

BHARATHIAR UNIVERSITY, COIMBATORE.**B. Sc. BOTANY (SCHOOL OF DISTANCE EDUCATION)****For the students admitted during the academic year 2014-15 Batch and Onwards****SCHEME OF EXAMINATIONS**

Year	Part	Subject	Title of the Paper	University Exams	
				Duration in Hrs	Maximum Marks
I	I	Language	Language – I	3	100
	II	Language	English –I	3	100
	III	Core -1	Plant Diversity –I (Algae, Fungi, Lichen and Plant Pathology)	3	100
		Core -2	Plant Diversity -2 (Bryophytes, Pteridophytes, Gymnosperms and Paleobotany)	3	100
		Core Practical -1	Plant Diversity I & II	3	100
		Allied – 1	Zoology	3	100
II	I	Language	Language – II	3	100
	II	Language	English –II	3	100
	III	Core -3	Anatomy and Embryology	3	100
		Core -4	Cell Biology and Instrumentation	3	100
		Core Practical -2	Anatomy and Embryology, Cell Biology and Instrumentation	3	100
		Allied -2	Chemistry	3	100
III	III	Core -5	Genetics, Plant Breeding and Biostatistics	3	100
		Core -6	Plant Systematics and Economic Botany	3	100
		Core -7	Ecology and Phytogeography	3	100
		Core -8	Plant Physiology and Biochemistry	3	100
		Core -9	Fundamentals of Microbiology & Biotechnology	3	100
		Core Practical -3	Genetics, Plant Breeding & Biostatistics, Plant Systematics & Economic Botany, Ecology & Phytogeography	3	100
		Core Practical -4	Plant Physiology & Biochemistry, Fundamentals of Microbiology & Biotechnology	3	100
Total					1900

PAPER - I**PLANT DIVERSITY - I**
Algae, Fungi, Lichen, and Plant Pathology**Unit - I**

Algae : Classification of Algae (G.M. Smith, 1955) Study of the structure, reproduction and life cycle of *Anabeana*, *Pinnularia* & *Chlorella*.

Unit - II

Structure, reproduction and life cycle of *Dictyota* and *Polysiphonia*. Economic importance of algae

Unit - III

Fungi and Lichen: Classification of fungi (Ainsworth, 1971) structure and reproduction of *Albugo*, *Aspergillus*, *Puccinia*, & *Cercospora*.

Unit - IV

Structure and reproduction of Lichens - foliose and fruticose. Economic importance of fungi and Lichens. Cultivation of edible mushrooms.

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 :

- Agrios, G.N. 1997. Plant Pathology. Academic Press, London.
- Gangulee, HC. & Kar, AK. 1989. College Botany, Vol-II, Books & Allied Pvt. Ltd., Calcutta.
- Hale, ME Jr. 1983. The biology of Lichens, New Age International publishers, New Delhi.
- Mehrotra, RS & Aneja, KR. 1999. An introduction to Mycology, 2nd Ed. New Age International Publishers, New Delhi.
- Sharma, OP. 1989. Text Book of fungi. Tata Mc Graw Hill, New York.
- Sharma, OP. 1992. Text Book of Algae. Tata Mc Graw Hill, New Delhi.
- Sharma, P.D. 2006. Plant Pathology. Narso Publishing House, New Delhi.
- Singh V, Pande PC & Jain OK. A text book of Botany, Rastogi Publications, Meerut.
- Smith, GM. 1955. Cryptogamic Botany Vol-1&II, McGraw Hill, New York
- Vasishta, BR & Sinha, AK. 2003. Botany for degree students Fungi. S. Chand and Company Ltd., New Delhi.

PAPER - II**PLANT DIVERSITY – II****(Bryophytes, Pteridophytes, Gymnosperms and Palaeobotany)****Unit - I** : Bryophytes

Classification of Bryophytes (Reimers, 1954). Structure and reproduction of *Marchantia*, *Anthoceros* and *Polytrichum*.

Unit - II : Pteridophytes

Classification of Pteridophytes (K.R.Sporne, 1960), Structure and Reproduction of *Selaginella*, *Equisetum*, *Adiantum* and *Azolla*.

Unit - III

Heterospory and Seed Habit, Stellar evolution, and Economic importance of Pteridophytes.

Unit - IV : Gymnosperms

Classification (K.R.Sporne, 1960), Structure and Reproduction of *Cycas*, *Pinus* and *Gnetum*.

