



## M.E.S MAMPAD COLLEGE (AUTONOMOUS)

MAMPAD COLLEGE P.O, MALAPPURAM, KERALA, INDIA, 676542

Affiliated to University of Calicut

Accredited by NAAC with A grade

Syllabus Year	2019-20
Department	Zoology
Programme	B Sc

### Programme outcome.

Sl.No	Programme Outcome
P01	<b>Critical Thinking:</b> Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.
P02	<b>Problem Solving:</b> Understand and solve the problems of relevance to society to meet the specified needs using the knowledge, skills and attitudes acquired from humanities/ sciences/mathematics/social sciences.
P03	<b>Effective Communication:</b> Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media and technology.
P04	<b>Effective Citizenship:</b> Demonstrate empathetic social concern and equity centered national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.

P05.	<b>Environment and Sustainability:</b> Understand the issues of environmental contexts and sustainable development.
P06.	<b>Self-directed and Life-long Learning:</b> Acquire the ability to engage in independent and life-long learning in the broadest context of socio- technological changes.

Programme specific out come

PSOs	Program Specific Outcomes
PSO1	Understand the biological diversity and grades of complexity of various animal forms through their systematic classification and process of organic evolution.
PSO2	Understand the roles of plants, animals and microbes in the sustainability of the environment and their interaction among themselves and deterioration of the environment due to anthropogenic activities.
PSO3	Understand the concepts and principles of biochemistry, immunology, physiology, ethology, endocrinology, developmental biology, cell biology, genetics, molecular biology and microbiology and develop technical skills in biotechnology, bioinformatics and biostatistics.
PSO4	Perform laboratory procedures as per standard protocols in the areas of animal diversity, systematics, cell biology, genetics, biochemistry, molecular biology, microbiology, physiology, immunology, developmental biology, environmental biology, ethology, evolution and science methodology.

\* PSOs related to elective courses are excluded since they are college specific.

Course Outcome (add sufficient Number of rows in each semester)

Semester	Course Code	Course Name	Course out come
I FIRST SEMESTER	ZOL1B01T	<b>ANIMAL DIVERSITY: NON-CHORDATA PART- I</b>	Describe the principles of classification and nomenclature (5 hrs)
			Explain the five kingdom classification of living organisms (1 hr)
			Understand the concepts of classification of animals (4 hrs)
			Explain the classification with examples and characteristic features of kingdom Protista and describe the morphology and structural organization of Paramecium (6 hrs)
			Describe the characteristic features of subkingdom Mesozoa (1 hr)
			Explain the classification of phylum Porifera and elucidate the salient features of each class (3 hrs)
			Describe the characteristic features of phylum Cnidaria and Ctenophora, illustrate the classification of phylum Cnidaria down to classes and explain the structural organization of Obelia (8 hrs)
			Explain the salient features of phylum Platyhelminthes and illustrate its classification down to classes (3 hrs)
			Explain the characteristic features and classification of super-phylum Aschelminthes and phylum Nematoda (3 hrs)
			Elucidate the characters of Pseudocoelomate minor phyla Rotifera and Gastrotricha (2 hrs)
II	ZOL2B02T	<b>ANIMAL DIVERSITY:</b>	Explain the classification with examples and characteristic features of phylum Annelida and

		<b>NON-CHORDATA PART - II</b>	describe the morphology and structural organization of Neanthes (7 hrs)
			Describe the distribution, peculiarities and affinities of phylum Onychophora (2 hrs)
			Explain the classification of phylum Arthropoda; elucidate the salient features of each class and describe the morphology and structural organization of Penaeus (11 hrs)
			Describe the characteristic features of phylum Mollusca, illustrate its classification down to classes and explain the structural organization of Pila globosa (8 hrs)
			Explain the salient features of phylum Echinodermata and illustrate its classification down to classes (4 hrs)
			Understand the salient features and affinities of phylum Hemichordata (1 hr)
			Elucidate the characters of coelomate minor phyla Phoronida, Ectoprocta and Echiura (3 hrs)
III	ZOL3B03T	<b>ANIMAL DIVERSITY: CHORDATA PART - I</b>	Explain the characteristics of chordates and outline classification of the phylum Chordata (2 hrs)
			Describe the salient features and affinities of subphylum Urochordata and its classification down to classes; elucidate the morphology and structural organization of Ascidia (5 hrs)
			Explain the salient features and affinities of subphylum Cephalochordata with reference to Branchiostoma (4 hrs)
			Describe the salient features of subphylum Vertebrata, illustrate its classification down to classes and elucidate the characteristics of division Agnatha (3 hrs)

