



RAYALASEEMA UNIVERSITY: KURNOOL

(A State University Establishment by Govt. of (A.P)
(UGC 2 (f) & 12B, Accredited by NAAC with 'B' Grade)

DEPARTMENT OF BOTANY

CURRICULUM (CBCS) – M.Sc. (BOTANY) (Syllabus W.e.f. Academic Year 2021-2022)

I SEMESTER

S.No	Paper Code	Title of the Paper	No. Of Credits	Semester End Exam Duration (Hrs)	Total Marks	
					IAE	SEE
THEORY						
1	BOT2111	Biology and Diversity of Algae, Bryophytes, Pteridophytes and Gymnosperms	4	3	20	80
2	BOT2112	Plant Taxonomy	4	3	20	80
3	BOT2113	Biology and Diversity of Bacteria, Fungi , Viruses & Plant Pathology	4	3	20	80
4	BOT2114	Cell Biology & Tools and Techniques	4	3	20	80
PRACTICAL						
1	BOT2111P & BOT2112P	Biology and Diversity of Algae, Bryophytes, Pteridophytes and Gymnosperms Plant Taxonomy	2	5	-	100
2	BOT2113P & BOT2114P	Biology and Diversity of Bacteria, Fungi , Viruses & Plant Pathology Cell Biology & Tools and Techniques	2	5	-	100

Total Credits: 20 **Total Marks : 600**

IAE: Internal Assessment Examination - 20 marks

SEE: Semester End Examination (Both theory and Practicals)



RAYALASEEMA UNIVERSITY: KURNOOL

(A State University Establishment by Govt. of (A.P)

(UGC 2 (f) & 12B, Accredited by NAAC with 'B' Grade)

DEPARTMENT OF BOTANY

II SEMESTER

S.No	Paper Code	Title of the Paper	No. of Credits	Semester End Exam Duration (Hrs)	Total Marks	
					IAE	SEE
THEORY						
1	BOT2121	Molecular Plant Physiology	4	3	20	80
2	BOT2122	Plant Metabolism	4	3	20	80
3	BOT2123	Internal Elective: a) Genetics & Evolution b) Plant Development & Reproduction c) Ecology & Environment	4	3	20	80
4	BOT2124	Plant Molecular Biology	4	3	20	80
PRACTICAL						
1	BOT2121P& BOT2122P	Molecular Plant Physiology & Plant Metabolism	2	5	-	100
2	BOT2123P& BOT2124P	Internal Elective & Plant Molecular Biology	2	5	-	100

Total Credits : 20

Total Marks : 600

IAE: Internal Assessment Examination - 20 marks

SEE: Semester End Examination (Both theory and Practicals)



RAYALASEEMA UNIVERSITY: KURNOOL

(A State University Establishment by Govt. of (A.P)
(UGC 2 (f) & 12B, Accredited by NAAC with 'B' Grade)

DEPARTMENT OF BOTANY

III SEMESTER

S.No	Paper Code	Title of the Paper	No. of Credits	Semester End Exam Duration (Hrs)	Total Marks	
					IAE	SEE
THEORY						
1	BOT2131	Ethnobotany & Phytomedicine	4	3	20	80
2	BOT2132	Plant Biotechnology & Genetic Engineering	4	3	20	80
3	BOT2133	Open Elective: a) Plant Resources and Utilization b) Plant Drugs c) Forestry & Silviculture	4	3	20	80
4	BOT2134	Skill Oriented Course: a) Hydroponics b) Mushroom Cultivation c) Organic Farming	4	3	20	80
PRACTICAL						
1	BOT2131P & BOT2132P	Ethnobotany & Phytomedicine & Plant Biotechnology & Genetic Engineering	2	5	-	100
2	BOT2133P & BOT2134P	Skill Oriented Course:	2	5	-	100

Total Credits : 20

Total Marks : 600

IAE: Internal Assessment Examination - 20 marks

SEE: Semester End Examination (Both theory and Practicals)



RAYALASEEMA UNIVERSITY: KURNOOL

(A State University Establishment by Govt. of (A.P)
(UGC 2 (f) & 12B, Accredited by NAAC with 'B" Grade)

DEPARTMENT OF BOTANY

IV SEMESTER

S.No	Paper Code	Title of the Paper	No. of Credits	Semester End Exam Duration (Hrs)	Total Marks	
					IAE	SEE
THEORY						
1	BOT2141	Horticulture and Agriculture Biology	4	3	20	80
2	BOT2142	Plantomes and Bioinformatics	4	3	20	80
3	BOT2143	Phytodiversity, Conservation & Management	4	3	20	80
4	BOT2144	MOOCS/SWAYAM	4	3	20	80
5	BOT2145	Project (Compulsory) Dissertation & Viva -Voce	4	-	-	200

Total Credits : 20 Total Marks : 600

IAE: Internal Assessment Examination - 20 marks

SEE: Semester End Examination (both theory and Practicals)



RAYALASEEMA UNIVERSITY: KURNOOL

(A State University Establishment by Govt. of (A.P)
(UGC 2 (f) & 12B, Accredited by NAAC with 'B' Grade)

DEPARTMENT OF BOTANY

I SEMESTER

BOT 2111-BIOLOGY AND DIVERSITY OF ALGAE, BRYOPHYTES, PTERIDOPHYTES AND GYMNOSPERMS

Unit-I: Algae- General characters, Algae in diversified habitat (terrestrial, aquatic-freshwater and marine, Unusual habitat of algae). Thallus organization: unicellular motile, unicellular non-motile, colonial, filamentous, heterotrichous, siphonous, parenchymatous, pseudo parenchymatous, special thallus. Cell structure. Reproduction (vegetative, asexual and sexual). Criteria for classification of algae: algal pigments, reserve food, algal flagella. Fritsch classification. General account of Cyanophyta, Chlorophyta, Charophyta, Xanthophyta, Bacillariophyta, Phaeophyta and Rhodophyta. Economic importance of algae, algal blooms.

