

RRC - UEA 8/4/08

Placed at the Special Meeting
of the Academic Council
held on 25.06.2008

APPENDIX - BD

MADURAI KAMARAJ UNIVERSITY
(University with Potential for Excellence)

B.Sc. Botany Major (Semester) Degree course **SBY8**
(Revised Syllabus - CBCS - MAJOR)

This will come into effect from the academic year 2008-09. (For those who joining the first Semester of the course in July 2008 and afterwards)

Semester - I

Part	Paper	Study component	No. of Course	Credit	Hours
I	I (TAMIL) UTMELI	Tamil/Other Language	1	3	6
II	II (ENGLISH) UENEEI	English	1	3	6
III	Core - I	Algae and Bryophytes SBY8 C II	1	4	4+2(P)
	Allied Subject - I	Chemistry Theory (Inorganic & Physical) SBY8 A II	1	4	4+2(P)
IV	Skill based - I SBY8 S II	Biofertilizer, Biopesticides and Biofuels SBY8 S II	1	2	(2)
	Skill based - II	Horticulture and Plant Breeding SBY8 S II	1	2	2
		Non-Major Elective - I AII SBY8 A II	1	2	2
		AECSNII SBY8 N II	7	20	30

General Economic

Attended by
Jaidi
9/2/2021

Dr. M. ALVANDI, M.Sc., M.Phil., P.Sc., Ph.D.

Principal
Arulmigu Palaniandavar
College of Arts & Culture
Palani - 624 601

L. Jany
PRINCIPAL
Arulmigu Palaniandavar College
of Arts & Culture,
PALANI - 624 601,

RRC - UEA8640

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APPENDIX - BD

MADURAI KAMARAJ UNIVERSITY
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B.Sc. Botany Major (Semester) Degree course

(Revised Syllabus - CBCS - MAJOR)

SBY8C

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This will come into effect from the academic year 2008-09. (For those who joining the first Semester of the course in July 2008 and afterwards)

Semester - I

Part	Paper	Study component	No. of Course	Credit	Hours
I	I	Tamil/Other Language	1	3	6
II	II	English	1	3	6
III	Core - I	Algae and Bryophytes SBY8C II	1	4	4+2(P)
	Allied Subject - I	Chemistry Theory - I SCH8AII	1	4	4+2(P)
IV	Skill based - I SBY8SII	Biofertilizer, Biopesticides and Biofuels SBY8SII	1	2	2
	Skill based - II	Horticulture and Plant Breeding SBY8S12	1	2	2
		Non-Major Elective - I A1158AII	1	2	2
		Total	7	20	30

General Economic

Attended by
Jaidi
4/2/2021

Principal
Arulmigu Palaniandavar
College of Arts & Culture
Palani - 624 601

Dr. M. ATTANDI, M.Sc., M.Phil., B.Ed., Ph.D.
HEAD P.G. Dept. of Botany,
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PALANI - 624 601.

B.Sc. BOTANY CODE - SBY8

Semester - II

I	CTM8L21	Tamil/Other Language	1	3		
II	UEN8E21	English	1	3		
III	Core - II UEN8E21	Fungi, Lichens and Plant Pathology SBY8C21	2	4+2	4+2	4+2
	Practical - I	Algae, Fungi, Lichens, Bryophytes And Plant Pathology SBY8C2P				
IV	Allied Subject-I	Chemistry Theory - II SBY8C22	1	4+2	4+2(P)	4+2(P)
	Skill based - III	Plant Ecology and Phytogeography SBY8S21	1	2	2	2
	Skill based - IV	Medicinal Botany SBY8S22	1	2	2	2
	BAE8001	Non-Major Elective - II	1	2	2	2
		Total	9	24	30	30

Semester - III

III	CTM8L31	Tamil/Other Language	1	3	6	
II	UEN8E31	English	1	3	6	
III	Core - III SBY8C31	Pteridophytes, Gymnosperms & Palaeobotany	1	4	4+2(P)	4+2(P)
	Allied Subject - I SCH8A31	Chemistry Theory - III	1	4	4+2(P)	4+2(P)
	Allied Subject - II SBY8A11	Zoology Theory - II	1	4	4+2(P)	4+2(P)
		Total	5	18	30	30

Semester - IV

IV	CTM8L41	Tamil/Other Language	1	3	6	
II	UEN8E41	English	1	3	6	
III	Core - IV SBY8C41	Plant Anatomy and Microtechniques	2	4+2	4+2(P)	4+2(P)
	Practical - II	Pteridophytes, Gymnosperms Palaeobotany, Anatomy, Microtechniques				

SCH8A41

Allied Subject - I	Chemistry Theory - IV	4+2	4+2(P)
	Chemistry Practical - II		
Allied Subject - II	Zoology Theory - II	4+2	4+2(P)
	Zoology Practical - I		
	Total	8	24

Semester - V

III	Core - V SBY8C51	Cell biology and Angiosperm Embryology	3	12	12	8(P)
	Core - VI SBY8C52	Biochemistry and Biotechniques				
IV	Core - VII SBY8C53	Microbiology	1	4	4+2(P)	4+2(P)
	Allied Subject - II	Zoology Theory - III				
IV	Skill Based - V SBY8S51	Biotechnology and Bioinformatics	1	2	2	2
	SBY8S52	Environmental Studies	1	2	2	2
		Total	6	20	30	30

Semester - VI

III	Core - VIII	Taxonomy of Angiosperms	6	12+15	12	8(P)
IV	Core - IX	Genetics and Evolution				
IV	Core - X	Biophysics and Plant Physiology				
IV	Practical Paper SBY8C6P	Cell Biology and Angiosperm Embryology, Biochemistry and Bio-techniques and Microbiology				
IV	Practical Paper SBY8C6Q	Taxonomy of Angiosperm				
IV	Practical Paper SBY8C6R	Genetics and Evolution, Biophysics and Plant Physiology				

S.K.P. 2021

	Allied Subject- II	Zoology Theory - IV			
		Zoology Practical - II	2	4+2	4+2(P)
IV	SZY8M4P Skill Based-VI SBY8561	Food Microbiology	1	2	2
	UVE8V61	Value Education	1	2	2
		Extension Activities	1	2	
		Total	11	39	30

Language Part I Tamil - Theory - 4 Papers / 24 Hours / 12 Credits

Language Part II English - Theory - 4 Papers / 24 Hours / 12 Credits

Core Paper - Theory - 10 Papers + Practical - 5 Papers = Total = 15 Papers

60 Hours / 59 Credits

Allied Subject - I - Theory - 4 Papers + Practical - 2 Papers = Total = 6 Papers

24 Hours / 18 Credits

Allied Subject - I - Theory - 4 Papers + Practical - 2 Papers = Total = 6 Papers

24 Hours / 18 Credits

Skilled Electives - Theory - 6 Papers / 12 Hours / 12 Credits

Non-Major Elective Theory - 2 Papers / 4 Hours / 4 Credits

Environmental Studies Theory - 1 Papers / 2 Hours / 2 Credits

Value Education Theory - 1 Papers / 2 Hours / 2 Credits

Extension Activities I / 1 Credit

Botany Major Syllabus (Theory)

I-Year - First Semester

Core Paper-I Algae and Bryophytes

A-Algae

Unit I

- General characters of Algae.
- Classification of algae based on Fritsch.
- A brief account on thallus structure and variations.
- Economic importance of Algae.
 - Algae as food and medicine.
 - Algae as biofertilizer.
 - Source of alginic acid and agar.
 - Diatomite
- Harmful effects of algae

Unit II

Study of the distribution, structure, reproduction and life history of the following

(Need not study the development of sex organs)

- Charophyceae - *Nostoc, Oscillatoria*.
- Chlorophyceae - *Volvox, Oedogonium, Caulerpa*.

Unit III

Study of the distribution, structure, reproduction and life history of the following

(Need not study the development of sex organs)

- Bacillariophyceae - *Fragilaria*
- Bacillariophyceae - *Diatoms*
- Phaeophyceae - *Agaricium*
- Rhodophyceae - *Polysiphonia*

B - Bryophytes

Unit IV

General characters of Bryophytes.

- a) Classification of Bryophytes based on Rothmaler.
- b) Structure and reproduction of the following type including the Gametophyte and Sporophyte (Development of sex organs need not be studied).

- 1) Hepaticopsida - *Marchantia*

Unit V

Structure and reproduction of the following type including the Gametophyte and Sporophyte (Development of sex organs need not be studied)

- 1) Anthocerotopsida- *Anthoceros*.
- 2) Bryopsida - *Polytrichum*.

Reference Books

- 1) Frisch, F.E.- The structure and reproduction of the Algae volume I & II. Vikas Publication, New Delhi.
- 2) Vashishta B.R. Algae-S. Chand & Co Ltd. New Delhi.
- 3) Bhatia K.M. Treatise of algae. S. Chand & Co, New Delhi.
- 4) Chopra G.D.- A text book of algae, S.Nagin & CO, New Delhi.
- 5) Gupta J.S. Text book of Algae, S.Nagin & CO, New Delhi.
- 6) Singh R.N. Role of blue green algae. Indian council of agricultural Research, New Delhi.
- 7) Sharma, O.P. Text book of algae. Tata McGraw- Hill publishing company Ltd, New Delhi.
- 8) Smith G.M. Cryptogamic Botany volume II, Tata Mc Graw-Hill publishing Company Ltd-New Delhi.
- 9) Parihar N.S. An introduction to Bryophytes Vol.I Central book Depot, Allahabad.
- 10) Pandey, B.P. College Botany - Algae, Fungi and Bryophyta Vol I, S, Chand & Co. P.Ltd Ram Nagar, New Delhi.

