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DETAILED SYLLABUS

FOR

DISTANCE EDUCATION

POST GRADUATE PROGRAM

M.Sc. BOTANY

YEARLY SYSTEM

COURSE TITLE : M.Sc. BOTANY
DURATION : 2 YEAR
MODE : YEARLY
TOTAL MARKS : 700

COURSE TITLE		***MARKS***				
		THEORY		***PRACTICAL***		***TOTAL MARKS***
		INTERNAL	***EXTERNAL***	***INTERNAL***	***EXTERNAL***	
ALGAE, FUNGI & BRYOPHYTES		**40**	**60**	**NA**	**NA**	**100**
GENERAL MICROBIOLOGY AND BIOCHEMISTRY		**40**	**60**	**NA**	**NA**	**100**
PTERIDOPHYTES, GYMNOSPERMS AND PALAEO BOTANY		**40**	**60**	**NA**	**NA**	**100**
CYTOLOGY, GENETICS, EVOLUTION AND PLANT BREEDING		**40**	**60**	**NA**	**NA**	**100**
ANATOMY, EMBRYOLOGY AND BIOSTATISTICS		**40**	**60**	**NA**	**NA**	**100**
I PRACRICALS COVERED IN PAPER I & II		**NA**	**NA**	**40**	**60**	**100**
II – PRACTICALS COVERED IN THE PAPERS – III, IV & V		**NA**	**NA**	**40**	**60**	**100**

SECOUND YEAR

COURSE TITLE		MARKS				
		THEORY		PRACTICAL		TOTAL MARKS
		INTERNAL	EXTERNAL	INTERNAL	EXTERNAL	
ANGIOSPERM MORPHOLOGY, TAXONAMY AND MEDICINAL PLANTS		40	60	NA	NA	100
BIOTECHNOLOGY		40	60	NA	NA	100
PLANT PHYSIOLOGY, ECOLOGY & PHYTOGEOGRAPHY		40	60	NA	NA	100
BIOLOGICAL TECHNIQUES AND INSTRUMENTATION		40	60	NA	NA	100
III – PRACTICALS CONCERNED IN THE PAPERS VI & VII		NA	NA	40	60	100

ALGAE

UNIT – I

1. Comparative survey of important systems of classification of algae – Modern trends – Diagnostic features of algal phyla – range of thallus - Life history patterns.
2. Comparative account of algal pigments – Ultra structure of algal cell and functions of flagella, chloroplast, pyrenoids and eyespots - their biological importance.

UNIT – II

Study of Cyanophyte, Chlorophyte, Xanthophyte, Bacillariophyte Phaeophyte with reference to the following genera,

1) Anabaena.
2) Gonia.
3) Chlorella.
4) Balbochaete.
5) Patrydiumm.
6) Naviculla.
7) Padina.
8) Liagora.

UNIT – III

Distribution of algae, in soil, fresh water and in marine environment. Role of algae in soil fertility, in fisheries - Algae in polluted habitats – algae as indicators of pollutions, algal blooms - Economic importance.

FUNGI

UNIT – IV

1. Recent trends in the classification of fungi – General Characters – Morphological variations – Reproduction – Asexual and sexual reproduction.
2. Comparative study of the following sub-divisions.
    a. Myxomycotina - Plasmodiophora.
    b. Mastigomycotina – Plasomophora.
    c. Ascomycotina – Taphrina.
    d. Besidiomycotina – Puccinia, Ustilago, Polyporus.
    e. Deutromycotina – Fusarium, Cercospera, Colletrotrichum.

UNIT – V Economic importance of fungi:

1. Beneficial effects – Production of alcohol, Organic aids, Antibiotics, Yeast and mushroom cultivation – Lichen & Mycorrhiza – types – their application in agriculture.
2. Harmful effects - Blight of Potato, Tikka disease in ground nut, Smut of sugarcane, Stem rust of wheat, Blight of Tmoato – in plants. Dandruff, Ringworm, Athletes foot - in human beings.

