

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR – 639 005

M. Sc., - BOTANY COURSE STRUCTURE UNDER CBCS SYSTEM

(For the candidates admitted from the year 2016-2017 onwards)

SEMESTER	COURSE	SUBJECT TITLE	SUBJECT CODE	INSTR. HOURS WEEK	CREDIT	EXAM HOURS	MARKS		TOTAL
							INT	ESE	
I	Core Course – I	Plant diversity - I	P16BO1C1	5	4	3	25	75	100
	Core Course – II	Plant Diversity - II	P16BO1C2	5	4	3	25	75	100
	Core Course - III	Microbiology and Plant Pathology	P16BO1C3	5	4	3	25	75	100
	Core Course – IV	Practical – I (CC-I, CC-II, CC-III)	P16BO1C4P	10	4	3	40	60	100
	Elective Course - I	Horticulture	P16BO1E1	5	4	3	25	75	100
				30	20				500
II	Core Course – V	Cell And Molecular Biology	P16BO2C5	5	5	3	25	75	100
	Core Course – VI	Plant Anatomy And Embryology	P16BO2C6	5	5	3	25	75	100
	Core Course – VII	Plant Microtechnique and Microscopy	P16BO2C7	5	5	3	25	75	100
	Core Course – VIII	Practical - II (CC-V CC-VI & CC-VII)	P16BO2C8P	10	5	3	40	60	100
	Elective Course – II	Food Science	P16BO2E2	5	4	3	25	75	100
				30	24				500
III	Core Course – IX	Genetics And Crop Improvement	P16BO3C9	5	5	3	25	75	100
	Core Course – X	Taxonomy and Biosystematics	P16BO3C10	5	5	3	25	75	100
	Core Course – XI	Practical – III (Covering CC XI & CC X)	P15BO3C11P	10	5	3	40	60	100
	Elective Course - III	Plant Biotechnology	P16BO3E3	5	4	3	25	75	100
	Elective Course – IV	Plant Tissue Culture	P16BO3E4	5	4	3	25	75	100
				30	23				500
IV	Core Course – XII	Plant Physiology and Biochemistry	P16BO4C12	5	5	3	25	75	100
	Core Course – XIII	Biophysics, Bioinstrumentation and Biological Techniques	P16BO4C13	5	5	3	25	75	100
	Core Course – XIV	Practical – IV (Covering CC XII & CC XIII)	P16BO4C14P	8	5	3	40	60	100
	Elective Course – V	Research Methodology	P16BO4E5	5	4	3	25	75	100
	Project Work	Project Work	P16BO4PW	7	4	3	**	**	100
				30	23				500
TOTAL				120	90				2000

** Dissertation – 80 Marks and Viva Voce Examinations – 20 Marks

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BOARD OF STUDIES IN BOTANY**

CONTROLLER OF EXAMINATIONS

Sl. No.:

Subject Code:

GOVERNMENT ARTS COLLEGE (AUTONOMOUS): KARUR-05

M.Sc., - BOTANY – SEMESTER I – CORE COURSE -I

(For the candidates admitted from the year 2016-17 onwards)

PLANT DIVERSITY - I

(ALGAE, FUNGI, BRYOPHYTES AND LICHENS)

Unit I : ALGAE : Introduction, Classification (Fritsch and Christenson), phylogeny of algae. Thallus organization, algal pigments, reserve food materials, structure, reproduction, life cycle of major groups of algae.

Unit II : Salient features of major divisions of algae – Cyanophyta (Cyanobacteria), Chlorophyta, Charophyta, Xanthophyta, Bacillariophyta, Phaeophyta and Rhodophyta. Ecology and economic importance of algae.

Unit III : FUNGI : Introduction, Classification (Alexopolus and Ainsworth) phylogeny and life cycle of major groups of fungi . A general knowledge of nutrition, heterothallism, sexual reproduction, economic importance of fungi.

Unit IV : Salient features of major divisions of Mastigomycotina, Myxomycotina, Zygomycotina, Basidiomycotina, Ascomycotina and Deuteromycotina.

LICHENS : A general account of lichens with reference to structure, reproduction, nutrition, classification and economic importance.

Unit V : BRYOPHYTES : Classification (Watson), general features of major divisions – Hepaticopsida, Anthocerotopsida and Bryopsida. Evolution of sporophytes, Fossil Bryophytes. Distribution of Bryophytes in India. Economic importance of Bryophytes.

Reference Books :

Algae :

1. Fritsch , F.F. (1935) The structure and reproduction of the Algae volume I & II. NewDelhi.
2. Pandey.S.N., S.P.Misra and P.S. Trivedi. 2002. A Textbook of Botany Volume II. Vikas Publishing House Pvt Ltd, New Delhi
3. Sambamurthy A.V. S.S. 2005. A Textbook of Algae. I.K. International Pvt.Ltd, New Delhi.
4. Bilgrami, K.S. and L.C. Saha, 2004. A textbook of Algae, CBS publications.

Fungi :

1. Alexopoulos, C.J., C.W. Mims and M. Blackwell. 2007. Introductory Mycology. IV Edition. Wiley India (P) Ltd., Daryaganj, New Delhi.
2. Bessay, E.A. 1979. Morphology and Taxonomy of Fungi. Vikas publishing House, New Delhi.
3. Mukta Bhargava, 2003. The latest portfolio of theory and practice in Fungi, A.S Saini Dominant Publications.

Bryophytes :

1. Rashid.A. 2007. An Introduction to Bryophyta – Vikas publications, New Delhi.
2. Chopra, R.N. and P.K. Kumar, 2003. Biology of Bryophytes, New age International Pvt.
3. Chandrakant Pathak, 2003. The latest portfolio of theory & practice in Bryophyta, Dominant Publications.

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GOVERNMENT ARTS COLLEGE (AUTONOMOUS): KARUR-05

M.Sc., - BOTANY – SEMESTER I – CORE COURSE -II

(For the candidates admitted from the year 2016-17 onwards)

PLANT DIVERSITY – II

(PTERIDOPHYTES, GYMNOSPERMS AND PALAEOBOTANY)

Unit I : PTERIDOPHYTES : Introduction, Classification (Sporne and Reimers), phylogeny of pteridophytes. Range of morphology, Structure, Reproduction and Evolution of the sporophytes and gametophytes of Psilopsida and Lycopsida.

Unit II : Range of morphology, Structure, Reproduction and Evolution of the sporophytes and gametophytes of Sphenopsida and Pteropsida. Stelar evolution. Heterospory and seed habit, morphogenesis, phylogeny and economic importance of Pteridophytes.

