GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR – 639 005.

(Reaccredited with A Grade status by NAAC)
(Affiliated to Bharathidasan University, Tiruchirappalli.)

PG& RESEARCH DEPARTMENT OF ZOOLOGY
M.Sc. Zoology

PROGRAMME OUTCOMES

PO.NO.	On successful completion of M.Sc. Zoology programme in our institution, the post-graduates will be capable of
PO – 1	Comprehending the basic knowledge on the animal kingdom and their evolution
PO - 2	Perceiving the cytogenetic mechanism of cell in different developmental stages of life at molecular level and principles of bio techniques
PO – 3	Understanding the functional anatomy of fauna especially the human being to maintain the good health
PO – 4	Grasping the knowledge of commercially important organisms to develop the entrepreneurial skill for the uplifting the economic status of villagers.
PO – 5	Understanding and applying the natural aspects of life and framing the technologies for the production of life saving products necessary for the welfare of the society.
PO – 6	Developing awareness over the protection of the environment through the nature oriented and eco-friendly sustainable practices
PO-7	Designing a research project, analysing interpreting and solving the problems statistically.

PROGRAM SPECIFIC OUTCOMES

1. Ability to apply biological knowledge to other disciplines and to integrate knowledge into their personal life.
2. Capacity to illustrate the structural anatomy and physical functions of various organs in the human body and significance of various immune organs
3. Calibre of understanding the problems existing in the environment and finding out the natural eco-friendly solutions
4. Theoretically and practically sound knowledge in Molecular biology, Biotechnology, Genetics, Cell biology, and Environmental Conservation.
5. Capacity to understand and magnify the microbiological phenomena
6. Expert in the field of identification of entomological specimen and analysing their importance
7. Contributors in the area of Biological Research, Teaching and Biodiversity Conservation
8. Acumen skills in solving the problems of environmental pollution
9. Entrepreneurial skills in commercial branches of life sciences.
10. Wider knowledge on biology of wild life and *in-vitro* and *in-vivo* conservation strategies
11. Skills of using the computers and informatics in studying biology and research
12. Competence in knowing the enzymaitic reactions in biochemistry.
13. Capability of understanding the developmental stages of organisms
14. Decoding knowledge on genetic principles of heredity and evolution
13. Designing the methodologies of research and capacity of analysing research data using statistical software.

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR – 639 005 M.SC.,
ZOOLOGY COURSE STRUCTURE UNDER CBCS SYSTEM
(For the candidates admitted from the year 2016-2017 onwards)

SEMESTER	COURSE No.	SUBJECT TITLE	SUBJECT CODE	INSTR. HOURS /WEEK	CREDIT	EXAM HOURS	MARKS		TOTAL
							INT	EXT	
I	Core Course – I	Biology of Invertebrates and Chordates	P16ZO1C1	6	4	3	25	75	100
	Core Course – II	Microbiology and Immunology	P16ZO1C2	6	4	3	25	75	100
	Core Course - III	Biotechnology	P16ZO1C3	5	4	3	25	75	100
	Core Course - IV	Practical – I (CCI, II & III)	P16ZO1C4P	8	4	3	40	60	100
	Elective Course-I	General and Applied Entomology	P16ZO1E1	5	4	3	25	75	100
				30	**20**				**500**
II	Core Course – V	Cell and Molecular Biology	P16ZO2C5	6	5	3	25	75	100
	Core Course – VI	Genetics and Evolution	P16ZO2C6	6	5	3	25	75	100
	Core Course – VII	Developmental Biology	P16ZO2C7	5	5	3	25	75	100
	Core Course – VIII	Practical – II (CCV, VI & VII)	P16ZO2C8P	8	4	3	40	60	100
	Elective Course II	Applied Zoology	P16ZO2E2	5	5	3	25	75	100
				30	**24**				**500**
III	Core Course – IX	Animal Physiology and Behaviour	P16ZO3C9	6	5	3	25	75	100
	Core Course – X	Biomolecular Chemistry	P16ZO3C10	6	5	3	25	75	100
	Core Course – XI	Practical – III (CCIX & X)	P16ZO3C11P	8	4	3	40	60	100
	Elective Course -III	Computer applications and Bioinformatics	P16ZO3E3	5	5	3	25	75	100
	Elective Course- IV	Wildlife biology	P16ZO3E4	5	5	3	25	75	100
				30	**24**				**500**
IV	Core Course – XII	Ecology and Toxicology	P16ZO4C12	5	5	3	25	75	100
	Core Course – XIII	Research methodology and Biostatistics	P16ZO4C13	5	5	3	25	75	100
	Core Course –XIV	Practical – IV (CCXII & XIII)	P16ZO4C14P	5	4	3	25	75	100
	Elective Course-V	Biophysics and Bioinstrumentation.	P16ZO4E5	8	4	3	40	60	100
	Project	Project Work	P16ZO4PW	7	4	-	*	**	100
TOTAL				**30**	**22**				**500**
GRAND TOTAL				**120**	**90**				**2000**

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

CHAIRMAN
BOARD OF STUDIES IN ZOOLOGY

CONTROLLER OF EXAMINATIONS

Sl. No.: **Subject Code:** **P16ZO1C1**

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR-5

M. Sc. ZOOLOGY – I SEMESTER – CORE COURSE - I

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

BIOLOGY OF INVERTEBRATES AND CHORDATES

Course Outcomes

On completion of this course the students will be able to

1. Acquire an in-depth knowledge on the diversity and relationships in animal world.
2. Understand the phylogeny and adaptations in animals.
3. Analyze the taxonomy and significance of Biodiversity
4. Understanding on the cell, tissue, organ and system level organization.

UNIT- I

Symmetry - Asymmetry, Radial, Biradial and Bilateral symmetry – Significance; Coelom - Acoelomate, Pseudocoelomate, and Coelomate groups (Schizocoel, Enterocoel, Mesenchyme) – Significance; Metamerism - Pseudometamerism, Cyclometamerism, Corm theory, Embryological theory – Significance; Locomotion: Movement in Annelids, Molluscs and Prochordates; Nutrition: Filter feeding in Polychaetes, Molluscs and Prochordates.

UNIT-II

Respiration: Gills and Trachea in Arthropods, Respiration in Molluscs; Circulation: Circulation in Arthropods and Molluscs; Excretion: Different types of excretory organs in Invertebrates - their structure and functions; Nervous System: Primitive Types - Coelenterates and Nerve net, Advanced types- Annelids, Arthropods and Molluscs.

UNIT-III

Chemical coordination: Endocrine glands in Crustaceans and Insects-Pheromones and allelo chemicals; Reproduction: Patterns- Asexual and Sexual Reproduction- Invertebrate Larval forms and their significance ; Minor Phyla: Organisation and Affinities of Chaetognatha and Phoronida.

UNIT- IV

Comparative study, structure and function of the following system in vertebrates Integumentary System: Exoskeletal Structures and their Modifications; Digestive system: Alimentary Canal and Associated Glands; Respiratory System: Gill Respiration in Cyclostomes and Fishes, Pulmonary Respiration in Tetrapods; Circulatory System: Types of Heart and Aortic Arches; Excretory system: Types of Kidney.

UNIT – V

Comparative study of the following system in vertebrates Nervous System: Brain and Spinal cord, Cranial, Spinal and Visceral Nerves; Autonomic Nervous System - Sympathetic and Parasympathetic Nervous System; Reproductive System: Reproductive Structures and Accessory Reproductive Glands.

