chromosome, Euchromatin and Heterochromatin, Karyotype. DNA Replication. Special types of chromosomes: Lampbrush Polytene and B - chromosomes. (7h)

**Unit - II:**

4. Extra nuclear genome: Mitochondrial and plastid DNA, plasmids. (3 h)
5. Cell division: Cell and its regulation; mitosis, meiosis and their significance (3h)
6. Mendelism: Laws of inheritance. Genetic interactions - Epistasis, Complementary, Supplementary and inhibitory genes. (5h)

**Unit - III:**

7. Linkage: A brief account and theories of Linkage. Crossing over: Mechanism and theories of crossing over. (4 h)
8. Genetic maps: Construction of genetic maps with Two point and Three point test cross data. (3h)
9. Mutations: Chromosomal aberrations - structural and numerical changes; Gene mutations, Transposable elements. (3 h)

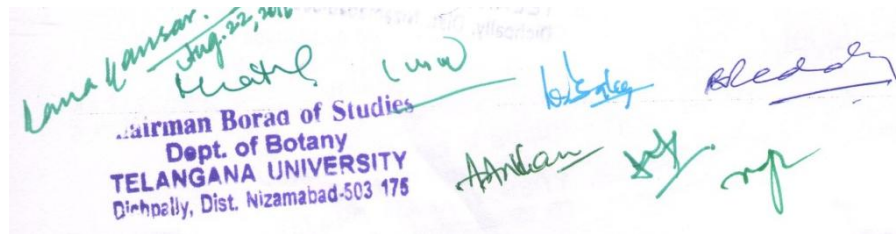
**Unit-IV**

10. Gene Organization- Structure of gene, Genetic code, Method of Replication of DNA in Eukaryotes & Prokaryotes (3h)
11. Mechanism of transcription in Prokaryotes and Eukaryotes, translation (4h)
12. Regulation of gene expression in prokaryotes (*Lac* and *Trp* Operons). (2h)



## References:

1. Sharma, A. K. and A. Sharma. 1999. Plant Chromosomes: Analysis, Manipulation and Engineering. Harward Academic Publishers, Australia.
2. Shukla, R. S. and P. S. Chandel. 2007. Cytogenetics, Evolution, Biostatistics and Plant Breeding. S.Chand & Company Ltd., New Delhi.
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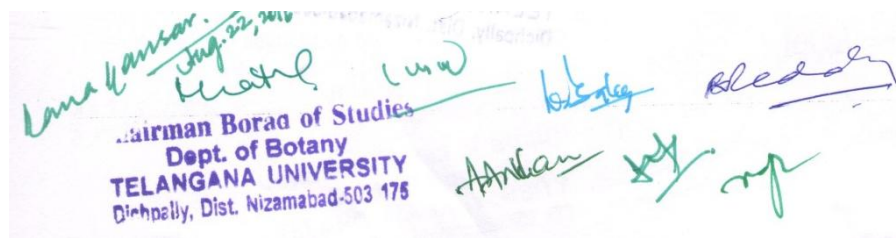


**B. Sc. (CBCS) Botany- III Year  
Semester-V - Paper-V (Core)  
Cell Biology and Genetics**

**Practical Syllabus**

**(45 hours)**

1. Demonstration of cytochemical methods: Fixation of plant material and nuclear staining for mitotic and meiotic studies. (6 h)
2. Study of various stages of mitosis using cytological preparation of Onion root tips. (6 h)
3. Study of various stages of meiosis using cytological preparation of Onion flower buds. (3h)
5. Solving genetic problems related to monohybrid, dihybrid ratio incomplete dominance and interaction of genes (minimum of six problems in each topic). (12h)
6. Construction of linkage maps; two and three point test cross. (6 h)
7. Study of ultra structure of cell organelles using photographers. (6h)
8. Study of Special types of Chromosomes (6h)