Unit III : GYMNOSPERMS : Introduction, Classification (Sporne), phylogeny of gymnosperm. Range of morphology, Structure, Reproduction and Evolution of sporophytes and gametophytes of Cycadopsida and Coniferopsida.

Unit IV : Range of morphology, Structure, Reproduction and Evolution of the sporophytes and gametophytes of - Gnetopsida. Economic importance of gymnosperms. Evolutionary significance of Welwitschiales, Pteridospermales, Cycadales, Pentoxylales and Cordaitales.

Unit V : PALAEOBOTANY: General account on geological time scale – Types of fossils, methods of fossilization, age determination and methods of study of fossils. Role of fossil in oil exploration.

Reference Books :

Pteridophytes:

1. Sporne, K.R. (1970) - The morphology of pteridophytes(The structure of ferns and allied plants).
2. Singh, V., Pande, P.C. and Jain, D.K. - 4th Edition (2014-15) - A Text Of Botany - Rastogi Publications, Meerut.
3. Vashishta , P.C , Sinha and Anilkumar (2010). Pteridophytes, S. Chand &company Ltd, New Delhi.

Gymnosperms :

1. Johri, RM, Lata S, Tyagi K (2005), A text book of Gymnosperms, Dominate Pub. & Distributer, New Delhi.
2. Biswas, C. and Johri, B.M. (2004). The Gymnosperms. Narosa Publishing House, New Delhi.

Palaeobotany :

1. A.C.Arnold 2000. An introduction to palaeobotany, Tata McGraw Hill Education Private Limited, New Delhi.
2. Kimura, M. (1983). The natural theory of molecular evolution, Cambridge University Press, Cambridge.
3. Arora M.P. (1990). Evolutionary biology, Himalaya Publication House, Delhi.

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GOVERNMENT ARTS COLLEGE (AUTONOMOUS): KARUR-05

M.Sc., - BOTANY – SEMESTER I – CORE COURSE -III

(For the candidates admitted from the year 2016-17 onwards)

MICROBIOLOGY AND PLANT PATHOLOGY

Unit I : History and scope of Microbiology. Classification of Microorganisms: Five kingdom, Eight kingdom and Three Domain concepts. Bergey's system of bacterial classification. Bacterial nomenclature and modern trends of Bacterial taxonomy.

Unit II : Morphology and structure of bacterial cells. Chemical composition of cell wall - Gram positive, Gram negative and Archaeobacteria. Nutrition - Reproduction - Bacterial recombinations - Transformation, Transduction and Conjugation.

Unit III : Viruses - Classification of viruses (LHT system). General characteristics, morphology of viruses – shape, size, structure - Helical, icosahedral and complex viruses. Viral envelope, Nucleic acids and proteins. Plant viruses and Transmission of plant viruses.

Unit IV : Introduction to Plant Pathology. Classification of plant diseases. Components of plant diseases. Causal organism and causal factors responsible for plant diseases. General symptoms of plant diseases (Bacterial, fungal and viral symptoms). Effect of environment on disease development. Defense mechanism in plants. Methods of control of plant diseases.

Unit V : Study of selected Plant diseases (Causal Organism/symptoms and Control)

Bacterial Diseases: Bacterial blight of Cotton, Stalk rot of Maize. and Leaf Blight of Rice.

Fungal Diseases: Rhizopus soft rot of fruits and vegetables, Tikka disease of Groundnut and Rust of Sunflower.

Viral Diseases: Bunchy top Banana, Leaf curl of Papaya and Tobacco mosaic

Mycoplasma Diseases: Little leaf of Brinjal.

Reference Books :

1. Michael, J Pelczer, E.C.S. Chan, Noel R. Krieg, 1993. Microbiology—concepts and applications, McGraw Hill Inc, New York.
2. Prescott, John, P. Harley, Donald, A Klein, 1995. Microbiology (2nd Edition), WMC Brown brothers.
3. Dubey, R.C. and D.K. Maheswari, 2007. A Textbook of Microbiology, S. Chand & Company, New Delhi.
4. Sambamurthy A.V. S.S. 2006. A Textbook of Plant Pathology. I.K. International Pvt.Ltd., New Delhi.
5. Singh. R.S. 2005. Principles of Plant Pathology – 4th edition. Oxford & IBH.
6. George N. Agrios, 2006. Plant Pathology – 5th edition, Elsevier. New Delhi.
7. Mehrotra, R.S, and Ashok Aggarwal, 2004. Plant pathology – 2nd Edition, Tata Mc Graw – Hill, New Delhi.

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GOVERNMENT ARTS COLLEGE (AUTONOMOUS): KARUR-05

M.Sc., - BOTANY – SEMESTER I – CORE COURSE -IV

(For the candidates admitted from the year 2016-17 onwards)

PRACTICAL -I (Covering CC - I, CC - II and CC - III)

- Algae** : Study of the morphology of algae with particular reference to forms :
Chlamydomonas, Volvox, Hydrodictyon, Codium, Nitella, Vaucheria, Liagora, Chambia, Gracillaria and *Ceramium*.
- Fungi** : Study of *Phytophthora, Taphrina, Erisyphae, Septoria, Penicillium, Pyricularia, Alternaria, Cercospora* and *Sclerotium*.
- Bryophytes** : Study of *Reboulia, Targionia, Porella, Ricardia, Anthoceros* and *Bryum*.
- Pteridophytes** : Study of *Psilotum, Selaginella, Lycopodium, Equisetum, Ophioglossum, Osmunda, Gleichenia, Salvinia* and *Azolla*.
- Gymnosperms** : Study of *Araucaria, Podocarpus, Cedrus, Cupressus* and *Ephedra*.
- Paleobotany** : **Fossil Pteridophytes and Gymnosperms** : *Horneophyton, Stigmara, Calmostachys, Spenophyllum, Botryopteris, Archaeopteris, Lyginopteris, Hetrangium, Lagenostoma, Medullosa* and *Cordiates* Diagram only
- Microbiology** :
1. Isolation of microbes from Soil – Serial dilution and plating technique.
 2. Gram's staining of Bacteria.
 3. Disc diffusion assay (Antibiosis).
 4. Methylene blue reduction test.
- Plant Pathology** : Study of selected plant diseases (Causal Organism/symptoms and Control)
- Bacterial Diseases** : Bacterial blight of Cotton, Red rot of Sugarcane and Leaf Blight of Rice.
- Fungal Diseases** : *Rhizopus* soft rot of fruits and vegetables, Tikka disease of Groundnut and Rust of Sunflower.
- Viral Diseases** : Bunchy top Banana, Leaf curl of Papaya and Tobacco mosaic
- Mycoplasma** : Little leaf of Brinjal.

