

SRI VENKATESWARA UNIVERSITY::TIRUPATI
S.V.U.COLLEGE OF SCIENCES
DEPARTMENT OF ZOOLOGY

(Syllabus common for SV University College and affiliated colleges offered PG Courses
in SVU Area)

(Revised Scheme of Instruction and Examination, Syllabus etc., with effect from the
Academic Years 2016-17 for I and II Semesters and 2017-18 for III and IV Semesters)

M.Sc. ZOOLOGY

SCHEME OF INSTRUCTION AND EXAMINATION

Semester	Code	Title of the course	Hr s/ we ek	No. of Cre dits	Core/ Elective	Uni Ex am s (Ho urs	I A	Sem e- ster end exa m	Tot al Ma rks
FIRST	ZOO-101	Invertebrata and Chordata	4	4	Core	3	20	80	100
	ZOO-102	Genetics and Evolution	4	4	Core	3	20	80	100
	ZOO-103P		8	4	Practical	4			100
	ZOO-104P		8	4	practical	4			100
	ZOO-105	Metabolic regulation and function-Compulsory Foundation	4	4	Compul. Founda	3	20	80	100
	ZOO-106	HVPE-I Elective foundation	4	4	Elective foundati	3	20	80	100
		TOTAL	36	24					600
SECOND	ZOO-201	Cell Biology and Immunology	4	4	Core	3	20	80	100
	ZOO-202	Molecular Biology	4	4	Core	3	20	80	100
	ZOO-203P		8	4	Practical	4			100
	ZOO-204P		8	4	practical	4			100
	ZOO-205	Comparative Animal Physiology, Compulsory Foundation	4	4	Compul. Founda	3	20	80	100
	ZOO-206	HVPE-II Elective foundation	4	4	Elective foundati	3	20	80	100
		TOTAL	36	24					600

Semester	Code	Title of the course	Hrs/week	No. of Credits	Core/Elective	Uni. Exams (Hours)	IA	Semester end exam	Total Marks	
THIRD	ZOO 301	Developmental Biology	4	4	core	3	20	80	100	
	ZOO 302	Environmental biology	4	4	core	3	20	80	100	
	ZOO 303P		8	4	Practi	4		--	100	
	ZOO 304P		8	4	Practi	4		---	100	
	ZOO 305		a) Tools and Techniques b)Enzymology c)Bioinformatics and biostatistics	4	4	Gener Electives:* (related to subject)	3	20	80	100
				4	4		3	20	80	100
	ZOO 306		a)Economic Zoology b)Pathobiology	4	4	Open Elective (For other department students)	3	20	80	100
				4	4		3	20	80	100
							80	320	600	

*Among the generic electives a student shall choose two.

FOURTH	ZOO 401	Neurobiology	4	4	core	3	20	80	100	
	ZOO 402	Toxicology	4	4	core	3	20	80	100	
	ZOO 403P		8	4	Practical	4		--	100	
	ZOO 404P		8	4	Practical	4		---	100	
	ZOO 405 :* (two papers out of three)		a)Animal Biotechnology and Micro biology b) Animal Behaviour and Wild life. c)Endocrinology	4	4	Generic Electives	3	20	80	100
				4	4		3	20	80	100
	ZOO 406 (For other department)		a)Genetic engineering b)Structural biology	4	4	Open Elective students)	3	20	80	100
				4	4		3	20	80	100
							80	320	600	

*Among the generic electives a student shall choose two.

Total Number of Credits: 96, Total Marks excluding open electives: 2400
NUMBER OF HOURS ALLOTTED: Theory: 4 hours/ week, Practical's: 8 hours/ week
Seminar/ Library: 4 hours/week: For I and II semester,
Seminar/ Library/ open elective: 4 hours/week: For III and IV semester.

SEMESTER-I

ZOO-101: INVERTEBRATA & CHORDATA

UNIT-1

Evolutionary time scale, Eras, Periods & Epoch - major events.
Species concept, International code of Zoological nomenclature, Taxonomical procedures, New Trends in taxonomy.
Patterns of feeding and digestion in lower metazoans: Holozoic nutrition , Pinocytosis, Saprozoic Nutrition, Myxotrophic nutrition, Nutrition of parasites.
Feeding in Polychaeta, Mollusca, Echinodermata.

UNIT-2

2.1. Acoelomata, Pseudocoelomata, Coelomata, Proterostomia and Deuterostomia.
Structure of Gill, lungs, trachea and Mechanism of Respiration. Circulatory system in Annelids, Arthropods & Molluscs.
Advanced nervous system- Annelida, Arthropoda and Mollusca.
Larval forms of Crustaceans: Larval forms: Nauplius, Metanauplius, Protozoa, Zoea, Cypris, Mysis, Megalopa, Phyllosoma, Alima, Significance of larval forms;
Larval forms of Echinodermata: Asterozoa Bipinnaria Larva, Ophiurozoa, Echinozoa, Holothurozoa, Crinozoa Doliolaria Larva, Significance of Echinoderm larval forms.

UNIT- 3

Vertebrate integument and derivatives: - Skin structure and functions - glands, scales, horns, claws, nails, hoofs, feathers and hair.
Comparative anatomy of heart: - Types - structure- blood circulation-aortic arches and portal system.
Comparative anatomy of reproductive system: - Organs of male reproductive system – organs of female reproductive system – functions.
Comparative account of excretory system.

UNIT- 4

4.1. Comparative anatomy of respiratory organs: - Gills, trachea and lungs – types structure-mechanism of respiration.
Comparative anatomy of brain and spinal cord: - structure, composition and functions
Organs of vision: structure of eye in different phyla - mechanism of vision, Photoreceptors-fishes, Amphibians, Reptiles, Birds and Mammals.
Organs of Gustatory hearing and tactile responses: - Structure of hearing organs in different Phyla - mechanism of hearing - tactile organs.

SUGGESTED READING MATERIAL:

1. Alexander, R.M. The Chordata. Cambridge University Press, London.
2. Barnes, R.D. Invertebrate Zoology, III edition. W.b. Saunders Co., Philadelphia, 1980.
3. Barrington, E.J. W. Invertebrate structure and function. Thomas Nelson and Sons Ltd., London. 1969.
4. Barrington, E.J. W. The Biology of Chordata and Protochordata. Oliver and Boyd, Edinburgh.
5. Bourne, G.H. The structure and functions of nervous tissue. Academic Press, New York.
6. Carter, G.S. Structure and habit invertebrate evolution Sedwick and Jackson, London.

7. Eccles, J. C. The understanding of the brain. McGraw Hill Co., New York and London.
8. Hyman, L.B. The Invertebrates smaller coelomate groups, Vol. V. Mc.GrawHill, Co., New York.
9. Hyman, L.B. The Invertebrates. Vol.2 Mc Graw Hill Co., New York and London.
10. Hyman, L.B. The invertebrates. Vol.1. Protozoa through Ctenophora, Mc Graw Hill Co., New York.
11. Hyman, L.H. The Invertebrates. Vol. 8. Mc Graw Hill Co., New York and London.
12. Jagerstein, G. Evolution of Metazoan life cycle, Academic Press, New York & London.
13. Kingsley, J.S.Outlines of Comparative Anatomy of Vertebrates. Central Book Depot, Allahabad.
14. Parker, T.J., Haswell, W.A. Text Book of Zoology, Mc Millan Co., London.
15. Read, C.P.Animal Parasitism. Prentice Hall Inc., New Jersey.
16. Russel-Hunter, W.D. Biology of higher invertebrates, the Mc Millan Co. Ltd., London.1969.
17. Sedwick, A. A student text book of Zoology, Vol.II and III. Central Book Depot, Allahabad.1972.

ZOO-102: GENETICS AND EVOLUTION

UNIT-1

Concept of gene: Alleles, Multiple alleles and Pseudoalleles (ABO blood grouping, Bombay phenotype and Rh factor).

Extensions of Mendelian Principles: Pleiotropy, genomic imprinting, Penetrance and expressivity, phenocopy, sex linked (color blindness; Haemophilia), sex limited and sex influenced characters.

Gene mapping methods: Linkage maps, tetrad analysis, mapping with molecular markers, mapping with somatic cell hybrids.

Mutation: Types (Spontaneous, Induced, lethal, conditional, biochemical) causes, loss of function, gain of function, Frame shift mutations, insertional mutagenesis.

UNIT-2

Microbial genetics: Methods of genetic transfers -Conjugation, Transduction and sexduction, mapping genes by interrupted mating,

Recombination: homologous and non homologous recombination including Transposition.

Human genetics: Pedigree analysis, genetic disorders (Brachydactyly, Huntington's chorea).

