

BHARATHIAR UNIVERSITY, COIMBATORE.
M. Sc. BOTANY DEGREE COURSE (AFFILIATED COLLEGES)
(Restructurized syllabi with effect from the academic Year 2012-2013)
SCHEME OF EXAMINATIONS – CBCS PATTERN

Sem.	Study Components	Course title	Ins. hrs/ week	Examinations			Credit	
				Dur. Hrs.	CIA	Marks		Total Marks
I	Paper I	Phycology, Mycology, Bacteriology & Lichenology	5	3	25	75	100	4
	Paper II	Bryophytes, Pteridophytes & Gymnosperms	5	3	25	75	100	4
	Paper III	Genetics, Plant Breeding & Biostatistics	5	3	25	75	100	4
	Paper IV	Cell & Molecular Biology	5	3	25	75	100	4
	Paper V	Ethnobotany	5	3	25	75	100	4
II	Paper VI	Anatomy, Embryology & Tissue Culture	5	3	25	75	100	4
	Paper VII	Environmental Botany & Conservation Biology	5	3	25	75	100	4
	Paper VIII	Seed Technology	5	3	25	75	100	4
	Paper IX	Industrial Microbiology	5	3	25	75	100	4
	Paper X	Phytopathology	5	3	25	75	100	4
	Practical - I	(Papers I to V)	5	3	40	60	100	4
	Practical - II	(Papers VI to X)	5	3	40	60	100	4
III	Paper XI	Taxonomy & Biosystematics	5	3	25	75	100	4
	Paper XII	Forest Botany	5	3	25	75	100	4
	Paper XIII	Plant Physiology	5	3	25	75	100	4
	Paper XIV	Phytochemistry	5	3	25	75	100	4
	Elective-I	Physiological Embryology of Angiosperm	5	3	25	75	100	4
IV	Paper XV	Biotechnology & Genetic Engineering	5	3	25	75	100	4
	Elective- II	Introduction to Bioinformatics	5	3	25	75	100	4
	Elective- III	Horticulture						
	Practical - III	(Papers XI & XII)	5	3	40	60	100	4
	Practical - IV	(Papers XIII, XIV & XV)	5	3	40	60	100	4
	Practical - V	Elective Papers (I, II & III)	5	3	20	30	50	2
	Total						2250	90

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M.Sc., BOTANY DEGREE COURSE (AFFILIATED COLLEGES)

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SEM.I

**Paper I - PHYCOLOGY, MYCOLOGY, BACTERIOLOGY AND
LICHENOLOGY**

UNIT-I:

Classification of Algae (Fritsch, 1945), Comparative studies of range of structure, distribution, reproduction, life cycles, phylogeny and inter relationships of Cyanophyta, Chlorophyta, Phaeophyta and Rhodophyta, Economic Importance of Algae.

UNIT-II:

Classification of Fungi (Alexopoulos and Mims, 1979), Range of structure, distribution, reproduction, Phylogeny and interrelationship of Myxomycetes, Oomycetes, Ascomycetes, Basidiomycetes and Deuteromycetes. Host-Parasite interaction, Heterothallism and economic importance of Fungi.

UNIT-III:

Classification of Bacteria (Bergey, 1923), Morphology and ultra structure. Bacterial culture and cultural characteristics. Isolation and maintenance of pure culture. Growth curve of Bacterial population, Industrial uses of Bacterial-Lactic acid, Vinegar and Insulin. Reasons for inclusion of Cyanophyta under Bacteria.

UNIT-IV:

History of viruses, classification (Harrison et al., 1971), Structure of Virus, Double stranded DNA Viruses, Double stranded RNA Viruses, Cauliflower Mosaic virus, Wound tumor viruses, Bacteriophages-Morphology, structure and replication, Isolation and purification of Plant viruses. HIV/AIDS.

UNIT-V:

Classification of Lichens (Hale, 1969). Occurrence and interrelationship of phycobionts and mycobionts, structure and reproduction in Ascolichens, Basidiolichens and Deuterolichens. Lichens as indicators of Pollution, Economic importance of Lichens.

PRACTICALS:

1. Phycology: Gloeocapsa, Lyngbya, Pediastrum, Pithophora, Bulbochaete, Nitella, Padina, Turbenaria, Batrachospermum, Ceramium, Amphiroa and Gelidium.
2. Mycology: Albugo, Saprolegnia, Phyllochora, Alternaria and Puccinia. Slide culture technique, fungal spore count using Haemocytometer.
3. Microscopical analysis of a) Spoiled food stuffs b) Spoiled vegetables c) Spoiled fruits
4. Bacteriology, Virology and Lichenology: Bacteriophage-Books / Photographs TMV Viruses-Books/ Photographs. Antibiotic disc assay.
5. Isolation of soil microbes (Bacteria and Fungi) by dilution plating method using selective media and plate counting. Gram staining. Usnea.

REFERENCES:

1. Bold. H.C. and H.J. Wyne (1978) Introduction to the Algal structure and reproduction, Prentice Hall, Englewood Cliffs, New Jersey.
2. Chapman. V.J and P.J. Chapman (1973). The algae. The English language book society and Macmillen.
3. Fritsch, F.E. (1935-1945). Structure and reproduction of the Algae. Vol. II III & I.
4. Smith, G.M. (1971). Cryptogamic Botany Vol. Algae and Fungi.
5. Lee, R.E. (1987), Phycology, Cambridge University, London.
6. Round, F.E, (1973), The Biology of Algae.
7. Kumar, H.D, (1988), Introductory Phycology.
8. Alexopoulos, C.J. and C.W. Mims (1985). Introductory Mycology.
9. Anisworth, S.C., Sparrow, F.E. and A.D. Sussman. The fungi and advanced treatise. Vol. I, II, III, IV A & IV B.
10. Bessey, E.A. (1950), Morphology and Taxonomy of Fungi.
11. Webster, J. (1985), Introduction to Fungi.
12. Smith, K.M. (1974), Viruses, Cambridge University Press.
13. Power, C.B. and H.F. Dagainawala. (1982), General Microbiology.
14. Michael, J. Pelczar, Jr. E.C.S. chan and N.R. Krief. (1995). Microbiology. Tata McGraw-Hill (Ed), New Delhi.
15. Singh, R.S.-Introduction to the Principles of plant pathology.
16. Mehrotra, R.S. (1985). Plant Pathology.
17. Rangaswamy, G. and Mahadevan, A. (1999). Diseases of crop plant in India 4th Edition.
18. Das Gupta M.K. (1958). Principles of Plant Pathology.
19. Hale, M.E. (1961). A Hand Book of Lichens.
20. Hale, M.E. (1970). The Biology of Lichens.

SEM.I

Paper II - BRYOPHYTES, PTERIDOPHYTES AND GYMNOSPERMS

UNIT-I:

Classification of Bryophytes (Reimers-1954), Distribution, structure, reproduction and lifecycle of Marchantiales, Jungermanniales, Anthocerotales and Bryopsida. Fossil bryophytes, economic importance.

UNIT-II:

Classification of Pteridophytes (Reimers), Morphology, anatomy and reproduction of Psilophytopsida, Psilotopsida, Lycopsida, Sphenopsida and Pteropsida .

