

## **Department of Botany - Course Outcome**

### **Paper: M 101 (Theory)** **(Plant Kingdom, Algae and Fungi)**

**CO-I:** Ancient and modern classification of plant kingdom and criteria are studied with special reference to their diversity, form, longevity, nutrition and ecological status.

**CO-II:** Prime importance are given in the classification, morphological differences and varied types of reproductive mechanism, relation between the species with their affinities of algae.

**CO-III:** Life history of Chlorophyceae algae, one Xanthophyceae and two numbers of Cyanophyceae algae are studied.

**CO-IV:** Here a brief account is given on the Bacillariophyceae which are commonly called as Diatom. The thallus structure of brown algae (Ectocarpus, Fucus), the red algae (Polysiphonia) are being discussed.

**CO-V:** Structure, sexuality and economic importance of Fungi are discussed.

**CO-VI:** life history of main classes of fungi are discussed.

**Paper: M 102 (Theory)**  
**(Bryophytes and Pteridophytes)**

**CO-I:** Discussion are made on Hepaticopsida with reference to Riccia and Marchantia.

**CO- II:** Discussion are made on Anthocerotopsida with reference to Anthoceros.

**CO-III:** Discussion are made on Bryopsida (Sphagnum and Polytrichum) and also the Economic importance of Bryophytes

**CO-IV:** Discussion are made on extinct group of Pteridophyte (Psilotum).

**CO-V:** The living pteridophyte- Lycopodium, Selaginella are discussed with stellar diversity and heterozygosity

**CO-VI:** Discussion are carried on two division of pteridophytes e.g.; Sphenopsida (Equisetum) and Pteropsida (Adiantum and Marsilea)

**Paper: M 103**  
**(Practical)**

**CO-I:** Practical works are done on Algae, Fungi, Bryophytes and Pteridophytes.

**CO- II:** Permanent slide preparation and herbarium

**CO-III:** Submission of field reports and collected species.

**Paper: E 101 (Theory)**

**(Diversity of microbes and cryptogams)**

**CO I:** Classification of plant kingdom and importance of plants for survival of living organisms.

**CO II:** General features on some algal specimens.

**CO III:** Introduction to viruses and bacteria with their reproductive and mode of transmission.

**CO IV:** Life histories of some fungal specimen with their pathogenic cycles and control measures.

**CO V:** Study of bryophytic plants such as Marchantia, Anthoceros and Funaria.

**CO VI:** Origin and evolution of Lycopodium, Sellaginella, Equisetum, Pteris.

**Paper: M 201 (Theory)**

**(Gymnosperms, Paleobotany and Plant Anatomy)**

- CO-I:** Classification, general characters and significance of gymnosperms are allotted.
- CO-II:** Cycas, Pinus, Cryptomeria, Thuja, Ginkgo, Gnetum all these gymnosperms are studied.
- CO-III:** The extinct species of pteridophytes (Rhynia, Lepidodendron, Sphenophyllum) are allotted under paleobotany.
- CO-IV:** Stress are given on fossilization Processes and general account of some fossilized plants.
- CO- V:** Descriptive part of Cell structure Origin, chemical constituents ,ultra structure and models
- CO- VI:** Theories of structural development of roots and shoots (monocot and dicot ), tissue systems and their functions, secondary growth of stems and roots.