Skill Based Subject

Skill Based Paper-I - Biofertilizers, Biopesticides and Biofuels

Unit I

SUB: CODE **BBY8511**

Introduction, types (Bacterial, Algal and Fungal Biofertilizers) field application, yield, success percentage and advantages of biofertilizers. Bacterial biofertilizers: *Rhizobium* and Phosphobacteria, Mass cultivation of *Rhizobia*.

Unit -II

Nitrogen fixation - Symbiotic and Nonsymbiotic, Mechanism of N_2 fixation with reference to *Rhizobium* and Azotobacter, Nif genes, Nodulation.

Unit III

Algal biofertilizers. Blue green algae- *Nostoc*, *Anabaena*, and Mass cultivation of BGA - Algalization. VAM fungi - uses and Mass cultivation.

NIT - IV

Organic farming, advantages of organic farming: Composting, Vermi composting, Jeeva Kavya - Production and uses.

NIT - V

Biopesticides. Bacterial and Viral biopesticides. Mechanism of action and uses. Advantages of biopesticides. Extraction and uses of biofuels - *Jatropha*, *Pongamea*, Production of Ethanol-Cassava.

References -

- 1) Biotechnology - Dr. Subba Rao
- 2) Venkatraman, Algal biofertilizers and Rice cultivation, Sathish book enterprises, Agra
- 3) Singh, Nitrogen fixation in Indian rice fields by azolla and blue green algae.
- 4) Gupta P.K. Elements of biotechnology, S.chand & Co., Madras.
- 5) Sathyanarayana. V. Biotechnology, Books and Allied

Skill Based Paper-II Horticulture and Plant Breeding

Horticulture

UNIT I

Horticulture and its importance, Division of Horticulture

Layout and Planning of Orchards and kitchen garden

Training and Pruning

Propagation-Seedage, Cuttage, Layerage and Graffage

UNIT II

Fruit Culture

Unfruitfulness, fruit drops-causes and prevention

Study of the following plants with special reference to Propagation, area of cultivation, season, soil irrigation and harvesting

- 1) Mango
- 2) Grape

UNIT III

Designing a garden: Lawn, Hedges, Rockery and Water Garden, Landscape Gardening, Bonsai, Cut flower, Horticultural show, Hanging pot

Plant Breeding

UNIT IV

Plant Breeding and its objectives, Historical account

Crop improvement: Selection methods-Mass, Pure line and Clonal.

Hybridization: Types and objectives of hybridization, techniques followed in hybridization in general.

UNIT V

Methods of hybridization-Pedigree method and Back cross method Hybridization techniques adapted in 1. Rice 2. Maize Hybrid vigour

Role of Mutation in Plant Breeding.

Reference Books

1. Edmond et al - Fundamentals of Horticulture. Tata McGraw Hill Publishing Co., Mumbai
2. Kumar N-Introduction to Horticulture, Rohini Agency, Nagarcovil
3. Gopala Swami iyengar K.S.-Complete Gardening
4. Percy Lancaster- Gardening in India, Rekha Printers, New Delhi
5. Shukla R.S. and Chandel P.S.- Cytogenetics, Evolution and Plant Breeding
6. Allard R.W.- Principles of Plant Breeding, John qiley, New York
7. Chowtry-Introduction to Principles of Plant Breeding.

I Year - Second Semester

Core Paper II-Fungi, Lichens and Plant Pathology

Fungi

Unit I

General characters and classification of fungi based on Alexopoulos-Economic importance of fungi- as food, medicine, growth regulators and role of Fungi in industries- Harmful effects-Diseases in humans and important crops.

Unit II

Occurrence, structure, reproduction and life cycle of following;

- a) Phycomycetes- *Rhizopus*.
- b) Ascomycetes-*Aspergillus*.
- c) Basidiomycetes - *Puccinia*.
- d) Deuteromycetes-*Fusarium*.

Lichens

Unit III

General characters, types, economic importance, structure and reproduction of *Usnea*.

Plant Pathology

Unit IV

Introduction, classification of plant diseases- symptoms of plant diseases- Symptoms caused by Bacteria, fungal and viral pathogens- Robert Koch's Postulates. Biocontrol of Plant diseases.

Unit V

Study of the etiology and control measures of the following diseases:

- 1) Citrus Canker.
- 2) Paddy Blast.
- 3) Tikka disease of groundnut.
- 4) Red rot of sugar cane.
- 5) Bunchy top of Banana.
- 6) Little leaf of Brinjal.

Reference Books

1. Alexopoulos C.J. - Introductory Mycology - John Wiley & Sons, N.York.
2. Chopra, G.L. - A textbook of Fungi. Nagin & Co., N.Delhi.
3. Singh R.S. - Principles of Plant Pathology. Oxford & IBH Publishing co
- 4) Rengaswami, G. - Diseases of crop plants of India.
5. Smith, G.M. Cryptogamic Botany Vol-I, Algae and Fungi.

Skill Based subject

Skill Based Paper - III- Plant Ecology and Phytogeography

Plant Ecology

Unit I

Introduction:- Definition, Historical background, Ecology and its relation to other sciences- Scope of ecology.

Soil-Erosion and conservation

Biotic factors-Positive and Negative interactions.

UNIT II

Study of the following groups with special reference to their morphological, anatomical and physiological adaptations.

- a) Hydrophytes
- a) Xerophytes
- b) Halophytes

UNIT III

Units of vegetation-plant formation, plant association and plant consociation. Ecological succession- Hydrosere and Lithosere. Ecological field-study -methods and techniques. (Transect method, quadrat, method, point frame method)

Phytogeography

Unit IV

Principles of Phytogeography. A brief account of continental drift, Endemism & age and area hypothesis. Phytogeographic regions of India. Vegetation of Tamil Nadu

UNIT V

Biogeochemical cycle - sedimentary cycle- phosphorous and sulphur cycle Life forms -Raunkiaer's lifeform -classification. Productivity-primary Productivity-measurement of Primary Productivity by harvest method and oxygen measurement method.

Reference books

1. Odum, E.P. Fundamental Of Ecology. W.B. Saunder Colondon
2. Ambast, R.S. - A text Book Of Plant Ecology. Students Friends & C Varanashi
3. Sharma, P.D. - Element of Ecology. Rastogi publications Meerut.
4. Kumar, H.D. Modern concepts of Ecology. vikas publishing house new delhi
5. Shukla, R.S. and P.S. chandel- plant Ecology and soil science. S.Chand & co. td.
6. Bhatia and Sharma- treatise on plant Ecology. pradeep publications Jalendhur.
7. Stanley A. Caim. Fkkundamentals of plan Geography. harper and brothere, New york

Skill Based Paper - IV - Medicinal Botany

UNIT - I

Historical background of herbal medicines

A brief account of Siddha medicine.

A brief account of Ayurvedic medicine

UNIT - II

Methods of preparation and uses of Choornam, Kashayam and Thailam.

Conservation of existing medicinal plants

Conservation of endangered medicinal plants (insitu and exsitu methods)

UNIT - III

The study of diagnostic features, systematic position and medicinal values of whole plant and plant parts (roots, underground parts, bark, stem, leaves, flowers, fruits and seeds with reference to the plants listed below.

1. Malvaceae - *Hibiscus rosa-sinensis*
2. Caesalpiniaceae - *Cassia auriculata*
3. Meliaceae - *Azadirachta indica*
4. Cucurbitaceae - *Momordica charantia*
5. Apiaceae - *Centella asiatica*

UNIT - IV

The study of diagnostic features, systematic position and medicinal values of whole plant and plant parts (roots, underground parts, bark, stem, leaves, flowers, fruits and seeds with reference to the plants listed below.

- 1) Lamiaceae - *Ocimum sanctum*
- 2) " - *Coleus aromaticus*
- 3) Verbenaceae - *Vitex negundo*

- 4) Nyctaginaceae - *Boerhaavia diffusa*
- 5) Amaranthaceae - *Aleemthera sessilis*

UNIT - V

The study of diagnostic features, systematic position and medicinal values of whole plant and plant parts (roots, underground parts, bark, stem, leaves, flowers, fruits and seeds with reference to the plants listed below.

- 1) Euphorbiaceae - *Phyllanthus emblica*
- 2) " - *Phyllanthus niruri*
- 3) Zingiberaceae - *Curcuma longa*
- 4) " - *Zingiber officinale*
- 5) Liliaceae - *Aloe vera*

Reference Books

- 1) Sambamurthy, A.V.S.S. and N.S. Subramanyam. The text book of economic Botany. Wiley Eastern Ltd., Madras.
- 2) Kochar S.L. Economic Botany in the tropics. Mac Millan Indian Ltd. New Delhi
- 3) Hill, F. Economic Botany, Tata Mc Graw Hill Publishing Co., Ltd, New delhi.
- 4) Murugesu Mudaliar, G.S. Gunapadam. Tamil Nadu Ayurved Medicines centre
- 5) Kandasamy Pillai. History of Siddha Medicine. Govt of Tamil Nadu
- 6) Panda, H. Herbs cultivation and medicinal, uses. NIR Publication, Delhi
- 7) Chopra, R.N. et al Indigenous drugs of India Academic publishers.
- 8) Wallis, T.E. Text book of pharmacognosy. J.A. Churchill Ltd.
- 9) Nadkarni, K.M. Materia medica Vols: I and II, Popular prakasham Pvt.Ltd.,

II Year - Third Semester

Core Paper III-Pteridophytes, Gymnosperms and Palaeobotany

Pteridophytes

Unit I

General characters - classification based on Smith structure and Reproduction

(Need not study the developmental aspects)

- a) Psilotales - *Psilotum*
- b) Lycopodiales - *Lycopodium*

Unit II

Structure and reproduction of

- a) Equisetales - *Equisetum*
- b) Filicales - *Gleichenia*
- c) Marsileales - *Marsilea*

Unit III

Classification of Gymnosperms according to Chamberlain.