Unit-II: Bryophytes- General characters, Morphology, Structure, Reproduction: vegetative and sexual methods and life history. Classification of Bryophytes; General account of Marchantiales, Anthocerotales, Sphagnales and Polytrichales; Diversity and Evolution of Sporophyte in Bryophytes, economic and ecological importance. Distribution of bryophytes in India.

Unit-III: Pteridophytes- Classification, General characters & Habitat of Pteridophytes (terrestrial, aquatic, xerophytic). Morphology: sporophyte and gametophyte structure and Reproduction. Origin of Pteridophytes, steelar evolution in Pteridophytes, heterospory and origin of seed habit. Apospory and Apogamy. Evolution of sporophyte: telome theory. General account of Psilopsida, Lycopsida, Sphenopsida and Pteropsida. Fossil Pteridophytes. Economic importance. Distribution of Pteridophytes in India.

Unit-IV: Gymnosperms- General characters, Classification & Morphology (vegetative and reproductive organs) and Reproduction (vegetative and sexual), Distribution of gymnosperms in India, General account and affinities of living gymnosperms: Cycadales, Ginkgoales, Coniferales, and Gnetales. Salient features and affinities of fossil gymnosperms - Pteridospermales, Cycadeoidales, Pentoxylales and Cordaitales. Economic importance.

List of Practicals:

1. Examination of vegetative morphology of various algae
2. Examination of reproductive morphology of various algae
3. Morphological study of representative members of all groups using whole mount preparations and sections.
4. Examination of vegetative morphology of various algae
5. Examination of reproductive morphology of various algae
6. Morphological study of representative members of all groups using whole mount preparations and sections.
7. Study of morphology and anatomy



RAYALASEEMA UNIVERSITY: KURNOOL

(A State University Establishment by Govt. of (A.P)

(UGC 2 (f) & 12B, Accredited by NAAC with 'B' Grade)

DEPARTMENT OF BOTANY

8. Morphological study of representative members of all groups using whole mount preparations and sections.
9. Study of morphology and anatomy of vegetative structures of Bryophytes,
10. Study of morphology and anatomy of vegetative structures of Pteridophytes
11. Study of morphology and anatomy of vegetative structures of Gymnosperms.
12. Study of fossils from Pteridophytes.
13. Study of fossils from Gymnosperms.

Prescribed Books:

1. Datta, S.C. (1984) : An Introduction to Gymnosperms, Kalyani Publishers, New Delhi
2. Rashid, A. (1998) : An Introduction to Bryophyta, Vikas Publishing House (P) Ltd., New Delhi
3. Rashid, A. (1999) : An Introduction to Pteridophyta, Vikas Publishing Co., New Delhi,
4. Bhatnagar, S.P. & Alok Moitra (1997) : Gymnosperms, New Age International (P) Ltd., Publisher, New Delhi.

Reference Books:

5. Sharma, O.P. (1990) : Textbook of Pteridophyta, MacMillan India Ltd., Delhi.
6. Chapman, V.J., & Chapman, D.J., (1973) : The Algae (2nd Edition), ELBS & MacMillan
7. Chopra, R.N. & Kumara, P.K. (1988) : Biology of Bryophytes, Wiley Eastern Ltd., New Delhi. 4. Coulter, J.M. & C.J. Chamberlain (1964) : Morphology of Gymnosperms, Central Book Depot, Allahabad.
8. Sporne, K.R. (1971) : The Morphology of Gymnosperms (The Structure and Evolution of Primitive seed Plants), Hutchinson University Library, London.
9. Sporne, K.R. (1970): The Morphology of Pteridophytes, (The Structure of Ferns and Allied Plants), Hutchinson University Library, London.



RAYALASEEMA UNIVERSITY: KURNOOL

(A State University Establishment by Govt. of (A.P)
(UGC 2 (f) & 12B, Accredited by NAAC with 'B' Grade)

DEPARTMENT OF BOTANY

BOT 2112-PLANT TAXONOMY

UNIT I: Angiosperm classifications and Phylogeny: Plant taxonomy – scope and significance; Brief history of plant classifications- Natural and Phylogenetic systems; Bentham and Hooker's system of classification; Principles of phylogenetic classifications; Engler and Prantle; Hutchinson; Takhtajan and Cronquist; plesiomorphy; apomorphy; monophyly and polyphyly; phylogenetic trees; Angiosperm Phylogeny Group classification – salient features; clades, orders and families; A comprehensive account on origin and evolution of Angiosperms.

UNIT II: Floristic studies, Herbarium methodology and Nomenclature: Floristic inventories in India- a general account. Botanical Survey of India and its activities; Flora of Andhra Pradesh – Significant contributors; vegetation types and floristic diversity of Andhra Pradesh; endemic and threatened taxa; Herbarium methodology – methods of collection, processing and preservation of plant specimens; Significant herbaria in the world and India; International code of nomenclature (Melbourne code, 2011) – principles, rules and recommendations; typification, rule of priority; nym concept and author citation; effective and valid publication.