Text Books:

1. Kotpal, R.L., Agarwal, S,K. and Khetarpal, R.P.R.,1989, Modern Text Book of Zoology, Rastogi Publications, Meerut

References:

1. Hyman, G.H., 1940, The Invertebrates, Vo1.I to VII, McGraw Hill Book Co., Inc., N.Y.
2. Weischert, C. K., 1965, Anatomy of Chordates, McGraw Hill Book Co., Inc., N.Y.
3. Romer, A.S., 1979, Hyman's Comparative Vertebrate Anatomy, 3rd Ed., The University of Chicago Press, London.
4. Barnes, R.D., 1974, Invertebrate Zoology, 4th Ed., Holt Saunders International Edition

CHAIRMAN – BOS **COE**

Sl. No.: | | **Subject Code:** | **P16ZO1C2** |

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR-5

M. Sc. ZOOLOGY – I SEMESTER – CORE COURSE - II

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

MICROBIOLOGY AND IMMUNOLOGY

Course Outcomes

On completion of this course the students will be able to

1. Understand the nature of microorganisms and human immune system.
2. Get an idea on structure and functioning of lymphoid organs.
3. Explore new developments in immunology and microbiology.
4. Understand the role of microbes in different spheres of life
5. Analyse the ways to control harmful bacteria, viruses and fungi
6. Get familiarized with the applied aspects of microbiology.

UNIT- I

Bacteria -Taxonomy, Structure, Recombination, Growth, Nutrition, Culture - Types of Media and Conditions for Culturing; Viruses -Taxonomy, Structure and Life Cycle of Viruses-T4 Phage and HIV; Viroids and Prions.

UNIT-II

Infectious Diseases - Causative Agents, Modes of Transmission and Control of Polio, Dengue, AIDS. Tuberculosis, Diphtheria, Typhoid, Syphilis and Gonorrhea. Prevention and Control of microorganisms - Physical and Chemical Methods. Antibiotics and Other Anti-microbial Agents and Mechanism of Drug Resistance.

UNIT-III

Scope of Immunology - Types of Immunity - Innate and Acquired, Passive and Active. Primary and Secondary Lymphoid Organs - Structure and Function of Bone Marrow, Thymus, Spleen, Bursa of Fabricius, GALT, BALT, MALT and Lymph Nodes. Cells of Immune System - Origin and Differentiation of T & B Cells and Macrophage. Antigens-types and importance

UNIT-IV

Antibody - Immunoglobulin - Primary Structure - Classes, Functions, Synthesis. Genetic Mechanisms in Generation of Antibody Diversity - Regulation of Antibody Diversity. Complement - Classical and Alternative Pathways and Immunological Significance-Antigen- antibody reaction.

UNIT-V

Major Histocompatibility Complex (HLA) and its Products in Man. Transplantation Immunology, Tumour Immunology - Immune Deficiency Diseases – AIDS - Autoimmune Diseases – Examples - Concept and Mechanisms - Types of Hypersensitivity.

Text Books:

1. Powar, C.B.and Daginawala. H.F., 1982, General Microbiology Volume I &II, Himalayas Publishing House, Mumbai.
2. Ananda narayanan, T. and Jayram Paniker, C.K., 2000, Textbook of Microbiology, 6th Ed.Orient Longman Ltd., Chennai.
3. Kannan, I., 2011, Immunology, MJP publishers, Chennai.
4. NandhiniShetty, 1996, Immunology: Introductory Text Book New Age International Pvt. Ltd., New Delhi.

References:

1. Pelczar, M.J., Reid, R.D. and Chan. E.C.S, 2002, Microbiology, 5th Ed. Tata McGraw Hill Publishing Co.Ltd., New Delhi.
2. Barbara J. Howard., 1994, Clinical and pathogenic Microbiology. The C V Mosby Company
3. Kuby,J.1994, Immunology, W.H. Freeman & Co., NewYork.
4. Roitt, M.I., 1994, Essential Immunology, Blackwell Science Ltd., UK
5. Sells, S., 1987, Basic Immunology, Elsiever Science Publishing Co., New York.

CHAIRMAN – BOS **COE**

Sl. No.: | **Subject Code:** **P16ZO1C3**

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR-5

M. Sc. ZOOLOGY – I SEMESTER – CORE COURSE - III

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

BIOTECHNOLOGY

Course Outcomes

On completion of this course the students will be able to

1. Get an intensive and in-depth knowledge in the field of biotechnology.
2. Understand the modern biotechnology practices and approaches with an emphasis in technology application, medical, industrial, environmental and agricultural areas.
3. Understand the public policy, biosafety, and intellectual property rights issues related to biotechnology.

UNIT- I

Tools and Techniques of Genetic Engineering: Basic Principles of Genetic Engineering; Restriction enzymes, Linkers/Adaptors; Cloning Vectors - Salient Features and Types; Techniques – Strategies of rDNA Technology, Gene Library, Insertion of a Foreign DNA into a Vector; Transfer of rDNA into a Bacterial Cell, Selection & Screening of Recombinants, Blotting Techniques, Recovery of Cells containing rDNA, Expression of Cloned DNA, Detection of Nucleic Acids.

UNIT- II

Industrial & Environmental Biotechnology: Fermentation - Types, Fermenter Designs, Upstream and Down Stream Processing; Production of Alcohol, Aminoacids, and Vitamins; Biofuels, Bioremediation, Biodegradation, Biomining & Biosorption.

UNIT-III

Animal biotechnology: Equipments for animal cell culture, Types of tissue culture medium, Primary culture, Stable cell line, Cultivation of Animal Cells in a Bioreactor; Somatic Cell Fusion, Applications of Cell Culture – tPA, Blood Factor VIII and Erythropoietin; Organ Culture; Transgenic Animals and their application; Biosafety and bioethics

UNIT IV

Enzyme Biotechnology: Microbial Production of Enzymes, Immobilisation of Enzymes and its applications.

Agricultural Biotechnology: -*Agrobacterium* as a natural genetic engineer; Single Cell Protein, Nitrogen fixation- nitrogen fixing organisms, mechanism and genetics of fixation Bio-pesticides Biofertilizers.

UNIT-V

Medical Biotechnology: Production of Antibiotics, Hormones, Vaccines, Interferons, Diagnosis of Diseases MAbs, Molecular Markers in Forensic science- RFLPs, RAPD, AFLP, VNTR and Microsatellites, Diagnosis of diseases, Gene Therapy - Germ Line Gene Therapy & Somatic Cell Line Gene Therapy.

Text Books:

1. Kumaresan, V., 2006, Biotechnology, Saras Publication, Nagercoil.
2. Dubey, R.C., 2008, A Text book of Biotechnology, S.Chand & Co., New Delhi.

References:

1. Gupta, P.K., 2006, Elements of Biotechnology, Rastogi Publications, Meerut.
2. Lewin, B., 2002, Gene XI , Oxford University Press, New York.

CHAIRMAN – BOS **COE**

Sl. No.: **Subject Code:** **P16ZO1C4P**

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR-5

M. Sc. ZOOLOGY – I SEMESTER – CORE COURSE - IV

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

[

PRACTICAL – I (CCI, CCII & CCIII)
(BIOLOGY OF INVERTEBRATES AND CHORDATES, MICROBIOLOGY AND IMMUNOLOGY & BIOTECHNOLOGY)

A. BIOLOGY OF INVERTEBRATES & CHORDATES

Course Outcomes

1. Observational, Analytical and Evaluation skills related to Taxonomy of different species of invertebrates and chordates
2. Understanding the significance of Biodiversity
3. Ability to dissect out a species and study its anatomy
4. Ability to grow bacteria under lab conditions
5. Capacity to run the biotechnological tools and devices

l. Taxonomy:
Identification and Classification of at least 50 representative animals belonging to major classes of Invertebrate phyla and phylum Chordata by studying their salient features.

2. Mounting:
Nereis sp. - Parapodium, Prawn appendages, Teleost Fish – Placoid, Cycloid, Ctenoid scales, Honey bee - Sting apparatus and Mouth parts.

3. Spotters:
Invertebrate Larval forms, Minor Phyla - *Chaetognatha*, *Phoronida*, and *Sipunculida*.

4. Dissections:
Demonstration -Dissections Arterial System and Cranial nerves- Shark, Frog, Calotes and Rat Using Video Clippings.

