

Department of Zoology, Osmania University

Two Year M.Sc. (Zoology) Programme w.e.f. 2016–2017

Proposed Scheme for Choice Based Credit System

SEMESTER - I

	Course	Tea. Hrs	Credits	Evaluation		Marks
				Internal	External	
1	Core (SB)	4	4	20	80	100
2	Core (ECB)	4	4	20	80	100
3	Core (IMM)	4	4	20	80	100
4	Core (TSFAI)	4	4	20	80	100
5	Practical (SB)	4	2	-	50	50
6	Practical (ECB)	4	2	-	50	50
7	Practical (IMM)	4	2	-	50	50
8	Practical (TSFAI)	4	2	-	50	50
	Total	32	24			600

Paper – I : Structural Biology [SB]

Paper – II : Environmental and Conservation Biology [ECB]

Paper – III: Immunology [IMM]

Paper – IV: Taxonomy, Systematics and Functional Anatomy of Invertebrates [TSFAI]

Department of Zoology, Osmania University

Two Year M.Sc. (Zoology) Programme w.e.f. 2016–2017

Proposed Scheme for Choice Based Credit System

SEMESTER – II

Course		Tea. Hrs	Credits	Evaluation		Marks
				Internal	External	
1	Core (TTB)	4	4	20	80	100
2	Core (AP)	4	4	20	80	100
3	Core (MGDB)	4	4	20	80	100
4	Core (EFAV)	4	4	20	80	100
5	Practical (TTB)	4	2	-	50	50
6	Practical (AP)	4	2	-	50	50
7	Practical (MGDB)	4	2	-	50	50
8	Practical (EFAV)	4	2	-	50	50
Total		32	24			600

Paper – I : Tools, Techniques and Biostatistics [TTB]

Paper – II : Animal Physiology [AP]

Paper – III: Molecular Genetics and Developmental Biology [MGDB]

Paper – IV: Evolution and Functional Anatomy of Vertebrates [EFAV]

UNIT I–Basic concepts of Biomolecules and Structural Biology	15 Hrs
1.1 Biomolecules and their significance – carbohydrates, proteins, amino acids, nucleic acids and lipids.	
1.2 Chemistry and structure of mono, oligo and polysaccharides. Deoxysugars, aminosugars and glycosides	
1.3 Classification and structures of proteins – primary, secondary, tertiary and quaternary.	
1.4 Classification, structure and function of lipids, fatty acids, triglycerides; phospholipids, cerebrosides, steroids	
1.5 Nucleic acids – Structure of DNA and RNA , DNA polymorphism, RNA types.	
UNIT II–Enzymes and Metabolism	15 Hrs
3.1 Classification, nomenclature and properties of enzymes – catalysis and energy of activation; Enzyme kinetics, Michaelis–Menten Constant; (Km values) and LB plot; mechanism of enzyme action and regulation of enzyme activity	
3.2 Metabolism of carbohydrates – Glycolysis; TCA cycle; Gluconeogenesis; biological oxidation; role of respiratory chain in energy capture; ATP synthesis	
3.3 Catabolism of amino acids – Transamination, deamination and decarboxylation	
3.4 Oxidation and biosynthesis of fatty acids	
3.5 Metabolic disorders of different biomolecules (carbohydrates, proteins, lipids)	
UNIT III–Cellular Organization	15 Hrs
2.1 Molecular organization and functions of cell membranes	
2.2 Cell permeability – Transport across the cell membrane; transport of small molecules; Carrier proteins; Ion pumps; membrane bound enzymes	
2.3 Cell communications – Inter cellular communication and gap junctions; chemical signaling between the cells; strategies of chemical signaling	
2.4 Signaling mediated by intracellular receptors; signaling mediated cell surface receptors – second and third messengers; C–AMP, G–proteins, Ca ⁺⁺ , Inositol Triphosphate (IP ₃) and prostaglandins	
2.5 Cell cycle; molecular events in cell cycle; mitotic spindle	
UNIT IV - Functional Biology of Nucleic Acids	15 Hrs
4.1 DNA replication – semi conservative, enzymology of DNA replication, replication of circular DNA, initiation, elongation and termination of replication process. Proof reading function of DNA polymerases.	
4.2 Enzymatic synthesis of RNA.	
4.3 Protein synthesis – Events of protein synthesis; transcription in prokaryotes and eukaryotes; post transcriptional processing.	
4.4 Regulation of genetic code – Wobble’s concept, translation in prokaryotes and eukaryotes.	
4.5 DNA repair mechanism – High fidelity of DNA sequence – Repair of damage caused by UV light, Eukaryotes repair systems.	