			Enumerate the salient features of superclass Pisces and illustrate its classification down to orders and the morphology and structural organization of Mugil cephalus (12 hrs)
			Describe the salient features and affinities of class Amphibia and its classification up to orders; explain the morphology and organ systems of Hoplobatrachus tigerinus (13 hrs)
			Elucidate the characteristic features of the class Reptilia and its classification down to orders; describe the morphology and organ systems of Calotes versicolor (15 hrs)
IV	ZOL4B04T	<b>ANIMAL DIVERSITY: CHORDATA PART-II</b>	Describe the classification of class Aves down to orders, salient features of each order with suitable examples (11 hrs)
			Describe the external characters and functional systems of Columba livia (14 hrs)
			Enumerate the salient features and classification of class Mammalia down to orders with suitable examples (11 hrs)
			Elucidate the external characters and functional systems of Oryctolagus cuniculus (14 hrs)
			Compare the circulatory, excretory and nervous systems of vertebrates (4 hrs)
I, II, III & IV	ZOL4B05P	ZOOLOGY [CORE COURSE] PRACTICAL – I: ANIMAL DIVERSITY	Identify and describe specified protists and acoelomate & pseudocoelomate non- chordates and perform the culture of selected protists; understand the histological features of coelenterate, platyhelminth and nematode. (36 hrs)
			Identify and describe specified coelomate non- chordates and the transverse

			sections of annelids; Perform mounting of the specified organs of selected non- chordates. (36 hrs)
			Identify and describe specified chordates and specified bones of chordates; Prepare key for identification of venomous snakes; Perform mounting and dissection of specified organ systems of chordates. (36 hrs)
			Identify and describe selected vertebrates and specified bones of vertebrates.(36 hrs)
V	ZOL5B06T	<b>CELL BIOLOGY AND GENETICS</b>	<p>Understand the principles and applications of various types of light microscopes, electron, Scanning-tunnelling and Atomic force microscope and illustrate the histological and histochemical processing of tissues (7 hrs)</p> <p>Explain the basic structure of a eukaryotic cell and the structure and functions of plasma membrane, mitochondria, lysosome, cytoskeletal elements and interphase nucleus (12 hrs).</p> <p>Illustrate the nucleosome organization of chromatin and higher order structures; structure of chromosomes and giant chromosomes (2 hrs).</p> <p>Enumerate eukaryotic cell cycle and cell division by amitosis, mitosis and meiosis (4 hrs)</p> <p>Explain the causes of transformation, characteristics of transformed cells and the role of protooncogenes and tumor suppressor genes in malignant transformation; mechanism and significance of apoptosis (2 hrs)</p>

			Enumerate allelic and non-allelic gene interactions; supplementary, complementary, polymeric, duplicate and modifying genes and polygenic inheritance (5 hrs).
			Illustrate multiple allelism and solve problems related to blood group inheritance (4 hrs).
			Explain characteristics of linkage groups and linkage map; crossing over and calculation of recombination frequency; sex-linked, sex-influenced and sex-limited characters; sex differentiation and disorders of sexual development (8 hrs).
			Describe the mechanisms of sex determination including chromosomal, genic, haploid-diploid mechanisms; the hormonal and environmental influence on sex determination and gynandromorphism (3 hrs).
			Explain mutagenesis, mutagens and chromosomal and gene mutations (3 hrs).
			Enumerate the classification and grouping of human chromosomes; numerical and mutational human autosomal and sex chromosomal anomalies; polygenic human traits and genetic counseling (4 hrs).
V	ZOL5B07T	<b>BIOTECHNOLOGY, MICROBIOLOGY AND IMMUNOLOGY</b>	Illustrate the steps in genetic engineering and animal cell culture (12 hrs)
			Explain transfection methods, transgenic animals and ethical issues of transgenic animals (5 hrs)
			Enumerate the applications of biotechnology (7 hrs)
			Understand the biological diversity of microbial