UNIT III: Modern Taxonomy: Source of Taxonomic characters-External morphology; comparative anatomy; embryology: palynology – pollen aperture morphology, exine stratification and ornamentation; Cytology – chromosome morphology and behavior, banding patterns; Biochemical and molecular systematics; Secondary metabolites, chemical markers, Molecular taxonomy applications, DNA bar coding; Numerical taxonomy – principles, merits and demerits.

UNIT – IV: STUDY OF SELECTED ANGIOSPERMIC CLADES-ORDERS

Salient features, distribution and diversity of the following groups (based on APG –IV); ANITA Grade (Pro Angiosperms); Magnolids (Magnoliales- Annonaceae); Monocots (Asparagales- Orchidaceae); Commelinids (Poales- Poaceae); Fabids (Fabales- Fabaceae, Malphigiales- Euphorbiaceae); Malvids (Malvales- Malvaceae, Caryophyllales- Amaranthaceae); Lamids (Gentianales- Apocyanaceae, Solanales- Solanaceae, Lamiales- Lamiaceae); Campanulids (Asterales- Asteraceae).

Practicals:

1. Study of about 25 wild taxa representing different families and identification to species level.
2. Study of flora of the college campus.
3. Major botanical tour of 5-8 days duration, covering south Indian flora and vegetation types, Field trips to acquaint with local flora. Submission of a report on botanical tours.
4. Preparation of 50 herbarium specimens of common wild plant taxa.
5. Construction of taxonomic keys.
6. Nomenclatural exercise.



RAYALASEEMA UNIVERSITY: KURNOOL

(A State University Establishment by Govt. of (A.P)
(UGC 2 (f) & 12B, Accredited by NAAC with 'B' Grade)

DEPARTMENT OF BOTANY

Prescribed Books:

1. Taxonomy of Angiosperms ,Author A. V. S. S. Sambamurty ,Publisher I. K. International Pvt Ltd, 2010
2. Modern Plant Taxonomy Author Subrahmanyam N.S.Publisher Vikas Publishing House Pvt Limited, 2009
3. Judd, W.S, Christopher S. Campbell, Elizabeth A. Kellogg, Peter F. Stevens, and Michael J. Donoghue. 2007. Plant Systematics: A Phylogenetic Approach, 3rd ed. Sinauer.
4. Pullaiah, T. 2005. Taxonomy of Angiosperms. Regency publications, New Delhi.

Reference Books:

4. Gamble & Fischer 1915-1935. Flora of Presidency of Madras. 3 vols.BSMS, Dehradun.Heywood, V.H., RK Brummitt, A. Culham, O. Seberg 2007. Flowering Plant Families of the World. Firefly books Ltd. New York.
5. Simpson, Michael G. 2006. Plant Systematics. Elseiver& Academic Press.
6. Singh, Gurucharan. 2005. Plant Systematics. Oxford & IBH. New Delhi.
7. Kocchar, S.L. 1998. Economic Botany in Tropics, 2nd ed. Macmillan India Ltd., New Delhi.
8. Sharma, O.P. 1996. Hill's Economic Botany, Tata McGraw Hill Co.Ltd. New Delhi.



RAYALASEEMA UNIVERSITY: KURNOOL

(A State University Establishment by Govt. of (A.P)
(UGC 2 (f) & 12B, Accredited by NAAC with 'B' Grade)

DEPARTMENT OF BOTANY

BOT 2113-BIOLOGY AND DIVERSITY OF BACTERIA, FUNGI, VIRUSES AND PLANT PATHOLOGY

Unit-I: Bacteria and Phytoplasma-General account: classification, ultrastructure, cell wall of bacteria, nutrition, and reproduction-fission and genetic recombination (transformation, transduction and conjugation), economic importance (useful and harmful aspects). Cyanobacteria: salient features and biological importance. Phytoplasma: general characteristics and role in causing plant diseases.

Unit-II: Viruses-General characters and classification of viruses. Chemistry and ultrastructure of viruses & viroids and prions. Isolation and purification of viruse. Replication and transmission of viruses. General account of plant, animal and human viral diseases.

Unit- III: Fungi-General characters of fungi, Nutrition (saprobic, biotrophic, symbiotic), Reproduction (vegetative, asexual, sexual), Heterothallism, Heterokaryosis, Parasexuality. Recent trends in classification & Phylogeny of fungi: General account of Mastigomycotina, Zygomycotina, Ascomycotina Basidiomycotina, Deuteromycotina. Fungi in industry, medicine and as food & fungal diseases in plants and humans. Lichens: Types, structure and reproduction. Mycorrhizae.

Unit –IV: Plant Pathology-Classification of plant diseases and symptomology. Mechanism (s) of pathogenesis and resistance and disease control measures (physical, chemical and biological control). Plant-virus interaction with emphasis on-TMV & BYMV, Plant-bacterial interaction with emphasis on blight of paddy & citrus canker; Plant-fungus interaction with emphasis on-downy mildew of bajra, club root of crucifers, red rot of sugarcane, leaf spot and tikka diseases of groundnut.

Practicals:

1. Gram staining of Bacteria
2. Sterilization methods, preparation of media and stains
3. Demonstration of motility in Bacteria.
4. Demonstrations of Bacterial growth curves.
5. Isolation of fungi from soil: media preparation, dilution plate technique.
6. Morphological study of fungi belonging to Myxomycota, Zygomycotina, Ascomycotina, Basidiomycotina and Deuteromycotina.
7. Morphological study of fungi belonging to Ascomycotina, Basidiomycotina and Deuteromycotina.
8. Study of Lichens
9. Identification of Fungal cultures: *Rhizopus*, *Mucor* *Aspergillus* & *Penicillium*
10. Study of symptomology of locally available diseased specimens.