PRACTICAL

- 1 Determination of proteins by Biuret method/ Folin Phenol method
- 2 Determination of glucose by Somogi / Anthrone method
- 3 Determination of lipids by Vanlin method
- 4 Determination of glycogen by Kemp's method
- 5 Estimation of cholesterol
- 6 Determination of enzyme activities of SDH and LDH
- 7 Effect of substrate concentration and pH on SDH activity
- 8 Protein fractionation using sodium sulphate
- 9 Estimation of DNA and RNA
- 10 Electrophoretic analysis of proteins/DNA
- 11 Feulgen reaction method for DNA localization.
- 12 Submission of assignment on structure of Biomolecules, mechanism of enzyme action , Metabolic cycles, DNA, RNA, protein synthesis. [To be submitted at the time of Examination – 10 Marks]

Suggested Books

- 1 Textbook of Biochemistry by Harper
- 2 Textbook of Biochemistry by Lehninger
- 3 Textbook of Biochemistry by Stryer and Stryer
- 4 Textbook of Biochemistry by Conn and Stumpf
- 5 Textbook of Biochemistry by A.B.V. Rama Rao
- 6 Cell and molecular biology by De Robertis and De Robertis, 8th ed.
- 7 Molecular Biology by Friefielder
- 8 Molecular cell biology by Darnell, Lodish and Baltimore (Scientific American Books)
- 9 Molecular biology by H. D. Kumar
- 10 Biochemistry and molecular biology by W. H. Elliot and D. C.Elliot(OU Press)
- 11 Molecular Biology of Cell by Bruce Alberts et al.
- 12 Cell by Karp

Syllabus Committee

- 1 Prof. P. Nagaraja Rao
- 2 Dr. Rafath Yasmeeen
- 3 Dr. B. Jyothi
- 4 Dr. S. Padmaja

M.Sc. Zoology

Semester I
CORE PAPER

Paper II

Code Zoo_102

Title Environmental and Conservation Biology [ECB]

UNIT I – Basic concepts of Ecology 15 Hrs

- 1.1 Laws of limiting factor, Laws of minimum, Laws of Tolerance and Tragedy of commons
- 1.2 Micronutrients and macronutrients
- 1.3 Types of ecosystem – freshwater, marine and terrestrial
- 1.4 Population characteristics and dynamics – conceptual approach
- 1.5 Growth curves and pyramids; sigmoid curve, J curve and hyperbola; logistic equation and concepts relating to growth

UNIT II – Community Organization and Structure 15 Hrs

- 2.1 Community analysis, species diversity, ecotone concept and edge effect; interaction between environment and biota Habitat and ecological niche and niche overlap; concept of biome
- 2.2 Concepts of productivity; eutrophication of lakes; biological indicator and water quality
- 2.3 Ecosystem dynamics and management; stability and complexity of ecosystem
- 2.4 Biogeochemical cycles; inorganic pollutants and their impact SO₂, NO₂, CO, Phosphates, heavy metals (Arsenic, Lead and Mercury); radioactive nucleotides and their impact on biological system
- 2.5 Acid rain sources and its impact on biological system; green house effect and ozone depletion

UNIT III - Biogeography of India, Habitats and Resources 15 Hrs

- 3.1 Classical concepts of biogeography – continental drift, endemism, refugia
- 3.2 Biogeographical regions of India and their salient features
- 3.3 Classification, function and values of habitats – Freshwater wetlands, deserts, grasslands and forests
- 3.4 Concepts of natural resources – renewable and non-renewable resources
- 3.5 Overexploitation of resources – deforestation, water table depletion and land degradation

UNIT IV - Natural Resource Management 15 Hrs

- 4.1 Environmental Impact Assessment – principle, scope and purpose
- 4.2 Role of ecological restoration in conservation; displacement and settlement of local communities
- 4.3 Major conservation movements in India; NGOs in conservation efforts
- 4.4 Community diversity resources use and management; conflict management and resolution
- 4.5 National legislations for protecting biological resources – Biodiversity Act, 2002 and Biodiversity Rules, 2004

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PRACTICAL

- 1 Estimation of phosphates from the water sample
- 2 Estimation of nitrates and nitrites
- 3 Estimation of magnesium
- 4 Estimation of calcium
- 5 Biological indicators of water quality and their population dynamics – collection of water sample
- 6 Identification, enumeration of zooplankton, and their ecological significance
- 7 Estimation of total alkalinity of water and soil
- 8 Estimation of particulate matter in air
- 9 Draw the biogeographical regions of India and provide in brief the salient features of each biogeographical zone
- 10 Enumerate the biological diversity (zooplanktons and birds) using the habitat of freshwater lake in your place
- 11 Enumerate the diversity (plants and animals) use and their management in a community/village near your place

