B.Sc. –Plant Biology & Plant Bio Technology

MAIN

FIRST YEAR – SEMESTER: I

PAPER - I : ALGAE & FUNGI – 1MB01a

UNIT 1 : Classification of Algae by F.E. Fritsch up to the order level, highlighting the diagnostic features of Cyanophyceae, Chlorophyceae, Bacillariophyceae, Phaeophyceae & Rhodophyceae. Classification of Fungi up to the order level [by Alexopoulos], highlighting the diagnostic features of major classes like Oomycetes, Basidiomycetes & Deuteromycetes.

UNIT 2 : Thallus & Cell Structure, flagellation, pigmentation, Reproduction & Life cycle of *Oscillatoria, Nostoc, Volvox, Ulva, Caulerpa, Coleochaete, Sargassum* & *Gracilaria.*

UNIT 3 : Life cycle of *Albugo, Peziza, Puccinia, Agaricus* & *Cercospora.*

UNIT 4 : Economic importance of Algae: Biofertilizers: Cyanobacteria Blue Green - Mass cultivation & uses, SCP – *Chlorella* & *Spirulina*- Cultivation, composition & uses, Diatomite – Sources, extraction & uses, Agar – Sources, extraction, properties & uses.

UNIT 5 : Economic importance of Fungi: Types, cultivation & uses of edible mushrooms - *Pleurotus,* Sources, extraction & uses of Antibiotics-*Penicillin,* Types, symbiosis & uses of Mycorrhiza.

SUGGESTED READING

TEXT BOOKS:

(1) Vasishta, B.R. (1988): Algae, Chand & Co., New Delhi,

(2) Vasishta, B.R.(1991): Fungi, Chand & Co., New Delhi, India.

REFERENCE BOOKS:

(1) Round, F.E. (1989): The Biology of Algae, Edward Arnold Ltd. London.

(2) Smith, G.M. (1985): Cryptogamic Botany, Vols I & II, Mc Graw Hill Ltd. London.

(3) Fritsch, F.E. (1987): The Structure & Reproduction of Algae, Vols I & II, Vikas, New Delhi.

(4) Alexopolous, G.J. (1990): Introductory Mycology, John Wiley Ltd, London.

(5) Sharma, O.P. (1989): TextBook of Fungi, Tata Mc Graw Hill Publishing Ltd.

FIRST YEAR – SEMESTER : I

PAPER II : GENERAL MICROBIOLOGY – 1MB02a

UNIT 1 : Introduction, History of Microbiology, Scope of Microbiology, Prokaryotic and Eukaryotic Organisms, General features &Classification of Microorganisms- Protozoa, Rickettsiae, Mycoplasma, Archaebacteria.

UNIT 2 : Bacteria – Main outline of bacterial classification, Morphology- Shape, Size & Occurrence, Electron microscopic structure of Bacteria Cell wall, Plasma Membrane, Cytoplasm, Ribosomes, Mesosomes, Plasmid, Flagella & Pili. Nutritional types of Bacteria, Nutritional requirements of Bacteria. Staining of Bacteria - Simple and Gram Staining, Plant characteristic features of bacteria.

UNIT 3 : Viruses - Nature and Architecture of Viruses. Structure and Reproduction of Tobacco Mosaic Virus. Phages – Shape, Size and Electron microscopic structure of Bacteriophage - T Even Phages,Reproduction - Lytic and Lysogenic.

UNIT 4 :Aim of control of Microorganisms, Microbial control strategies - Heat and Cold Sterilization, Aldehydes & Gases Disinfection, Antisepsis, Chemotherapy, Preservation and Aseptic Techniques.

UNIT 5 : Culture media – General characters, types of media - Liquid, Solid, Semi Solid and Special Media, Preparation of media – Basic procedure, Physical condition for growth of Bacteria, Methods of isolation, maintenance and Preservation of Pure culture.

SUGGESTED READING

TEXT BOOKS:

(1) Microbiology - A. Mani, Dr. L.M. Narayanan, Dr. A.M. Selvaraj, N.Arumugam, Saras Publications.

(2) Microbiology - Anna K.Joshua, Popular Book Depot

REFERENCE BOOKS:

(1) Pelczar, M.J., Reid, R.D. & Chan, E.C.S. (1987).

(2) Swatek,F.E. (1989).

(3) Microbiology – P.D. Sharma

(4) A TextBook of Microbiology - R.C Dubey and Maheswari – 1999 - S.Chand & Company Ltd.

(5) Practical Microbiology - R.C Dubey and Maheswari – 2002 - S.Chand & Company Ltd

FIRST YEAR – SEMESTER: II

PAPER III : APPLIED MICROBIOLOGY – 2MB03a

UNIT 1 : Introduction, Application of microbiology in Food, Industry,Genetic Engineering, Biotechnology, Biogeochemical cycles, Medicine, Agriculture and Pollution.

UNIT 2 : Soil Microbiology - Soil Microorganisms, Rhizosphere, Nitrogen Cycle- Physical and Biological Nitrogen Fixation - Symbiotic and Non Symbiotic Nitrogen Fixation, Denitrification, Microorganisms as Biofertilizers and Bio-Pesticides and Silage.

UNIT 3 : Aquatic Microbiology - Microorganisms in Water, contamination of water, Water borne diseases. Tests for sanitary quality of Water - *E.Coli*, *Streptococci* and *Clostridium*. Purification of water - Drinking Water and Sewage Water.

UNIT 4 : Microorganisms in food, Bacteriological examination of milk, Food pathogens causing diseases, Food preservation – Physical and Chemical methods.

UNIT 5 : Advanced Microbiology – Probiotics – History & Potential benefits, Multibiotics, Biofilm technology, Marine microbiology, Anaerobic microbiology, Bioprocessing technology – Vaccines and Edible vaccines.

SUGGESTED READING

TEXTBOOKS: (1) Microbiology - A. Mani, Dr. L.M. Narayanan, Dr. A.M. Selvaraj, N.Arumugam, Saras Publications.

(2) Microbiology - Anna K.Joshua, Popular Book Depot

REFERENCE BOOKS:(1) Pelczar, M.J., Reid, R.D. & Chan, E.C.S. (1987).