RAYALASEEMA UNIVERSITY: KURNOOL

(A State University Establishment by Govt. of (A.P)

(UGC 2 (f) & 12B, Accredited by NAAC with 'B' Grade)

DEPARTMENT OF BOTANY

Prescribed Books:

1. Pelczar, M.J., E.C.S.Chan & N.R.Krieg. Microbiology. Tata McGraw Hill, New Delhi. 1986.
2. Ainsworth G.C., E.K.Sparrow & A.S.Sussman, The Fungi-An advanced treatise.Academic Press. 1973.
3. Mehrotra, R.S. and Aneja, K. R. An Introduction to Mycology. New Age International Press. 1998.
4. Sharma, P.D. Plant Pathology. Narosa Publishing House, India. 2000.
5. Dr. Bendre and M. Kumar A Text book of Practical Botany 1. Rastogi publications, 2009.

Referred Books:

6. Alexopoulos, C.J., Mims, C.W. and Blackwel, M. Introductory Mycology. John Wiley & Sons Inc.1996.
7. R.S. Singh. Introduction to principles of Plant Pathology. Medtech Publishers, 2017.



RAYALASEEMA UNIVERSITY: KURNOOL

(A State University Establishment by Govt. of (A.P)

(UGC 2 (f) & 12B, Accredited by NAAC with 'B' Grade)

DEPARTMENT OF BOTANY

BOT 2114-CELL BIOLOGY & TOOLS AND TECHNIQUES

UNIT-I: Cell Structure & Chromosomes : Cellular organelles and their structural organization: Plasma membrane, Chloroplasts; Mitochondria; Golgi complex; Endoplasmic reticulum; Vacuole; Structure and function of plant cell wall. Euchromatin and Hetero chromatin, Structure and Organisation of cytoskeletal filaments Actin and Intermediate filaments, Microtubules.

UNIT-II: Cell cycle & Cell Communication: Regulation of cell cycle by cell growth and extra cellular signals; Cell cycle check points; Cell Death:i) Apoptosis - Definition, Morphological and Biochemical differences between Apoptosis and Necrosis; Mechanism (Intrinsic pathway and Extrinsic pathway), Inhibitors of Apoptosis and Significance. General principles of cell communications. Cell surface receptors - Ion channel linked, G- protein linked and Enzyme linked receptors. Forms of Intracellular signaling - Autocrine, Paracrine, Contact dependent, Synaptic and Endocrine signaling

UNIT- III: Centrifugation & Chromatography: Centrifugation - Basic principles of sedimentation; types of centrifuges and rotors; Centrifugation types - differential centrifugation, density-gradient, analytical, and ultracentrifugation and their applications.

Chromatography: Principle, instrumentation, Methods based on polarity; Partition chromatography (Paper chromatography); adsorption chromatography (thin-layer chromatography); gas-liquid chromatography; High-performance liquid chromatography

UNIT-IV: Electrophoresis & Spectroscopy:

General principles and definitions SDS-PAGE; Isoelectric focusing; 2D electrophoresis; Agarose gel electrophoresis - Preparation, separation and determination of molecular size of DNA. laws of light absorption;

Spectro-photometry: Instrumentation and applications of UV- visible spectrophotometer, Mass spectroscopy.

Radioisotope Techniques - Types of isotopes; radioactive decay; Detection and measurement of radioactivity; GM counter; scintillation counter; Auto-radiography

Practicals:

1. Introduction to Cell Biology
2. Smear and Squash Techniques
3. Preparation of Cytological slides for Mitosis using Root tips.
4. Preparation of Toxicological slides for Meiosis-I using Flower buds.
5. Preparation of Buffers and Measurement of pH.
6. Separation of Amino acids by TLC.
7. Absorption Spectra of Proteins
8. Demonstration of HPLC



RAYALASEEMA UNIVERSITY: KURNOOL

(A State University Establishment by Govt. of (A.P)

(UGC 2 (f) & 12B, Accredited by NAAC with 'B' Grade)

DEPARTMENT OF BOTANY

Prescribed Books:

1. Freifelder, D. - Molecular Biology, Narosa Publishing House, New Delhi. 2004.
2. Animal cell culture: A practical approach: Edited by R I Freshney. pp 248. IRL Press, Oxford. 1986.
3. Wilson & K.W. Goulding- A Biologists Guide to Principles and Techniques of Practical Biochemistry, ELBS Edn.1986.
4. Cooper Geoffrey, M. - The Cell-A Molecular Approach, ASM Press, Washington.1986.

Reference Books:

5. De Robertis, E.D.P. & E.M.F. DeRobertis. - Cell and Molecular Biology, Lippincott Williams & Wilkins, Bombay. 2017.
6. K.T. Brown and D.G. Flamming IBRO - Advanced Micro pipette Techniques for cell physiology Hand Book Series, A Wiley Inter science publications, John Wiley and Sons, New York. 1986.



RAYALASEEMA UNIVERSITY: KURNOOL

(A State University Establishment by Govt. of (A.P)
(UGC 2 (f) & 12B, Accredited by NAAC with 'B' Grade)

DEPARTMENT OF BOTANY

II SEMESTER

BOT 2121- MOLECULAR PLANT PHYSIOLOGY

UNIT-I: Plant nutrients - Uptake and utilization, Solute Transport : Phloem transport of organic substances – Phloem loading and unloading; Passive and active solute transport; Membrane transport proteins; **Plant water relationship:** SPAC concept; Thermodynamic concept of plant cell and water relations; Stomata-structural features; mechanism of stomatal movements and stomatal index, frequency,; Stomatal responses to environmental factors; antitranspirants and their importance in drought resistance.

