

**VIJAYANAGARA SRI KRISHNADEVARAYA UNIVERSITY,
BALLARI**



SYLLABUS

Department of Studies in Zoology

MASTER OF SCIENCE

(I to IV Semester)

Choice Based Credit System

With effect from 2019 - 20

**VIJAYANAGARA SRI KRISHNADEVARAYA UNIVERSITY,
BALLARI**



SYLLABUS

FOR

MASTER OF SCIENCE

With effect from 2019-20

MASTER OF SCIENCE IN ZOOLOGY

COURSE OF VSK UNIVERSITY



VIJAYANAGARA SRI KRISHNADEVARAYA UNIVERSITY, BELLARY

Post Graduate Department of studies in Zoology

(2019-20)

Credit Based, Choice Based Credit System, Continuous Assessment Patterned Semester Scheme.

The Board has framed and approved the Syllabus / Scheme of examination of Choice Based Credit System (CBCS) and recommended for implementation of I & III semester papers from 2019-20, II and IV semester papers from 2020-21. The following are the core papers and scheme of examination proposed by the Board.

1. M.Sc., Degree in Zoology I & II Semester
2. M.Sc., Degree in Zoology III and IV Semester.

The pattern of matrix for two year Master's Degree Program in Zoology shall be as follows.

N o	COURSES	I SEM			II SEM			III SEM			IV SEM			TOTAL		
		C	P	M	C	P	M	C	P	M	C	P	M	C	P	M
1.	HARD CORE (Theory)	12	3	300	8	2	200	8	2	200	8	2	200	36	9	900
2	HARD CORE (Practicals)	6	3	150	4	2	100	4	2	100	4	2	100	18	9	450
3.	SOFT CORE (th)	4	1	100	4	1	100	4	1	100	4	1	100	16	4	400
4.	SOFT CORE (pr)	2	1	50	2	1	50	2	1	50	2	1	50	08	4	200
5.	OPEN ELECTIVE	-	-	-	4*	1	100	4*	1	100	-	-	-	08	2	200
6.	HARD CORE (PROJECT)	-	-	-							6	1	150	06	1	150
	TOTAL	24	8	600	22	7	550	22	7	550	24	7	600	92	29	2300

*The M.Sc. Zoology students have to choose open elective papers from other courses/programs



M. Sc Zoology syllabus

I Semester

Course code	Title of the paper	Credits	Teaching hours/wk	Duration of examination theory/practical hours	Max. marks at semester end examination	Max. marks at internal examination	Total Max. Marks
ZOT-HCT.1.1	Animal Systematics	04	04	03	70	30	100
ZOT-HCT.1.2	Biology of Non-Chordates	04	04	03	70	30	100
ZOT-HCT-1.3	Cell and Molecular Biology	04	04	03	70	30	100
ZOT-SCT.1.4	Aquatic Biology	04	04	03	70	30	100
ZOT-HCP.1.5	Practical based on 1.1	02	04	04	35	15	50
ZOT-HCP.1.6	Practical based on 1.2	02	04	04	35	15	50
ZOT-HCP.1.7	Practical based on 1.3	02	04	04	35	15	50
ZOT-HCP.1.8	Practical based on 1.1	02	04	04	35	15	50

IV Semester

Course code	Title of the paper	Credits	Teaching hours/week	Duration of examination theory/practical hours	Max. marks at semester end examination	Max. marks at internal examination	Total Max. Marks
ZOT: HCT. 4.1	Biodiversity	04	04	03	70	30	100
ZOT: HCT. 4.2	Animal Behaviour	04	04	03	70	30	100
ZOT: HCMP . 4.3	Project	04	04	03	70	30	100
ZOT: SCT. 4.4	:(I):Endocrinology Or (II):Parasitology	04	04	03	70	30	100
ZOT: SCP. 4.5	Practical based on 4.1	02	04	04	35	15	50
ZOT: HCP. 4.6	Practical based on 4.2	02	04	04	35	15	50
ZOT: HCP. 4.7	Presentation, Colloquium & Viva	02	04	04	35	15	50
ZOT: SCP. 4.8	Practical based on 4.4	02	04	04	35	15	50

HCT= Hard core theory, HCP= Hard core Practical, SCT= Soft core theory, SCP= Soft core practical, HCMP= Hard Core Major Project

M Sc, ZOOLOGY I SEMESTER (CBCS)

ZOT-HCT.1.1 Animal Systematics

56 HOURS

Code :ZOT-1.1

Univ Code :

Contact Hours : 56

Work load : 4 hours per week

Credit Points : 4

Evaluation: Continues Internal Assessment - 30 marks
Semester and Examination - 70 marks

Unit -I:

14 hours

Introduction to Science of taxonomy, Principles of taxonomy, History of biological Classification, Taxonomy as Science and Profession.