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GOVERNMENT ARTS COLLEGE (AUTONOMOUS): KARUR-05

M.Sc., - BOTANY – SEMESTER I – ELECTIVE COURSE -I

(For the candidates admitted from the year 2016-17 onwards)

HORTICULTURE

- Unit I :** Introduction : History, scope, divisions of horticulture. Importance of Soil, Water, and climatic factors. Nutritional requirements and growth of horticultural crops. The role of computers in horticulture.
- Unit II:** Importance, design and types of gardens (indoor, outdoor and kitchen gardens). Maintenance of nursery, methods of rockery and water gardens. Cultivation of commercial flowers (Rose, Jasmine, and Chrysanthemum). Cultivation and preservation methods of vegetables (bhendi, brinjal and tapioca) and fruits (mango, banana and orange).
- Unit III :** Establishment orchards, plant propagation techniques - vegetative propagation - cutting, budding, layering, pruning and grafting. Methods of shoot and root induction, making a potted and bonsai plants. Flower thinning and decorations.
- Unit IV :** Introduction of botanical gardens, lawn making and pathway designing. Role of green house, mist chamber and seed bank in gardening. Methods of Irrigation. Development and preservation of cacti and orchids.
- Unit V :** Arboretum in India - Factors affecting in gardening:- Light, Temperature, Soil pH, Humidity, Water and wind. Role of growth hormone in horticultural crops.

Reference Books:

1. H. D. Kumar 1999 Introduction to Horticulture.
2. Prasad,S and U.Kumar, 1999. Principles of Horticulture. Agrobotanica, bikaner.
3. Chadha, (2001). Hand Book of Horticulture. ICAR Publications, New Delhi.
4. Benu Singh, (2010). A Modern Book on Forestry and Horticulture, Vista International Pub. New Delhi.
5. Williams, C.N., Uzo, J.O. and Peregrine, W.T.H. (1991). Vegetable production in Tropics. Longman Scientific & Technical, Essex (UK).
6. Edmond JB. T.L.Senn. F.S. Andrews and R.G. Halfacre 1975. Fundamentals of Horticulture. Tata McGraw Hill Publishing Co., New Delhi.
7. Jules Janic (1979). Horticultural Science Surjeet Publications, New Delhi.
8. Manibhushan Rao, 1991. The text book of horticulture, MacMillan Indian Ltd, New Delhi.
9. Allard (1960). Principles of plant breeding John Wiley Publications New York.

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GOVERNMENT ARTS COLLEGE (AUTONOMOUS): KARUR-05

M.Sc., - BOTANY – SEMESTER II – CORE COURSE -V

(For the candidates admitted from the year 2016-17 onwards)

CELL AND MOLECULAR BIOLOGY

Unit I : Prokaryotic and Eukaryotic cells : shape, size and organization of cells. Structure and function of cell wall. Plasma membrane - chemical composition, structure and functions. Cytoplasm - physical, chemical and biological properties. Cytoplasmic inclusions.

Unit II : Cell organelles - Ultra structure and function of Nucleus, Chromatin, Nucleolus, Ribosomes, Mitochondria, Plastids, Endoplasmic reticulum, Golgi complex, Lysosome, Microbodies - Peroxisomes and Glyoxisomes.

Unit III : Cytoskeleton - Structure, chemical composition, functions of Microtubules, Microfilaments, Intermediate filaments, Centrioles and Basal bodies, Cilia and flagella. Cell cycle - Mitosis and Meiosis.

Unit IV : Molecular Biology - Introduction, Historical events in molecular biology - DNA as the genetic material. Chemical nature and structure of DNA, Replication of DNA in Prokaryotes and Eukaryotes. RNA - Chemical nature and major classes of RNA - Mechanism of transcription in Prokaryotes and Eukaryotes.

Unit V : Genetic code - characteristics of genetic code, Central dogma of life - Protein synthesis in Prokaryotes and Eukaryotes. Regulation of gene expression. DNA mutation and DNA repair mechanisms.

Reference Books:

1. Verma P.S. and Agarwal,V.K. Cytology, Revised Edition 2010. S. Chand & Co. Publication.New Delhi.
2. Friedfielder, D(1986) Molecular Biology Jones & Barriet Publishing INC., Boston, Portola Valley.
3. Ajoy paul (2009). Text book of Cell and molecular biology , books and Allied (p)Ltd, Kolkata.
4. Walker J.M and Rapley,R (2006). Molecular biology and biotechnology(4th edition) Panima Publishing Corporation , New Delhi.
5. Karp.G. (2008) Cell and Molecular Biology.5th edn. John Wiley & sons. London.
6. De Robertis and De Robertis. (1998).Cell and Molecular Biology. B.I. Waverly Pvt. Ltd. New Delhi.
7. Geoffrey M. Cooper .(1997). The Cell – A Molecular approach. ASM Press, Washington.
8. William D. Stansfield et al., (1996). Schaun’s outline of theory and problems of Molecular and Cell biology. McGraw Hill, New York.
9. Lodish, et al. (2000). Molecular and Cell Biology. W.H. Freeman & Co. New York.

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GOVERNMENT ARTS COLLEGE (AUTONOMOUS): KARUR-05

M.Sc., - BOTANY – SEMESTER II – CORE COURSE -V

(For the candidates admitted from the year 2016-17 onwards)

PLANT ANATOMY AND EMBRYOLOGY

Unit I : Plant Tissues - Types; Meristems: General account, Cytological characteristics and Classification. Organization of Shoot apex and Root apex. Theories on organization of meristems. Permanent Tissues: Structural and functional aspects of Parenchyma, Collenchyma and Sclerenchyma. Secretory ducts and Laticifers. Epidermis - Epidermal Appendages; Stomata - Structure and Types. Transfer cells - Structure and Functions.

Unit II : Complex Tissues: Xylem and Phloem. Structural variations, Types and Functions. Primary structure of Stem, Leaf and Root. Secondary Xylem: Structure, types and ontogeny, Dendrochronology, Compression Wood, Tension wood. Secondary Phloem Structure, Types and Ontogeny. Anomalous secondary growth, Dicotyledons - *Bignonia*, *Boerhaavia*, *Nyctanthes* and *Aristolochia*. Monocotyledons: *Dracaena*, Nodal Anatomy, Uni and Trilocular. Branch Traces and Branch gaps. Closing of Leaf gaps.

Unit III : Vascular cambium: General Account, Structure, Types, Seasonal Activities and Factors Influencing Cambial activity. Healing of wounds. Periderm; Structure and Development, Commercial Cork, Polyderm. Lenticels: Structure and Development.