Suggested Books

- 1 Caughley, G., and A. Gunn. 1996. Conservation Biology in Theory and Practice. Blackwell Science, Cambridge, Massachusetts, U.S.A.
- 2 Cox, G. W. 2005. Conservation Biology: Concepts and Applications. McGraw-Hill, Dubuque, Iowa, U.S.A.
- 3 Dasmann, R., 1981. Wildlife Biology, 2nd ed. John Wiley and Sons, NY
- 4 Dobson, A. P. 1996. Conservation and Biodiversity. Scientific American Library, New York, New York, U.S.A.
- 5 Jeffries, M. J. 1997. Biodiversity and Conservation. Routledge, New York, New York, U.S.A.
- 6 Mills, L. Scott 2006. Conservation of Wildlife Populations. Blackwell Science, Oxford, U. K.
- 7 Milner-Gulland, E. J., and R. Mace. 1998. Conservation of Biological Resources. Blackwell Science, Oxford, U.K.
- 8 Morris, W. F., and D. F. Doak 2002. Quantitative Conservation Biology: Theory and Practice of Population Viability Analysis. Sinauer Associates, Sunderland, Massachusetts, U.S.A.
- 9 Sinclair, A. R. E., J. M. Fryxell, and G. Caughley 2006. Wildlife Ecology, Conservation and Management, Blackwell Publishing
- 10 Soulé ME (ed) 1986. Conservation biology: the science of scarcity and diversity- Sinauer, Sunderland
- 11 Bram F. Noble 2005. Introduction to Environmental Impact Assessment: A Guide to Principles and Practice. Oxford University Press, London
- 12 John A. Wiens and Michael R. Moss 2005. Issues and Perspectives in Landscape Ecology. Cambridge University Press, London
- 13 Aparna Sawhney 2004. The New Face of Environmental Management in India. Ashgate Publishing Ltd., Sheffield

Syllabus Committee

- 1 Prof. S. Jithender Kumar Naik
- 2 Dr. C. Srinivasulu
- 3 Dr. Apka Nageshwar Rao

UNIT I – Introduction to Immune System	15 Hrs
1.1 Phylogeny of Immune system –invertebrates and vertebrates	
1.2 Immune system – Innate and adaptive immunity , humoral mediated immunity and cell-mediated immunity	
1.3 Cells involved in immune system; role of macrophages in immunity	
1.4 The Lymphoid tissues – primary and secondary lymphoid organs, lymphatic traffic	
1.5 Activation of B- and T- Cells; production of effectors – antibodies and cytokines	
 UNIT II – Antigen-Antibody Nature and Complement System	 15 Hrs
2.1 Antigens nature, epitope, haptens, antigen presenting cells, adjuvants, antigenicity	
2.2 Immunoglobulins structure, function and classification of antibodies.	
2.3 Monoclonal antibodies and its application. Antigen antibody reactions. Immunological techniques -Principles and applications of ELISA, RIA, Immunoprecipitation, FISH and GISH	
2.4 Complement system – Components of complement system, pathways - classical and alternative, biological consequences of complement activation and complement significance	
2.5 Major histocompatibility complex (MHC) structure and function; genetic control of Immunoresponses; MHC restriction	
 UNIT III – Hypersensitivity Reactions and Autoimmune Diseases	 15 Hrs
3.1 Hypersensitivity – Classification of hypersensitivity reactions; Type-I – Anaphylactic hypersensitivity; Type – II Antibody – mediated cytotoxic hypersensitivity.	
3.2 Type-III – Immunocomplex mediated hyper sensitivity; Type – IV Cell mediated (Delayed) hypersensitivity.	
3.3 Autoimmune diseases – Organ specific auto immune diseases – Grave’s disease, insulin-dependent diabetes mellitus (type-I diabetes).	
3.4 Autoimmune diseases – Systemic autoimmune diseases – Systemic Lupus Erythematosus (SLE), Rheumatoid arthritis.	
3.5 Genetic factors, pathogenesis and treatment of autoimmune diseases.	
 UNIT IV – Transplantation and Tumour Immunology	 15 Hrs
4.1 Transplantation – Barriers to transplantation.	
4.2 Genetic predisposition for graft rejection, prevention of rejection.	
4.3 Immunity to infection – viruses, bacteria, fungi, parasites, nature of interaction; immunopathological considerations.	
4.4 Tumor immunology – Immunity to tumors, tumor specific antigens.	
4.5 Immunosurveillance.	