BRYOPHYTES

UNIT – VI

Comparative morphological, anatomical and cytological studies of gametophytes and sporophytes of Calobryals, Jungermaniales, Marchantiales, Takakiales, Sphagnales, Andreales, and Bryales.

UNIT – VII

1. Experimental studies – Spore germination, Protonemal differentiation, apogamy, apospory.
2. Alteration of generation, Bryophytes as pollution indicators, horticultural uses and economic importance.

Reference:

Algae :

1. Smith G.M.. 1955 – Cryptogamic botany Vol.I . T.M. Hill.
2. Govind Prakash 1975. A text book of Algae. Jai Prakash Nath & Co.
3. H.D. Kumar & Singh H.N. 1976. A text book on algae. Affiliated East-West press. Pvt. Ltd.
4. Venkateshwaralu.V. 1972. Text book of Algae, Maruthi Publishers.
5. Chapmann V.J. and Chapmann. D.J. 1980. Sea weeds and their uses. 3rd Edition, Chapmann and Hall, London.
6. Lothan.C.A. Chapman. D.T. and Kramer.B.P. 1988. Experimental phycology. A Laboratory manual.

Fungi :

1. Alexopoulos C.J. 1962. Introductory mycology. John wiley.
2. Vashista B.R. 1969. Botany for degree students – Part-II Fungi. S-Chand, & Co.
3. Dube H-C. 1978. A text book of fungi, Bacteria, and viruses. Vikas Publishing House (P) Ltd.
4. Rangasami. G. 1972. Diseases of crop plants in India (Private).
5. Subha Rao, N.S. 1995. Soil micro organisms and plant growth – Oxford & IBH Publications Co. Pvt. Ltd.
6. Text book of microbiology – Ananthanarayanan R. and Jayaram Panikar. Orient Longmans, 1986, 3rd.
7. Mishra a & Agarwal R.P. 1970, Lichens A preliminary text. Oxford &. IBH Publishing Co.

BRYOPHYTES :

1. Vashishta P.R. (1970) – Text book of Botany – Bryophyta – S.Chand.
2. Pandey . B.D – 1977, A text book of Botany Bryophyta – Pteridophyta and gymnosperms. K.Nath & Co meerut.
3. Watson. EV. 1967. The structure and life of Bryophytes. Hutchinson University library.
4. Prem puri – 1973 – Bryophytes – A broad perspective Atmaram & sons.

Paper – 2
GENERAL MICROBIOLOGY AND BIOCHEMISTRY

GENERAL MICROBIOLOGY

UNIT – I

1. Classification of bacteria – characters of each group – Bacterial anatomy – structure and functions of cell organelles – Growth – nutrition and reproduction.
2. Staining procedures and cultivation of bacteria – Bio chemical tests for identification – E-Coli, Azatobacter, Staphylococcus, Pseudomonas, Rhizobium, Xahthomonas, Azospirillum – an outline study.

UNIT – II

1. General characters of Virus - morphology and nature of virus particles - Nomen clature and classifications of plant viruses - Replication of virus.
2. Transmission of plant viruses and control measures – Phages, Mycophages, Phycophages and Bacteriophages – viroids, virions and origin of viruses.

UNIT – III Scope and application of microbes in

1. Agriculture – Biofertilizers, Biopesticids, Biological nitrogen fixation.
2. Industry – Bioconvertion of waste products – alcohol, Bio gas.
3. Pollution – Degradation of pesticides and hydro carbon oils.
4. Biotechonology – Importance and application of microbes in genetic engineering.

UNIT – IV

1. Harmful effects of Bacteria & Viruses in Plants – Citrus canker, Blight of Rice, Wilt of Potato, TMV, TYMV, Bunchy top of banana.
2. Harmful effects of Bacteria & Viruses in Man and Animals – Tetanus, Anthrax, Bacillary dysentery, AIDS, Hepatitis, Poliomyelitis.
3. General account of immunity – types – properties of antigen and antibodies – types of vaccines.