UNIT-III:

Phylogenetic trends-Evolution of stele, sorus evolution, heterospory and seed habit, Affinities of various classes of Pteridophytes.

UNIT-IV:

Classification of Gymnosperms (Pilger and Melchoir) General account of Pteridospermales, Cycadales, Coniferales, Bennettitales, Pentoxylales and Ginkgoales.

UNIT-V:

General account of Cordaitales, Taxales, Gnetales, Phylogenetic trends and affinities of various classes. Evolution of angiosperms.

PRACTICALS:

1. Bryophytes: *Lunularia, Reboulia, Targonia, Aneura, Sphagnum, Bryum.*
2. Pteridophytes: *Psilotum, Selaginella, Angiopteris, Osmunda, Dicranopteris, Lygodium, Trichomanes, Alsophila, Nephrolepis, Salvinia, Azolla.*
3. Gymnosperms: *Cupressus, Podocarpus, Araucaria, Pinus, Ephedra.*
4. Fossils: *Rhynia, Asteroxylon, Sphenophyllum, Ankyropteris, Botryopteris, Heterangium, Lagenostoma, Pentoxylon, Medulosa, Cycadeoidea, Cordaites.*

REFERENCES:

1. Arnold, C.D. 1947, An introduction to Palaeobotany.
2. Coulter, J.M. and C.J. Chamberlain 1917. Morphology of gymnosperms.
3. Foster, A.S. and E.R. Gifford 1959. Comparative morphology and vascular plants.
4. Parihar, N.S. 1967. An introduction to embryophytes Vol III.
5. Seward, A.C. Fossil plants.
6. Smith, G.M. Cryptogamic Botany II
7. Sporne, K.R. 1966. The morphology of Pteridophytes.
8. Sporne, K.R. 1967. The Morphology of Gymnosperms.
9. Vashishta, P.C. 1971, Botany for degree students.

SEM.I

Paper III - GENETICS, PLANT BREEDING AND BIOSTATISTICS

UNIT-I:

Mendel's Law of inheritance-interaction of genes, quantitative inheritance, sex determination in plants, theories of sex determination. Sex linked characters-primary, secondary and permanent, non-disjunction of sex chromosomes in *Drosophila*. Sexes influenced and sex limited characters. Chromosome theory of inheritance. Gene mutation-Detection of mutation CLB Method, Muller 5 method, Biochemical mutants in Bacteria and *Neurospora*. Detection of mutation in Bacteriophages and higher plants. Molecular basis of mutation, physical and chemical mutagens and their mode of action.

UNIT-II:

Multiple alleles and pseudoalleles. Modern concept of genes. Fine structure of the gene IS Element-transposons. Extrachromosomal inheritance, genome of mitochondria and

plastids and their role in inheritance. Uniparental inheritance in *Chlamydomonas* and *Paramecium*-Male sterility, Population genetics-gene frequencies, mutation selection, migration, genetic drift, genetics disorder of chromosomal and geneic origin. Regulation of gene expression in Eukaryotes and Prokaryotes.

UNIT-III:

Methods of plant breeding self-fertilized, cross fertilized and vegetatively propagated plants. Breeding plants for improving yield and quality and resistant to diseases and pests. Plant breeding work in India with special reference to Rice, cotton and Sugar cane. Role of polyploidy and distant hybridization in plant improvement. Induced mutations in crop improvement.

UNIT-IV:

World diminishing plant resources threatened and endangered plants. Red Data Books. Plant germplasm resources-plantation, horticultural and field crops. Medicinal plants-germplasm collection and conservation. Germplasm maintenance of Rice and Sugarcane. The role of IBPGR (Rome, Italy) and NBPGR (New Delhi), in germplasm conservation, patent and intellectual properties-Rights of Plant breeders and Biotechnologists.

UNIT-V:

Principle and practice of statistical methods in Biological research. Population and sampling. Data collection & Representation-graph and tabulation. Measures of central tendency-mean (only arithmetic), median and mode. Measures of dispersion-mean, deviation, standard division and standard error. Probability of distribution (binomial, Poisson & normal). Tests of statistical significance-chi-Square test, theories of probabilities. Analysis of variance.

PRACTICALS:

Solving problems involving

1. Dihybrid cross
2. Interactions of factors
3. Incomplete dominance
4. Chromosome mapping from test cross data. Calculation of interference.
5. Multiple alleles and blood group inheritance
6. Sex linked inheritance
7. Quantitative inheritance
8. Population genetics
9. Calculation of gene frequencies
10. Allelomorphic pair, multiple alleles (classical blood Groups), sex linked alleles
11. Training in hybridization techniques.
12. Hi - square test.

REFERENCES:

1. Gardener, E.J. (1975). 5th Ed. Principles of Genetics, Johanwiley, New York.
2. Gilber, N.W. (1978). Organellar Heredity, Revan Press, New York.
3. Gupta, P.K. (1994). Genetics. Rastogi Publication, Meerut, India.
4. King, R.C. (1975). A Hand book of Genetics, Plenium Press, New York.

5. Strickboarger, M.V. (1977). Genetics, Mac Milian, New York.
6. Arnold, R.W. (1960). Principles of Plant Breeding. Jolin Wily & Sons, Inc, New York.
7. Sing, D.D. Plant Breeding: Principles and Methods. Kalyani Publishers, New Delhi.
8. Swaminathan, M.S. And Jana.S (1992). Biodiversity. Mac Millan, India Press, Madras.
9. Palanichami, S. and Manokaran, M. (1994), Statistical Methods for Biologists.
10. Khan, J.D and Khanum, A. (1994), Fundamentals of Biostatistics.
11. Zar, J.K. 1984, Biostatistical analysis, Prentice-Hall International, INC, Engleword chiffs, New Jersey.

SEM.I

Paper IV - CELL AND MOLECULAR BIOLOGY

UNIT- I:

Cell ultra structure and detailed study of cytoplasmic organelles. Cytoplasm – structure, physiochemical properties and chemical composition. Mitochondria-origin, structure and functions. Golgi apparatus-origin, structure and function. Plastids-proplastids and development of plastids, classification, morphology, structure, chemistry and functions. Structure and functions of Ribosome, Dictyosome, Lysosome, Sphaerosome, Glyoxisome and peroxisome.

UNIT- II:

Plasma membrane- Molecular structure, chemical nature and functions. Cell wall-primary, secondary and tertiary at microscopic, submicroscopic and molecular levels. Chemistry of cell wall-different polysaccharides, lignin, chitin, suberin, cutin and wax. Structure and functions of nucleus, nuclear envelope and nucleolus.

UNIT- III:

Chromosomes-general account only. Cell divisions: Mitosis-mitotic apparatus and its physiochemical characteristics and biochemical composition. Meiosis- process of meiosis in detail, theories on crossing over and chiasma formation and significance. Chromosomal aberration-causes autonomous and induced deficiencies, duplications, inversions (paracentric and pericentric) and translocation.