(2) Swatek,F.E. (1989).

(3) Microbiology – P.D. Sharma

FIRST YEAR – SEMESTER : II

PAPER IV : LICHENS & BRYOPHYTES – 2MB04

UNIT 1 :Structure, Classification and Reproduction of Lichens. Economic importance of Lichens. Detailed study of thallus structure and reproduction in Parmelia & Usnea.

UNIT 2 :Brief Classification of Bryophytes upto the order level, highlighting the diagnostic characters of 3 major classes. A detailed study of Thallus structure, Reproduction and Sporophyte structure in Marchantia & Porella.

UNIT 3 : A detailed study of Thallus Structure, Reproduction and Sporophyte Structure in Anthoceros & Polytrichum.

UNIT 4 : Comparative study of the Structure of Thallus, Sex Organs and Sporophytes of four Genera. General pattern of development of Sex Organs and Sporophyte. Evolutionary trends in the Sporophytes.

UNIT 5 : Ecology of Bryophytes, Bioindicators of Air Pollution, Economic importance of Bryophytes, Vegetative Reproduction in Bryophytes.

SUGGESTED READING

TEXT BOOKS:

(1) Vasishta B.R.(1988): Fungi. Chand & Co.,New Delhi.

(2) Vasishta B.R.(1988): Bryophytes, Chand & Co., New Delhi (9^{th} Edition)

REFERENCE BOOKS: (1) Misra .A. and Agarwal R.P.(1988): Lichens: A Preliminary Text, Oxford & IBH Publishing Co.

(2) Parihar N.S.(1991): An Introduction to Embryophyte Vol I: Bryophyta, Central Book Depot**.**

(3) Smith G.M.(1985): Cryptogamic Botany, Vols I & II, Mc Graw Hill Ltd. London.

FIRST YEAR – SEMESTER II

PRACTICAL – PAPER : I – 2MBP1

1. A detailed study of genera prescribed in
   UNITS 2 & 3 of Paper I
   UNITS 2 & 3 of Paper IV
2. Observation of materials in UNITS 4 & 5 of Paper I
3. A general study of various types of Lichens – *Parmelia* and *Usnea*
4. Observation of Soil bacteria – *Agrobacterium* and *Pseudomonas*; Air bacteria – *Salmonella* and *Mycobacterium*; Water bacteria – *E.Coli* and Bacteria of milk
5. Gram staining of Bacteria. (individual practical)
6. Demonstration – Sterilisation techniques and Sterilising equipment, Culture medium and Inoculation.

SECOND YEAR – SEMESTER : III

PAPER V : PLANT ANATOMY – 3MB05

UNIT 1 : Tissues – Definition, Types – Simple Permanent – Parenchyma, Collenchyma, Sclerenchyma , Fibres and Sclereids – Structure and Functions, Complex Permanent Tissues – Xylem and Phloem, Development and Distribution of Mechanical Tissues in different Plant Organs.

UNIT 2 : Meristems-Classifications-Apical, Intercalary & Lateral Meristems, Based on stage of development, Based on origin of initiating cells, Meristems based on position in Plant body and Meristems based on Functions, Apical meristems - Initials and Derivatives, Vegetative Shoot Apex – Theories of Shoot Apex Organization, Root Apex – Theories of structural development and differentiation

UNIT 3 : Types of vascular bundles, Nodal anatomy, Cambium – Origin, Fascicular & Inter – Fascicular Cambium, Wound tissues & Cambium in monocotyledons

UNIT 4 : The Stem-Primary & Secondary structure, Origin of stem, Anatomy of Dicotyledonous and Monocotyledonous stems, Secondary growth in Dicotyledonous stems – Cambium, Secondary xylem, Secondary phloem, Periderm, Bark, Lenticels, Secondary growth in Monocotyledons, Anomalous secondary growth in dicots – Nyctanthus, Boerhaavia, Bougainvillea & Monocots – Dracaena and Palm .

UNIT 5 : The Root – Primary and Secondary anatomy of Dicotyledonous roots, Anatomy of Monocot roots, Anatomy of storage roots, Secondary growth in Dicot roots, Leaf – Anatomy of Dicot and Monocot leaf, Leaf abscission, Stomata – types & functions.

SUGGESTED READING

TEXT BOOK: (1) Vashsihta, P.C. (1988): A Text Book of Plant Anatomy, S. Nagin & Co.

REFERENCE BOOKS:(1) Pandey, B.P. (1990): Plant Anatomy, S. Chand & Co. Ltd.

(2) Esau, K. (1985): Anatomy of Seed Plants, John Wiley

(3) Cutter, E.G. (1989): Plant Anatomy – Part I, Addison–Wesley Publishing Co.

SECOND YEAR – SEMESTER : III

PAPER VI : PLANTS & ENVIRONMENT – 3MB06a

UNIT 1 : Introduction, Main ecological factors- Climate - Light, Temperature, Wind, Precipitation and Humidity, Microclimate, Biotic factors – Positive and negative interactions, Edaphic factors
- Soil temperature, Soil nutrients and Soil organisms.

UNIT 2 : Plant adaptations - Hydrophytic plants – Anatomical and Morphological adaptations, Xerophytes - Morphological and Anatomical adaptations, Epiphytes and Halophytes.

UNIT 3 : Ecosystem - Types, Structure- Food chain, Food web, Ecological pyramids, Function -Energy flow, Biogeochemical cycles - Carbon, Nitrogen and Hydrological, Carbon credits, Carbon sequestraions, And Carbon trade .

UNIT 4 : Plant Succession - Types, Causes, Processes, Hydrosere and Xerosere, Climax and its concept. Forestry- Forest protection and Conservation.

UNIT 5 : Geographical regions of India, Vegetational types of Tamilnadu- Evergreen & Deciduous forests, Mangroove, Scrub jungle and Grassland - Structure and Distribution, Endemism.

SUGGESTED READING

TEXT BOOK: (1) Sharma P.D. (1987): Elements of Ecology, Rastogi Publications.