BIOCHEMISTRY

UNIT – V

1. Carbohydrates – classification, occurrence, structure and functions – monosaccharide, oligosaccharide and polysaccharide.
2. Lipids – Classification, occurrence, structure and importance. Biosynthesis and β-oxidation of fatty acids.
3. Amino acids – occurrence, structure and functions – proteins - classification.
4. Enzymes – Classification, mode of action, structure and factors influencing enzyme activity.

UNIT – VI

1. Mechanism of water absorption in plants – Accent sap, Transpiration – Types, stomatal opening mechanism and factors affecting transpiration.
2. Cycles of elements. N_2 cycle, Biochemistry of symbiotic and Non-symbiotic nitrogen fixation, sulphur cycle, Phosphorous cycle

3. Plant nutrition – Biological functions of micro and macro nutrients in plants and their deficiency symptoms.

UNIT – VII

1. Plant growth regulators – Chemistry, Bio synthesis, mode of action of - Auxins, Gibberllins, Cytokines, Abscicic acid and Ethelene.
2. Bio chemistry of seed dormancy, seed germination, fruit ripening and Senescence.

Reference:

1. Salle A.J. 1974 – Fundamental Principles of bacteriology. TMG Hill.
2. Sistron W.R. 1962. Microbial life – Holt Rinchart Winston.
3. Bio chemistry of Bacterial Growth – Blockwell Oxford.
4. Subba Rao N.S. 1995. Soil micro organism and Plant growth. Oxford & IBH Publishing Co. Pvt. Ltd.
5. Rangasami G. 1972 – Diseases of crop plants in India – Prentice Hall India Private Ltd.
6. General virology, Lurta – 2nd Edition John Wiley and Sons, London 1977.
7. Topley & Wilson's 1995. Principles of Bacteriology virology and immunology Edward Arnold, London.
8. Ivon Roitt, Essential immunology. Black well Service Oxford.
9. Weir D.M. Steward 5 (1993). Immunology VII edition (ELBS), London.
10. Text Book of Microbiology. Ananthanarayanan R. and Jayaram Paniker. Orient Longmans. 1986, 3rd Edn.

Paper – 3
PTERIDOPHYTES, GYMNOSPERMS AND PALAEO BOTANY

PTERIDOPHYTES

UNIT – I

General Characters and classification of Pteridophytes – Life cycle – alteration of generation – colonization – terrestrial environment, Telome concept.

UNIT – II

Comparative organography, Systematics, Reproduction and Phylogeny of the following :

1. Psilophytes.
2. Rhyniales.
3. Psilotales.
4. Lycopodiales.
5. Lepidodendrales.
6. Isoetales.
7. Selaginellales.
8. Calamitales.
9. Equisitales.
10. Ophioglossales.
11. Osmundales.
12. Salviniales.
13. Marsiliales.

UNIT – III

1. Evolutionary trends in ferns, Steelar evolution, Sorus evolution, Prothalial evolution – Polyploidy, Hybridisation.
2. Apomictic life cycle – apogamy, apospory, vegetative apomixis,

GYMNOSPERMS

UNIT – IV

Classification and general characters of Gymnosperms. Morphology and anatomy of reproductive organs in gymnosperms.

UNIT – V

1. Comparative study of the following orders :
    a. Cycadales.
    b. Ginkoyales.
    c. Coniferales.
    d. Taxales.
    e. Welwitchiales.
    f. Gnetales.
2. Living and fossil gymnosperms in India – Evolution and economic importance of gymnosperms.

PALEOBOTANY

UNIT – VI

1. Importance of the study of Paleo botany – Fossil and fossilization - kinds of fossils – compressions casts and molds, petrifactions impressions, coal balls.
2. Geological time scale – era, period, epics, knowledge of computation of age of fossil – Radio carbon dating.

UNIT – VII

1. Nomenclature of fossil plants.
2. Study of the following fossils :
    a. Rhynia.
    b. Lepidodendron
    c. Stigmaria
    d. Lepidocarpon
    e. Calamites
    f. Botryopteris
    g. Williamsonia.