**B. Sc. (CBCS) Botany-III Year  
Semester-V - Paper VI  
Elective Paper (Discipline centric)  
Ecology & Biodiversity**

**Theory Syllabus**

**Credits-3  
(45 hours)**

**UNIT - I**

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

**UNIT - II**

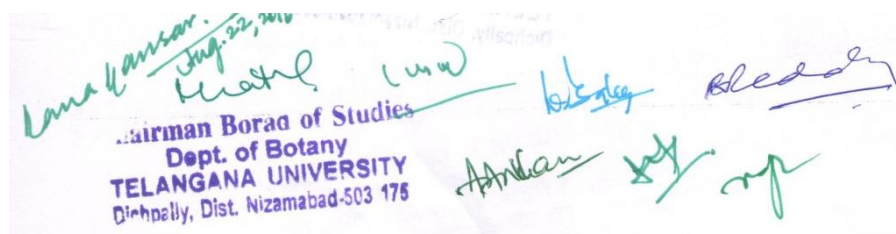
4. Edaphic Factors: Soil- Formation- Weathering, mode of formation-residual;Transported: Colluvial, Alluvial, Glacial & Eolian. Soil erosion & Conservation. (4h)
5. Population ecology: Natalty, Mortality, Growth curves, Ecotypes & Ecads. (4h)
6. Community ecology: Frequency, density cover, Life forms & Biological spectrum. (4h)

**UNIT- III**

7. Community Dynamics: Succession - Serial stages, Modification of physical environment, Climax formation with reference to Hydrosere and Xerosere. (4h)
8. Production ecology: Concepts of productivity - Primary and Secondary Productivity. (4h)
9. Biodiversity: Concepts, Convention of Biodiversity - Earth Summit (Copenhagen). (4h)

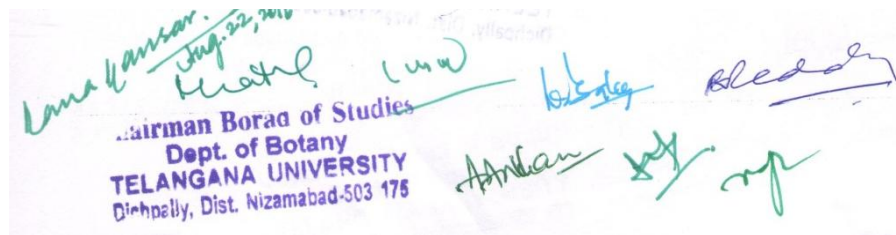
**UNIT - IV**

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



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1. Bharucha, E. 2005. Textbook of Environmental Studies for Undergraduate Courses. Universities Press (India) Private Limited, Hyderabad.
2. Khitoliya, R. K. 2007. Environmental Pollution – Management and Control for Sustainable Development. S. Chand & Company Ltd., New Delhi.
3. Michael, S. 1996. Ecology. Oxford University Press, London.
4. Mishra. D. D. 2008. Fundamental Concepts in Environmental Studies. S. Chand & Company Ltd., New Delhi.
5. Odum, E. P. 1983. Basics of Ecology. Saunder's International Students Edition, Philadelphia.
6. Sharma, P. D. 1989. Elements of Ecology. Rastogi Publications, Meerut.
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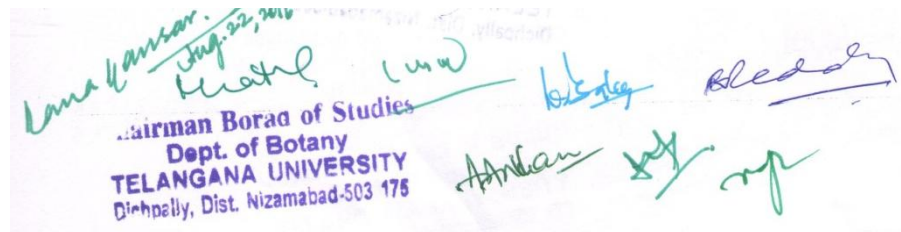


**B. Sc. (CBCS) Botany-III Year  
Semester-V - Paper VI  
Elective Paper-I (Discipline centric)  
Ecology & Biodiversity**

