SETH NARSINGDAS MOR COLLEGE OF ARTS & COMMERCE &
SMT. G. D. SARAF SCIENCE COLLEGE, TUMSAR.

PROGRAMME OUTCOME DEPARTMENT OF BOTANY

Programme B. Sc. (Semester Pattern)

Botany Course Outcome

B.Sc. Sem. I
Paper- I (VIRUSES, PROKARYOTES AND ALGAE)
Paper-II (FUNGI, LICHEN, PLANT PATHOLOGY, BRYOPHYTA)

Paper	Syllabus Topic	Objectives	Course Outcome
Paper-I	• Introduction to Botany. • Viruses. • Mycoplasma. • Bacteria • Cyanobacteria. • Algae- General characters, classification Economic Importance, • Life histories of *Oedogonium, Chara, Vaucheria and Ectocarpus*	To acquaint the students about the morphology, anatomy ,reproduction , classification, life history, alternation of generation and economic importance of prokaryotes, eukaryotes, algal organisms, fungal organisms, fungal disease ,control measures and lichens and bryophytes	On completion of this course students will enriched the knowledge in the following ways:- 1. The course will enable students to know the earlier plants, their vegetative and reproductive structures and their importance. 2. Students will be able to identify the major groups of organisms with an emphasis on plants and be able to classify them within a phylogenetic frame work following different classification systems. 3. Students will be able to compare and contrast the characteristics of plants, algae, and fungi that differentiate them from each other and from other forms of life. 4. Students will be acquainted the knowledge of the life history pattern in different groups of plants. 5. Students will be able to know about the different plant diseases and their control measure. 6. Students will explore economic importance of Viruses, bacteria, cyanobacteria, algae, fungi, lichens and bryophytes.
Paper-II	• Fungi general account • Classification • Economic Importance • Life histories of *Albugo, Mucor, Puccinia,* and *Cercospora* • Lichens • Plant pathology • Bryophyta general account • Classification • Economic Importance • Alternation of generation • Life histories of *Riccia,Anthoceros* and *Funaria*		

Recommended Laboratory Work:-

B.Sc. Sem. I

S. No.	Objective	Learning course Outcome
1	Study of bacterial forms from permanent micro preparations	1 The course will enable students to know technique of staining and micro preparation of different life forms. 2. The course will enable students to understand the morphology, internal details, reproductive structures ,types, and forms of different group of plants. 3.Botancal excursion exposed and enriched the knowledge the students about natural habit of plants.
2	Gram staining of bacteria	
3	To study the ultrasructure of bacteriophage from TEM photographs.	
4	To study cyanobacteria- *Nostoc*	
5	To study algal genera- *Oedogonium, Chara, Vaucheria and Ectocarpus*	
6	To study fungal genera- *Albugo, Mucor, Puccinia,* and *Cercospora*	
7	To study lichen thallus and types	
8	To study plant diseases- Leaf curl of papaya, red rot of sugarcane, citrus canker	
9	To study Bryophyte- Riccia, *Anthoceros* and *Funaria.*	
10	Botanical Excursions	

SETH NARSINGDAS MOR COLLEGE OF ARTS & COMMERCE &
SMT. G. D. SARAF SCIENCE COLLEGE, TUMSAR.

PROGRAMME OUTCOME DEPARTMENT OF BOTANY

Programme B.Sc. (Semester Pattern)

Botany Course Outcome

B.Sc. Sem. II
Paper- I (Pteridophyta and Gymnosperms)
Paper-II (Paleaobotany and morphology of angiosperms)