Quantitative genetics: Polygenic inheritance, Types of quantitative traits (continuous, meristic and threshold); examples (skin color and height in humans), Mapping of Quantitative trait loci (QTL mapping).

UNIT-3

Critical reviews of Darwinism.

Neo-Darwinism.

Isolation and role of isolating mechanisms in evolution.

Speciation and models of speciation (Allopatric, sympatric and parapatric).

UNIT- 4

4.1. Factors of evolution (i) Mutations (ii) Natural Selection (iii) Genetic Drift.

Basic patterns of evolution; Micro and Macro evolution.

Species categories: (i) Morphological species (ii) Biological species (iii) Sibling species (iv) Sub species

Evolution of Proteins- Examples of protein evolution (Hb, insulin, growth hormone).

SUGGESTED READING MATERIAL:

1. An introduction to Modern genetics by Ch. Waddingson
2. Basic Human Genetics- E.J. Mange, Arthur P. Mange. Indian Print, 1997.
3. Genetic disorders of Man by M.R. Goodman.
4. Genetics - Monrve W. Strickberger. 3rd Ed., May, 2000.
5. Genetics-K.B.Alluwallia-1985.
6. Molecular Biology of genes- Watson, J.D., N.H. Hopkins, J.W. Roberts, J.A. Steitz &A.M. Weiner. The Benjamin Cummings publishing company. Inc. Tokyo.
7. Principles of Genetics - E.J. Gardner. M.J. Simmons & D.P. Snustad.
8. Genetics-P.S.Verma and V.K.Agarwal-2009, S.Chand Publication.
9. An introduction to genetic analysis. Griffiths, A.J .F., J.B. Miller, D.T. Suzuki, R.C. Lewontin & W.M. Gelbark, W.H. Freeman and Company, New York.
10. Dobzhansky, Th. Genetics and origin of species, Columbia University press.
11. Dobzhansky, Th., F.J. Ayala, G.L. Stebbins and J .M. Valentine Evolution: Surjeet publications, New Delhi latest edition.
12. Gould, J.L. The mechanisms and evolution of behavior.
13. Hartl, D.L. A primer of population genetics, sinauer Associatesm Inc., Massachusetts.
14. P.A. Moody Introduction to Evolution II ed/latest: Kalyani publishers, New Delhi.
15. Peter Volpe E. Understanding Evolution, University Book stall, New Delhi.

ZOO 103P : Invertebrata, Chordate and Genetics.

ZOO 104P: Evolution and Metabolic regulation and cell function

ZOO-105: METABOLIC REGULATION AND CELL FUNCTION

UNIT-1.:

Chemical Bonds (Covalent, Ionic and Hydrogen Bonds) and Thermodynamic principles in Biology (Enthalpy, Entropy, Free energy, First law and Second law of thermo-dynamics in relation to Biological system).

Carbohydrates: Definition and Classification- Structure and function of important Mono, Oligo and Polysaccharides.

Intermediary Metabolism-I: Glycolysis, TCA Cycle and their Bio-medical importance.

Intermediary Metabolism-II: Gluconeogenesis, HMP Shunt, Metabolism of Galactose and Fructose and their Bio-medical importance.

UNIT-2:

Proteins: Definition and Classification- Structure (Primary, Secondary and Tertiary structures, Protein folding and denaturation) and function of important Proteins- Haemoglobin, Myosin and Actin.

Bio-synthesis of nutritionally non-essential amino acids and their Bio-medical importance.

Catabolism of Proteins and Amino acids-I: Biosynthesis of Urea- Detoxification of Ammonia- Metabolic disorders of Urea cycle.

Catabolism of Proteins and Amino acids-II: Phenylalanine, Tryptophan, Biosynthesis and degradation of Polyamines and their Bio-medical importance.

UNIT-3:

Chemistry of purines, pyrimidines, Nucleosides, Nucleotides, Synthetic derivatives.

Biosynthesis of purine nucleotides, Catabolism of purines.

Biosynthesis of pyrimidine nucleotides, Catabolism of Pyrimidines,

Clinical disorders of purine and pyrimidine metabolism; Hyperurecemia or gout; Hypo-urocemia, Orotic aciduria.

UNIT-4

Biomedical importance, Classification of lipids; Saturated and unsaturated fatty acids; Triacylglycerols (tri-glycerides), Phospholipids, Glycolipids, Steroids, Lipid peroxidation. β - oxidation of fatty acids, Oxidation of unsaturated fatty acids, Ketogenesis. Biosynthesis of long chain fatty acids (Palmitic acid), Clinical aspects.

Overview of Metabolism(Carbohydrate, Protein and Lipid): Integrated metabolism at tissue and organ level(Kidney, Liver, Muscle, Adipose tissue and Small intestine);Metabolic interrelationships among Adipose tissue, Liver and Extra hepatic tissues

SUGGESTED READING MATERIAL:

1. D. Voet and J.G Voet, Biochemistry, 1. Wiley & Sons.
2. David L. Nelson and Michael M. Cox, Lehninger; Principles of Biochemistry, McMillan Lange Medical
3. Robert K.Murrey, D.K. Granner, P.A. Mayes and V.W. Rodwell; Harper's Biochemistry, Worth Publishers.

ZOO 106: HUMAN VALUES AND PROFESSIONAL ETHICS – I (With effect from 2014-15)

(effective from the batch of students admitted from the academic year 2014-15)

Definition and Nature of Ethics- Its relation to Religion, Politics, Business, Law, Medicine and Environment. Need and Importance of Professional Ethics- Goals – Ethical Values in various Professions.

Nature of Values- Good and Bad, Ends and Means, Actual and potential Values, Objective and Subjective Values, Analysis of basic moral concepts- right, ought, duty, obligation, justice, responsibility and freedom, Good behavior and respect for elders, Character and Conduct.

Individual and society:

Ahimsa (Non-Violence), Satya (Truth), Brahmacharya (Celibacy), Asteya (Non possession) and Aparigraha (Non-stealing). Purusharthas (Cardinal virtues)- Dharma (Righteousness), Artha (Wealth), Kama (Fulfillment Bodily Desires), Moksha (Liberation).

Bhagavad Gita – (a) Niskama karma. (b) Buddhism – The Four Noble Truths – Arya astanga marga, (c) Jainism – mahavratas and anuvratas. Values Embedded in Various Religions, Religious Tolerance, Gandhian Ethics.

Crime and Theories of punishment – (a) Reformative, Retributive and Deterrent. (b) Views on manu and Yajnavalkya.

Books for study:

1. John S Mackenzie: A manual of ethics.
2. "The Ethics of Management" by Larue Tone Hosmer, Richard D. Irwin Inc.
3. "Management Ethics – integrity at work" by Joseph A. Petrick and John F. Quinn, Response Books: New Delhi.
4. "Ethics in Management" by S.A. Sherlekar, Himalaya Publishing House.
5. Harold H. Titus: Ethics for Today
6. Maitra, S.K: Hindu Ethics
7. William Lilly: Introduction to Ethics
8. Sinha: A Manual of Ethics
9. Manu: Manu Dharma Sastra or the Institute of Manu: Comprising the Indian System of Duties: Religious and Civil(ed.) G.C. Haughton.
10. Susruta Samhita: Tr. Kaviraj Kunjanlal, Kunjalal Brishagratha, Chowkamba Sanskrit series, Vol. I, II and III, Varnasi, Vol I OO, 16-20, 21-32 and 74-77 only.

11. Caraka Samhita: Tr. Dr. Ram Karan Sarma and Vaidya Bhagavan Dash, Chowkambha Sanskrit Series office, Varanasi I,II,III Vol I PP 183-191.
12. Ethics, Theory and Contemporary Issues, Barbara Mackinnon, Wadsworth/Thomson Learning, 2001.
13. Analyzing Moral Issues, Judith A. Boss, Mayfield Publishing Company, 1999.
14. An Introduction to Applied Ethics (Ed.) John H. Piet and Ayodhya Prasad, Cosmo Publications.
15. Text book for Intermediate logic, Ethics and Human Values, board of Intermediate Education & Telugu Academic Hyderabad.
16. I.C. Sharma Ethical Philosophy of India. Nagin & co Julundhar.

SEMESTER-II

ZOO-201: CELL BIOLOGY AND IMMUNOLOGY

UNIT-1.

Organization of Prokaryotic and Eukaryotic cell.

Membrane structure – Lipid bi layer and two dimensional structure – Fluidity of lipid bilayer – Assembly of lipid bi layer – Membrane proteins.

Membrane transport: Active transport – Passive transport – Diffusion – Osmosis – Ion channels - Membrane pumps.

Vesicular traffic and Protein sorting: Translocation of proteins in to mitochondria – Endoplasmic reticulum and Golgi - Endocytosis – exocytosis.