			forms and the various techniques for handling microbes in the laboratory (8 hrs)
			Enumerate the basic structure and life cycle of bacteria and virus (8 hrs)
			Understand the industrial and medical importance of microorganisms (8 hrs)
			Describe different types of immunity and the cells and organs of the immune system (6 hrs)
			Explain antigen, antibody, immunity and major histocompatibility complex (9 hrs)
			Enumerate autoimmune and immunodeficiency diseases and immunology of tumor and organ transplantation (9 hrs)
V	ZOL5B08T	<b>BIOCHEMISTRY AND MOLECULAR BIOLOGY</b>	Understand the elements of biological importance and the non-covalent interactions that stabilize biomolecules (1 hr).
			Describe the classification, types, structure, reactions and biological roles of carbohydrates, and diabetes Type I and II (6 hrs)
			Enumerate the properties and classification of amino acids and their standard abbreviations; hierarchical levels of protein structure, classification, separation, purification and sequencing of proteins (7 hrs).
			Explain the classification and functions of lipids and fatty acids; chemistry and structure of nucleic acids and sequencing of DNA (7 hrs)
			Understand the classification, nomenclature and properties of enzymes; enzyme action, co-enzymes, cofactors, isozymes, ribozymes and allosteric enzymes (3 hrs)
			Explain glycolysis, Krebs's cycle, glycogenesis, glycogenolysis, gluconeogenesis, HMP pathway;



			<p>amino acid and fatty acid oxidation and oxidative phosphorylation (12 hrs).</p> <p>Describe the mechanism of DNA duplication and the role of enzymes (4 hrs).</p> <p>Understand the concept of gene and gene expression; genetic code and wobble hypothesis (6 hrs).</p> <p>Explain the mechanism of transcription and post-transcriptional modification of hnRNA (7 hrs).</p> <p>Enumerate the processes of translation and post-translational modification and targeting of peptides (7 hrs).</p> <p>Describe the regulation of trp operon, C-value, repetitive DNA, satellite DNA, selfish DNA, overlapping genes, pseudogenes, cryptic genes, transposons and retrotransposons (8 hrs).</p> <p>Explain the structure and life cycle of bacteriophages and the gene transfer mechanisms in bacteria (4 hrs).</p>
V	ZOL5B09T	<b>METHODOLOGY IN SCIENCE, BIOSTATISTICS AND BIOINFORMATICS</b>	<p>Explain science, its importance, disciplines and the major steps in formulating a hypothesis, various hypothesis models, theory, law and importance of animal models, simulations and virtual testing (6 hrs)</p> <p>Illustrate the principles and procedures in designing experiments and elaborate the requirements for carrying out experiments (4 hrs)</p> <p>Describe the ethical concerns in practicing science (5 hrs)</p> <p>Understand the Scope and role of statistics; methods and procedures of</p>

			<p>sampling; Construction of tables, charts and graphs (5 hrs)</p> <p>Calculate central tendency and measures of dispersion and application of its knowledge on hypothesis testing as well as in problem solving (10 hrs)</p> <p>Enumerate major biological databases and database search engines (8 hrs)</p> <p>Perform DNA and protein sequence analysis, including sequence alignment and sequence similarity search using BLAST, FASTA, CLUSTAL W and CLUSTAL X (4 hrs)</p> <p>Understand molecular phylogenetics and tools and methods for construction of phylogenetic trees (3 hrs)</p> <p>Explain genome sequencing technologies, functional genomics, proteomic technologies and molecular docking and drug design (9 hrs)</p>
V		<p><b>PRACTICAL II*A:</b> CELL BIOLOGY, GENETICS, BIOTECHNOLOGY, MICROBIOLOGY AND IMMUNOLOGY [72 hours] [4 hrs /week]</p> <p><b>PRACTICAL II*B:</b> BIOCHEMISTRY, MOLECULAR BIOLOGY, METHODOLOGY IN SCIENCE, BIOSTATISTICS &amp; BIOINFORMATICS[72 hours] [4 hrs/week]</p>	<p>Perform experiments in cell biology and genetics including demonstration of Barr body in buccal epithelial cells of man, polytene chromosome in the salivary glands of D. melanogaster larva, mitotic division in onion root tip cells, micrometry of microscopic objects, prepare whole mounts of microscopic objects, and calculate mitotic and metaphase index from slides.</p> <p>Enumerate the inheritance of major human genetic traits, pedigree chart, normal and abnormal human karyotypes, phenotypic differences of male and female Drosophila and solve problems on</p>