**Paper: M 202 (Theory)**

**(Cell Biology)**

**CO-I:** Introduction to cell and its structure, function and different hypothesis related to cell.

**CO-II:** Chromosomal structure, function, dynamism with special references to giant types of chromosome.

**CO-III:** Membrane trafficking, post translational targeting of protein, end and exocytosis of components.

**CO-IV:** Signal protein and signal transduction.

**CO-V:** Cell cycle and cell division.

**CO-VI :** Structure function of genetic material –DNA and RNA.

**PAPER M 203 (PRACTICAL).**

**CO-I:** Study of living genera of gymnosperms.

**CO-II:** Paleobotanical studies of slides.

**CO-III:** Anatomical studies of some organs of plants.

**CO-IV:** Study of anomalous growth of stems.

**CO-VI:** Study of various stages of cell divisions—Mitosis and meiosis.

**Paper E 201 (Theory)**  
**(Cell Biology and genetics)**

**CO-I:** Prokaryotic and eukaryotic cell structure with reference to nucleus, mitochondria and chloroplast

**CO-II:** Structure of chromosome, DNA, RNA, Replication

**CO-III:** Cell division and its significance

**CO-IV:** Structure of gene, synthesis of proteins and gene expression.

**CO-V:** Mendel's Law, Allelic and Non-Allelic interaction.

**CO-VI:** Linkage and crossing over, numerical and structural changes of chromosome, Physical and chemical mutations.

**Paper: M 301 (Theory)**  
**(Ecology, Plant Geography, Evolution)**

**CO-I:** Abiotic and biotic components and adaptations of plants

**CO-II:** Ecotypes; Ecads. Community ecology: Frequency; Density; Cover; IVI; Life forms, Biological spectrum with its significance.

**CO-III:** Different ecosystem ecology types and patterns.

**CO-IV:** Environmental pollution and its impact on plants and ecosystems.

**CO-V:** Different phytogeographical regions of India with special reference to North Eastern Regions; Major biomes of the world.

**CO-VI:** Evidences, theories and mechanism of evolution; Origin of new species. Gene pool; Genetic drift; gene frequencies etc.

**Paper: M 302 (Theory)**

**(Instrumentation and Laboratory Techniques)**

**CO- I:** Working principles of different types of microscope.

**CO-II:** Types and Principles of some micro-techniques ( Hot air oven, incubators, autoclave, centrifuge, lux meter, pH meter etc).

**CO-III:** Working principle, methods of different types of chromatography and advantages and disadvantages of it. Laws of Spectrophotometer with its applications.

**CO-IV:** Different types of Fixatives and stains with its application in culture media; Mounting media etc.

**CO-V:** Preservation process of herbarium specimen.

**CO-VI:** Preparation of normal, molal, molar, ppm and percent solutions. Different types of indicator and lab reagents.



### **Paper: M 303 (Practical)**

**CO-I:** Quadrate method.

**CO-II:** Dissolved oxygen of polluted and unpolluted water samples.

**CO-III:** Study of anatomical peculiarities with reference to ecological adaptations

**CO-IV:** Soil testing for the presence of Phosphorus, Potassium, Nitrate.

**CO-V:** Use of camera lucida.

**CO-VI:** Preparation of microtome block / TLC chromatogram.

**CO-VII:** Demonstration of different types of instruments.

**CO-VIII:** Preparation of different stains, solutions and reagents.

**CO-IX:** Field report submission and slides submission.

**Paper: E 301 (Theory)**

**(Diversity of Seed Plants and their Systematic)**

**CO-I:** Origin & Evolution of seed habit of gymnosperms.

**CO-II:** Study of Cycas, Pinus, Gnetum

**CO-III:** Process of Fossilization and study of fossil gymnosperms

**CO-IV:** Artificial, natural, phylogenetic. Salient features of classification systems with merits and demerits.

**CO-V:** Diversity of flowering Plants with reference to some families of Dicots and Monocots.

**Paper: E 302 (Practical)**

**CO-I:** Practical on Algae, Fungi.

**CO-II:** Practical on Bryophyta and Pteridophyta genera

**CO-III:** Practical on Gram staining of Bacteria.

**CO-IV:** Practical on Cycas, Pinus, Gnetum.

**CO-V:** Study of fossil specimens and slides.

**CO-VI:** Description of dicotyledonous and monocotyledonous plant species belonging to some special families.

**CO-VII:** Submission of Practical Note Books and Permanent slides.

**PAPER : M 401 (THEORY)**

**(Morphology,Palynology,Embryology of Angiosperms)**

**TOTAL MARKS : 60**

COI : Morphology of flowers and stamen – carpel

COII : Theory of telome,phyllode,carpel,polymorphism,inferior ovary.

COIII : Under Palynology,pollen morphology,pollen sterility have to be studied.

COIV : Micro and mega sporogenesis and their gametophytes and different forms of embryos.

COV : Fertilization, polyembryony,apomixes,endosperm development and their importance in crop development

PAPER : M 402 (THEORY)

(PLANT TAXONOMY)

TOTAL MARKS : 60

COI : Objectives,principles and evolutionary trends in taxonomy.