Paper	Syllabus Topic	Objectives	Course Outcome
Paper-I	• Pteridophyta- Classification, general character, eco. Importance, alternation of generation, • Life history of *Rhynia, Selaginella ,Equisetum* • Apogamy, apospory Stelar structure , concept of heterospory and seed habit • Gymnospems- Classification, general character, eco. Importance, alternation of generation, • Life cycle of *Cycas, Pinus, Cycadeoidea*	To acquaint the students about the morphology, anatomy reproduction , classification, life history, alternation of generation and economic importance of pteridophytes , gymnosperms , stellar organization and concept of evolution of seed.	On completion of this course students will enriched the knowledge in the following ways:- 1. The course will enable students to know the earlier plants, their vegetative and reproductive structures and their importance. 2. Students will be able to identify the major groups of organisms with an emphasis on plants and be able to classify them within a phylogenetic frame work following different classification systems. 3. Students will be able to compare and contrast the characteristics of plants of pteridophyte and gymnosperms that differentiate them from each other and from other forms of life. 4. Students will be acquainted the knowledge of the life history pattern in pteridophyte and gymnosperms . 5. Students will understand stellar evolution and seed formation habit in pteridophytes.
Paper-II	• Paleaobotany • Fossilization • Types of fossils- • Fossil plant - *Glossopteris* • Root morphology • Stem morphology • Leaf morphology • Inflorescence • Flower – calyx, carolla, androecium, gynoecium, Fruit	To acquaint the students about the- geological time scale, theories of fossilization, impression, compression,petrifaction study of *Glossopteris.* To acquaint the students about morphology and modifications of root, stem, leaf and type of inflorescence and details about flower with reference to calyx ,corolla, androecium gynoecium, placentation, and classification and types of fruits.	1. Students will understand about Paleaobotany, geological time scale. 2. Students will be able to know about fossils ,type of fossils and the process of fossilization. 3.Students will gain the knowledge about morphology and modification of root, stem and leaf. 4 Students will have knowledge of types of inflorescence. 5.Students will be able to describe flower in technical language. 6. Students will be able to differentiate the fruit s.

Recommended Laboratory Work:-

B.Sc. Sem. II

S. No.	Objective	Course Outcome
1	To study fossils- *Glossopteris,Cycadeoidea*	1 The course will enable students to know the past plant remnants with fossil specimens. 2. The course will enable students to understand the morphology, of root, stem, leaf, with modifications. 3. Students will study the parts of flower. 4. Students will acquire the knowledge about different types of fruits of plants. 5. Botanical excursion exposes and enrich the knowledge about different types of plants parts available in nature.
2	To study root types and modifications.	
3	To study stem morphology and modifications.(Ex. *Hibiscus,Ocimum and grass*)	
4	To study leaf morphology and modifications.	
5	To study different type of Inflorescence .	
6	To study the typical flower.	
7	To study different types of fruits.	
10	Botanical Excursions	

SETH NARSINGDAS MOR COLLEGE OF ARTS & COMMERCE &
SMT. G. D. SARAF SCIENCE COLLEGE, TUMSAR.

PROGRAMME OUTCOME DEPARTMENT OF BOTANY

B.Sc. Sem. III
Paper- I (Angiosperm Taxonomy)
Paper-II (Cell biology, Plant breeding and Genetics)