Unit IV : Flower Ontogeny, Vascularization of Flower. Anther: Structure and Development - Microsporogenesis - Palynology. Microgametogenesis. Pollen - Pistil Interaction, Structure, Types and Development of Ovule - Megasporogenesis - Structure and development of female gametophyte - types of Embryo sac.

Unit V : Double Fertilization, Self and Sexual incompatibility. Barriers to Fertilization Genetics, Physiology and Biochemistry of incompatibility. Embryo Development - Dicot and Monocot. Endosperm: Structure, Development and Types. Structure of fruit wall and seed coat. Polyembryony and Apomixis. Embryology in relation to Taxonomy.

Text Books:

1. Pandey, B.P. (1989) - Plant Anatomy - S. Chand & co, New Delhi. Revised Edition (2010).
2. Singh.V., P.C. Pandey and D.K.Jain. (2003). Embryology of Angiosperms. Rastogi Publications. Meerut.
3. Bhojwani, S.S. and Bhatnagar S.P, (1981). Embryology of Angiosperms - Vikas publication House (P) Ltd, New Delhi.

Reference Books:

1. Pijushroy,(2010).plant Anatomy, New central Book Agency ,Pvt Lit, New delhi
2. Pandey, P.B.(2000). Plant Anatomy. S.Chand & Co.
3. Pandey.S.N and Ajanta Chandha. (2006). Plant Anatomy and Embryology. Vikas Publishing House Pvt.Ltd , New Delhi.

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Subject Code:

P16BO2C7

GOVERNMENT ARTS COLLEGE (AUTONOMOUS): KARUR-05

M.Sc., - BOTANY – SEMESTER II – CORE COURSE –VII

(For the candidates admitted from the year 2016-17 onwards)

PLANT MICROTECHNIQUE AND MICROSCOPY

Unit I : Killing and Fixing - Dehydration - Infiltration - Embedding. Paraffin Embedding, Microwave Paraffin Embedding and Plastic Embedding techniques - Reagents for embedding - Fixatives - Post fixatives - Buffers - Resins used for different kinds of embedding - Procedure for embedding. Advantages and disadvantages of various kinds of embedding techniques.

Unit II : Sectioning Methods - Freehand and Serial sectioning - Types and Applications of microtomes - Sledge Microtome, Rotary microtome, Sliding microtome, Cryomicrotome - Microtomy.

Stains - General stain, Specific stain, Monochromatic stain and Metachromatic stain, Acidic stain, Basic stain, Neutral stain, Vital stain, Negative stain - Mordants - Staining Procedure - Double Staining - Mounting.

Unit III : Slide preparations - Temporary, Semi-permanent and Permanent slide preparations - Smear - Squash - Clearing - Whole Mount - Peeling - Maceration techniques.

Drawing microscopic images - Camera lucida - types (prism and mirror) and applications. Micrometry - Ocular and Stage micrometers - Callibration. Measuring and Scaling - Magnification and Scale Bar.

Unit IV : Histochemistry - Definition, staining methods, staining theory. Scope of histochemistry and Cytochemistry in Biology. Gus staining, Qualitative histochemistry, Quantitative histochemistry.

Histochemical Techniques - Detection and localization of structural and storage components in plants using specific dyes and fluorochromes– Starch, protein, lipid, nucleic acids, cellulose, lignin, potassium, magnesium, calcium, iron, alkaloids, terpenoids, phenolics (tannin), glycosides.

Unit V : Microscopy - Principles, Parts, Functioning and Applications of Bright Field, Dark Field, Phase Contrast, Polarized and Fluorescence microscopy. Structure, Functioning and Applications of TEM and SEM.

Photomicrography - Principles of Photomicrography - SLR and DSRL (Digital SLR) and USB eyepiece cameras - Photomicrography attachments.

Reference Books:

1. Clark, G. 1981. Staining procedures. Williams and Wilkins, Baltimore.
2. Jensen, W. A. 1962. Botanical Histochemistry. Principles and practices. W. H. Freeman and Company, San Francisco.
3. Johanson, W.A. 1982. Botanical Histochemistry-Principles and Practice. Freeman & Co, U.S.A.
4. Johanson, W.A. 1984. Plant Microtechnique. Mc Graw Hill.
5. Kierman, J.A. 1999. Histological and Histochemical Methods. Butterworth Publications, London.
6. Krishnamurthy, K. V. 1988. Methods in Plant Histochemistry. S. Viswanathan Printers and Publishers private limited, Madras.
7. O' Brien, T. P., and M. E. Mc Cully. 1969. Plant structure and development. A Pictorial and physiological approach. The Mac millan Company, London.

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GOVERNMENT ARTS COLLEGE (AUTONOMOUS): KARUR-05

M.Sc., - BOTANY – SEMESTER II– CORE COURSE -VIII

(For the candidates admitted from the year 2016-17 onwards)

PRACTICAL - II (Covering CC - V, CC - VI AND CC - VII)

(PLANT ANATOMY, EMBRYOLOGY, TAXONOMY, BIOSYSTEMATICS, CELL AND MOLECULAR BIOLOGY)

Cell and Molecular Biology:

1. Squash and smear techniques - Onion Root Tip (Mitosis) and Rheo flower buds (Meiosis)
2. Study of karyotypes and ideograms
3. Isolation of DNA
4. Isolation of plasmid
5. pBR322 Genome map Demonstration

Plant Anatomy:

1. L.S of shoot and root apices
2. Identification of stomatal types
3. T.S. of *Boerhaavia*, *Nyctanthes*, *Aristolochia* and *Dracaena*,
4. Nodal Anatomy - Uni and Trilocunar
5. Examination of secondary wall thickenings.
6. Wood structure T.S., T.L.S and R.L.S

Embryology:

1. Palynology - Study of pollen morphology
2. Study of pollen germination.
3. Developmental stages of Anther, Ovule, Embryosac, Endosperm and Embryo
4. Types of ovules, embryo sacs, endosperms.
5. Dissection of endosperm haustoria of Cucurbitaceae members
6. Dissection of embryo *Tridax*.

Plant Microtechnique:

1. Microtomy - killing and fixing, infiltration, embedding - sectioning mounting
2. Staining - single staining and double staining
3. Peeling - Clearing - Maceration
4. Freehand sectioning and preparation of semi-permanent slide
5. Micrometry - callibration
6. Drawing of microscoping images using camera lucida
7. Magnification and Scaling
8. Histochemical staining for starch, protein, lipid, nucleic acids, cellulose, lignin, alkaloids, ter-penoids, phenolics (tannin), glycosoides.