UNIT-IV:

Macromolecules- Classification. Nucleic acid- physical and chemical structure of DNA, Types of DNA, Watson and crick model of DNA, viral DNA, bacterial DNA, Mitochondrial and chloroplast DNA. DNA as genetic material, DNA synthesis and replication, termination of replication, Enzymes of DNA replication, Methylation of DNA and mismatch repair.

UNIT-VI:

Synthesis of RNA, different types of RNA, DNA dependent RNA, and polymerize. Initiation of transcription, post transcriptional changes in RNA, Genetic code. Working principles of Electron, Scanning, Transmission and Fluorescence Microscopy.

PRACTICALS:

1. Study of mitosis and meiosis using squashes and smears.
2. Interpretation of micrographs from standard purchased materials or from transparencies.
3. Karyotyping and chromosome banding technique.

REFERENCES:

1. Freifelder, D. (1983). 2nd Ed. Marosa publishing house
2. C.P. Swanson, T.Merz, W.J. Young. (1988). Cytogenetics. 2nd Ed. Prentice hall India. Pvt. Ltd.,
3. J.D. Watson and W.A. Benjamine. 3rd Ed. Molecular Biology of the genes.
4. Archana Sharma. (1985). 2nd Ed. Chromosomes. Oxford and IBH Publishing Company.
5. Arthur koreng, W.H.DNA Synthesis. Freeman and Company.

SEM.I

Paper V - ETHNOBOTANY

UNIT I:

Ethnobotany – definition, its significance within the limits of the state, the nation and the conservation of rare heritage from global point of view. The loss to mankind, if the heritage is not preserved and researched by present generation. Landmarks in history of ethnobiology – relation between geology, phyto geography and ethnobotany.

UNIT II:

indigenous societies and interaction with plants - a global view. Relationship between man and plants – for benefit of both and developmental strategies of both. Relationship between man and plants – mutually destructive approaches.

UNIT III:

Linkage of Ethnobotany with other sciences and disciplines in biology – food and nutrition, medicine, sociological and cultural practices, religions and social costumes and economic relations, archaeology, history and politics.

UNIT IV:

Major tribes of South India and their ethnobotanical and ethno-biological heritage – Parayar, Kurichiar, Paniyar, Mulla, Karuman, Kanikkars, Naikas, Shola Naikas, Thodas, Kothas, Kurumbas, Irullas, Kattu Naikas.

UNIT V:

Ethnobotany and conservation of plants with special reference to India – mythology and conservation of ecosystems, conservation of selected plant species: sacred groves, forestry and unique ecosystems and their ethnobiological values, plants and animals in art, tradition and ethnography: methodologies in ethno-botanical research.

PRACTICALS:

1. Collection and identification of 100 plant specimens of ethno-botanical importance in South India.
2. Knowledge of making use of 20 plants – parts of the above 100 for various medicinal purposes. The mode of application, the efficiency and superstitions, if any, associated with them. The student may prepare a case study report, preferably, by direct contact with the Tribe or the community concerned who are known to possess with the knowledge of the same.
3. Visit to sacred grove or sacred forest or a particular ecosystem to prepare a field report on the ecosystem.
4. Collection and identification of ethnobotanical specimen – preparations of the following categories (4 each) – oils, medicines for asthma, skin diseases, diarrhea, family planning, and snake bite.

REFERENCES:

1. "Ethnobiology in human welfare: - abstracts published symposium volume under print – IV international Congress of Ethnobiology – 1994. organized by society of Ethnobotanists, national botanical research institute, Lucknow – 226001.
2. Ariyar, Yegna Narayana A.K. 1980. "Field crops of India", Bangalore – Printing and Publishing company – Bangalore.
3. CSIR 1948 – 76. The wealth of India. XI volumes.
4. Murthy A.V.S & N.S. Subramanian, 1989. "The Book of economic botany" Wiley Easterns, New Delhi.
5. Krishna Iyer L.A. 1987. "The travancore Tribes and Casts, Government Press, Travancore.
6. Manilal K.S. 1990. "Linkages of ethnobotany with other sciences and disciplines", ethnobotany 1(1):14-23.
7. Sivarajan V.V. and Indira Balachandran. 1994. "Ayurvedic drugs and their plant sources", Oxford – IBH, Bangalore.
8. Manilal K.S. 1981. "Hortus malabaricum, Indian ethnobotany and Carmelite Missionaries", in The Christian heritage of Kerala, Ed. K.John, Fr.G.
9. Burkill I.H. 1965. "Chapters on the history and botany in India". Botanical Survey of India, Calcutta.
10. Jain. S.K. (Ed).....Glimces of Ethnobotany.

SEM.II

Paper VI - ANATOMY, EMBRYOLOGY AND TISSUE CULTURE.

UNIT – I:

Meristems (general account, vascular cambium – origin, types, structure and etiology. Cambium in wound healing, various types of Anomalous secondary thickening (different positions and activity of cambium). Leaf ontogeny of monocots and dicots.

UNIT-II:

Secondary xylem – Ontogeny, structure and function – Diffuse and porous wood growth layers, sap wood and heart wood. Arrangement of vessels in secondary xylem of Dicots. Structure of rays – types and evolution of rays. Dendrochronology – Compression wood and Tension wood. Phylogenetic trends and specialization of Primary xylem and Primary Phloem – nodals types and evolution.

UNIT-III:

Development of anther, physiology and etiology of anther tapetum, pollen wall morphogenesis. Pollen stigma compatibility, Megasporogenesis and female gametophyte, nutrition of the embryosac.

UNIT-IV:

Fertilization, control of fertilization, apomixes, parthenocarpy, etiology and physiology of endosperm Haustoria, Development of dicot and Monocot embryos and classification. Embryology in relation to taxonomy.

UNIT-V:

Choice of explant, inoculation, protoplast culture, somatic hybridization, meristem culture for virus free clones, cryopreservation – tissues culture in plant improvement, Role of growth promoting substances.

PRACTICALS:

- 1. Anatomy:** Study of suitable examples to illustrate features in Anatomy theory syllabus, with the help of section, peelings and mace rations. Submission of double stained 5 hand section slides. Micrometry.
- 2. Embryology:** stages in the development of microsporangium and male gametophyte. Configuration of ovules, 2,4 nucleate embryosac, mature embryosac. Types of endosperm. Stages in embryogeny globular proembryos. Mature embryos of monocot and dicot. Interpretation of embryological drawings. In vitro pollen germination.
- 3. Tissues culture:** Preparation of stock solution, sterilization, inoculation, nutrient media, organ culture, Morphogenesis, Induction of callus, embryoids.

REFERENCES:

1. Eames, A.J and M.C.Daniel 1976. An introduction to plant Anatomy.
2. Elizabeth, G.Cutter 1978. Plant anatomy part I & II ELBS AND Eclivand Arnald Ltd.
3. Esau, K. 1977. Anatomy of seed plants. Willy
4. Esau, k. 1965. Vascular differentiation in plants. Rirehant and Winston. Inc.