REFERENCE BOOKS:(1) Odum,E.P.(1983):Ecology, Holt Rinchart and Winston.

(2) Daubenmire,R.F.(1989): Plants and Environment,2nd Edn, John Wiley Publications.

(3) Billings,W.D. (1984):Plants and Ecosystem, Wadworth. Pub.Co. Belmont.

(4) Kellman,C.M.(1980): Plant Geography 2nd Edn M

SECOND YEAR – SEMESTER : IV

PAPER VII : EMBRYOLOGY OF ANGIOSPERMS – 4MB07

UNIT 1 : Introduction, Microsporangium, Wall layers, Amoeboid and secretory tapetum, Sporogenous tissue, Microsporogenesis – Development of male gametophyte, Vegetative and Generative cell.

UNIT 2 : Megasporangium (Ovule) – Different types, Nucellus, Hypostase, Epistase, Endothelium, Megasporogenesis, Development of female gametophyte – Monosporic – Polygonum and Oenothera, Bisporic – Allium and Endymion, Tetrasporic – Adoxa and Peperomia, Embryosac Haustoria .

UNIT 3 : Germination of pollen tube, Course of pollen tube, Entry of pollen tube into the embryosac, Gametic fusion, Discovery of syngamy, Chalazogamy, Double fertilization, Triple fusion, development of dicot embryo –Capsella, Development of monocot embryo – Luzula.

UNIT 4 : Endosperm – Definition, Endospermous and Non – Endospermous seeds, types - Free nuclear, Cellular, Helobial, Xenia, Mosaic, Ruminate Endosperm and Endosperm Haustoria.

UNIT 5 : Apomixis – Definition and different types, Polyembryony– Different types, Tissue culture, Embryo culture, Parthenogenesis – Induction and Parthenocarpy

SUGGESTED READING

TEXTBOOK: (1) Maheswari, P. (1991): An Introduction To Embryology of Angiosperms, Tata – Mc Graw Hill Publishing Co. Ltd.

REFERENCE BOOKS:(1) Swamy, B.G.L. and Krishnamurthy, K.V. (1990): From Flower to Fruits, Tata-Mc Graw Hill Publishing Co. Ltd.

(2) Bhojwani, S.S. and Bhatnagar, S.P. (1987): Embryology of Angiosperms, Vikas Publishing House Pvt. Ltd.

SECOND YEAR – SEMESTER : IV

PAPER VIII : PLANT PROTECTION – 4MB08

UNIT 1 : Principles of plant protection – Plant protectants, Quarantines, Seed certification and Legislation, Appliances for plant protection.

UNIT 2 : General classification of plant diseases – Common symptoms of plant diseases,Dissemination of plant pathogens by air, water & animals – Control measures, Damages to crops by Insects, Pests and Nematodes.

UNIT 3 : Causative organisms, Etiology, Symptoms and Control measures of diseases caused by Fungi – Damping off, Red-rot of sugarcane, Bud-rot of Coconut, Cotton-Wilt and Tikka disease of Groundnut.

UNIT 4 : Bacterial diseases – Ring-rot of Potato, Soft-rot of vegetables – Carrot, Citrus canker, Paddy blight – Viral diseases – Tobacco Mosaic Virus, Bhendi mosaic and Bunchy top of Banana.

UNIT 5 : Biological control – Trichoderma, Pathogen related proteins, Genetically modified crops – Bt cotton.

SUGGESTED READING

TEXTBOOK:

(1) Mukundan, T.K. (1993): Plant Protection – Principles and Practices, Asia Publishing House, Bombay.

REFERENCE BOOKS:

(1) Bap Reddy, D. (1988): Plant Protection in India, Allied Publishers

(2) Rangaswamy, G. (1984): Bacterial Plant Diseases in India, Asia Publishing House, Bombay

(3) Krishnamoorthy, S. (1983): Control of Pests and Diseases on Fruit Cultures in India, I.C. & K – Monograp

SECOND YEAR – SEMESTER : IV

PAPER IX : CELL BIOLOGY – 4MB09a

UNIT 1 : Introduction – Ultra structure of a plant cell – Cell as a structural and functional unit of biological organisms, Cellwall – Primary, Secondary & Tertiary wall –Simple pits – Bordered pits. Plasma membrane – Chemical composition, structure – Model – Fluid mosaic model – Functions of plasma membrane.

UNIT 2 : Cytoplasm – Physical nature and chemical composition – Physical & chemical properties-Origin, structure and functions of organelles: (1)Endoplasmic Reticulum (2) Golgi Complex (3) Plant lysosomes – Spherosomes, Vacuoles, Glyoxysomes and Peroxisomes.

UNIT 3 : Origin, Structure and functions of Mitochondria –Morphology, Electron microscopic structure – Plastids - Chloroplast morphology, Electron microscopic structure.

UNIT 4 : Nucleus – Shape – Nuclear Membrane – Nucleoplasm & Nuclear Pore – Nucleolus Chromosome structure& functions – Chemical composition – Heterochromatin and Euchromatin .

UNIT 5 : Giant chromosomes, Polytene chromosome, Abnormal chromosome – B-Chromosome, Holokinetic chromosome Nucleic acid – DNA & RNA – Occurence, Structure, Chemical composition, Replication, Functions.

SUGGESTED READING

TEXTBOOK: (1) Verma, P.S. and Agarwal, V.K. (1990): Text Book of Cytology, S. Chand & Co. Ltd., New Delhi

REFERENCE BOOKS: (1) Esau, K. (1982): Plant Anatomy, Wiley Eastern Pvt.Ltd., New Delhi .

(2) Clowes, F.A.L. and Juniper, B.E. (1988): Plant Cell, Blackwell Scientific Publications, Oxford & Edinburgh

(3) De Robertis (1991): Cell Biology, Nourishky and Salz Pub.