Theories of biological classification. Species concepts. Hierarchy of Categories and Higher taxa.

Unit -II

14 hours

(a) Taxonomic Procedures: taxonomic collections, preservation, enrating, cataloging identification.

(b) Taxonomic characters; Procedure of classification.

(c) International Code of Zoological Nomenclature (ICZN); Interpretation of Rules of Nomenclature (in Brief).

Unit – III:

14 hours

(a) General characters and classification of invertebrate phyla (Protozoa to Echinodermata).

(b) General characters and classification of Minor phyla

Unit –IV

14 hours

(a) Phylogenetic interrelationship between major invertebrate phyla.

(b) Phylogenetic interrelationship between Protochordates and chordates.

(c) General characters and classification of Protochordata

(d) General characters and classification of Chordata

References:

1. Ernest Mayr. 1997. Principles of systematic Zoology. Tata-McGraw-Hill, New Delhi.428 pp.
2. Simpson, G.G.1961. Principles of animal Taxonomy. Columbia University Press, new York.247 pp.
3. Barnes, R.D.1968. Invertebrate Zoology.IIEd. Saunders, Philadelphia.
4. Barrington, E.J.W.1967. Invertebrate Structure and Function, Nelson, London.

ZOT: HCT-1.2- BIOLOGY OF NON-CHORDATES

56 hours

Unit-I Locomotion

14 hours

Principles of hydrostatic movements, Amoeboid and flagellar movements and Locomotion in Arthropods

Unit-II Nutrition and Digestion

14 hours

Food and feeding habits of non-chordates, Filter feeding in Polychaeta, Mollusca and Echinodermata, Symbiotic nutrition

Unit-III Respiration and Excretion

14 hours

Organs of respiration: Gills, trachea and Lungs, Respiratory pigments, Mechanisms of respiration, Organs of excretion- Coelomoducts, Nephridia, malphigian tubules, Coxal glands and mechanism of excretion

Unit-IV Nervous system and Reproduction

14 hours

Primitive nervous system: Coelenterata and Echinodermata, Advanced nervous system: Annelida, Arthropoda (Crustacea and Insecta) and Mollusca (Cephalopod), Sense organs and their importance

Reproduction

Patterns of reproduction in invertebrates, Larval forms of free living, Larval forms of Parasites

References:

1. Barrington. E J W. 1967. Invertebrate structure and function, Nelson, London.
2. Barnes, R. D 1968. Invertebrate Zoology, 2nd Ed. Saunders, Philadelphia.
3. Hyman L H. 1940-67. The Invertebrates, Vol. I-VI. McGraw-Hill, New York.
4. Russell-hunter. W D. 1968. Biology of lower invertebrates, Macmillan Company, New York.
5. Marshall, A.J and Williams, W D (Eds). 1995. Text book of Zoology-Invertebrates. VII Ed., Vol. I, A.L.T.B.S. Publishers.

ZOT: HCT 1.3: CELL AND MOLECULAR BIOLOGY

56 hrs.

Unit-I

14 hours

Structure of eukaryotic chromatin. Chromosomal condensation during mitosis. Heterochromatin, Chromosomal nomenclature: Chromatid, Centromere, Kinetophore, Telomere, Telomerase, Satellite, Secondary constriction, Nucleolar Organizer. Biomembranes: Molecular organization, Transport across cell membrane, Cell to cell communication and recognition. Modifications of membranes: Gap junctions and tight junctions, Membrane receptors, ion channels and gated channels.