Paper	Syllabus Topic	Objectives	Course Outcome
Paper-I	• Origin of angiosperm • Phylogeny of angiosperm • Fossil angiosperm *Sahanianthus* • Angiosperm Taxonomy • Botanical Nomenclature • Classification of angiosperm • Systems of classification • Modern trends in taxonomy • Study of dicot families • Study of monocot family	To get acquainted the students about Origin of angiosperm, Phylogeny of angiosperm, Fossil angiosperm *Sahanianthus,* Angiosperm Taxonomy, Angiosperm Taxonomy Botanical Nomenclature Classification of angiosperm Systems of classification Modern trends in taxonomy Study of dicot families Study of monocot family	On completion of this course students will enriched the knowledge in the following ways:- 1. The course will enable students to know the origin of angiosperm by Benettitalean. 2.Students will be able to acquire knowledge about the phylogeny of angiosperm through homology, monophyly, polyphyly and clads 3. Students will expose to past remnant of angiosperm – *Sahanianthus* flower specimen 4.Students will have idea about floras, herbarium, keys and type methodology. 5. Students will get acquainted with the different principles of plant nomenclature. 4. Students will have knowledge about the classification of angiosperm with reference to Bentham and Hooker, & Englar and Prantle system of classification. 5.Students will understand how cytotaxonomy, phytochemistry, and taximetrics helps in taxonomic classification 6.Students will get knowledge about dicot and monocot plants assigned to different families.
Paper-II	• Structure of typical plant cell • Ultra structure and functions of: Cell wall, cell membrane, nucleus, E. R., Golgy complex, vacuoles. Ribosomes, mitochondria and chloroplast • Chromosome organization- Morphological and molecular	To acquaint the students with ultra structure and functions of plant cell, Cell wall, cell membrane, nucleus, E. R., Golgy complex, vacuoles. Ribosomes, mitochondria and chloroplast. To study organization of chromosome at Morphological and molecular level.	1. Students will understand about ultra structure and functions of typical plant cell and different cell organells in plant cell. 2. Students will be able to know about different parts of the chromosomes at morphological and molecular level(Nucleosome Model). 3.Students will gain the knowledge about how chromosome controls the determination of sex in plants. 4 Students will have knowledge of types of Divisions , their different stages and significance. 5.Students will acquire the knowledge of different techniques of plant improvements like pureline, hybridization, clonal selection and heterosis

	organization • Sex Chromosome in plant • Cell Division- Mitosis and meiosis and significance • Plant breeding • Biostatistics • Evolution	To study organization of sex chromosome in *Melandrium.* To workout different stages of cell divisions(mitosis and meiosis) To study the different means of breeding. To study the application of statistics in bioscience. To study the evolution.	6. Students will be able to apply the mean,mode, median,standard deviation, standard error and student 's ' t ' test over the population and would be able to predict correct data. 7. Students will understand how origin of life takes place on this globe by considering the Miller's experiment.

Recommended Laboratory Work:-

B.Sc. Sem. III

S. No.	Objective	Course Outcome
1	To study plants belongs to different monocot and dicot families.	1 The course will enable students to know the different characters of plant. 2. The course will enable students to know the past plant remnants with fossil specimens 3. The course will enable students to understand the ultrastructure of cell organells. 4. Students will able to describe the different stages of mitosis and meiosis. 4. Students will acquire the knowledge about how to process data using bio-statistical methods . 5. Botanical excursion exposes and enrich the knowledge about different types of plants present in nature.
2	To study the fossil angiosperm with permanent micro preparation and specimens of *Sahanianthus* and *Enigmocarpon*	
3	To study cell organells through slides/microphotographs.	
4	To study the mitosis and meiosis in plant cell.	
5	To calculate mean,mode, median,standard deviation, standard error from given data.	
6	To calculate the student's ' t ' value from given data.	
7	Botanical Excursions	

SETH NARSINGDAS MOR COLLEGE OF ARTS & COMMERCE &
SMT. G. D. SARAF SCIENCE COLLEGE, TUMSAR.

PROGRAMME OUTCOME DEPARTMENT OF BOTANY

B.Sc. Sem. IV
Paper- I (Anatomy and Embryology of Angiosperm)
Paper-II (Genetics and molecular biology)