Structure and Reproduction of Pinus (Coniferales)

(Need not study the developmental aspects)

Unit IV

Structure and life cycle of *Gnetum* (Gnetales)

(Need not study the developmental aspects)

Economic importance of Gymnosperms

Palaeobotany

Unit V

General classification of geological era-brief study of the methods of formation of fossils-brief study of the following types of fossils-

- a) Psilotales-*Rhynia*
- b) Lepidodendrales-*Lepidodendron*
- c) Cycadofilicales-*Ligninopteris*

Reference Books

- 1) Sporne, K.R. - Morphology of Pteridophytes.
- 2) Pandey, B.P. - A text book of Botany (Bryophyta, Pteridophyta & Gymnosperms)
- 3) Parihar, N.S. - An Introduction to Embryophyta Vol II (Pteridophytes)
- 4) Chopra, G.L. - Gymnosperms.
- 5) Sporne, K.R. - The Morphology of Gymnosperms.
- 6) Shukla and Misra - Essentials of Palaeobotany.

II Year - Fourth Semester

Core Paper IV-Plant Anatomy and Microtechniques

Plant Anatomy

Unit I

Plant cell wall-Primary, secondary, Ultrastructure

- Chemistry of cell wall - simple and bordered pits, Tissues-

- Meristems, classification, shoot apex, Tunica corpus theory,

- Root apex: Histogen theory-Quiescent centre.

Unit II

Simple and Permanent tissues-Parenchyma, Collenchyma and Sclerenchyma-structure composition and function. Complex permanent tissues, Xylem and phloem - structure, composition and function of the same Primary structure of monocot root and stem.

Unit III

Normal secondary thickening in dicot stem, dicot root, anomalous secondary thickening in stems of *Boerhaavia*, *Achyranthes* and *Dracaena*.

Unit IV

Leaf anatomy- dicot leaf – dorsi-ventral leaf (*Hibiscus*) Monocot leaf (Grass)
Nodal Anatomy-Unilacunar node (*Justicia*), trilacunar node (*Azadirachta*), Multilacunar node (*Aralia*)

Microtechnique

Unit V

Micro techniques-Fixatives- fixation of plant materials. Dehydration, Infiltration, sectioning, staining and mounting-maceration technique- and whole mount preparation.

Reference Books

1. Kaatherine, Esau: Plant anatomy. Wiley Eastern Pvt/Ltd, N.Delhi.
2. Vashista, P.C.Plant anatomy, S.Nagin & Co, N.Delhi.
3. Donald Alexander Johnson: Plant microtechnique, Tata Mc Graw Hill, Delhi

III year – Fifth Semester

Core Paper V-Cell Biology and Angiosperm Embryology

Cell Biology

Unit I

Structural and organizational differences between prokaryotic and eukaryotic cells. Cell division: stages of mitosis and meiosis- events in cell cycle. structure and chemical composition and function of plasma membrane- Membrane models- Unit Membrane model

Unit II

Brief study of the Structure and function of cell organelles. Chloroplast, mitochondria. E.R., Ribosome, Golgi complex. Lysosome-Non-living inclusions, Rhaphides, Druses, Cystolith, Nucleus, chromosome - structure, types and chemical composition-Watson and Crick model of DNA.

Angiosperm embryology

Unit III

Structure and development of microsporangium and male gametophyte.

Structure and development of megasporangium. Type of ovules, female gametophyte-Monosporic embryosac (*Polygonum*) type, bisporic embryosac (*Allium* type).

Unit IV

Fertilization Double fertilization and triple fusion. Parthenocarpy, development of dicot embryo (Capsella type), development of monocot embryo (Luzula type) endosperm types: Nuclear, Cellular & Helobial (Haustoria development not included)

Unit V

Somatic hybridization, ovule culture, Anther and pollen culture, embryoculture.

Reference Books

1. DeRobertis et al. Cell Biology, WBSaunders Co, London.
2. Verma & Agarwal - Cytology, Chand & Co. N. Delhi.
3. Maheswari, P. Introduction to the embryology of angiosperms.
4. Bhojwani, s. s. & S.P. Bhaatnagar-Embryology of Angiosperms.

III year – Fifth Semester

Core Paper VI-Biochemistry and Biotechniques

Biochemistry

Unit I

Definition and scope. Basic concepts of atoms, molecules and types of Bonding in biomolecules Isomerism-types, structural-stereo and optical

Carbohydrates -Nomenclature, definition and classification

Monosaccharides -Glucose

Disaccharides -Classification and structure-Maltose, & sucrose

Polysaccharides -Structure and classification-starch.

Unit II

Amino acids -Classification based on polarity and electrical charge, structure and properties of amino acids.

Proteins: Classification based on composition, solubility, shape, and function
Primary Structure - peptide bond, N and C terminals. Secondary - types of Bonding in secondary structure. tertiary-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) factors affecting enzyme activity (substrate, pH and temperature).

Lipids: classification of lipids, saturated and unsaturated fatty acids Cholesterol. Simple lipids: fats and oils. Compound lipids: phospholipids Derived lipids: steroids. (with an example each)

Unit IV

Vitamins - structure importance, source, deficiency symptoms of water soluble Vitamin - Riboflavin, Niacin, Biological detoxification, Principles- Mechanism of detoxification

Unit V

Biotechniques

Basic principles and application of colorimetry, pH metry, centrifugation Basic principles-types, chromatography- Basic principles-types (Paper and Column chromatography)

Reference Books

1. Conn E.E. and P.K. Stumpf-Outlines of Biochemistry, Wiley Eastern Ltd. Chennai.
2. Lehninger A.L/- Biochemistry, Kalyani Publishers, New Delhi.
3. Lubert Stryer-Biochemistry, CBS Publishers, New delhi
4. Power C.B. and GR. Chatwal-Fundamentals, of Biochemistry S.Chand & co., New Delhi.
5. Jain J.L.- Fundamentals of Biochemistry S.Chand & co.,New Delhi.
6. Jeyaraman, Kunthala. M.Lakshmanan, M.Gnanam and J.Jeyaraman. Experiments in Microbiology, Higgin Bothams, Chennai.
7. Jeyaraman.J-Laboratory manual in Biochemistry, Wiley eastern Ltd. Chennai.
8. Jeyaraman.J-Techniques in Biology-A college level study-Higgin Bothams, Chennai.
9. Plummer D.T.- An Introduction to practical biochemistry, Tata Mc Graw Hill publishing Co, Bombay.
10. Veerakumari.J- Biochemistry, MJP Publishers, Chennai.
11. Keith Wilson and Kenneth H.Goldizg-Principles and Techniques of Practical Biochemistry, Cambrindge University press, Foundation books.,

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III year - Fifth Semester

Core Paper - VII - Microbiology

Unit I

Contributions to microbiology by Anton Van Leeuwenhoek, Louis Pasteur, Robert Koch. Morphology of Bacteria: size, shape, arrangement, fine structure, cell wall, pili, plasma membrane, mesosome, capsule, flagella, endospore.

Unit II

Outlines of Bergey's bacterial classification, Reproduction of Bacteria-Binary fission, Budding and fragmentation, Growth: Growth curve, measurement of growth, Nutritional types of Bacteria. Bacteriophage: structure and reproduction.

Unit III

Methods in Microbial-culture, media preparation, sterilization, inoculums. Inoculation: pure culture-spread plate, pour plate and streak plate Staining Technique: simple and differential (Gram's)

Unit IV

Disinfectants, Antibiotics-source, structure and mode of action of penicillin and its derivatives, streptomycin. Mushroom cultivation, single cell protein.

Unit V

Applied Microbiology

Tests for detection of coliform bacteria in water-sewage treatment-Oxidation pond-trickling filter, spoilage of food and preservation methods, Microflora of milk, maintenance of quality of milk.

Reference Books

1. Powar, C.B. and M.E. Dagainawala-General Microbiology Vol-I and Vol-II.
2. A.S. Rao. Introduction to Microbiology.
3. P.D. Sharma-Microbiology and plant pathology
4. G. Schelyal-General microbiology
5. Anna and Joshua-Microbiology.

Skill Based Paper V - Plant Biotechnology and Bio-informatics

Unit I

Restriction endonucleases- types-cleavage patterns, DNA ligase, cloning vectors - plasmids eg: pBR 322, phage vectors (bacteriophage) and *Agrobacterium tumefaciens*.

Ti plasmid as a vector for higher plant systems. cDNA library, genomic library, technique and applications of Southern blotting, Polymerase chain reaction.

Unit II

Integration of the DNA into the plasmid and phage vector, introduction of the vector into a suitable host, cloning of insulin gene. GM plants-Bt cotton

Unit III

Fermentation technology- Batch culture- fermenter structure and types -Ethanol production, penicillin production

Unit IV

Different media used in tissue culture, composition of MS medium, propagation of crop plants by tissue culture, protoplast culture, artificial seeds, Application of tissue culture in agriculture and horticulture.

Bioinformatics:-

Unit V

Databases and tools-Biological database 'NCBI' model-primary and Secondary databases-sequence analyzing tools-BLAST- proteomics and tools Homology modeling (concept only), Docking-Target- drug.