Unit_ II

14 hours

Molecular organization and functions of membrane orgnaelles: Endoplasmic Reticulum, Microsomes, Golgi Complex, Lysosomes, Peroxisomes, Mitochondria and Chloroplast. Molecular organization and function of cytoskeletal structures: microfilaments, microtubules, cilia and flagella. Cell cycle: Molecular events during different stages of cell cycle - cyclines and cyclin dependent kinases. Regulation of CDK cyclin activity.

Unit-III

14 hours

The central dogma of molecular biology. Proteins, Nucleic acid: A pentose, Phosphate and four Bases, Nucleotides, double helix formation. Structure of single and double stranded RNA. DNA Replication: Semi conservation of double stranded DNA, DNA polymerases and Ligases, Events in replication fork formation, Discontinuous replication, Leading strand and Okazaki fragments Circular DNA and its replication. Transcription: Prokaryotic transcription. RNA polymerases. Transcription signals. Classes of RNA molecules-messenger, soluble, ribosomal and transfer. Transcription in Eukaryotes. Means of studying intracellular RNA- 5-cap formation, 5-end processing, polyadenylation, splicing, editing and nuclear export.

Unit-IV

14 hours

Translation: The genetic code, Transfer RNA and aminoacyl synthetases. Initiation, Elongation, Temnination and transfer factors, The Wobble hypothesis, Polycistronic mRNA, overlapping genes. Regulation of gene activity: Principles of regulation in *E. coli* lactose system and Operon model. Tryptophan Operon. Auto regulation and feedback initiation. DNA recombination and repair: Alteration of DNA molecules. Repair of incorrect bases. Repair of thymine dimers. Isolation, Characterization and joining of DNA molecules, Genetic transposition. Immunology as a tool in biology and medicine

References:

1. Alberts, B., Bray Dennis, Lewis Julian, Raff Martin, Roberts. K and Watson, J.D. **Molecular Biology of the Cell**. Garland Publishing Inc. New York, 1994.
2. Cellis, J.E. **Cell Biology: a Laboratory Handbook** Vol. I and II. Academic Press, 1998.
3. Lodish, H., Berk, A., Zipuosky, L.S., Matsudaira, P., Baltimore, D & Darnell, J. **Molecular Cell Biology** IV Ed. W.H. Freeman & Co. 2001.
4. Malacinski, G.M & Freifelder, D. **Essentials of Molecular Biology** III Ed. Jones & Bartlett Publishers, 1998.
5. Atherly. A.G., Girten, J.R and Mcdonald, J.F. **The Science of Genetics**. Saunders college, 1999.
6. Gardner, E.J., Simmons, M.J and Snustad, D.P. **Genetics** III Ed. John Willy & Sons, New York, 1990.
7. Stickberger, N.W. **Genetics**. MacMillan Publishing Co. New York, 1985.
8. Watson, J.D et al., **Recombinant DNA**. W.H. Freeman & Co, 1992.
9. Trevor, B.B and Julian Burke. **Gene structure and transcription**. Oxford Univ Press, 1998.
10. Benjamin Lewin. **Genes** Vols I-IV. Oxford Univ Press, 1995.

ZOT: SCT-1.4- (I) COMPUTER APPLICATIONS AND METHODS IN BIOLOGY 56

hours

Unit-I

14 hours

Computer hardware and soft wares. General maintenance of computer systems. Operating systems. Programming languages. Bioinformatics. Computers assisted teaching (CAT) and labs: Integrations ICT in teaching learning, virtual learning resources. Computer simulation of physiological processes. Molecular modeling, Image analysis. Computer interfacing with equipments, microscopes. Scanning and micrometric analysis. Biotelemetry. Data processing and plotting, Excel, presentations and drawings. Power point and word processors. Corel Draw.

Unit-II

14 hours

Networking. Access to Internet: dialup, leased line, cable and *wifi* connections. Internet browsers, search engines and information retrieval. Cloud computing. Microscopy: Light, phase contrast, dark - field fluorescence. Electron microscopy - transmission and scanning. Histological and histochemical staining techniques.

Unit-III

14 hours

Cell and tissue culture: types of culture, cell lines and culture media. Contact inhibition of Growth. Immuno-fluorescence and vital stains. Separation techniques and instrumentation: Chromatography and gel filtration. Electrophoresis and electro-focusing. Cell fractionation, gradient centrifugation and subcellular fractions. Spectroscopy- UV and visible, Raman and atomic absorption. Cytophotometry, Flow cytofluorimetry- Cell sorting.

