

S. V. K. P. & Dr. K. S. RAJU ARTS & SCIENCE COLLEGE (A), PENUGONDA

**I B.Sc BOTANY FIRST SEMESTER SYLLABUS
(W.e.f .2020-2021 Admitted Batch)**

**PAPER I- FUNDAMENTALS OF MICROBES AND NON –VASCULAR PLANTS
(20BOT1)**

B.Sc	Semester -1	Credits:4
Course :1	Fundamentals of Microbes and Non-vascular Plants	Hrs/Wk:4

Learning Outcomes : On successful completion of this course, the students will be able to:

- Explain origin of life on the earth.
- Illustrate diversity among the viruses and prokaryotic organisms and can categorize them.
- Classify fungi, lichens ,algae and bryophytes based on their structure, reproduction and life cycles.
- Analyze and ascertain the plant disease symptoms due to viruses, bacteria and fungi.
- Recall and explain the evolutionary trends among amphibians of plant kingdom for their shift to land habitat.
- Evaluate the ecological and economic value of microbes, thallophytes and bryophytes.

UNIT I: Origin of life and Viruses:

12 hours

1. Origin of life, concept of primary Abiogenesis; Miller and Urey experiment. Five kingdom classification of R.H.Whittaker
2. Discovery of microorganisms, Pasteur experiments , germ theory of diseases.
3. Shape and symmetry of viruses; structure of TMV and Gemini virus; multiplication of TMV ; A brief account of Prions and Viroids.
4. A general account on symptoms of plant diseases caused by viruses. Transmission of plant viruses and their control.
5. Significance of viruses in vaccine production, bio-pesticides and as cloning vectors.

UNIT II: Special groups of Bacteria and Eubacteria

12 Hrs

1. Brief account of Archaeobacteria, Actinomycetes and Cyanobacteria.
2. Cell structure and nutrition of Eubacteria.
3. Reproduction- Asexual (Binary fission and endospores) and bacterial recombination (Conjugation, Transformation, Transduction).
4. Economic importance of Bacteria with reference to their role in Agriculture and industry (fermentation and medicine).
5. A general account on symptoms of plant diseases caused by Bacteria ; Citrus canker.

UNIT III: Fungi & lichens**12 Hrs**

1. General characteristics of fungi and Ainsworth classification (upto classes).
2. Structure, reproduction and life history of (a) Rhizopus (Zygomycota) and (b) Puccinia (Basidiomycota).
3. Economic uses of fungi in food industry, pharmacy and agriculture.
4. A general account on symptoms of plant diseases caused by Fungi; Blast of Rice.
5. Lichens-structure and reproduction ; ecological and economic importance.

UNIT IV: Algae**12 Hrs**

1. General characteristics of Algae (pigments, flagella and reserve food material); Fritsch classification (upto classes).
2. Thallus organization and life cycles in Algae
3. Occurrence, structure, reproduction and life cycle of (a) Spirogyra (Chlorophyceae) and (b) Polysiphonia (Rhodophyceae).
4. Economic importance of Algae.

UNIT V: Bryophytes**12 Hrs**

1. General characteristics of Bryophytes ; classification upto classes.
2. Occurrence, morphology, anatomy, reproduction (developmental details are not needed) and life cycle of (a) Marchantia (Hepatopsida) and (b) Funaria (Bryopsida).
3. General account on evolution of sporophytes in Bryophyta.

TEXT BOOKS:

1. Botany-I (Vrukshasastram-I) : Telugu Akademi, Hyderabad
2. Pandey, B.P. (2013) College Botany, Volume-1, S. Chand Publishing, New Delhi
3. Hait, G., K. Bhattacharya & A.K. Ghosh (2011) A Text Book of Botany, Volume-1, New Central Book Agency Pvt.Ltd., Kolkata.
4. Bhattacharjee, R.N., (2017) Introduction to Microbiology and Microbial Diversity, Kalyani Publishers, New Delhi.