UNIT-II: Photosynthesis and Respiration: Current knowledge on the mechanism of photosynthesis - light harvesting complexes; photochemical reactions; electron transport in chloroplasts; Oxygen evolution and photophosphorylation; Carbon fixation pathways-Reductive Pentose Phosphate pathway and its regulation by light and metabolites; C4 pathway; C3-C4 intermediates; CAM pathway; Photosynthesis versus plant productivity; Photorespiration-Glycolate pathway, significance of photorespiration. **Respiration:** Overview of plant respiration; Glycolysis; TCA cycle; Electron transport and ATP synthesis; Pentose Phosphate pathway; Glyoxylate cycle; alternative oxidase system.

UNIT-III: Phytohormones: Biosynthesis, Mode and Mechanism of Action, Biological functions, Perception and Signalling, (Auxins, Cytokinins, Gibberellins, Ethylene, Abscic Acid, Brassinosteroids) . Role of Polyamines, Jasmonic Acid and Salicylic acid in stress adaptations responses and hormone receptors. **Photo-Morphogenesis:** Role of Light in Growth and Development, Establishing Circadian Rhythms, Phytochromes and Cryptochromes - Molecular mechanism of action of phytochrome in gene expression; Floral induction and development – genetic and molecular analysis,

UNIT-IV: Stress avoidance and tolerance mechanisms: Structural, physiological, biochemical and molecular responses of plants to environmental stress; Phytohormone signalling in plant defence Molecular Plant Pathogen Interactions. Reclamation of saline soils and heavy metal contaminated soils.

Practicals:

1. Determination of cell permeability by using Beet root tissues.
2. Determination of stomata index and frequency in leaves.
3. Determination of the water potential of the tissue.
4. Extraction and Estimation of Chlorophyll pigments.(Arnan method).
5. Determination of viability of different seed material.
6. Estimation of IAA by Solkowski's method.
7. Determination of membrane stability and chlorophyll stability index of stressed plants 8.
8. Estimation of free Proline in stressed plants sample.



RAYALASEEMA UNIVERSITY: KURNOOL

(A State University Establishment by Govt. of (A.P)

(UGC 2 (f) & 12B, Accredited by NAAC with 'B' Grade)

DEPARTMENT OF BOTANY

Prescribed Books:

1. Thomas C. Moore.1992. Biochemistry and Physiology of Hormones.Narosa.
2. Buchannan et al 2001. Biochemistry and Molecular Biology of Plants.
3. Taiz& E. Zeiger. 1998. Plant Physiology. Second Edition.Sinauer Associates Inc, Publishers, Massachusetts, USA.

Reference Books:

4. Salisbury F. B. & C. W. Ross 1992 Plant Physiology. 4 thEdn. Wadsworth Publishing Co., Belmont, California.
5. Hopkins, W. 1998. Introduction to Plant Physiology.ELBS & Longman, Essex., England.



RAYALASEEMA UNIVERSITY: KURNOOL

(A State University Establishment by Govt. of (A.P)
(UGC 2 (f) & 12B, Accredited by NAAC with 'B' Grade)

DEPARTMENT OF BOTANY

BOT 2122- PLANT METABOLISM

Unit- I: Bioenergetics and Enzymes: Chemical foundations of biology: Chemical bonds; pH; pKa; acids,; bases; buffers,; isomerism; Principles of thermodynamics; Properties of water; Energy transformation in living systems, laws of thermodynamics, free energy, standard free energy changes; Phosphoryl group transfers, biological energy transducers; Enzymes, principles, nomenclature, classification, enzyme regulation, enzyme kinetics (Michaelis-Menten equation, and Reversible reactions), coupled reaction, biocatalysts, isozymes and ribozymes.

Unit – II: Amino acid, peptide and proteins: **Amino acids:** Classification, Properties, reactions, rare amino acids; Biologically important peptides; Protein classification: Reactions, functions, properties and Solid phase synthesis; Structural levels of protein: (a). Primary Structure: Peptide bond, importance of primary structure. (b). Secondary structure: X ray diffraction, alpha-helix, β - structure, β -helix, super secondary structure. (c). Tertiary Structure: Forces stabilizing, unfolding/ refolding experiments. Prediction of tertiary Structure (d). Quaternary structure – haemoglobin; End group analysis, sequencing and peptide synthesis, Ramachandran plot and its significance. Biosynthesis of Aromatic amino acids.

UNIT- III: Lipids and Fatty acids: Definition and nomenclature, Fatty acids and their types, structure and biological functions of various class of lipids – Triacyl glycerol, phospholipids, glycolipids, sphingolipids, terpenoid lipids, including steroids, alkyl glyceryl ethers and wax; Lipoproteins; Lipids of physiological significance; Lipid transport and storage; Bio- membranes; formation of micelles; bilayers, vesicles, membrane composition and fluid mosaic model. Structure and functions of Polyamines, Prostaglandins, Thromboxanes, leucotrienes. Types and functions of Porphyrins, pigments and growth regulators.

Unit – IV: Nucleic acids: **Nucleic acid as genetic material, building blocks of nucleic acids-** Purines and pyrimidines, nucleosides, nucleotides; Types of DNA (A, B and Z); Double stranded linear DNA; Circular DNA and Extra chromosomal DNA; Watson and Crick DNA double helix model; Chargaff's rule; DNA organization, Stability and formation of phosphodiester linkages; Effect of acids, alkali and nucleases; Supercoiling, helix to random coil transition; denaturation of nucleic acids; Different types of RNA and their biological functions; Classification, structure and physiological roles of Vitamins.

