

**BHARATHIAR UNIVERSITY, COIMBATORE:641 046**

**B.Sc. BOTANY**

**(For students admitted during the academic year 2015 – 2016 batch & onwards)**

**SCHEME OF EXAMINATION - CBCS PATTERN**

Part	Study Components	Course title	Ins. hrs/ week	Examinations				Credit
				Dur.Hrs	CIA	Marks	Total Marks	
<b>SEMESTER I</b>								
I	Language – I		6	3	25	75	100	4
II	English - I		6	3	25	75	100	4
III	Core Paper – Plant diversity I		4	3	25	75	100	4
	Core Paper II Fundamentals of Computer Applications		4	3	20	55	75	3
	Core Practicals - I		2	-	-	-	-	-
	Allied -I Paper I Zoology / Chemistry		4	3	20	55	75	3
	Allied Practicals		2	-	-	-	-	-
IV	Environmental Studies #		2	-	-	50	50	2
<b>SEMESTER II</b>								
I	Language – II		6	3	25	75	100	4
II	English - II		6	3	25	75	100	4
III	Core Paper III - Plant diversity II (Bryophytes, Pteridophytes, Gymnosperms & Palaeobotany)		8	3	25	75	100	4
	Core Practical - Paper I		2	3	40	60	100	4
	Allied -II - Paper II Zoology / Chemistry		4	3	20	55	75	3
	Allied Practical - I		2	3	20	30	50	2
IV	Value Education – Human Rights #		2	3	-	50	50	2
<b>SEMESTER III</b>								
I	Language – III		6	3	25	75	100	4
II	English - III		6	3	25	75	100	4
III	Core Paper IV Cell Biology & Lab techniques		3	3	20	55	75	3
	Core Paper V ANATOMY & Embryology		4	3	25	75	100	4
	Allied III - Paper I Chemistry / Zoology		4	3	20	55	75	3
	Allied Practical		2	-	-	-	-	-
	Skill based Subject – Biodegradable waste management Paper I - Introduction to Environmental Pollution		3	3	20	55	75	3
	Tamil @ / Advanced Tamil# (OR) Non-major elective - I (Yoga for Human Excellence)# / Women's Rights#		2	3	50		50	2

<b>SEMESTER –IV</b>							
I	Language – IV	6	3	25	75	100	4
II	English - IV	6	3	25	75	100	4
III	Core Paper VI Medicinal Botany and Human Welfare	5	3	25	75	100	4
	Core Practical II - Paper IV, V & VI	2	3	40	60	100	4
	Allied IV - Paper II Chemistry / Zoology	4	3	20	55	75	3
	Allied III Practical	2	3	20	30	50	2
IV	Skill based Subject – Biodegradable waste management Paper II – Urban waste and management	3	3	20	55	75	3
	Tamil @ /Advanced Tamil # (OR) Non-major elective -II (General Awareness #)	2	3	50		50	2
<b>SEMESTER – V</b>							
III	Core Paper VII - Taxonomy of Angiosperms & Economic Botany	5	3	25	75	100	4
	Core Paper VIII – Genetics Plant Breeding and Biostatistics	4	3	25	75	100	4
	Core Paper IX -Ecology & Phytogeography	4	3	25	75	100	4
	Core Paper X Microbiology-Fundamentals of Microbiology	4	3	20	55	75	3
	Core Practical Paper VII, VIII, IX & X	4	-	-	-	-	-
	Elective – I	4	3	20	55	75	3
	Elective Practical	2	-	-	-	-	-
IV	Skill based Subject – Biodegradable waste management Paper III – Industrial Wastes and Management	3	3	20	55	75	3
<b>SEMESTER – VI</b>							
III	Core Paper XI Biophysics Biochemistry & Plant Physiology	5	3	25	75	100	4
	Core Paper- XII Horticulture	5	3	25	75	100	4
	Elective – II	5	3	20	55	75	3
	Elective – III	5	3	20	55	75	3
	Core Practical III Paper VII, VIII, IX, X & XI	4	3	40	60	100	4
	Core Practical IV - Practical for Elective subjects I, II & III	2	3	40	60	100	4
	Skill based Subject – Biodegradable waste management Practical	4	3	30	45	75	3
	Extension Activities @	-	-	50	-	50	2
	<b>Total</b>					3500	140

@ No University Examinations. Only Continuous Internal Assessment (CIA)

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<b>List of Elective papers (Colleges can choose any one of the paper as electives)</b>		
Elective – I	<b>A</b>	Microbiology – Applied Microbiology
	<b>B</b>	Plant Pathology
	<b>C</b>	Economic Botany
Elective – II	<b>A</b>	Biotechnology – Concept & Techniques
	<b>B</b>	Seed Technology
	<b>C</b>	Pomology
Elective - III	<b>A</b>	Biotechnology – Applied biotechnology
	<b>B</b>	Ethnobotany
	<b>C</b>	Bioinformatics

**PAPER - I**                      **4 Hrs / Week**  
**PLANT DIVERSITY - I**  
**Algae, Fungi, Lichen, and Plant Pathology**

**Unit - I**

Algae : Classification of Algae - G.M. Smith, Economic importance of algae, Study of the structure, reproduction and life cycle of Spirulina, Navicula and Oedogonium.

**Unit - II**

Structure, reproduction and life cycle of Dictyota and Polysiphonia

**Unit - III**

Fungi and Lichen : Classification of fungi (Alexopoulos & Mims 1973) structure and reproduction of Albugo, Saccharomyces, Puccinia and Polyporus.

**Unit - IV**

Structure and reproduction of Cercospora. Structure and reproduction of Lichens, foliose and fruticose. Economic importance of fungi.

**Unit - V**

Plant Pathology : Study of the following plant diseases with special reference to the symptoms, causal organisms, and disease cycle and control measure of

1. Blast disease of rice
2. Red rot of sugarcane
3. Citrus canker
4. TMV

**Practical :** Study of the types mentioned in the syllabus.

**References :**

- Algae-S.Sundararajan.,Anmol Publications.,New Delhi.2  
College Botany - Vol. I. Gangulee and Kaur New Central Book Depot.,Culcutta.  
Cryptogamic Botany. Vol.I- G.M. Smith.Tata McGraw Hill.,New Delhi.  
A text Book of Botany - Algae - B.P. Pandey. S.Chand & Co., NewDelhi.  
Algae - Vashishta, P.C S.Chand & Co., NewDelhi.  
Algae - B.P. Pandey S.Chand & Co., NewDelhi.  
Algae&Bryophytes.,A.Ragland., Saras Publication.,Nagercoil., Tamil Nadu  
Phycology, A.Ragland., Saras Publication.,Nagercoil., Tamil Nadu  
Fungi&Plant Pathology., A.Ragland., Saras Publication.,Nagercoil., Tamil Nadu  
Fungi ,Bacteria and Viruses, DubeH.C., Agrobios., Jodhpur  
Virology.,S.Sundararajan.,Anmol Publications.,New Delhi.2  
A text Book of Botany – Algae.,Kavita&Tyagi., Scintific Pub.,Jodhpur.  
Fungi- SKSingh.,Campus Books Int.,NewDelhi.

**PAPER - II**                      **4 Hrs / Week**  
**FUNDAMENTALS OF COMPUTER APPLICATIONS**

**Unit - I** : Introduction to computer - components of computer - capabilities of computer - hardware - software-classification of software language-machine language -high level language-compilers, translators-input output storage devices - operating system/DOS/windows.

**Unit - II** : Introduction to internet-data communication concepts - W W W e-mail-smiley (emotion) - Acronyms, URL, FTP,INTERNET, Service Provider - Internet addressing (Domain IP)-Net Browser, search engines, news groups-intranet -web server-web pages.

**Unit - III** : Windows - 98, Xp, Windows – 8, Wi-Fi, Bluetooth and Android (overall view )

**Unit -IV** : - Microsoft word - creation of documents - Excel-spread sheet, workbook charts and table.

**Unit -V** : - Microsoft -Power Point - features - slide presentation MS Access - Creating a database.

**Practicals:**

1. Creating, editing and printing a document in MS-Word
2. Creating a table in MS-Excel
3. Creating a chart in MS-Excel
4. Creating slide presentation in MS-Power-point
5. Web Browsing
6. E-Mailing

**References :**

Fundamentals of Computer., Rajaraman.V Prentice hall of India PVT Ltd., New Delhi  
Digital Design-Mooris mano., Prentice hall of India PVT Ltd., New Delhi.  
Structured Computer Organisation., Tanenbaum A.S,Prentice Hall of India PVT Ltd., New Delhi  
.  
Introduction to Computers. Peter Norton, Tata Mc Graw-Hill, New Delhi  
Teach Yourself Windows in 24hrs Greg Perry, Techmedia Publication, New Delhi  
Lean Windows 98 in a week end Michal Meadhra and Faithe Wempen Galotia, New Delhi.  
The Internet-Complete Reference, Harley Hahn, Tata Mc Grw-Hill, New Delhi.