ANGIOSPERM MORPHOLOGY, TAXONAMY AND MEDICINAL PLANTS

ANGIOSPERM MORPHOLOGY

UNIT – I The plant body:

Root – Types, modification – Stem – modifications – aerial and underground stems. Leaf – Phyllotaxy, simple and compound leaves – parts of leaves – modifications of leaves.

UNIT – II

Flowers – Infrosence types – parts of flowers and their arrangements. Fruits – types – simple, aggregate, multiple fruits – fleshy and dry fruits - Dispersal of fruits and seeds – Germination, types.

TAXONOMY

UNIT – III

Principles of plant classification – importance of classification – Artificial, Natural phylogenic systems of classification – Hutchinson, Cronquist, Tacktajan, and Thorne.

UNIT – IV

Botanical Nomenclature; History ICBN – Principle, concepts of taxon – attitudes – practical naming of plants – naming by comparison, naming by means of keys, use of floras for identification – Author citation.

UNIT – V

Phylogeny of angiosperms – origin, evolution and interrelationships dicots and monocots; phylogeny of Ranales, Amentiferae, Centrospermae, Tubiflorae and Helobiales.

UNIT – VI

Study of the following families and their economic importance :

1. Rananculaceae.
2. Menisperma laceae.
3. Polygalinae
4. Portulacaceae.
5. Tiliaceae
6. Zygophyllaceae
7. Rhamnaceae
8. Guttiferae
9. Vitaceeae
10. Droseraceae
11. Combrutaceae
12. Onagraceae
13. Cactaceae
14. Aizoaceae
15. Sapotaceae
16. Solvadoraceae
17. Gentianaceae
18. Boraginaceae

19. Cuscutaceae
20. Scruphulariaceae
21. Pedalicceae
22. Nyctaginaceae
23. Polygonacea
24. Aristolochiaceae
25. Loranthaceae
26. Caurinidae
27. Amaryllidaceae
28. Dioscoreaceae
29. Commellinaceae
30. Typhaceae
31. Cyperaceae
32. Archidaceae.

MEDICINAL PLANTS
UNIT – VII

Detailed study of the following plants with reference to distribution part of the plant used and medicinal value.

1. Aconite
2. Ashwagandha
3. Ginger
4. Rouwolfia.
5. Turmeric
6. Withania
7. Ashoka
8. Catechu
9. Belladona
10. Eucalyptus
11. Clove
12. Black and white pepper.
13. Coriander
14. Cardamom.

BIOTECHNOLOGY

UNIT – I

Biotechnology – Definition, concepts – History – Achievements and scope. Plant tissue culture and pollen culture, somatic embryogenesis, callus culture and selection of mutants – Disease resistant, salt tolerance draught tolerance, nutritional quality, herbicide tolerance varieties.

UNIT – II

Protoplast culture and somatic hybridization - isolation of protoplast, culture methods – fusion methods – production of cybrids and hybrids.

UNIT – III

Enzymes – Restriction endo nucleases – Nomenclature – classification and application – Nucleases, methylases, ligases,.

UNIT – IV

Definition of gene – structures - Cloning – Salient features, plasmids, cosmids **,** single stranded DNA viruses, Ti plasmid, construction of plasmid vectors, lampda phages, vectors, M13 vectors their uses in cloning and sequencing, Expression vectors genomic libraries, C DNA libraries – gene banks.

UNIT – V

General considerations of microbial strain improvement for pharmaceutical products and Industries, Growth hormone and antibiotics – Gene therapy methods.

UNIT – VI

Strain improvement for production of Agriculture products – SCP. (algae, yeast. mushroom), Biofertilizers. (BGA, VAM), Bio pesticides Bacillus thuringiensis – Fuel, ethonal - microbial algal technology.

UNIT – VII

Techniques employed in recombinant DNA. Agarose gel electrophoresis, Pulse gel electrophoresis, Southern/Northern / Western blotting.

Paper – 8
PLANT PHYSIOLOGY, ECOLOGY & PHYTOGEOGRAPHY

UNIT – I

Plant physiology – Introduction – structure and composition of membrane – brief account of models – fluid mosaic models – Lipoprotein model – endo – membrane system – water relations of plants – physico – chemical properties of water – apparent, free space, bulk movement of water – Diffusion, Imbibition – Permeability, Osmosis – Transpiration – Stomatal regulation.