REFERENCE BOOKS:

1. Dubey, R.C. & D.K. Maheswari (2013) A Text Book of Microbiology, S.chand & Company Ltd., New Delhi
2. Pelczar Jr., M.J., E.C.N. Chan & N.R. Krieg (2001) Microbiology, Tata McGraw-Hill Co, New Delhi.
3. Prescott, L. Harley, J. and Klein, D. (2005) Microbiology, 6th edition, Tata McGraw-Hill Co. New Delhi.
4. Alexopoulos, C.J., C.W. Mims & M. Blackwell (2007) Introductory Mycology, Wiley & Sons, Inc., New York

S. V. K. P. & Dr. K. S. RAJU ARTS & SCIENCE COLLEGE(A), PENUGONDA
I B.Sc., SECOND SEMESTER
BOTANY SYLLABUS
BASICS OF VASCULAR PLANTS AND PHYTOGEOGRAPHY (20BOT2)
(w.e.f 2020-21 Admitted Batch)

UNIT I: Pteridophytes

General characteristics of Pteridophyta; classification of Smith(1995) up to divisions.

1. Occurrence, morphology, anatomy, reproduction (developmental details are not needed) and life history of (a) Lycopodium (Lycopsidea) and (b) Marsilea (Filicopsida).
2. Stellar evolution in Pteridophytes;
3. Heterospory and seed habit.

UNIT II: Gymnosperms

General characteristics of Gymnosperms; Sporne classification up to classes.

1. Occurrence, morphology, anatomy, reproduction (developmental details are not needed) and life history of (a) Cycas (Cycadopsida) and (b) Gnetum (Gnetopsida).
2. Outlines of geological time scale.
3. A brief account on Cycadeoidea.

UNIT III: Basic aspects of taxonomy

Aim and scope of taxonomy; Species concept : Taxonomic hierarchy, species, genus and family.

1. Plant nomenclature: Binomial system, ICBN-rules for nomenclature.
2. Herbarium and its techniques, BSI herbarium and Kew herbarium ; concept of digital herbaria.
3. Bentham and Hooker system of classification;
4. Systematic description and economic importance of the following families:
(a) Annonaceae (b) Cucurbitaceae

UNIT IV: Systematic Taxonomy

Systematic description and economic importance of the following families:

- (a) Asteraceae (b) Asclepiadaceae (c) Amaranthaceae (d) Euphorbiaceae
(e) Arecaceae and (f) Poaceae
2. Outlines of Angiosperm phylogeny Group (APG IV).

UNIT V: Phytogeography

Principles of Phytogeography, Distribution (wides, endemic, discontinuous species)

1. Endemism- types and causes.
2. Phytogeographic regions of World.
3. Phytogeographic regions of India.
4. Vegetation types in Andhra Pradesh.

TEXT BOOKS:

1. Botany -I (Vrukshasastram-I) : Telugu Akademi, Hyderabad.
2. Botany –II (Vrukshasastram-II) : Telugu Akademi, Hyderabad.
3. Acharya, B.C., (2019) Archchegoniates, Kalyani Publishers, New Delhi.
4. Bhattacharya, K., G. Hait & Ghosh, A.K., (2011) A text Book of Botany, Volume –II, New Central Book Agency Pvt.Ltd., Kolkata
5. Hait, G., K. Bhattacharya & A.K. Ghosh (2011) A text book of Botany, volume- I, New Central Book Agency Pvt.Ltd., Kolkata
6. Pandey, B.P.(2013) College Botany, Volume-1 S.Chand Publishing, New Delhi
7. Pandey, B.P. (2013) College Botany, Volume-II, S. Chand Publishing, New Delhi

REFERENCE BOOKS:

1. Smith, G.M.(1971) Cryptogamic Botany Vol-II., Tata McGraw-Hill, New Delhi
2. Sharma, O.P.(2012) Pteridophyta. Tata McGraw-Hill, New Delhi.
3. Kramer, K.U.&P.S. Green (1990) The Families and Genera of Vascular plants, Volume-i: Pteridophytes and Gymnosperms (Ed.k.Kubitzuki) Springer-verlag, New York.
4. Bhatnagar, S.P.& Alok Moitra (1996) Gymnosperms. New Age International, New Delhi
5. Coulter, J.M. & C.J. Chamberlain (1910) Morphology of Gymnosperms, The University of Chicago Press, Chicago, Illinois.
6. Govil, C.M. (2007) Gymnosperms: Extinct and extant. KRISHNA Prakashan Media(p) Ltd. Meerut & Delhi.
7. Sporne, K.R.(1971) The morphology of Gymnosperms. Hytchinsons Co.Ltd., London
8. Arnold, C.A., (1947) An introduction to Paleobotany McGraw-Hill Book Company, INC, New York
9. Stewart, W.N., and G.W. Rothwell (2005) Paleobotany and the evolution of plants Cambridge University Press, New York.
10. Lawrence, George H.M. (1951) Taxonomy of Vascular Plants. The McMillan Co., New York
11. Heywood, V.H. and D.M. Moore (1948) Current concepts in Plant Taxonomy. Academic Press, London.
12. Jeffrey, C.(1982) An Introduction to Plant Taxonomy. Cambridge University press, Cambridge.
13. Sambamurthy, A.V.S.S.(2005) Taxonomy of Angiosperms 1. K. International Pvt.Ltd., New Delhi.
14. Singh, G.(2012). Plant Systematics: Theory and Practice. Oxford & IBH Pvt.Ltd., New Delhi.
15. Singh, G.(2012) Plant Systematics. Elsevier Academic press, San Diego, CA, U.S.A .
16. Cain, S.A. (1944) Foundations of Plant Geography Harper & Brothers, N.Y.
17. Good, R.(1997) The Geography of flowering Plants (2 nd edn.) Longmans, Green & Co., Inc.,
18. Mani, M.S (1974) Ecology & Biogeography of India Dr.W.Junk Publishers, The Hague.

III SEMESTER BOTANY SYLLABUS (20BOT3)

(w.e.f. 2020-2021 A.Y.)

B.Sc.	Semester – III	Credits: 4
Course: 3	Anatomy and Embryology of Angiosperms, Plant Ecology and Biodiversity	Hrs/Wk: 4

UNIT I: Anatomy of Angiosperms

12 Hrs.

1. Meristamatic tissues, Organization of apical meristems: Tunica-carpus theory and Histogen theory.
2. Tissue systems—Epidermal, ground and vascular.
3. Anomalous secondary growth in *Boerhaavia* and *Dracaena*.
4. Study of timbers of economic importance - Teak, Red sanders and Rosewood.

Additional input: Meristamatic Tissue

UNIT II: Embryology of Angiosperm 12 Hrs.

1. Structure of anther, anther wall, types of tapetum. Microsporogenesis and development of male gametophyte.
2. Structure of ovule, megasporogenesis; monosporic (*Polygonum*), bisporic (*Allium*) and tetrasporic (*Peperomia*) types of embryo sacs.
3. Outlines of pollination, pollen – pistil interaction and fertilization.
4. Endosperm - Types and biological importance - Free nuclear, cellular, helobial and ruminate.
5. Development of Dicot (*Capsella bursa-pastoris*) embryo.

UNIT III: Basics of Ecology

12 Hrs.

1. Ecology: definition, branches and significance of ecology.
2. Ecosystem: Concept and components, energy flow, food chain, food web, ecological pyramids.
3. Plants and environment: Climatic (light and temperature), edaphic and biotic factors.
4. Ecological succession: Hydrosere and Xerosere.