PRACTICAL

- 1 Agglutination test
- 2 Precipitation
- 3 Demonstration of Immunolectrophoresis
- 4 Neutralization and complement fixation
- 5 Separation of lymphocytes
- 6 Collection of macrophages and their characterization
- 7 Immunization schedules and rising of antibodies
- 8 Identification of histological slides of lymphoid tissue - Spleen, thymus, lymphnode and bone marrow
- 9 Demonstration of lymphocyte transformation test with nitrogen and an antigen

Suggested Books

- 1 Immunology, Kuby, W.F.Freeman, U.S.A
- 2 Fundamentals of Immunology, W.Paul
- 3 Essentials of Immunology, I.M.Roitt
- 4 Immunology A Foundation Test by Basiro Davey
- 5 An introduction to immunology, by Ian R. Tizard

Syllabus Committee

- 1 Prof. K. Pratap Reddy
- 2 Dr. G. Sunitha Devi
- 3 Dr. Rafath Yasmeen

UNIT I - Biosystematics and Taxonomy 15 Hrs

- 1.1 Basic concepts of biosystematics, taxonomy and classification
- 1.2 Recent trends in biosystematics – molecular taxonomy
- 1.3 Taxonomic hierarchies, species concepts.
- 1.4 International Code for Zoological Nomenclature (ICZN) – operative principles, interpretation and application of important rules; basis of scientific names
- 1.5 Concepts of Prokarya, Eukarya, Protostomia and Deuterostomia; Significance of symmetry, coelom and metamerism

UNIT II– Protozoa to Platyhelminthes 15 Hrs

- 2.1 Structure and functions of Locomotory organs in protozoans, reproduction in protozoa, conjugation in verticella
- 2.2 Porifera :-scolec canal system, life cycle
- 2.3 Platyhelminthes:- Polyembryons
- 2.4 Life cycles and modes of transmission, Paragonimus westermani, Diphyllbothrium latum.
- 2.5 Overview of reproduction and development in Protozoa, Proifera, Cnidaria, Ctenophora and Platyhelminthes

UNIT III - Annelida to Echinodermata 15 Hrs

- 3.1 Filter feeding in polychaetes and respiration in Annelida.
- 3.2 Shell in mollusca; respiration in mollusca foot in molluscs
- 3.3 Arthropoda; social life in insects; respiration and excretion in arthropods
- 3.4 Echinodermata; Autotomy and regeneration in echinodumata
- 3.5 Overview of reproduction, development and phylogenetic significance of the larval forms of Arthropoda and Echinodermata

UNIT IV - Minor and Other Phyla 15 Hrs

- 4.1 Systematic position, general organization and affinities of Ctenophora and Nemertea (Rhynchoceola)
- 4.2 Systematic position, general organization and affinities of Rotifera
- 4.3 Systematic position, general organization and affinities of Bryozoa (Ectoprocta).
- 4.4 Systematic position, general organization and affinities of Onychophora and Chaetognatha
- 4.5 Systematic position, general organization and affinities of Hemichordata

PRACTICAL

- 1 Salient characteristics, identification and classification of representative types of invertebrate groups from Protozoa, Porifera, Cnidaria, Ctenophora, Annelida, Mollusca, Arthropoda, Echinodermata and Hemichordata

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- 2 Preparation of permanent slides of mouth parts of house fly, mosquitoes and silk moth
- 3 Collection and identification of invertebrates in pond water
- 4 Collection and identification of parasites from cockroach
- 5 Dissections –
 1. Minor – a) Reproductive system of cockroach, b) Mouth parts of cockroach
 2. Major – a) Nervous system of prawn

Suggested Books

- 1 Principles of systematic Zoology (2 nd Edition) by E. Mayr and P.D. Ashlock
- 2 A Textbook of Zoology Vol. I by Parker and Haswell (Revised)
- 3 The Invertebrates Vol. I to Vol. VI by L. H. Hyman
- 4 Invertebrate structure and function by E. J. W. Barrington
- 5 Invertebrate Zoology by P. A. Meglitsch (Oxford Press)
6. Life of Invertebrates by Russel Hunter
7. Invertebrate Zoology by Ruppert and Barnes (Saunders College Publishing Co.)
8. Life of Invertebrates by S. N. Prasad
9. Evolutionary Biology by Eric C. Mitkoff
10. Worms and Man by D. W. T. Crompton
11. Parasitology by Noble and Noble
12. Regeneration by S. M. Rose–Appleton (Century Crofts)

Syllabus Committee

- 1 Prof. Geeta Rajalingam
- 2 Dr. C. Srinivasulu
- 3 Dr. A. V. Rajashekar

M.Sc. Zoology

Semester II
CORE PAPER

Paper I

Zoo_201

Title Tools, Techniques and Biostatistics [TTB]