SECOND YEAR – SEMESTER IV

PRACTICAL – PAPER : II – 4MBP2

1. Study of primary structure of Dicot and Monocot roots, Secondary thickening of Dicot stem (*Polyalthia*), Secondary thickening of Dicot root (*Tinospora*), Anomalous secondary thickening of Dicot stem (*Nyctanthus, Bougainvillea* and *Boerhaavia*) and Monocot stem (*Dracaena*), Structure of Dicot (*Nerium*) and Monocot (*Grass*) leaf.
2. Electron microscopic structure of cell organelles from photographs – Mitochondria, Chloroplast, Golgi Complex, Endoplasmic Reticulum, Nucleus and DNA, Study of cell inclusions – Raphides, Cystoliths, Protein bodies and Starch grains (From Slides).
3. Study of young and old stages of Anther, Male gametophyte, Pollen grains, Female gametophytes and ovules – Orthotropous, Anatropous and Campylotropous (From Slides).
4. Demonstration of Koch's postulates, Study of diseased plant materials (Red rot of Sugarcane, Soft rot of vegetables, Citrus canker, Paddy blight and TMV).
5. Adaptations of Hydrophytes, Xerophytes, Halophytes and Heliophytes (Morphology and Anatomy).

THIRD YEAR – SEMESTER : V

PAPER X : PTERIDOPHYTES – 5MB10

UNIT 1 : General characters, Reimer's classification, Evolution of steles in Pteridophytes .

UNIT 2 : Detailed study of morphological and anatomical structures, Development of Sporangium, Prothallus, Sex organs and Embryo in Lycopodium and Selaginella .

UNIT 3 : Detailed study of morphological and anatomical structures, Development of sporangium, Prothallus, Sex organs and Embryo Equisetum and Dicranopteris.

UNIT 4 : Detailed study of morphological and anatomical structures, Development of sporangium, Prothallus, Sex organs and Embryo in Adiantum, Nephrolepis and Marsilea .

UNIT 5 : Heterospory and its importance. Apospory, Apogamy, Organization of spore producing organs.

SUGGESTED READING

TEXTBOOK:

(1) Vasishta, P.C. (1991): Pteridophyta, S.Chand & Co., New Delhi.

REFERENCE BOOKS:

(1) Sporne, K.R. (1986): Morphology of Pteridophytes, B.I. Publications

(2) Smith, G.M. (1985): Cryptogamic Botany, Vol. II, Mc Graw Hill Ltd. London

(3) Parihar, N.S. (1987): An Introduction to Embryophyta – Vol. II: Pteridophyta, Central Book Depot.

THIRD YEAR – SEMESTER : V

PAPER XI : GYMNOSPERMS & PALEOBOTANY – 5MB11

UNIT 1 : General features of Gymnosperms, Pilger and Melchior classification, Affinities to Pteridophytes.

UNIT 2 : A detailed study of morphological and anatomical structures, Micro and Mega sporangium structures, Male and female gametophyte and Embryo in Cycas & Pinus. (No Development).

UNIT 3 : A detailed study of morphological and anatomical structures, Micro and Mega sporangium structures, Male and female gametophyte and Embryo in Gnetum , Affinities of Gnetum to angiosperms (No Development).

UNIT 4 : Fossils, Kinds of fossils, Geological time scale, Structure of Rhynia, Lepidostrobus, Lepidocarpon and Stigmaria.

UNIT 5 : Structure of Calamities, Leaves, Roots and Fructifications of calamities, Botryopteris and Williamsonia.

SUGGESTED READING

TEXTBOOKS: (1) Vasishta, P.C. (1991): Text Book of Gymnosperms, S. Chand & Co., New Delhi

(2) Shukla and Mishra (1989): Essentials of Paleobotany, S.Chand & Co., New Delhi

REFERENCE BOOKS:(1) Sporne, K.R. (1976): Morphology of Gymnosperms, Hutchinson University Library

(2) Chamberlain, C.J. : Gymnosperms – Structure and Evolution, Chicago

(3) Gupta, M.N. (1972): The Gymnosperms, 2nd Edn Shiva Lal Agarwala & Co., Agra

(4) Arnolds, C.A. (1947): Introduction to Paleobotany

(5) Andrews, H.N. (1961): Studies in Paleobotany

THIRD YEAR SEMESTER : V

PAPER XII : SYSTEMATIC & ECONOMIC BOTANY – 5MB12b

UNIT 1 : Stem modification- Phyllotaxy, Phyllode, Pitcher, Stipules, Bladder, Inflorescence- Racemose, Cymose, Mixed and special types, Flower.

UNIT 2 : Herbarium techniques, Concept of Taxon, Genus, Species, Citation of Authors, Binomial nomenclature, ICBN, Taxonomic hierarchy, Artificial keys for identification of families.

UNIT 3 : Linnaeus classification, Benthem and Hooker's classification – Merits & Demerits, APG (Angiosperm phylogenic group) Classification, Range of characters and Economic importance of the following families: Annonaceae, Nymphaeaceae, Rutaceae, Mimosae, Caesalpineae, Fabaceae and Cucurbitaceae.

UNIT 4 : Range of characters of Acanthaceae, Apocynaceae, Asclepiadaceae, Convolvulaceae, Verbenaceae, Euphorbiaceae, Liliaceae, Cannaceae and Poaceae.

UNIT 5 : Economic importance - Cultivation, Harvesting and uses of the following: Cereal-Rice, Fibre-Cotton, Rubber-Hevea, Sugar – Saccharum, Spice-Eugenia, Beverage-Coffee.

SUGGESTED READING

TEXTBOOKS:

(1) Vasishta, P.C. (1990): Taxonomy of Angiosperms, S. Chand & Co, New Delhi.

(2) Hill, A.W. (1981): Economic Botany, Mc Graw Hill Publications.

REFERENCE BOOKS:

(1) Lawrence, G.H.M. (1985): An Introduction to Plant Taxonomy, Central Book Depot, Allahabad.

(2) Porter, C.L. (1982): Taxonomy of Flowering Plants, Eurasia Pub.House, New Delhi.

(3) Rendle, A.B. (1980): The Classification of Flowering Plants, Vol. I & II, Vikas Students Edition.

(4) Pandey, B.P. (1987): Taxonomy of Angiosperms.

(5) Pandey, B.P. (1987): Economic Botany.

(6) Verma, V. (1984): Economic Botany.