UNIT-2.

Models of cell-cell signaling (steroid receptors, Nitric oxide and Carbon monoxide).

Functions of cell surface receptors (G-protein coupled receptors, Tyrosine kinases, cytokine receptors, receptors linked to other enzymatic activities).

Pathways of intracellular signaling transduction (c-AMP pathways, cyclic c-GMP, phospholipids and Ca²⁺, Ras, Raf and MAP kinases).

Signaling in development and differentiation (the receptors tyrosine kinase, Ras, MAP kinase pathway in Drosophila, notch signaling).

UNIT-3.

3.1. Cells of the immune system: Lymphoid cells, Mononuclear cells, granulocytic cells, Mast Cells

Organs of the immune system- primary and secondary lymphoid organs, lymphatic system

Antigens: Antigenic determinants or Epitopes, Immunogenicity, Haptens, Adjuvants

Innate (Non-specific): Anatomical barriers, Phagocytosis, Physiological barriers, inflammatory barriers.

UNIT-4.

Humoral immunity: Immunoglobulins (fine structure of immunoglobulins and Classes); the complement system, Classical and alternate pathway, Inflammation.

Cell mediated immunity: Mechanism of cell mediated immunity; brief account on Antigen Presentation, Major Histocompatibility complex

Antigen-antibody interactions: Affinity, Avidity, Cross-reactivity, precipitation reactions and Agglutination reactions and ELISA.

Brief account on immunological disorders:

- a) Tolerance to autoimmunity
- b) Transplantation
- c) Immunodeficiency diseases
- d) Immunization (active and passive immunity)

SUGGESTED READING MATERIAL:

1. An introduction to Immunology by C.Y. Rao, Narosa publishing house, 2002.
2. Cell and Molecular Biology by EDR De Robertis and EMR De Robertis Jr, Indian Edition, B.I. Publications, Pvt. Ltd.
3. Cell Biology (Fundamentals and Applications) By Gupta/ Jangir, 2001; Agrobios, India.
4. Harpers Review of Biochemistry, Murray, Granier, Mayes and Rodwell, Lange Medical Publications, 25th Ed.
5. Human Physiology by Stuart Era Fox, W.M.C. Brown Publishers, USA 1984 or Recent Edition.
6. Immunology introductory textbook by Nandini Shetty, Wiley Eastern Ltd.
7. Kubly, J. (1998) Immunology, W.H. Freeman and Company, New York.
8. Roitt, I., Brostoff, J. Male, D. (1999/2000) Immunology, 4th Edition. Harcourt Brace and Company Asia, Pvt. Ltd., Singapore.
9. The Cell (A Molecular Approach) by Geoffrey M. Cooper, 2nd Edn. 2000, ISBN.

ZOO-202: MOLECULAR BIOLOGY

UNIT-1.

Watson and Crick Model: Types of DNA; Properties of DNA (C-value paradox, Cot value)
Nuclear and mitochondrial genome, mitochondrial and maternal Inheritance
Structure of gene (Cistron, Muton, Recon, Cis-trans test)
DNA damage and repair: Biological indication of repair, photo reactivation, Excision repair, Recombination repair, SOS repair, and Mismatch repair.

UNIT-2.

Replication in Prokaryotes: Geometry of DNA replication, semi conservative replication.
Enzymology of DNA replication: DNA polymerase I, II and III; Replication of Eukaryotic Chromosomes; Eukaryotic DNA polymerases; Multiple fork; Replication of Chromatin.
Discontinuous Replication: Fragments in Replication fork and detection of fragments; Events in the Replication fork; De novo initiation and covalent extension.
Bidirectional replication, Termination of replication.

UNIT-3. Transcription and Translation:

Synthesis of RNA:- RNA Polymerase, Promoter, Auxiliary Proteins, RNA chain initiation, elongation, termination and Splicing mechanism
Types of RNA, Processing of mRNA, rRNA and tRNA, Ribozyme.
Genetic code, Identification of start and stop codon, Universality of genetic code
Degeneracy, Wobblers Hypothesis. Codon usage, Genetic code of Mitochondria.
Ribosome structure (Prokaryotic and Eukaryotic), Protein synthesis: Initiation, Elongation and Termination of polypeptide chain, Signal peptide hypothesis, Post translational modification, Polyproteins, Inhibitors of translation.

UNIT-4.

Temporal response, Induction, Repression, Lac Operon, Galactose Operon
Lambda Operon, Tryptophan Operon
Gene regulation in Eukaryotes- I: Gene families, Gene alteration (Gene loss, Gene amplification, gene rearrangement), Regulation of synthesis of primary transcripts (gene organization that affects regulation-Activator gene; Transcriptional control by hormones, Methylation).
Gene regulation in Eukaryotes-II: Brief description of Chromatin remodeling, Enhanceosome, Reporter or Chimeric genes, Role of binding motifs in gene expression (Helix-Turn-Helix motif, Zinc finger and Leucine Zipper), miRNA.

SUGGESTED READING MATERIAL:

1. Biochemistry by A.L. Lehninger
2. Cell and Molecular Biology-E.D.P. De Robertis and E.M.F.
3. Concepts in Molecular Biology-S.C. Rastogi, V.N. Sharma and Ananda Tandon (1993) Genes VII by Benjamin Lewin.
4. Harper's review of Biochemistry by D.W. Martin et al 1990
5. Molecular Biology by David Freifelder, 1993

ZOO 203P : Cell Biology and Molecular Biology ZOO 204P: Immunology and Comparative Animal Physiology

ZOO-205: COMPARATIVE ANIMAL PHYSIOLOGY

UNIT-1:

Aim and scope of physiology; General physiological functions and principles. Validity of comparative approach of physiology.

Feeding mechanisms and regulation: Nutrition, Autotrophs, Heterotrophs, Feeding Mechanisms, Digestion, Digestion in mouth, swallowing, Peristalsis, Digestion in the Stomach, Gastric secretion, Gastric juice, Regulation of Gastric secretion, Activities of Gastric Secretion, Digestion in small intestine.

Comparative physiology of digestion: Mechanical treatment, Movement of gut contents, Chemical Action: intracellular digestion, extracellular digestion, The digestive tract and its Enzyme chain; Digestive enzymes: Carbohydrases, Lipases and Esterases, Proteinases, Other Digestive enzymes, Absorption.

Coordination of Digestive activities: Visceral Autonomic system, Gastro intestinal Hormones.

UNIT-2:

Respiration and Metabolism: Types of respiration, Respiratory organs, Mechanism of Respiration.

Circulation of body fluids: Major types of body fluids, Blood, General properties of blood, Composition of blood, Blood groups and Transfusions.

Patterns on nitrogen excretion among different animal groups: Introduction, Nitrogenous Waste Products, Morphology of the excretory system in different groups of animals, Mechanism of urine formation.

Osmoregulation in different animal groups: Biological significance of water, Body compartmentation, Nature of the problem of osmoregulations in different environments, Invertebrate body fluid regulation, Vertebrate body fluid regulation.

UNIT-3.

Thermoregulation: Temperature as an environmental factor, Thermoregulation in Invertebrates, Thermoregulation in vertebrates.

Poikilothermic animals: Temperature relation in poikilotherms, Aquatic poikilotherms, Terrestrial poikilotherms, Homeothermic animals: Temperature relations of homeotherms, Physical heat regulation, Chemical heat regulation.

Hibernation & Aestivation.

Biological Rhythms.

UNIT-4:

Bioluminescence: Occurrence of bioluminescence among different animals, Mechanism of light production, Control of bioluminescence, Functions of luminescence.

Chromatophores and regulation of their function: Colour production, Chromatophore pigments, Mechanism of action of chromatophore, Movement of pigment, Control of Chromatophores, Factors influencing on chromatophore system.

Contractile elements in animals.

Muscle structure and function-correlation.

SUGGESTED READING MATERIAL:

1. C.L. Prosser. Comparative Animal Physiology. W.B. Saunders & Company.
2. C.L. Prosser. Environment and Metabolic Physiology. Wiley-Liss, New York.
3. R. Eckert. Animal physiology, Mechanism and Adaptation. W.H. Freeman & Company.
4. Schiemdt-Nielsen. Animal Physiology, Adaptation and Environment. Cambridge.
5. W.S. Hoar. General Comparative Animal Physiology.

ZOO 206: HUMAN VALUES AND PROFESSIONAL ETHICS – II **COMMON SYLLABUS FOR ALL P.G. COURSES (CBCS & NON-CBCS)** **(With effect from 2015-16)**

(effective from the batch of students admitted from the academic year 2014-15)

Value Education- Definition – relevance to present day - Concept of Human Values – Self introspection – Self esteem. Family values - Components, structure and responsibilities of family Neutralization of anger – Adjustability – Threats of family life – Status of women in family and society – Caring for needy and elderly – Time allotment for sharing ideas and concerns.