Unit-IV

14 hours

Radioisotopes and tracer techniques: Definition and properties of radioisotopes. Units of measurement of radioactivity. Autoradiography and its utility. Radioimmunoassays, radiometric enzyme assays. Liquid scintillation counters.

Care and handling of laboratory animals. Committee for the purpose of control and supervision of experiments on animals (CPCSEA). Alternatives for use of animals for laboratory experiments to prevent vivisection..

Writing of science report/paper. Bibliography. Citations index and impact factors. Microphotography, micrometry and field photography. Biostatistics: Mean, standard deviation/error, t-test, analysis of variance (ANOVA) and significance value. `

References:

1. Young, S. S. Computerized data acquisition & Analysis for life Sciences: A Hands-on guide. Cambridge University Press, 2001.
2. Snedecor ,G.W and Cochran, W.G. Statistical Methods. Ed VI. Oxford and IBH Publishing co, New Delhi, 1967.
3. Higgins, D & Taylor, W (Eds). Bioinformatics Sequence, Structure. Chapman & Hall, 1995.
4. Bailey, N.T.J. Statistical Methods in Biology-III Ed. Cambridge University Press, 1995.
5. John, R.W.M. Ed. Animal Cell Culture- A practical approach. IRL Press.
6. Robert Brown. Introduction to instrumental analysis. McGraw Hill International Editions.
7. Wilson, K & Goulding, K.H. A Biologists Guide to Principles and Techniques of Practical Biochemistry. ELBS Ed.

ZOT: SCT-1.4- (II) AQUATIC BIOLOGY

56 hours

Unit-I:

14 hours

Introduction to Aquatic Biology and Concepts

Physical Characteristics of Water: light, temperature,Electrical Conductivity, turbidity, density, pressure

Chemical properties of water: Hydrogen-ion-concentration Dissolved oxygen, free carbondioxide, total alkalinity, yotal hardness,chloride, sulphate, nitrate-nitrite, phosphatephosphorus,BOD, COD,NOD

Unit-II

14 hours

Rivers and Lakes: origins and morphometry, thermal stratification

Biological communities of lakes and rivers: Phytoplankton, periphyton, Zooplankton, benthos, microphytes, insects, mollusca, amphibians, fish and birds

Unit-III

14 hours

The Dynamics of ecosystem: The components, abiotic substances, producers, consumers, decomposers, transformers, productions rates, energy flow structure and ecological pyramids. Aquatic pollution monitoring and control.

Unit-IV

14 hours

Benthic communities and Detritus: Organic carbon cycling and Ecosystem metabolism.

Lowland rivers, flood plains and wetlands

Conservation and management of aquatic ecosystem

References:

1. Tonapi, G.T. (1980): Freshwater animals of India. Oxford and IBH Publishing Company, New Delhi, India.
2. Blakey, D.R.and Hrusa, D.C. (1989): Inland Aquaculture development handbook. Fishing News Books Great Britain.
3. Jhingran.V.G. (1985): Fish and Fisheries of Indian Hindustan Publishing Co, New Delhi.
4. Pillay, T.V.R. (1990): Aquaculture Principles and Practices, Fishing News Books, Oxfo

Practicals

ZOT- HCP. 1.5 Practical based on 1.1

ZOT-HCP.1.6 Practical based on 1.2

ZOT-HCP.1.7 Practical based on 1.3

ZOT-HCP.1.8 Practical based on 1.4

M Sc, ZOOLOGY II SEMESTER (CBCS)

ZOT HCT-2.1- (I) BIOLOGY OF CHORDATES

56 hours

Code :ZOT-2.1
Contact Hours : 56
Credit Points : 4

Univ Code :
Work load :4 hours per week

Evaluation: Continues Internal Assessment - 30 marks
Semester and Examination - 70 marks

Unit-I **14 hours**

Origin and systematic position

Origin of chordate in the light of recent theories, Protochordata: Life cycles of Salpa, Doliolum and Amphioxus, Significance of retrogressive metamorphosis

Origin and evolution

Agnatha, Placoderms and Chondrichthyes, Systemic position of Holocephali
Osteichthyes: Lateral line system, Migration in fishes

Unit II **14 hours**

Amphibia

Origin and evolution, Breeding behaviour and parental care of living Amphibia,
Neoteny Adaptive radiation

Reptilia

Origin and Evolution of temporal acrales and fossae, Extinct reptiles, Adaptive radiation
in living reptiles, Poisonous and non-poisonous snakes in India.