Paper	Syllabus Topic	Objectives	Course Outcome
Paper-I	• Basic body plan & growth • Meristems- classification • Permanent tissue & Functions • Apical meristem of root and shoot • Primary structure of root in dicot and monocot • Primary structure of stem in dicot and monocot • Types of vascular bundles • Cambium • Periderm • Growth ring- sap wood & heart wood • Secondary growth and anomalous secondary growth • Anatomy of leaf • Senescence and abscission of leaf • Pollination • Structure of anther, microsporogenesis, male gametophyte • Types of ovule ,Structure of anatropous ovule • Megasporogenesis and female gametophyte • Double fertilization and triple fusion • Endosperm and its type • Structure of embryo (dicot monocot)	To get acquainted the students about basic plant body structure, meristem classification, tissues system and their function. To expose student to the primary and secondary structures in dicot, monocot roots and stems and structure of cambium and types of vascular bundles. To get acquainted about the anatomy of stem and leaf in dicot and monocot plants with reference to secondary and secondary anomalous growth. To get acquainted the students about the embryology of angiospermic plants.	On completion of this course students will enriched the knowledge in the following ways:- 1. The course will enable students to know the Basic body plan & growth pattern. 2.Students will be able to acquire knowledge about the different tissue involve in the building of plant body with their origin. 3. Students will have an idea about the Internal details of the different plants roots ,stem and leaf. 4.Students will be able know the different organs involve in the plant growth and their functions. 5. Students will have knowledge about the different aspects involved in the reproductive biology of angiosperm.
	• Mendelism- Laws of inheritance • Interaction of genes-	To acquaint the students with inheritance of genes	1. Students will understand inheritance and interaction of different genes during expression of characters.

Paper-II	Allelic and non-allelic genes • Linkage-types & significance • Crossing over & significance • Variation in chromosome number • Structural change in chromosome • Structure of DNA • DNA replication • Concept of gene • Mutation-spontaneous and induced • DNA damage and repair • Satellite and repetitive DNA • Genetic code • Transfer RNA • Gene expression in prokaryotes • Regulation of gene expression(Lac operon)	and their interaction with others genes during inheritance. To study the linking group and crossing behavior of genes during inheritance. To study change in the structure and number of the chromosomes in an individuals. To study the molecular structure and replication and types of DNA. To study concept of gene, mutation DNA damage and repair. To understand the gene expression, genetic code and types of RNAs. To understand the regulation of gene expression in prokaryotes.	2. Students will be able to know about what is linkage ,crossing over and their consequences. 3.Students will gain the knowledge about how chromosome aberrations play important role in bringing change in the character, variation and their deleterious effects on organism. 4 Students will have knowledge of structure of DNA and their replication in eukaryote at molecular level. 5.Students will acquire the knowledge of different techniques of plant improvements like pureline, hybridization, clonal selection and heterosis 6. Students will be able to know the nature ,function of gene, types of mutation and importance in human welfare. 7. Students will understand how gene works, expresses and control the synthesis of different polypeptides in prokaryote in Lac Operon.

Recommended Laboratory Work:-

B.Sc. Sem. IV

S. No.	Objective	Course Outcome
1	To study tissue system and vascular bundles in plant	1 The course will enable students to know the different tissues in plant. 2. The course will enable students to differentiate the dicot and monocot on the basis of internal structure . 3. The course will enable students to understand the primary and secondary structure in plant. 4. Students will able to describe the different structures ,functions and importance of male and female reproductive organs in plants. 4. Students will acquire the knowledge about how the genes flow and expresses in plants. 5. Botanical excursion exposes and enrich the knowledge about variations present in nature.
2	To study the internal detail of monocot and dicot roots, stems and leaves.	
3	To study the internal structure of secondary growth and anomalous secondary growth and growth ring in wood.	
4	To study the types of ovule, anther structure, pollen grain and different adaptation for pollination.	
5	To calculate the pollen germination percentage.	
6	To prove the Mendel's law of inheritance using colour beads.	
7	To workout the type of gene interaction in the given cross.	
8	Botanical Excursions	

SETH NARSINGDAS MOR COLLEGE OF ARTS & COMMERCE &
SMT. G. D. SARAF SCIENCE COLLEGE, TUMSAR.