Medical ethics- Views of Charaka, Sushruta and Hippocrates on moral responsibility of medical practitioners. Code of ethics for medical and healthcare professionals. Euthanasia, Ethical obligation to animals, Ethical issues in relation to health care professionals and patients. Social justice in health care, human cloning, problems of abortion. Ethical issues in genetic engineering and Ethical issues raised by new biological technology or knowledge. Business ethics- Ethical standards of business-Immoral and illegal practices and their solutions. Characteristics of ethical problems in management, ethical theories, causes of unethical behavior, ethical abuses and work ethics.

Environmental ethics- Ethical theory, man and nature – Ecological crisis, Pest control, Pollution and waste, Climate change, Energy and population, Justice and environmental health.

Social ethics- Organ trade, Human trafficking, Human rights violation and social disparities Feminist ethics, surrogacy/pregnancy. Ethics of media- Impact of Newspapers, Television Movies and Internet.

Books for study:

1. John S Mackenjie: A manual of ethics.
2. “The Ethics of Management” by Larue Tone Hosmer, Richard D. Irwin Inc.
3. “Management Ethics – integrity at work’ by Joseph A. Petrick and John F. Quinn, Response Books: New Delhi.
4. “Ethics in management” by S.A. Sherlekar, Himalaya Publishing House.
5. Harold H. Titus: Ethics for Today
6. Maitra, S.K: Hindu Ethics
7. William Lilly: Introduction to Ethics
8. Sinha: A Manual of Ethics
9. Manu: Manu Dharma Sastra or the Institute of Manu: Comprising the Indian system of Duties: Religious and Civil(ed.) G.C. Haughton.
10. Susruta Samhita: Tr. Kaviraj Kunjanlal, Kunjalal Brishagratha, Chowkamba Sanskrit series, Vol. I, II and III, Varnasi, Vol I OO, 16-20, 21-32 and 74-77 only.
11. Caraka Samhita: Tr. Dr. Ram Kraran Sarma and Vaidya Bhagavan Dash, Chowkambha Sanskrit Series office, Varanasi I,II,III Vol I PP 183-191.
12. Ethics, Theory and Contemporary Issues, Barbara Mackinnon, Wadsworth/Thomson Learning, 2001.

13. Analyzing Moral Issues, Judith A. Boss, Mayfield Publishing Company, 1999.
14. An Introduction to Applied Ethics (Ed.) John H. Piet and Ayodhya Prasad, Cosmo Publications.
15. Text book for Intermediate logic, Ethics and Human Values, board of Intermediate Education & Telugu Academic Hyderabad.
16. I.C. Sharma Ethical Philosophy of India. Nagin & co Julundhar.

SEMESTER-III

ZOO-301: DEVELOPMENTAL BIOLOGY

UNIT-1:

Potency, commitment, specification, Induction, Competence, Determination and differentiation of embryonic cells.

Embryonic stem cells, origin and mechanism of Cell lineage, Fate maps.

Imprinting; Mutants and transgenics in analysis of development.

Genomic equivalence, cytoplasmic determinants and Nuclear transplantation experiments.

UNIT-2:

Origin and migration of germ cells; production of gametes and establishment of polarity.

Fertilization; Cell surface molecules in sperm egg recognition in animals; Molecular events of post fertilization.

Cleavage types, Blastula formation, Gastrulation and Molecular mechanism in germ layers formation.

Environmental regulation of normal development.

UNIT-3:

Axis and pattern formation in Drosophila, Amphibia and Chick.

Cell aggregation and differentiation in dictyostelium.

Organogenesis- vulva formation in caenorhabditis elegans, eye lens induction.

Development in tetrapod Limb (Amphibians) and Neural fold formation.

UNIT-4:

Sex determination in animals (mechanism of primary and secondary sex determination)

Hormonal regulation of sexual phenotypes.

Regeneration - types of Regeneration; Axial patterning during Regeneration. Metamorphosis- hormonal regulation of metamorphosis in insects and amphibians.

Ageing and senescence- Reactive oxygen species and cell senescence; dietary restriction and anti aging action; genetic control of longevity; Age related diseases.

Programmed cell death- Incidence of Apoptosis; Apoptosis during animal development;

Apoptosis in metamorphosis and morphogenesis; Apoptosis during limb development:

Biochemical and molecular mechanisms involved in Apoptosis.

SUGGESTED READING MATERIAL:

1. Austen, C.R. and Short, R.V. Reproduction in Animals
2. Ethan Bier The Coiled Spring Harlow Laboratory Press, New York
3. F.T. Longo, Fertilization, Chapman & Hall
4. Molecular Developmental Biology – 2008, T. Subramonian, Narosa Publishing House
5. R.G. Edwards, Human Reproduction
6. S.F. Gilbert, Developmental Biology, Sinauer Associates Inc., Massachusetts
7. Schatten and Schatten. Molecular Biology of Fertilization.

ZOO-302: ENVIRONMENTAL BIOLOGY

UNIT-1:

A general account on Biomes and their environments.

Fresh Water: Classification and Characteristics, eutrophication, seasonal changes.

Marine: Classification and Characteristics.

Terrestrial: Forests – Grass lands – Tundra – Desert.

UNIT-2.

Trophic dynamic view of ecosystem and energy flow.

Ecological Energetics and productivity of ecosystems.

Impact of environmental factors on Energy flow.

Bioaccumulation and Biological magnification.

UNIT-3.

Air Pollution: Criteria and standards in India, health hazards and Toxicology – Green house gases and Green House Effect.

Water Pollution: Criteria and standards in India, health hazards and toxicology.

Role of environmental epidemiological studies and health indices in evaluation of environmental health hazards: environmental epidemiological episodes in India and Abroad.

Environmental Laws; Environmental Laws in India – legislation and Execution.

UNIT-4.

Biomonitoring,.

Bio indicators and environmental monitoring, Environmental impact assessment.

Bioremediation: Need and scope of bioremediation, Environmental applications of bioremediation. Future outlook of Bioremediation: Phytoremediation, Biotechnological cleaning up of the environment by plants.

Natural calamities and disaster management.

SUGGESTED READING MATERIAL:

1. Animal Physiology - Adaptation & Environment. 4th Edition Knut Schmidt - Nielsen - Cambridge University Press.
2. Biochemical ecology and water pollution - PR Dugan, plenum press, London, 1972.
3. Biodegradation & Bioremediation - 2nd editon, Martein Alexander - Academic Press, 1999 USA.
4. Chemical and biological methods for water pollution studies R.K. Trivedy and P.K. Goel, 1984.
5. Current pollution researches in India - RK. Trivedy and P.K. Goel. Karad.
6. Ecology & Environment - P.D. Sharma, 1991.
7. Ecotechnology for pollution control and environmental management, enviromedia, Karad, RK. Trivedi.
8. Encyclopedia of environmental pollution and control, enviromedia, Karad, Vol. 1 &2, R.K Trivedi.
9. Environmental Biology and Toxicology-P.D. Sharma, Rastogi Publications, Meerut (India), 1998.
10. Environmental Physiology of desert organism. Ed.by N.F. Hadley - Dowden Huchinson and Ross, Inc.Penn.USA.
11. Environmental Science Research Volumes: Vol.1. Indicators of environmental quality - W.A. Thomas, 1972. Vol.3. Environmental pollution by pesticides - C.A. Edwards, 1974.
12. Field Biology & Ecology - Allen H Benton & E. Werner, JR, 1980.
13. Health hazards and human environment, World Health Organization (WHO) 1972.
14. Industrial Pollution - VP. Kudesia, 1990.
15. Methods in Environmental Analysis - Water soil and air by P.K. Gupta - Agrobios (India), Jodhpur, 2001
16. Pesticides in the environment - R White Stevenns, MarcelDekker Inc. New York, 1971.
17. Practical methods in Ecology & Environmental Science, RK. Trivedy, Goel, Trisal, 1997.

18. The Ecology of waste water treatment - H.A. Hawkes pergoman press, 1963.
19. Vol.5 Environmental dynamics of pesticides - R. Hague and V.H. Preed, 1975.
Water Treatment and purification technology - W.J. Ryan, Agrobios (India), Jodhpur, 2002.

ZOO 303 P : Developmental Biology and Environmental biology

ZOO 304 P : Any two generic electives

Generic Electives: ZOO-305(a): TOOLS & TECHNIQUES

UNIT-1.

Chromatography: Molecular sieve chromatography: Principle, Determination of void volume and molecular mass of native molecules. Ion exchange chromatography: Ion exchange materials – Cation and anion exchange materials. Principle and separation of charged molecules. Principle and application of TLC and HPLC.