Unit III **14 hours**

Aves

Aerial adaptations and mechanism of flight, Courtship and breeding behaviour, migration.
Birds and human welfare, Aquatic Birds.

Unit IV 14 hours Mammalia

Origin and evolution of mammals. Adaptive radiation in Marsupials. Aquatic mammals.
Origin and evolution of mammalian ear ossicles.

References:

1. Marshall, A.J and Williams. W.D (Ed). Textbook of Zoology: Vertebrates-VII Ed. Vol. II. AITBS Publishers and distributors, 1995.
2. Young, J.Z. The Life of Vertebrates, III rd Ed Clarendon Press Oxford,1981.
3. William N McFarland, F and Harvey Pough Tom.J.C and Heiser, J.B. Vertebrate Life. Collier-Macmillan Publishers, London, 1979.
3. Romer, W.B. The Vertebrate Body. Saunders, Philadelphia, 1956.

Unit-I**14 hours**

Introduction: Overview of animal development. The questions of Developmental Biology. Anatomical approach to Developmental Biology. Experimental approach to Developmental biology.

Genes and Development: Embryological origin of gene theory. Evidence for genomic equivalence. Nucleo-cytoplasmic interactions in *Acetabularia* and in frog during early development. Nuclear-transplantation experiments in frog. Cloning in mammals and the Stem cell research and regenerative medicine.

Unit-II**14 hours**

Early embryonic development: Fertilization- structure of gametes, cellular and biochemical processes during early fertilization. Strategies for monospermy and conservation of species specificity. Acrosome reaction and egg activation. Cleavage and blastulation in *Drosophila*, *Amphioxius*, frog, chick and mouse (till blastocyst).

Gastrulation in frog, chick. Presumptive areas and fate maps.

Early development in *Drosophila*: Larva. Origin of anterior & posterior polarity, maternal effects of genes. Segmental genes, homeotic selector genes. Generation of dorso-ventral polarity.

Unit-III**14 hours**

Early development in sea urchin egg: Experimental analysis of early development, biochemical and physiological gradients.

Axis formation in Amphibians: The progressive determination of amphibian axis, primary embryonic induction. Function of organizer-Diffusible proteins of organizer. Regional specificity of induction.

Organogenesis: Development of somites and differential cell proliferation in shaping organ primordia. Differentiation of neural tube - anterior posterior axis, dorsoventral axis, Differentiation of vertebrate lens.

Unit-IV**14 Hours**

Post-embryonic and abnormal development: Regeneration in animals with reference to Hydra, Planeria and Salamander limb. Metamorphosis in Amphibia- morphological, biochemical changes and hormonal control of metamorphosis. Teratology-causation of abnormal development, experimental studies and teratogens. Ageing-consequences and causes of ageing. Control of ageing by genes.

References:

1. Gilbert, S.F. Developmental Biology IV ED. Sinauer Associates Inc. Publishers, Massachusetts, 2000.
2. Kalthoff. K. Analysis of Biological Development. McGraw Hill Inc. New York, 1996.
3. Rao, K. V. Developmental Biology: A Modern Synthesis. Oxford & IBH Publishing co. Pvt. Ltd, 1993.
4. Subramanian, T. Developmental Biology, Narosa Publishing House, 2002.
5. Twyman, R .M. Instant Notes. Developmental Biology. Bios Scientific Publishers Ltd, 2001.
6. Wolpert, L., Beddington, R., Brocks, J., Jessel, T., Lawrence, P and Meyerwitz, E. Principles of Development. Oxford Univesity Press, 1998.

Unit-I **14 hours**

History and scope of molecular genetics. Identification of DNA as genetic material.

Properties, storage and transmission of genetic information.

DNA Replication: Semi conservation of double stranded DNA. DNA polymerases and ligases. Events in replication fork. Discontinuous replication. Leading strand. Circular DNA and its replication.

Unit-II **14 hours**

Transcription: Prokaryotic transcription. RNA polymerases. Transcription signals. Classes of RNA molecules-messenger, soluble, ribosomal and transfer. Transcription in Eukaryotes.