PROGRAMME OUTCOME DEPARTMENT OF BOTANY

B.Sc. Sem.V
Paper- I (Biochemistry and Plant Physiology-I)
Paper-II (Plant Ecology)

Paper	Syllabus Topic	Objectives	Course Outcome
Paper-I	• Carbohydrate • Lipids • Amino acids • Basics of Enzymology • Plant water relations • Water conduction through xylem • Phloem transport • Mineral nutrition • Lipid metabolism • Respiration • Photosynthesis • Nitrogen metabolism	To study the molecular structure and properties of bio molecules. To study the nomenclature, structure, properties, mode of action, of enzyme. To study the means of conduction, physiological importance of water and photosynthetic product in plants. To study the importance of mineral nutrition in plants. To study the respiration and nitrogen metabolism photosynthesis pathway.	On completion of this course students will enriched the knowledge in the following ways:- 1. The course will enable students to know the basics of Carbohydrate Lipids, Amino acids , proteins and Basics of Enzymology. 2. Students will be able to know the major physiological importance of water in plant. 3. Students will be able to know deficiency symptoms and role of minerals in plants. 4. Students will be acquainted the different metabolic pathway occurring in plants to carry out respiration, photosynthesis, and uptake of nitrogen.
Paper-II	• Ecology-overview • Climatic factors • Edaphic factor • Physiographic factor • Interaction between plant community , and soil micro-organisms. • Biogeochemical cycle • Ecosystem • Autecology • Synecology • Phyto geography • Phyto geographic region of India	To study climatic, edaphic and physiological factor of nature. To study the different interaction between the plants. To study the different component of ecology and cycles working. To study different branches of ecology. To study phytogeography and region of India	1. Students will be able to know the ecology and influence of different ecological factors. 2. Students will explore the different branches of ecology . 3. Student will be able to know the different vegetation type in India with respect to region. 4 Student will be acquainted with movement of different inorganic element in the nature in cyclic form.

Recommended Laboratory Work:-

B.Sc. Sem. V

S. No.	Objective	Learning course Outcome
1	To study the effect of various chemicals on permeability of membrane.	1 The course will enable students to know effect of chemicals on membrane permeability; path of water conduction, different chlorophyll pigments in plants; Different RQ; osmotic potential in cell; photosynthetic efficiency ; enzyme present in plant tissues; will able to test unknown samples of sugar, starch, cellulose, oil and proteins; will able to know the different phenomenon working in plant body;
2	To study the ascent of sap in plant .	
3	To separate chlorophyll pigments by paper chromatography.	
4	To determine the RQ in plant material.	
5	To determine osmotic potential of cell sap by plasmolytic method.	
6	To study the effect of light intensity and quality, Co_2 concentration and temperature on the rate of photosynthesis.	
7	To study the activity of enzymes amylase, catalase and peroxidase in plant material.	
8	To perform micro-chemical test for sugar, starch, cellulose, oil and proteins.	
9	To demonstrate the phenomenon of dispersion, adsorption, imbibitions, root pressure, transpiration, photosynthesis fermentation, respiration, growth, geotropism in plant.	
10	To determine minimum number of quadrate required for estimation of biomass.	2. The course will enable students to understand the ecological technique are being used for the estimation of biomass, frequency, abundance and density of different types of vegetations. 3.Botancal excursion exposed and enriched the knowledge about natural habit of plants.
11	To study the frequency of herbaceous species in grassland and compare with RSF diagram.	
12	To estimate importance value index of grassland	
13	To measure vegetation cover of grassland through point –frame method.	
14	To measure above ground plant biomass in a grassland.	
15	To determine the Kemp's constant.	
16	To determine the diversity indices.	
17	To estimate bulk density and porosity.	
18	To determine moisture content and water holding capacity of grassland and woodland.	
19	Botanical excurtion	

SETH NARSINGDAS MOR COLLEGE OF ARTS & COMMERCE & SMT. G. D. SARAF SCIENCE COLLEGE, TUMSAR.