B. MICROBIOLOGY AND IMMUNOLOGY

Culture Techniques - Culture of Bacteria, Bacterial Growth Curve, Preparation of Smears, Simple Staining and Gram Staining.
Identification of lymphoid organs in rat / mouse.
Preparation of antigen and raising of antibody in Fish.
Determination of human blood group and Rh typing by haemagglutination test
Detection of the presence of precipitating antibody (IgG) with soluble antigens by precipitin ring test.

Spotters: Micrometer, Microscope, Autoclave, Petridish, Inoculation loop, Colony counter, Laminar Air Flow Chamber.Antibody structure –model, Immunoelectrophoresis, ELISA reader

C. BIOTECHNOLOGY

Isolation of DNA from tissues - Plasmid isolation (Demonstration only) DNA fragmentation using restriction enzymes.
Spotters: Plasmid - pBR 322, PCR, Transgenic animal-Dolly, CO_2 incubator, Bioreactor, Spinner flask.

A Record of laboratory work shall be submitted at the time of practical examination

Mark distribution for the Practical Examination:

Invertebrata & Chordata Taxonomy	**: 10 (2 x 5 = 10)**
Invertebrata / Chordata Mounting	**10**
Microbiology Immunology	**10**
Biotechnology	**10**
Spotters (Microbiology & Immunology-1 & Biotechnology -1)	**: 10 (2 x 5 = 10)**
Record	**10**
Total	**60**

CHAIRMAN – BOS **COE**

Sl. No.: | **Subject Code:** P16ZO1E1

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR-5

M. Sc. ZOOLOGY – I SEMESTER – ELECTIVE COURSE - I

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

GENERAL AND APPLIED ENTOMOLOGY

Course Outcomes

On completion of this course the students will be able to

1. Identify and classify different insects and measure the biodiversity
2. Know how to control the insect pests.
3. Understand the beneficial insects and their economic value

UNIT- I

Taxonomy- Basics of Insects Classification, Classification up to Order Level, Key Characteristics with South Indian Examples.

UNIT- II

External anatomy and Growth:

External Anatomy of a Typical Insect - Exoskeleton, Head, Thorax, and Abdomen. Mouth Parts in Insects, Different Types of Larvae and Pupae - Growth and Metamorphosis of Insects,

UNIT-III

Physiology of Insects - Digestive System, Excretory System, Respiratory System, Circulatory System, Nervous System and Sense organs, Reproductive System, Endocrine System and Pheromones.

UNIT-IV

Ecology of Insects - Abiotic Factors Affecting Insects - Temperature, Moisture, Air-currents, Diapause, Light, Food, Habitat - Terrestrial and aquatic, Biotic factors - Capacity for Increase, Protection, Competition, Parental Care, Trophyllaxis, Commensalism, Captives, Food Storage, Natural Enemies, Insects and Plant associations, and Social Insects.

UNIT-V

Medical Entomology: Vectors, Vector borne diseases and their control.

Agricultural Entomology: Insect Pest of Crops and their control measures: Paddy, Groundnut, Coconut, Cotton. Sugarcane, Brinjal, Lady's finger, Pests of Stored grains. Pest Control: Prophylatic, Mechanical, Chemical and Biological Control measures. Integrated Pest Management.

Text Books:

1. Ambrose Dunston P., 2004, The Insects: Structure, Function and Biodiversity, Kalyani Publishers, Ludhiana.
2. Vasantharaj David, B. and Kumaraswami, T., 1982, Elements of Economic Entomology, Popular Book Depo, Chennai.

Reference Books:

1. Chapman, R.F., 1998, The Insects: Structure and Function, Cambridge University Press.
2. Nayar, K.K., T.N. Ananthakrishnan, and B.V.David, 1986, General and Applied Entomology, Tata McGraw Hill Publishing House, New Delhi.
3. Wigglesworth, V.B., 1979, Principles of Insect Physiology, 9th Ed. Chapman & Hall, London.
4. Snodgross, R.E., 1985, The Principles of Insect Morphology, McGraw Hill & Co., New York.
5. Tembhare, D.B., 2012, Modern Entomology, Himalaya Publishing House, Mumbai.

CHAIRMAN – BOS **COE**

Sl. No.: | **Subject Code:** P16ZO2C5

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR-5

M. Sc. ZOOLOGY – II SEMESTER – CORE COURSE - V

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

CELL AND MOLECULAR BIOLOGY

Course Outcomes

On completion of this course the students will be able to

1. Gain an in-depth knowledge on the ultra-structure of cell and its organelles
2. Understand the molecular mechanism of cell physiological phenomena
3. Decipher the organisation of genome and genetic code

UNIT- I

Membrane structure and function: Models, ultrastructure, functions, ion pumps, mechanism of sorting and regulation of intracellular transport, electrical properties of membranes- membrane modifications.

Cell signaling: G-protein coupled receptors, Signal transduction pathways, Regulation of signaling pathways.

Cellular communication: Principle, Cell adhesion, Gap junctions, extracellular matrix and integrins.

UNIT- II

Structural organization and function of intracellular organelles: Nucleus, mitochondria, Golgi bodies, lysosomes, endoplasmic reticulum, peroxisomes, structure & function of cytoskeleton.

UNIT - III

Cell division and cell cycle: Mitosis and meiosis, their regulation, steps in cell cycle, and control of cell cycle. **Cancer:** Oncogenes, tumor suppressor genes, cancer and the cell cycle, virus-induced cancer, metastasis, interaction of cancer cells with normal cells, apoptosis. Immune response to cancer stem cell types-application

UNIT -IV

Organization of Genome: Structure of chromatin and chromosomes, Giant chromosomes Fine structure of gene- transposons; Structure, Forms of DNA and types of RNA, DNA replication and repair; RNA synthesis and processing;

UNIT V

Genetic code- Ribosome structure and types -Protein synthesis and processing; Regulation of gene expression- *lac* operon *and trp* operon, Regulation of gene expression in eukaryotes.

Text Books:

1. DeRobertis, E.D.P. and DeRobertis, E.M.E., 1987, Cell and Molecular Biology VIII Ed. Lea and Febger, Philadelphia.
2. David Freifelder, 1998, Molecular Biology, II Ed. Narosha Publishing House, New Delhi.

Reference books:

1. Powar, C.B., 1985, Cell Biology, Himalayas Publishing House, Bombay.
2. Lewis, Keleinsmith and ValerisM.Kish 1988, Principles of cell biology, Harper and Row Publications, New York.
3. Prakash S.Lohar, 1965, Cell and Molecular Biology, MJP Publishers, Chennai.
4. Gupta, M.L. and Jangir, M.L., 2003, Cell Biology Fundamentals and Application, Student Edition, Jothpur.

CHAIRMAN – BOS **COE**

Sl. No.: | | **Subject Code:** | **P16ZO2C6** |

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR-5

M. Sc. ZOOLOGY – II SEMESTER – CORE COURSE - VI

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

GENETICS AND EVOLUTION

Course Outcomes

On completion of this course the students will be able to

1. Distinguish Classical Genetics and Molecular Genetics
2. Acquire an in-depth understanding on the principles and mechanisms of inheritance.
3. Explain the fine structure and molecular aspects of genetic material.
4. Understand the mechanism of evolution in Man.
5. Get exposed to the emerging field of research and equip with various research methodologies.

Unit I

History and concept of Genetics, Linkage and crossing over, Multiple allele-Sex linkage, sex limited and sex influenced characters, sex determination-Extra chromosomal inheritance: Inheritance of mitochondrial genes, maternal inheritance. Recombination: Homologous and non-homologous recombination, including transposition, site-specific recombination. Gene mapping methods.

Unit II

Microbial genetics: Methods of genetic transfers – transformation, conjugation, transduction and sex-duction. Human genetics: Pedigree analysis, karyotypes, Genetic disorders: non disjunction-Chromosomal Syndromes, Gene based disorders, mitochondrial gene disorders-genetic counselling.