COII : Artificial,natural,phylogenetic,phonetic,cladistic and APG system of classification

COIII : Binomial nomenclature,ICBN and its different recommendations,type concepts,bicode concept etc.

COIV : Role of anatomy,embryology,palynology in modern classification of plants .  
Numerical,chemo,cyto and serotaxonomy are the another topics for study.

COV : Comparative studies of different families and their economic importance of dicots.

COVI : Comparative studies of different families and their economic importance of monocots.

PAPER : M 403 (PRACTICAL)

(MORPHOLOGY,PALYNOLOGY,EMBRYOLOGY,PLANT TAXONOMY)

TOTAL MARKS : 40

COI : Study of special types of inflorescenes.

COII : Study of special types of fruits .

COIII : Parmanent slide preparation of pollen grains

COIV : Parmanent slide preparation of anther,ovules,embryosac,endosperms and di and monocotyledonas embryos

COV : Description of different available families .

COVI : Submission of herbarium and palynology slide

COVII : Academic excursions for the study of vegetation.

PAPER : E 401 (THEORY)

PLANT PHYSIOLOGY AND BIOCHEMISTRY

TOTAL MARKS : 40

COI : Plant and water relations (osmosis,diffusion,plasmolysis,imbibitions,ascent of sap,transpiration and their theories)

COII : Role of micro and macro elements in plants and their deficiency,functions and symptoms of diseases,theories of translocations etc.

COIII : Process of photosynthesis in plants,photosynthetic pigments,different cycles of photosynthesis and significance of it . Respiratory mechanism and their types.

COIV : Different growth hormones and their practical applications,seed dormancy,photoperiodism,vernalization,devernalization,plant movements and classification of it .

COV : Different organic constituents of cells,physical and biological nitrogen fixation,ammonification,nitrification,denitrification,enzymes and its mode of actions .

**PAPER : E 402 (PRACTICAL)**  
**PLANT PHYSIOLOGY AND BIOCHEMISTRY**  
**TOTAL MARKS : 40**

COI : Determination of osmotic potential by plasmolytic method

COII : Determination of DPD of plant cell

COIII : Determination of effect of time period on the rate of imbibition

COIV : Determination of relation between absorption and transpiration

COV : Effect of environmental conditions on the rate of imbibitions – determination of it by Ganong's Potometer.

COVI : Effect of CO<sub>2</sub> concentration on the rate of photosynthesis .

COVII : Determination of RQ

COVIII : Qualitative analysis of plant material

COIX : Qualitative analysis of plant ash.

PAPER : M 501 (THEORY)

MICROBIOLOGY AND IMMUNOLOGY

TOTAL MARKS : 60

COI : Introduction to microbial world , its taxonomy,scope and modern trends

COII : N,C,S cycles and its impact in nature,biological nitrogen fixation

COIII : Distinguishing features of Actinomycetes,Archaeobacteria and Mycoplasma

COIV : Bacterial cell,classification,reproduction,growth and its recombinations .  
Rickettsiae,Chlamydiae and diseases caused by them

COV : Virus and its classifications,nature,replication,transmission and study of viroids,virusoids  
and prions .

COVI : Types of immunity,antigen and antibody's structures and classes.



PAPER : M 502 (THEORY)

PLANT PATHOLOGY AND LICHEN

TOTAL MARKS : 60

COI : Symptoms of plant diseases,causal agents of disease and resistance,parasitism,interaction of host parasite

COII : Disease cycles,dissemination and transmission of plant pathogens,epidemiology and disease forecasting.

COIII : Defense mechanisms of plants

COIV : Study of plant disease with causal organism,symptoms and control measures

COV : Chemical,biological control of plant diseases.

COVI : Accounts on lichen

PAPER : M 503(THEORY)

CYTOGENETICS,PLANT BREEDING AND BIOMETRICS

TOTAL MARKS : 60

COI : Mendelism,deviations to mendel's law,sex linked inheritance,non-Mendelian and extra chromosomal inheritance .

COII : Structural and numerical changes of chromosomes,importance of polyploidy with evolutionary significance

COIII : Linkage and crossing over and linkage map .