			<p>Monohybrid, dihybrid crosses, blood groups and sex-linked inheritance.</p> <p>Understand electrophoresis, PCR, Northern blotting, Southern blotting and Western blotting, DNA sequencing and fingerprinting and isolation of genomic DNA.</p> <p>Perform gram staining and preparation of culture media for bacteria and demonstrate bacterial motility by standard laboratory protocols.</p> <p>Understand the detection of human blood groups and organs of immune system</p> <p>Perform standard biochemical tests for the detection of reducing and nonreducing sugars, polysaccharides, proteins and lipids.</p> <p>Understand the staining of mitochondria, tissue homogenization and isolation of nuclei, effect of colchicines on cell division, extraction of DNA and polyacrylamide and agaros egel electrophoresis</p> <p>Solve basic problems in biostatistics and Bioinformatics</p>
V	ZOL5D01T	<b>REPRODUCTIVE HEALTH AND SEX EDUCATION</b>	<p>Understand the reproductive health, and importance of sex education for teen and youth. (2 hrs)</p> <p>Explain the chromosomal mechanism of sex determination and sex chromosomal anomalies. (3 hrs)</p> <p>Describe the structural and functional features of human reproductive system,</p>

			fertilization, implantation, pregnancy, gestation, placenta, parturition and lactation. (17 hrs)
			Explain the scope of reproductive technologies in infertility management and the assisted reproductive techniques. (10 hrs)
			Understand the different methods of prenatal diagnosis and associated ethical issues (4 hrs)
			Describe the different methods of fertility control. (4 hrs)
			Understand the symptoms, mode of transmission, diagnosis and treatment of different sexually transmitted diseases and their socio economic dimensions. (7 hrs)
			Describe sexual orientation, sexual abuse and myths (5 hrs)
			Understand the ethical aspects of sex (2 hrs)
VI	ZOL6B10T	<b>PHYSIOLOGY AND ENDOCRINOLOGY</b>	Describe the regulation of digestion in man, nutrition in pregnancy and infancy, nutritional disorders, balanced diet, starvation, fasting and obesity. (5 hrs)
			Understand the mechanism of transport and exchange of respiratory gases and its neurophysiological control and physiological problems in diving mammals, new-born and aged individuals. (6 hrs)
			Describe functions, composition, coagulation, transfusion, agglutination and clinical analysis of blood, haemoglobinopathies, types of heart and common cardio-vascular problems. (6 hrs)
			Understand the osmoregulatory mechanisms in

			<p>animals; excretion and its hormonal control and common renal disorders in man. (6 hrs)</p> <p>Explain the ultrastructure of skeletal muscles and biochemical events and energetics of muscle contraction. (5 hrs)</p> <p>Understand the different types of nerve cells, glial cells and nerve fibres, and the mechanism of nerve impulse transmission (6 hrs)</p> <p>Understand the types, physiology and significance of bioluminescence, and the structure and functions of electric organs. (2 hrs)</p> <p>Describe invertebrate neuro-endocrine organs and hormones, vertebrate endocrine glands, their hormones and functions (12 hrs)</p> <p>Understand the concept of neurosecretion and the mode of action of peptide and steroid hormones. (6 hrs)</p>
	ZOL6B11T	<b>REPRODUCTIVE AND DEVELOPMENTAL BIOLOGY</b>	<p>Explain the reproductive strategies in invertebrates and vertebrates and structural and functional features of human reproductive system (6 hrs)</p> <p>Describe process of fertilization, pregnancy, gestation, placentation, parturition and lactation in humans. (3 hrs)</p> <p>Explain the scope of reproductive technologies in infertility management; prenatal diagnostic techniques and methods of fertility control (5 hrs)</p> <p>Understand the phases and theories of development, and classification of eggs (3 hrs)</p> <p>Enumerate the types of cleavage, arrangement of blastomeres, germ layers and their derivatives, cell lineage in Planocera and different types of blastula. (3</p>