**PAPER - III**

**8 Hrs / Week**

**PLANT DIVERSITY - II**  
**(Bryophytes, Pteridophytes, Gymnosperms and Palaeobotany)**

**Unit - I** : Bryophytes

Classification of Bryophytes (Rothmaler). Structure and reproduction of Marchantia and Polytrichum.

**Unit - II** : Pteridophytes

Classification of Pteridophytes (K.R.Sporne) Stellar evolution, Structure and Reproduction of Selaginella and Equisetum.

**Unit - III**

Heterospory and Seed Habit, Structure and Reproduction of Adiantum and Marsilea

**Unit - IV** : Gymnosperms. Classification of Gymnosperms (K.R.Sporne) Structure and Reproduction of Cycas and Gnetum.

**Unit - V** : Palaeobotany. Geological time scale, Radio carbon dating, Fossils and kinds of fossils. Study of the following : Lepidodendron (Stem), Lepidocarpon (Fruit) and Stigmaria (Root).

**Practicals:** Study of the types mentioned below.

Bryophytes : Marchantia and Polytrichum.

Pteridophytes : Selaginella, Equisetum, Adiantum and Marsilea.

Gymnosperms : Cycas and Gnetum.

Palaeobotany : Lepidodendron Lepidocarpon and Stigmaria

**References :**

A text Book of Botany - Pteridophytes - B.P. Pandey. S.Chand & Co., NewDelhi.

Pteridophyta - Vashishta, P.C S.Chand & Co., NewDelhi.

Morphology of Pteridophytes - K.R. Sporne. BI Publications NewDelhi.

An introduction of Embryophyta - Pteridophyta - N.S.Parihar

Cryptogamic Botany. Vol.II- G.M. Smith. Tata McGraw Hill.,New Delhi.

Morphology of Gymnosperms - K.R. Sporne.BI Publications NewDelhi.

An introduction of Palaeobotany - Arnold.,Agrobios., Jodhpur.,

Gymnosperms - P.C. Vashishta S.Chand & Co., NewDelhi.

Gymnosperms - B.P. Pandey S.Chand & Co., NewDelhi.

Phytogeography and Paleobotany.,Kumar.,N.C.,Emkay Publication.,Delhi,51.

Pteridophytes,Gymnosperms&Palaeobotany,A.Ragland.&V.Kumaresan.,Saras Pub.,Nagercoil,TN

A text Book of Botany - Gymnosperms RMJohn *et al* Scintific Pub.,Jodhpur.

A text Book of Botany- Pteridophytes., RMJohn *et al* Scintific Pub.,Jodhpur  
Pteridophytes.,SKSingh.,Campus Books Int.,NewDelhi.

**PAPER -IV**

**3 Hrs / Week**

**CELL BIOLOGY & LAB TECHNIQUES**

**Unit - I**

Cell Biology: Structure of Plant Cell – Prokaryotic and Eukaryotic cell, Structure and function of cellwall, plasmamembrane, endoplasmic reticulum and ribosomes.

**Unit - II**

Mitochondria, Chloroplast, Nucleus, Chromosome (Structure and function only)

**Unit - III**

Cell Division - Mitosis, Meiosis Nucleic acid - Structure of DNA (Watson & Crick Model) , Replication of DNA (Semi-conservative method). RNA - types, Protein synthesis

**Unit IV**

Lab Techniques: Principles, Operation, Techniques and uses of pH meter, Colorimeter, Centrifugation. Microscopy - light TEM and SEM.

**Unite - V**

Principles and elementary knowledge of Chromotography (paper, T L C & Column), Electrophoresis (Basics).

**Practicals : In the next semester (IV)**

1. Study of mitosis using Onion roots
2. Study of cell organelles through slides and Photographs
3. Demonstration of pH meter, Colorimeter, Clinical centrifuge and chromatography of leaf pigments - paper only

**References :**

Cytology P.S.Verma & Agarwal V.K. S.Chand & Co., NewDelhi.  
Cell biology,Genetics,MolecularBiologyandEvolution.Vermaand Agarwal S.Chand & Co., NewDelhi.  
Laboratory Manual.,J.Jayaraman., Wiley Eastern Ltd.,NewDelhi.  
Cell Biology -C.B. Powar Himalya publishing New Delhi.  
Genetics- Verma and Agarwal., S. Chand and Co.New Delhi.  
Developmental Botany., A.Ragland., Saras Publication.,Nagercoil., Tamil Nadu  
Cell Biology, N.Arumugam, Saras Publication.,Nagercoil., Tamil Nadu  
Genetics,R.P Meyappan, Saras Publication.,Nagercoil., Tamil Nadu

**PAPER - V**

**4 Hrs / Week**

**ANATOMY AND EMBRYOLOGY**

**Unit - I**

Structure and function of Apical Meristems - Root Apex and Shoot Apex - Theories of Meristems. Structure and function of simple and permanent tissues - Parenchyma, Collenchyma, Sclerenchyma, Xylem and Phloem.

**Unit - II**

Types of vascular bundles, Primary Structures of Dicot and Monocot root and stem. Structure of Dicot and Monocot leaf. Secondary growth of Dicot stem and root.

**Unit - III**

Anomalous secondary growth in Dicots - Intraxylary phloem, Successive cambia, cortical vascular bundles and Arborescent monocots (Primary anomalies)

**Unit - IV**

**EMBRYOLOGY** :- Structure and development of microsporangium, male gametophyte, Types of ovules, megasporangium, female gametophyte (Polygonum type)

**Unit - V**

Double fertilization, endosperm - Structure, development and types of endosperm. Structure and development of dicot embryo (Capsella).

**Practicals :**

**Anatomy Study of tissues mentioned in the theory**

1. Stem - Primary structure - Tridax, Cucurbita, Sorghum
2. Root Primary structure - Bean. Canna. Vanda
3. Leaf - Nerium & Grass
4. Anomalous Secondary thickening - Boerhaavia, Nyctanthes,

**Embryology** : T.S of anther. 2. Various stages of development of male and female gametophyte, endosperm and embryo sac to be studied from permanent slides. 3. Embryo Mounting - Tridax - Crotalaria.

**References :**

A text book of Plant Anatomy - P.C. Vashishta S.Chand & Co., NewDelhi.

An introduction to the Embryology of Angiosperms - P.Maheswari

The Embryology of Angiosperms, S.S.Bhojwani & Bhatnagar, S.P. Vani Educational Books New Delhi.

Plant Anatomy - A. Fahn. Pergman Press., Oxford., London.

A text book of Plant Anatomy., E.J.J. Prakash., Emkay Publication., Delhi, 51

Plant Anatomy - Esau. K Wiley Eastern Ltd., NewDelhi.

Anatomy of seed plants - Esau. K. Wiley Eastern Ltd., NewDelhi.

Plant anatomy - Pandey, B.P. S.Chand & Co., NewDelhi.

Plant Anatomy & Microtechnique, V.Kumaresan, Saras Publication., Nagercoil., Tamil Nadu.

**PAPER - VI**

**5 Hrs / Week**

**MEDICINAL BOTANY & HUMAN WELFARE**

**Unit - I** : Pharmacognosy - Definition and History. A general account of different survey of Different systems of Medicines - Indian systems of medicine - Siddha Ayurveda and Unani systems. Classification of drugs (elementary). Chemistry of Drugs(Basics).

**Unit - II** : Morphological and Histological studies - Chemical constituents. Therapeutic and other Pharmaceutical uses of Bark - Cinchona, Leaves - Adathoda and Eucalyptus, Flower - Clove.

**Unit - III** : Fruits and seed - Wood apple, Goosberry and Poppy seed, Underground stem - Ginger, Unorganized drugs. Gum - Acacia, Resin - Turpentine, Fixed oil - Castor oil.

**Unit - IV** : A brief account of the following : a) Drugs acting on the Central Nervous system – Belladonna, Aswakantha & Nux-vomica b) Drugs used in the disorders of the Gastro Intestinal tract – Asafoetida, Pepper & Ginger c) Cardio Vascular drugs – Digitalis, Terminalia arjuna & Rawolfia.