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GOVERNMENT ARTS COLLEGE (AUTONOMOUS): KARUR-05
M.Sc., - BOTANY – SEMESTER II – ELECTIVE COURSE -II
(For the candidates admitted from the year 2016-17 onwards)

FOOD SCIENCE

- Unit I :** Introduction to food science – Types , Constituents and functions of food - Nutritive aspects of food constituents. Quality factors in food. Food deterioration and it's control - Microorganisms associated with Food.
- Unit II :** Food materials of plant origin - Cereals and cereal products, Pulses, Nuts and Oil Seeds. Vegetables and fruits - Sugar and related products - Fats, Oil and Spices.
- Unit III :** Food Preservation - Impact of science and technology in food preservation - Principles of food preservation - Physical methods - Low temperature - Freezing - Drying - Irradiation - Canning - High temperature - High Pressure and Fermentation.
- Unit IV :** Chemical preservatives - Organic acids and Esters - Nitrite - Sulfur dioxide natural food preservatives – Sugar, NaCl - Antimicrobial agents - Food additives - functional characteristics of chemical food additives.
- Unit V :** Food spoilage - Causes of food spoilage - Spoilage of cereals, vegetables and fruits. Food adulteration - Types of adulterants - Quality factors in foods - Food poisoning - Food borne intoxications and food borne infections - Food borne diseases and their control.

Reference Books:

1. Khatkar, Bhupendra Singh (2013 - Food Science and Technology. ASTRAL International (P) Ltd, New Delhi.
2. Khetarpaul, Neelam (2013) - Food Processing and Preservation. ASTRAL International (P) Ltd, New Delhi.
3. Subbulakshmi, G., Subhadra & Mandalika (2014) - Functional Foods and Nutrition, ASTRAL International (P) Ltd, New Delhi.
4. Khetarpaul, Neelam (2013) - Food Microbiology . ASTRAL International (P) Ltd, New Delhi

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GOVERNMENT ARTS COLLEGE (AUTONOMOUS): KARUR-05
M.Sc., - BOTANY – SEMESTER III– CORE COURSE -IX
(For the candidates admitted from the year 2016-17 onwards)

GENETICS AND CROP IMPROVEMENT

Unit I : Transmission Genetics : History of Mendel's studies - Mendel's law of inheritance - Test Cross. Mendel's experiments in modern context - Allelic and Nonallelic interactions between genes. Qualitative vs. Quantitative traits. Genetic segregation in human pedigrees.

Unit II : Chromosomal Basis of Heredity : Structure and Function of chromosomes. Autosomes and sexchromosomes. Structural and Numerical variations of chromosomes – Mutation, Euploidy, Aneuploidy and Polyploidy. Evolutionary significance of chromosomal aberrations. Sex determination, differentiation and Sex-linkage, Sex-influenced and Sex-limited inheritance.

Unit III : Gene Linkage and Genetic Mapping : Linkage detection, estimation; Recombination and genetic mapping in eukaryotes, Somatic cell genetics, Extra chromosomal inheritance.

Population Genetics Mendelian population - Random mating population - Frequencies of genes and genotypes. Causes of change: Hardy-Weinberg equilibrium. Historical background on quantitative inheritance.

Unit IV : Introduction to Plant breeding : History, objectives, achievements. Plant introduction, Selection and Hybridization. Centres of origin of Crop Plants, gene pool concept - primary, secondary and tertiary gene pool, and gene introgression.

Plant genetic resources: Importance of plant genetic resources and diversity in plant breeding, collection, evaluation and conservation of germplasm.

Unit V : Methods of breeding : Self pollinated, cross pollinated and asexually propagated crops; Land races, pure line selection and mass selection; Pedigree selection, bulk method and its modification; Clonal selection. Mutation breeding, use of polyploidy and distant hybridization in plant breeding.

Application of biotechnology in Plant breeding: Embryo rescue, somaclonal variation, diploidization of haploids, protoplast fusion, transgenics, molecular plant breeding, biosafety issues involved with genetically modified organisms.

Reference Books:

1. Allard, R.W. 1960. Principles of Plant Breeding. John Wiley & Sons, New York.
2. Hays, H.K., Immer, F.R. and Smith, D.C. 1955. Methods of Plant Breeding. McGraw Hill Book Company, Inc., New York.
3. Jain, H.K. 2000. Genetics, Oxford & IBH, New Delhi.
4. Poehlman, J.M. 1986, Breeding Field Crops. AVI Publishing Company, Connecticut.
5. Singh, B.D. 2000. Plant Breeding Principles and Methods. Kalyani Publishers, New Delhi.
6. Comstock, R.E. 1996, Quantitative Genetics with Special Emphasis on Plant and Animal Breeding. Iowa State University Press, Iowa.
7. Falconer, D.S. and Mackay, J. 1996. Introduction to Quantitative Genetics, Longman Group Ltd., London.
8. Mather, K. and Jinks, J.L. 1971. Biometrical Genetics. Chapman and Hall, London.

Sl. No.:

Subject Code:

P16BO3C10

GOVERNMENT ARTS COLLEGE (AUTONOMOUS): KARUR-05

M.Sc., - BOTANY – SEMESTER III – CORE COURSE -X

(For the candidates admitted from the year 2016-17 onwards)

TAXONOMY AND BIOSYSTEMATICS

Unit I : **Plant taxonomy:** Scope and importance; principles and goals; applications IUCN Red List, Conservation priorities.

Floras, Revisions and Monographs: Flora, Revisions and Monographs as basis of taxonomy; Role of herbaria, botanic gardens and literature in taxonomic studies; important literature resources.

International Code of Plant Nomenclature: Purpose, Principles, and overall knowledge of Articles pertaining to typification, publication, priority, author citation and their application.

Unit II : **Systems of Classification:** Natural System (Bentham & Hooker); Phylogenetic system of classification Phylogeny and Classification of Angiosperms (Takhtajan, APG III system of classification of angiosperms) , Taxonomic characters and Numerical methods in taxonomy.

Unit III : **Molecular Systematics:** Introduction - Classical taxonomy as base for molecular systematics. The choice of molecules in systematics - Nucleic acids, proteins and amino acids. Molecular evolution - neutral theory, molecular clock.

Cladistics (Phylogeny): concepts, parsimony, cladograms and trees; characters: apomorphic and plesiomorphic characters, homologous vs analogous; character states, binary and multistate characters, characters transformations. Trees monophyly, polyphyly and paraphyly.

Unit IV : **Study of Families and their Economic Importance: Polypetalae -** Menispermaceae, Violaceae, Portulacaceae, Meliaceae, Vitaceae, Sapindaceae, Aizoaceae;

Gamopetalae - Rubiaceae, Gentianaceae, Boraginaceae and Scrophulariaceae.