			hrs)
			Illustrate the early developmental process of egg in Amphioxus, frog, chick and man (22 hrs)
			Explain the basics of cell differentiation and its genetic control, stem cells and applications of stem cell technology (3 hrs)
			Describe parthenogenesis, types, and significance (2 hrs)
			Explain fate map construction, Spemann's constriction experiments on amphibian embryos, organizers in development, embryonic induction, gradient experiments in sea urchin eggs, cloning experiments in sheep and teratogenesis (7 hrs)
	ZOL6B12T	<b>ENVIRONMENTAL AND CONSERVATION BIOLOGY</b>	Explain the structure of ecosystem and its functioning through energy flow and nutrient cycling (6 hrs).
			Enumerate biogeochemical cycles and understand the concept of limiting factors (5 hrs).
			Describe the ecology of population, community and habitat as a self regulating system (14 hrs)
			Understand various types of population interactions and appraise the co-evolution (3 hrs).
			Comprehend the diverse environmental and sustainability challenges ranging from local to global and the establishment of perfect harmony between economic development, social issues and environmental conservation (4 hrs).
			Enumerate the several tools and techniques employed for studies on populations,

			communities and ecosystems. (4 hrs)
			Understand the threats to biodiversity, and strategies adapted for the conservation of diversity of organisms (10 hrs)
			Describe the various international strategies for conserving biodiversity (4 hrs)
			Describe the toxic chemicals, their toxicity levels and the health hazards caused by them (4 hrs).
	ZOL6B13T	<b>ETHOLOGY, EVOLUTION AND ZOOGEOGRAPHY</b>	Describe the patterns and mechanisms of animal behaviour (5 hrs)
			Illustrate biological rhythms and the chemical basis of communication (7 hrs)
			Identify major evolutionary transitions over time, and explain the tools and evidences that support current hypotheses of the history of life on earth (8 hrs)
			Describe the evidences for evolution and its required corollaries (5 hrs)
			Explain the various theories of evolution (6 hrs)
			Describe the mechanisms by which evolution occurs (5 hrs)
			Recognize the significance of reproductive isolation in reducing gene flow between populations, biological and morphological species concepts and distinguish between prezygotic and postzygotic barriers to reproduction (7 hrs)
			Review the events in human evolution (3 hrs)
			Explain ecological and historical foundations for understanding the distribution and abundance of species, and their changes over time and comprehend the basic principles of biogeography as a discipline (8 hrs)
	ZOL6B14(E)02T	<b>AQUACULTURE, ANIMAL HUSBANDRY</b>	Explain aquaculture and the process of prawn, mussel and pearl culture (10 hrs).
			Illustrate the methodology of pisciculture and

		<p><b>AND POULTRY SCIENCE</b></p>	<p>understand common culture fishes and ornamental fishes (13 hrs)</p> <p>Identify major fishing crafts and gear and enumerate fish utilization and preservation (13 hrs)</p> <p>Enumerate the poultry rearing techniques and understand major breeds of fowl (7 hrs)</p> <p>Understand the major breeds of cattle, cattle feeds and diseases of cattle (6 hrs)</p> <p>Illustrate the steps in dairy processing and identify the role of dairy development in rural economy (5 hrs).</p>
		<p><b>PRACTICAL III*A:</b>          PHYSIOLOGY,          ENDOCRINOLOGY,          REPRODUCTIVE          AND          DEVELOPMENTAL          BIOLOGY[72          hours] [4 hrs          /week]</p> <p><b>PRACTICAL III*B:</b>          ENVIRONMENTAL AND          CONSERVATION BIOLOGY,          ETHOLOGY, EVOLUTION,          ZOOGEOGRAPHY &amp; ELECTIVE          COURSE [72 hours] [4          hrs/week]</p>	