Centrifugation. Techniques-Density gradient., ultra centrifugation.

1.3. Electrophoresis: principle, Matrices used in electrophoresis – PAGE for separation of proteins, molecular mass determination. Separation of nucleic acids using agarose gel- electrophoresis. Pulse field electrophoresis and isoelectric focusing.

1.4. Blotting techniques: western, southern and northern blotting techniques.

UNIT-2.

Introduction to cell and tissue culture: Preparatory techniques – cleaning, sterilization, sterile handling tissue culture laboratory requirements, Design of tissue culture laboratory: Equipments and purpose.

Cell types (Primary and secondary) and cell lines, Cell proliferation measurements, Cell viability testing: Dye inclusion and dye exclusion tests.

Culture media: composition, preparation and sterilization, macro and micro nutrients, Importance of serum and limitation with serum media, cell harvesting methods.

The biology of stem cell: overview; different types of stem cells – embryonic stem cells, fetal tissue stem cells, adult stem cells, stem cell nuclear transfer; somatic cell nuclear transfer, Animal cloning.

UNIT-3.

Electromagnetic spectrum of light- Simple theories of absorption of light by molecules. Beer-Lambert law.

Types of detectors: UV-Visible spectrophotometry, Infra red spectrophotometry, Fluorescent spectroscopy. Flame photometry, AAS.

Electrophysiological methods: Single neuron recording, patch-clamp recording, ECG

Brain activity recording, lesion and stimulation of brain, pharmacological testing, PET, MRI, CAT.

UNIT-4.

Microscopic techniques: Principles of microscopy Scanning and transmission microscopes.

Image processing methods in microscopy.

Different fixation and staining techniques for Light microscope and Electron microscope.

Microtomy and processing of tissues for Light microscope and Electron microscope.

Cryopreservation and cryotechniques for microscopy

Freeze-etch and freeze-fracture methods for EM.

SUGGESTED READING MATERIAL:

1. A Biologists Guide to Principles and Techniques of Practical Biochemistry, K. Wilson & K.W. Goulding, ELBS Edn.
2. Animal Cell Culture – A practical approach, Ed.John. R. W.Masters IRL Press.
3. General Zoological Microtechniques - P.M. Weesner.

- Principles and techniques of Biochemistry and molecular biology by Kein Wilson and John Walker, VII volume, Cambridge press Edition.
- Neuro anatomical Techniques, N.J. Stransfed and T.A. Miller Springer Verlag, New York Heidelberg, Berlin.
- Principles of Neuro Phychopharmacology- Robert S. Feldman, Jerrold S. Meyer and Lind F. Quenzer. Sinauer Associates, Inc. Publishers. Sunderland. Massachusetts.
- Biophysical chemisty by Upadhyay – Upadhyay - Nath.
- Analytical Biochemistry (Biochemical techniques) by Dr P. Asokan. Chinnaa publications.
- Introduction to Instrumental analysis, Robert Braun. McGraw Hill International Edition.
- Vogel's Qantitative Chemical Analysis by Vogel, ArthurI.

Generic Electives: ZOO-305 (b): ENZYMOLOGY

UNIT-1.

Historical Background, overview and specific examples, nomenclature and classification of enzymes–IUB system, chemical nature and properties of enzymes.

Enzyme specificity (Absolute specificity, Group specificity, Broad specificity).

Enzyme catalysis, Quantitative measurement of enzyme activity, Assay of enzyme activity-units of enzyme activity.

Isolation and purification of enzymes, intracellular distribution of enzymes.

UNIT-2:

Theories of enzyme kinetics - kinetic theory and collision theory.

Enzyme kinetics and its importance, derivation of Michaelis-Menton equation, Methods of Vmax and Km determination, construction of Line weaver burk plots.

Effect of reactant concentrations (Rate constant, First order, Second order and Zero order kinetic reactions, Ramachandran plot, determination of slope).

Effect of Temperature, pH and enzyme concentration on reaction rate.

UNIT-3:

Inhibition of enzyme activity (competitive, non-competitive, uncompetitive and mixed inhibition).

Kinetics of allosteric enzymes.

Regulation of enzyme activity (Metabolic regulation), Catalytic efficiency of enzymes (feed back inhibition, covalent modification).

Mechanism of enzyme action (Lock and Key, Induced fit model), catalytic site, role of metal ions.

UNIT-4:

Clinical Aspects of enzymology, Medical and Therapeutic applications of enzymes; Enzymes-Clinical diagnosis.

Immobilized enzymes, various methods of immobilization-ionic bonding, absorption, covalent bonding (based on R groups of amino acids).

Iso enzymes and multiple forms of enzymes.

Enzyme engineering–economic importance of enzyme production. Enzymes in industries-food, biotechnology and other industries.

SUGGESTED READING MATERIAL:

- Biochemical calculations. I.H. Segel, 2nd Ed., John Wiley & Sons.
- Biochemistry. D. Voet & J.G. Voet, J.Wiley & Sons.
- Enzyme Kinetics. I.W. Segil.
- Enzyme Kinetics. D.V. Roberties, Cambridge University Press.
- Harper's Biochemistry. Robert K. Murrey, Peter A. Mayer, D.K. Granner, V.W. Rodwell, Lange Medical.

Generic Electives: ZOO 305 (c): BIOINFORMATICS AND BIO STATISTICS

UNIT—1.

Scope, importance and status of Bioinformatics.

Internet basics, Tools for web search, Data retrieval tools,.

Sources of websites.

Data base types-primary, secondary and specific annotation databases

UNIT—2.

Database types, Prediction of protein structure and protein folding, Protein sequence databases.

Prediction of gene structure, Functional genomics, Genomic databases

Submission of sequence to the database, Homology, BLAST- Types of BLAST

Phylogenetic analysis, Human genome project

UNIT—3.

Definition of statistics: Biostatistics, classification, variables and attributes, Diagrammatic distribution of biological data.

Measures of location and dispersion: Arithmetic mean, median and mode. Mean deviation, quartile deviation, Standard deviation and co-efficient of variation.

Curve fitting: Fitting straight line, parabola exponential curve and geometric curve to the data.

Fitting of straight line using Ms-Excel.

Correlation and regression: Scatter diagram, types of relationship. Positive and negative correlation, computation of correlation coefficient, Interpretation of correlation coefficient.

Simple regression lines and its interpretation.

UNIT-4.

Normal probability distribution & its applications.

Tests of significance: level of significance, null and alternative hypothesis, power of test and p-value of a test.

Student t- test for one a sample and two samples means-paired t-tests.

F-test, chi square test and their application, concept of ANOVA.

SUGGESTED READING MATERIAL:

1. Basic Bioinformatics by S. Ignacimuthu, s. j. Narosa publications, 2005.
2. Bioinformatics by Andreas D. Baxevanis and B.P. Francis Ouellette, 2nd Ed., 2002.
3. Bioinformatics, Methods and Applications, Genomics proteomics and drug discovery, S.C. Rastogi, N. Mendiratla and P. Rastogi, prentice-Hall ofIndia, 2004.
4. Bioinformatics. Murthy, C.S.V. Himalaya Publishing House, Hyderabad.
5. Computers to-day by Suresh K.Basandra (1999), Published by Galgotia publications, Pvt.Ltd., New Delhi.
6. Database processing by D.M. Kroenke, Galgotia publications, 1990.
7. Introduction to Bioinformatics, S. Sundara Rajan and R. Balaji, Himalaya Publishing House, 2003.
8. Microsoft Office, by Setultz, 1997.
9. Bio-Statistics- An introductory text-Goldstein, A The Macmillan Co., New York, 1971.
10. Biostatistics by Lewis Alvin (1971) Affiliated East West Press pvt., Ltd., New Delhi.
11. Bio-Statistics- By Lewis Alvin E. Affiliated East-West press (P) Ltd., 1971.
12. Interpretation and uses of Medical Statistics – G.J. Bourke & J.Mc.Gilvaray, Blovkwell Science Publication,London, 1969.
13. Introduction to Biostatistics – By Sokal – Rohlf (2nd Edn) Freeman International Editor (1973).

14. Introduction to Biostatistics by Holdan Bancroft (1962) Pual B.Hoebar Inc., New York.
15. Introduction to Instrumental analysis, Ronert Braun. McGraw Hill Intemational edition.
16. Principles and techniques of Biochemistry and molecular biology by Kein Wilson and John Walker, VII volume, Cambridge press Edition.
17. Probit Analysis by Finney, D.J.S. Chand & Co., Ltd., New Delhi.
18. Statistical analysis in Biology by Mather, K Chapman and Hall, London, 1972.
19. Statistical methods in Biology by Bailey Norman T.J.(1965) The English Language Book Society & The English University press Ltd.,

Open Electives: ZOO: 306 (a): ECONOMIC ZOOLOGY

UNIT-1.