Means of studying intracellular RNA- 5-cap formation, 5-end processing, polyadenylation, splicing, editing and nuclear export.

Translation: The genetic code. Transfer RNA and aminoacyl synthetases. Initiation.

Elongation and transfer factors. The Wobble hypothesis. Polycistronic mRNA.

Overlapping genes. Ribosomes.

Unit-III **14 hours**

Regulation of gene activity: Principles of regulation. *E. coli* lactose system and Operon model. Tryptophane Operon. Auto regulation and feedback initiation.

Mutation: Types of mutations. Biochemical bases of mutations. Mutagenesis-base analogue mutation, ultraviolet irradiation, mutagenesis, intercalating substances and transposable elements.

Unit-IV **14 hours**

Bacteriophages: Stages in the lytic cycles of typical phage. Specific phages. *E. coli* Phage T4, *E. coli* Phage T7, *E. coli* Phage λ XT4, *E. coli* Phage λ . Lytic cycle. The transgenic life cycle. DNA recombination and repair: Alteration of DNA molecules. Repair of incorrect bases. Repair of thymine dimers. Recombination repair. Isolation. Characterization and joining of DNA molecules. Genetic transposition.

References:

1. Atherly, A.G., Girten, J.R and McDonald, J.F. The Science of Genetics. Saunders college, 1999.
2. Gardner, E.J., Simmons, M.J and Snustad, D.P. Genetics III Ed. John Willy & Sons, New York, 1990.
3. Stickberger, N.W. Genetics. MacMillan Publishing Co. New York, 1985.
4. Watson, J.D et al., Recombinant DNA. W.H. Freeman & Co, 1992.
5. Trevor, B.B and Julian Burke. Gene structure and transcription. Oxford Univ Press, 1998.
6. Benjamin Lewin. Genes Vols I-IV. Oxford Univ Press, 1995.

ZOT: SCT-2.3 (II) - WILDLIFE BIOLOGY AND CONSERVATION 56 Hours

Unit-I

14 hours

- i) Introduction to study of wildlife; Definition; Historical accounts.
- ii) Importance of wildlife; Ecological, Scientific, Ethical, Aesthetic, Game and Commercial values of wildlife.
- iii) Forest and wildlife as natural resources.

Biogeographic regions of India; Distribution of wildlife: Global scenario, Indian scenario- Himalayan ranges, Western Ghats, Andaman and Nicobar Islands.
Wildlife habitats and their protection.

Biology of Indian wildlife:

An introduction to mammals, birds, reptiles and amphibians, fishes, insects and other invertebrates of the wild-their zoogeography, adaptations, special aspects in brief.

Unit-II

14 hours

Wildlife study :(a) Traditional methods-Capturing, Marking, Tagging (b) Modern methods: Photography, Recording of calls, Use of Radio-location, Telemetry, Remote sensing.

Extinction of organisms; trends in extinction
Causes for depletion of wildlife with special reference to India.
Endangered fauna of India-Invertebrates and vertebrate

Unit-III

14 hours

Wildlife conservation and management:

- i). General importance; History of wildlife management and current status; protected area network in India.
- ii). Special conservation projects in India-Project Tiger, Project Gir Lion, Project hangul, musk deer project, Manipur Deer project, Project Elephant, Crocodile Breeding Project, Great Indian Bustard project.
- iii). Zoos, wildlife sanctuaries, National parks, Biosphere reserves and their role in conservation of wildlife.

Unit-IV

14 hours

- i). Wildlife legislations-need and perspectives
 - ii). Trade in wildlife; CITES
 - iii). Wildlife (Protection) Act, 1972.
 - iv). Wildlife(Protection)Act,1972-Schedules-Schedule I [part-I,II, II A, III, IV, IV A, IV B, IV C], Schedule-II,III, IV, V, & VI.
- Wildlife crimes-Introduction; Pouching, Smuggling; Prevention of wildlife crimes-Agencies and their role.

Organizations connected with wildlife management and conservations: WWF-India; BNHS; IBCN.

Awareness about wildlife - role of Government and Non-government organizations.