UNIT IV: Population, Community and Production Ecology

12 Hrs.

1. Population ecology: Natality, mortality, growth curves, ecotypes, ecads
2. Community ecology: Frequency, density, cover, life forms, biological spectrum
3. Concepts of productivity: GPP, NPP
4. Secondary production, P/R ratio and Ecosystems.

Deletion: Community Respiration

UNIT V: Basics of Biodiversity

12 Hrs.

1. Biodiversity: Basic concepts, Convention on Biodiversity - Earth Summit.
2. Value of Biodiversity; types and levels of biodiversity and Threats to biodiversity
3. Biodiversity Hot spots in India. Biodiversity in North Eastern Himalayas and Western Ghats.
4. Principles of conservation: IUCN threat-categories, RED data book
5. Role of NBPGR and NBA in the conservation of Biodiversity

S.V.K.P & KS RAJU ARTS AND SCIENCE COLLEGE(A) PENUGONDA**B.Sc BZC IV SEMESTER BOTANY SYLLABUS****PLANT PHYSIOLOGY AND METABOLISM****PAPER CODE : 20BOT4A****Theory:****60 Hrs****Learning Outcomes:**

On successful completion of this course, the students will be able to;

- Comprehend the importance of water in plant life and mechanisms for transport of water and solutes in plants.
- Evaluate the role of minerals in plant nutrition and their deficiency symptoms.
- Interpret the role of enzymes in plant metabolism.
- Critically understand the light reactions and carbon assimilation processes responsible for synthesis of food in plants.
- Analyze the biochemical reactions in relation to Nitrogen and lipid metabolisms.
- Evaluate the physiological factors that regulate growth and development in plants.
- Examine the role of light on flowering and explain physiology of plants under stress conditions.

Unit-1: Plant Water relations**10 Hrs**

1. Importance of water to plant life, physical properties of water, diffusion, imbibitions, osmosis. Water potential, osmotic potential, pressure potential.
2. Absorption and lateral transport of water; Ascent of sap.
3. Transpiration: stomata structure and mechanism of stomatal movement (K^+ ion flux).
4. Mechanism of phloem transport; source-sink relationship

Unit-2: Mineral nutrition, Enzymes and Respiration**14 Hrs**

1. Essential macro and micro mineral nutrients and their role in plants; symptoms of mineral deficiency
2. Absorption of mineral ions; passive and active processes.
3. Characteristics, nomenclature and classification Enzymes. Mechanism of enzyme action, enzyme kinetics.
4. Respiration: Aerobic and Anaerobic; Glycolysis, Krebs cycle; electron transport system, mechanism of oxidative phosphorylation,

Unit-3: Photosynthesis and Photorespiration

12 Hrs

1. Photosynthesis: Photosynthetic pigments, absorption and action spectra; Red drop and Emerson enhancement effect
2. Concept of two photosystems; mechanism of photosynthetic electron transport and evolution of oxygen; photophosphorylation.
3. Carbon assimilation pathways (C₃,C₄ and CAM);
4. Photorespiration – C₂ pathway

Unit- 4: Nitrogen and lipid metabolism

12 Hrs

1. Nitrogen metabolism : Biological nitrogen fixation- asymbiotic and symbiotic nitrogen fixing organisms. Nitrogenase enzyme system.
2. Lipid metabolism : Classification of Plant lipids, saturated and unsaturated fatty acids.
3. Beta -oxidation of fatty acids, Glyoxylate cycle.

Unit-5: Plant growth-Development and Stress physiology

12Hrs

1. Growth and Development : Definition, phases and kinetics of growth.
2. Physiological effects of plant Growth Regulators (PGRs) – auxins, gibberellines, cytokinins, ABA, ethylene and brassinosteroids.
3. Physiology of flowering : Photoperiodism, role of phytochrome in flowering.
4. Stress physiology: Types and causes of plant stress.