5. Fahn, A. 1967. Plant anatomy Channel and Company.
6. Shewin Carlquist 1962. Comparative plant anatomy. Haif, Rein hart and Wonsten.
- Pandey, B.P. 1978. Plant anatomy Channel and Company.
7. Bhojwani, S.S and Bhatnagar S.P. 1978. The embryology of angiosperms – Vikas – new Delhi.
8. Johansen, D.A. 1950. Plant embryology.
9. Maheswari, P. 1950. Introduction to embryology of angiosperms McGraw Hill.
10. Maheswari, P. 1963. Recent advances in the embryology of Angiosperms.
11. Reinert Bajaj, 1977. Plant cell, Tissue & Organ culture.
12. Krube Jr. P.J. and Jr. M.K. Petterson 1973. Tissue culture methods and application.
13. Thorpe T.A. 1981. Plant tissue culture methods and application in agriculture.
14. Raghavan. V. 1976. Experimental embryogenesis in vascular plants. Academic press London.
15. Pullaiah, T., Naidu, K.C., Lakshminarayana, K. and Hanumatha Rao, B. 2007. Plant Development. Regency Publications, New Delhi.
16. Pullaiah, T., Lakshminarayana, K. and Hanumatha Rao, B. 2000. Text Book of Embryology of Angiosperms. Regency Publications, New Delhi.

SEM.II

Paper VII - ENVIRONMENTAL BOTANY AND CONSERVATION BIOLOGY

UNIT-I:

History and scope of ecology, Concept of ecosystem. Synecology – Basic concept of population ecology. Modern concept of biotic community. Major and Minor communities. Methods of studying plant community.

UNIT-II:

Biogeochemical cycling. Reserve and cycling pattern in tropical and temperate regions. Ecological indicators.

UNIT-III:

Environmental pollution. Scope, sources of air, water, soil. Radiation and noise pollution-effects and control measures. Environmental management and legislation (Broad outline).

UNIT-IV:

Environmental education- Principles, Environmental education programmes. Environmental education in India. Environmental organization and agencies, MAB-national organization. Indian forests and wild life.

UNIT-V:

Conservation – Principles and applications, *ex situ* and *in situ* preservation of natural resources, strategy to demand agroforestry and social forestry, Forest conservation

through laws, world conservation strategy (WCS) and national conservation strategy (NCS).

PRACTICALS:

1. Determination of linear changes in vegetation by using line and Belt transect methods.
2. Determination of frequency, density abundance, dominance, FICC, dominance index. Similarity index & diversity index by using quadrat frame.
3. Description of community structure by using the units, conservation and association.
4. Estimation of total biomass and herbage yield by harvest method.
5. Description of zonation in a pond and stratification in a forest
6. Soil and water
 - i. Garden soil experiment to make texture.
 - ii. Capillary water.
 - iii. Field capacity.
 - iv. Witing coefficient.
 - v. PH of the soil.
 - vi. Chemistry of the soil (NO_3 PO_4 & SO_3)
 - vii. Water analysis for dissolved oxygen and carbon-di-oxide.

REFERENCES:

1. Ambasht, R.S. (1988). A text books of plant ecology. Students, Friends & Co., Varanasi.
2. Edward J. Kormondy, (1996). Concept of Ecology, Prentice Hill of India Pvt, Ltd. New Delhi.
3. Emil T. Charlett. Environmental protection Tata Mc graw Hill New Delhi.
4. George L. Clarke (1954). Elements of Ecology. John Wiley & sons. Inc., New york.
5. Joseph M. Moran, Micheal D. Morgan and jances H. Wiersing. Introduction to environmental science W.H. Freemar & Sam Francisco. U.S.A.
7. Misra K.C. (1980). Manual of plant ecology (second edition) Oxford and IBH Publishing Co., New Delhi.
8. Odum E.P. (1971). Fundamentals of ecology, W.B. Saunders Co., Philadelphia, London.
9. Perkins H.C. (1974). Air pollution, Mc Graw Hill Kongotusta Ltd, Tokyo.
10. Robert Smith, (1977). Elements of ecology and field biology, Harper and Raw Publishers, New York, London.
11. Sharma, P.D. (1991). Ecology and Environment, Rastogi Publishers, Meerut.
12. Micheal. P. (1984). Ecological methods for field and laboratory investigations, Tata Mc Graw Hill publishing company Ltd., New Delhi.
13. Misra, R. (1986). Ecology work book, Oxford and IBH publishing company, New Delhi.
14. Mc. Coull J. Crostant (1974). Water pollution. Hancount Pracojavanocichetne, New york, Atlanta.

Paper VIII - SEED TECHNOLOGY

UNIT – I:

Scope of seed biology – Exomorphic structure of seeds – structure of dicot and monocot seeds grains. Anatomy of seed coats of Malvaceae and Leguminosae members. Albuminous (Endospermic) and non-albuminous (non-endospermic) seeds-role of caruncle, micropyle and raphe in seeds.

UNIT – II:

Chemical composition of rice, wheat. And ragi-chemical composition of green gram, black gram, chick pea and pigeon pea- chemical composition of peanut (Ground nut) and sesame(Gingili).

UNIT – III:

Physiology of seed/ grain development-phases of growth and growth curves- role of flag leaf in grain-filling and role of pericarp and seed coats in seed development.

UNIT – IV:

Synthesis and accumulation of starches in developing cereal grains- synthesis and accumulation of proteins in developing legume seeds- synthesis and accumulation of fatty acids, lipids/ oils in developing oily seeds.

UNIT – V:

Physiology of seed dormancy and germination, types of seed dormancy; physical and chemical methods to overcome seed dormancy. Physiology of seed germination- role of hydrolytic enzymes in degradation of starches, storage protein and lipids/oils in storage organs/Tissue and translocation of hydrolysed products to the developing embryonal Axis- role of phytohormones in regulation of the synthesis and, activity of hydrolytic enzymes.

PRACTICALS:

1. Anatomical studies of seed coat in members of Malvaceae and Fabaceae.
2. Study of seed viability by tetrazolium chloride method.
3. Seed of seed viability permeability test (in at least two samples) stored for different periods of time.
4. Determination of electrical conductivity of leachates.
5. Extraction and estimation of
 - (a). Total soluble carbohydrates by anthrone reagent method.
 - (b). Total free amino acids by ninhydrin reagent method.
6. Seed quality evaluation by starch- agar- iodine assay method.
7. Simple assay for L-amylase from germinating seeds of wheat or paddy.
8. Simple assay for protease from germinating green gram or pea seeds.
9. Simple assay for lipase from germinating seeds or castor bean.
10. Effect of thermic changes magnetism and electric shock on seed germination.