**Unit - V** : Cultivation of medicinal plants in India. Medicinal plant Biotechnology - Genetics- Breeding methods applied to medicinal herbs. Drug Adulteration. Methods of Drug evaluation.

**Practicals :**

1. Morphology and anatomy of medicinal plants mentioned in the syllabus.
2. Identification of medicinal plants and their useful parts in examination.

**References :**

- Pharmacognosy - GE Trease and WC Evans. E LBSociety. Baelliere Tindall. London.
- Pharmacognosy & Pharmacotherapeutics.Saroskar and S.D.Bhandarkar Popular Pakashan, Bombay.
- Textbook of Pharmacognosy- T.E. WALLIS Fifth Edition. CBS Publishers and distributors Delhi.
- Pharmacognosy - S.S.Handa and V.K.Kapoor second edition. Vallabh Prakash, Delhi.
- Pharmacognosy - S.S.Handa and V.K.Kapoor second edition CBS publishers and distributors, Delhi.
- An introduction to Medicinal Botany &Pharmacognosy-N.C KumarEmkay Publications. New Delhi.
- Pharmacognosy - C.K.Kokate, A. Purohit and S.R.Gokhale 12<sup>th</sup> Edition Nirali Prakas
- A Hand Book of Medicinal Plants, Prajapathi ND Agrobios .Jodhpur
- A Hand Book of Medicinal Herbs.,DeshpandeDJ Agrobios .Jodhpur



**PAPER - VII** **5 Hrs / Week**  
**TAXONOMY OF ANGIOSPERMS AND ECONOMIC BOTANY**

**Unit - I :**

Descriptive terms used in taxonomy. Taxonomy and its significance. Systems of classification - Natural - Bentham & Hooker, Modern Takhtajan (outline only)

**Unit - II**

Herbarium technique and uses, Nomenclature -ICBN, Priority, Typification, Effective and Valid publication. Author citation. Modern trends in Taxonomy (general)

**Unit - III**

A detailed study of the following families and the economic importance of types and pollination mechanisms wherever applicable. Annonaceae, Capparidaceae, Sterculiaceae, Rutaceae, Anacardiaceae, Curcubitaceae and Apiaceae.

**Unit - IV**

Rubiaceae, Apocynaceae, Asclepiadaceae, Scrophulariaceae, Acanthaceae and Lamiaceae.

**Unit - V**

Amaranthaceae, Euphorbiaceae, Orchidaceae, Liliaceae and Poaceae.

**Practicals :**

1. Taxonomical studies of selected plant species included in the families mentioned in the theory syllabus.
2. Study of economic products of the plants belonging to the families mentioned in the theory syllabus.
3. Students should submit - 20 herbarium sheets of local plants at the time of practical examination.
4. Field trip-for 5 days to study vegetation in Tamil Nadu and neighboring states.
5. Tour report should also be submitted during the practical examination.

**References :**

- Taxonomy, Embryology & Horticulture., A. Ragland., Saras Publication., Nagercoil., Tamil Nadu  
Taxonomy of Angiosperms. Singh, V. and D.K. Jain, S.Chand & Co., New Delhi.  
Taxonomy of Angiosperms. Pandey, B.P. S.Chand & Co., New Delhi.  
Narayanaswamy, R.C. and K.N.Rao, Outlines of Botany. Vishvanathan & Co Chennai.  
Economic Botany., TM Hill., Tata McGraw Hill., New Delhi...  
Economic Botany Pandey, B.P., S.Chand & Co., New Delhi..  
Taxonomy of Angiosperms. Vasudevan Nair, R., Tata McGraw Hill., New Delhi  
A Handbook of Herbarium Methods. Jain, S.K. and R.R.Rao, S.Chand & Co., New Delhi..  
Morphology and Economic Botany of Angiosperms. Sundara Rajan, S., Anmol Publi., New Delhi.2  
Taxonomy of Angiosperms, A. Ragland., Saras Publication., Nagercoil., Tamil Nadu  
An Introduction to Systematic Botany. AK Ganguly & NCKumar., Emkay Pub., Delhi  
Flowering Plants. Origin and Despersal., A M Takhtajan., Oliver Boyd Ltd., Edinburgh.  
Lawrence, G.H.M., 1951, Taxonomy of Vascular Plants. Tata Mc Grw-Hill, New Delhi

**PAPER - VIII**

**4 Hrs / Week**

**GENETICS, PLANT BREEDING AND BIOSTATISTICS**

**Unit - I**

Monohybrid and Diblybrid cross, Test cross, Back cross, Incomplete dominance, Gene Interaction (Complementary, Supplementary, Duplicate and Inhibitory), Polygenic, Inheritance.

**Unit - II**

Linkages and crossing over Multiples alleles - Blood groups in man, Polyploidy, Sex determination.

**Unit - III**

Mutation types, physical and Chemical Mutagens, Cytoplasmic inheritance, Gene structure, Genetic code, DNA barcoding.

**Unit - IV**

Plant breeding - Objectives, Plant introduction, Selection, Hybridization, hybrid vigour, - Achievement in Crop breeding - Sugarcane.

**Unit - V**

Biostatistics – Data, Types and methods of collection of Data, Sampling techniques, Frequency distribution. Presentation of Data – Tabulation – Parts of Table, Types of table, Graphic representation of data- Histogram, Frequency curve, Frequency polygon and Ogives. Analysis of data – Arithmatic Mean, Median and Mode. Measures of dispersion – Standard Deviation and standard error. Test of significance – Chi-Square test.

**Practicals :**

1. Observation of charts for Mendelian ratios, Gene interaction and Linkage - Simple Problems in genetics.
2. Simple problems in mean, median, mode in Bio - Statistics and T-test.

**References :**

Principles of Plant breeding., Allard - Tata McGraw Hill.,New Delhi.

Essential of genetics -Powar

Fundamentals of Genetics Singh, B.D. S.Chand & Co., NewDelhi.

Plant breeding -Singh, B.D. S.Chand & Co., NewDelhi.

Principle and Practice of Plant breeding- Sharma B.D-

Principles of Genetics.- Sinnot, Dunn and Dobzhansky, Tata McGraw Hill.,New Delhi

**PAPER - IX**

**4 Hrs / Week**

**ECOLOGY AND PHYTOGEOGRAPHY**

**Unit - I :**

Ecology-Principles and approaches, Structure and function of Ecosystem, Role of climatic, edaphic and Biotic factors on plants, Biogeochemical cycles (Nitrogen, Carbon)

**Unit - II**

Autecology and synecology-vegetation-units of vegetation (formation, association, consociation, fasciation and society). Methods of studying vegetation - Quadrat, Belt and Line transect.

**Unit - III**

Hydrophytes, Mesophytes and Xerophytes - morphological and Anatomical features in relation to their habitats (Adaptation)

**Unit - IV**

Dispersal and migration, concept of Barriers, Continental drift, endemism, plants and plant communities as indicators.

**Unit - V**

Plant geography -principles and vegetational types of India - Tropical Rain forest, shoals and deciduous forest - sand dunes and mangroves scrub jungle, phytogeographical regions of India.

**Practicals :**

1. Study of morphological and anatomical adaptations of hydrophytes, xerophytes, including epiphytes and halophytes and mesophytes using representative samples.
2. Determination of frequency and density constituent of plant species in a terrestrial community through quadrat and transect (line and belt)
3. Phytogeographical regions of India.

**References :**

Plant Ecology, Shukla & Chandal., S. Chand and Co. New Delhi.  
Textbook of Plant Ecology, Ambast R.S. - Students and Friends & Co. Varanashi.  
Fundamentals of Ecology, Odum Eugene Philadelphia & Saunders, Tokyo, Toppon.  
Elements of Ecology., Sharma, P.D. Rastogi's Company Ltd., Publications Meerut.  
Environment and Pollution, N. Arumugam & V. Kumaresan, Saras Pub., Nagercoil., Tamil Nadu  
Manual of Plant Ecology., Oxford & IBH Publish., Pvt. Ltd., New Delhi.  
Plant Ecology, AK Agarwal., Agrobios .Jodhpur.  
The Geography of Flowering Plants-Ronald Good., Longman Group Ltd London.

**PAPER -X**                                      **4 Hrs / Week**  
**FUNDAMENTALS OF MICROBIOLOGY**

**Unit - I :**

Definition and scope of microbiology. Historical development of industrial microbiology. Concepts, characterization and classification of microorganisms. Sterilization techniques.