THIRD YEAR – SEMESTER : V

PAPER XIII : GENETICS & BIOSTATISTICS – 5MB13a

UNIT 1 : Mendelian genetics – Mono and Dihybrid ratios – Laws of Mendel, Phenotypes and genotypes, Test cross and Back cross, Non-Mendelian principles – Incomplete dominance -Mirabilis & Antirrhinum, Co-Dominance -Coat colour in cattle, Lethal genes – Non-Chlorophyllous lethals in Mirabilis, Pleiotropism Drosophila – Sex determination in plants.

UNIT 2 : Genetic interaction–All types with one example each– Biochemical genetics, Complementation in Neurospora–Multiple alleles– Definition, Characteristics with two examples–Male sterility in corn–Cytoplasmic inheritance–Plastid inheritance in Mirabilis, Genetics of blood groups (ABO & RH).

UNIT 3 : Polygenic inheritance–Definition, Characteristics with two examples–Linkage –Definition, Types, Phases with Maize as an example –Crossing over–Types, Mechanisms, Proof for crossing over (Experiments in Maize and Drosophila) – Sex linked inheritance with two examples.

UNIT 4 : Chromosome variation in number – Types of ploidy, Colchicine induction, Synthetic ploids, Biochemical disorders in man – Variations in structure – Additions, Deletions, Inversions, Translocations, Shifts, Mutations – Classification, Mode of action of Mutagens.

UNIT 5 : Concept of Arithmetic Mean & Standard Error, Significance of correlation & Regression, Sampling techniques–Simple & Stratified random sampling, Tests of significance – Chi-Square test.

SUGGESTED READING

TEXTBOOKS:

(1) Verma, P.S. & Agarwal, V.K. (1980): Genetics, S. Chand & Co., New Delhi.

(2) Dalela, R.C. & Verma, S.R. (1986): A Text Book of Genetics, (5^{th} Edn), Jai Prakash Nath & Co., Meerut.

REFERENCE BOOKS:

(1) George W. Burns (1989): The Science of Genetics, Macmillan & Company, New York.

(2) Karvita B Ahluwalia (1985): Genetics, Wiley Eastern Limited.

THIRD YEAR – SEMESTER : V

PAPER XIV : INSTRUMENTATION & BIOINFORMATICS – 5MB14a

UNIT 1 : Principles and parts of Light microscope – Basic principles and uses of Polarised and Dark field microscope – Basic principles and Functions of TEM & SEM .

UNIT 2 : Principles of Colorimeter – Methods of using with plant material, Spectrophotometer – Basic principles & differences between Colorimeter & Spectrophotometer, pH Meter – pH, Buffers – Basic principles and uses ,Centrifuge – Principles, Types & Uses.

UNIT 3 : Chromatography – Basic principles –Types – Paper chromatography – extraction of plant materials using Paper chromatography – Principles of Gas, Column and Thin layer chromatography – Electrophoresis – Acrylamide.

UNIT 4 : Bioinformatics – Introduction and application, homepages, types of computers – Main frame, super, desktop and note book.

UNIT 5 : Applied bioinformatics – Introduction to phylogenetics, Pharmacogenomics, Introduction to Toxicogenomics &Introduction to Chemoinformatics, Pre-Clinical & Clinical data management, Drug design.

SUGGESTED READING

TEXTBOOKS:

(1) De Robertis (1992): Cell Biology, Nourishky & Salz Publications.

(2) Plummer, T. (1971): Practical Biochemistry

REFERENCE BOOKS:

(1) Srivatsava, T. (1976): Chromatography.

(2) Jayaraman, T. (1985): Laboratory Techniques

(3) Purvis, M.J. et.al. (1986): Laboratory Techniques in Botany, Butterworths, London.

(4) Duddington, C.L. (1982): Practical Microscopy, Pitman, London

(5) Pearse, A.G.E. (1980): Histochemistry – Theoretical & Applied, Churchill Livingstone.

THIRD YEAR – SEMESTER : V

ELECTIVE PAPER : I

PAPER XV : PLANT BREEDING & HORTICULTURE – 5EB01a

UNIT 1 : Objectives of plant breeding, Important steps in breeding crop plants – Introduction and Acclimatization, Selection – Mass, Pureline and Clonal, Definitions and brief procedure, Hybridization – Types and Procedure, Hybrid vigour and Heterosis – Effects and causes.

UNIT 2 : Mutation breeding – Definition, Procedure and Achievements – Breeding for Disease resistance - Phytopathogenicity – Inoculation and developing disease resistance – Procedure and achievements, Breeding for drought resistance – Proposed scheme for breeding resistant genotypes.

UNIT 3 : Achievements in crop breeding in India with special reference to Tamilnadu in revolutionizing production of important crops like Rice, Wheat, Maize, Cotton and Sugarcane.

UNIT 4 : Vegetative propagation – Cutting types – Herbaceous stem cutting – Leaf cutting – Soft wood and hard wood cutting and root cutting – Layerage and Graftage types, Crop plant growing operations – Transplantation, Mulching, Pruning, Trimming & Weeding.

UNIT 5 : Floriculture – Commercial floriculture – Production of cut flowers – Potted plants – Bulbs & Corms – Bedding plants & Home floriculture – Horticultural practices for fruits & vegetable crops, Leafy – Cabbage & Cauliflower, Tuber crops – Carrot & Raddish, Fruits as vegetables- Solanaceous, Evergreen & Deciduous tree fruits.

SUGGESTED READING

TEXTBOOKS:

(1) Chaudhari, H.K. (1988): Principles of Elementary Plant Breeding, Oxford and IBH Pub. Co. Pvt. Ltd.

(2) Edmond, J.B. et al. (1971): Fundamentals of Horticulture, S. Chand & Co., New Delhi

REFERENCE BOOKS:

(1) Sharma, J.R. (1994): Principles And Practice Of Plant Breeding, Tata Mc Graw Hill publishers.

(2) Vijendra Das, L.D. (1988): Plant Breeding, New Age International Pvt. Ltd.