Unit III

Quantitative genetics: Polygenic inheritance, Mutation: Types - chromosomal and gene, causes and detection, mutant types; Structural and numerical alterations of chromosomes: Deletion, duplication, inversion, translocation, ploidy and their genetic implications.

Unit IV

Origin of life- Theories - abiogenesis- concept of Oparin and Haldane; experiment of Urey-Miller; evolution of prokaryotes; origin of eukaryotic cells; Theories of evolution-Lamarkism, Darwinism, DeVries theory of Mutation- Modern synthetic theory- Evidences for evolution-Molecular Evolution: Concepts of neutral evolution, molecular divergence and molecular clocks.

Unit V

Population genetics – populations, gene pool, gene frequency; Hardy-Weinberg law; concepts and rate of change in gene frequency through natural selection, migration and random genetic drift; adaptive radiation and modifications; isolating mechanisms; speciation; allopatricity and sympatricity; convergent evolution; sexual selection; co-evolution. Geological time scale-Evolution of Man: Biological and cultural evolution.

Text Books:

1. Gardner, E.J. and Snustad, D.P., 1984, Principles of Genetics, John Wiley & Sons, New York.
2. Arumugam, 2011, Essentials of Organic Evolution, Saras Publications, Nagercoil.
3. Dobzhansky, Aval,F.J., Stebbins, G.L. and Valentine, J.W., Surjeet Publications, Delhi.

Reference Books:

l. Jenkins, J.B., 1983, Human Genetics, The Benjamin Cummins Publishing Co.
2. Benjamin Lewin, 2005, Genes VIII, Oxford University Press, New York.
3. Strickberger Monroe, W., 1996, Genetics, Prentice Hall of India Pvt. Ltd.
4. John,D., Hawkins, 1996, Genes structure and expression, III Ed. Cambridge Univ. Press.
5. Strickberger, 2000, Evolution, Jones and Barlett Publishers Inc., London.
6. Mange, E.J. and Mange, A.P., 1997, Human genetics, Rastogi Publications, Meerut.

CHAIRMAN – BOS **COE**

Sl. No.: **Subject Code:** **P16ZO2C7**

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR-5

M. Sc. ZOOLOGY – II SEMESTER – CORE COURSE – VII

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

DEVELOPMENTAL BIOLOGY

Course Outcomes

On completion of this course the students will be able to

1. Get familiarized with various stages involved in the developing embryo
2. Apply the knowledge to collect various Biological data
3. Understand the initial development al procedures involved in Amphioxus, frog and chick
4. Get familiarized with types of placenta

Unit I

Basic concepts of development: Potency, commitment, specification, induction, competence, determination and differentiation; morphogenetic gradients and polarity; cell fate and cell lineages; genomic equivalence and the cytoplasmic determinants; imprinting; mutants and transgenics in analysis of development.

Unit II

Gametogenesis, fertilization and early development: Production of gametes, cell surface molecules in sperm-egg recognition in animals; embryo sac development; zygote formation, cleavage, blastula formation, embryonic fields, gastrulation and formation of germ layers in animals.

Unit III

Morphogenesis and organogenesis in animals: Cell aggregation and differentiation in *Dictyostelium*; axis and pattern formation in *Drosophila* and amphibia; organogenesis - Development of eye, ear and brain; Development of Extra embryonic membranes in chick, post embryonic development-larval formation, metamorphosis.

Unit IV

Organiser, Nuclear transplantation, Nuclear cytoplasmic interaction, Differentiation, Regeneration – Aging and senescence

Unit V

Placenta, Sexual cycles: Oestrous cycle, Menstrual cycle, Menopause, Pregnancy, Parturition and Hormonal control of reproductive cycles, Devlopment of foetal membranes in mammals, Birth control, Infertility, Test tube baby, Invitro fertilization, Twins, Embryo transfer and cloning

Text Books:

1. Gilbert, S.F., 2003, Developmental Biology, 7th Ed., Sinamer Associates Inc., Publishers, Saunderland, Massachusettes, USA.
2. Arumugam, N., 2012, A Text book of Embryology, Saras Publications, Nagercoil.

Reference books :

1. Balinsky, B.L., 1981, An Introduction to Embryology, 5th Ed., Saunders & Co., Philadelphia.
2. Berril, N.J., 1986, Developmental Biology, Tata McGraw Hill, New Delhi.
3. Browder, L.N., 1980, Developmental Biology, Saunders & Co., Philadelphia.
4. Saunders, A.W., 1982, Developmental Biology: Pattern/Principles/ Problems MacMillan Publishing Co., New York.

CHAIRMAN – BOS **COE**

Sl. No.: | | **Subject Code:** | P16ZO2C8P |

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR-5

M. Sc. ZOOLOGY – II SEMESTER – CORE COURSE - VIII

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

PRACTICAL – II (CCV, CCVI & CCVII)
(CELL AND MOLECULAR BIOLOGY, GENETICS AND EVOLUTION & DEVELOPMENTAL BIOLOGY)

Course Outcomes

On completion of this course the students will be able to

1. Make slides showing sectional view of tissues and study the histology
2. Prepare the squash of any tissue and study the cell division
3. Carry out experimental study

A. CELL AND MOLECULAR BIOLOGY

1. Micrometry - Measuring the Diameter of Microscopic Cells Using Ocular and Stage micrometer
2. Human Buccal Smear
3. Smear and staining of Haemolymph of cockroach and Blood of human being.
4. Blood Cells as Osmometers.
5. Cytochemical Detection of Carbohydrates, Protein, Lipid, DNA and RNA
6. Study of Mitosis in the Cells of Onion Root Tip
7. Observing the Giant chromosomes in the salivary glands of larva of *Chironomus* sp.

Spotters: Dissection and Compound Microscope, Centrifuge, Homogenizer, Epithelial Tissues (Ciliated, Columnar, Glandular and Squamous epithelium), Smear of Frog's Blood, Muscles (Cardiac, Striated and Non - Striated) and Nerve cell

B. GENETICS AND EVOLUTION

1. Recording Mendelian Traits in Human Beings
2. ABO and Rh Blood Groups and their Genetic Significance –
3. Hardy - Weinberg Law & Calculation of Gene Frequency of Dominant and Recessive

Spotters: Normal Human Karyotype, Down syndrome, Klinefelter's syndrome, Turner's syndrome, Drosophila male and female, DNA and RNA model
Fossils: Ammonoids, Belemnoids, Nautiloids and Echinoderm fossils

C. DEVELOPMENTAL BIOLOGY

Preparation of Sperm Suspension and Observation of Spermatozoa in bull semen.
Study of Rate of Motility of Sperm in Bull Semen
Effect of Thyroxine or Iodine on Metamorphosis of Frog (Demonstration)

Spotters:
Frog's / Human's sperm, Frog's Egg, 2-Celled Stage, 4-Celled Stage, 8-Celled Stage, 16 Celled Stage, Yolk Plug Stage, Blastula, Gastrula - T.S. of Mammalian Testis & Ovary, Chick Embryo : Primitive Streak, 24 hrs, 48 hrs and 72 hrs Chick Embryo.

A Record of laboratory work shall be submitted at the time of practical examination

Mark distribution for the Practical Examination:

Cell and Molecular biology	: 15
Genetics and Evolution	: 10
Developmental Biology	: 10
Spotters (CMB-1,GE-1 and DB -1)	: 15 (3 x 5 = 15)
Record	: 10
Total	**: 60**

CHAIRMAN – BOS **COE**

Sl. No.: | | **Subject Code:** | **P16ZO2E2** |

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR-5

M. Sc. ZOOLOGY – II SEMESTER – ELECTIVE COURSE - II

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

APPLIED ZOOLOGY

Course Outcomes

On completion of this course the students will be able to

1. Know the economically important animals and their products
2. Be familiar with the rearing and management of the silkworm, honeybee, earthworm, Poultry and fish.
3. Become entrepreneurs or develop the self-employment skills.