**Practical Syllabus**

**45 hours**

1. Study of plant communities by Quadrat Method (9h)
2. Estimation of carbonates and bicarbonates in the given water sample. (6h)
3. Determination of soil texture (composition of clay, sand silt etc.) and pH. (6h)
4. Study of morphological and anatomical characteristics of plant communities using locally available plant species: Hydrophytes (*Eichhornia, Hydrilla, Pistia, Nymphaea, Vallisneria*), Xerophytes: (*Asparagus, Opuntia, Euphorbia spp*), Halophytes (*Rhizophora, Avicennia*). (12h)
5. Value of biodiversity (12h)
  - a) Medicinal value: *Catharanthus, Tinospora* and *Emblica*
  - b) Timber Value: *Acacia, Tectona* and *Azardirachta*
  - c) Aesthetic Value: *Mangifera, Ficus, Ocimum*



**B. Sc. (CBCS) BOTANY: III YEAR**  
**Semester-V - Paper VII**  
**Elective Paper-II (Inter disciplinary)**  
**Horticulture**

**Theory Syllabus**

**Credits-3**  
**(45 hours)**

**UNIT - I**

1. Definition, branches, scope and economic importance of horticultural crops (2h)
2. Nutritive value of fruits and vegetables (3h)
3. Classification of horticultural crops based on -Climatic requirements, Season of growth, Plant parts used for consumption and Botanical classification (5h)

**UNIT - II**

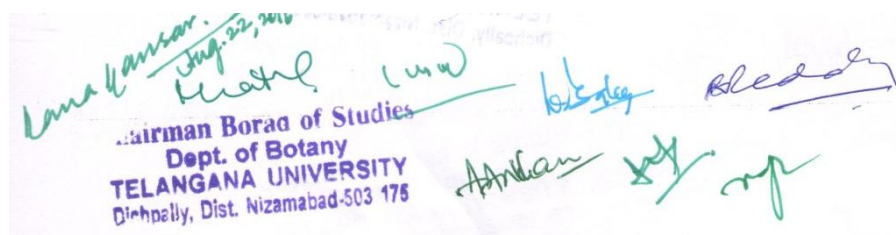
4. Manures: Definition, importance of manures FYM (compost), oil cakes, green manure, Organic manures and vermi-compost. (3h)
5. Natural Propagation: By seeds, Vegetative Structures like Bulbs, Tubers, Corms, Rhizomes, Root stock, runners, Offsets and suckers. (4h)
6. Artificial Propagation: Cutting, Layering, Grafting and Budding (4h)

**UNIT - III**

7. Application of the following plant growth regulators in horticulture - (3h)  
Auxins, Gibberellins, Cytokinins, Ethylene and Brassinosteroids.
8. Green house technology- definition, types, layout, construction, irrigation systems, care and attention, hardening of plants. (3h)
9. Horticulture as a business definition and nature, organization, planning and operation of horticulture farm business. (3h)

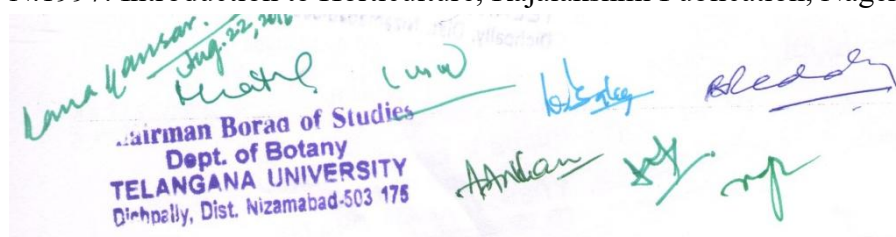
**UNIT- IV**

10. Soil and climatic requirements of horticultural crops, Selection of site, planning, training, pruning and Cropping system; Garden implements and their uses. (5h)
11. Management: Orchard management, Nutrition management, Water management and Weed Management. (4h)
12. Organic Farming; Bonsai techniques. (6h)