Unit V : **Study of Families and their Economic Importance: Monochlamydeae -** Nyctaginaceae, Aristolochiaceae, Loranthaceae, Moraceae (Urticaceae)).

Monocotyledonae - Orchidaceae, Cannaceae, Liliaceae, Commelinaceae, Areaceae(Palmae) and Cyperaceae.

Reference Books:

1. APG III, (2009). An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants: APG III. Botanical Journal of the Linnean Society 161: 105 -121.
2. Gurcharan Singh. (2004). Plant Systematics : Theory and practice Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
3. Stoeckle , M.(2003).Taxonomy ,DNA and the bard code of life .bioscience 53: 796 797.
4. Simpson M.G.(2006). Plant systematics , Elsevier Academic Press,USA.

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Sl. No.:

Subject Code:

P16BO3C11P

GOVERNMENT ARTS COLLEGE (AUTONOMOUS): KARUR-05

M.Sc., - BOTANY – SEMESTER III – CORE COURSE -XI

(For the candidates admitted from the year 2016-17 onwards)

PRACTICAL - III (Covering CC - IX & CC - X)

(GENETICS, CROP IMPROVEMENT, TAXONOMY AND BIOSYSTEMATICS)

Plant Genetics and Crop Improvement

1. Simple problems of Mendelian and Post Mendelian experiments.
2. Learning to use rules of probability to predict genetic results chisquare test to find the fitness of Mendelian and Post Mendelian experiments.
3. Recombination and Genetic Mapping.
4. Conducting Self pollination and Cross pollination.
5. Emasculation and Bagging.

Taxonomy and Biosystematics:

1. Study of published Flora; identification, listing and analysis of their components.
2. Botanical illustrations (line drawing) basic rules regarding proportion, scientific accuracy, scale, numbering and legend.
3. Identification of any two species and families (selecting one from Polypetalae or Gamopetalae and another from Monochlamydeae or Monocotyledonae) with author citation and references of locally available angiosperms using Flora.
3. Salient features of families, Identification of species, Author Citation with complete reference Identification of family with salient features, Detailed study of identification, dissection, description and illustration of at least 18 families studied in theory

Polypetalae :

Menispermaceae, Violaceae, Portulacaceae, Meliaceae, Vitaceae, Sapindaceae, Aizoaceae.

Gamopetalae :

Rubiaceae, Gentianaceae, Boraginaceae, Scrophulariaceae;

Monochlamydeae :

Nyctaginaceae, Aristolochiaceae, Loranthaceae, Moraceae

Monocotyledonae :

Orchidaceae, Cannaceae, Liliaceae, Commelinaceae, Arecaceae, Cyperaceae

4. Study of economic importance
5. Preparation of dichotomous key with locally available five plants.
6. Construction of phylogenetic tree or cladogram using the given character set.
7. Collection, preparation and identification of herbarium of at least two species per family studied by you from a field trip for 3 - 5 days. Each student should submit 50 Herbarium Sheets with nomenclature, author citation, description, phenology and notes. Herbarium should be associated with field note and field report

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Sl. No.:

Subject Code:

P16BO3E3

GOVERNMENT ARTS COLLEGE (AUTONOMOUS): KARUR-05

M.Sc., - BOTANY – SEMESTER III – ELECTIVE COURSE -III

(For the candidates admitted from the year 2016-17 onwards)

PLANT BIOTECHNOLOGY

- Unit I :** Biotechnology : Definition, History, Scope and importance of biotechnology. Plant biotechnology status and scope. Plant cell culture in plant biotechnology and plant pathology. Market potential of plant biotechnology in India.
- Unit II :** Genetic engineering: Definition and concepts Methodology of plant genetic engineering. Gene transfer mechanism in Plants. Vectors for Gene transfer - Ti and Ri plasmids vectors, viral vectors. Agroinfection and Gene transfer. Direct gene transfer methods - Microinjection and Macroinjection, Gene Gun, Electroporation, Liposome mediated gene transfer.
- Unit III :** Transgenic crops : Resistance to Biotic and abiotic stresses - Herbicide resistant plants, Insect resistant transgenic plants. Resistance against viral infection, resistance genes from extremophiles - resistance against drought, salinity, chilling, heat and heavy metals.
- Unit IV :** Molecular Farming / Pharming. Transgenic plants as bioreactors. Genetically Engineered Plants as Protein factories - Production of Industrial Enzymes in plants - Production of antibiotics, Edible Vaccines, Bio Pharmaceuticals and Lipids.
- Unit V :** Biodiversity and Plant Biotechnology : Steps to conserve Biodiversity - *In situ* and *Ex situ* conservation, Gene Banks. Genetically modified crops and their impacts on agriculture, human health and Ecological impacts. Plant biotechnology and IPR.

Reference Books:

1. Ignacimuthu, S.J.(2003). Plant Biotechnology. Oxford & IBH Publishing, New Delhi.
2. John Jothi Prakash, E. (2005). Outlines of Plant Biotechnology. Emkay Publishers, New Delhi.
3. Dubey, R.C., (2001). A text book of biotechnology. S. Chand & Co., New Delhi.
4. Trivedi, P.C. 2000 – Plant Biotechnology, Panima Publishing Corporation, New Delhi.
5. Gupta P. K. 2005 Elements of Biotechnology. Rastogi Publications Meerut.
6. Singh B. D. 2003 Biotechnology Expanding Horizons. Kalyani publishers Ludhiana.

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Sl. No.:

Subject Code:

P16BO3E4

GOVERNMENT ARTS COLLEGE (AUTONOMOUS): KARUR-05

M.Sc., - BOTANY – SEMESTER III – ELECTIVE COURSE -IV

(For the candidates admitted from the year 2016-17 onwards)

PLANT TISSUE CULTURE

Unit I : History, Scope and Concepts of Plant Tissue Culture. Tissue Culture Laboratory: Requirements, Establishment and Safety. Sterilization Types: Filter, Heat and Chemicals. Media Preparation: Inorganic nutrients, Organic Supplements, Carbon Source, Gelling Agents, Growth Regulators. Composition of different Culture Media: MS, B5 and White's Media.

Unit II : Totipotency – Cytodifferentiation. Plant Cell, Tissue and Organ Culture. Explants for Culture. Organogenesis : Direct and Indirect. Meristem culture, Callus Culture, Suspension culture. Micropropagation : Methods, Stages and Advantages.

Unit III : Protoplast culture and Somatic hybridization. Isolation of protoplasts - Mechanical and Enzymatic. Protoplast Fusion - Somatic Hybrids - importance of Somatic Hybrids. Somatic Embryogenesis, Artificial Seeds. Somaclonal and Gametoclonal variations.