REFERENCES:

1. Bewley, J.D and M. Black (1978). Seed biology Vol. I & II Academic press, New York.
2. Bewley, J.D and M. Black (1985). (Eds.) Seeds; Physiology of development and germination plenum Press: New York.
3. Murray, D.R. (1984). (Ed.) Seed physiology Vol I & II Academic Press: Sydney – New York- London.
4. Khan, A.A. (Latest edition),(Ed) The physiology and biochemistry of seed Dormancy and germination. North-Holland Publishing company: Amsterdam- New York- Oxford.
5. Metha S.L. Lodha, M.L. and Sane P.V. (1993). (Eds.) Recent advances in Plant Biochemistry. Publication and information division ICAR, New Delhi.
6. Well J.H. (1990). (Ed.) General Biochemistry Wiley Eastern Limited, New Delhi.
7. D.K. Salunkhe. Kadam S.S and Chavan J.K. (1985) (Eds.) Post harvest Biotechnology of food legumes. CRC Press, Boca Raton, Florida USA.
8. Salunke D.K. Chavan J.K. and Kadam S.S., (1985) (Eds.) CRC Press, Boca raton. Florida. Post harvest biotechnology of cereals. USA.
9. Arora S.K. (1982). (Eds.) Chemistry and biochemistry of food legumes. Oxford and IBH publication New Delhi.
10. Norton, (1976). (Eds.) Plant proteins butlerworths – London Boston.
11. Dausant.J. Mosse.J. and Vaughan, J. (1983). (Eds.) Seed proteins Academic Press., New York, USA.
12. Summerfield R.J. and Bunting A.H. (1980). (Eds.) Advances in legume science, Kew Richmond, Surrey, UK. Royal Botanic Gardens.
13. Dure L.S. (1975). Seed formation. Ann.Rev.Plant Physiol 26: 259 – 78.
14. Murray D.R. (1987). Nutritive role of seed coats in developing legume seeds. Amer. J. Bot. 74: 1122 – 1137.
15. Stump P.K. and conn E.E. (1981). (Eds.) The biochemistry of plant vol. 6 Academic Press, New York.
16. Higgins T.J.V. (1984). Synthesis and regulation of major proteins in seeds. Ann Rev. Plant physio. 35: 191 – 21.
17. Bryant J.A.(1985). Seed Physiology. Edward Arnold London.

SEM.II

Paper IX - INDUSTRIAL MICROBIOLOGY

UNIT I:

History and scope of industrial microbiology, concepts, characterization and classification of micro organisms, importance of microbial enzymes in industry – commercial microbial enzymes – methods of industrial production of enzymes. Manufacture of vitamins like riboflavin and vitamin B.

UNIT II:

Fermentation techniques – products of microbial metabolism – SCP – Use of microbes in textile and cottage industries, cellulolytic and pectolytic enzymes obtained from microbes. Microbiology of soil and water, rhizosphere and mycorrhizae.

UNIT- III:

Development of industrial fermentation process, screening, detection and assay of fermentation products, stock culture, fermentation.. Media, industrial preparation, scale up of fermentation down stream process, Biological waste treatment.

UNIT-IV:

Source of important antibiotics, their chemistry and efficacy in controlling diseases of human beings and plants, industrial production of amino acids, organic acids, lactic acid, citric acid and glutamic acid, manufacture of vinegar by microbial oxidation transformations.

UNIT-V:

Petroleum microbiology-petroleum formation, petroleum recovery, oil spills. Deterioration of materials – paper, textiles, and cordage. Painted surfaces prevention of microbial deterioration, immobilized cell technology.

PRACTICALS:

1. Media preparation – solid, liquid
2. Isolation and identification of bacteria, yeast and fungi from different sources.
3. Inoculation of fungi and bacteria on selected media and maintenance of cultures.
1. Hanging drops differential staining.
2. Isolation and identification of different types of fungi and bacteria from curd, rotten fruits and vegetables.
3. Soil microbiology – dilution and plating – estimation of microbial content of the soil.
4. Preparation of spawn for cultivation of edible mushrooms.
5. Micrometry.

REFERENCE:

1. Casida, IC, 1968. Industrial microbiology Wiley Eastern Ltd.
2. Chahal D.S. 1991. Food feed and fuel from Biomass, IBH. New Delhi.
3. Paul. A. Ketchum 1968. Micro biology, John Wiley & Sons USA.
4. Pelezer M.J.(Jr.), Chan, E.C.S. and Kreig, N.R, 1993. Microbiology 3rd Edn. Tata McGraw Hill, New Delhi.
5. Stanier, Dounduroff and Adelbergi – General Microbiology.
6. Alexander, M – Soil Microbiology.
7. Frobischer – Microbiology.

SEM.II

Paper X - PHYTOPATHOLOGY

UNIT-I:

Plant pathology; its scope and relationships to other sciences. Concept of plant diseases; saprophytes and parasitism (heterotrophic organisms and mode of nutrition), pathogenicity. Classification of plant diseases plant diseases control. Principles and methods. Legislative methods, cultural methods, soil and sand treatment, biological, control, chemical control, Control through resistant varieties, quarantine. Plant disease forecasting.

UNIT-II:

Symptoms, causal organism, disease cycle and control of pathogenic diseases caused by pathogenic fungi with special reference to the following diseases. Club root of crucifers, Black wart of potato, Powdery mildews wheat, Brown spot of Rice, Early blight of Potato, Angular leaf spot and Black arm of Cotton, Bacterial blight of Paddy, Sandal spike. Grassy shoot disease of Sugarcane.

UNIT-III:

Pathogenesis penetration and entry, colonization of the host, factors affecting in infection, enzymes in plant diseases – cell wall degrading enzyme. Toxins in relation to plant diseases: a general account, mode of action and types.

UNIT-IV:

Plant responses to post infectious agents; alteration in growth photosynthesis, respiration, nitrogen metabolism, aromatic compounds, and growth regulators-vascular transport.

UNIT V:

Defence mechanism; Genetics of plant-pathogen interaction. Effect of environment on Diseases development. Plant diseases, epidemiology, forms of epidemics and conditions governing some of the important crop diseases.

PRACTICALS:

1. Anatomical studies of infected regions.
2. Rhizosphere and rhizoplane studies.
3. Analysis of exudates
4. Enzymes assay in infected plants.
5. Comparison between infected and uninfected plants with reference total carbohydrate and protein.
6. Respiratory changes in infected and uninfected plants.(Demonstration only).
7. Estimation of total chlorophyll in infected and healthy plants.
8. Effect of chemicals in control of diseases.
9. Laboratory testing of the efficacy of common fungicides.
10. Biological control - methods like Tobacco leaf extracts, turmeric, neem oil, pungam oil etc.,

REFERENCES:

1. Agrios, Gergon, n 1988, Plant pathology academic press London.
2. Anega, KG, 1993, Experiments in microbiology, plant pathology, and tissue culture. Wishwz prakasam (willey esternlimited).
3. Boicer, F and Cook RJ 1974 Biological control of plant pathogens, Sanfrancisco.
4. Braual NK and others 1980, Text book of plant pathology. Oxford publishing company New Delhi.
5. Bilgrani, KG and Dubey HC 1980 a Text book of modern plant pathology.
6. Butler EJ Jones 1986 Plant pathology periodical book agency, Delhi.
7. Ganulco HC and KAR, AK 1986 College botany volume11. central book depot, Calcutta.
8. Holliday, P, 1980 Fungal diseases of tropical crops. Cambridge University.
9. Manners JG 1982 Principles of plant pathology Cambridge University Press Cambridge.
10. Mehrotra, RS 1979, Plant pathology 2nd Edition. Tata McGraw hill Publi. New Delhi.
11. Manibushanrao K (ed) 1994 Fecent advancement in the biocontrol of plant pathogens.
12. Puthak vn 1984 Laboratory manual of the plant Pathology, 2nd. Oxford and Ibh Publishing company, New Delhi.