**Unit - II**

Soil microbiology-Types of microorganism in soil, Role of microorganisms in plant growth, factors affecting microbial growth. Microbiology of air-Role of microorganism in air, methods of purification of air.

**Unit - III**

Bacteria : Morphology, ultra structure, growth and reproduction. Culture of E.coli bacterium. Mycoplasma – structure, Concepts of Gram's staining.

**Unit - IV**

Viruses : General morphology, ultra structure, structure and replication of T<sub>2</sub> phage, transmission of viruses. Satellite virus.

**Unit - V**

Fermentation, dual and multiple fermentations. Detection and assay of fermentation products. Physical, chemical and biological assays (a general account to be discusses).

**References :**

Industrial Microbiology, L.E.Casida, J.R.Willey Eastern Ltd., ISBN,  
Flood, Feed and Fuel from Buiomass, Ed. D.S. Chahal, Oxford & IBH, Publishing Ltd., New  
Delhi, 1  
Experimental Microbial Ecology, RG. Burns and J. Howard Slater, Black Well Scientific  
Pub.Oxford  
Microbiology, Paul A Ketchum, John Wiley and Sons., USA  
Microbiology - Pelezar, M.J. Reid, R.D. and E.C.S. Chan, Tata Mc Graw Hill,NewDelhi.  
Modern Food Microbiology, Ed. Jay, J.N. CBS Publishers, Delhi .  
General Microbiology, 6<sup>th</sup> edition, Schiesel, H.B. Cambridge University Press.  
Hand Books of Indigenous fermented food parcel. Edition Steindrans, KH, Inc, NewYork,  
Microbiology, 3<sup>rd</sup> Edition, Wintrien, G.M. and M.D.Lechtman, Macmillan Publishing London,.  
Microbiology, Fundamntals and applications S.S.Purohit,Agrobios Jodhpur.  
Microbiology ALBhatia., Avinash Kar Publi.,Jodhpur  
Fundamentals of Microbiology.,Vijaya Ramesh k. MJ Pub.,Chennai.  
Applied Microbiology,TrivediPC Agrobios.,Jodhpur.

**PAPER - XI** **5Hrs / Week**  
**BIOPHYSICS, BIOCHEMISTRY AND PLANT PHYSIOLOGY**

**Unit - I :**

Biophysics : Electromagnetic radiation, Absorption and action spectra. Spectrophotometer (Basics) and Laws of thermodynamics (Basics)

**Unit - II**

Biochemistry : Acids, basis and solutions.  $p^H$  and buffer systems. Structure and Basic functions of protein, lipids and carbohydrates.

**Unit - III**

Plant Physiology : Water relations - osmosis, absorption of water, water potential and its components, active and passive absorption of water. Transpiration - its kind, significance and factors. Physiology of stomatal movement, ascent of sap.

**Unit - IV**

Photosynthesis - Pigments system, light and dark reactions. C<sub>4</sub> and CAM Pathways. Respiration - aerobic and anaerobic - Glycolysis, Krebs cycle - electron transport system.

**Unit - V**

Growth regulators - auxins, gibberellins, Kinetins, ethylene and ABA. Physiology of flowering (Photoperiodism).

**Practicals :**

1. Rate of respiration in flower buds/germinated seeds using simple respiroscope (Demonstration Only)
2. Separation of leaf pigments by paper chromatography
3. Measurement of the rate of Photosynthesis under varying concentration CO<sub>2</sub> concentration
4. Effect of Light intensity on O<sub>2</sub> evolution during photosynthesis.
5. Effect of light intensity on transpiration. Determining the rate of transpiration using Ganong's potometer (Demonstration Only)

**References :**

- Plant Physiology-Salisbury and Ross.,Prantices Hall.,New Delhi  
Biophysics & Plant Physiology-A.Ragland.,Saras Publication.,Nagercoil., Tamil Nadu  
Plant Physiology-Devlin.,Affiliated East West .,New Delhi.,  
Introductory Plant Physiology-Noggle and Fritz., Prantices Hall.,New Delhi  
Fundamentals of Plant Physiology-V.K. Jain., S. Chand and Co.New Delhi.  
Biochemistry- J.L. Jain., S. Chand and Co.New Delhi.  
Biostatistics-P.Ramakrishnan., Saras Publication.,Nagercoil., Tamil Nadu  
Basics Biophysics for Biologist.,Danial M., Agrobios.Jodhpur  
Plant Physiology, A.Ragland *et al*, Saras Publication.,Nagercoil., Tamil Nadu  
Laboratory Manual of Biochemistry -J. Jayaram Wiley Eastern Ltd.,NewDelhi.  
Plant Physiology, S.Sundararajan.,Anmol Publications.,New Delhi.2  
Principles of Plant Physiology,R.S.Singh.,Oxford & IBH Publications.,New Delhi.  
Plant Physiology research methods.,S S Narwal *et al*.,Scientific Pub.,Jodhpur.  
Plant Physiology,Kumar&Purohit.,Agrobios, Jodhpur.

**PAPER - XII**

**5Hrs / Week**

**HORTICULTURE**

**Unit - I :**

Scope and divisions of Horticulture - methods of vegetative propagation - cutting, layering and grafting - organic manures - fertilizers - irrigation.

**Unit - II**

Gardening : Types of gardens, Indoor garden, Kitchen garden and Public garden. Important ornamentals - habit and types - garden components - lawn making, glass house, rockery, water garden and topiary.

**Unit - III**

Production technology - Cultivation of vegetables - Brinjal, Tomato and Onion. Cultivation of fruits - Banana, Mango and Apple growth regulators in horticulture. Plant protection measures for horticulture.

**Unit - IV**

Commercial horticulture I

Cultivation of flowers - Jasmine, Rose, Orchid, Anthurium. Cultivation of plantation crops - Tea, Cardamom and Coffee- Cultivation of medicinal plants - Periwinkle, Sarpagandha and Pepper.

**Unit - V**

Commercial horticulture II

Extraction of Jasmine concrete and Papain - Bonsai Flower arrangement - Cut flowers - Preservation of fruits and vegetables.

**Practicals :**

Demonstration of vegetative methods of propagation - Flower arrangement with cut flowers.

**References :**

An introduction to Horticulture - N. Kumar Narosa Pub., NewDelhi

Vegetables – Choudhury Narosa Pub., NewDelhi

Horticulture - Manibhusan Rao., Vishvanathan&Co.,Cennai.

Home Gardening - Trivedi, P. Narosa Pub., NewDelhi

Introduction to Spices Plantation Crops Medicinal and Aromatic Plants

Plant Breeding-GSChahal *et al.*,Narosa Pub., NewDelhi.

Weed control RC Mandal ., JV Publi.,House.,Jodhpur

Organic Farming DGelhot JV Publi.,House.,Jodhpur.

Vistas in Horticulture., SK Bhattacharya., Gene Tech Books., New Delhi.2

Commercial Floriculture.,SK Chatopadhyya,Gene Tech Books., New Delhi.2

**SKILL BASED SUBJECT: BIODEGRADABLE WASTE MANAGEMENT**

**PAPER – I** (3 Hours / Week)  
**INTRODUCTION TO ENVIRONMENTAL POLLUTION**

- UNIT - I** Environment – introduction, a brief account of biosphere and hydrosphere.
- UNIT – II** Environmental pollution – introduction, definition, kinds of pollutants in water, air and soil.
- UNIT – III** Water pollution – industrial, agricultural and sewage, effects and control of water pollution.
- UNIT - IV** Air pollution – industrial and transport. Effects of air pollution – greenhouse effect, acid rain and ozone depletion.
- UNIT - V** Soil pollution – industrial, domestic and agricultural. Effects and control of soil pollution.

**References :**

1. Shukla, R.S and Chandal P.S. 2003. Ecology and Soil Science, S. Chand and Company Ltd., New Delhi
2. Asthana D.K. and Meera Asthana, 1998, Environment : Problems and Solutions, First eddition, S. Chand and Company Ltd.
3. Padmanabh Dwivedi, 2004. Environmental Pollution and Environmental Management, Scientific Publishers Jodhpur (India).
4. Gupta P.K. 2000. Methods in Environmental Analysis : Water, Soil and Air, First edition, Agrobios (India).
5. Arun Kumar, Environmental problems, protection and control, Anmol Publication Pvt. Ltd.
6. Sharma P.D. 2004, Ecology and Environment, Seventh edition, Rastogi publications, Meerut.
7. Bhatia A.L. and Kohli K.S. 2005. Environmental Biology, Publishers – Ramesh Book Depot Jaipur.
8. Purohit S.S. 2004. Environmental Pollution – Causes, Effects and Control, Agrobios, India.