Reference

1. Dubly, R.C. (1999) A Text book of Biotechnology
2. Gubta, P.K. (1998) Elements of Bioten
3. Sathayanarayana, U. (2008) Biotechnology
4. Razhan, M.K. (2003) Introduction to Plant tissue culture.

III Year - Sixth Semester
Core Paper VIII - Taxonomy of Angiosperms

Unit I

Taxonomy and its significance.

Systems of classification-Artificial, Natural and Phylogenetic

- Linnaeus system of classification
- Bentham and Hoocker's system of classification - Merits and demerits

Unit-II

Brief account of the principles of nomenclature. Nomenclature rules-Binomials, Typification, Effective valid publication Conserved names and new names of eight families- author citation.

Herbarium techniques and its importance.

Botanical survey of India and its functions.

Unit III

Study of the following families with special reference to morphology of medicinal plant parts and economic importance

Amnaceae, Brassicaceae, Tiliaceae, Fabaceae, Cucurbitaceae and Apiaceae

Unit IV

Study of the following families with special reference to morphology of medicinal plant parts and economic importance

Rubiaceae, Apocynaceae, Asclepiadaceae, Solanaceae, Acanthaceae, Verbenaceae

and Lamiaceae.
Unit V: Study of the following families with special reference to morphology of medicinal plants and economic importance
① Amaranthaceae ② Orchidaceae ③ Cannaceae ④ Amegillaceae
⑤ Commelinaceae ⑥ Araceae ⑦ Utriculariaceae

Angiosperm Taxonomy

Time: 3 hours

Max. Marks - 100

Question Pattern

- Refer specimen "A", "B", "C" and "D" to its respective family, giving reasons. (Sketches not required) 4×7=28 Marks
- Describe specimen "E" and "F" in technical terms. Draw labeled sketches of floral parts including L.S of the flower. Construct the floral diagram and write the floral formula 2×15=30 Marks
- Write genus and family of the given specimen 'G', 'H', 'I', 'J', 'K' and 'L' 6×2 = 12 Marks
- Submission of herbarium (20 Numbers) 10 Marks
- Submission of observation note books 20 Marks

Total Marks = 100

(Note: Scale down to 60 marks)

Key and scheme of valuation

- A, B, C and D. Families Prescribed in the syllabus.

As a whole	4×7=28 Marks
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- E and F - Plants included in the syllabus 2×15=30 Marks

Technical Description	5 Marks
Diagram	5 Marks
Floral diagram	3 Marks
Floral formula	2 Marks

4. "C"-Hanging drop - (Curd or yeast or Bacterial culture).
Preparation and submission 10 Marks
5. Spot at sight
- D - Electron micrograph of organelles
- E - Cell inclusion
- F- Embryology. G - From Biochemistry
- H- Any instrument
- I } - Microbiology -
- J } Identification-1 Mark/Diagram-2 Marks/Notes-2 Marks.

Botany Major Practical

Paper IV - Angiosperm Taxonomy

Syllabus

1. To refer Angiosperm plants to their respective families by giving reasons
2. To describe plant in technical terms, draw diagrams construct the floral diagram and give the floral formula
3. To identify at sight the Angiosperm specimens from the local flora or from herbarium
4. To attend fieldwork under the supervision for a minimum period of three days to acquaint with the flora of the same and prepare 20 Herbarium plants.
5. To maintain and submit observation notebook for external valuation.

SBYB N 21 First Year Semester - II

Paper II - Plant utility and exploitation

Unit I ✓

Origin of cultivated plants, Vavilov's centre's of origin KK

Unit II

Plants as sources for food, fodder, fibres, spices, Beverages AS

Unit III ✓

Drugs, narcotics, insecticides, timber, gums, resins and dyes. KK

Unit IV

Plant as sources of Latex, cellulose, starch and their products. Perfumery. ✓

Unit V

Importance of Ethnobotany in Indian context. Energy plantation, Botanical gardens and Herbaria. AS

References

- 1) Economic Botany by R.Hill.
- 2) Economic Botany by Kumar, H.D.
- 3) Economic Botany by Sambasiva Iyer.

NON-MAJOR ELECTIVE,

I Year - I Semester

Paper-I: Mushroom cultivation

SBY 8 N 11

Unit I

AS Historical background, Distribution edible mushroom in India

Present status of mushroom. Cultivation in India. General characters of Mushroom

Unit ii

Edible mushroom, Non edible mushroom

AS Nutritional value and importance of mushrooms

Mushrooms as Medicine. Recipes of mushroom

Unit III ✓

AS/KK Spawn production methods, factors effecting spawn production/storage of spawn.

Unit IV ✓

Substrates used in mushroom cultivation, ✓

KK Cultivation methods and Harvesting. ✓

Ex: Button mushroom and Milkymushroom. ✓

Unit V

KK Cultivation Methods and Harvesting of Oyster mushroom Ganoderma. Pests and diseases affecting mushroom and their control measures.

References:

- 1) Hand Book on Mushrooms - 1998 Edu.
- 2) By Dr.Nita Bahl. Oxford & I B H Publishers, New Delhi.
- 3) Mushroom culture - 1999 - A.D.Muthusamy & Yesuraju TNAU - Publication. Madurai.

B.Sc. Botany Ancillary Practical

(Question pattern)

Time: 3 hours

Max: 100 Marks

Paper-II Taxonomy Embryology of Angiosperms, Medicinal Botany, Plant Physiology and Horticulture

1. Refer specimen A to its family giving reasons 10 Marks
2. Describe B in Technical terms. Draw labeled sketches including L.S. Of flower. Submit L.S. of the flower for valuation. 15 Marks
3. Identify and write notes on Botanical name, common name and medicinal value of C, D, E & F (No sketches required) 4×5 = 20 Marks
4. Identify and write notes on G. 5 Marks
5. Demonstrate the Horticultural technique (any one method) assigned to you [H] and write the procedure for the same. 10 Marks
6. Identify and write notes on I, J & K. 3×5 = 15 Marks
7. Comment on the physiology set up L. 5 Marks
8. Observation notebook. 20 Marks

(Note: Scale down to 60 marks)

Key and Scheme of valuation

1. A-Angiosperm material of any family prescribed in the syllabus. As a whole - 10 Marks.
2. B - Any Angiosperm specimen. (Included in the syllabus) (Description -5, L.S.-2, other diagrams-5, Floral diagram -2, Floral formula - 1)
3. C, D, E, & F - Medicinal plants prescribed in the syllabus (Botanical and common names 1+1, Notes-3) -
4. G. Embryology slides section of Anther and Ovule (Description-3, Diagram-2).
5. Horticulture - (Demonstration - 5, Procedure - 5).
6. I and J - Horticulture, K- Physiology. (Identification - 1, Diagram - 2, Notes - 2).
7. Any Physiological setup (Identification - 1, Diagram - 2, Notes - 2)

Key for Botany ancillary Practical-I

1. A-Angiosperm material-Stem, leaf of Hydrophytes or Xerophytes prescribed in the syllabus [Slide=5, Diagram=2 Description=3]
2. (B&C) Vegetative. Material from plant diversity [Pteridophyte and gymnosperm] For each material [Slide=5, Diagram=2 Description=3]
3. E, F and G, H, I-[Permanent slides or museum specimens of Algae, Fungi, Bryophytes, Pteridophytes and Gymnosperms]. J & K -Applied Botany.[for each one Identification=1, Diagram=2and Description=2]
4. L & M - Xerophytes, or Hydrophyte or a mangrove plant or plant part [Identification=1, diagram=2, Description=2]
5. Observation note book - 20 Marks

B.Sc., Botany Ancillary Practical

Paper II Taxonomy and Embryology of angiosperms, Medicinal Botany

Plant physiology and Horticulture

Syllabus

1. To make dissections using dissection microscope of the floral parts of angiospermic plants and to make drawing to bring out the salient features [floral diagram also expected] to learn to mount the floral parts on a given slide.
2. To assign the given plants to its natural order giving reasons
3. To describe plants in technical terms
4. Identification of medicinal plants and record their morphological features.
5. Identification of sections of anther and ovule.
6. Propagation methods of horticulture plants-Cuttage, Layerage and Graftage.
7. Demonstration of techniques of Horticulture.
8. To describe simple setups in plant physiology (Evolution of oxygen-photosynthesis, Light screen experiment, Mohl's half leaf expt.)
9. To maintain an observation notebook and to submit it for external valuation.

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Syllabus for B.Sc., Botany Ancillary Practical

Paper I Plant diversity, Plant pathology, Plant Ecology and Applied botany

Syllabus

1. Micro preparation of plants mentioned in plant diversity part of the syllabus.
2. Section cuttings and submission of slides-*Selaginella* and *Pinus*.
3. Spotters-Identification of specimens or slides from Algae, Fungi, Bryophytes, Pteridophytes and Gymnosperm included in the syllabus.
4. Section cutting and mounting plant materials of ecological importance [such as *Nerium*, *Bryophyllum*, *Nymphaea*, leaves and other available materials]
5. Maintenance of Observation notebook and submission of the same during practical examination.

B.Sc. Botany Ancillary Practical

(Question pattern)

Paper I Plant diversity, Plant Ecology & Applied Botany

Time: 3 Hrs

Max.Marks:100

1. Take T.S of specimen A. Identify, draw labeled sketch giving reasons. Submit slide for valuation. 10 Marks
2. Make suitable micro preparation of B and C. Identify, draw labeled sketches giving reasons. Submit slides for valuation. 2×10=20Marks
3. Identify, draw sketches and write notes on spotters D, E, F, G, H, I, J and K. 8×5 = 40Marks
4. Comment on the ecological adaptations of the plant L and M 2×5=10Marks
5. Observation note book. 20Marks

(Note: Scale down to 60 marks)

120

Unit II - Respiration

Structure and function of Mitochondria. Glycolysis and Krebs's cycle.