Unit I-Vermiculture: Introduction to vermiculture. Types of earthworm, Biology of *Eisenia foetida*. *Eudrilus eugeniae*, Rearing of earthworms, Equipments, devices used in vermiculture, Vermicompost Technology -Methods and Products, Small Scale Earthworm farming for home gardens, Larger scale commercial composting, Vermiwash collection, composition &use, Predators and parasites and diseases of Earthworms and their control.

Unit II-Apiculture: Systematics, Morphology and Biology of honey bees - Honey bee species - Seasonal activities and social behaviour of honey bees - Food of the honeybees, bee flora and honey flow period - Bee keeping and ancillary industries – Newton's Beehive- Extraction of honey- Medicinal value of honey- bee products- Importance of bee colonies in crop pollination- diseases and Predators and parasites of honeybees and their control.

Unit III-Sericulture: Origin and history of Sericulture, Moriculture-Mulberry cultivation methods, Silkworm –Taxonomy, Types, Biology and Lifecycle of *Bombyx mori*, Rearing of silkworm – Equipments, Methods, Characteristics and quality of Cocoon- Economic importance of Silk and Silk worm, Diseases and Predators and parasites of Silkworm and their control.

Unit IV-Aquaculture: Pond construction, Types of fish culture, Cultivable freshwater fishes- Culture of carps Nursery, Rearing and stocking ponds – composite fish culture, Preparation of ponds–stocking and post stocking management, harvesting. Aquaponics. Monoculture, polyculture, composite fish culture. Diseases and Enemies of Fresh water fishes and their control. Preservation and Marketing of Fishes, MPEDA, CMFRI, CIFNET and CIBA

Unit V-Poultry Management: Breeds of fowl, Housing and equipment, deep litter system, laying cages, Methods of brooding and rearing, debeaking. Management of growers, layers, broilers - Feed formulations for chicks, growers, phase I to phase III layers and broilers. Diseases and enemies affecting fowl. Nutritive value of egg and meat, factors affecting egg size, storage and preservation of egg, marketing, incubation and hatching of eggs. Economics of poultry production units.

Text Books:

1. Ismail, S., 2001, Vermiculture, Orient Longman Ltd., Chennai.
2. Seethalakshmi.M, and Shanthi.R., 2014,Vermitechnology, Saras Publications, Nagercoil.
3. Rare, S., 1998, Introduction to Bee Keeping, Vikas Publishing House.
4. Ganga, G. and Sulochana Chetty, J., 1997, An Introduction to Sericulture, Oxford IBH Publishing Cp. Pvt. Ltd., New Delhi.
5. Arumugam, 2002, Aquaculture, SARAS Publications, Nager coil.
6. Gnanamani, M.R., 2010, Modern Aspects of Commercial Poultry Keeping, Deepam Publications, Madurai.

References:

1. Sathe Tukaram Vithatran, 2004, Vermiculture and Organic Farming,
2. NIIR Board, 2004, The Complete Technology Book on Vermiculture and Vermicompost
3. FAO, 1992, Sericulture Manual-2 (silk worm rearing), Oxford & IBH.
4. FAO, 1994, Sericulture Manual-2 (silk reeling), Oxford & IBH.
5. Sunil Kumar Das, 1994, Poultry production, CBC Publishers and Distribution, Delhi.
6. Shukula, G.S. and Upadhyay, V.B.,1997, Economic Zoology, Rakesh Rastogi Publications, Meerut.
7. Sakuntbak B.Gupta, 1976, Indian Poultry Industry year book 1975-76.By C-34,New Bactak Road, New Delhi.
8. Zade, S.B., Khune, C.J., Sitre, S.R., and Tijare, R.V., 2011, Principles of Aquaculture, Himalaya Publishing House, Mumbai.
9. Takeo Imai, 1977, Aquaculture in Shallow seas, , Oxford & IBH Publishing Co., New Delhi.
10. Gnanamani, M.R., 1991, Profitable Poultry Farming J.Hitone Publications, Madurai.
11. Bannerjee, G.C., 1992, A text Book of Animal Husbandry, Oxford & IBM Publishing Co., New Delhi.
12. Sharma, P., and Singh,L. 1987, Hand Book of Bee Keeping, Controller Printing and Stationery, Chandigarh.

CHAIRMAN – BOS **COE**

Sl. No.: | **Subject Code:** P16ZO3C9

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR-5

M. Sc. ZOOLOGY – III SEMESTER – CORE COURSE - IX

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

ANIMAL PHYSIOLOGY AND BEHAVIOUR

Course Outcomes

On completion of this course the students will

1. Have a general view of the structure and functions various system.
2. Become familiarized with the peculiar animal behaviour.
3. Have an intensive and in-depth knowledge on the field physiology and behaviour.
4. Frame strategies to understand the complexities of both animal and human behavior.

Unit I: Blood and circulation: Blood and its components, Blood corpuscles, haemopoiesis and formed elements, plasma function, blood volume, blood volume regulation, blood groups, haemoglobin, haemostasis.

Cardiovascular System: Comparative anatomy of heart structure, myogenic heart, ECG – its principle and significance, cardiac cycle, heart as a pump, blood pressure, neural and chemical regulation.

Unit II: Digestive system (Man) : Digestion, absorption, energy balance, BMR

Respiratory system (Man): Comparison of respiration in different animals, anatomical considerations, transport of gases, exchange of gases, waste elimination, neural and chemical regulation of respiration in man

Excretory system (Man): Comparative physiology of excretion- kidney, urine formation, urine concentration, waste elimination, micturition, regulation of water balance, blood volume, blood pressure, electrolyte balance, acid-base balance, Dialysis

Unit III: Nervous system (Man): Neurons, action potential, gross neuroanatomy of the brain and spinal cord, central and peripheral nervous system, neural control of muscle tone and posture.

Sense organs (Man): Vision, hearing and tactile response.

Thermoregulation: Comfort zone, body temperature – physical, chemical, neural regulation, acclimatization.

Unit IV: Muscles: Structure and mechanism of Muscle Contraction - Regulation and Energetics of Contraction.

Physiology of Reproduction: Human Reproductive Physiology- Reproductive Cycles, Hormonal Control.

Endocrinology and reproduction: Endocrine glands, basic mechanism of hormone action, hormones and diseases; neuroendocrine regulation.

Unit V: Ethology: patterns of behaviour, objectives of behaviour, mechanism of behaviour-

Reflexes: reflex action, types of reflexes, reflex arch, characteristics of reflexes and complex behaviour-

Orientation: primary and secondary orientation; kinesis – orthokinesis, klinokinesis; taxis – different kinds of taxis; sun-compass orientation, dark- light reaction.

Sexual selection: intra sexual selection (male rivalry), inter-sexual selection (female choice), infanticide, sperm competition, mate guarding, sexual selection in human, consequences of mate choice for female fitness, monogamous verses polygamous sexual conflict.

Text Books:

1. Echert R. and Randall, D., 1987, Animal Physiology, CBS Publishers and Distributors, New Delhi.
2. Mariakuttikan, A., 2011, Animal Physiology. SARAS Publication, Nagercoil.
3. Verma, P.S., Agarwal, N.K.,Thyagi, B.S., 1980, . Animal Physiology. S.Chand & Co., New Delhi.
4. McFerland, 1986, Animal Behaviour – PsychoBiology, Ethology and Evolution, ELBS Longman.

Reference Books:

1. Hoar, W.S., 1987, General and Comparative Physiology, Prentice Hall.
2. Turner, C.D. and Bangara, J.T. (1976) General Endocrinology, W.B.Saunders Co., Philadelphia.
3. Dawson, H (1964) General Physiology, Little Brown Co; Boston.
4. Giese, A.C (1979) Cell Physiology and Biochemistry Prentice Hall.
5. Hall, J.E., 2013, Text Book of Medical Physiology, Elsevier Inc.
6. Prasad, S., 2004, Animal Behaviour, CBS Publishers and Distributors, New Delhi.