Unit IV : Haploid Production : Androgenesis and Gynogenesis. Anther and Pollen Culture Embryo and Endosperm Culture. Types of Secondary metabolites, Valuable natural compounds by plant cell and Tissue Culture. Elicitors, Allelopathy and Phytoalexins.

Unit V : Cryopreservation and Gene Banks. Application of plant Tissue Culture in Forestry, Horticulture, Agriculture and Pharmaceutical industries.

Text Books:

1. London Timir Baran Jha and Biswajit Ghost, Plant tissue culture (Basic and Applied). University Press, Hyderabad. 2005
2. Pullaiah, T. (2013), Plant Tissue Culture: Emerging Trends - ASTRAL International (P) Ltd, New Delhi.
3. Jha, T.B. and Ghosh, B. (2005)- Plant Tissue Culture. Agrobios (India) Revised Edition.

Reference Books:

1. Bhojwani, S.S. & Razdan, M.K. (2004). Plant Tissue Culture, Read Elsevier India Pvt. Ltd.
2. Kalyankumar De,(2008). Plant tissue culture. New Central Book Agency, Calcutta.
3. Purohit, S.S. 2010. Plant Tissue Culture. Agrobios (India) Revised Edition.
4. Purohit, S.S. 2010. Plant Tissue Culture. Agrobios (India) Revised Edition.

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Sl. No.:

Subject Code:

P16BO4C12

GOVERNMENT ARTS COLLEGE (AUTONOMOUS): KARUR-05

M.Sc., - BOTANY – SEMESTER IV – CORE COURSE -XII

(For the candidates admitted from the year 2016-17 onwards)

PLANT PHYSIOLOGY AND BIOCHEMISTRY

Unit I : **Water relations** of plants Physicochemical properties of water, chemical potential and water potential in the plant, bulk movement of water, soil plant atmosphere continuum, Transpiration - stomatal physiology and regulation. Modern concepts of mineral salt absorption and translocation.

Unit II : **Photosynthesis** - Photophysical and photochemical phases - Light reactions - sequence of photosynthetic pathway - Electron Transport Chain - Cyclic and Non-Cyclic Photophosphorylation. Pathways of CO₂ fixation (C₃, C₄ and CAM).

Respiration: Photorespiration (C₂) and dark respiration - Glycolytic pathway - Aerobic and Anaerobic Respiration - Krebs's cycle, Oxidative phosphorylation, Pentose Phosphate Pathway, Gluconeogenesis.

Unit III : **Plant growth regulation** - Growth - Growth Curve - Plant Growth Regulators - auxins, gibberellins, cytokinins - Growth retardants - Mode of action, physiological actions and applications in agriculture and horticulture.

Photoperiodism - Phytochromes and Flowering.

Physiology of Seed Dormancy - Causes of seed dormancy - Breaking seed dormancy - Vernalization - Senescence and Aging.

Unit IV : **Carbohydrates** - Classification, structure and functions of mono, di, oligo and polysaccharides.

Proteins and aminoacids - Classification, structure and composition of amino acids. Primary, secondary, tertiary and quaternary structure of proteins.

Lipids - Classification, structure and functions - properties. Biosynthesis of fatty acids.

Unit V : **Enzymes** - classification, mode of action, Michaelis - Menton constant, coenzymes, isoenzymes. Reverse turn and Ramachandran Plot.

Nucleic acids - Structure, composition - Nucleotides - cyclic nucleotides - biosynthesis of purines and pyrimidines.

Secondary metabolites - A general account - Biosynthesis and function of lignins, terpenes, phenols, alkaloids and flavonoids.

Reference Books:

1. Lincoln Taiz and Eduardo Zeiger, 2005. Plant Physiology Sinauer Associates Inc. Publishers, Sunderland, Massachusetts.
2. Salisbury, F.B and Cleon Ross, 2007. Plant physiology, Wadsworth publishing company, Belmont.
3. William G. Hopkins, 1999. Introduction to Plant Physiology, John Wiley and sons, INC, New York.
4. Jain, J.L., Sunjay Jain and Nitin Jain, 2007. Fundamentals of Biochemistry, S.Chand & co New Delhi.
5. Hans-Walter. Headt, 1997. Plant Biochemistry and Molecular Biology. Oxford University press, New York.
6. Brett, C. T. & Hillman, J. R. (ed.) (1985). Biochemistry of Plant Cells Walls. Cambridge University Press, UK.

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Subject Code:

GOVERNMENT ARTS COLLEGE (AUTONOMOUS): KARUR-05

M.Sc., - BOTANY – SEMESTER IV– CORE COURSE -XIII

(For the candidates admitted from the year 2016-17 onwards)

BIOPHYSICS, BIOINSTRUMENTATION AND BIOLOGICAL TECHNIQUES

- Unit I :** **Biophysics** - Bioenergetics, Energy and work. Laws of Thermodynamics. Energy transductions in biological systems. Redox potential, Redox couples, ATP bioenergetics. Photobiology: Dual nature of light, characteristics of solar radiation, solar energy - Efficiency of atoms Absorption spectra in molecules, energy states, Deexcitation.
- Unit II :** **Separation technique** - Centrifuge and centrifugation - Basic principles, Types of centrifuges - Analytical and Preparative centrifugation, Differential and density gradient centrifugation. Preparative, analytical and ultra centrifugation techniques with special reference to determination of molecular weight of macromolecules.
- Unit III :** **Separation technique** - Chromatography - Principles, procedures and applications of Paper (PC), Thin layer (TLC), High performance thin layer chromatography (HPTLC), Ion exchange, Affinity, Gas chromatography (GC), Gas liquid chromatography (GLC), High performance liquid chromatography (HPLC).
- Unit IV :** **Separation technique** - Electrophoresis - Basic principles - Isolation and staining of DNA and Protein from plant sample - AGE, PAGE, PFGE - Extraction and estimation of DNA by AGE - Extraction and estimation Protein by PAGE
- Unit V:** **Analytical Techniques** - Principle and applications of Colorimetry, Spectrophotometry. Spectroscopy : Flame emission spectroscopy, Atomic absorption spectroscopy, Nuclear Magnetic Resonance spectroscopy (NMR), Circular Dichroism Spectroscopy, ESR spectroscopy, Mass spectroscopy, X-ray crystallography.