Plant growth Hormones - Auxins, Gibberellins, Cytokinins, Abscisic acid and Ethylene.

Unit III - Horticulture

Introduction Basic requirements, kinds of manures, methods of vegetative propagations, cuttage, layerage and graftage.

★ Unit IV

Planning and Layout of kitchen garden

Planning and Layout of orchards

Indoor gardening, Hanging pots.

Unit V

Bonsai, Rockery and methods of storage of fruits

References

1. Kumar, N. 1999. Introduction to Horticulture, Rajalakshmi Publications, Nagercoil.
2. Chandha, K.L. 2001-Hand Book of Horticulture, ICAR., New Delhi.
3. Rao, K.M. Text Book of Horticulture., Mac Millan India Ltd, New, Delhi.
4. Modern weed management-Gupta, O.P. 2004, Agrobios (India) 2005 Jodhpur.
5. Greenhouse management for horticultural crops-Prasad, S. 2004 Agrobios (India) 2005 Jodhpur-342 002.
6. Plant Physiology, Rao-Chand & Co
7. Complete Home gardening Dey, S.C., 2001 Agrobios (India) 2005 Jodhpur.
8. Plant Hormones Action and applications Rajan 2004 Agrobios (India) 2005 Jodhpur-342 022.

Unit V - Embryology of Angiosperms

1. Structure and Development of Anther & Male gametophyte
2. Structure and types of ovules -
3. Embryosac - *Polygonum* type - structure and development.

References

1. A text book of Systematic Botany-R.K.Gupta, Atmaram & sons, Delhi-5
2. Outlines of Botany.R.N.Narayanaswami&K.N.Rao.
3. Economic Botany-B.P.Pandey, Chand & Co 1980
4. Text book of Pharmacognosy-T.E.Wallis, CBS Publishers&Distributors, Delhi.
5. Pharmacognosy-K.R.Arumugam &N.Muruges (Sathya Publishers)
6. Herbs cultivation and medicinal uses-H.Panda, NIIR Publication, Delhi
7. Indigenous drugs of India-Chopra R.N., Handa.K.L.,&Kapur.L.D., Academic publishers [1994]
8. Flora of the Presidency of Madras-Gamble et al [1921] 3 volumes.
9. Economic Botany-Albert, F.Hill. Tata Mc. Graw-Hill Publishing Co Ltd New Delhi.(1974)
10. A hand book Medicinal plants Prajapathi et al, 2004 Agrobios (India) Jodhpur

Paper IV - Plant Physiology and Horticulture

Plant Physiology

Unit I

Absorption of water

Transpiration

Ascent of sap (Dixons cohesion theory only)

Photosynthesis, Structure and function of chloroplast, Light and Dark reactions

Paper - III - Taxonomy, Embryology of Angiosperms
and Medicinal Botany.

Unit I

Bentham & Hooker Systems of classification, study of the following families and their Economic importances.

1. Nymphaeaceae ✓
2. Caesalpiniaceae ✓
3. Rutaceae ✓

Unit II

1. Asclepiadaceae ✓
2. Lamiaceae ✓
3. Euphorbiaceae ✓
4. Poaceae ✓

Unit III

Medicinal Botany - study the systematic position, description of the individual plant, morphology of useful part and curative properties of the following plants prescribed in Unit III and IV.

Rutaceae	-	<i>Aegle marmelos</i>
Meliaceae	-	<i>Azadirachta indica</i>
Lamiaceae	-	<i>Ocimum sanctum</i>

Unit IV

Apiaceae	-	<i>Coriandrum sativum</i>
Euphorbiaceae	-	<i>Phyllanthus niruri</i>
Liliaceae	-	<i>Gloriosa superba</i>

Unit III - Plant tissue culture

Introduction, application of plant tissue culture, Basic tissue culture techniques.

Unit IV - Bio-fertilizers - Introduction

- Symbiotic Nitrogen fixers
- Asymbiotic Nitrogen fixers
- Blue green Algae
- VAM Fungi, PO₄ solubilizers.
- Advantages of Biofertilizers.

Unit V

- Organic Farming
- Methods of compost preparation
- Biodiesel - Production from Jatropha

References

1. Elements of Biotechnology-P.K.Gupta, Rastogi & Co
2. Economic Botany-Pandey.B.P., S.Chand & Co
3. Textbook of Biotechnology-R.C.Dubey
4. Economic Botany Hill
5. Mushroom cultivation and uses-B.C.Suman & V.P.Sharma, Agrobios(India) 2005 Jodhpur-342 002.
6. Plant Tissue culture-Purohit 2005, Agrobios(India) 2005 Jodhpur-342 002.
7. A handbook of organic farming, A.K.Sharma, Agrobios (India) 2005 Jodhpur.

Unit V – Gymnosperms

1. Introduction
2. General Characters
3. Structure and life history of *Pinus*

References

1. Cryptogamic Botany Vol I & II – Smith, G.M.
2. Structure and reproduction of Algae. Fritsch.
3. Pteridophyta -Rashid
4. Gymnosperms -Chopra
5. A Text book of Gymnosperms – Venkatesvaralu
6. A Text book of Algae – Vashista
7. Outlines of Botany – Narayanasamy & Rao

Paper II – Plant Ecology and Applied Botany

Unit I – Ecology

1. Historical account, concepts & Terminology
2. Plant adaptations
(a) Hydrophytes, (b) Xerophytes and (c) Halophytes
3. Vegetation of TamilNadu.
4. Methods of studying vegetation – Quadrat and Transect.

Applied Botany

Unit II

Mushroom cultivation

Introduction – Nutritive value and Importance of mushrooms, cultivation of Button mushroom-spawn preparation-preservation of mushrooms.

B.Sc. Botany Ancillary
(Semester-Degree course) CBCS
Paper I – Plant Diversity

Unit I – Algae

1. Introduction
2. General Characters
3. Structure and life cycle of the following:
(a) *Oscillatoria* (b) *Oedogonium* (c) *Sargassum*
4. Economic Importance of Algae

Unit II – Fungi

1. Introduction
2. General Characters
3. Structure and life cycle of the following:
(a) *Aspergillus*, (b) *Puccinia*
4. Economic Importance of Fungi

Unit II – Bryophytes

1. Introduction
2. General Characters
3. Structure and life cycle of *Funaria*

Unit IV – Pteridophytes

1. Introduction
2. General Characters
3. Structure and life cycle of *Selaginella*

5. E & F – Genetics
 G – Evolution
 H, I & J – Biophysics and Physiology
 Same as Question No. 4 6X5=30 Marks
6. Observation Note Book 20 Marks
- Total – 100 Marks

Branch V Botany B.Sc., Botany Ancillary
(Semester-Degree course)
Revised syllabus (CBCS)

This will come into effect from the academic year 2008-2009 (i.e., for those who joined the first Semester of the course in July 2008 and afterwards)

Semester	Paper	Study Component	No. of Course	Credit	Hours
I	I	Plant diversity <i>SBX8 A11</i>	1	4	4+2(P)
II	II	Plant Ecology & Applied Botany <i>SBX8 A21</i>	1	4+1	4+2(P)
	Practical I	Plant diversity, Plant Ecology and Applied botany. <i>SBX8 A2P</i>			
III	III	Taxonomy and Embryology of angiosperms & Medicinal botany <i>SB-1813</i>	1	4	4+2(P)
IV	IV	Plant Physiology and Horticulture <i>SB-1824</i>	1	4+1	4+2(P)
	Practical II	Taxonomy and Embryology of Angiosperms, Medicinal botany, Plant Physiology and Horticulture <i>SB-1822P</i>			

Botany Ancillary – Theory – 4 Papers/16 Credits/ 16 Hours

Practical – 2 Papers/2 Credits/4 Hours

- e) Mohl's half leaf experiment
 f) Measurement of growth by Auxanometer
 g) Phototropism
 h) Geotropism
6. To maintain and submit observation note books for external valuation.

Paper V Genetics and Evolution, Biophysics and Plant Physiology

Time: 3 hours

Max. Marks - 100

1. Solve the given genetic problem 'D' and 'E' 2x5=10 Marks
 2. Find out the mean, median, mode and standard deviation of the given sample and explain and interpret your observations with graph. 15 Marks
 3. Taking a lot, write procedure, do the physiology experiment and interpret the data 15 Marks
 4. Comment on the Physiology set up 'C' and 'D'. 2x5 = 10 Marks
 5. Identify draw diagrams and write notes on 'E', 'F', 'G', 'H', 'I' and 'J'. 6x5 = 30 Marks
 6. Observation note book 20 Marks
- Total – 100 Marks**

(Scale down to 60 Marks)

Key and Scheme of valuation

1. A & B - As a whole 2x5=10 Marks
2. (Mean-1/Median-2/Mode-2/Standard deviation-4/Tabulation and graph-6)
 (Leaf length/Fruit weight) 15 Marks
- Procedure -5 Marks
- Conducting of Experiment -5 Marks
- Results and interpretations -5 Marks
- Identification -1 Mark
- Notes -2 Marks
- Diagram -2 Marks
- 2x5 = 10 Marks

3. G. H, I, K and L. Genus - 1
 Family - 1
(G & H from herbarium, others from local flora) 6x2 = 12 Marks
4. Herbarium 20 Nos. 10 Marks
5. Observation Note Books - 20 Marks

Botany Major Practical

Paper V Genetics and Evolution, Biophysics and Plant Physiology

Syllabus

1. To study probability by Coin tossing
2. To workout simple genetic problems in monohybrid, dihybrid cross.
3. To study polygenic inheritance of quantitative traits in plants such as height of pods, number of seeds in fruits and to explain and interpret the observation in graphs.
4. To set up the following Experiments and explain the working with suitable diagrams, observation and interpretations.
 - a) Measurement of Water potential - Chardkov's method.
 - b) Determination of osmotic pressure - Plasmolysis method.
 - c) Rate of Transpiration - Ganong's photometer method under different conditions
 - d) Rate of Photosynthesis - Using Willmont's bubbler method.
 - e) Separation of Photosynthetic pigments using paper chromatography

Experiments set up-Demonstration only

- a) Thistle funnel osmoscope and Potato osmoscope
- b) Farmer's photometer
- c) Ganong's respiroscope
- d) Fermentation - Kuhne's tube

Unit II

Linkage and crossing over-significance, Determination of sex in plants. Extrachromosomal inheritance. Gene mutations-induced and spontaneous. Mutagens.