CHAIRMAN – BOS **COE**

Sl. No.: | **Subject Code:** P15ZO3C10

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR-5

M. Sc. ZOOLOGY – III SEMESTER – CORE COURSE - X

(For the candidates admitted from the year 2015-16 onwards)

BIOMOLECULAR CHEMISTRY

Course Outcomes

On completion of this course the students will be able to

1. Understand the basics and principles of bio chemistry.
2. Know the metabolic pathways and its importance and how our food is converted into energy.
3. Gain critical understanding on enzymes, proteins and role of other biomolecules
4. Get exposed to the basics and advances in biochemistry.

UNIT- I

Structure of atoms, molecules and chemical bonds. Stabilizing interactions: Vander Waals, electrostatic, hydrogen bonding, hydrophobic interaction.

Classification, Composition, structure and function of biomolecules: carbohydrates, lipids, aminoacids, proteins, nucleic acids and vitamins.

UNIT- II

Principles of biophysical chemistry: pH, buffer, reaction kinetics, thermodynamics, colligative properties.

Bioenergetics, glycolysis, oxidative phosphorylation, coupled reaction, group transfer, biological energy transducers.

UNIT- III

Classification of Enzymes, Principle and mechanism of enzyme action, Enzyme kinetics, Enzyme regulation, Factors affecting enzyme action.

UNIT- IV

Conformation of proteins: Ramachandran plot, secondary, tertiary and quaternary structure; domains; motif and folds.

Metabolism of Nucleotides, Aminoacids and Proteins.

UNIT- V

Metabolism of carbohydrates, lipids, and vitamins.

Text Book:

l. Nelson, D.L., Leninger, A.L. and Cox, M.M.., 2008**,** Lehninger Principles of Biochemistry, W.H. Freeman Co.,

2. Ambika Shanmugam, 2003, Fundamentals of Biochemistry for Medical Students

Reference books:

1. Stryer, L., 1988, Biochemistry, W.H. Freeman & Co. New York.
2. Cooper, T.G., 1977, the Tools of Biochemistry, Wiley Interscience Publications, John Wiley & Sons, New York.
3. Murray, R.K., Granner, D.k., Mayes, P.A., Rodwell, V.W., 1988, Harper's Biochemistry, 21 ed., Appleton & Lange, Medical publications, California.
4. Bhagavan, N.V., 2004, Medical Biochemistry, 4th Ed., Academic Press (Elsevier) California.

CHAIRMAN – BOS **COE**

Sl. No.: | **Subject Code:** P16ZO3C11P

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR-5

M. Sc. ZOOLOGY – III SEMESTER – CORE COURSE - XI

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

PRACTICAL – III (CC IX & CC X)
(ANIMAL PHYSIOLOGY AND BEHAVIOUR, BIOMOLECULAR CHEMISTRY)

Course Outcomes

On completion of this course the students will be able to

1. Develop Observational, Analytical and Evaluation skills in physiology
2. Design and demonstrate an experiment
3. Perform the various haematological tests in laboratory
4. Operate various instruments and devices required for practicals

ANIMAL PHYSIOLOGY AND BEHAVIOUR

Quantitative Estimation of Amylase Activity

Oxygen Consumption in Fish

Rate of Salt Loss and Salt Gain in Fish Using Different Media Observation of

Haemin crystals

Estimation of Haemoglobin by Sahli's method

Total RBC count

Total WBC count and Differential count

Detection of nitrogenous wastes-Ammonia, Urea and Uric acid

Spotters: Haemocytometer, Haemoglobinometer, Sphygmomanometer and Kymograph, Glucometer.

BIOMOLECULAR CHEMISTRY

Qualitative analysis and Quantitative Estimation of Carbohydrates, Proteins and Lipids Isolation and identification of aminoacids using paper chromatographic method (demo only)

Estimation of Vitamin C.

Preparation of Solutions - Moles, Milli Moles, Micro Moles and Nano Moles.

Calculation of Molarity, Normality and Percentage

Buffer Preparation

Determination of pH using pH Meter.

Spotters – Thin Layer Chromatography, Agarose gel Electrophoresis, pH-Meter

Calorimeter, Spectrophotometer, Models of Heamoglobin and ATP.

A record of laboratory work should be submitted at the time of Practical Examination

Mark Distribution:

1.	Animal Physiology & Behaviour	: 20 Marks
2.	Biomolecular Chemistry	: 10 Marks
3.	Spotters (AP-2, BC-2)	: 20 Marks (4 x 5 = 20)
4.	Record	: 10 Marks
	Total	**: 60 Marks**

CHAIRMAN – BOS **COE**

Sl. No.: **Subject Code:** **P16ZO3E3**

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR-5

M. Sc. ZOOLOGY – III SEMESTER – ELECTIVE COURSE - III

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

COMPUTER APPLICATIONS AND BIOINFORMATICS

Course Outcomes

On completion of this course the students will be able to

1. Provide an intensive and in-depth knowledge in basics of computers.
2. Understand the role of databases in the field of bioinformatics.
3. Get familiarized with new developments in computer and bioinformatics.
4. Express the concepts and process of computer applications and bioinformatics in biology.
5. Understand the nuances of genomics and proteomics

UNIT-I

Evolutionary stages of computer- Hardware and software- CPU, monitor, keyboard, mouse, printer and its types. Packages of computer- Operating system; Windows- MS- Office, Power point, Excel; Adobe reader and their uses in biology.

UNIT-II

Internet- Intranet- LAN, WAN- WiFi, Computer virus and Antivirus software, Search Engines- Google, Google Scholar, Searching methods in Browser (web, images, and videos) – e-mail, e-book, Applications of you tube in biology.

UNIT-III

Genomics- Methods of gene sequencing- shot gun- EST- Sequence data bases-DDBJ, EMBL, Gen bank- Mapping data bases- Types of maps- Cytogenetic map, Genetic link map-Information retrieval databases-DNA data bases- NCBI, EBI, DDBJ, Pubmed,Gen bank, File format for Gen bank.

UNIT-IV

Proteomics**:** Proteomics - Relation between Gene and Protein; Mass spectroscopy for protein analysis- Protein array-Protein-Protein interaction- Types of Proteomics-Protein sequence Databases – SWISSPROT, PIR, Protein Structure Database – PDB-Bimolecular interaction pathways and data bases- BIND and MINT.

UNIT - V

Bioinformatics tools – Similarity tools-BLAST, FASTA, sequence alignment – PAM, BLOSUM, MSA –clustal, Hidden morkov model, Phylogentic analysis- PHYLIP, NJplot, Rasmol – Protein structure prediction – Chou–Fasman method and GOR method.

Text Books:

1. Rajaraman V., 2001, Fundamentals of Computer, Prentice-Hall of India Pvt.Ltd. New Delhi
2. Sundaralingam, R. and Kumaresan, V., 2012, Bioinformatics, Saras Publications, Nagercoil

References:

1. Virendra S. Gomase, NandakishoreT.Chikkale, 2009, Proteomics Theory and Practice, Himalaya Publishing House Pvt. Ltd, Mumbai
2. KaviKishore, Chavali, L.N., 2013, Principles of Biological Databases, Himalayas Publishing House Pvt. Ltd. Mumbai.
3. Baxevanis, A. and Ouellette, B.F.F., 2006, Bioinformatics, A Practical Guide to the Analysis of Genes and Proteins, John Wiley and Sons, New Delhi.
4. Balagurusamy E., 2001, Programming in BASIC, 3rd Edition, TATA Mc.Graw Hill Publishing Company Ltd. New Delhi.