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

Practicals:

- Bryophytes : *Marchantia* and *Polytrichum*.
- Pteridophytes : *Selaginella*, *Equisetum*, *Adiantum* and *Azolla*.
- Gymnosperms : *Cycas* and *Gnetum*.
- Palaeobotany : *Lepidodendron*, *Lepidocarpon* and *Calamites*.

References :

- Arnold, C.R. 1947 (Rep. 1979). An Introduction to Paleobotany. Mc Graw Hill Publishing Co. Ltd., New Delhi.
- Gangulee, HC. & Kar, AK. 1989. College Botany, Vol-II, Books & Allied Pvt. Ltd., Calcutta.
- Pandey, BP. 1998. A text book of Botany Vol. II. S. Chand & Co. Ltd. New Delhi.
- Prem Puri. 1981. Bryophytes – morphology growth and differentiation. Atma Ram & Sons. Lucknow.
- Rashid, A. 1976. An Introduction to Pteridophytes. Vikas Publishing House, New Delhi.
- Singh V, Pande PC & Jain OK. A text book of Botany, Rastogi Publications, Meerut.
- Smith, GM. 1955. Cryptogamic Botany Vol-1&II, McGraw Hill, New York
- Sporne, KR. 1967. The Morphology of Gymnosperms, Hutchinson & Co., London.
- Sporne, KR. 1975. The Morphology of Pteridophytes, Hutchinson & Co., London.
- Vanderpooren, A. & Gogginet, B. 2009. Introduction to Bryophytes. Cambridge University Press.
- Vasishta PC, Sinha AK & Anilkumar. 2005. Botany for degree students, Gymnosperms. S Chand And Company Ltd., New Delhi.

PAPER - III
ANATOMY AND EMBRYOLOGY

Unit - I

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

Unit - II

Primary Structure of Dicot and Monocot root, stem and 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

Structure and development of microsporangium, male gametophyte, megasporangium, female gametophyte (Polygonum type)

Unit - V

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

Practicals :

- Stem - Primary structure - *Tridax*, *Cucurbita*, *Sorghum*
- Root Primary structure - Bean. *Canna*, *Vanda*
- Leaf - *Nerium* & Grass
- Anomalous Secondary thickening - *Boerhaavia*, *Nyctanthes*,
- T.S of anther.
- Various stages of development of male and female gametophyte, endosperm and embryo sac to be studied from permanent slides.
- Embryo Mounting - *Tridax*, *Crotalaria*.

References :

- Bhojwani, SS. & Bhatnagar, SP. 1994. Embryology of Angiosperms, Vikas Publishing House (P) Ltd., New Delhi.
- Cuttler, EG. 1969. Plant Anatomy - Part I Cells & Tissue. Edward Arnold Ltd., London.
- Esau K. 1985. Plant Anatomy (2nd ed.) Wiley Eastern Ltd. New Delhi.
- HP Brown, AJ Panshin & CC. Farsaith, 1981. Text book of Wood Technology, Mc Graw Hill Inc. New York.
- Maheshwari, P. (ed.) 1963. Recent advances in embryology. Intl. Soc. Pl. Morphol, New York.
- Maheshwari, P. 1950. An introduction to the embryology of Angiosperms. McGraw Hill, New York.
- Pandey B.P. 2007. Plant Anatomy, S. Chand & Co. De, New Delhi.
- Pullaiah, T., Lakshminarayana, K. and Hanumantha Rao, K. 2001. Text Book of Embryology of Angiosperms, Regency Publications, New Delhi.
- Raghavan, V. 1979, Experimental embryogenesis of vascular plants. Cambridge University Press, Cambridge. U.K.

PAPER - IV**CELL BIOLOGY AND INSTRUMENTATION****Unit - I**

Cell biology : Structure and function of Cell wall, Plasma membrane (fluid mosaic model only) Endoplasmic reticulum, Golgi apparatus and Ribosome.

Unit - II

Structure, Organization and functions of Mitochondria, Chloroplast, Nucleus, Chromosome. A brief account of special types of chromosomes.

Unit - III

Cell division: Mitosis and Meiosis, DNA - Structure, Replication. RNA – types and Protein synthesis

Unit IV

Principles, Operation and applications of Microscope (Bright field & SEM), pH meter, Colorimeter, Spectrophotometer and Ultra Centrifuge.

Unit - V

Principles, Operation and applications of Chromatography (paper, TLC & Column), Electrophoresis (SDS-PAGE).