UNIT – II

Photosynthesis – energy, pathway in photosynthesis, photosynthetic pigments – Pigment systems – Electron flow through cyclic, Non-cyclic and Pseudocyclic photophos phorylation – difference between C_3 and C_4 photosynthesis – different kind of C_4 pathway, occurance, biochemical events and adaptive advantage – regulation of photorespiration.

UNIT – III

Respiration – Aerobic and Aerobic respiration – Glycolysis, Krebs cycles Electron transport system – Phosphoylation – substrate and oxidative – HM P – pathway – Resipatory quotient – Factors – affecting respiration.

UNIT – IV

Uptake of ions mechanism – Translocation of solutes and assimilators – mechanism – mineral nutrition – Essential elements – micro and macro elements – role and deficiency symptoms –Fertilizer – foliar nutrition.

ECOLOGY

UNIT – V

1. Concepts of an ecosystem – application of law of thermo dynamics, food chain food web, energy flow – Ecological factors – climatic, physiographic, edaphic and biotic factors.
2. Study of pond, grass land and forest ecosystems and their succession.

UNIT – VI

1. Major terrestrial plant communities – study of climate, distribution, adaptation to environment, deserts/ (dry and cold), tundra, grass land, savannah, temperate and tropical forests and mangroves.

PHYTOGEOGRAPHY

UNIT – VII

Plant geography – factors of plant distribution – theories concerning present and past distributions – continental drift, glaciations, land bridges and their effect on plant distribution. Theories and hypothesis concerning the flora and phytogeography of south Indian hills, endemism and discontinuous distribution with examples from Indian flora, floristic regions of India.

Paper – 9
BIOLOGICAL TECHNIQUES AND INSTRUMENTATION

UNIT – I

Principles of microscopy – Lenses, and image formation – oculars and objectives – condensers – Light sources – and control of illumination – phase contrast, florescence Dark field illumination, electron microscopy(TEM / SEM).

UNIT – II

Reagents & stains : General reagents, dehydrating reagents, clearing reagents, adhesives, embedding media, mounting media – killing and fixing fluids, stains – Natural dyes, coal tar dyes, cytoplasmic stains, nuclear stains.

UNIT – III

Microscopic preparations – Temporary, permanent and semi permanent preparations – smearing, squashing, macerating and whole movements – Staining procedures – solvents, general and special staining – Slide preparation – hand section – and paraffin methods. Microtomy – types of microtome and their use.

UNIT – IV

pH meter – general principles – construction and working of a pH meter. Buffer and buffer action – preparation of buffers..

UNIT – V

Chromatographic techniques – Adsorption chromatography, Counter current and Partition chromatography, Gas-liquid chromatography, Ion exchange chromatography, affinity chromatography.

UNIT – VI

Electro phoretic methods. Basic principles, paper and gel electrophoresis. Centrifugation techniques – Principles, density gradient and preparative centrifugation, Spectroscopic techniques – Basic principles, applications, of the UV spectrophotometry, Infrared spectrophotometry - Atomic and Flame photometry.

UNIT – VII

Culture of lower plants and higher plant cells, tissues and organs – sterilization techniques – Dry heat, moist heat, chemicals – gases – media preparation, culture techniques – Bacteria, Fungi and their isolation.

PRACTICAL – III – PRACTICALS CONCERNED IN THE PAPERS VI & VII

1. Study of the morphology of the angiosperms as in the theory with suitable examples.
2. Description of plants in technical terms.
3. Preparation of keys and use of keys in identification.
4. Dissection of vegetative and floral pasts of plants belonging to the families mentioned in the theory.
5. Study of the economic value of the plants mentioned in the theory part.
6. Preparation of herbarium (minimum of 20 angiosperm plants) with proper field note book – shall be submitted at the time of practical examinations.
7. Study of medicinal value of the plants mentioned in the theory part.
8. Agarose gel electrophoresis – Paper electrophoresis.