CHAIRMAN – BOS **COE**

Sl. No.: **Subject Code:** P16ZO3E4

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR-5

M. Sc. ZOOLOGY – III SEMESTER – ELECTIVE COURSE - IV

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

WILDLIFE BIOLOGY

Course Outcomes

On completion of this course the students will be able to

1. Know the importance of animal resources in the ecosystem.
2. Understand the hotspots, sanctuaries, reserve forest, national park, biosphere reserve in India
3. Get familiarized with the wild life protection act among the students
4. Formulate the strategies of animal conservation

Unit- I: Wild life resources of India- Types of wild life- Habitats- values of life, Hotspots in India, Wild Life depletion-causes, IUCN-Red data book, Red list categories, Extinct, Critically endangered, endangered, vulnerable. Endemic fauna of India.

Unit – II: Evaluation of wild life: Basic survey technique vegetative analyses: Quadrate and Transect animal population estimation: Direct count (blocks count, transect methods, Point counts, visual encounter) survey & water hole survey, Indirect count, cell count, track & signs, pellet count, pugmarks, camera trap, DNA finger printing, aerial photography & videography.

Unit – III: Human – animal interactions: human- animal conflicts- causes and remedial measures- migration of animals- elephants and tiger; Predator- prey interactions; Exotic Species conflict.

Unit – IV: Wild life management: Basic concept – Wild life protection act 1972, The Wild life (Protection) Rules,1981- IUCN, CITES, NBIA, IBA-Protected areas, National Forest policy, 1988-Indian Forest Act, 1927 (Forest conservation Act and Rules, 1980)

Unit –V: Wild life conservation Principles of conservation, major approaches to management, Conservation/management strategy-*in-situ* and *ex-situ* conservation .**C**ase studies in India- Project tiger, Asian elephant project, Project Crocodile, Project Gir-lion, Project Rhino.

Text Books:

Basra, G. 2004. Wildlife in India.

Chadha, S.K., 2010, Conserving wildlife in India.

Singh. S K,2005, Text Book of Wildlife Management.

Reference books:

Dhyani, S.N., Wildlife Management. (BNHS, Mumbai).

Gee, E.P., 2000. The wildlife of India. (Harper Collins Publ., India)

Hosetti, B.B., 2003. Wildlife management in India.

Khati, A.S., 2004. Indian national parks and sanctuaries: A living portrait of wild India.

Mojupuria, T.C. (Ed.), 1986. Wildlife Wealth of India

Ranga, M.M., 2002. Wildlife: Management and conservation. (Agrobios, India).

Saharia, V.B., 1982. Wildlife in India. (Natraj Publ., DehraDun).

CHAIRMAN – BOS **COE**

Sl. No.: | | **Subject Code:** | P16ZO4C12 |

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR-5

M. Sc. ZOOLOGY – IV SEMESTER – CORE COURSE - XII

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

ECOLOGY AND TOXICOLOGY

Course Outcomes

On completion of this course the students will be able to

1. Understand on environment and influence of man on environment.
2. Use various tools and techniques for the study of environment
3. Launch a project proposal on applied ecology, community ecology and population ecology

UNIT-I

The Environment: Abiotic and Biotic environment and their interactions.

Habitat Ecology and niche: Lake, Marine – Rocky, Muddy and Sandy shore, Estuary, Terrestrial, Grassland, forest and desert ecosystem Concept of habitat and niche; niche width and overlap; fundamental and realized niche; resource partitioning; character displacement.

UNIT-II

Population ecology: Characteristics of a population; population growth curves; population regulation; life history strategies (*r* and *K* selection); concept of metapopulation – demes and dispersal, interdemic extinctions, age structured populations.

Species interactions: Types of interactions, interspecific competition, herbivory, carnivory, pollination, symbiosis.

Community ecology: Nature of communities; community structure and attributes; levels of species diversity and its measurement; edges and ecotone.

UNIT-III

Ecosystem: Structure and function; energy flow and mineral cycling (CNP); primary production and decomposition; structure and function of ecosystems: terrestrial (forest, grassland) and aquatic (fresh water, marine, estuarine).

Ecological succession: Types; mechanisms; changes involved in succession; concept of climax.

Biogeography: Major terrestrial biomes; theory of island biogeography; biogeographical zones of India.

UNIT-IV

Applied ecology: Environmental pollution-Air, Water, Land, Thermal, Radiation and Noise; global environmental change; Biodiversity-status, monitoring and documentation; major drivers of biodiversity change; biodiversity management approaches.

Remote sensing and GIS – Methods and Applications in environmental management

UNIT-V

Toxicology: Environmental Toxicants and their accumulation, biotransformation and biomagnification in ecosystem, Evaluation of Toxic residues, Toxicity-Factors affecting toxicity, Bioassay - concept of LC_{50} and LD_{50}. Xenobiotics, Teratogens, Safety evaluation of toxicants.

Text Books:

1. Odum, E.P., 1966, Fundamentals of Ecology, W.B. Saunders Company.
2. Verma, P.S., Agarwal, N.K.,Thyagi, B.S., 1980, . Animal Physiology and Ecology, S.Chand & Co., New Delhi.
3. Subramaniian, M.A., 2004, Toxicology Principles and Methods, MJP Publishers, Chennai

Reference Books:

1. Clark, G.L.1954, Elements of Ecology, John Wiley & Sons. Inc. Topman Co., Ltd.
2. Kormandy, E.J., 1986, Concepts of Ecology, Prentice Hall of India Private Ltd.
3. Kumarasamy, K., Moses, A.A., and Vasanthy, M., 2007, Environmental Studies, BDU, Trichy-24.
4. Sharma, P.D., 1999, Environmental Biology and Toxicology, Rastogi Publications Meerut.
5. Sharma, B.K., 2005, Environmental Biochemistry, Krishna Prakashan Media (P) Ltd., Meerut.
6. Bhattacharya, S., 2011, Environmental Toxicology, Books and Allied Pvt. Ltd. Kolkatta.

CHAIRMAN – BOS **COE**

Sl. No.: | **Subject Code:** P16ZO4C13

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR-5

M. Sc. ZOOLOGY – IV SEMESTER – CORE COURSE – XIII

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

RESEARCH METHODOLOGY AND BIOSTATISTICS

Course Outcomes

On completion of this course the students will be able to

1. Design the research work and proceed with financial support obtained from funding agencies.
2. Apply various statistical tools
3. Understand the Laboratory hazards, safety measures, CPCEA guidelines and research ethics.
4. Get financial assistance from various agencies
5. Write the thesis or research paper and publish in a peer reviewed journal

UNIT-I

Meaning of Research in Biological Sciences, Basic and applied research, essential steps in research-Formulating the Research Problem, Extensive Literature Review, Developing the objectives, Preparing the Research Design, Types, Approaches, Methods of Research (Survey, Observation, case study, experimental, historical and comparative methods) , Research ethics-plagiarism, –Research funding promoting agencies- State-TANSCHE, TNSCST, National (ICMR, ICAR, DAE,CSIR, UGC, DST, DBT) - Patent and IPR

UNIT-II

Preparation and Presentation of Research Report/Dissertation – Components, Tables, Figures, Formatting and Typing. Publication of Results in Journals, Proceedings, Seminars, Symposia, Conferences; Journals- inflipnet -Peer reviewed journals (Nature, PubMed, Springer, Elsevier), Impact factor, Citation index.

UNIT-III

Laboratory hazard and safety measures- hazardous handling, fire electrical and radio hazards, Bio-safety equipment- Disposal of various category wastes- Animal maintenance for research- CPCEA guidelines and ethics. Maintenance of glass wares and instrument-washing, drying and sterilization. Preparation of solutions for research- Normality, molarity and percentage solution.

UNIT-IV

Variables in Biology, Collection, classification and tabulation of data. Frequency distribution, Diagrammatic and Graphical presentation of statistical data, Sampling techniques. Measures of Central Tendencies: Mean, Median and Mode; Measures of Deviation: Standard Deviation, Quartile deviation, Mean deviation and Standard Error Normal Distribution.