Definition and scope of aquaculture.

Culture of prawns-fresh post harvesting processing.

General account of Edible fresh water fishes. • Carp culture: management of ponds, processing and preservation.

Plankton as a live feed for Fisheries. • Poly culture practices.

UNIT-2.

History, scope and status of Sericulture Industry in India.

Species of silkworm, life history of mulberry silkworm and tasar silkworm(Eri0.

Silk worm diseases-

Brief idea of cocoon processing for silk fabric - cocoon boiling, reeling, rereeling, winding, doubling, twisting and weaving

UNIT-3:

Types of honey bees.

Life cycle, culture of honey bees using movable frame hive.

Methods of bee keeping, enemies of bees.

Bye products of Honey bees and its economic importance.

UNIT-4:

Lac culture – Lac insect,Laccifera lacca - Life cycle, Lac processing, Lac products and Economic Importance.

Pearl culture and Pearl Industry. Vermiculture and Composting

Economics of Poultry keeping: Morphology of different breeds of Chicken-Brooding and Rearing of Chicks-Processing of Egg, Meat and By-Products of Poultry.

Dairy farm management, Milch breeds. Draught breeds, Dual purpose breeds and New Cross breeds of Cows and Buffaloes in India.

SUGGESTED READING MATERIAL:

1. Sukla, G.S. and Upadhyay, V.B., 2000 Economic Zoology – ISBN – 81-7133-137-8 Rastogi Publications, Meerut, India.
2. Jawaid Ahsan and Subhas Prasad Sinha, 2000 A Handbook on Economic Zoology- ISBN-81-219-0876-O S. Chand & Co., Ltd., New Delhi.
3. Ashok Kumar and Prem mohan Nigam, 1991 Economic and Applied Entomology Emkay Publications, New Delhi.
4. Shammi, Q.J. and Bhatnagar, S., 2002 Applied Fisheries: ISBN-81-7754-114-5 Agrobios (India), Jodhpur – India.
5. Major Hall, C.B. 2005 Ponds and Fish culture - ISBN-81-7754-146-3 Agrobios (India), Jodhpur – India.
6. Keith Wilson, N.D.P., 2005 A Handbook of Poultry Practice – ISBN-81-7754-O-69-6 Agrobios (India), Jodhpur – India.
7. Banerjee, G.C. 1992 Poultry – III- Edition – ISBN-81-204-008-4 Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi. B.Sc. Zoology: Syllabus (CBCS) 45

8. Banerjee, 1988 A Text Book of Animal husbandry-VIII-Edition-ISBN-81-204-1260-5 Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
9. Kaushish, S.K., 2001 Trends in Livestock Research – ISBN-81-7754-112-9 Agrobios (India), Jodhpur – India.
10. Ismail, S.A. 1997. Vermiculture the Biology of Earth worm Orient Longman, India
11. A. Mary violet Christy 2008 vermy technology MJP Publ. Chennai

Open Elective: ZOO-306 B: PATHOBIOLOGY

UNIT—1.

Disease and injury (communicable and non-communicable)

Local and systematic reactions of injury

Cellular reactions to injury

Inflammation and Immunological reactions

UNIT—2.

Important human and veterinary parasites (Protozoan and helminthes)

Life cycle and biology of plasmodium, Trypanosoma, Ascaris, Schistosoma and Leishmania

Symptoms of the disease caused parasites

Host - Parasite interactions

UNIT—3.

Biology of house flies (*Musca domestica*) and mosquitoes (*Culex*, *Anaphiles*)

Arthropods as vectors of human diseases (Mosquitoes, Lice, Flies and Ticks)

Mode of transmission of pathogens by vectors

Vector Control methods- Chemical-, Physical-, Biological and Environmental control.

UNIT—4.

Biochemical and micro chemicals studies.

Changes in the blood during infection & disease

Types of anaemia, Biochemical and Microscopic changes.

Molecular basis of Hemophilia.

SUGGESTED READING MATERIAL:

1. Animal parasites, their life cycles and ecology - O. W. Olslen.
2. Clinical Haematology - Dy. L. Aksencu & A. Dranaikota, 1972.
3. Principles of Pathobiology - Lavia, Mariano F.Hill, Rolla B. Oxford University Press, London, 1975.
4. Text book of Pathology - an introduction to medicine 6th edition Philadelphia. Lea & Febiger, 1953.
5. Veterinary clinical pathology, E.H. Coles D 1967.

SEMESTER-IV

ZOO-401: NEUROBIOLOGY

UNIT-1.

Anatomical techniques: Golgi Silver stain; Cobalt chloride Back-filling; HRP method; Procion yellow staining.

Neurons and associated structures; Micro anatomy of neurons; Types of neurons and Glial cells.

Organization of the Central Nervous System (Spinal cord; Brain stem; Cerebral cortex).

Organization of the Peripheral nervous System (Sympathetic and Parasympathetic nervous system).

UNIT-2.

Electrophysiological techniques (Voltage-clamp and Patch-clamp); Bioelectrical properties of Neurons-Neuronal excitability; The resting potential membrane potential; Nernst equation; Sodium and Potassium pump; Generation of the action potential; Propagation of nerve Impulse.

Molecular mechanism of Excitation Carrier protein; Ion channels; Gating mechanisms.

Synapses: Structure and Integration; Morphology and Ultra structure of synapse; Types of Synapses; Chemical transmission; Electrical transmission.

Second messenger systems: Cyclic AMP and GMP; G-protein; IP₃; Calcium and Calmodulin.

UNIT-3.

Chemical composition of the nervous system-Cerebro Spinal Fluid-CNS Barriers-Nerve Growth Factor.

Synthesis-storage-release and inactivation mechanisms and functions of the neurotransmitters. Viz. Acetylcholine & Catecholamines (Norepinephrine, Epinephrine, Dopamine and Serotonin).

Amino acid Neurotransmitters- Excitatory amino acids (Glutamate and Aspartate); Inhibitory Amino acids (GABA and Glycine).

Peptide Neurotransmitters: Oxytocin, Vasopressin, Substance-P and Cholecystokinin.

UNIT-4.

Major drug classes-brief history-absorption-binding-tolerance-excretion physiological and Behavioral Effects of the following drugs; Opium; Stimulants (Amphetamine, Cocaine, Nicotine and Caffeine) Hypnotic and Anxiolytic drugs. (Barbiturates & Benzodiazepines); Mind altering drugs (Marijuana, LSD)

Drug abuse and treatment programs

Etiology, Pathology, Symptoms, Diagnosis and treatment strategies for the Neurological Disorders Viz. Schizophrenia, Depression; Epilepsy, Alzheimer's and Parkinson's disease.

SUGGESTED READING MATERIAL:

1. Basic Neurochemistry-G.J. Siegal, R.W. Albers, B.W. Agranoff, R. Katzman (1981) Little, Brown and company. Boston.
2. Introduction to Nervous system- T.H. Bullock, R. Cork, A. Granner (1977); W.H. Freeman & Co.
3. Mechanism of Drug Action on the Nervous System M.A.B. Brazil, R.W. Ryall. (1979), Cambridge University Press. Cambridge, London and New York.
4. Neuro anatomical Techniques, N.J. Strassler and T.A. Miller Springer Verlag, New
5. Neurobiology. Shepherd, G.M. Oxford University press, London.
6. Principles of Neural Science -E.R. Kandel and J.H. Schwartz. (1981); Elsevier North Holland. NY. Oxford.
7. Principles of Neuro Psychopharmacology- Robert S. Feldman, Jerrold S. Meyer and Lind F. Quenzer. Sinauer Associates, Inc. Publishers. Sunderland. Massachusetts.
8. The Bio Chemical basis of Neuropharmacology-J.R. Cooper, F.E. Bloom, & R.H. Roth. (1982); Oxford University Press, NY and London. York Heidelberg, Berlin, 1980.

ZOO-402: TOXICOLOGY

Unit- 1:

1.1 Introduction and scope of toxicology and classification of xenobiotics.

1.2 Principles of toxicology- Dose response relationship- Toxicity tests {acute (LD₅₀, LC₅₀, ED₅₀) and chronic toxicity tests on aquatic and terrestrial animals}, Variations in toxic response.