(3) Randhawa, G.S. (1973): Ornamental Horticulture in India, Today and Tomorrow Printers & Publishers

(4) Yawalkar, K.S. (1961): Vegetable Crops of India, Agri – Horticultural Pub. House, Nagpur.

(5) Gopalswamy Iyengar (1973): Complete Gardening in India, Kalyan press, Bangalore.

THIRD YEAR – SEMESTER : VI

PAPER XVI : PLANT FUNCTIONS – 6MB15

UNIT 1 : Introduction-Water relations-Definition and importance of Diffusion, Osmosis, Diffusion pressure deficit, Osmotic pressure, Imbibition, pH, Transpiration-Stomatal mechanism, Guttation, Factors affecting Transpiration, Significance, Absorption and Translocation of water, Translocation of solutes – Munch hypothesis.

UNIT 2 : Enzymes-Introduction, Nature of enzymes, Nomenclature and specificity, Mode of action – Factors affecting enzymes – Respiration – Types – Aerobic and Anaerobic, Mechanism, Oxidative phosphorylation, Significance, Factors affecting Respiration and Respiratory quotient.

UNIT 3 : Photosynthesis – Radiant Energy – Emerson Effect – Two pigment systems – Photophosphorylation – Cyclic and Non-Cyclic – Carbon pathway – Calvin‘s cycle - C4 pathway – Factors affecting photosynthesis – Photorespiration – Evidences and mechanism – Organelles involved in photorespiration.

UNIT 4 : Mineral nutrition – Introduction – Essential elements – Critical elements – Importance and deficiency symptoms of Nitrogen, Phosphorous, Potassium, Magnesium and Calcium, Hydroponics – Its merits and demerits.

UNIT 5 : Growth regulators – Auxins, Gibberllins, ABA, Ethylene, Photomorphogenesis-Photoperiodism-Phytochrome –Vernalization-Biological clock – Seed dormancy and viability and physiology of seed germination.

SUGGESTED READING

TEXTBOOK: (1) Pandey and Sinha (1992): Plant Physiology, Vikas Publishing House.

REFERENCE BOOKS:(1) Devlin, R.M (1986): Plant Physiology, Affiliated East West Press

(2) Salisbury and Ross (1988): Plant Physiology, Prentice – Hall of India.

3) Noggle and Fritz (1987): Introductory Plant Physiology, Prentice – Hall Of India.

THIRD YEAR – SEMESTER : VI
PAPER XVII : MICROBIAL GENETICS – 6MB16a

UNIT 1: Architecture of prokaryotic and viral chromosomes-The bacterial chromosomes, Plasmids and Episomes – Chromosomes of viruses - double stranded DNA of viruses, single stranded DNA of viruses, RNA of viruses rII fine structure mapping – Genomes of mitochondria & plastids.

UNIT 2: Proof from bacteria & virus that DNA is the genetic material, structure, organization and types of DNA, replication of DNA, evolution of gene concept, structure and types of RNA.

UNIT 3: Gene and its organization - Genetic code, cistron, recon, muton. Protein synthesis-transcription and post transcriptional modifications– translational and post translational modifications in bacteria.

UNIT 4: Gene recombination – mechanism, types – general, non reciprocal, site specific. DNA repair, proof reading, mismatch repair, excision repair, dark reactivation, recombinational repair and SOS repair. Gene amplification.

UNIT 5: Gene action – Regulation of gene expression in prokaryotes – gal operon, lac operon and tryp operon.

SUGGESTED READING

TEXTBOOKS: (1) Verma, P.S. & Agarwal, V.K. (1980): Genetics, S. Chand & Co., New Delhi.

(2)Dalela, R.C. & Verma, S.R. (1986): A Text Book of Genetics, (5^{th}Edn), Jai Prakash Nath & Co., Meerut.

(3) David Freidfelder: Molecular Biology – Narosa Publishing House.

REFERENCE BOOKS: (1) George W. Burns (1989): The Science of Genetics, Macmillan & Company, New York.

(2) Karvita B Ahluwalia (1985): Genetics, Wiley Eastern Limited.

(3) Carl P.Swanson, Timothy Merz & William J. Young, Cytogenetics, Eastern Economy Edition.

THIRD YEAR – SEMESTER : VI

PAPER XVIII : RECOMBINANT DNA TECHNOLOGY – 6MB17a

Unit I: Restriction enzymes-endonucleases and exonucleases. Vectors- Plasmids, Phage vector, Phagemids, Cosmids, Transposons and Expression vectors, Shuttle vector.

Unit II: Gene cloning in prokaryotes-Isolation of bacterial plasmids, Construction of cDNA and plasmid, Insertion of cDNA fragment into suitable vector by using ligases, Blunt end ligation by using homopolymers and enzyme linkers. Methods of insertion of recombinant plasmid into suitable host, Culturing of host cells, Master plating, Replica plating and Colony Hybridization: Southern, Northern & Western blotting techniques.

Unit III: Generation of fragments by hydrodynamics shear, Scrambling of DNA, Methods which insure that plasmid vector will contain foreign DNA, Methods which insure that a phage vector will contain foreign DNA, Mass screening for plasmids containing a particular DNA – Genomic library and PCR Technology.

Unit IV: Biology of Lambda phage, Phage DNA and its gene organization, Transcription and Replication of Phage DNA, Lytic and Lysogenic life cycle.

Unit V: Application of genetic engineering – structure, function and commercial production of following using rDNA technology, insulin, somatotropin, stomatostatin, interferons, HB vaccines, erythropoietin, polio vaccine, site directed mutagenesis, production of protein from cloned gene.

SUGGESTED READING

TEXTBOOKS:

(1) Dubey, R.C. (1993): A Text Book of Biotechnology, S. Chand & Co.

(2) Vijendra Das, L.D. (1988): Plant Breeding, New Age International

REFERENCE BOOKS:

(1) Sandya Mithra (1994): Genetics, Tata Mcgraw Hill Publishers.

(2) Ignacimuthu,S.J.(1992): Biotechnology New Age International Pvt. Ltd.

(3) Old and Primrose (1996): Gene Manipulation, 5th Edn.

(4) David Freidfelder: Molecular Biology – Narosa Publishing House.