COIV : Introduction to plant breedings and its different methods

COV : Heterosis and inbreeding depression , male sterility

COVI : Mean,mode,median,standard deviation,t-test,chi-square test,genefrequency,Hardy-Weinberg equilibrium .

PAPER : M 504(THEORY)

APPLIED BOTANY

TOTAL MARKS : 60

COI : Algae as food,feed,medicine,commercial product and its role in soil fertility

COII : Funji as food,feed,medicines and Commercial uses.Mycotoxins andmicotoxicosis,lichen and mycorrhiza and their roles.

CO III: Useful and harmful effect of bacteria ,bacteria in medicines,agriculture,bioremediation and serology.

CO IV : Mutation and crop improvement,polyploidy and evolution ,breeding for diseaseresistence.

CO V : Deforestation and its effects on environment and climate change.

COVI : Growth regulators in agricultures ,methods of plant propagation.

PAPER: M 505(PRACTICAL)  
MICROBIOLOGY, PLANT PATHOLOGY AND LICHEN  
TOTAL MARKS 60

COI : Gram staining bacteria.

COII : Basic liquid media and solid media for cultivation of bacteria and fungi respectively.

COIII : Serial dilution and agar plating method for isolation of soil microorganisms.

COIV : Isolation of micro organism from soil.

COV : Isolation of fungal pathogens from diseased plants.

COVI : Streak-plate method and pour plate method of pure culture.

COVII : Counting of bacterial cells by haemocytometer.

COVIII : Isolation and cultures of plant pathogen

COIX : Study of Fungal, bacterial and viral diseases of plants and making of permanent slides.

COX : Collection ,identification and preparations of diseased specimens.

COXI : Study of morphology of lichen.

PAPER : M 506 (PRACTICAL)

CYTOGENETICS, PLANT BREEDING, BIOMETRICS AND APPLIED BOTANY.

TOTAL MARKS 60

COI : Karyotype study of onion, garlic and aloe vera .

COII : Study of chromosomal aberration

COIII : Study of gene interaction

COIV : Study of emasculation

COV : Work out mean, mode, median, SD and SE.

COVI : Isolation of rhizobium from root nodule

COVII : Pollen grain counting

COVIII : Submission of permanent slides and practical record books .

PAPER : E 601 (THEORY)

ECOLOGY AND UTILIZATION OF PLANTS

TOTAL MARKS : 80

COI : Autecology and synecology, ecological organization, biosphere, biotic and abiotic component .

COII : Ecological succession, food chain, food web and pyramids

COIII : Bio-geo chemical concept, nitrogen and carbon cycle, simple, complex and artificial ecosystem.

COIV : Hydrophytes and Xerophytes and their adaptive characters, air and water pollution and green house effect

COV : Uses of rice, wheat, maize and their sources

COVI : Economically important food staff of daily life

COVII : Non timber plant products and their uses and souces

COVIII : Timber and medicinal plant resources and their uses .

PAPER : E 602 (PRACTICAL)  
ECOLOGY AND UTILIZATION OF PLANTS  
TOTAL MARKS : 80

COI : Determination of frequencies and density of herbaceous plant species by quadrat method.

COII : Study of anatomical features of hydrophytes and xerophytes .

COIII : Test for the presence of inorganic salt in the soil(chloride,sulphate and phosphate)

COIV : Study the morphology,chemical nature and uses of cereals,pulses and legumes,beverages,fibre,fats and oils etc.

PAPER : M 601(THEORY)

MOLECULAR BIOLOGY, PLANT PHYSIOLOGY, BIOTECHNOLOGY

TOTAL MARKS : 60

COI : Structure, organization of gene, expression and regulation of gene, Lac-operon, genetic code and its proof

COII : DNA replication, different forms of RNA, concept of exon and intron, transcription and translation process

COIII : Introduction to mutation and its different forms, mutagens and gene mutation, significance of mutation

COIV : Nitrogen metabolism, amino acid metabolism and protein synthesis.

COV : Holo enzyme, apoenzyme, classification of enzymes, enzymatic action, enzyme as biocatalyst .