PRACTICAL – IV – PRACTICAL COVERED IN THE PAPERS VIII & IX

1. Determination of Chl a, Chl b and total Chl.
2. Determination of OP by plasmolytic method.
3. Effect of temperature and chemical on membrane permeability.
4. Rate of transpiration in different plants.
5. Separation of plant pigments by thin layer / pager chromatography.
6. Photosynthesis under different light intensities.
7. Rate of respiration in germinating seeds or flower buds in respiroscope.
8. Preparing and recording of microcscopic preparations – Temporary, semi permanent and permanent slids.
9. Smear, squash, maceration, technique studies.
10. Handling of, spectrophotometer, pH meter, microtome, colorimeter, centrifuge, electrophoresis unit.
11. Staining procedures – simple, differential, capsule, flagellar staining for bacteria.
12. Study of sterilization methods.
13. Isolation of bacteria and fungi.

Paper – 4
CYTOLOGY, GENETICS, EVOLUTION AND PLANT BREEDING

UNIT – I

Ultra structure of plant cell – Structure, composition and functions of cell wall and intracellular organs – Plasma membrane, Cytoplasm, E.R. Golgi apparatus, Lysosomes, Mitochondria, Plastid, Ribosome and Nucleus.

UNIT – II

Structure and organization of chromosomes, - Euchromatin and Heterochromatin – Giant chromosomes Polytene and Lampbrush chromosomes. Types of cell division, - mitosis and miosis – stages – significance of mitosis and miosis.

GENETICS

UNIT – III

1. Mendelian genetics – Monohybrid and Dihybrid ratio – allelic and non allelic gene interactions – Polygenic inheritance – Multiple alleles.
2. Cytogenetics of Polyploids – Trisomics, Monosomics, Nullisomics, - Population genetics.

UNIT – IV

1. Fine structure of gene – Cistron, recon, mutan, Operan – DNA – Structure, Function & Replication - RNA – Types, structure and function. Protein synthesis and genetic code.
2. Mutagenesis – Mutation – repair mechanisms – mechanism of DNA repair – molecular basis of mutation – physical and chemical mutagens.

PLANT BREEDING

UNIT – V

1. Introdcution to plant breeding – objective – scope – methods – in self pollinated, cross pollinated, vegetatively propagated and apomictic plants. Crop improvement – selection, hybridization, introduction and acclimatization. Heterosis.

EVOLUTION

UNIT – VI

Evolutionary concepts – origin of life – spontaneous and chemosynthetic evolution of the living organisms.

UNIT – VII

Variation in nature – analysis of variation – Sources of variation – mutation, recombination – adaptation and selection.

Evolutionary theories of Lamarck, Charles Darwin and Devries.

Paper – 5
ANATOMY, EMBRYOLOGY AND BIOSTATISTICS

ANATOMY
UNIT – I

Apical, Lateral and Intercalary meristems – theories of apical organization – Apical theory, Histogen theory – Tunica corpus theory, Kaper – Kappe theory, Mantle – Core theory – Quiescent centre theory.

UNIT – II

1. Epidermal tissues – Trichosomes, Stomata – Structure and functions – Primary tissues – Parenchyma, Collenchyma, Sclerenchyma.
2. Ontogeny, phylogeny, evolution, ultrastructure and functions of primary and secondary xylem and phloem – Wood anatomy - Anomalous secondary thickening in monocot & Dicot stems.

UNIT – III

1. Structural variability in leaves, leaf histogenesis, leaf meristem, origin, - nodal anatomy – nodal types.
2. Vascular cambium and cark cambium - factors affecting their activity – Periderm – lenticels, abscission – wound healing.

EMBRYOLOGY
UNIT – IV

1. Gametogenesis in Angiosperms – Microsporogensis – Megasporogensis.
2. Ovule ontogeny – types – Embryo sac, synergid and antipodal haustoria .
3. Polination – factors influencing pollination & barriers.
4. Fertilization – Syngamy, triple fusion, post fertilization and metabolic changes in embryo sac.