Unit III

DNA as genetic material DNA-structure and DNA replication. RNA-types, structure and functions, mechanism of biosynthesis proteins. Operon concept.

Unit IV

KK Eucaryotic genome organization with reference to Arabidopsis thaliana- Human genome project-golden rice. Bacterial genetics -Transformation, Transduction and Conjugation.

Evolution

Unit V

Historical account. Theories of Evolution - Darwinism, Lamarckism, Weismannism and Hugo de crism.

Reference Books

1. Burns, G.W. 1980 - The Science of Genetics. Collier acillan. New York
2. Gardnet, E.J. Simmons, and Snustad, D.P. 1985-Principles of Genetics. Edition 8, John Wiley & Sons, New York.
3. Verma P.S. and V.K. Agarwal 1991, S.Chand & CO, New Delhi.

Unit V

Study of the following families with special reference to morphology of medicinal plant parts and economic importance

Amaranthaceae, Orchidaceae, Cannaceae, Amaryllidaceae, Commelinaceae, Araceae and Poaceae.

Reference Books

1. George H.M. Lawrence – Taxonomy of vascular plants, Oxford and IBM Publishing on New Delhi.
2. Singh V and D.K.Jain, Taxonomy of angiosperms, Rasstogi publication, Meerut.
3. Vasishtha P.C. Taxonomy of angiosperms S.Chand and company, New Delhi
4. Pandey, B.P. Taxonomy of angiosperms S.Chand and company, New Delhi
5. Ramasami, S.N. Taxonomy, maruthi book depot, Hyderabad
6. Sharma, O.P. Plant taxonomy, Tata mac Graw Hill and co, New Delhi
7. Kochar S.L. Economic botany in the tropics, Macmillian India Ltd, New Delhi
8. Hill-Economic botany Tata mac Graw hill publishing co, Ltd.
9. Henry-A.N. Chandrabose, An aid to the international code of botanical Nomenclature, today and tomorrow's printed nomenclature and publishers.

III -Year Sixth Semester

Core Paper IX – Genetics and Evolution

Unit I

A brief account of Mendel's laws of heredity – Mono and dihybrid Crosses-Test cross. Interaction of genes- Non-epistatic simple gene interaction Comb. type in fowls- Complementary genes (9:7) Multiple alleles with reference to ABO blood group in man- Polygenic inheritance with reference to Ear size in Maize.

Cell Biology, Angiosperm Embryology, Biochemistry, Bio-techniques and Microbiology

Time: 3 hours

Max. Marks - 100

Question pattern

1. Taking a lot from the set of experiments, submit the procedure proceed with the experiments, tabulate and interpret the results. $1 \times 15 = 15$ Marks
 2. Make suitable temporary micro preparations of "A" and identify atleast two stages. Submit the slide for valuation. $1 \times 10 = 10$ Marks
 3. Dissect and display any one of the stages of the embryo from the material "B". Submit the slide for valuation $1 \times 10 = 10$ Marks
 4. Prepare the hanging drop of the material "C". Submit the slide for valuation. $1 \times 10 = 10$ Marks
 5. Write critical notes on D, E, F, G, H, J and I. $7 \times 5 = 35$ Marks
 6. Submission of record note books 20 Marks
- Total - 100 Marks

(Note: Scale down to 60 marks)

Key and scheme of valuation

1. Experiments prescribed in the biochemistry syllabus
Procedure 5 Marks/Experiment & tabulation 5 Marks Result and Interpretation -5 Marks
A-Onion roof tip (or) Anther slide any two stages -10 Marks $2 \times 5 = 10$ Marks
- Any suitable material - (Tridax, Cleome) to be given in "B" slide 10 Marks

Shift to page (98)
Practical IV is in pp. 109

Permanent slides
 ① Monocot stem (epidermis)
 ② Pteridophyte (Sphenocladon - Anacardium - Juniper)

4. F,G,H,I & J - F,G,H - Pteridophytes, Gymnosperms, I - Anatomy, J - Micro techniques.

Identification - 1 mark, diagram - 2 marks and notes - 2 marks
 $5 \times 5 = 25$ marks
 5. Submission of two permanent slides $2 \times 10 = 20$ marks
 6. Submission of record note book 20 marks
 Total - 100 marks

Xylem - outer side
 Sclerenchyma - inner side

Botany Major practical
 Paper - III - Cell biology, Angiosperm Embryology, Biochemistry,

Bio-techniques and Microbiology

SBY 8C6P

Syllabus

- To smear roof tip and identify different stages of mitosis.
- To smear young anther and identify different stages of meiosis.
- To identify cell inclusions
- To dissect and mount embryo (Cleome and Tridax)
- To observe and identify the developmental stages of anther, and embryo using permanent slides.
- Estimation of starch in plant tissues by colorimetry
- Estimation of starch in plant tissues by gravimetric method
- Determination of complementary colours and verification of Beer's law. *1/3*
- Separation of sugars by paper chromatography (Circular and Ascending) *✓*
- Alcohol fermentation by using Yeast
- Simple staining and Gram's staining of bacteria
- To make Hanging drop of microbes.
- To do the simple culture techniques of microbes
- To maintain an observation notebook and submit for external valuation.

Pteridophytes, Gymnosperms, Palaeobotany, Plant Anatomy and Micro techniques
Question Pattern

Time: Three Hours

Max. Marks - 100

- Make suitable temporary micro preparations of "A" and "B" mount it in glycerine and submit the slides for valuation. Draw diagrams, identify and give reasons $2 \times 10 = 20$ marks.
- Make suitable temporary micro preparations of "C" and "D" mount it in glycerine and submit the slides for valuation. Draw diagrams, identify and give reasons $2 \times 10 = 20$ marks
- Identify and write the geological era, notes and draw diagrams of "E" $1 \times 5 = 5$ marks
- Write critical notes on F, G, H, I and J $5 \times 5 = 25$ marks
- Submission of two permanent slides $2 \times 10 = 20$ marks
- Submission of record note book 20 marks

Total - 100 marks

(Note: Scale down to 60 marks)

Key and scheme of valuation

- A & B - Pteridophytes, Gymnosperms
 (Slides - 5marks, Identification - 1mark, Diagram - 2marks and Notes - 2marks) $2 \times 10 = 20$ marks
- C & D Anatomy material - mark distribution same as per question no: 1 $2 \times 10 = 20$ marks
- E - Fossil slide,
 Identification - 1mark, Geological era - 1mark, sketch and diagram 3 marks 5 marks

*Key to the question
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Key and scheme of valuation

1. A, B, C and D. Algae, Fungi, Bryophytes and Plant Pathology materials to be given. (Slide -5/ Diagram - 2/ Identification - 1 & Reason - 2).
2. E, F, G & H. Algae, Fungi, Bryophytes and Lichen. (Diagram - 2/ Identification - 1 & Reason - 2).
3. Causal organism - 1/ Diagram - 2 & Reason - 2.
4. K, L, M & N. Algae, Fungi, Bryophytes and Plant Pathology (Genus - 11/2/ Group - 1)

Botany Major Practical

Paper -II -Pteridophytes, Gymnosperms, Palaeobotany, Plant Anatomy and Micro techniques

Syllabus

1. To make suitable micro preparations of the types prescribed in Pteridophytes, Gymnosperms and Plant Anatomy.
2. To observe and identify the microscopic and macroscopic specimens at sight and write illustrated and explanatory notes of them.
3. To observe and identify the fossil slides included in the syllabus
4. Micro techniques - Demonstration only
5. To submit two double stained permanent slides from the material prescribed in theory syllabus for external valuation

Botany major Practical

Paper -I - Algae, Fungi, Lichens, Bryophytes and Plant Pathology

Syllabus

1. To make suitable temporary micropreparation of the types prescribed in Algae, Fungi, Lichens, Bryophytes and Plant Pathology.
2. To observe and identify the specimens at sight and write illustrated and explanatory notes on them.
3. To observe and identify at sight and make detailed study of the type of the diseases specified.
4. To maintain observation note and submit for external valuation.