UNIT I - Tools and Separation Techniques	15 Hrs
1.1 Principles of microscopy – light, UV, confocal, phase contrast, fluorescent, electron microscopy (SEM & TEM)	
1.2 Principles of histology – microtomy – tissue fixation, staining, mounting, histochemistry	
1.3 Homogenization; cell fractionation; centrifugation – principles and applications of Preparative, analytical and ultra centrifugation	
1.4 Chromatographic techniques – principle and applications of adsorption, affinity, partition, permeation, ion-exchange, column, TLC, GLC, HPLC	
1.5 Electrophoresis techniques – principles and applications of continuous, disc, isoelectrofocussing, isotachopheresis.	
UNIT II - Separation and Diagnostic Techniques	15 Hrs
2.1 Spectroscopic techniques – principles and applications of visible, UV, fluorescence, IR, ESR, NMR and mass spectroscopy	
2.2 Radioisotope techniques – principles and application of Geiger-Muller counter, scintillation counter, tracer studies, autoradiography	
2.3 Electrophysiological techniques – principles and applications of single neuron recording, patch clamp recording.	
2.4 Imaging techniques - ECG, PET, MRI, fMRI and CAT	
2.5 Microarray techniques – principles and applications of DNA, RNA and Protein microarray Techniques	
UNIT III - Biostatistics I – Introduction, Measures and Theories of Probability	15 Hrs
3.1 Statistical data, organization, classification and tabulation of data; Frequency distribution and graphical representation of data	
3.2 Measures of central tendency – Mathematical average (Mean – Arithmetic, Geometric & Harmonic Mean) and Positional Averages (Median and Mode)	
3.3 Measures of dispersion (or variability) – types, range, quartile deviation, mean deviation, variance, standard deviation, coefficient of variance	
3.4 Basics of Probability – Concept of probability, addition and multiplication laws of probability and application to the problems of biology	
3.5 Probability distribution – Definition, Types, properties and applications – Normal, Binomial and Poisson distributions	
UNIT IV - Biostatistics II – Hypothesis testing and Inferential Statistics	15 Hrs
4.1 Sampling – concept, sampling distribution of mean, standard error; Random variable – concept, expectation and variance of random variable	
4.2 Statistical estimation – types, methods and applications; Statistical hypothesis – types, testing (hypothesis, null hypothesis, alternate hypothesis), decision making (Type I & Type II errors), determination (fixation of level of significance)	

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- 4.3 Nonparametric tests – Assumptions, applications of Sign Test, Wilcoxon Signed Rank Test, Man-Whitney Test
- 4.4 Parametric tests – Student's t-Test; Analysis of Variance (ANOVA or F-Ratio: One way and Two-way analysis); Chi-square test (Test of Independence and Test of Goodness of Fit)
- 4.5 Correlation and regression analysis concepts and their application

PRACTICAL

- 1 To fix a tissue with Bouin's fixative and stain using haemotoxylin – eosin stain for histochemical studies
- 2 To prepare a paraffin block of tissue for microtomy for making sections of tissue for histochemical studies
- 3 Quantitative detection of total carbohydrates using Anthrone technique
- 4 Quantitative detection of total lipids using sulpho-phosphovanillin technique
- 5 Quantitative detection of total proteins using Lowry et al's Biuret technique
- 6 Graphic presentation of data – bar diagram, histogram, frequency polygon and pie chart
- 7 Calculation of measures of central tendencies – mean, median and mode
- 8 Calculation of measures of dispersions – range, mean deviation, standard deviation, variance and coefficient of variance
- 9 Computation of test of significance – comparison of sample mean with population mean and two sample means
- 10 Calculate the coefficient of correlation between two variables
- 11 Computation of linear regression
- 12 Computation of One Way Analysis of Variance (ANOVA)
- 13 Using Chi Square Test, test the independence of two variables

Suggested Books

- 1 Principles and techniques of Practical Biochemistry Ed. B.L. Williams & K. Wilson, Arnold Publishers
- 2 Practical Biochemistry By Plummer
- 3 Immunology – Roit
- 4 Cell and Molecular Biology – DeRobertis
- 5 Cell and Molecular Biology – Ladish et al.
- 6 Statistical methods, Snedecor, G.W. and W.G. Cochran, Iowa State Univ. Press
- 7 Biometry by W. H. Freeman and Francisco
- 8 Fundamentals of Biometry by L.N. Balaram (1980)
- 9 Biostatistics by N. Gurumani
- 10 Techniques in life sciences – by Tembhare