(5) A Textbook of Microbiology Dr. R.C Dubey & Dr.D.K Maheshwari(2014)

THIRD YEAR – SEMESTER : VI
PAPER XIX : BIOTECHNOLOGY - 6MB18

UNIT 1: Scope and achievements, Molecular Probes and its types: DNA probe,RNA probe, cDNA, synthetic oligonucleotide probes. Molecular Markers: Types and applications – Restriction Fragment Length Polymorphisms(RFLPs),Random Amplified Polymorphic DNA(RAPD), Amplified Fragment Length Polymorphisms(AFLP), Variable Number of Tandem Repeats (VNTRs),Simple Sequence Repeats (SSRs).

UNIT 2: Gene cloning in Eukaryotes, Structure of Ti and Ri plasmids, T DNA transfer, Methods of Gene transfer – Plant cell transformation, Ultrasonication, Liposome mediated transfer, Particle bombardment method, microinjection, electroporation - Tobean plant and Transgenic plants.

UNIT 3: Tissue culture: Totipotency, History, Techniques, Requirements, Culture of plant materials – explants, callus formation, protoplast culture, somatic hybridisation, hybrids and cybrids, anther and pollen culture, *invitro* androgenesis, mentor pollen technology, cryopreservation method, germplasm bank.

UNIT 4: Environmental Biotechnology: Bioremediation- *exsitu* and *insitu* bioremediation of contaminated soils and waste land, bioremediation of xenobiotics - Biofertiliser – *Azolla* and *Azospirillum.*

UNIT 5: Fermentation – Culture of microorganism - Batch culture, Continuous Culture, Fedbatch culture, Commercial production of Vitamin B_{12} and Citric acid, Toxins – Chemical nature of fungal toxins, Biosensor-types and applications.

SUGGESTED READING

TEXTBOOKS:
(1) Dubey, R.C. (1993): A Text Book of Biotechnology, S. Chand & Co.
(2) Vijendra Das, L.D. (1988): Plant Breeding, New Age International

REFERENCE BOOKS:
(1) Sandya Mithra (1994): Genetics, Tata Mcgraw Hill Publishers.
(2) Ignacimuthu, S.J. (1992): Biotechnology, New Age International Pvt. Ltd.
(3) Old and Primrose (1996): Gene Manipulation, 5th Edn.

THIRD YEAR – SEMESTER : VI

ELECTIVE PAPER : II

PAPER XX : PHARMACOGNOSY – 6EB02

UNIT 1 : Definition, History and scope of Pharmacognosy, Indigenous systems of Medicine – Ayurvedic, Siddha, Unani and Homeopathy, Description of secondary plant metabolites – Alkaloids, Terpenoids, Glycosides, Volatile Oils, Tannins and Resins.

UNIT 2 : Laxative – Preparation, Sources, Descriptions, Constituents, Chemical tests and uses – Aloe, and Castor Oil, Astringent – Black catechu, Carminative – Nutmeg and Black pepper, Cardio-Tonic – Digitalis and Terminalia.

UNIT 3 : Drugs acting on Nervous system – Preparation, Sources, Cultivation, Collection, Description, Constituents, Chemical tests and uses of the following: Nuxvomica and Opium, Antitussive – Adhatoda and Ocimum.

UNIT 4 : Sources, Descriptions, Constituents and uses of the following: Antirheumatic – Colchicine, Antitumor – Vinca, Antidiabetic – Gymnema, Antimalarial – Cinchona, Antiseptic – Neem and Diuretic – Chota Gokru, Antioxidant – β Carotenes, Antimutagen – Garlic.

UNIT 5 : Preparation, Sources, Descriptions, Constituents and uses of the following: Liquorice – Glycyrrhiza, Pyrethrum- Chrysanthemum, Vitamins – Amla, Enzymes – Papaya, Pharmaceutical aids – Different types of Starch and Lemon grass oil.

SUGGESTED READING

TEXTBOOK: (1) Ansari, S.H. (1993): Pharmacognosy, S. Chand & Co.

REFERENCE BOOKS:(1) Willis, T.E. (1994): Text Book of Pharmacognosy, Tata Mc Graw Hill Publishers.

(2) Gokhale, S.B. (1992): Pharmacognosy, S. Chand & Co.

THIRD YEAR – SEMESTER VI

PRACTICAL – PAPER : III – 6MBP3

1. Pteridophytes – Morphological and anatomical studies of *Lycopodium, Selaginella, Equisetum, Dicranopteris,Nephrolepis, Adiantum and Marsilea.*
2. Gymnosperms and Paleobotany – Morphological and anatomical studies of C*ycas, Pinus* and *Gnetum*. Observation of fossil slides of *Rhynia, Lepidodendron, Lepidostrobus, Lepidocarpon, Stigmaria, Calamites, Botryopteris* and *Williamsonia.*
3. Systematic Botany – Observation and sketching of vegetative and floral parts of plants belonging to the families specified in the syllabus. Description of plants in technical terms. Field study of plants shall form a part of the practical work with the submission of 16 Herbaria.
4. Economic Botany – Study of economically useful plants included in theory.
5. Biotechnology – Preparation of culture medium and demonstration of tissue culture. Demonstration of plasmid DNA isolation and PCR.
6. Pharmacognosy – morphological identification of medicinal plants prescribed in the syllabus.

THIRD YEAR – SEMESTER VI

PRACTICAL – PAPER : IV – 6MBP4

1. Plant functions – Individual experiments:
   - (a) Determination of rate of transpiration of a given twig.
   - (b) Calculation of DPD in *Hydrilla.*
   - (c) Determination of rate of respiration in different respirable materials (flower buds and germinating seeds).
   - (d) Finding out the effect of light in photosynthesis.
   - (e) Effect of temperature on membrane permeability.