Paper -I - Algae, Fungi, Lichens, Bryophytes and Plant Pathology

Question Pattern

Time: Three Hours

Max. Marks - 100

1. Make suitable temporary micro preparation of A, B, C and D. Submit the slides for valuation. Draw diagram and give reasons. $4 \times 10 = 40$ Marks
2. Identify, draw diagrams and write critical notes on E, F, G and H. $4 \times 5 = 20$ Marks
3. Comment on etiology of J and I. $2 \times 5 = 10$ Marks
4. Spot at sight (Genus and group only) K, L, M, & N. $4 \times 2.5 = 10$ Marks
5. Observation note book 20 Marks

(Note: Scale down to 60 marks)

Unit II

Features of spoilage of foods like fruits, vegetables, milk and milk products, bread, cereals, egg and meat products.

Unit III

Food preservation by removal of microorganisms: low temperature, high temperature, radiation, chemicals. Food borne infection: food borne intoxication. Detection of food-borne pathogens.

Unit IV

FOOD MICROBIOLOGY

Microbiology of fermented foods-Role of lactic acid, propionic acid and Ethanol Fermentation in food microbiology. Fermented milk, fruit juice, cereals, etc., plant products, spoilage and methods of preservation of the above products

Unit V

Food microbiology of egg, meat, fish and poultry and their products Spoilage and preservation techniques.

References:

1. M.R.Adams and M.O.Moss. 1995. Food Microbiology, New age International P. Ltd., Publications.
2. W.C.Frazier and D.C.Westhoff. 1998. Food Microbiology, 4th edition. McGrawHill, New York.
3. B.C.Hobbs and D.Roberts 1993. Food Poisoning and food Hygiene, Edwardss Arnold, London.
4. A. E.Yousef and C.Carlstrom. 2003 Food Microbiology- A Laboratory Manual, Wiley Interscience.
5. J.M. Jay 2000, Modern Food Microbiology, Aspen Publishers.

Unit IV

Respiration - Respiratory substrates - types of respiration-aerobic and anaerobic respiration. Mechanism and significance of respiration - Glycolysis and Kreb's cycle, electron transport and oxidative, Phosphorylation and Photorespiration

Nitrogen - Source of nitrogen-methods of nitrogen fixation-metabolism Symbiotic and nonsymbiotic. - Nitrogen cycle

Unit V

Physiology of flowering - Photoperiodism-definition and concepts Phytochrome- theories, vernalization and devernialization and practical applications

Plant growth hormones: Auxins, gibberellins, cytokinins, abscisic acid ethylene- production physiological role. Seed dormancy, circadian rhythms.

Reference Books

1. Dr.Salil Bose-Elementary Biophysics.
2. Fulier et al- concepts and mechanics.
3. Jain V.K.Fundamentals of Plant Physiology
4. Robert M.Devlin-Plant physiology
5. Casey..E.J. Biophysics.
6. Bidwell R.G.S.Plant Physiology-Macmillian Publishing co..

Skill Based Paper - VI - FOOD MICROBIOLOGY SBY8561

Unit I

Food as substrate for microbial growth, intrinsic and extrinsic factors affecting growth and survival of microorganism in foods. Microbial population in the vegetables, fruits, cereals, milk egg.

III Year – Sixth Semester

Core Paper X Biophysics and Plant Physiology

Unit – I

Biophysics

Laws of thermodynamics: first and second law

Concepts of free energy, ATP as high-energy compound-chloroplast and Mitochondrial bioenergetics

Photophysiology

Light-characteristics and absorption

Light emission-Fluorescence, Phosphorescence and Bioluminescence

Plant Physiology

Unit II

Absorption of water-imbibition, Diffusion, Osmosis, Plasmolysis, Mechanism of water absorption, Ascent of sap - Mechanisms and theories.

Transpiration - Types of transpiration - stomatal, cuticular and Lenticular - Significance of transpiration - Mechanism of stomatal movement-factors affecting Transpiration, Guttation and exudation

Unit-III

Photosynthesis- Photosynthetic unit-Two Photo systems-recent views on light reactions-Electron transport chain - Photophosphorylation: Cyclic, Non-cyclic; Dark reaction-carbon fixation-C3, C4, CAM pathways.

Translocation of path of transport-evidence, mechanism of translocation-Organic solutes theories-pressure flow hypothesis, cytoplasmic streaming and electro osmosis.

	Allied Subject- I	Chemistry Theory - IV	2	4 +2	4 +2(P)
		Chemistry Practical - II			
	Allied Subject- II	Zoology Theory - II	2	4 +2	4 +2(P)
		Zoology Practical - I			
Total			8	24	30
Semester - V					
III	Core - V	Cell biology and Angiosperm Embryology	3	12	12 8 (P)
	Core - VI	Biochemistry and Biotechniques			
	Core - VII	Microbiology			
	Allied Subject- II	Zoology Theory - III	1	4	4+2(P)
IV	Skill Based-V	Biotechnology and Bioinformatics	1	2	2
		Environmental Studies	1	2	2
Total			6	20	30
Semester - VI					
III	Core - VIII	Taxonomy of Angiosperms	6	12+15	12 8 (P)
	Core - IX	Genetics and Evolution			
	Core - X	Biophysics and Plant Physiology			
	Practical Paper III	Cell Biology and Angiosperm Embryology, Biochemistry and Bio-techniques and Microbiology			
	Practical Paper IV	Taxonomy of Angiosperm			
	Practical Paper V	Genetics and Evolution, Biophysics and Plant Physiology			

	Allied Subject- II	Zoology Theory - IV	2	4 +2	4 +2(P)
		Zoology Practical - II			
IV	Skill Based-VI	Food Microbiology	1	2	2
		Value Education	1	2	2
		Extension Activities	1	2	
		Total	11	39	30

Language Part I Tamil - Theory – 4 Papers / 24 Hours / 12 Credits

Language Part II English - Theory – 4 Papers / 24 Hours / 12 Credits

Core Paper–Theory–10 Papers + Practical-5 Papers=Total=15 Papers

60 Hours/ 59 Credits

Allied Subject – I - Theory–4 Papers + Practical-2 Papers=Total=6 Papers

24 Hours/ 18 Credits

Allied Subject – I - Theory–4 Papers + Practical-2 Papers=Total=6 Papers

24 Hours/ 18 Credits

Skilled Electives – Theory – 6 Papers / 12 Hours / 12 Credits

Non-Major Elective Theory – 2 Papers / 4 Hours / 4 Credits

Environmental Studies Theory – 1 Papers / 2 Hours / 2 Credits

Value Education Theory – 1 Papers / 2 Hours / 2 Credits

Extension Activities 1 / 1 Credit

A-Algae

Unit I

- a) Gene
- b) Class
- c) A br
- d) Econ
- 1) /
- 2) /
- 3) S
- 4) I
- e) Haru

Unit II

Stud

algae;

- a) Cyan
- b) Chlo

Unit III

Stud

algae;

- a) Xant
- b) Bac
- c) Phac
- d) Rhiz

**CHOICE BASED CREDIT SYSTEM
NON-MAJOR ELECTIVES**

Date	Time	Subjects	Code	Marks	
<u>THIRD SEMESTER</u>					
26-04-2017	02.00 pm to 05.00 pm	Computer Applications	ECH8N31	75	
"	"	Environmental Science	ECH8N32	75	02.
"	"	Analytical Chemistry	EPC8N31	75	03.C
"	"	Mushroom Cultivation	EBY8N31	75	
"	"	Entrepreneurial Zoology	EZY8N31	75	
"	"	Modern Biotechnology	EBT8N31	75	
"	"	Clinical Biochemistry (Basics)	EBC8N31	75	04.05
"	"	Applied Microbiology (T & P)	EMB8N31	75	
"	"	Introduction to Internet & Web Designing	ECA8N31	75	
"	"	Internet & Web Programming	ECT8N31	75	
"	"	Open Source Software	ECS8N31	75	
"	"	Microprocessors	EPH8N31	75	
"	"	Computer Programming in C++	EPH8N32	75	02.05.2
"	"	Bio Statistics (Arrear Candidates only)	EMT8N31	75	
"	"	Business Statistics (Arrear Candidates only)	EMT8N32	75	03.05.21
"	"	Mathematics for Competitive Examinations (Arrear Candidates only)	EMT8N33	75	
"	"	Econometrics (Arrear Candidates only)	EMT8N34	75	04.05.20
"	"	Bio-Statistics	EMTDN31	75	
"	"	Business Statistics	EMTDN32	75	"
"	"	Mathematics for Competitive Examinations	EMTDN33	75	"
"	"	Econometrics	EMTDN34	75	"
"	"	Nutrition in Health & Diseases	EFP8N31	75	
"	"	Biostatistics & Computer Application	END8N31	75	

CHOICE BASED CREDIT SYSTEM
NON-MAJOR ELECTIVES

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Date	Time	Subjects	Code	Marks	
<u>FIRST SEMESTER</u>					
25-04-2017	02.00 pm. to 5.00 pm.	Fundamentals of Computer	CBK8N11	75	15
"	"	Introduction to Indian Constitution	CCS8N11	75	16
"	"	Business Accounting (Common to B.Com. B.Com.(CA) and B.Com. E.Commerce)	CCR8N11/ CCA8N11/ CEC8N11	75	17
"	"	Business Accounting (Common to B.Com., B.Com.(CA) and B.Com. E.Commerce) (for those who joined in July 2013 and after)	CCRDN11/ CCADN11/ CECDN11	75	
<u>SECOND SEMESTER</u>					
25-04-2017	10.00 am. to 1.00 pm.	Customer relationship management	CBK8N21	75	1
"	"	Retail Marketing (Common to B.Com., B.Com.(CA) and B.Com. E.Commerce)	CCR8N21 CCA8N21 CEC8N21	75	1
"	"	Consumer Behaviour	CCS8N21	75	
"	"	Advertising in Salesmanship (Common to B.Com., B.Com.(CA) and B.Com. E.Commerce) (For those who joined in July 2013 and after)	CCRDN21/ CCADN21/ CECDN21	75	1