Syllabus Committee

- 1 Prof. B. Reddy Naik
- 2 Dr. C. Srinivasulu

UNIT I – Digestion-Respiration- Circulation	15 Hrs
1.1 Cellulose digestion –Ruminant and non-ruminant digestion; absorption in mammals; events of absorptive and post absorptive states and their regulation (endocrine and neural).	
1.2 Respiration – Cascade of oxygen transport to tissues at high altitude; adaptation to diving.	
1.3 Responses to CO ₂ and O ₂ rich environment; oxygen toxicity; hypercapnea, control of respiration.	
1.4 Buffering mechanisms by body fluids.	
1.5 Circulation - Cardiac cycle and principles of hemodynamics; blood coagulation,haematome formation; Anti-coagulants.	
UNIT II– Osmoregulation, Excretion and thermoregulation	15 Hrs
2.1 Osmoregulation – Osmoregulatory problems in brackish water, fresh water and marine organisms; osmotic problems in terrestrial animals; hormonal control of osmoregulation.	
2.2 Excretion – Urine formation, counter current mechanism; juxtaglomerular apparatus, rennin-angiotensin system; hormonal regulation – ADH and aldosterone.	
2.3 Detoxification of nitrogen products; purine cycle and miscellaneous detoxification pathways.	
2.4 Thermal physiology – temperature regulation in poikilotherms,homeotherms and heterotherms, and their mechanisms of survival; central control of homeothermy.	
2.5 Cold death, cold resistance, heat death; Torpor, hibernation and aestivation.	
UNIT III– Muscle Physiology, Neurophysiology & Receptors	15 Hrs
3.1 Comparative molecular structure and function of skeletal, smooth and cardiac muscles; energy metabolism in skeletal muscle, muscle fatigue.	
3.2 Types of neurons and glial cells.	
3.3 Basis and significance of membrane potentials, equilibrium potentials, their change during stimulus, Na, K currents in action potential.	
3.4 Types of synapses, synaptic transmission - electrical and chemical; synaptic inhibition and neurotransmitters.	
3.5 Receptors – Receptor mechanisms, sensory coding; Mechanoreceptors, photochemical aspects of vision and phonoreception in mammals.	
UNIT IV – Endocrinology, Bioluminescence & Stress Physiology	15 Hrs
4.1 Structure and function of endocrine glands of invertebrate.	
4.2 Structure and function of endocrine glands of vertebrate.	
4.3 Mechanism of hormone action (peptide and steroid hormones).	
4.4 Bioluminescence-luminiscent organisms-neural control. Biochemistry and significance of luminescence.	

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4.5 Stress – resistance to stress, functions of hormones and sympathetic nervous system in stress

PRACTICAL

- 1 Estimation of blood chlorides under hetero osmotic media.
- 2 Cold and heat stress on metabolic rate in tilapia fish/crab.
- 3 Effect of heat stress on glycogen levels in tilapia fish/crab.
- 4 Estimation of Acetylcholinesterase activity.
- 5 Estimation of phosphorylase activity.
- 6 Adrenalin and insulin induced changes in blood glucose levels in rat/mice.
- 7 Kymographic recordings of twitch, tetanus and fatigue.
- 8 Estimation of Hb, ESR and blood clotting time.
- 9 Cell fragility.

Suggested Books

- 1 Principles of Animal Physiology by D.W. Wood.
- 2 Principles of Animal Physiology by Gordon.
- 3 Animal Physiology-Adaptations and environment by Schmidt-Nielson.
- 4 Principles of Animal Physiology by Wilson.
- 5 Text Book of Medical Physiology by Guyton.
- 6 General & Comparative Animal Physiology By William Hoar.
- 7 Comparative Animal Physiology by Florey.
- 8 Comparative Animal Physiology by L.C.Prosser.
- 9 Human Physiology by vander .