Practicals :

- Study of mitosis using Onion roots and meiosis using *Tradescantia* flower
- Study of cell organelles through slides and Photographs
- Demonstration of pH meter, Colorimeter, Clinical centrifuge and chromatography of leaf pigments - paper only

References :

Freifelder, D.1993. Essentials of Molecular Biology, Jones & Bartlett, Boston.

De Robertis & De Robertis. 1990. Cell and Molecular Biology, Saunders College, Philadelphia, USA.

Elliott WH & Elliott, DC. 2005. Biochemistry and Molecular Biology, 3rd Ed. Oxford University, Oxford.

Keith Wilson & John Walker 2006. Principles and techniques of Biochemistry and molecular Biology, Cambridge low price edition.

Sadasivam.S. and A.Manickam 2008. Biochemical Methods. New Age International Publishers.

Henry, R.J. 1997. Practical Applications of Plant Molecular Biology. Chapman & Hall, London, UK.

PAPER - V**GENETICS, PLANT BREEDING AND BIOSTATISTICS****Unit - I**

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

Unit - II

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

Unit - III

Types of Mutation, Physical and Chemical Mutagens, Cytoplasmic inheritance, Nature and function of genetic material (DNA) Gene structure, Genetic code.

Unit - IV

Objectives of plant breeding, Plant introduction, Selection (Pure line and Mass selection), Hybridization- hybrid vigour. An outline of modern methods in plant breeding.

Unit - V

Collection of data (Sampling, Classification, Tabulation and Graphic representation) Frequency distribution, Measurement of Central Tendency -Mean (arithmetic Only) Median, Mode & Standard error, Chi square test and Standard deviation.

Practicals :

- Observation of charts for Mendelian ratios, Gene interaction and Linkage - Simple Problems in genetics.
- Simple problems in mean, median, mode and Chi square test.

References:

- Allard, R.W. 1960. Principles of Plant Breeding, John Wiley and Sons, Inc. New York.
- Gupta, S. P. (1990). Statistical Methods. S. Chand & Co. Ltd., New Delhi.
- Khan, I. A. and Khannum, A. (1994). Fundamentals of Biostatistics. Vikas Publishing, New Delhi.
- King, R.C. 1975. A Hand book of Genetics, Plenum Press, New York.
- Panse, V. G. and Sukhatme, P.V. (1978). Statistical Methods for Agricultural Workers. ICAR, New Delhi.
- Rastogi, V. B. (2006). Fundamentals of Biostatistics. Ane Book India, New Delhi.
- Simmonds, N.W.1979. Principles of Crop improvement. Longman, London.
- Singh, E.D. 1990. Plant Breeding. Kalyani Publishers, New Delhi.
- Stanley R. Maloy, John E. Cronan, David Freifelder Jones & Bartlett 1994. Learning Microbial Genetics
- Strickboarger, M.V. 1977. Genetics, MacMilian, New York.
- Zar, J. H. (1984). Biostatistics Analysis. Prentice Hall International, New Jersey.

PAPER - VI**PLANT SYSTEMATICS AND ECONOMIC BOTANY****Unit - I :**

Taxonomy and its significance. Systems of classification - Bentham & Hooker (Natural), Engler & Prantl (Phylogenetic), and Linnaeus (artificial).

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 Annonaceae, Rutaceae, Curcubitaceae, Apocynaceae, Asclepiadaceae, Asteraceae and Rubiaceae.

Unit - IV

A detailed study of the following families and the economic importance of Amaranthaceae, Euphorbiaceae, Orchidaceae, and Poaceae

Unit - V

Origin, cultivation and Economic importance of the following: Cereals-Paddy, Pulses – Pigeon pea, Fibre- Corchorus, Timber – Teak, Beverage- Tea, Spices- Clove, Oil- Groudnut

Practicals :

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

References :

Bentham, G. 1888. Handbook of British Flora. (7th Ed., revised by A.B. Rendle in 1930). Ashford, Kent.

Hutchinson, J. 1973. The Families of Flowering Plants. (3rd Ed.) Oxford Univ. Press.

Lawrence, G.H.M. 1951. Taxonomy of Vascular Plants. MacMillan, New York.

Lindley, J.1984. Medical and Economical Botany. Bishen Singh Mahendra Pal Singh, 23-A New Connaught Place, P.O.Box 137, Dehradun 248 001. India

Nayar, M.P., Ramamurthy, K. and Agarwal, V.S. 1989. (Eds.). Economic Plants of India. Botanical Survey of India, Calcutta – 700 001. 159 pp.