**SKILL BASED SUBJECT: BIODEGRADABLE WASTE MANAGEMENT**  
**PAPER – II (3 Hours / Week)**  
**URBAN WASTE AND MANAGEMENT**

**UNIT - I** Solid waste – definition, classification – biodegradable and nonbiodegradable.

**UNIT - II** Urban waste – types and disposal, effects on biosphere.

**UNIT - III** Polymers and plastic wastes, problems associated with solid wastes resistance to degradation.

**UNIT - IV** Persistence of pesticides in environment, bioaccumulation and biomagnification of pesticides.

**UNIT - V** Vermitechnology – earthworm for vermiculture, principles and management of vermiculture, methods of earthworm production.

**References :**

1. Asthana D.K. and Meera Asthana, 1998, Environment : Problems and Solutions, First edition, S. Chand and Company Ltd.
2. Srivastava, K.P. 2002. An Introduction to Environmental study, First edition, Kalyani Publishers, New Delhi.
3. Shukla, S.K and P.R. Srivastava, 1992. Waste management and control, First edition, Commowearth Publishers, New Delhi.
4. Palaniappan, S.P. and K. Annadurai, 2003. Organic farming theory and practice, Scientific Publishers, Jodhpur, India.
5. Sathe, T.V. 2004, Vermiculture and organic farming, Daya Publishing Home, New Delhi.



**SKILL BASED SUBJECT : BIODEGRADABLE WASTE MANAGEMENT**

**PAPER – III (3 Hours / Week)**  
**INDUSTRIAL WASTES AND MANAGEMENT**

**UNIT – I** Scope and importance of waste management Application – Consolation of Environment

**UNIT - II** Industrial waste – classification, sludge treatment processes – thickening, aerobic and anaerobic digestion, conditioning, de-watering

**UNIT - III** Solid wastes, treatment, Bio composting – SCP Production.

**UNIT - IV** Treatment of Industrial effluents – Primary – and. Tertiary – Biological screening.

**UNIT - V** Bioremediator – definition, in-situ bioremediation, bioremediation of hydrocarbons, heavy and xenobiotics.

**References :**

1. Narayana Rao M. and Amal K. Dutta, 2003. Waste Water Treatment, Second edition, Oxford IBH Publishing Co. Pvt. Ltd., New Delhi.
2. Gupta, P.K. 2001. Elements of Biotechnology, First edition, Rastogi Publication, Meerut.
3. Subha Rao, N.S. 1993, Biofertilizers in Agriculture and Forestry, Oxford IBH Publishing Co. Pvt. Ltd., New Delhi.
4. Dubey, R.C. 2001. A Text Book of Biotechnology, S. Chand and Company Ltd.
5. Jogdand ,S.N. 1995, Environmental Biotechnology, First edition, Himalayan Publishing House, Bombay.
6. Agarwal, S.K. 1996. Industrial Environment, APH Publishing Corporation, New Delhi.
7. Sharma, P.D., 2003. Environment Biology, Seventh Edition, Rastogi Publication, Meerut.
8. Wulf Crueger and Anneliese Crueger, 1996 Biotechnology : A text book of Industrial Microbiology, Second edition, Sinauer Associates inc. Sunderland MA 01375.
9. Palaniappan, S.P. and K. Annadurai, 2003. Organic farming theory and practice, Scientific Publishers, Jodhpur, India.
10. Sathe, T.V. 2004, Vermiculture and organic farming, Daya Publishing Home, New Delhi.
11. Kudesia, V.P. 1990. Industrial Pollution, First edition, Pragati Prakashan Publishers, Meerut.

## SKILL BASED SUBJECT : BIODEGRADABLE WASTE MANAGEMENT

### PAPER – IV - PRACTICAL (4 Hours / Week) (Covering theory papers I, II & III)

1. Determination of Soil  $p^H$
2. Effluent analysis (Paper / Distillery) – dissolved oxygen, free carbon dioxide, carbonate and bicarbonate, turbidity, total solids, dissolved solids, hardness, chloride,
3. Sterilization technique. Autoclave & Hor air oven.
4. Morphology and Identification of earthworms.  
(*Eudrilus eugeniae*, *Eisenia foetida* and *Lampito mauritii*).
5. Analysis of vermicompost – Nitrogen, Phosphorus, Potassium and Carbon.
6. Analysis of effluents of any one industry – dissolved oxygen, free carbon dioxide, calcium, magnesium, nitrate and sulphur.
7. Microbial analysis of effluent – bacteria, fungi and actinomycetes.

#### References :

1. Lal Singh, 1998. Practical Agricultural, Chemistry and Soil Science, Bishen Singh Mahendra Palsingh, Dehradum.
2. Gupta. P.K. 2002. Methods in Environmental Analysis : Water, Soil and Air, First edition, Agrobios (India.)
3. Lois Beishir, 1983. Microbiology in Practice. Harper and Row Publishers, New York.
4. Rao, K.S. 1993. Practical Ecology. Anmol Publications, New Delhi.
5. APHA, 1995. Standard methods for the examination of water and waste water, APHA, AWWA, Publications, New York.
6. Kannan, N. 1996. Laboratory Manual in General Microbiology, First edition, Palani Paramount Publication.
7. Bhatia, A;L. and Kohil K.S. 2005. Environmental Biology, Publishers – Ramesh Book Deport, New Delhi.

## **ELECTIVE I – A : APPLIED MICROBIOLOGY**

### **Unit - I :**

Introduction to applied microbiology. Various applied aspects of microbiology. Fermentation - kinds of fermentors; fermentation media - composition ; sterilization, contamination and screening.

### **Unit - II**

Microbiology of domestic water. Water purification, determination of sanitary quality - chemotherapy and control of microorganisms through antibiotics. Source and mode of action of penicillin. Basic principles of immunology - structure of antigen and antibody and their reaction.

### **Unit - III**

Food microbiology: Milk-physical and chemical composition, pasteurization, dairy products (manufacture of cheese) Microbial flora of fresh food, microbial examination of foods-Food poisoning. Botulism.

### **Unit - IV**

Industrial microbiology: Manufacture of alcohol, ethanol, antibiotics - streptomycin, Vitamin-B<sub>12</sub>, enzyme-cellulase, amino acids, Glutamic, organic acid-citric acid.

### **Unit - V**

Production of microbial biocides-historical background, bacteria, protozoa, fungi, actinomycetes. Microbial Biotechnology and Pollution control.

### **Practicals :**

1. A study of Rhizosphere and mycorrhizae.
2. Preparation of culture media for bacteria, fungi and actinomycetes.
3. Estimation of bacteria, fungi and actinomycetes (plate count) from soil and water by series dilution method.
4. Preparation of agar streak and agar slants, sterilization and inoculation.
5. Identification of gram staining bacteria using milk or curd.
6. Observation of microbes using hanging - drop method.
7. Knowledge on antimicrobial activities using antibiotics.

### **References :**

Industrial Microbiology, L.E.Casida, J.R.Willey Eastern Ltd., ISBN,  
Food, Feed and Fuel from Biomass, Ed. D.S. Chahal, Oxford & IBH, Publishing Ltd., New Delhi, 1  
Experimental Microbial Ecology, RG. Burns and J. Howard Slater, Black Well Scientific Pub.Oxford  
Microbiology, Paul A Ketchum, John Wiley and Sons., USA  
Microbiology - Pelezar, M.J. Reid, R.D. and E.C.S. Chan, Tata Mc Graw Hill, New Delhi.  
Modern Food Microbiology, Ed. Jay, J.N. CBS Publishers, Delhi .  
General Microbiology, 6<sup>th</sup> edition, Schiesel, H.B. Cambridge University Press.  
Hand Books of Indigenous fermented food parcel. Edition Steindrans, KH, Inc, New York,  
Microbiology, 3<sup>rd</sup> Edition, Wintrien, G.M. and M.D.Lechtman, Macmillan Publishing London,.  
Microbiology, Fundamentals and applications S.S.Purohit, Agrobios Jodhpur.  
Fundamentals of Microbiology., Vijaya Ramesh k. MJ Pub., Chennai.  
Applied Microbiology, Trivedi PC Agrobios., Jodhpur.  
Sequence analysis in molecular biology " Alexleons and M. Leon " Academic Press. New York

## **ELECTIVE I – B : PLANT PATHOLOGY**

- Unit- I:** Introduction, Historical account of plant pathology  
Definition- Pathogen,disease,virulence, resistance/ susceptibility, epidemics  
Brief account of major epidemics, Koch's postulates.
- Unit – II:** Classification of plant diseases, dissemination of propagules of pathogens, factors governing out break of diseases. Pathogenesis- Inoculum, inoculum potential, penetration and entry, combination of the host, factors affecting infections.
- Unit – III:** Role of enzymes in disease development, cell wall degrading enzymes.  
Toxins in relation to plant diseases: A general account, mode of action and types.
- Unit – IV:** Fungal diseases and deficiency symptoms: Symptoms, causal organism, disease cycle and control measures of the following fungal diseases.  
Club root of crucifers, Powdery mildew of wheat, Late blight of potato.  
Deficiency symptoms: General account, measures to rectify.
- Unit – V:** Disease management: Legislative methods, cultural methods, soil and sand treatment, biological control, chemical control, control through resistant varieties.