Syllabus Committee

- 1 Prof. Sugita Mathur
- 2 Dr. Rafath Yasmeen
- 3 Dr. S. Padmaja
- 4 Dr. Jyothi

UNIT I - Introduction to Genetics	15 Hrs
1.1 Mendelism, mendelian inheritance; modification of mendelian inheritance.	
1.2 Linkage studies, crossing over and extra chromosomal inheritance, multiple alleles, blood group antigens.	
1.3 Chromosome structure (Prokaryote and Eukaryote); identification, karyotype.	
1.4 Genetic disorders – chromosomal disorders, inborn errors of metabolism and polygenic and environmental disorders.	
1.5 Bacterial genetics – transformation, transduction, conjugation, viral lytic and lysogenic cycle.	
UNIT II – Molecular Genetics	15 Hrs
2.1 Introduction of DNA technology – Restriction endonucleases, methods of ligation – DNA ligases, ligation of fragment with cohesive and blunt ends.	
2.2 Features of vectors – cosmids, plasmids and shuttle vector with one example representing each class construction and characterization of new cloning vectors	
2.3 Applied molecular biology – DNA sequences – Maxam and Gilbert methods, Sanger’s method. Application of recombinant DNA technology with reference to the example of insulin, somatostatin, and interferon. DNA fingerprinting and its application	
2.4 Cloning strategies – Shotgun cloning, construction of gene libraries, genomic library and DNA library	
2.5 Hybridization techniques – Southern blot, Northern blot, R-loop mapping methods, In-situ hybridization	
UNIT III – Overview of Developmental Biology	15 Hrs
3.1 Scope and importance of developmental biology	
3.2 Gametogenesis; spermatogenesis, oogenesis, vitellogenesis and chemodifferentiation	
3.3 Fertilization, parthenogenesis and its significance	
3.4 Types of cleavage, mechanism of cleavage, chemical changes during cleavage	
3.5 Role of cytoplasm and nucleus during early development; morphogenetic movements, presumptive areas and fate maps	
UNIT IV – Organogenesis	15 Hrs
4.1 Gastrulation, metabolic events during gastrulation and rudimentary organs formation	
4.2 Concept of organisers and induction – Neural tubule formation	
4.3 Organogenesis: limb, central nervous system, heart, kidney and eye	
4.4 Role of hormones in metamorphosis of insects and frog; regeneration in Cnidaria, Echinodermata, Amphibia (limb and tail regeneration), and Reptiles (tail regeneration)	
4.5 Teratogenesis– genetic and environmental; developmental mechanisms of teratogenesis	

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PRACTICAL

- 1 Identification of ABO Blood groups
- 2 Extraction of DNA from tissues
- 3 Extraction and isolation of RNA from tissues
- 4 Estimation of RNA, DNA in tissues
- 5 Estimation of structural proteins
- 6 Estimation of soluble proteins
- 7 Estimation of SDH activity in chick embryo
- 8 Estimation of LDH activity in chick embryo
- 9 Estimation of calcium in egg shell by EDTA method
- 10 Identification of chick embryo developmental stages – 24hrs, 48hrs, 72hrs, &96hrs

Suggested Books

- 1 General genetics by Winchester
- 2 Molecular Biology of gene by Watson et al. Vol I & II
- 3 Genetics by Strickberger
- 4 Molecular Biology by Friefielder
- 5 Genetics by P.K. Gupta
- 6 Genes by Lewis
- 7 General genetics by S. R. B. Owen
- 8 Cell and molecular biology by De Robertis and De Robertis, 8th ed.
- 11 Molecular cell biology by Darnell, Lodish and Baltimore (Scientific American books)
- 12 Molecular biology by H. D. Kumar
- 13 Biochemistry and molecular biology by W. H. Elliot and D. C. Elliot (OUPress)
- 14 Text book of molecular biology by K. S. Sastry et al. (MacMillan Ind. Pvt. Ltd.)
- 15 Developmental Biology - patterns, problems and principles by W. Saunders Jr.
- 16 Principles of Animal Developmental Biology by S.C. Goel
- 17 Introduction to embryology by Balinsky
- 18 Developmental Biology S. Gilbert
- 19 Evolution by Savage
- 20 Process of organic evolution by Stebbings
- 21 Evolution of vertebrates by Colbert
- 22 Developmental Biology by Berryl

Syllabus Committee

- 1 Prof. V. Vanitha Das
- 2 Dr. G. Sunitha Devi
- 3 Dr. A.V. Rajashekar

UNIT I – Evolution	15 Hrs
1.1	Concept of evolution and theories of evolution
1.2	Variation, gene mutation and chromosomal aberrations in evolution; genetic drift
1.3	Speciation – species concepts, categories; Modes of speciation – Allopatric, parapatric and sympatric speciation
1.4	Natural selection; patterns of evolution – sequential, divergent, convergent, gradual, punctuated, monophyletic, polyphyletic and paraphyletic
1.5	Origin and evolution of primates and human
UNIT II – Evolution of Vertebrates	15 Hrs
2.1	Origin and salient features of Ostracoderm, Placoderm, Acanthodii, Sarcopterygii and Actinopterygii
2.2	Origin, salient features and adaptive radiation in amphibians – Lepospondyli and Lissamphibia
2.3	Origin, salient features and adaptive radiation in early and Mesozoic reptiles
2.4	Origin, salient features and adaptive radiation in birds – Palaeognathae and Neognathae
2.5	Origin, salient features and adaptive radiation in mammals – Prototheria and Theriiformes
UNIT III – Functional Anatomy of Vertebrates – from fishes to mammals	15 Hrs
3.1	Integumentary system – Integument and its derivatives
3.2	Skeletal system – Cranial and Post-Cranial (axial and appendicular) skeletal system
3.3	Nervous system – brain, spinal cord and peripheral nerves; sense organs
3.4	Respiratory and circulatory system; Digestive and excretory system
3.5	Reproductive system – comparison of male and female reproductive systems from fishes to mammals
UNIT IV – Functional Anatomy of Vertebrates – Evolutionary significance	15 Hrs
4.1	Evolutionary significance of internal fertilization, neoteny and paedogenesis
4.2	Amniotic egg – structure and its evolutionary significance
4.3	Basic plan of skull; Temporal fossae and their evolutionary significance; Vertebrate Jaw suspension
4.4	Types and evolutionary significance of axial and appendicular joints
4.5	Types and evolutionary significance of placenta; evolutionary significance of opposable thumb and bipedalism in primates (both non-human and human)