## References:

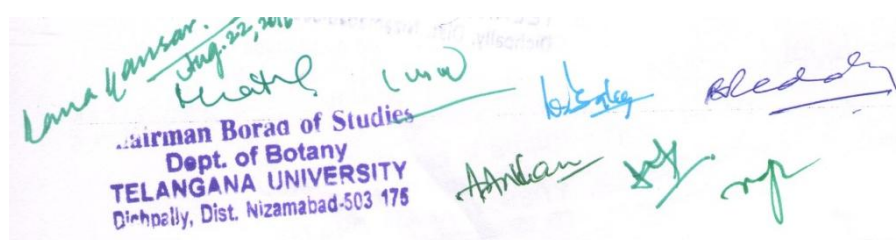
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2. Chadha, K.L. 2001, Handbook of Horticulture, ICAR, New Delhi.
3. Chandra, R. and M. Mishra. 2003. Micropropagation of horticultural crops. International Book Distributing Co., Lucknow.
4. Chattopadhyaya, P.K.2001. A text book on Pomology (Fundamentals of fruit growing) Kalyani Publication, New Delhi
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12. Shanmugavelu, K.G., N. Kumar and K.V. Peter. 2005. Production technology of spices and plantation crops. Agrobios, Jodhpur.
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17. Utpal Banerjee. 2008. Horticulture. Mangal Deep publishers
18. Vijaikumar UmRao. 2008. Horticulture terms – Definitions and Terminology. IBD publishers, Dehradun
19. Adams, C.R. and M. P. Early. 2004. Principles of horticulture. Butterworth –Heinemam, Oxford University Press.
20. Bansil. P.C. 2008. Horticulture in India. CBS Publishers and Distributors, New Delhi.
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**B. Sc. (CBCS) BOTANY: III YEAR**  
**Semester-V - Paper VII**  
**Elective Paper-II (Inter disciplinary)**  
**Horticulture**

**Practical Syllabus**

- (45 hours)**
1. Garden tools and implements. (3h)
  2. Identification and description of any two varieties/hybrids of tropical and subtropical vegetable, fruit, flower and ornamental crops. (3h)
  3. Propagation practices by seed, Vegetative propagation (Rhizome, bulb, corm), cutting, layering, budding, grafting with two examples. (9h)
  4. Seed propagation- seed treatments, sowing and seedling production. (6h)
  5. Nursery practices, transplanting, field preparation, sowing/planting, use of herbicides, top dressing of fertilizers and use of growth regulators. (6h)
  6. Nursery containers, media, potting and repotting of plants, hardening of plants in nursery, shade regulation in nursery, plant protection in nursery plants (Demonstration) (6h)
  7. Packing nursery plants for local and long distance markets. (Demonstration) (3h)
  8. Making of organic-compost. (9h)



**B. Sc. (CBCS) Botany: III Year  
Semester-VI - Paper-VIII (Core)  
Plant Physiology**

**Theory Syllabus**

**Credits-3  
(45 hours)**

**UNIT - I**

1. Water Relations: Importance of water to plant life, physical properties of water, diffusion, imbibition, osmosis; water, osmotic and pressure potentials; absorption, transport of water, ascent of sap; transpiration; Stomatal structure and movements. (7h)
2. Mineral Nutrition: Essential macro and micro mineral nutrients and their role; symptoms of mineral deficiency. (3h)
3. Stress physiology: concept and plant responses to water, salt and temperature stresses (2h)

**UNIT- II**

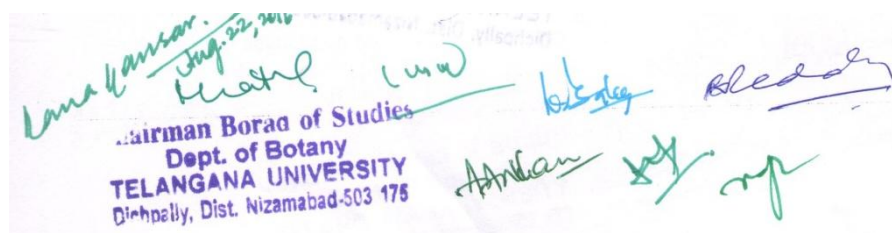
4. Enzymes: Nomenclature, characteristics, mechanism and regulation of enzyme action, enzyme kinetics, factors regulating enzyme action. (4h)
5. Photosynthesis: Photosynthetic pigments, absorption and action spectra; Red drop and Emerson enhancement effect; concept of two photosystems; mechanism of photosynthetic electron transport and evolution of oxygen; Factors effecting Photosynthesis, photophosphorylation
6. Carbon assimilation pathways: C3, C4 and CAM. (8h)