   Demonstration experiments:
   - (a) Paper chromatography
   - (b) Respiratory quotient
   - (c) Absorption equals transpiration
   - (d) Anaerobic respiration
2. Genetics – Simple problems on Monohybrid and Dihybrid ratios, Incomplete dominance & Gene interactions. Mapping of genes in chromosomes using crossing over data – Demonstration of karyotyping.
3. Plant breeding – Demonstration of hybridisation technique in potted plants.
4. Horticulture – Study of vegetative propagation – Plant cuttings, learning procedure for producing potted plants and raising seed beds.
5. Instrumentation – Learning the principles and uses of pH Meter, Colorimeter and Chromatographic techniques.

FIRST YEAR – SEMESTER I

PAPER I – ALLIED BOTANY – 1ABZ1a

UNIT 1 : Root modifications, Stem modifications, Phyllotaxy, Simple and Compound leaves, Stipules, Tendrils and Spines.

UNIT 2 : Racemose and Cymose inflorescence types, Flower – Description of floral parts and construction of floral diagram and floral formula; Fruits – Simple (Berry, Drupe, Hesperidium, Legume, Loculicidal Capsule and Achene), Aggregate of Berries, Multiple – Sorosis.

UNIT 3 : Outline of Benthem and Hooker's classification; Range of characters and economic importance of the following families: Annonaceae, Rutaceae, Fabaceae, Mimosae, Caesalpiniae and Cucurbitaceae.

UNIT 4 : Range of characters and economic importance of the following families: Rubiaceae, Apocynaceae, Lamiaceae, Euphorbiaceae and Arecaceae.

UNIT 5 : Ultra structure of a eukaryotic cell, Functions of cell organelles; Simple and Complex permanent tissues, Meristems – Classification (Primary and Secondary, Apical, Lateral and Intercalary); Primary structure of dicot stem and root, Secondary thickening of dicot stem (Normal).

FIRST YEAR – SEMESTER II

PAPER II – ALLIED BOTANY – 2ABZ2

UNIT 1 : Classification of plants, Life history and economic importance of the following: Oscillatoria, Chara, Sargassum, Albugo, Penicillium and Agaricus.

UNIT 2 : Structure and life history of Funaria, Lycopodium and Cycas.

UNIT 3 : Absorption of water and salts, Transpiration, Photosynthesis – Light and Dark reactions - Calvin's cycle, Respiration – Glycolysis, Kreb's cycle, ETS and Nitrogen cycle.

UNIT 4 : Climatic, Edaphic and Biotic factors, Adaptations of Xerophytes, Hydrophytes and Mesophytes to their habitats, Vegetational types of India.

UNIT 5 : Mendel's laws, Monohybrid and Dihybrid ratios, Theories of Lamarck, Darwin and de Vries, Structure of anther, Structure of ovule and development of dicot embryo.

SUGGESTED READING

TEXT BOOK: (1) Muneeswaran, A.(1987): A Text Book of Botany, S.Viswanathan Pvt Ltd., Madras.

REFERENCE BOOKS:(1) Fuller, H.J. & Tippo, O. (1989): College Botany, Henry Holt & Co.

(2) Ganguly, A.K.:General Botany, Vol 1 (1971) & Vol 2 (1975) – The New Bookstall, Calcutta.

(3) Rao, K.N., Krishnamurthy, K.V. & Rao, G. (1979): Ancillary Botany, S.Viswanathan Pvt Ltd., Madras.

ALLIED BOTANY

PRACTICAL PAPER – 2ABZP

1. A detailed study of the forms included in UNITS 1 & 2 of Paper I & II
2. Study of the characters of the plants belonging to the families mentioned in UNITS 3 & 4 of Paper I.
3. Detailed study of primary and secondary structure of Dicot stem and Primary structure of Dicot root.
4. Permanent slides of tissues.
5. Detailed study of morphological and anatomical structures of Xerophytes, Hydrophytes and Mesophytes.
6. Demonstration of experiments in Osmosis, Respiration, Photosynthesis, Transpiration, Ascent of sap and Anaerobic respiration.

OPTIONAL – BASIC BIOLOGY (BOTANY)

PAPER – I – 1OB1 (UNITS 1 & 2)

PAPER – II – 2OB2 (UNITS 3 TO 5)

UNIT 1 : Basic concepts of Structure, Function and Perpetuation of lower and higher categories of plants – An outline – Importance of plants as basic components of human survival and for maintenance of purity of atmosphere.

UNIT 2 : Environment and Plants – Basic components of environment – Structure of environment – Plants as pollution indicators – Green house effect – Afforestation and deforestation with special reference to historically important events like Chipko & Narmada Valley projects – Biogas production.

UNIT 3 : Plants for medicines – Names, Principles and Methods of using plants for

- Cardiac ailments
- Respiratory problem
- Liver disorders
- Memory enhancement
- Conditioning hair and skin

UNIT 4 : Genetic engineering in plants – Tissue culture – Totipotency – Transgenic plants – Terminator seed technology – A brief account of Biological warfare.

UNIT 5 : Gardening – Types of gardens – Details of Kitchen garden, An outline: Propagation of plants by Cutting, Layering and Grafting, Floriculture & Cultivation of bonsai plants.

SUGGESTED READING

REFERENCE BOOKS:(1) Ansari, S.H. (1993): Pharmacognosy, S.Chand & Co

(2) Randhawa, G.S. (1973): Ornamental Horticulture in India, Today and Tomorrow Printers & Publishers

(3) Old &Primrose (1996): Gene Manipulation, 5th Edn

(4) Gokhale, (1992): Pharmacognosy, S.Chand & Co

OPTIONAL - OPH

PLANTS IN HEALTH CARE

UNIT-1

Introduction - Study of plants in Health care - Importance- Natural remedies- External and Internal use.

UNIT-2

Plants for Skin care - *Acalypha indica, Cucumis sativus, Azadirachta indica*.

UNIT-3

Plants for Hair care - *Lawsonia inermis, Acacia concinna, Trigonella foenugraecum.*

UNIT-4

Plants for Eye care - *Daucus carota*, Greens.

UNIT-5

Conservation and Management Strategies for Health care plants - Cultivation of any 3 important plants.

REFERENCE BOOKS:

ECONOMIC BOTANY-Sampat Nehra-2007-Pointer publication.

Gokhale,S.B (1992): Pharmacognosy, S.Chand & Co.