UNIT-V

Hypothesis Testing and estimation: Measures of Relationship: Correlation – Simple, Partial and multiple- Regression analysis. Definitions and applications of Chi-square test, ‘t’ and ‘f’ test. Analysis of variance (ANOVA)-One way and two way classified data; Application of SPSS in biology.

Text Books:

1. Gurumani, 2006, Research Methodology, MJP Publishers, Chennai.
2. Gurumani, 2006, Biostatistics, MJP Publishers, Chennai.
3. Ramakrishnan P., 2009, Biostatistics, Saras publication, Nagercoil.

References:

1. Basotia G.R. and Sharma. K.K., Research Methodology,
2. Chaudhary, C.H. Research Methodology- RBSA Publication,
3. Zar, J.H., 1984, Biostatistical Analysis, Prentice Hall, New Jersey, USA.
4. Bailey, N.T.J., Statistical Methods in Biology.
5. Sokal, R. and James, F., 1981, Introduction to Biostatistics, W. Freeman & Co., USA.
6. RaoK.Surya, 2010, Biostatistics for Health and Life Sciences, Himalaya Publishing House Pvt. Ltd., Mumbai.

CHAIRMAN – BOS **COE**

Sl. No.: | **Subject Code:** P16ZO4C14P

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR-5

M. Sc. ZOOLOGY – IV SEMESTER – CORE COURSE - XIV

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

PRACTICAL – IV (CCXII &CCXIII)

(ECOLOGY AND TOXICOLOGY&RESEARCH METHODOLOGY AND BIOSTATISTICS)

Course Outcomes

On completion of this course the students will be able to

1. Estimate the physic-chemical parameters of water samples
2. Operate the ecological devices and measure the whether parameters
3. Evaluate the toxicity of any effluent
4. Prepare research design and carry out the research work
5. Analyze the data using statistical tools and represent them in diagrams
6. Make documents in M.S.word and use Excel

ECOLOGY AND TOXICOLOGY

1. Hydrological Studies of Water Samples with Reference to Pollution - Estimation of Chlorides, Calcium, Total Hardness, Phosphates and Nitrates.
2. Determination of pH, DO and BOD
3. Quantitative Estimation of Fresh Water Zoo-plankton
4. Mounting of any five Fresh Water Zoo-plankton
5. Evaluation of Toxicity of textile/Paper mill effluent through LC_{50} 96 hr value using Fishes
6. Report on Ecological Collection of Fauna representing Different Habitat (Study Tour/Field Trip may be arranged for this purpose)

Spotters:

Secchi Disc, BOD incubator, Maximum and Minimum Thermometer, Wet and Dry bulb Thermometer, Thermometer, Hygrometer, Rain Guage, Sandy, Muddy and Rocky Shore Fauna (each five).

RESEARCH METHODOLOGY AND BIOSTATISTICS

Preparing a research design,

Writing and arranging the references, Components of a research paper for publication.

M.S. Word: Typing, editing and formatting a document,

M.S. Excel –Drawing Bar diagram, Histogram, Line diagram and Pie chart Problems related to Chi-square test and Correlation analysis

Spotters:

Bar diagram, Histogram, Pie chart, Frequency polygon, Ogive, Positive and Negative Correlation curves

A record of laboratory work should be submitted at the time of Practical Examination

Mark Distribution:

1.	Ecology and Toxicology	: 20 Marks
2.	RMBS	: 10 Marks
3.	Spotters (ET-2, RMBS-2)	: 20 Marks (4 x 5 = 20)
4.	Recordwith tour report	: 10 Marks
	Total	**: 60 Marks**

CHAIRMAN – BOS **COE**

Sl. No.: | **Subject Code:** P16ZO4E5

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR-5

M. Sc. ZOOLOGY – IV SEMESTER – ELECTIVE COURSE - V

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

BIOPHYSICS AND BIOINSTRUMENTATION

Course Outcomes

On completion of this course the students will be able to

1. Understand the importance of Physics to recognize life process.
2. Get an idea on tools and techniques available for studying biophysical nature of life.
3. Equipped with use the tools and techniques for project work and research.
4. Carry out original research project in biology.
5. Improve analytical and critical thinking skills through problem solving.
6. Use various tools and techniques confidently.

UNIT-I

Laws of Thermodynamics- Entropy, Enthalpy and Free energy- colloids and their properties-, **Microscopy:** Electromagnetic spectrum; Compound and Electron Microscope (SEM & TEM), Phase contrast microscopy. **Centrifugation:** Basic principles of sedimentation, Types of centrifuges, Differential and density gradient centrifugation.

UNIT–II

Chromatography: Paper chromatography, Thin layer chromatography, Ion exchange & Affinity chromatography; Gas chromatography; High pressure liquid chromatography (HPLC) **Electrophoresis :** Polyacrylamide gel electrophoresis (PAGE) – SDS, Agarose gel electrophoresis , Isoelectric focusing.

UNIT–III

Colorimetry, Spectrophotometry and Spectroscopy :

Principle instrumentation and applications of colorimetry and spectrophotometry. Spectroscopy : UV – Visible spectroscopy, Nuclear Magnetic Resonance spectroscopy (NMR), ESR spectroscopy, Raman Spectroscopy, Mass spectroscopy.

UNIT–IV

Radioisotope Detection and Measurement: Dosimetry: Ionization chamber, GM counter, Solid and liquid scintillation counters, Autoradiography – **Assays**: Radio Immuno Assay, Enzyme Linked Immuno Sorbent Assay (ELISA); X –ray diffraction.

Nanotechnology- Introduction and biological application.

UNIT–V

Biotechnological methods: Isolation of genomic DNA and Plasmid, Flow cytometry, FISH & GISH, animal tissue culture. PCR and its types, DNA microarray, Gel documentation. Hybridoma technology Monoclonal Antibodies and their Applications.

Histology and histochemistry: Fixation and sectioning of tissue, embryos and cells.

Text Books:

1. Upadhyay, A., Upadhyay, K., and Nath, N., 2004, Biophysical Chemistry, Himalayas Publishing House, Mumbai.
2. Wilson K. and John Walker, Principles and Techniques of Biochemistry and Molecular Biology, 7th Ed., Cambridge University Press, New York.
3. Subramanaiam, M.A., 2002, Biophysics. MJP Publishers, Chennai.
4. Webster, J.G., 2004, Bioinstrumentation, John Wiley & Sons, New Delhi.

Reference Books:

1. Molecular cloning A Laboratory Manual 3rd edition Vol. 1,2, 3-
2. Casey, EJ., 1962, Biophysics, Concept and Mechanism East West Press Ltd, New Delhi.
3. Daniel, M., 1989, Basic Biophysics for Biologists, Agro-Botanical Publisher, Bikaner, India.
4. Freifelder, D., 1976, Biophysical Chemistry Applications to Biochemistry and Molecular Biology, W.H. Freeman & Co., SanFrancisco.

CHAIRMAN – BOS **COE**

Sl. No.: | | **Subject Code:** | P16ZO4PW |

GOVERNMENT ARTS COLLEGE (AUTONOMOUS): KARUR-05

M.Sc., ZOOLOGY – SEMESTER IV – PROJECT WORK

(For the candidates admitted from 2016-17 onwards)

PROJECT WORK

Course Outcomes
On completion of this course the students will have

1. Scientific approach of analysing a problem.
2. Capacity to plan and execute experimental design so as to carry out research project
3. Ability to analyse data with statistical tools.

SL.	Area of Work	Maximum Marks
1.	**PROJECT WORK:** **(i) Plan of the Project** **(ii)Execution of the plan / Collection of data / Organization of materials/ Fabrication Experimental study / Hypothesis, Testing etc., and Presentation of the report.** **(iii) Individual Initiative**	**20** **45** **15**
2.	**VIVA VOCE EXAMINATION**	**20**
	TOTAL	**100**

PASSING MINIMUM – 50 MARKS

CHAIRMAN – BOS **COE**