Pullaiah, T. 2007. Plant Bensen, 1957. Plant Classification. Oxford & IBH Publishing Co., New Delhi.

Rendle, A.B. 1904. Classification of Flowering plants. Cambridge , England. 2nd. Vol.1 1930.

- Sharma, O.P. 1958. Plant Taxonomy. Tata McGraw Hill Publishing Company Ltd., New Delhi. 482pp.
- Singh, G 1999. Plant Systematics – Theory and Practice. Oxford and IBH Publishing Co. Pvt Ltd., New Delhi. 35pp.
- Stace, C.A. 1989. Plant Taxonomy and Blosystematics (2nd Ed.). Edward Arnold. London.
- Takhtajan, A.L. 1997. Diversity and Classification of Flowering Plants. Columbia Univ. Press. New York, 642 pp.
- Woodland , D.W. 1991. Contemporary Plant Systematics. Prentice Hall. New Jersey.

PAPER - VII**ECOLOGY AND PHYTOGEOGRAPHY****Unit - I :**

Ecology-Principles, 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, plant indicators.

Unit - V

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

Practicals :

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

References :

- Agarwal, K.C. (1987) - Environmental biology- Agro-botanical publications, India.
- Ambasht, R.S. (1974) - A text book of plant ecology (3rd Edn.) Students' Friends. & Co., Varanasi, India.
- Anathakrishnan, T.N. (1982)-Bioresource Ecology-Oxford & IBH Publ.Co.,Inc.,Belmont.
- Cain, S.A. (1944) – Foundation of Plant Geography – Harper & Brothers, N.Y.
- Gates, D.M. (1980) – Biophysical Ecology – Springer Verlag, N.Y.
- Good, R. (1953) – The Geography of Flowering Plants (2nd Edn.) – Longmans, London.
- Krishnamoorthy, K.V. (2003) – An Advanced Text book on Biodiversity – Oxford & IBH Book Company, New Delhi.
- Misra, K.C. (1974) – Manual of Plant Ecology – Oxford & IBH Publishing & Co., Calcutta.
- Odum, E.P. (1971) – Fundamentals of ecology – W.B. Saunders & Co., Philadelphia, USA.
- Vashita, P.C. (1974) – A text book of Plant Ecology – Vishal Publications, Jullender City, India.

PAPER - VIII**PLANT PHYSIOLOGY AND BIOCHEMISTRY****Unit - I**

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

Unit - II

Photosynthesis - Pigments system, light and dark reactions. C₃, C₄ and CAM Pathways. Respiration - aerobic and anaerobic - Glycolysis, Krebs cycle - electron transport system.

Unit - III

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

Unit - IV

Biochemistry : Acids, bases and solutions. p^H and buffer systems, Chemical bonds. Laws of thermodynamics. Structure

Unit - V

Classification, Structure and functions of Carbohydrates, Proteins and Lipids.

Practicals :

- Rate of respiration in flower buds/germinated seeds using simple respiroscope (Demonstration Only)
- Measurement of the rate of Photosynthesis under varying concentration CO₂ concentration
- Effect of Light intensity on O₂ evolution during photosynthesis.
- Effect of light intensity on transpiration. Determining the rate of transpiration using Ganong's potometer (Demonstration Only)
- Estimation of total carbohydrates (Anthrone method)
- Estimation of proteins (Lowry method)

References :

- Conn; E.E., P.K. Stumpf; G. Bruring and R.H. Doi. 1998. Outline of Biochemistry (5th Ed) John Wiley & Sons, N-Y-Singapore – Toronto.
- David L. Nelson and Michael M. Cox 2012. Lehninger's Principles of biochemistry. 6th edition. W. H. Freeman Publishers, New York.
- Devlin, R. M. and Baker 1973. Photosynthesis, Reinhold Affiliated East-West Press Pvt.Ltd, New Delhi.
- Harold, F.M. 1986. The vital force; A study of bioenergetics. Freeman & Co., New York.
- Hewitt, E.J. and cutting, C.V. 1979. Nitrogen metabolism of plants, Academic Press,
- Jain V.K. 2000. Fundamentals of Plant Physiology, 5th edition. S Chand & Co Ltd; New Delhi.