### **References**

1. Plant pathology by G.P.Gupta
2. Illustrated dictionary of Plant pathology Vyas, N.L
3. Microbial Plant pathology- Whitney ,P.J
4. Plant pathology- Singh, R.S.
5. Plant pathology-Mehoratra, R.S.
6. Introduction to principle of Plant pathology ed.3- Singh, R.S.
7. Lab. Manual of Plant pathology- Pathak U.N
8. Text book of Modern Plant pathology- Bilgrami.K.S & Dube....

## **ELECTIVE PAPER I - C**

### **ECONOMIC BOTANY**

**UNIT – I :** Scope of economic botany . Origin , distribution, cultivation & economic importance of Cereals , pulses, oil crops, vegetables, fruits & nuts ( General account only )

**UNIT – II :** Origin , distribution , cultivation & economic importance of Spices  
Condiments , cosmetics , essential oils , beverages .

**UNIT – III :** Origin, distribution , cultivation & economic importance of  
Timber , fuel, Fibers & dyes .

**UNIT – IV :** Storage facilities and preservation methods of Cereals , pulses ,  
oil crops , vegetables , fruits & nuts .

**UNIT – V :** Trading of economically important products . ( general account  
Only ) Conservation and sustainable utilization of economically  
important products .

- REFERENCES :**
- 1 . Economic Botany – Pandey .B . P.
  - 2 . Economic Botany –Hill . A . F
  - 3 . Origin of cultivated species – Bailey
  - 4 . A dictionary of the Economic products of India –Wall .G .  
( 6 volumes )

## **ELECTIVE II - A : BIOTECHNOLOGY - CONCEPTS AND TECHNIQUES**

### **Unit - I :**

Biotechnology - definition, history and importance - Plant tissue culture, concepts and techniques, constituents of MS and White's media. Sterilization techniques -Callogensis, regeneration, micropropagation through somatic embryogenesis and suspension culture.

### **Unit - II**

Anther culture, Pollen culture (Androgenic haploids), isolation and culture of protoplast, somaclonal - variations - somatic hybridization, cybrids, synthetic seeds. In vitro establishment of mycorrhizae.

### **Unit - III**

Genetic engineering - Procedure for gene cloning, isolation of specific genes, enzymes used in gene cloning - polymerases, restriction endonucleases, ligases and reverse transcriptase.

### **Unit - IV**

Cloning vectors - Plasmids, phages, cosmids, transposons and YAC. Gene cloning in higher plants - use of CaMV and Agrobacterium Ti - Plasmid as vehicle. Methods of direct gene transfer - electroporation, micro injection and liposomes. Isolation and screening of rDNA.

### **Unit - V**

Application and uses of PCR, RFLP, RAPD and DNA finger printing techniques in biotechnology. Southern, Northern and Western blotting techniques agarose gel - electrophoresis.

### **References :**

- Applied Biotechnology.,L P Rema.,MJ Public.,Chennai.  
Plant Biotechnology,B Nirmala MJ Public.,Chennai.  
Applied Plant Biotechnology, S. Ignacimuthu - Vishvanathan&Sons.,Chennai.  
Basic Biotechnology, S. Ignacimuthu - Vishvanathan&Co.,Chennai  
Plant Biotechnology, S. Ignacimuthu - Vishvanathan&Co.,Chennai  
A Text Book of Biotechnology, R.C.Dubey.,Agrobios.Jodhpur.  
Biotechnology, S.S. Purohit and S.K. Mathur - Agrobios.Jodhpur  
Biotechnology the Biological Principle, M.P. Trehan and Others.,TataMcGraw Hill.,New Delhi.  
Biotechnology.,V.Kumaresan., Saras Publication.,Nagercoil., Tamil Nadu  
Outlines of Biotechnology., Emkay Public., Delhi.,51.

## **ELECTIVE PAPER II- B : SEED BIOLOGY**

### **UNIT - I : Morphology and structural details of seeds**

Cereals : Paddy / Wheat  
Pulses : Dolichos / Glycine  
Oil seeds : Castor  
Fibers : Cotton  
Vegetables : Cucurbita  
Study on importance of seed .

**UNIT – II :** Chemical composition of seeds mentioned above . Germination - General account . Factors affecting germination . Changes that take place during germination ( physical and chemical ) Treatments given to quicken germination .

**UNIT – III :** Seed germination test under laboratory conditions .Using paper ( BP & TP ) sand and soil . The environmental test conditions also be discussed . Evaluation of germination test .

**UNIT – IV :** Seed viability ; Topographical Tetrazolium Test .  
Preparation of solution and methods of application & evaluation .  
Seed vigour : Concept , Direct and Indirect vigour tests .

**UNIT – V :** Dormancy – Primary and secondary dormancies . Significance , factors involved , methods used to break dormancy .

### **References ;**

1. Germination of seeds – Mayer A. M & Poljakoff Mayer – 1975
2. Seed physiology -Bryant J . A 1985 –Edward Arnold , London .
3. Recent advancement in the anatomy of Tropical seed plants .  
Chowdhury K A U B Jawahar Nagar New Delhi .
4. Seed technology – Rattan Lal Agarwal – 2<sup>nd</sup> edn .
5. A text book of General Botany for colleges & Universities.  
2<sup>nd</sup> edn - Chapman & Hall . London .
6. Anatomy of seed plants .
7. Economic Botany – B . P. Pandey
8. Economic Botany in the tropics .

## **ELECTIVE II – C : POMOLOGY**

- UNIT – I:** Tropical fruits cultivation - . Past and present status of tropical fruits in India. General appraisal of fruit growing regions / Zones in India and Tamil Nadu
- UNIT-II :** Production, productivity, varieties- exportable varieties. Climate and soil requirements— propagation techniques - planting. Nutrition-nutrient deficiency and management – flowering, fruit set, bearing problems – special horticultural technique  
Harvesting techniques – post harvest handling & post harvest treatments - ripening of fruits - storage and processing of Mango, Banana
- UNIT – III:** Climate and Soil environments- varieties- Propagation-Planting requirements, manures and manuring of Papaya, Guava, Sapota, Acid lime, Lemon, Sweet orange, Jack fruit and Pine apple.
- UNIT – IV:** Subtropical and humid zones of India and Tamil Nadu – importance and scope of fruit crops in these zones – varieties, propagation and planting and aftercare, – management of nutrient – water needs – weed management – Training and pruning method – physiology of flowering, use of plant growth regulators – harvesting procedures – post harvest aspects of the following crops.  
Mandarin, , avocado, , litchi, , carambola,
- UNIT – V:** Classification of temperate fruits – detailed study of area, production, varieties, climate and soil requirements – propagation – planting density – cropping systems– training and pruning –use of growth regulators – nutrient and weed management – harvesting – post harvest handling and storage in the following crops. Apple, pear, plum, strawberry, cherries.

### **REFERENCE BOOKS**

1. Bose, T. K. S. K. Mitra, and D. S. Rathore. 1998. Temperate Fruits – Nayaprakash, Calcutta
2. Bose, T. K. 1996. Fruits of India – Tropical and sub – tropical. Nayaprakash, Calcutta1. Bose T.K. S. K. Mitra and M. K. Sadhu. 1988 Mineral Nutrition of Fruit Crops. Naya Prokash, Calcutta.
3. Bose, T. K., S. K. Mitra and D. Sanyal, 2001. Fruits: Tropical and subtropical volume I. Naya Udyog, Calcutta
4. Gardener, Bradford and Hooker. 1952. Fundamentals of fruit production. Mc Graw Hill Book Co. Inc. London.
5. Fruit culture in India (1967) Singh, S., Krishnamoorthy. S., and Katyal, S. L. ICAR, New Delhi.
6. Fruit growers in India, W. B. Hayes Kitabishan, Allahabad.