SEM.III

Paper XI - TAXONOMY AND BIOSYSTEMATICS

UNIT-I:

A brief historical account of the classification of angiosperms up to the present day. Systems of classification: Detailed study of Bentham and Hooker, Engler and Prantl, Bessy, Hutchinson, Takhtajan, Cronquist – Merits and demerits. International code of Botanical Nomenclature, Typification, Principles of priority and their limitations, Effective and valid publication, citation, retention, choice and rejection of names.

UNIT-II:

Menispermaceae. Polygalaceae, Caryophyllaceae. Portulacaceae, Oxalidaceae, Tiliaceae. Combretaceae. Onagraceae, Lythraceae, Aizoaceae.

UNIT-III:

Oleaceae, Gentianaceae, Apocynaceae, Boraginaceae, Bignoniaceae, Pedaliaceae, Nyctaginaceae, Chenopodiaceae, Loranthaceae, Commelinaceae, Aroideae, Cyperaceae, Economic importance of families mentioned.

UNIT-IV:

Flora, Monograph, Keys, Botanical gardens. Source of taxonomic information, Anatomy, Embryology, Palynology, Cytology and Ultra structure and phyto chemistry.

UNIT-V:

Biosystematic- its aim and scope. Biosystematic categories, Phenotypic plasticity. Turrerson's work. Population concept. Species and genus concepts, Genecology, ecological differentiation, Numerical taxonomy.

PRACTICALS:

Study of the characters of the above-mentioned families, Economic importance, Preparation of artificial key and submission of herbarium sheets – 50.

REFERENCES:

1. A classification of flowering plants Vol. I & II Rendle A.R. Cambridge University press.
2. Taxonomy of vascular plants. Lawrance.H.M. Mac Millan & Co.
3. Principles of Numerical Taxonomy. Sokal, S.R and Sneath P.H, N.H Fremem & co.
4. New concepts in flowering plants taxonomy. Heslop. J. Herrison.
5. Plant Taxonomy – Hey wood, V.H. English hand book society
6. Principles and methods of Plant Biosystematics-solbrig. The Mac Millian Company.
7. An introduction to plant Nomenclature. S.S.R. Bennet international Book distribution India.
8. An aid to the International code of Botanical. Hentry A.N. Today & Tomorrow Pvt. Ltd.
9. Principles of angiosperm Taxonomy. Devis & Hey wood Krieger publication Co.
10. Introduction to Principles of Plant Taxonomy Sivarajan Oxford & IBH Pvt. Company.
11. A hand book of field and Herbarium methods Jain S.K. and Rao R.R. Today and Tomorrow Publications.
12. Plant Taxonomy and Biosystematics. Stace clive. A Edward Arnold.

SEM.III

Paper XII - FOREST BOTANY

UNIT I:

Scope; merits of combining traditional botany and forestry practices. General introduction to – forest, natural and man made; different examples: tropical, temperate, evergreen, semi evergreen, deciduous, monoculture, multipurpose, social, industrial. Forest and climate; forest and biodiversity, forest and gene conservation, forest and ecosystem, forest and civilization. Geographical history of the forest vegetation: natural Vs artificial. Characteristics of each. And categories under each. Special emphasizes on social forestry. Industrial forestry. Multipurpose forestry. And preservation of natural forestry, pollution control.

UNIT II:

Forest genetics, Forest physiology, forest ecology – strong interrelationships. Macro dynamic ecosystem reserves, hydrological cycles, balance. Identification of timber plants based on vegetative features. Seedlings, leaves, bark branching pattern architectural models of trees. Major and minor forest products, use and misuse of forests by man, direct and indirect forest wealth, forest policies, forest protection through peoples committee.

UNIT III:

Silviculture: concept and scope of study, forest in general form, composition, classification of world forests and Indian forests. Classification based on site quality density, tolerance, crown; water cycles of forest. Photosynthetic processes in forest: nitrogen and mineral nutrition in forests.

UNIT IV:

Seed dynamics in forest: seed production, dissemination, germination, establishment and mortality, growth of trees in general terms – height, diameter, volume, growth of stands – gross increment, net increment, stand reaction to various types of cuttings. Mensuration: definition, direct measurements, direct and indirect estimate, and prediction. Measurement of diameter – rules and methods, measurement of height – different rules, methods, instruments, total height and merchantable length.

UNIT V:

Measurement of volume – common units, different methods and procedures of volume measurements. Measurement of age: direct estimate, averages, standard error, and sampling, General concept of indirect estimate based on one or more independent variables. Forestry for social and national development. Progress to be achieved in social forestry, industrial forestry and multiple forestry.

PRACTICALS:

1. Ecological studies on forest soil analysis, soil mycorrhiza, succession and natural balance in selected areas.

2. Biomass studies – based on number, energy, fresh and dry weight.
3. Selected forest ecosystem analysis through project work.
4. Defoliation studies related to climate.
5. Physiological studies on photosynthetic rates of different strata of vegetation.
6. Germination studies – percentage, competition.
7. Water demand, collection and evaporation in selected forest areas.
8. Physical features of wood – height, diameter, density, moisture, specific gravity, tension, strength, modulus of rupture.
9. Anatomical features of wood – porous, non-porous, ring-porous, diffused-porous, different kinds of wood parenchyma rays.
10. Menturation – measurement of tree height, diameter, volume, estimation, prediction, standard error, growth pattern and factors affecting growth.

REFERENCES:

1. Principles of silviculture, Frederick S. Backer, Mc Graw Hill Book Co. NY, 1950.
2. Forest menturation, Donald Bruce and Grancis X. Schumacher, Mc Graw Hill Book Co. NY, 1950.
3. Multipurpose tree germplasm, Ed. Burley S. and Von Carlowitz P. international council for research in agroforestry, Nairobi, 1984.
4. Tropical forests, Ed. Holm – Neilsen L.B. Nielsen. DC and balslev II Academic press, London, 1989.
5. Plant anatomy – A Fahn.
6. Plant anatomy – K. Esau.
7. Indian woods – six volumes Ed. Chowdhuri, Pub. Forest research institute, Dehra Dun.

SEMESTER - III

PAPER – XIII - PLANT PHYSIOLOGY

Marks: 75, CIA: 25

Credit: 4

UNIT - I

Water relationship of plants: Diffusion - Osmosis- water potential and Imbibition - Transpiration and stomatal mechanism. A General account of absorption and translocation of water - assimilates.

UNIT - II

Photosynthesis: Photosynthetic pigments - Mechanism of Photosynthesis : Light reaction – two pigment systems. Electron carriers – photophosphorylation - Carbon fixation in C₃ and C₄ plants - CAM pathway. Photorespiration (out line only).

UNIT - III

Respiration: Glycolysis - outline of pentose phosphate pathway - Pyruvate metabolism - TCA cycle - electron transport system coupled with Oxidative phosphorylation.

UNIT - IV

Growth hormones: Auxin, Gibberellins, Cytokinin, Ethylene, ABA – structure, distribution, physiological effects.