1.3 Mechanism of toxic action of pesticides (Receptor concept, nature of receptors, Theory of toxicants- receptors interactions and mechanism of action of some pesticides)

1.4. Toxicokinetics-

Classic toxicokinetics

- ii) Physiologic toxicokinetics

Unit- 2:

2.1 Translocation of toxicants; Absorption of Toxicants, Distribution of Toxicants, Excretion of Toxicants

2.2 Biotransformation of Xenobiotics; Biotransformation sites, Biotransformation enzymes, Biotransformation reaction and bioactivation

2.3 Bioaccumulation of Xenobiotics; Bioconcentration, Bioaccumulation and Biomagnification; Biomagnification of lipophilic and recalcitrant substances

2.4 Toxic effect of metals - Mercury, Lead, Cadmium and Arsenic

Unit- 3:

3.1 Toxic Response of Blood: Toxicology of erythron, leukon, platelets and homeostasis

3.2 Toxic Response of Liver; Mechanism and types of toxin – induced liver injury; critical factors in toxicant induced liver injury; detoxification mechanisms by liver.

3.3 Toxic Response of Kidney; Susceptibility of the kidney to toxic injury; Biochemical mechanisms / mediators of renal cell injury.

3.4 Toxic Response of Reproductive system; Endocrine disruption (including screening and puberty) in humans and mammals. Testicular and ovarian dysfunction. Deterioration in fertility by toxicants.

Unit- 4:

4.1 Xenobiotic effect on basic metabolism (Carbohydrates, Proteins, Lipids)

4.2 Teratogens and Teratology (Relationships between maternal and developmental toxicity)

Antidotal therapy; Types of antidotes and antidotal procedures.

Risk assessment – Hazard identification; Risk characterization and Safety evaluation of Chemicals.

SUGGESTED READING MATERIAL

1. Casarett & Doull's- Toxicology- The basic science of poisons- C.D. Klassen, Mary, O.D & John Doull.
2. Concepts of Toxicology Dr. Omkar, Vishal Publishing C.2003.
3. Environmental toxicology of pesticides- F. Mastimura, G.M.Boush and T.Misato.
4. Introduction of Biochemical Toxicology- E.Hodgson & F.E.Gutherie.
5. Pesticides action and metabolism- O'Brrien.
6. Pesticides and Human Welfare- D.L. Gunn and J.G.R.Stevens. Oxford University Press-1978.
7. The Encyclopedia of Americana- Vol.15.

ZOO 403 P: Neurobiology and Toxicology

ZOO 404 P : Any two generic electives

Generic Electives: ZOO-405(a): ANIMAL BIOTECHNOLOGY AND MICROBIOLOGY

UNIT-1.

1.1 General Introduction and Achievements of Biotechnology

1.2 Genetic Engineering and r-DNA technology (Restriction endonucleases, DNA ligases, Topoisomerases, Methylases, Nucleases, Polymerases, Reverse transcriptase and their Properties and functions).

1.3 Cloning vectors (plasmids, Bacteriophages, Cosmids, Yeasts Shuttle vectors, Viruses, PBR-322 and its derivatives, S.V 40 and other vectors) used in Gene cloning.

1.4 Cloning Strategies and Screening Analysis of recombinants (Single colony hybridization Technique), immunologic test, Southern blotting.

UNIT-2

2.0 Application of Biotechnology in veterinary sciences

2.1 Transgenic (Technology) animals, super bugs

2.2 Multiple ovulation in farm animals Genetic recombination in Mammalian cells and embryos production of cattle embryos in vitro; Artificial insemination, in vitro fertilization, Embryo Transfer technology

2.3 Application of Biotechnology in Medicine, Production of monoclonal antibodies (Hybridoma Technology), Production of vaccines, Production of Growth Hormone.

2.4 Gene therapy (Adenosine deaminase deficiency disease (ADA); Duchenne Muscular disease (DMD); Haemophilia; Phenyl ketonuria, alkaptonuria, Thalassaemia, etc.

UNIT-3.

History and Scope of Microbiology

Microbial nutrition, growth and their control

Normal microbial flora of Human Body- Skin, Nose, Oral cavity, Pharynx, Respiratory tract, Eye, Ear, Stomach, Intestine, Genitourinary tract.

Microbial diseases and their control

a) Bacterial diseases - Tuberculosis, Plague, Anthrax.

b) Viral diseases - Influenza, AIDS, Hepatitis.

UNIT-4.

Microbiology of fermented food: Dairy Products, Meat and Fish, Microorganisms as Sources of feed

Industrial Microbiology: Types of fermentation process, Types of fermentors, Down stream processing, Alcoholic beverages

Manufacture of various chemicals: Lactic acid, and Citric acid.

Therapeutic compounds: Antibiotics (penicillin), Industrial enzymes (Amylase,).

SUGGESTED READING MATERIAL:

1. A text book of Biotechnology-RC. Dubey.S.Chand & Company Ltd., New Delhi -1996.
2. A text book on Biotechnology-(n Ed.) H.D. Kumar. EWP - Private Ltd., New Delhi -1998.
3. Animal Biotechnology-M.M. Ranga, Agrobios (India), 2000.
4. Biotechnology-Fundamentals & Applications-S.S .Purohit & S.K. Mathur, Agro Botonics-1999.
5. Biotechnology-V. Kumaresan. Saras Publication-1994.
6. C.M. Presscotts, J.P. Harley & D.AKlein Mc Graw Hill. WCB Publication 4th Edition.
7. Elements of Micro biology, by MJ. Pelzar, Jr & E.C.S Chan International students Edition, 1981, MCGRA WHill international Book Company, New Delhi. Microbiology
8. General Microbiology by C.B. Powar & H.F. Dagainawala 1st Edition, Himalaya Publishing House, Bombay, 1982.
9. Text Book of Microbiology, by R Aananthnarayan &C.K. Jayaram Panikar, 4th Edition, Orient Longmen, Hyderabad, 1990.

Generic Electives: ZOO – 405 (b): ANIMAL BEHAVIOUR AND WILD LIFE BIOLOGY

UNIT-1

Habitat selection-food selection; Optimal foraging theory, Antipredator defenses.

Parental care in Fishes, Amphibians, Reptiles, Birds and Mammals.

Homing and territoriality; bird migration; orientation and navigation.

Social organization; Insects and Primates

UNIT-2

Conditioning Learning: Classical conditioning: Laws of classical condition, Extinction, Discrimination; Operant conditioning: Skinners Experiment, Measures of Operant Strength, Partial Reinforcement, Reinforcement Schedules, Shaping behavior.

Cognitive Learning: Reasoning, Physiology of Reasoning, Insight learning, Sign learning, Latent Learning.

Neural basis of memory and theories and memory: Kinds of remembering redintegrative Memory, Recall, Recognition, Types of memory phenomenon, Organisation of semantic Memory, Two process Theory of memory: Long-term and Short-term memory.

The nature of forgetting and improving memory: Decay through discuse, Inference effect, Proactive Inhibition, motivated forgetting, chemical process of memory.

UNIT- 3:

Importance of wild life conservation – Values of biodiversity - Modes of conservation.

Threats of biodiversity changes in habitat- hunting- pollution etc

Types of Biodiversity: Genetic biodiversity- species biodiversity- Domesticated Biodiversity- In-situ and Ex-situ conservation.

Seshachalam Biosphere reserve – Sanctuaries and National parks in Andhra Pradesh-World heritage sites.

Study of signs and symptoms: Recording basic field observations, Foot prints, types of tracks, animal droppings etc.

UNIT- 4:

Remote sensing and GIS usage for conservation and case studies(Slender loris, Golden geckos) - Role of Government and non Government agencies in wild life management

Environmental impact assessment and methods of EIA in conservation

Human and animal conflicts and remedial measures

Environmental pollution- Global environmental change - Biodiversity management - Wild life policy and legislation

SUGGESTED READING MATERIAL:

1. Alcock, J. Animal behaviour: An evolutionary approach. Sinauer Assoc., Sunderland, Mass. USA.
2. An introduction to genetic analysis. Griffiths, A.J .F., J.B. Miller, D.T. Suzuki, R.C. Lewontin & W.M. Gelbark, W.H. Freeman and Company, New York.
3. Bradbury, IW. and S.L.Vehrencamp. Principles of animal communication. Sinauer Assoc. Sunderland, Mass. USA.
4. Clutton-Brock, T.H. the evolution of parental care. Princeton Univ. Press, Princeton,USA.
5. Hosetti, B.B.Venkateswarlu, M. Trends in Wild life Biodiversity Conservation and Management.
6. K.C. Agarwal, Biodiversity (1998).
7. Kumar & Asija., Biodiversity Principles & Conservation, Published by Upadesh Purohit by Agrobios (India), Jodhpur, 2002.
8. M.Shamin Jairajpuri, Biological Diversity and Environment-CBS Publishers and Distributors, New Delhi, 1996.
9. T.I. Khan, YS. Shishodia, Biodiversity Conservation and Sustainable Development.
10. Wild life in India-V.V.Saharia, 1982, Natraco Pub., Dehradun.