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B.Sc BZC IV SEMESTER BOTANY SYLLABUS

CELL BIOLOGY ,GENETICS,AND PLANT BREEDING

PAPER CODE : 20BOT4B

Theory

60 Hrs

Learning outcomes:

On successful completion of this course, the students will be able to:

- Distinguish prokaryotic and eukaryotic cells and design the model of a cell.
- Explain the organization of a eukaryotic chromosome and the structure of genetic material.
- Demonstrate techniques to observe the cell and its components under a microscope.
- Discuss the basics of Mendelian genetics, its variations and interpret inheritance of traits in living beings.
- Elucidate the role of extra-chromosomal genetic material for inheritance of characters.
- Evaluate the structure, function and regulation of genetic material.
- Understand the application of principles and modern techniques in plant breeding.
- Explain the procedures of selection and hybridization for improvement of crops.

Unit-1: The Cell

12Hrs

1. Cell theory; prokaryotic vs eukaryotic cell; animal vs plant cell; a brief account on ultra-structure of a plant cell.
2. Ultra-structure of cell wall.
3. Ultra- structure of plasma membrane and various theories on its organization.
4. Polymorphic cell organelles (Plastids); ultra structure of chloroplast. Plastid DNA.

Unit- 12: Chromosomes

12Hrs

1. Prokaryotic vs eukaryotic chromosomes. Morphology of a eukaryotic chromosome.
2. Euchromatin and Heterochromatin; Karyotype and ideogram.
3. Brief account of chromosomal aberrations- structural and numerical changes.
4. Organization of DNA in a chromosome (solenoid and nucleosome models).

Unit – 3: Mendelian and Non-Mendelian genetics

1. Mendel's laws of inheritance. Incomplete dominance and co-dominance; Multiple allelism.
2. Complementary, supplementary and duplicate gene interactions (plant based examples are to be dealt).
3. A brief account of linkage and crossing over; Chromosomal mapping – 2 point and 3 point test cross.

4. Concept of material inheritance (Corren's experiment on *Mirabilis Jalapa*): Mitochondrial DNA.

Unit -4 : Structure and functions of DNA

12Hrs

1. Watson and Crick model of DNA. Brief account of DNA Replication (Semiconservative method)
2. Brief account on Transcription. Types and functions of RNA. Gene concept and genetic code and Translation.
3. Regulation of gene expression in prokaryotes – Lac Operon.

Unit – 5 : Plant Breeding

12Hrs

1. Plant Breeding and its scope; Genetic basis for plant breeding. Plant introduction and acclimatization.
2. Definition, procedure; applications and uses; advantages and limitations of (a) Mass Selection, (b) Pure line selection and (c) Clonal selection.
3. Hybridization – schemes, and technique; Heterosis (hybrid vigour).
4. A brief account on Molecular breeding – DNA markers in plant breeding. RAPD, RFLP.

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BOTANY SEMESTER – V SYLLABUS

Course-20BOT5A1: Plant Propagation

(w.e.f.2020-21admitted batch)

Unit – 1: Basic concepts of propagation (10h)

1. Propagation: Definition, need and potentialities for plant multiplication; asexual and sexual methods of propagation - advantages and disadvantages.
2. Propagation facilities: Mist chamber, humidifiers, greenhouses, glasshouses, cold frames, hot beds, poly-houses, phytotrons nursery - tools and implements.
3. Identification and propagation by division and separation: Bulbs, pseudobulbs, corms, tubers and rhizomes; runners, stolons, suckers and offsets.

Unit – 2: Apomictics in plant propagation (10h)

1. Apomixis: Definition, facultative and obligate; types – recurrent, non-recurrent, adventitious and vegetative; advantages and disadvantages.
2. Polyembryony: Definition, classification, horticultural significance; chimera and bud sport.
3. Propagation of mango, *Citrus* and *Allium* using apomictic embryos.