UNIT - V

Physiology of flowering: Photoperiodism, phytochrome, vernalization, plant movements, seed dormancy.

PRACTICALS

1. Determination of osmosis and plasmolysis.
2. Determination of rate of transpiration using photometer.
3. Determination of rate of photosynthesis under different CO₂ concentrations.
4. Determination of rate of photosynthesis under different conditions.
5. Determination of rate of respiration.
6. Seed viability test using tetrazolium.

REFERENCE

1. Verma, V. 2007. Text book of plant physiology. Ane books pvt. Ltd.
2. Malick, C. P. 2010. Text book of plant physiology. Kalyani publisher.
3. Mukherji, S. 1995. Text book of plant physiology. Tata McGraw-hill education private Ltd.
4. Singh, Sp. 2001. Text book of plant physiology. Academic internet publishers.
5. Srivastava, H. S. 2005. Text book of plant physiology. Rastogi Publications.
6. Verma, V. 2006. Text book of plant physiology. Ane books pvt. Ltd.
7. Jain, V. K. 2005. Fundamentals of plant physiology. S. Chand and company Ltd.

SEM.III

PAPER – XIV - PHYTOCHEMISTRY

Marks: 75, CIA: 25

Credit: 4

UNIT - I

Carbohydrates: Classification, stereo isomerism, optical isomerism, structure of monosaccharide (Glucose), disaccharides (Maltose & Sucrose) and polysaccharides (Starch).

UNIT - II

Amino acids: Classification, structure, properties and biosynthesis of amino acids.
Proteins: Classification, structure (Primary structures – Peptide bond, N and C terminals), secondary (types of Bonding in secondary structures) and tertiary structures (types of bonding in tertiary structure). Physical and chemical properties of proteins.

UNIT - III

Enzymes: Nomenclature, classification and properties. Mechanism of enzyme action (Lock and key & induced fit model) and factors affecting enzyme activity (substrate, pH and temperature).

Lipids: Classification of lipids, saturated and unsaturated lipids. Structure of simple lipids (Fats and Oils), compound Lipids (Phospholipids) and derived Lipids (carotenoids). Oxidation and biosynthesis of any one fatty acid.

UNIT - IV

Nucleic acids: Physical and chemical properties of nucleic acids (DNA & RNA) and biosynthesis of DNA and RNA.

Vitamins: Structure, importance, source, deficiency and symptoms of water soluble and fat soluble vitamins.

UNIT – V

Biologically important phenolic compounds (phenols, tannins & flavonoids), terpenoids (essential oils, gibberellins and steroids), alkaloids and glycosides. Integration of metabolic pathways.

PRACTICALS

1. Estimation of starch.
2. Estimation of protein.
3. Estimation of lipid.
4. Estimation of amino acids.
5. Separation of plant pigments and amino acids by Paper Chromatography.
6. Determination of enzyme activities – Amylase, nitrate reductase and peroxidase.
7. Qualitative estimation of phenols, terpenoids and alkaloids.

REFERENCE

1. Campbell, M.K. 1999. Biochemistry, Saunders College Publishing, New York.
2. Harborne, J.B. 1999. Plant Biochemistry. Chapman & Hall, New Delhi.
3. Jain, J.L. 2005. Fundamentals of Biochemistry. S. Chand & Co. New Delhi.
4. Plummer, D.T. 1996. An introduction to practical biochemistry. McGraw Hill.
5. Satyanarayana, U. 2005. Biochemistry. Books and Allied (P) Ltd. Calcutta.
6. Conn E.E. and P.K. Stumpf. 1987. – Outlines of Biochemistry, Wiley Eastern Ltd, Chennai.
7. Lehninger, A.I. 1987. Biochemistry, Kalyani Publishers, New Delhi
8. Lubert Stryer. 1986. Biochemistry, CBS Publishers, New Delhi.
9. Veerakumari, I. 2004. Biochemistry, MJP Publishers, Chennai.

SEM.III

ELECTIVE - I. PHYSIOLOGICAL EMBRYOLOGY OF ANGIOSPERMS

UNIT – I:

Anther and pollen – morphology, cytology and physiology of tapetum, pollen wall formation, pollen analysis, physiology of pollen and germinability, pollen sterility. Anther and pollen culture and their importance in plant breeding.

UNIT – II:

Female gametophytes- Ultra structure of components, synergid and antipodal haustoria, nutrition of embryo sac, fertilization.

UNIT – III:

Embryo-embryogenic types, structure, cytology and function of suspensor, physiological and morphological relationship of endosperm and embryo, Embryo culture, Apomixis and polyembryony.

UNIT – IV

Endosperm- types, endosperm haustoria, their extension and persistence, function, storage metabolites, endosperm culture.

UNIT – V

Fruit- development, role of growth substances, parthenocarpy. Scope of embryology present and future status- Embryology in relation to phylogeny.

PRACTICALS:

1. Types of anther tapetum.
2. Pollen analysis – gross morphology of pollen.
3. Study of seed appendages from dissections.
4. Pollen germinability and growth.
5. Pollen germination on stigma-Maceration.
6. Dissection of embryos.
7. Methods to induce parthenocarpy.

(Candidates should also have the knowledge of the respective paper in M.Sc ., (general) level in practicals).

REFERENCES:

1. Austin 1968. Fertilization, Practice Hall of India, New Delhi.
2. Bhojwani S. S and S. P Bhatnagar 1985. The embryology of angiosperms – Vikas publishing House Pvt Ltd. New Delhi.
3. Davis. B 1966 systematic embryology of angiosperms.
4. Johri. B. M 1984 Systematic embryology of angiosperms.
5. Johri. B.M 1982. Experimental embryology of vascular plants. Narasu publications house, New Delhi.
6. Maheswari. P. 1958. Introduction to the embryology of angiosperms Mc Graw Hill Book Co Inc., New York.

7. Maheswari. P. and M. S. Rangaswamy (ed) 1963. Plant tissue and organ culture. International Sc. Plant morphogenesis. Delhi.
8. Raghavan V. 1976. Experimental embryogenesis in vascular plants. Academic press, London.
9. Shivanna, K. R. and B. M Johri. 1985. The angiosperm pollen structure and function. Wiley-Eastern Ltd.

SEM.IV

Paper XV - BIOTECHNOLOGY AND GENETIC ENGINEERING

UNIT-I:

Scope and importance of Biotechnology. Tools of genetic engineering; Enzymes and cloning vectors, Recombinant DNA and gene cloning. Polymerase Chain Reaction (PCR) and Gene amplification. Isolation, sequencing and synthesis of genes.

UNIT-II:

Gene transfer methods in plants. Transgenic plants. Chloroplast and Mitochondrion engineering maps of plant genomes.

UNIT-III:

Transfer of nif genes to Eukaryotes, Genetics of Diazotrophs (Nod gene, nif gene cloning and Hup genes). Protein engineering- rationale, assumptions , steps involved, modeling and methods. Production of encapsulated seeds.

UNIT-IV:

Isolation and culturing of microorganisms for the production of organic acid (ethanol), enzyme (Alpha amylase) and antibiotics (penicillin) by microbial fermentation. Biotechnology in paper industry, biohydro- metallurgy and biomineralisation, biofertilizers, bioinsecticides and application of genetically engineered bacteria.