**UNIT - III**

7. Respiration: Aerobic and Anaerobic; Glycolysis, Krebs cycle; electron transport system, mechanism of oxidative phosphorylation, pentose phosphate pathway. (6h)
8. Translocation of organic substances: Mechanism of phloem transport; source-sink relationships. (2h)
9. Nitrogen Metabolism: Biological nitrogen fixation, nitrate reduction, ammonia assimilation, (GS-GOGAT, transamination) (4h)

**UNIT- IV**

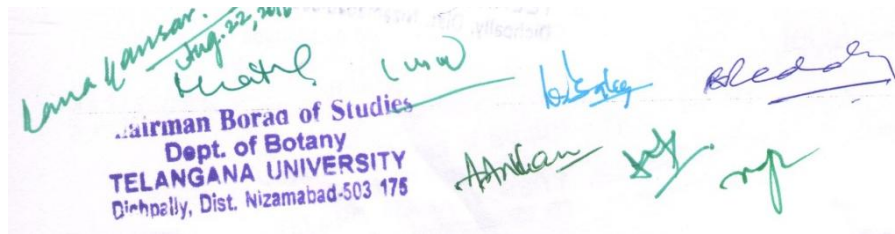
10. Lipid Metabolism: Structure and function of lipids. (3h)
11. Growth and Development: Physiological effects of phytohormones–Auxins, gibberellins, cytokinins, ABA, ethylene and Brassinosteroids (3h)
12. Physiology of flowering and photoperiodism. Role of Phytochrome in flowering. (3h)





## References:

1. Hopkins, W. G. 1995. Introduction to Plant Physiology. John Wiley & Sons Inc., New York, USA
2. Jain, J.L., S. Jain and Nitin Jain. 2008. Fundamentals of Biochemistry. S. Chand & Company Ltd., New Delhi.
3. Pandey, B. P. 2007. Botany for Degree Students: Plant Physiology, Biochemistry, Biotechnology, Ecology and Utilization of Plants. S. Chand & Company Ltd., New Delhi.
4. Salisbury, F. B. and C. W. Ross. 1992. Plant Physiology. 4th edn. (India Edition), Wordsworth, Thomson Learning Inc., USA.
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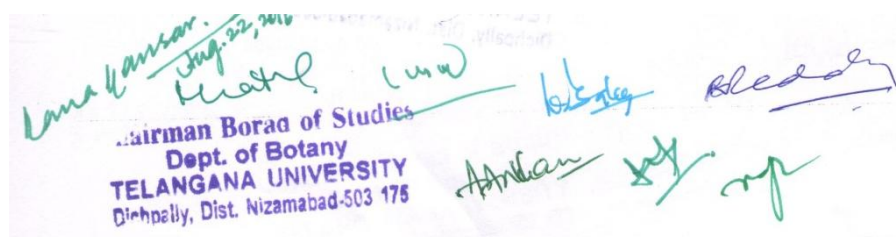


**B. Sc. (CBCS) Botany: III Year  
Semester-VI - Paper-VIII (Core)  
Plant Physiology**

**Practical Syllabus**

**(45 hours)**

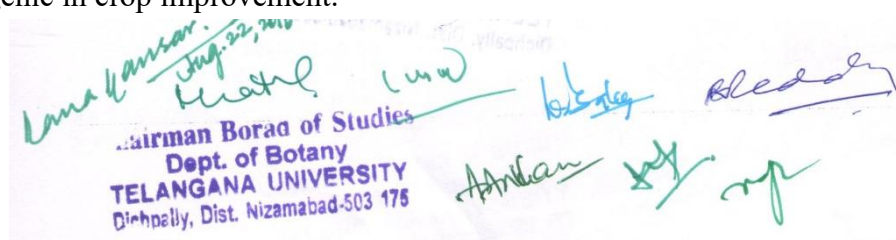
1. Determination of osmotic potential of vacuolar sap by Plasmolytic method using leaves of *Rheodiscolor* / *Tradescantia*. (6h)
2. Determination of rate of transpiration using Cobalt chloride method (3h)
3. Determination of stomatal frequency using leaf epidermal peelings / impressions (6h)
4. Determination of catalase activity using potato tubers by titration method (6h)
5. Separation of chloroplast pigments using paper chromatography technique (12h)
6. Estimation of protein by Biuret method (6h)
7. Mineral deficiency- Detail study of Micronutrients and Macro nutrients (3h)
8. Identification of C<sub>3</sub>, C<sub>4</sub> and CAM plants (3h)