Practicals:

1. Preparation of Buffers and determination of pH value.
2. General reaction of Amino acids.
3. General reaction of Carbohydrates.
4. Quantitative estimations of Proteins.
5. Quantitative estimation of Carbohydrates.
6. Estimation of Lipids.



RAYALASEEMA UNIVERSITY: KURNOOL

(A State University Establishment by Govt. of (A.P)
(UGC 2 (f) & 12B, Accredited by NAAC with 'B' Grade)
DEPARTMENT OF BOTANY

Prescribed Books:

1. Lehninger, Principles of Biochemistry by Nelson D. Cox Michael M - 6th Edition. 2017
2. JL Jain et al., Fundamentals of Biochemistry, S. Chand Publishers, 2009.
3. V. Voet and J.G. Voet - Biochemistry 4th Edition, John Wiley & Sons. 2016.

Reference Books:

4. L. Stryer, Biochemistry 4th Edition, New York, 1995.
5. Harpers Illustrated Biochemistry by Victor W. Rodwell, David Bender, Kathleen M. Botham - 30th Edition 2018
6. Modern Experimental Biochemistry by Rodney F. Boyer - 3rd Edition. 2000.



RAYALASEEMA UNIVERSITY: KURNOOL

(A State University Establishment by Govt. of (A.P)
(UGC 2 (f) & 12B, Accredited by NAAC with 'B' Grade)

DEPARTMENT OF BOTANY

INTERNAL ELECTIVE:

BOT 2123 (a): GENETICS & EVOLUTION

UNIT I: Mendelism and its extension: Mendel's Laws of Inheritance with examples from plants, Drosophila and human. Non – Mendalian inheritance: co-dominance and incomplete dominance; Epistasis and pleiotropism; lethals and sub-lethals; Multiple alleles-ABO blood groups in humans, Rh blood group incompatibility. Genetic Recombination: Types (Homologous - Reciprocal and Non-reciprocal, Site specific and Illegitimate), Different models of Homologous recombination, Molecular mechanism of Recombination.

UNIT II: Chromosome as a Linkage unit: Linkage, recombination and crossing over: Crossing over as a measure of genetic distance; Recombination mapping with two-point and three-point test cross, recombination frequency and genetic map distance. Chromosomal Aberrations: Types Numerical and Structural and their Significance in Evolution. Sex Chromosomes: Determination of Sex, Genic balance theory, Gynandromorphs, Sex- linked inheritance, Criss - cross inheritance.

UNIT III: Genetics and Epigenetics: Human chromosomes and Syndromes: Turner's, Down's and Klinefelter. Human karyotype and Human genome, Inborn errors of Metabolism, Pedigree analysis, Concepts of Eugenics, Artificial Insemination, Sperm banks, Amniocentesis, Consanguinity, Prenatal diagnosis, Inborn diseases and Genetic Counseling.

UNIT– IV: Emphasis on Darwinism and Lamarckism: Origin and evolution of life, Theories of evolution: Lamarckism, Darwinism and principles of Hugo de Vries. Mechanisms of evolution: natural selection, gene flow, Hardy-Weinberg equilibrium, genetic drift. Modes of speciation: sympatric, peripatric, parapatric and allopatric. Population genetics: Methods of studying population structure. Micro& Macro Evolution.

Practicals:

1. Mendelian Laws of Inheritance: Mendelian Laws using Colour Marbles or Beads.
2. Evaluation of Segregation and Random assessment using Chi-Square test or Test of fitness.
3. Chromosomal Mapping: Construction of Genetic Maps based on problems in three factor crosses.
4. Sex linked inheritance: Problems on Haemophilia & Colour blind of man
5. Demonstration of Barr bodies
6. Syndrome Charts – Demonstration.
7. Problems on Hardy Weinberg's law.
8. Demonstration of Neo-Darwinism and Lamarckism.
9. Charts – Micro and Macro Evolution.



RAYALASEEMA UNIVERSITY: KURNOOL

(A State University Establishment by Govt. of (A.P)
(UGC 2 (f) & 12B, Accredited by NAAC with 'B' Grade)

DEPARTMENT OF BOTANY

Prescribed Books:

1. A.V.S.S. Sambamurthy – Genetics, Narosa Publishers, New Delhi.2005.
2. B. D. Singh, P.B. KaviKishor, PratibhaNallari, P. H. Rao. Cell Biology and Genetics; Genetics: Fundamentals. Kalyani Publishers, Hyderabad, New Delhi. 2009.
3. E.J. Gardner. M.J. Simmons & D.P. Snustad- Principles of Genetics. 2009.
4. R.P.Meyyan and N. Arumugam – Genetics & Evolution, Saras Publications.
5. P.A. Moody – An Introduction to Evolution, II Edn, Kalyani publishers, New Delhi.

Referred Books:

- 1.Watson, J.D., N.H. Hopkins, J.W. Roberts, J.A. Steitz& A.M. Weiner - Molecular Biology of Genes, Benjamin Cummings Publishing Company. Inc. Tokyo.
- 2.Griffiths, A.J.F., J.H. Miller, D.T. Suzuki, R.C. Lewontin& W.M. Gelbark,W.H.- An Introduction to Genetic Analysis, Freeman and Company, New York.
- 4.Dobzhansky - Genetics and Origin of Species, Columbia University Press.