UNIT – V

1. Endosperm – Ultra structure – Types – Cellular, Helobial, Nuclear and Ruminate, endosperm – endosperm haustoria.
2. Histogenisis and organogenesis of monocot and dicot embryos.
3. Polyembryony – Apomixis – Parthenogenesis .
4. Embryology in plant breeding.

BIOSTATISTICS
UNIT – VI

1. Bio statistics – definition – basic principles – variables – scope and limitations of statistics.
2. Collection of data, sample, population and sampling techniques – Primary and secondary data – tabulation and presentation of data.
3. Measures of central tendency – mean – mode – median – geometric mean.
4. Measures of dispersion – Range, Standard deviation – Mean deviation.

UNIT – VII

1. Distribution – Normal, Binomial & Poisson.
2. Hypothesis testing – test of significance – test in large and small sample – t test, F-test – Chi square test.
3. Correlation and Regression analysis – Similarities and dissimilarities of correlation and regression.

PRACTICA L – I PRACRICALS COVERED IN PAPER I & II

ALGAE

1. Study of algae mentioned in the theory – identification up to generic level.
2. Preparation of synthetic medium and cultivation of algae.
3. Separation of algal pigments.
4. Study of electron micrograph in some algae in standard publications.

FUNGI

1. Study of the morphological characters and reproductive structures of the genera mentioned in the theory.
2. Staining procedure for fungi.
3. Isolation of fungi from soil, water, litter and dung.
4. Culture of fungi – slide culture.
5. Study of disease caused by fungi in plants and human beings mentioned in the syllabus.

BRYOPHYTES

1. Morphological and structural study of representative Bryophytes mentioned in the theory.
2. Study of bryophytes in their natural habitats.

GENERAL MICROBIOLOGY

1. Preparation of media to isolate bacteria & Actinomycetes,
2. Isolation of bacteria from, soil and sewage, by dilution technique.
3. Staining of bacteria – Gram staining and special stainings for capsule, flagella and endospore.
4. Identification of important genera by biochemical tests – E. Coli. Pseudomonas, Staphylococcus, Streptomyces.
5. Isolation of Rhizobium from legume plant.
6. Milk analysis for pathogenic bacteria.

BIOCHEMISTRY

1. Extraction and estimation of starch, lipids and reducing sugars.
2. Estimation of amino acids by ninhydrin.
3. Separation and identification of sugars by paper chromatography.
4. Determination of chlorophyell a, chl b, and total chlophyll.

PRACTICAL – II – PRACTICALS COVERED IN THE PAPERS – III, IV & V

PTERIDOPHYTES

1. Study of morphology and anatomy of vegetative and reproductive tissues and organs using dissections, macerations, sections and permanent preparations of the following gerera;
   Isoetes, Ophioglossum, Salvinia, Azolla, Psilotum, Locopodium, Equisetum, Marsilia.
2. Study of fossil forms of Pteridophytes.

GYMNOSPERMS

1. Comparative study of the anatomy of vegetative and reproductive pasts of the gymnosperms included in the theory.

PALEOBOTANY

1. Study of fossil forms (specimens and slides) of the genera listed in the theory part.

CYTOLOGY

1. Smear and squash techniques for study of cell divisions.
2. Differential staining and identification of different cellular components.
3. Practical study of all plant cell organelles from election micrographs and standard publications.

GENETICS

1.Problmes and exercises connected with the theory.

Evolution & Plant breading

1. Determination of hybridization techniques using potted plants.

ANATOMY

1. Epidermal studies by epidermal peeling.
2. Maceration techniques – Demonstrations only.
3. Study of primary and secondary structure in plants.
4. Study of Anomalous secondary growth.
5. Learning techniques of making temporary and permanent microscopic preparations.

EMBRYOLOGY

1. Preparation of dissected whole mounts of tapetum, ovule, endosperm and embryo.
2. Developmental stages of Anther, Pollen, Ovule, embryo sac, endosperm and embryo. (Permanent preparations).

BIOSTATISTICS

Problems and exercises connected with Biometry syllabus. b