**B. Sc. (CBCS) Botany-III Year  
Semester-VI – Paper-IX  
Elective Paper (Discipline centric)  
Tissue Culture and Biotechnology**

**Theory Syllabus**

	<b>Credits-3 (45 hours)</b>
<b>UNIT - I</b>	
1. Tissue culture: Introduction, sterilization procedures, explants, culture media – composition and preparation; Micropropagation.	(5h)
2. Organ culture: Vegetative Organs-Root, Shoot, Leaf culture Reproductive Organs-Anther, Ovary, Ovule, Embryo culture	(6h)
3. Callus culture, Cell and Protoplast culture	(4h)
<b>UNIT- II</b>	
4. Somatic hybrids and Cybrids.	(4h)
5. Applications of tissue culture: Production of pathogen free plants and somaclonal variants, production of stress resistance plants, secondary metabolites and synthetic seeds.	(6h)
6. Production of hairy roots and its applications in production of secondary metabolites.	(2h)
<b>UNIT - III</b>	
7. Biotechnology: Introduction, history, scope and applications.	(3h)
8. rDNA technology: Basic aspect of gene cloning, Enzymes used in gene cloning- Restriction enzymes, Ligases, Polymerases.	(4h)
9. Gene cloning-Vectors – cloning vehicles (Plasmid, Cosmids, Bacteriophages, & Phasmids) application of r DNA technology.	(5h)
<b>UNIT- IV</b>	
10. Gene Libraries: Genomic Libraries, cDNA Libraries, Polymerase chain reaction and its applications.	(4h)
11. Method of gene transfer in plants ( <i>Agrobacterium</i> and Microprojectile)	(4h)
12. Production of transgenic plants, Bt –application in cotton and brinjal. Application of Transgenic in crop improvement.	(3h)



## References:

1. Balasubramanian, D., C. F. A. Bryce, K. Dharmalingam, J. Green and K. Jayaraman. 2004.
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3. Channarayappa. 2007. Molecular Biotechnology – Principles and Practices. Universities Press  
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**B. Sc. (CBCS) Botany-III Year  
Semester-VI – Paper-IX  
Elective Paper (Discipline centric)  
Tissue Culture and Biotechnology**

**Practical Syllabus**

**Major Experiments:**

1. Estimation of plant DNA. (Tomato) (6h)
2. Production of synthetic seeds /Encapsulation of embryo (3 h)
3. Preparation of plant tissue culture medium. (6h)

**Minor Experiments:**

4. Callus Micropropagation (3h)
5. Demonstration of Micropropagation/ multiple shoots (6h)
6. Anther culture (3 h)
7. PCR –Demonstration (3h)
8. Study of biotechnology products: Samples of antibiotics and vaccines (6h)
9. Photographs of transgenic plants – Bt Cotton, Bt –Brinjal. (3h)
10. Instruments used in Biotechnology lab- Autoclave, Laminar air flow, Hot air oven and Incubator. (6h)



**B. Sc. (CBCS) BOTANY: III YEAR**  
**Semester-VI – Paper-X**  
**Elective Paper-II (Inter disciplinary)**  
**Seed Technology**

**Theory Syllabus**

**Credits-3**  
**(45 hours)**

**UNIT- I**

1. Seed: Structure and types. Seed dormancy: causes and methods of breaking dormancy (4h)
2. Seed storage: Long term and short term storage. Orthodox and recalcitrant seeds.  
Packing of seeds – Principles, practices, bagging and labelling. (3h)
3. Physico and Bio-chemical changes during seed storage. (2h)