RAYALASEEMA UNIVERSITY: KURNOOL

(A State University Establishment by Govt. of (A.P)
(UGC 2 (f) & 12B, Accredited by NAAC with 'B' Grade)

DEPARTMENT OF BOTANY

BOT 2123 (b)-PLANT DEVELOPMENT AND REPRODUCTION

UNIT I -Tissue types and Tissue systems in Plants: Root growth and Development: Root apical meristem; Cell division, Cell expansion and elongation. Differentiation of root; vascular tissue, root hair and Lateral roots formation. Stem growth and development: organization of the shoot apex; cytological and molecular analysis of shoot apical meristems. Tissue differentiation in the shoot; xylem regeneration and Phloem differentiation.

UNIT II - Leaf and flower development: Development of leaf, History, Specialized cells and tissue differentiation. Development and Anatomy of flower, including transition to Flowering and reproductive shoot apex.

UNIT III - Reproduction and Flower: Vegetative options and reproduction; Genes controlling Floral Organ Differentiation. Male gametophyte: Structure of anther; Microsporogenesis, Role of Tapetum; Pollen development, Pollen germination, Pollen tube growth and Guidance; Pollen storage. Female Gametophyte: Ovule- Structure and development; Megasporogenesis; Development and Organization of the mature Embryo sac; Structure of the Embryo sac cells; Embryo sac haustoria.

UNIT IV- Fertilization, Seed and Fruit Development: Pollination mechanisms and Vectors; Structure of the Pistil; Pollen- Stigma Interactions, Sporophytic and Gametophytic Self-Incompatibility; Double Fertilization. Endosperm development during early maturation and Desiccation stages; Embryogenesis- Dicot types; Monocot embryo; Polyembryony; Apomixis; Parthenocarpy. Dynamics of Fruit growth and Seed Development.

Practicals:

Plant Development:

1. Study of internal organization of different types of stems
2. Study of internal organization of roots.
3. Study of internal organization of plants showing anomalous secondary growth.
4. Microscopic examination of vertical sections of leaves such as Polyalthia, Ficus, Nerium, Nymphaea, maize and Wheat to understand the internal structure of leaf tissues and trichomes, glands etc. Also study C3 and C4 leaf anatomy of plants.
5. Wood maceration.
6. Preparation of permanent slides -5 slides to be submitted at the time of Examination.

Plant Reproduction:

1. Study of microsporogenesis and gametogenesis in anther sections.



RAYALASEEMA UNIVERSITY: KURNOOL

(A State University Establishment by Govt. of (A.P)
(UGC 2 (f) & 12B, Accredited by NAAC with 'B" Grade)

DEPARTMENT OF BOTANY

2. Examinations of anthers dehiscence and collection of pollen grains for microscopic examination (maize, grasses, Cannabis sativa, Crotalaria, Tadescantia, Brassica, Petunia, Solanum melongena etc.)
3. Study of pollen grains by acetolysis
4. Dissection and mounting of endosperm and embryo showing developmental stages and haustoria.
5. Microtomy: Fixation, Processing, Sectioning, Staining and mounting.
6. Micrometry: Use of stage and ocular micrometer.

Prescribed Books:

1. Pullai, T., Naidu, K. C., Lakshminarayana, K. & Hanumantha Rao, B. 2007. Plant Development. Regency Publications, New Delhi.
2. Bhojwani, S. S. and Bhatnagar, S.P. 2000. The embryology of Angiosperms (4th Revised and Enlarged Ed.). Vikas Publishing House, New Delhi.
3. Pullaiah, T. Lakshminarayana, K. & Hanumantha Rao, B. 2008. plant reproduction. Scientific publishers, Jodhpur.

Reference Books:

4. Murphy, T.M. and Thompson, W.F. 1988. Molecular Plant Development, Prentice Hall, New Jersey.
5. Fahn, A. 1982. Plant Anatomy (3rd Ed.), Pergamon Press, Oxford.
6. Fosket, D.E. 1994. Plant growth and Development. A molecular approach, Academic Press, San Diego, USA.
7. Howell, S.H. 1998. Molecular Genetics of Plant Development, Cambridge Univ. Press, Cambridge.
8. Lyndon, R.F. 1990. Plant Development. The Cellular Basis, Unwin Hyman, London.
9. Raghavan, V. 1999. Developmental Biology of Flowering Plants, Springer-Verlag, New York.
10. Steeves, T.A. and Sussex, T.M. 1989. Patterns in Plant Development (2nd Ed.). Cambridge Univ Press, Cambridge.



RAYALASEEMA UNIVERSITY: KURNOOL

(A State University Establishment by Govt. of (A.P)
(UGC 2 (f) & 12B, Accredited by NAAC with 'B" Grade)

DEPARTMENT OF BOTANY

BOT 2123 (c)-ECOLOGY & ENVIRONMENT

Unit- I: Ecology and Environment Definition, Scope and History of Ecology; climatic and topographic factor; physical environment and plant life- light, temperature and fire factors and biotic environment; Ecosystem-structure and function; energy flow in ecosystems-concept of productivity, types of food chains; Biogeochemical cycling global carbon cycle, sulphur and water cycle; Ecosystems of the world-terrestrial (tropical forests seasonal and rainforests; grasslands) and aquatic ecosystems.

Unit- II: Plant Communities and Classification Characteristics of plant communities; analytic-qualitative (life forms, phenology), and quantitative (abundance, density, frequency, basal area); synthetic-species dominance and species diversity. Methods of study of plant communities- quadrats and transects; Importance Value Index, dominance index, similarity index, species diversity indices; community succession process and modeling; concept of climax. Ecological adaptations.

Unit- III: Populations and Individuals Characteristics of plant populations-density, dispersion, natality, mortality and survival, age structure and biotic potential; population growth patterns; population regulation; concept of metapopulation; Population dynamics. Species interactions: plant-plant (inter-specific competition) and plant-animal (pollination ecology and plant defense against herbivores); concept of ecological niche.