M.Sc. Zoology

PRACTICAL

- 1 Salient characteristics, identification and classification of representative types of vertebrate groups from Pisces, Amphibia, Reptilia, Aves and Mammalia
- 2 Collection and preparation of slides of ticks, mites, bed bug, human lice, fleas, mosquitoes and house flies
- 3 Structure, bionomics and biology of earthworms. Commercially important prawns, mussels and pearl oysters, harmful and useful insects and moths, cultivable fishes and frogs
- 4 Dissections --
 1. Minor – a) Weberian ossicles of Labeo, and b) Respiratory trees of Clarius
 2. Major – a) Cranial nerves of Labeo (V, VII, IX & X cranial nerves, b) Cornea and pecten of chick

Suggested Books

- 1 Principles of systematic Zoology (2 nd Edition) by E. Mayr and P.D. Ashlock.
- 2 A Textbook of Zoology Vol. I by Parker & Haswell (Revised)
- 3 The Invertebrates Vol. I to Vol. VI by L. H. Hyman
- 4 Invertebrate Structure and Function by E. J. W. Barrington.
- 5 Invertebrate Zoology by P. A. Meglitsch (Oxford Press)
- 6 Life of Invertebrates by Russel Hunter
- 7 Invertebrate Zoology by Rupport and Barnes (Saunders College Publishing Co.).
- 8 Life of Invertebrates by S. N. Prasad
- 9 Evolutionary Biology by Eric C. Mitkoff
- 10 Worms and Man by D. W. T. Crompton
- 11 Regeneration by S. M. Rose–Appleton (Century Crofts).
- 12 Parasitology by Noble & Noble.

Syllabus Committee

- 1 Prof. V. Vanitha Das
- 2 Dr. C. Srinivasulu
- 3 Dr. B. Neeraja

Department of Zoology, Osmania University

Two Year M.Sc. (Zoology) Programme w.e.f. 2016–2017

Proposed Scheme for Choice Based Credit System

SEMESTER - I

	Course	Tea. Hrs	Credits	Evaluation		Marks
				Internal	External	
1	Core (SB)	4	4	20	80	100
2	Core (ECB)	4	4	20	80	100
3	Core (IMM)	4	4	20	80	100
4	Core (TSFAI)	4	4	20	80	100
5	Practical (SB)	4	2	-	50	50
6	Practical (ECB)	4	2	-	50	50
7	Practical (IMM)	4	2	-	50	50
8	Practical (TSFAI)	4	2	-	50	50
	Total	32	24			600

Paper – I : Structural Biology [SB]

Paper – II : Environmental and Conservation Biology [ECB]

Paper – III: Immunology [IMM]

Paper – IV: Taxonomy, Systematics and Functional Anatomy of Invertebrates [TSFAI]

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Proposed Scheme for Choice Based Credit System

SEMESTER – II

Course		Tea. Hrs	Credits	Evaluation		Marks
				Internal	External	
1	Core (TTB)	4	4	20	80	100
2	Core (AP)	4	4	20	80	100
3	Core (MGDB)	4	4	20	80	100
4	Core (EFAV)	4	4	20	80	100
5	Practical (TTB)	4	2	-	50	50
6	Practical (AP)	4	2	-	50	50
7	Practical (MGDB)	4	2	-	50	50
8	Practical (EFAV)	4	2	-	50	50
Total		32	24			600

Paper – I : Tools, Techniques and Biostatistics [TTB]

Paper – II : Animal Physiology [AP]

Paper – III: Molecular Genetics and Developmental Biology [MGDB]

Paper – IV: Evolution and Functional Anatomy of Vertebrates [EFAV]