7. Fruits : Tropical and subtropical (1990) T. K. Bose & S. K. Mitra, Nayaprakash, 206 Bidhan Saram, Calcutta – 700 116, India
8. Temperate fruits (1990) – S. K. Mithra, T. K. Bose and D. S. Rathore. Horticulture and Allied Publisher .
9. Chattopadhyay, T. K. 1994. A text book of Pomology (Vol 1-3) Kalyani Publishers, New Delhi.
10. Collins, J.L. 1960. The Pineapple: Botany cultivation and utilization, New York, Wiley.
11. Kumar, N. Introduction to Horticulture, Rajalakshmi Publications, Nagercoil.
12. Pal, J.S. 1997. Fruit Growing, Kalyani Publishers, New Delhi.
13. Shanmugavelu, K. G. 1987. Production technology of fruit crops SBA Publications, Calcutta.
14. Singh, S. S. Krishanmurthi and S. L. Katyal 1967. Fruit culture in India, ICAR, New Delhi.
15. Singh, S. P. 1995. Commercial Fruits, Kalyan Publishers, Ludhiyana.
16. Veeraraghavathatham, D., M. Jawaharlal, S. Jeeva and S. Rabindran 1996. Scientific Fruit culture, Suri Associates, Coimbatore

### **ELECTIVE III – A : BIOTECHNOLOGY - APPLIED BIOTECHNOLOGY**

#### **Unit - I :**

Food Technology - SCP as microbial food for future - mass cultivation and nutritional value or Spirulina, Scenedesmus, Yeast and Methylophilus.  
Mushroom Technology - Cultivation techniques and nutritional value of Pleurotus sajor and Agaricus bisporus.

#### **Unit - II**

Biofertilizers - Advantages mass cultivation and application technique of Rhizobium, Azospirillum, Blue Green Algae (nitrogen fixers), Phosphobacteria, and VAM.

#### **Unit - III**

Application of genetic engineering in agriculture (transgenic plants) medicine and insulin, hormones, vaccines, antibiotics, monoclonal antibodies and hybridoma techniques.

#### **Unit - IV**

Biological control of pathogens and weeds through engineered microbes. Bacillus thuringiensis, mycoherbicides and insects, production of secondary metabolites. Bacterial toxins and penicillin. Enzymes engineering and its uses.

#### **Unit - V**

Waste water effluent treatment and recycling for food, feed and bio - fertilizers. Treatment of paper and distillery effluents-oxidation ponds. Biomass and bio-energy production of hydrogen. Petrochemical plants - source of alternate fuel.

#### **Practical for biotechnology paper I & II :**

1. Cultivation of Pleurotus sajor.
2. Preparation of M.S.Medium-sterilization and inoculation of explants - shoot tip culture.
3. Synthetic seed preparation. Culture of yeast, Spirulina, Nostoc and Azolla.
4. Demonstration of biofertilizers - Azospirillum, Agrobacterium and antibiotics - specimens or slides or photographs.
5. Petrochemical Plants - specimens.
6. Blotting techniques - observation of photographs.

#### **References :**

Applied Plant Biotechnology, Vishvanathan&Sons.,Chennai.  
Basic Biotechnology, S. Ignacimuthu - Vishvanathan&Co.,Chennai  
Plant Biotchnolgy, S. Ignacimuthu - Vishvanathan&Co.,Chennai  
A Text Book of Biotechnology, R.C.Dubey.,Agrobios.Jodhpur.  
Biotechnology, S.S. Purohit and S.K. Mathur - Agrobios.Jodhpur  
Biotechnology the Biological Principle, M.P. Trehan and Others.,TataMcGrow Hill.,New Delhi.  
Biotechnology.,V.Kumaresan., Saras Publication.,Nagercoil., Tamil Nadu  
Biotechnology and Biologyof Plants PC Trivedi., Avinash Kar Publi.,Jodhpur  
Microbial Biotechnology., PC Trivedi., Avinash Kar Publi.,Jodhpur  
Biotechnology.,V.Kumaresan., Saras Publication.,Nagercoil., Tamil Nadu  
Outlines of Biotechnology., Emkay Public., Delhi.,51.

### ELECTIVE III- B : ETHNOBOTANY

**Unit: I.** Ethnobotany: Introduction, concept, scope and objectives. Ethnobotany as an interdisciplinary science. The relevance of ethnobotany in the present context. Major ethnic groups in Tamilnadu. (Any five)

**Unit II.** Methodology of Ethnobotanical studies. a) Field work b) Herbarium c) Ancient Literature d) Temples and sacred places. Plants used by the tribals: a) Food plants b) intoxicants and beverages c) Resins and oils and miscellaneous uses.

**Unit III** Plants and Tribal medicine: Significance of the following plants in ethno botanical practices (along with their habitat and morphology) a) *Azadiractha indica* b) *Ocimum sanctum* c) *Vitex negundo*. d) *Gloriosa superba* e) *Tribulus terrestris* f) *Pongamia pinnata* g) *Cassia auriculata* h) *Indigofera tinctoria*. Role of ethnobotany in modern medicine with special example *Rauwolfia serpentina*., *Trichopus zeylanicus*.

**Unit. IV.** Role of ethnic groups in conservation of plant genetic resources . Participatory forest management. Sharing of wealth concept with few examples from India.

**Unit V** Ethnobotany as a source of drug.

a) Reserpine b) Artemisin c) Gulipid d) Cocaine e) Strychnine.

#### References

- 1.S.K. Jain, Manual of Ethnobotany, Scientific Publishers, Jodhpur, 1995.
- 2.S.K. Jain (ed.) Glimpses of Indian. Ethnobotny, Oxford and I B H, New Delhi – 1981
- 3.S.K. Jain (ed.) 1989. Methods and approaches in ethnobotany. Society of ethnobotanists, Lucknow, India.
- 4.S.K. Jain, 1990. Contributions of Indian ethnobotny. Scientific publishers, Jodhpur.
- 5.Cotton C.M. 1997. Ethnobotany – Principles and applications. John Wiley and sons – Chichester
- 6.Rajiv K. Sinha – Ethnobotany The Renaissance of Traditional Herbal Medicine – INA – SHREE Publishers, Jaipur-1996
- 7.Faulks, P.J. 1958. An introduction to Ethnobotany, Moredale pub. Ltd. London
8. Gary J Martin, 2008. Ethnobotany A Methods manual, Earth scan, London.

### **ELECTIVE III- C : BIOINFORMATICS**

- Unit I:** Introduction to Bioinformatics, Knowledge Base in Biology, Information Technology in Biology, Types of Sequences used in Bioinformatics- DNA Sequences, RNA Sequences, Protein Sequences, application of Bioinformatics, fields related to Bioinformatics
- Unit II:** Biological databases and its significance- objectives , properties and classification of Biological databases, Hard – link relationships between databases, Symbols used in databases
- Unit III:** Nucleotide Sequence Databases, Nomenclature of DNA Sequences, Structure of Nucleotide Sequence Databases, GenBank format, Gene expression Databases
- Unit IV:** Proteomics - Classification based on shape, composition function; Nomenclature of Protein Sequences ; Genomics- Comparative Genomic Databases, organism specific Genomic databases.
- Unit V:** Gene finding, protein prediction, biomolecular visualization, phylogenetic analysis & Drug designing

### **REFERENCES**

- 1 . Rajaraman.V “Fundamentals of computer” Prentice Hall of India PVT Ltd. New Delhi 1996.
- 2 . Mooris mano “Digital Design” Prentice Hall of India PVT Ltd.,New Delhi,1996
3. Tanenbaum A.S,Structured computer Organisation “Prentice Hall of India Pvt Ltd.”,New Delhi`  
1990
4. Peter Norton, :Introduction to computers”Tata Mc Graw-Hill,New Delhi 1998
5. Alexeev and M.Leon “Internet in a Nutshell”
6. PGDCA Books vol.16 and 7-Bharathiar university
7. A.D.Baxevanis and B.J.Francis(Eds) “Bio-informatics”- A practical guide to the analyzing of gene protein”-john wiley and sons(1998)
8. Missener and A.S.Krawetg,”Bio-informatics to bio-informatics” Addison Wesley Longman Ltd(1999)
9. Bioinformatics for beginners K.Mani and Vijayaraj
10. Introduction to Bioinformatics S.Sundara Rajan and R.B
11. Introduction to Bioinformatics Arthor M.Lesle
12. Bioinformatics- A biologists guide to bio-computing and the internet 2000.Stuart M.Brown.
13. Bioinformatics”Sequence and Genome analysis.2001.David W.Mount.
- 14.Bioinformatics – R. Sundaralingam, V. Kumaresan.