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CHOICE BASED CREDIT SYSTEM
NON – MAJOR ELECTIVES – SECOND SEMESTER

(For those who joined in July 2008 and after)

Marks	Date	Time	Subjects	Code	Marks
75	25-04-2017	10.00 am. to 1.00 pm.	Plant Utility and Exploitation	SBY8N21/	75
75	"	"	Herbal Medicine	SBC8N21	75
75	"	"	Genes to Proteins	SBT8N21	75
75	"	"	Drugs and Cosmetics	SCH8N21	75
75	"	"	Introduction to Internet	SCS9N21	75
75	"	"	Introduction to office Automation	SCS8N21/	75
75	"	"	Satellite Communication	SST8N21	75
75	"	"	PC Hardware & Interfacing	SEL8N21	75
75	"	"	Bakery	SEC8N21	75
75	"	"	Hotel Reception Management	SFP8N21	75
75	"	"	Women and Child Health	SHM8N21	75
75	"	"	Web programming	SNCAN21/	75
75	"	"	Statistics and operation research	SNF9N21	75
75	"	"	Statistics and operation research	SCA8N21/	75
75	"	"	Medical Lab Technology	SNT8N21	75
75	"	"	Bakery & Confectionary	SMT8N21	75
75	"	"	Bakery & Confectionary	SMC8N21	75
75	"	"	Public health & hygiene	SMV8N21	75
75	"	"	Introduction to Agriculture – II	SND8N21	75
75	"	"	Basic Physics – II	SND9N21	75
75	"	"	Energy Science – II	SRS8N21	75
75	"	"	Travel Agency Business	SRD8N21	75
75	"	"	Ornamental Fish Culture	SPH9N21	75
75	"	"	Interior Decoration	SPH8N21	75
75	"	"	Front Desk Service	SPH8N21	75
75	"	"	Hotel Front Office Management	STH8N21	75
75	"	"	Basic Skills in Counseling	SZY8N21/	75
75	"	"	Methods of Yogic Practices	SZV8N21	75
75	"	"	Fundamentals of Mathematics – II	SHTDN21	75
75	"	"	Health Communication	SHPDN21	75
75	"	"	Introduction to Internet	SHADN21	75
75	"	"	Basic rooms division management	SPSCN21	75
75	"	"	Introduction to HTML	SPDCN21	75
75	"	"	Internet and its Applications	SPDCN21	75
75	"	"		SMTDN21/	75
75	"	"		SMCDN21	75
75	"	"		SVCFN21	75
75	"	"		SCSGN21	75
75	"	"		SHMGN21	75
75	"	"		SCAGN21	75
75	"	"		SNTGN21	75

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CHOICE BASED CREDIT SYSTEM
NON – MAJOR ELECTIVES – FIRST SEMESTER
(For those who joined in July 2008 and after)

Date	Time	Subjects	Code	Marks
25-04-2017	02.00 pm. to 5.00 pm.	Mushroom Cultivation	SBY8N11/ SBMAN11	75
"	"	Health and Human Diseases	SBC8N11	75
"	"	Infection Diseases	SBT8N11	75
"	"	Industrial Chemistry	SCH8N11	75
"	"	Introduction to Internet (Common to Software and Computer Science)	SCS8N11/ SST8N11	75
"	"	Introduction to Computers and Office Automation (Those who joined in July 2009)	SCS9N11	75
"	"	Basic Physic (Those who joined in July 2009)	SPH9N11/ SPEAN11	75
"	"	Embroidery and Surface Ornamentation	SCF8N11	75
"	"	PCB Design and Fabrication	SEL8N11	75
"	"	Electronic Equipments and Servicing	SEC8N11	75
"	"	Fruits and Vegetables Processing	SFP8N11	75
"	"	Basic Catering Services	SHM8N11	75
"	"	Introduction to Information Technology (Common to I.T. and B.C.A. Major)	SNT8N11/ SCA8N11	75
"	"	Fundamentals of Mathematics	SMT8N11	75
"	"	Fundamentals of Mathematics	SMC8N11	75
"	"	Food and Dairy Microbiology	SMV8N11	75
"	"	Modern Cookery in Catering	SND8N11	75
"	"	Nutrition and Health	SNDAN11/SNCAN11/ SNF8N11	75
"	"	Biomolecules and Human Welfare	SRS8N11	75
"	"	Introduction to Rural Development	SRD8N11	75
"	"	Energy Science – I	SPH8N11	75
"	"	Tourism Business	STH8N11	75
"	"	Human Biology (Common to Zoo(Gen) and Zoo (Vocational Major)	SZY8N11/ SZV8N11	75
"	"	Hotel Front Office Procedures	SHTDN11	75
"	"	Basic Hospitality Operations	SHPDN11	75
"	"	Basic Catering Service	SHADN11	75
"	"	Introduction of Psychology	SPSCN11	75
"	"	Fundamental of Yoga Education	SPDCN11	75
"	"	Human Communication	SVCFN11	75
"	"	Introduction to Compute Office Automation	SCSGN11	75
"	"	Basic Catering Service	SHMGN11	75
"	"	Office Automation	SCAGN11	75
"	"	Introduction to Information Technology	SNTGN11	75

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CHOICE BASED CREDIT SYSTEM
NON – MAJOR ELECTIVES – FIRST SEMESTER
(For those who joined in July 2008 and after)

Date	Time	Subjects	Code	Marks	
25-04-2017	02.00 pm. to 5.00 pm.	Mushroom Cultivation	SBY8N11/ SBMAN11	75	24
"	"	Health and Human Diseases	SBC8N11	75	
"	"	Infection Diseases	SBT8N11	75	
"	"	Industrial Chemistry	SCH8N11	75	
"	"	Introduction to Internet (Common to Software and Computer Science)	SCS8N11/ SST8N11	75	
"	"	Introduction to Computers and Office Automation (Those who joined in July 2009)	SCS9N11	75	
"	"	Basic Physic (Those who joined in July 2009)	SPH9N11/ SPEAN11	75	
"	"	Embroidery and Surface Ornamentation	SCF8N11	75	
"	"	PCB Design and Fabrication	SEL8N11	75	
"	"	Electronic Equipments and Servicing	SEC8N11	75	
"	"	Fruits and Vegetables Processing	SFP8N11	75	
"	"	Basic Catering Services	SHM8N11	75	
"	"	Introduction to Information Technology (Common to I.T. and B.C.A. Major)	SNT8N11/ SCA8N11	75	
"	"	Fundamentals of Mathematics	SMT8N11	75	
"	"	Fundamentals of Mathematics	SMC8N11	75	
"	"	Food and Dairy Microbiology	SMV8N11	75	
"	"	Modern Cookery in Catering	SND8N11	75	
"	"	Nutrition and Health	SNDAN11/SNCAN11/ SNF8N11	75	
"	"	Biomolecules and Human Welfare	SRS8N11	75	
"	"	Introduction to Rural Development	SRD8N11	75	
"	"	Energy Science – I	SPH8N11	75	
"	"	Tourism Business	STH8N11	75	
"	"	Human Biology	SZY8N11/ SZV8N11	75	
"	"	(Common to Zoo(Gen) and Zoo (Vocational Major)			
"	"	Hotel Front Office Procedures	SHTDN11	75	
"	"	Basic Hospitality Operations	SHPDN11	75	
"	"	Basic Catering Service	SHADN11	75	
"	"	Introduction of Psychology	SPSCN11	75	
"	"	Fundamental of Yoga Education	SPDCN11	75	
"	"	Human Communication	SVCFN11	75	
"	"	Introduction to Compute Office Automation	SCSGN11	75	
"	"	Basic Catering Service	SHMGN11	75	
"	"	Office Automation	SCAGN11	75	
"	"	Introduction to Information Technology	SNTGN11	75	

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**CHOICE BASED CREDIT SYSTEM
NON-MAJOR ELECTIVES**

Date	Time	Subjects	Code	Marks
05-11-2014	10.00 am. to 01.00 pm.	English for effective Communication	TEN8N31	75
"	"	Freedom Struggle in India A.D. 1800-1947	THS8N31	75
"	"	Archives Keeping	THS8N32	75
"	"	Petchukkalai (பேச்சுக்கலை)	TTM8N31	75
"	"	Major Economics Issues in Indian Economy	TEC8N31	75
"	"	Elements of Western Music	TMU8N31	75
"	"	Heritage of Tourism in India	TNC8N31	75
"	"	Internet & Web Designing	TNT8N31	75
"	"	Workshop on Presentation Skills	TNM8N31	75
"	"	Insurance Management(Arrear Candidates only)	TMC8N31	75
"	"	E- Commerce(Arrear Candidates only)	TCA8N31	75
"	"	Project Management (Arrear Candidate only)	TBK8N31	75
"	"	Human Rights Educational for Social Workers	TSW8N31	75
"	"	International Marketing Environment (Arrear Candidates only)	TFT8N31	75
"	"	Basics of Air Travel	TTS8N31	75
"	"	Human Rights Education for HR Managers (Arrear Candidates only)	THR8N31	75
"	"	Public Finance(M.Com. Finance Candidates only)	TFN8N41	75
"	"	Entrepreneurship	PMR8N31	75
"	"	Legal Environment of Business	TCACN31	75
"	"	Insurance Management	TMCCN31	75

L. Jeyaraj
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