PROGRAMME OUTCOME DEPARTMENT OF BOTANY

B.Sc. Sem.VI

Paper- I (Plant Physiology-II and Biotechnology)

Paper-II (Plant Ecology ,Techniques and Utilization of Plants)

Paper	Syllabus Topic	Objectives	Course Outcome
Paper-I	• Growth • Phytochromes • Circadian rhythms & biological clock • Plant growth regulator • Plant movements • Photoperiodism • Senescence & Abscission • Seed dormancy • Plant defense • Plant Tissue culture • Callus and organ culture, • Cybrid production • Genetic Engineering Tools-Enzyme, Plasmid as a cloning Vector • DNA Libraries • *Agrobacterium tumefaciens* mediated gene transfer • Ti Plasmid • Advantages and disadvantages of transgenic plants Ex. Bt. Cotton and Golden rice	To study the concept of growth with respect to different factors viz. light, hormones. To study the role of light, temperature and hormone in flowering, senescence and abscission. To study the causes of seed dormancy and how it can be break down. To study the different responses, acquired resistance and secondary metabolite in plant defense. To understand the meaning of different tissue culture terms . To study the method of sterilization, culture media & application of tissue culture. To study the technique of callus and organ culture and cybrid production and their applications. To study the different tools being used in genetic engineering. To study the structure of Plasmid, DNA libraries. To study the bacterial mediated gene transfer in plants through Ti plasmid. To study the importance of Bt. Cotton and Golden rice transgenic plants.	On completion of this course students will enriched the knowledge in the following ways:- 1. The course will enable students to know the how plant hormones, light affect the growth of plant . 2. Students will be able to know how light, temperature and hormone control flowering in plant. 3. Students will be able to know importance of seed dormancy in plants and process of breaking. 4. Students will be acquainted with different terms of tissue culture, type of culture methods and applications. 5. Students will be able to know tools and technique of genetic engineering in plants. 6. Students will be able to know the advantages and disadvantages of transgenic plant viz. Bt. Cotton and Golden Rice
	• Plant succession • Plant adaptation • Environmental pollution • Natural Resources • Microscopy,	To study succession leads to climax. To study the different adaptation in plants. To study the different factors responsible for	1. Students will be able to know the ecology and importance of different ecological process like succession, adaptations. 2. Students will study the different

Paper-II	• centrifugation, • electrophoresis, • spectroscopy, • chromatography • Utilization of food plants • Ethno botany	environmental pollution and their hazardous effect on life. To study different natural resources and their conservation. To study principle, type, and application of different techniques. To study economically importance of food ,fiber, medicinal and rubber and ethno botanical importance plants.	factors responsible for polluting the environment and know the control . 3. Student will be able to know the different natural recourses and why they have to be conserved. 4 Student will be acquainted with the different principle behind the techniques being used in biology. 5. Students will study the different parts are being used for food , fiber, medicine and rubber. 6. Students will be acquainted with types and importance of ethno botany.

Recommended Laboratory Work:-

B.Sc. Sem. VI

S. No.	Objective	Learning course Outcome
1	To determine seed viability by TCC method.	1The course will enable students to know % seeds viability. 2 The course will enable students to know principles on which the technique are based , handling and applications. 3. The course will enable students to understand effect of the plant growth regulator on plant. 3. Students will be able to estimated DO, salinity, transparency, pH, temperature of water; leaf area injury dust holding capacity of plants and able to identify the Hydrophyte , Xerophyte, halophyte, epiphyte and parasite. 4.Students will know the morphology, and use of different plant parts. 5. Students will be able to separate amino acid/ carbohydrates using technique. 6.Botancal excursion exposes and enriched the knowledge about natural habit of plants.
2	To study the principle and working of oven, autoclave laminar air flow hood.	
3	To study the structure of Plasmid and Binary vector	
4	To study effect of plant growth regulator on plant growth and development.	
5	To study DO of different water samples	
6	To study dust holding capacity of leaves.	
7	To study estimate salinity of different water samples	
8	To estimate transparency, pH and temperature of different water bodies.	
9	To determine the per cent leaf area injury of different leaf samples collected around polluted and non polluted sites.	
10	To study morphology, utilization and important chemical constituents of plant .	
11	To study the plants f ethno botanical importance.	
12	Electrophoretic/chromatographic separation of amino acids/carbohydrates.	
13	Botanical Excursions	
14	To study ecological character of Hydophyte, Xerophyte, halophyte, epiphyte and parasite.	