Unit- IV: Environmental Challenges Natural resources, Classification of natural resources. Energy resources: Renewable energy resources: solar energy, wind energy, tidal energy, thermal energy, bio energy. Non-renewable energy resources: fossil fuels; coal, natural gas, petroleum. Environmental pollution; sources, effects and control measures of air pollution, water pollution, soil pollution and noise pollution. Global warming-greenhouse gases, impacts on global environment and biodiversity; Ozone layer depletion; El Nino Southern Oscillation, La Nino; Earth Summit – 1992 (RIO DE JANERIO) and 2002 (JOHANNESBURG) and its outcome. Bioremediation. Environmental Impact Assessment (EIA).

Practicals:

1. Determination of texture of different soil samples.
2. Determination of organic matter in soil samples.
3. Determination of salinity in soil and water samples.
4. Estimation of dissolved oxygen in water samples.
5. Determination of minimum size of quadrates.
6. Determination of minimum number of quadrates.
7. Determination of quantitative characters of plant community
8. Determination of species-wise I V I in plant community.
9. Determination of species diversity indices of plant communities.



RAYALASEEMA UNIVERSITY: KURNOOL

(A State University Establishment by Govt. of (A.P)
(UGC 2 (f) & 12B, Accredited by NAAC with 'B" Grade)

DEPARTMENT OF BOTANY

Prescribed Books:

1. Chapman, J.I. & M.J. Reiss. 1992. Ecology-Principles and applications. OUP.
2. Harborne, H.B. 1998. Introduction to Ecological Biochemistry. Academic Press.
3. Cunningham, W.P. & M.A. Cunningham 2007. Principles of Environmental Science Inquiry and applications. Tata Mc Graw Hill Pub. New Delhi.

Reference Books:

4. Dash, M.C.2009. Fundamentals of Ecology. Tata Mc Graw Hill Pub. New Delhi.
5. Girard, James. 2005.Principles of Environmental Chemistry. Jones & Barlett. Sudbury.MA, USA.
6. Moore, P.D. & S.H. Chapman. 1986. Methods in Plant Ecology. Blackwell, Oxford.
- 7.Odum.E.P. 1971. Fundamentals of Ecology. W.B. Saunders, Philadelphia.



RAYALASEEMA UNIVERSITY: KURNOOL

(A State University Establishment by Govt. of (A.P)
(UGC 2 (f) & 12B, Accredited by NAAC with 'B' Grade)

DEPARTMENT OF BOTANY

BOT 2124- PLANT MOLECULAR BIOLOGY

Unit – I: Structure and Functions of Nucleic Acids: The beginning of Molecular Biology; DNA: A carrier of genetic information, Chemical structure of DNA and Base composition, biologically important nucleotides, Watson-Crick model, Supercoiled DNA, structure of different types of nucleic acids, hydrolysis of nucleic acids. Conformation of nucleic acids: A-, B-, Z-, DNA, t-RNA, micro-RNA.

Unit – II: DNA Replication and Repair: Modes of Replication Experimental evidences for Semi Conservative mode of Replication –Messelson- Stahl and Cairns experiments; Replication fork; Continuous and Discontinuous DNA synthesis; Enzymes and Proteins in Replication - Single Strand DNA binding Proteins (SSB); Helicases; Topoisomerases; DNA Ligases; Priming by RNA Polymerase and Primase; DNA Polymerases - E.coli DNA Polymerase I, II and III and Eukaryotic DNA Polymerases.

Unit –III: Transcription (RNA Biosynthesis): Polynucleotide phosphorylase; RNA polymerases Structure of E.coli; RNA polymerase and Nature of Eukaryotic RNA polymerases; Promoters and their Characterization; Enhancer Sequences; Initiation, Elongation and Termination of RNA Synthesis.

Unit–IV: Translation (Protein synthesis) - Mechanism of Initiation, Elongation and Termination of Protein synthesis; Translational factors; Inhibitors of Protein synthesis - Antibiotic and other Inhibitors; Post- Translational Modifications; Protein sorting and Targeting.

Practicals:

1. Determination of purity and quantity of DNA by UV absorption method.
2. Estimation of DNA by Diphenylamine method.
3. Estimation of RNA by Orcinol method
4. Determination of Melting Temperature (T_m) of DNA.
5. Determination of log phase during Culturing of E. coli
6. Estimation of proteins by Lowry method
7. Demonstration of SDS-PAGE



RAYALASEEMA UNIVERSITY: KURNOOL

(A State University Establishment by Govt. of (A.P)
(UGC 2 (f) & 12B, Accredited by NAAC with 'B" Grade)

DEPARTMENT OF BOTANY

Prescribed Books:

1. Lehninger, Principles of Biochemistry by Nelson D. Cox Michael M - 6th Edition. 2017
2. Benjamin Lewin – Genes, Oxford University Press. 2007 Maniatis, E.F. Fritsch and J. Sambrook - Molecular Cloning: Laboratory Manual, Cold Spring Harbor Laboratory, New York. 1982
3. B. Alberts, D. Bray, J. Lewis, M. Raff, K. Roberts and J.D. Watson - Molecular Biology of the Cell, Garland Publishing, New York & London. 1994.

Reference Books:

4. 5.D. Freifelder - Molecular Biology – A Comprehensive Introduction to Prokaryotes and Eukaryotes, Jones and Bartlett, USA. 1983
5. Alberts Johnson et al. – Molecular Biology of the Cell, Garland Science, New York. 2003