- Jeremy M. Berg, John L. Tymoczko and Lubert Stryer 2002. Biochemistry, 5th edition. WH Freeman & Co., New York.
- Moore, T.C. 1979. Biochemistry and physiology of plant hormones. Narosa book Distributors, New Delhi.
- Murray, R.K., P.A. Mayes, D.K. Granner and V.W. Rodwell 1990. Harper's Biochemistry Lange Medical Book.
- Pandey, S.N. and Sinha, 2010, Plant Physiology, Vikas Publishing, New Delhi.
- Peach, K. and Tracey, M.V. (revised edition). Modern methods of plant analysis vols. IVII, New Delhi.
- Robers, 1987. Plant growth regulators. Academic publications.
- Robert K. Murray, Daryl K. Granner, Peter A. Mayes and Victor W. Rodwell 2003. Harper's Illustrated Biochemistry, 26th Edition, The McGraw-Hill Companies, Inc., USA.
- Wey, P.M. and J.B Harbone, 2000. Plant biochemistry. Panima Educational Book agency, New Delhi.
- Zubay, G. 1988. Biochemistry. Macmillan Publishing Co., New York.

PAPER -IX

FUNDAMENTALS OF MICROBIOLOGY AND BIOTECHNOLOGY

Unit - I :

Definition and scope of microbiology. Bacteria : Morphology, ultra structure, growth and reproduction. Viruses: General morphology, ultra structure, structure and replication of phage.

Unit - II

Pure culture techniques, Media (PDA & Nutrient agar), Maintenance of pure culture. Microbiology of air, water and soil.

Unit - III :

Biotechnology – definition and importance - Plant tissue culture: sterilization techniques and preparation of MS medium. Techniques – Micropropagation (Callus and Nodal culture), Somatic embryogenesis and synthetic seeds.

Unit - IV

Genetic engineering - Procedure for gene cloning. Cloning vectors - Plasmids, phages and cosmids. Gene cloning in higher plants - using Agrobacterium Plasmid. Methods of direct gene transfer in plants- electroporaion, micro injection and liposomes.

Unite - V

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

Practicals:

- Preparation of PDA and nutrient agar.
- Isolation of microbes from water and soil samples.
- Gram staining of bacteria.
- Pure culture techniques (streak plate).
- Preparation of MS medium
- Preparation of synthetic seeds.
- Demonstration: Preparation and inoculation of explants.

References :

- Chawla, H.S. 2002. Plant biotechnology, 2nd Ed, Oxford IBH Publishing Co. Pvt. Ltd., New Delhi.
- Ernst L. Winnacker, 2002. From Genes to Clones-introduction to gene technology, VCR Pub., Weintin.
- James D Watson et al., 1992. Recombinant DNA (2nd Edition), WH Freeman and Co., New York.
- Jay, J.M. 1983. Modern Food Microbiology, CBS Publishers, Delhi.
- Jogdand, SN. 1997. Gene biotechnology, Himalaya Publishig House, New Delhi
- Pelezar, M.J., Reid, R.D. and Chan, E.C.S. 1983. Microbiology, Tata McGraw Hill Publishing Co., New Delhi
- Prescott, L.M., Harley, J.P. and Klien, D.A. 1996. Microbiology [3rd Ed.], W. C Brown Publishers, Boston, U.S.A., pp.935.
- Reed, G. [Ed.] 1983. Prescott & Dunn's Industrial Microbiology [4th Ed.], AVI Publishing Co., Connecticut, U.S.A.
- Schlegel, H.B. [Ed.] 1986. General Microbiology [6th Ed.], Cambridge University Press, Cambridge.
- Sinha, U. and Srinivasa, S. 1983. An Introduction to Bacteria, Vikas Publishing House Pvt. Ltd. New Delhi.
- Stainer, R.Y., Ingraham, J.I., Wheelis, M.L. and Painter, P.R. 1986. General Microbiology [5th Ed.], Macmillan Press Ltd., London, pp. 689
- Steindraus, K.H. [Ed] 1983. Hand Book of Indigenous Fermented Food, Parcel Dekker Inc., New York..
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- Tortora, G.J., Funke, B.R. and Case, C.L. 1995. Microbiology-An Introduction [5th Ed.], The Benjamin/Cummings Publishing Company Inc., Redwood city, California, U.S.A., pp.801
- Wistreich, G.A. and Lechtman, M.D. 1988. Microbiology [5th Ed.] Macmillan Publishing Company, 886, Third Avenue, New York, U.S.A., pp.916