**CORE PRACTICAL-I (Papers I, II, &III)**  
**(Algae, Fungi, Lichens, Plant Pathology; Fundamentals of Computer and applications;  
Bryophytes, Pteridopytes, Gymnosperms and Pale botany -2010 -2011 Batch)**

Time: 3 Hrs

Max. Marks: 60

1. Make suitable micro preparations of A, B & C. Draw labeled sketches.  
Identify Giving reasons and submit the slides for valuation 3x5=15 Marks
2. Comment on instrument D 1x5=5 Marks
3. Identify any TWO algal members from the algal mixture E. 2x4=8 Marks
4. Identify, draw diagrams and write notes on F,G,H,I,J,K,L,M and N 9x3=27 Marks

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55 Marks  
Record 5 Marks  
-----  
Total 60 Marks  
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**CORE PRACTICAL-I (Papers I, II, &III)**  
**(Algae, Fungi, Lichens, Plant Pathology; Fundamentals of Computer and applications;  
Bryophytes, Pteridophytes , Gymnosperms and Paleobotany )**

**Practical- I-KEY**

1. A- Algae/ Fungi  
B- Bryophytes/ Pteridopytes  
C-Gymnosperms (slide-2, Sketch & Reasons -3) 3x5=15 Marks
2. D- Computer devices 1x5 =5 Marks
3. E- Algal Mixture (Identification-1, Sketch & Notes-3) 2x4=8 Marks
4. F- Algae  
G-Fungi  
H-Lichen  
I-Computer  
J-Bryophytes  
K-Pteridopytes  
L- Gymnosperms  
M-Pale botany  
N- Plant Pathology (Identification-1, Sketch & Notes -2) 9x3=27 Marks

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55  
Record 5  
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Total 60 Marks

**CORE PRACTICAL II (PAPERS IV, V, & VI)**

**[Cell biology, Lab techniques, Anatomy, Embryology, & Medicinal Botany and Human welfare]**

Time: 3.00 Hrs	Max. Marks 60
1. Make squash of specimen A. Draw Sketches, Identify any one stage. Submit the slide for valuation.	7
2. Make suitable micro preparation of B & C. Draw labeled Sketches. Identify giving reasons & submit the slide for valuation.	2X6=12
3. Mount the embryo of the given specimen D & submit the slide for Valuation.	5
4. Cut T.S of E. Draw Sketches & write Notes.	6
5. Identify F,G,H,I & J	5x5=25
	----- 55
	RECORD 5
	-----
Total	60
	-----

**CORE PRACTICAL II (PAPERS IV, V, & VI)**  
**KEY**

1. A: Squash [Identification-1, Slide-2, Sketch & Notes-4]	7
2. B & C: Anatomy [Identification-1, Slide-2, Sketch-1, Notes-2]	2x6=12
3. D: Embryo Mounting [Tridax / Crotalaria] [Slide-2, Sketch & Notes-3]	5
4. E: Medicinal Botany [Bark leaves, Flowers, Stem, Fruits] [Identification-1, Sketch-2, & Notes-3]	6
5. F: Cell biology G: Lab techniques H: Anatomy I: Embryology J: Medicinal botany [Identification-1, Sketch-2, & Notes-2]	5x5 =25
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	Record 55
	5
	-----
Total	60
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**CORE PRACTICAL-III (Papers VII, VIII, IX & XII)**

**(Taxonomy & Economic Botany; Genetics, Plant Breeding & Biostatistics; Ecology  
Phytogeography; and Horticulture)**

Time 3 Hrs

Max. Marks 60

- |  |        |
|--|--------|
| 1. Assign specimen A and B to its respective family giving reasons.-----   | 2x5=10 |
| 2. Describe specimen C in technical terms. Draw sketches of floral<br>Parts, Construct floral diagram & write floral formula -----   | 10     |
| 3. Assign the specimen D to its respective habitat, giving the morphological and<br>Anatomical features -----  | 5      |
| 4. Analyse the plant communities present in the constructed Quadrat /Line<br>Transect/Belt transect E by Quantitative method. Present the data and give the<br>Inference ----- | 8      |
| 5. Work out the given Problem F -----  | 5      |
| 6. Work out the given Problem G -----  | 5      |
| 7. Comment on H -----  | 5      |
| 8. Identify and write notes on I -----   | 3      |

	-----	51
	Herbarium	4
	Record	5
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Total		60
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**CORE PRACTICAL-III (Papers VII, VIII, IX & XII)**

**KEY**

- |  |        |
|--|--------|
| 1. A & B Taxonomy (Identification -1 , Reasons -4)                                       | 2x5=10 |
| 2. C. Taxonomy (sketches-3,Floral diagram-2,Floral Formula-1,Notes-4)                    | 10     |
| 3. D. Hydrophyte / Xerophyte/Mesophyte<br>(Identification -1, Slide-1,Sketch -1,Notes-2) | 5      |
| 4. E. Quadrat / Line transect / Belt transect- (Identification-1, Graph & Notes-7 )      | 8      |
| 5. F. Genetics Problem   | 5      |
| 6. G-Bio statistics Problem  | 5      |
| 7. H. Horticulture (Cutting/ Layering / Grafting)-(Identification-1,Notes-4)             | 5      |
| 8. Economic Botany – (Identification-1, Notes -2)  | 3      |

	-----	51
	Herbarium	4
	Record	5
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Total		60
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**CORE PRACTICAL – IV - (Papers X & XI, Electives I, II, & III)**



**(Biophysics, Biochemistry, Plant Physiology, Microbiology, Applied Microbiology;  
Biotechnology-Concepts and techniques; Applied Biotechnology)**

Time: 3Hrs

Max.Marks:60

- |  |         |
|--|---------|
| 1. Write Procedure, apparatus required for the experiment A . Give the inference from the experiment and leave the setup for valuation ----- | 10      |
| 2. Test the presence of Carbohydrate/Protein in the given sample B.  | 10      |
| 3. Write the procedure for the Gram Staining and identify the type of bacteria Present in the given sample C.                                | 5       |
| 4. Write down the procedure for Preparing a medium/culture/inoculation Techniques in D   | 5       |
| 5. Identify the apparatus given in E and F and Write notes on their use  | 2x5= 10 |
| 6. Write notes on G, H, I, J & K   | 5x3=15  |

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55 Marks

Record 5 Marks

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Total 60 Marks  
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**CORE PRACTICAL – IV (Papers X & XI, Electives I, II, &III)**

**Key**

- |   |        |
|---|--------|
| 1. A- Physiology (Requirements-2, Procedure-3, Result-5)  | 10     |
| 2. B- Biochemistry(Requirements-2, Procedure-3, Result-5) | 10     |
| 3. C-Gram staining  | 5      |
| 4. D- Culture methods/ inoculation techniques             | 5      |
| 5. E- Physiology setup                                    |        |
| F-Apparatus used in Microbiology/Biotechnology            | 2x5=10 |
| 6. G-Biochemistry   |        |
| H & I –Microbiology                                       |        |
| J & K – Biotechnology (Identification-1, Notes-1)         | 5x2=10 |

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55 Marks

RECORD 05 Marks

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Total 60 Marks  
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### BIODEGRADABLE WASTE MANGEMENT: PRACTICAL

Time: 3Hrs

Max.Marks:60

1. Write the procedure and Requirements for estimating  
The chemical parameter of the given sample A. 10 Marks
2. Write the procedure and Requirements to calculate the parameter  
For the given sample B 10 Marks
3. Write the method of isolating the micro organism from the sample C 5 Marks
4. Write notes on D,E,F,G&H 5x3=15 Marks

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40 Marks

Record 5 Marks

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Total 45 Marks  
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### BIODEGRADABLE WASTE MANGEMENT

#### Key

1. A-(Requirement-5,Procedure-5, Data Presentaion-5 Result-5) 10 Marks
2. B-(Requirement-2, Proceudue-2,Data Presentaion-3 Result-3) 10 Marks
3. C-(Diagram-4 Notes-6) 5 Marks
4. D,E,F, G&H (Sketch&Notes-3) 5x3=15 Marks

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40 Marks

Record 5 Marks

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Total 45 Marks  
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