Reference Books:

1. Casey, E. J. (1962). Biophysics: Concepts and Mechanics. Van Nostrand Reinhold Co. and EastWest Press, New Delhi.
2. Rajeshwari, M.R. (2012)- Biophysics, Rastogi Publications, Meerut.
3. Salil Bose, S. (1982). Elementary Biophysics. Vijaya Printers, Madurai
4. Aggarwal S.K, 2009 Foundation Course in Biology Students Edition P 7993.
5. Eldon D. Enger, Frederick C. Ross and David Bailey (2008) -11th Edition, Concepts in Biology. Tata McGraw Hill, New Delhi.
6. Wilson & Walkar 2008 Principles and Techniques of Biochemistry and Molecular Biology Cambridge University Press.
7. Ghatak K.L. 2011.Techniques and Methods in Biology. PHI Learning Pvt. Ltd. New Delhi.
8. Gupta A. 2009. Instrumentation and BioAnalytical Techniques. PragatiPrakashan, Meerut.
9. Steven Ruzin, (2005). Plant Microtechnique and Microscopy. oxford university press, london.
10. Jayaraman - Laboratory manual in Biochemistry, Madurai.
11. Sadasivan, S. and Manickam - Biochemical methods, Coimbatore.
12. David T. Plummer - Introduction to Practical Biochemistry, New Delhi .

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Sl. No

Subject Code:

GOVERNMENT ARTS COLLEGE (AUTONOMOUS): KARUR-05

M.Sc., - BOTANY – SEMESTER IV– CORE COURSE -XIV

(For the candidates admitted from the year 2016-17 onwards)

PRACTICAL - IV (Covering CC-XII and CC-XIII)

LOT - I (Any one from A and B)

A) Plant Physiology (Individual Experiments)

1. Determination of water potential in plant tissues.
2. Estimation of photosynthetic pigments (chlorophyll and carotenoid)
3. Estimation Respiratory Quotient in flower buds or germinating seeds.

B) Separation techniques (Individual Experiments) - Any one from the lot for examination

4. Separation of photosynthetic pigments by Paper Chromatography
5. Separation of amino acids by Paper Chromatography
6. Separation of alkaloids by TLC
7. Electrophoretic separation of DNA and Protein

LOT - II (Any one from C)

C) Biochemistry (Individual Experiments) -

1. Extraction and estimation of starch.
2. Extraction and estimation of total sugar
3. Extraction and estimation of total protein
4. Extraction and estimation of total amino acid.
5. Extraction and estimation of lipid
6. Estimation of total acidity.
7. Extraction and estimation of total phenol.

LOT - III (Any two from D)

D) Qualitative analysis of primary and secondary metabolites (Individual Experiments)

1. Carbohydrates
2. Proteins and amino acids
3. Alkaloids
4. Flavonoids
5. Terpenoids
6. Coumarins
7. Glycosides
8. Tannins
9. Phenols
10. Saponins

Demonstration only (Spotters)

Physiology

Osmosis
Anaerobic respiration
Growth regulators and their role (IAA, IBA, NAA, 2,4-D, GA₃, KIN)

Biochemistry

Enzymes and their actions - peroxidase, catalase, amylase, nitrate reductase

Bio-instrumentation

pH Meter
Centrifuge
Spectrophotometer
Electrophoretic apparatus

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COE

Sl. No

Subject Code

GOVERNMENT ARTS COLLEGE (AUTONOMOUS): KARUR-05

M.Sc., - BOTANY – SEMESTER IV– ELECTIVE COURSE -V

(For the candidates admitted from the year 2016-17 onwards)

RESEARCH METHODOLOGY

Unit I : Introduction, meaning of research, objectives and types of research, Choosing problems for research. Literature survey - primary, secondary and tertiary sources. Bibliography, Indexing, Abstracting and Documentation.

Unit II : Research report Writing (thesis and publications). Components of research report. Planning and preparing a thesis and scientific papers. Proof corrections.

Unit III :Biostatistics: Importance, tabulation and classification of data, graphical representation of data. Study of frequency distribution, frequency polygon. Measures of central tendency - mean, median and mode, Standard deviation and Standard error. Test of significance - t-test, f- test and chi-square test, Null hypothesis. Variables and ANOVA, Single and multiple way.

Unit IV : Bioinformatics: Nucleic acid and protein sequences. Genomic, proteomic and metabolomic information. Bioinformatic data bases types, design, file formats and access tools with examples. Bioinformatics tools and resources, free online tools downloadable free tools, software packages, internet, books and journals.

Unit V : Nanotechnology. Concept of Nanotechnology. Classification of nanomaterials, nano structures and dynamics of bio-compatible materials, green synthesis of nanoparticles, nanotubes, colloidal gold, nanocrystals and microarray. Impact of nanotechnology on environment and society, Nanobiology, Nanosensors and Nanomedicines.

Reference Books:

1. Kothari C.K. 2004 2nd Ed. Research methodology methods and techniques (New age international, New Delhi)
2. Krishnaswamy, K. N. Sivakumar, Appa Iyar and Mathirangen M 2006. Management of research methodology integration of principles, methods and techniques (Pearson education New Delhi)
3. Antorson, Durston and Polle 1970. Thesis and assignment writing, Wiley eastern Ltd.
4. Parsons, C.J 1973 Thesis and project work. A guide to research and writing, George Allen and Unwin Ltd London.
5. Satguru Prasad (2013), Elements of Biosatistics - Rastogi Publications, Meerut.
6. Harisha S (2007). Fundamentals of Bioinformatics. IK International Publishing house Pvt. Ltd. New Delhi
7. Attwood T K and Parry Smith D J, (1999).Introduction to Bioinformatics Addison Wesley Longman Limited, England.
8. Shanmugam, S. (2011) Nanotechnology - MJP Publication New Delhi.
9. Charles PP and Frank JO, (2006). Introduction to Nanotechnology, Wiley India Ed.
10. Abdelhamid Elaissari, (2008). Colloidal Nanoparticles in Biotechnology, John Wiley.
11. Pradeep T. (2007). NANO : The Essentials – Understanding Nanoscience and Nanotechnology, TATA McGraw – Hill Education.

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Sl. No.: Subject Code:

GOVERNMENT ARTS COLLEGE (AUTONOMOUS): KARUR-05
M.Sc., BOTANY. – SEMESTER – IV – PROJECT WORK
(For the candidates admitted from 2016-17 onwards)

PROJECT WORK

Sl. No.	Area of Work	Maximum Marks		
		Int	Ext	Total
1.	PROJECT WORK: (i) Plan of the Project	10	10	20
	(ii) Execution of the plan / Collection of data / Organization of materials/ Fabrication Experimental study / Hypothesis, Testing etc., and Presentation of the report.	22.5	22.5	45
	(iii) Individual Initiative	7.5	7.5	15
2.	VIVA VOCE EXAMINATION	10	10	20
	TOTAL	50	50	100

Passing Minimum – 50 Marks

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