Generic Electives: ZOO-405 (c) ENDOCRINOLOGY

Unit 1:

Classification of hormones. Brief account of structural features of endocrine glands. Hormonal effects and regulation – basic concepts and methods

Biosynthesis and secretion of pituitary. Factors influencing secretion. Endocrine disorders - brief description

Biosynthesis and secretion of pancreas, adrenal, and thyroid hormones. Factors influencing secretion.

Biosynthesis and secretion of sex steroid hormones. Factors influencing secretion.

Unit 2:

Peptide hormones, Steroid hormones. Hormones as messengers. Cell surface receptors. Cascade of reaction linked to signal transduction.

Evolution of pituitary gland; Physiological actions of pituitary hormones. Urophysis and action of its hormone(s). Pancreatic hormones and glucose homeostasis.

Evolution of discrete adrenal gland; Synthesis of corticosteroid, structural diversity of glucocorticoids among vertebrates.

Sex steroids. Cytoplasmic and nuclear receptors. Mechanism of action of steroid hormones. Prostaglandins. Calcium-magnesium-protein Kinase. Hormones and eukaryotic metabolic regulation

Unit 3:

Evolution of thyroid gland.

Thyroid hormone synthesis and its regulation, paradigms of thyroid hormone action in poikilotherms and homeotherms.

A comparative account of parathyroid gland and ultimobranchial body/C cells, synthesis of parathyroid hormone, calcitonin and of vitamin D₃;

Hormonal regulation of calcium and phosphate homeostasis.

Unit 4:

Hormones, growth and development and reproduction

Hormones regulating reproduction

Hormones and human health

Production of hormones as Pharmaceuticals-Insulin, GH and Prolactin.

SUGGESTED READING MATERIAL:

1. Barrington. E.J.W. General and comparative Endocrinology Cambridge Press, Oxford.
2. Bentley, P.J. Comparative Vertebrate Endocrinology, Cambridge Press, Oxford.
3. Martin, C.R. Endocrine Physiology. Oxford Univ. Press, Oxford.
4. Prakash S. Lohar. Endocrinology-Hormones and human health-2005. MJP Publishers-Chennai.
5. Williams, R.H. Text Book of Endocrinology, W.B. Saunders Co., Philadelphia.

Open Elective: ZOO 406(a): GENETIC ENGINEERING**UNIT - 1:**

Enzymes used for the synthesis of DNA: DNA Polymerase I, Klenow fragment, Sequenase, Taq Polymerase, Reverse transcriptase, Terminal Transferase

Enzymes used for the synthesis of RNA: T₃ and T₇ RNA polymerases, SP6 RNA polymerase
Restriction enzymes - Outlines of bacterial restriction and modification systems – Classification of restriction enzymes - Type II restriction enzyme: Nomenclature, Production of DNA fragments with 3' protruding ends and blunt ends and their significance in molecular cloning - RFLP and its significance.

Enzymes used for ligation and modification of DNA: DNA ligase, Methylases, Kinase, Phosphatase

UNIT - 2:

Vectors for construction of genomic libraries - cosmids, bacterial artificial chromosomes (BACs), yeast artificial chromosomes (YACs) - vectors for construction of cDNA libraries - lamda ZAP. Multipurpose vectors - pUC 18/19, Blue script vectors

Expression vectors – structure - promoters used in expression vectors - lac, tac, λ pL, T₇ promoters and their significance in constructing expression vectors.

Promoter-probe vectors – Structure promoter probe vector - Reporter genes (lacZ, gfp, gus, luciferase) and strategies used to assay promoter activity.

Vectors used for cloning in to mammalian cells - SV40 Vectors

UNIT – 3:

Isolation of gene/DNA fragments. Mechanical shearing, restriction digestion, cDNA synthesis, PCR amplification and chemical synthesis of gene.

cDNA synthesis - Mechanism of cDNA synthesis, Strategies used to obtain full length cDNA. 5' and 3' RACE.

PCR - Concept and technology- Properties of primers - Inverse, multiplex PCR, RAPD and its significance. Real time PCR.

Chemical synthesis - Designing gene from amino acid sequence, solid phase synthesis of oligonucleotides - In vitro synthesis of gene.

UNIT - 4:

Ligation between cohesive and blunt end DNA fragments - T4 DNA ligase - Conversion of blunt end DNA fragment into cohesive ended DNA - linkers, adapters, homopolymer tailing.

Introduction of cloned genes into host - Transformation, conjugation, transduction, electroporation, particle bombardment, microinjection, liposome mediated DNA delivery.

Identification and characterization of cloned genes - Screening of genomic/cDNA libraries - genetic, molecular hybridization - immunochemical techniques

Expression of cloned genes – detection of expressed proteins – biological and molecular methods

SUGGESTED READING MATERIAL:

1. Biotech's Dictionary of Genetic Engineering by Dinesh Arora.
2. D. Green; Philip Hiltner Richard M. Myers Sue. Klapholz; Harold Riethman Jane Roskams.
3. DNA cloning: Mammalian systems - A Practical Approach by D.M. Glover, B. D. Hames.
4. From Genes to clones Introduction to Gene technology by Ernst-L- Winnacker.
5. Genetic disorders of Man by M.R. Goodman.
6. Genetic Engineering and its Applications by P. Joshi
7. Genetics - Monrve W. Strickberger. 3rd Ed., May, 2000.
8. Genetics-K.B.Alluwallia-1985.
9. Genome Alalysis - A laboratory Manual Volume-2 Detecting Genes by Bruce. Birren; Eric D.
10. Genome analysis - A laboratory manual volume-3 cloning systems by Bruce. Birren; Eric D. Green; Sue. Klapholz; Richard M. Myers & Harold Riethman Jane Roskams.
11. Genome Analysis - A laoboratory manual Voulume-4 Mapping Genomes by Bruce. Birren; Eric.
12. Green; Sue. Klapholz; Richard M. Myers Jane Roskam.
13. Molecular Biology of genes- Watson, J.D., N.H. Hopkins, J.W. Roberts, J.A. Steitz &A.M. Weiner. The Benjamin Cummings publishing company. Inc. Tokyo.
14. Molecular cloning by Sambrook.

Open elective ZOO 406 (b): STRUCTURAL BIOLOGY

UNIT-1.

Interaction in biology systems.

Structure of Biomolecules and confirmations of protein and nucleic acids.

Secondary, tertiary and quaternary structure of protein.

Primary and secondary structure of RNA and DNA

UNIT-2.

Conformational analysis and prediction of conformation.

Thermodynamics and kinetics of conformational transition of Proteins.

Protein folding, techniques for studying Macromolecular Structure.

Ultra centrifugation Sedimentation velocity and equilibrium- determination of molecular weights.

UNIT- 3.

Structural implications of the peptide bond; rigid planar peptide UNIT; cis and trans configuration; conformations of a pair of linked peptide UNITS;

Torsion angles phi and psi - steric hindrance; hardsphere approximation; allowed and disallowed conformations; Ramachandran Diagram; conformational maps for glycine and other natural amino acids; conformationally constrained amino acids and their importance.

Symmetry, space group crystal lattices, bragg's law in real & reciprocal space.

Nuclear Magnetic Resonance

UNIT-4.

Crystallography: External features and symmetry – UNIT-cell and Miller indices –

Detection and properties of X-rays-choice of radiation, synchrotron radiation Powder photographs – interpretation of powder photograph – ASTM index.

Theory of diffraction by helical structures and application to alpha-helix and DNA.

Structure Determination of Proteins by X-ray Crystallography: phasing: molecular replacement, MIR SAD/MAD. Light scattering studies of Globular macromolecules

SUGGESTED READING MATERIAL:

1. Biophysical Chemistry by Cantor & P. Schimmel. Vol. I & II
2. Physical Biochemistry by David Freifelder
3. Protein: Structure 7 molecular Properties by TE Creighton
4. Crystallography made crystal clear, Author: Gale Rhodes; Publisher: Academic Press
5. Introduction to Protein Structure By Carl Branden & John Tooze
6. Protein Structure New approaches to disease and therapy By Max Perutz

Model Question Paper:

M.Sc DEGREE EXAMINATION

Branch-ZOOLOGY

FIRST SEMESTER

ZOO-101: Title of Paper

Time : 3Hours

Max.Marks: 80

SECTION- A

Answer any FOUR questions. Each question carry 5 marks (4 x 5=20).

Two questions must be given from each unit.

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.

SECTION- B

Answer ALL questions. Each question carries 15marks (4 x 15=60).

Two questions must be given from each unit.

9. A)
- (or)
9. (B)
10. A)
- (or)
10. (B)
11. A)
- (or)
11. (B)
12. A)
- (or)
12. (B)