Unit – 3: Propagation by cuttings (10h)

1. Cuttings: Definition, different methods of cuttings; root and leaf cuttings.
2. Stem cuttings: Definition of stem tip and section cuttings; plant propagation by herbaceous, soft wood, semi hard wood, hard wood and coniferous stem cuttings.
3. Physiological and bio chemical basis of rooting; factors influencing rooting of cuttings; Use of plant growth regulators in rooting of cuttings.

Unit – 4: Propagation by layering (10h)

1. Layering: Definition, principle and factors influencing layering.
2. Plant propagation by layering: Ground layering – tip layering, simple layering, trench layering, mound (stool) layering and compound (serpentine layering).
3. Air layering technique – application in woody trees.

Unit – 5: Propagation by grafting and budding (10h)

1. Grafting: Definition, principle, types, graft incompatibility, collection of scion wood stick, scion-stock relationship, and their influences, bud wood certification; micrografting.
2. Propagation by veneer, whip, cleft, side and bark grafting techniques.
3. Budding: Definition; techniques of 'T', inverted 'T', patch and chip budding.

I. References:

1. Sharma RR and Manish Srivastav. 2004. Plant Propagation and Nursery Management International Book Distributing Co. Lucknow.
2. Hartman, HT and Kester, D.E. 1976. Plant Propagation: Principles and Practices, Prentice Hall of India Pvt. Ltd. Bombay.
3. Sadhu, M.K. 1996. Plant Propagation. New Age International Publishers, New Delhi.
4. Web resources suggested by the teacher concerned and college librarian including reading material.

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BOTANY SEMESTER – V SYLLABUS

20BOT5A2: Seed Technology

(w.e.f 2020-23 admitted batch)

Unit - 1: Seed dormancy

(10h)

1. Seed and grain: Definitions, importance of seed; structure of Dicot and Monocot seed.
2. Role and goals of seed technology; characteristics of quality seed material.
3. Dormancy: Definition, causes for seed dormancy; methods to break seed dormancy.

Unit – 2: Seed processing and storage

(10h)

1. Principles of seed processing: seed pre-cleaning, precuring, drying, seed extraction; cleaning, grading, pre-storage treatments; bagging and labelling, safety precautions during processing.
2. Seed storage; orthodox and recalcitrant seeds, natural longevity of seeds.
3. Factors affecting longevity in storage; storage conditions, methods and containers.

Unit – 3: Seed testing

(10h)

1. Definition of seed vigour, viability and longevity; seed sampling and equipment; physical purity analysis.
2. Seed moisture – importance – methods of moisture determination.
3. Seed germination tests using paper, sand or soil – standard germination test; TZ test to determine seed viability; seed health testing.

Unit – 4: Seed borne diseases

(10h)

1. A brief account of different seed borne diseases and their transmission.
2. Different seed health testing methods for detecting microorganisms.
3. Management of seed borne diseases; seed treatment methods: spraying and dusting.

Unit – 5: Seed certification

(10h)

1. Objectives - Indian seed Act; seed rules and seed order; new seed policy (1988).
2. Seed Inspector: Duties and responsibilities; classes of seeds, phases of certification standards (i.e., Land requirement, isolation distance) etc.
3. Issue of certificates, tags and sealing; pre and post control check: Genetic purity verification, certification, records and reporting.

II. References:

1. Umarani R, Jerlin R, Natarajan N, Masilamani P, Ponnuswamy AS 2006. Experimental Seed Science and Technology, Agrobios, Jodhpur
2. Agrawal, 2005. Seed Technology. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi
3. Desai B D 2004. Seeds Hand Book: Processing and Storage, CRC Press
4. Agarwal V K and J B Sinclair 1996, Principles of Seed Pathology, CRC Press
5. Tunwar NS and Singh SN. 1988. Indian Minimum Seed Certification Standards. CSCB, Ministry of Agriculture, New Delhi.
6. McDonald, M.B. and L.O. Copland. 1999. Seed Science and Technology Laboratory Manual. Scientific Publishers, Jodhpur
7. Web resources suggested by the teacher concerned and the college librarian including reading material.