**UNIT-II**

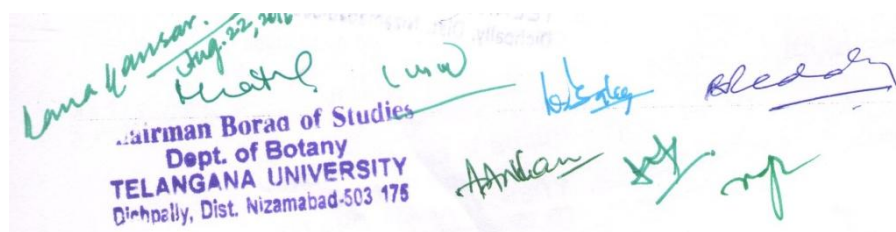
4. Seed viability, factors affecting seed viability and genetic erosion. (3h)
5. Cultural practices and harvesting of Seed: Isolation, Sowing, Cultural practices, harvesting and threshing of the following crops (9h)
  - a) Rice
  - b) Cotton
  - c) Sunflower
6. Seed Treatment to control seed borne disease –General account (3h)

**UNIT-III**

7. Structure of pollen and ovule-Types of ovules, Collection and storage of pollen (3h)
8. Principles of hybrid seed production-Cross pollination, Emasculation, Self pollination, role of pollinators and their management. (6h)
9. Seed development in cultivated plants, seed quality concept, importance of genetic purity of seed. Hybrid seed production and Heterosis. (4h)

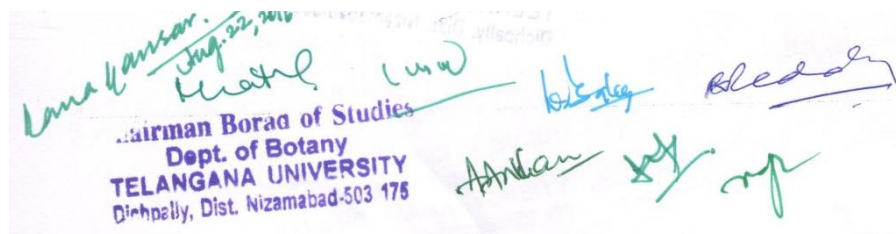
**UNIT-IV**

10. Seed production technology; seed testing- Procedures of seed testing, seed testing laboratories and importance of seed testing.
11. Seed certification- History, Seed certification agency, Indian minimum, general and specific seed certification standard. (3h)
12. Seed banks- National, International and Millennium seed banks. (3h)



## References:

1. Agrawal, P. K. 1993. Hand Book of Seed Technology. Dept. of Agriculture and Cooperation.  
National Seed Corporation Ltd., New Delhi
2. Balasubramanian, D., C. F. A. Bryce, K. Dharmalingam, J. Green and K. Jayaraman. 2004.  
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**B. Sc. (CBCS) BOTANY: III YEAR**  
**Semester-VI – Paper-X**  
**Elective Paper-II (Inter disciplinary)**  
**Seed Technology**

**Practical syllabus**

**(45 hours)**

**Major Experiment**

1. Testing of seed viability using 2, 3, 5-triphenyl tetrazolium chloride (TTC). (3h)
2. Estimation of amylase activity of germinating seeds (Qualitatively). (3h)
3. Demonstration of seed dressing using fungicides to control plant diseases. (3h)
4. Demonstration of seed dressing using Biofertilizers (BGA) to enrich nutrient supply. (3h)

**Minor Experiments**

5. Emasculation, bagging of flower for hybrid seed production. (6h)
6. Dissection of Dicot embryo (bean) and Monocot embryo (maize). (6h)
7. Pollen viability test using Evan's blue staining. (*Hibiscus*). (3h)
8. Harvesting and Importance of following seeds:  
Rice,  
Maize,  
Cotton,  
Groundnut and  
Sunflower. (6h)
9. Types of ovules: Orthotropous, Anatropous and Campylotropous. (3h)
10. Structure of pollen grains: *Hibiscus* and grass. (3h)
11. Study visits to research institutes, seed tests and certification laboratories and places seed banks. (6h)