COVI : Structure of monosaccharides, di and polysaccharides and its functions



PAPER : M 602(theory)

BIOINFORMATICS,COMPUTER APPLICATION AND  
BIOTECHNOLOGY

TOTAL MARKS : 60

COI : Branches of bioinformatics and its aim and scope,biological data bases,format of data bases and retrieval system.

COII : Application of Bioinformatics: basics of molecular phylogeny,drug discovery and drug design,DNA data bank,genomics,proteomics and their application in crop improvement

COIII : Basics of computers,use of operating system (MS Office), Data representation,internet browsing and searching of biological data using search engines .

COIV : History,scope and significance of biotechnology

COV : Plant tissue culture-different techniques , micropropagation , meristem culture , embryo culture,somatic embryogenesis,pollen culture and development of haploid plants,somaclonal variation , transgenic plants .

COVI : Genetics engineering techniques and applications (restriction enzymes,DNA libraries,DNA fingerprinting,DNA sequencing .

PAPER : M 603 (THEORY)

PLANT PHYSIOLOGY

TOTAL MARKS : 60

COI : Component and classification of soil, water and osmotic potential, absorption, transpiration and its significance, ascent of sap

COII : Mineral nutrition, salt absorption, micro and macro nutrients

COIII : Cyclic and non-cyclic photophosphorylation, ETS, C<sub>3</sub>, C<sub>2</sub>, C<sub>4</sub>, CAM cycle, chemosynthesis

COIV : Aerobic respiration, EMP, PPP and TCA cycles, anaerobic respiration mechanism and factors .

COV : Translocation, diffusion, Münch hypothesis, source and sink relationship, phloem loading and unloading

COVI : Physiological role and mechanism of action of auxin, cytokinin, GA, ABA and ethylene, photoperiodism, vernalization, seed dormancy, stress physiology concept .

PAPER : M 604 (THEORY)

PLANT RESOURCES UTILIZATION

TOTAL MARKS : 60

COI : Introduction,domestication,classification of plant resources,cereal crops and leguminous plant resources and its uses

COII : Beverages,condiments,oil yielding, plant species have to be studied .

COIII : Study of fibre,fruits and sugar containing plants

COIV : Study of timber and non-timber plants resources,medicinal plants and their uses

COV : Pharmacognosy and its importance .

COVI : Study of ethnobotany,importance of traditional plants and IPR

PAPER : M 605(PRACTICLE)

MOLECULAR  
BIOLOGY,BIOTECHNOLOGY,BIOINFORMATICS,COMPUTER  
REPLICATION

TOTAL MARKS : 60

COI : Determination of protein content by Biuret method

COII : Paper chromatography and technique for amino acid and plant pigment separation

COIII : Estimation of reducing sugar by Somogyi's method

COIV : TAN determination in bryophilum leaves

COV : Estimation of nitrogen by micro Kjeldahl method

COVI : Slant preparation and inoculation-MS medium

COVII : Micro propagation

COVIII : Photographs of genetic engineering technique-FISH,DNA fingerprint,DNA sequencing,Gene gun,Ti plasmid

COIX : Photographs of Bt cotton,Golden rice,Flavr Savr tomato

COX : Construction of Restriction Map

COXI : Aseptic germination of legume seed

COXII : Study of different bio fertilizers

COXIII : Homology modeling through the BLAST

COXIV : Nucleic acid and protein data bases.

COXV : Sequence retrieval and sequence alignment and sequence homology and gene annotation

COXVI : Construction of phylogenic trees .

PAPER : M 606 (PRACTICLE)

PLANT PHYSIOLOGY AND RESOURCE UTILIZATION

TOTAL MARKS : 60

COI : Determination of osmotic potential .

COII : Determination of water potential

COIII : Estimation of transpiration rate by different types of leaves

COIV : Effect of temperature on imbibitions and determination of Q10

COV : RQ determination in seeds, leaf buds and flower buds

COVI : Chloroplast separation by (i) solvent method

(ii) Paper chromatography method

COVII : Effect of CO<sub>2</sub> conc. On the rate of photosynthesis

COVIII : Chemical test in tea for tannins, alkaloids in vinca rosea

COIX : Studies of pharmacognosical of crude and powdered drugs of ginger, holarrhena and rauwolfia

COX : Histochemical test for plant species .

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