UNIT-V:

Current levels of biodiversity, alpha (α) and beta (β) biodiversity, extinction and endangered species, steps to preserve biodiversity, in situ and ex situ conservation- gene banks, species conservation. Intellectual Property Rights (IPR), Intellectual Property Protection (IPP) and patenting of biological material.

PRACTICALS:

1. Demonstration of techniques of in vitro culture of various explants.
2. Isolation in plant protoplasts (e.g. Tobacco, Petunia) using enzyme available commercially and estimation of their yield and viability.
3. Isolation of plant genomic DNA and checking its purity (Onion).
4. Isolation of chloroplast by using column chromatography.
5. Isolation of plasmid from microbes.
6. Production of ethanol using microbes.

7. Biodegradation of paper and pulp industry effluent.
8. Absorption of metals by using microbes.
9. Culture and isolation of chemical fertilizers and pesticides removal using microbes.

REFERENCES:

1. Callow, J.A., Ford Lloyd, B.V. and Newbury, H.J. (1997). Biotechnology and Plant Genetic Resources; Conservation and Use. CAB International, Oxon, UK.
2. Dubey, R.C. (1999). A Text Book of Biotechnology. S. Chand & Company.
3. Glazer, A.N. and Nikaido, H. (1995). Microbial Biotechnology. W.H. Freeman & Company, New York, USA.
4. Gupta, P.K. (1998). Elements of Biotechnology. Rastogi Publication.
5. Ignachimuthu, S.(1995). Basic biotechnology. TaTa Mc Graw-Hill Publishing Company Ltd., Madras.
6. Kartha, K.K. (1985). Cryopreservation of Plant cells and organs. CRC Press, Boca Ration, Florida, USA.
7. Santharam, S. and Montgomery, J.F. (1999). Biotechnology, Biosafety and Biodiversity. Oxford and IBH Publishing Co., New Delhi.

SEM.IV

ELECTIVE-II. INTRODUCTION TO BIOINFORMATICS

UNIT-I:

Introduction to concepts of Bioinformatics.

What is Bioinformatics?

History of Bioinformatics.

Applications and scope of Bioinformatics.

Computer Architectures.

Number system

Memory units

Auxillary storage devices

Input and output devices

-Key words, mouse, web camera, floppies, CD, monitors and printers.

Memory, hard disc, RAM and external memory.

UNIT-II:

Language. Windows environment and Internet.

Introduction to language

Operating systems. Windows

Windows environment; Menu bar, Task bar, system tray

Applications: Word, power point, excel

Internet; History, principles, uses and applications

HTTP, protocol, [WWW.FTP](http://www.ftp). E-mail. E-groups. Browsers, search engines and searching

tip.

UNIT-III:

- The biological databases
- What is a databases?
- Type of biological databases
 - Sequence databases
 - Structural databases
 - Literature databases
- Submission and retrieval of information through web and ftp.

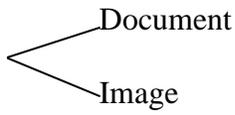
UNIT-IV:

- Sequence Analysis
 - Sequence alignment
 - Global Vs local alignment
 - Substitute matrices: BLOSUM and PAM
 - Scoring methods
 - Gap introduction in the alignment gap penalties.
- Similarity searching tools
 - Using of sequence similarity search BLAST and FASTA
- Multiple sequence alignment and phylogenetic analysis
 - Impotents of multiple sequence alignment.
 - Multiple sequence alignment tools
 - Phylogenetic analysis:
 - Homologs, paralogs and Zenologs
 - Uses of cluster phylogenetic analysis.

UNIT-V:

- Prediction of gene function
 - Prediction of gene in eukaryote and prokaryotes.
 - Translation of gene into protein.
 - Protein secondary structure prediction.
 - Prediction of domains, motifs and profiles of proteins.

PRACTICALS:

1. Document files creation using MS word. Creating document style.
2. Internet – E-mail and mail attachment
 - Downloading webpage
 - Saving a web page
 - Printing the web page
- Search engine 
3. Visit to genebank database
 - NCBI
 - EMBL
4. Visit to protein database

- Swis prot
- PDb
- 5. Use of literature database
 - Virtual library
 - Agricola
 - Pub med
- 6. Use of similarity search tools
 - NBLAST
 - PBLAST

REFERENCES:

1. Bioinformatics. A practical guide to analysis of genes and proteins. 1998. Baxevanis and Quellette.
2. Bioinformatics: A biologist's guide to biocomputing and the internet. 2000. Stuart M. Brown.
3. Bioinformatics for beginners. 2002 K.Mani and Vijayaraj.
4. Introduction to Bioinformatics. 2002. Arthur M.Lesk.
5. Introduction to Bioinformatics. 1999. T.K.Attwood and Parry-Smith.
6. Introduction to Bioinformatics. 2002. S.SundaraRajan and R.Balaji.
7. Bioinformatics: Sequence and genome analysis. 2001. David W. Mount.

SEM.IV

ELECTIVE - III HORTICULTURE

UNIT I:

History and importance of horticulture. Soil types and preparation and treatment. Chemical fertilizers – Nitrogen, phosphorous, potassium, mixed fertilizers, organic fertilizers and bio fertilizers. Methods of plant propagation – layering, cutting, grafting, budding and their advantages.

UNIT II:

Lawn making, gardening, bonsai. Out door garden types and arrangements – annuals, biennials. Perennials with common examples and culture: influence of environment, training, pruning and transplanting.

UNIT III:

Outdoor floriculture, cut flower, flower arrangement, Pomology – cultivation fruit crops – Mango, Grapes, spacing, irrigation, field disease control. Olericulture – cultivation of vegetables – Tomato, Ginger, Potato planting; Erosion control.

UNIT IV:

Pest and weed management – historical, theoretical, philosophical and biological insect pest suppression. Weed problem and ecological perspective, biological control of weeds in Indian region.

UNIT V:

A preliminary knowledge about glass houses – growth regulators in horticulture, growth retarders, sex modification, flower induction, parthenocarpy, harvesting seed storage, preservation of fruits and vegetables.

PRACTICALS:

1. Fertilizers – biological and industrial.
2. Establishment of nursery, different containers, soil transplantation techniques.
3. Methods of raising a lawn.
4. Plant propagation – layering, cutting, grafting.
5. Visit to nursery and knowledge about the instruments used in horticulture.
6. Layout of garden, plan of a rock garden, glass house, kitchen garden, artificial pond.

REFERNECES:

1. Al David – A complete guide to gardens.
2. Manibushan Rao – Horticulture.
3. Nanda and Kochar – Vegetative propagation of plants.
4. Randhava G. S. – Floriculture in India.
5. Subba Rao – Bio fertilizers in India.
6. Vishnu Swarup – Garden flowers
7. Readers digest – Complete library of gardens (3 volumes) Kissan world.
8. Borthkur S. and Ghen – Studies on weeds and their control.
9. Reinert and Bajaj 1977 – Plant cell, tissue and organ culture, Narosa publication. New Delhi.