Reference Books:

1. Dasmann F Raymond. Wildlife Biology. Wiley eastern Ltd.India .1982
2. Burnie,D.(Ed).Animal : The Definitive Visual Guide to the World Wildlife. D.K Publications.2001
3. Anderson,S Managing Wildlife Resources. Prentice-Hall ,Englwood Cliffs,New Jersey.1991
4. Gee,E.p The Wildlife of India. E.P.Dutton Co.N.Y.1964.
5. Nair ,S.M.Endangered animal of India and their Conservation. National Book Trust ,India 1992.
6. Khoshoo,T.N Environmental Concerns and Strategy. Ashish publishing Huse,New Dehli.1985.
7. Rao,R.R.Endangered species: Problems of assessment and conservation.Zoo Print,12:1-4.1994.
8. Thapar,V.Land of Land of the Tiger : A natural history of the Subcontinent.BBC Books London.1997.
9. The wildlife Protection Act(1972). Allahabad Law Publishers(India) Pvt.Ltd 1995.
10. Prater,S.H The Book of Indian Animals.BNHS Mumbai .oxford University Press.1998

ZOT: OET-2.1 - HUMAN PHYSIOLOGY

56 Hours

Unit-I

14 hours

Introduction to physiology: Cell and general physiology. Functional organization of human body. Internal environment and homeostasis. Cell and its function. Genetic control of protein synthesis.

Membrane physiology: Molecular organization of membrane transport across membrane. Anatomy and physiology of skeletal and smooth muscles. Anatomy and physiology of cardiac muscles. Cardiac arrhythmias, ECG myocardial infarction and cardiac arrest.

Unit-II

14 Hours

Blood circulation: Arteries, veins and capillaries. Blood flow and blood pressure. Regulation of blood circulation. Composition of blood, blood groups, blood transfusion and artificial blood.

Functional morphology of the gastrointestinal tract. Physiology of digestion and absorption. Nutrition and balanced diet and vitamins. Malnutrition, over-nutrition and obesity. Hyperacidity, amoebiasis, worms and gastroenteritis.

Unit-III

14 hours

Respiratory organs and physiology of respiration. Transport of gases. Energetics. High altitude and diving physiology. Regulation of respiration. Respiratory distress and asthma. Breathing exercises.

The kidneys: Physiology of excretion. Urine formation. Micturition and diuretics. Renal failure and dialysis.

Unit-IV

14 hours

a) General organization of the nervous system: peripheral and central nervous system. Sensory and motor systems. Structure of neuron and conduction of nerve impulse. Functional differentiation of brain. Mind and memory. Deviated mental functions, mania, depression and schizophrenia

b) Sensory organs and their physiology: photoreceptors, auditory receptors, olfactory and gustatory receptors.

Hormones and their physiological actions. Physiology of reproduction.

Spermatogenesis and oogenesis, Pregnancy and parturition. Infertility and assisted reproductive technologies. Prenatal identification of sex and gender bias.

References:

1. Text book of medical physiology: Guyton AC and Hall JE, Xth edition Saunders , Philadelphia, 2004.
2. Concise medical physiology: Chaudhuri SK, 4th edition, Central Book Agency, 2002, Kolkata.
3. Biological sciences: Taylor DJ, Green, NPO and Stout GW edited by Soper R, Cambridge University Press, 3rd edition 1997, Cambridge UK.
4. Animal physiology: Schmidt-Nielson K, 5th edition, Cambridge University Press, Cambridge UK.
5. Human physiology: Wiki books contributors.

6. Human Physiology: An Integrated Approach with Interactive Physiology: Dee Unglaub Silverthorn DU, 3rd edition, Prentice Hall.

ZOT: HCP 2.5 Practical based on 2.1

ZOT: HCP. 2.6 Practical based on 2.2

ZOT: SCP. 2.7 Practical based on 2.3

ZOT OEP. 2.8 Practical based on 2.4

M Sc, ZOOLOGY III SEMESTER (CBCS)

Paper : HCT-3.1- BASIC AND APPLIED ENTOMOLOGY.

56 Hours

Code :ZOT-3.1

Uni Code :

Contact Hours : 56

Work load : 4 hours per week

Credit Points : 4

Evaluation: Continuous Internal Assessment - 30 marks
Semester and Examination - 70 marks

Unit –I **14 hours**

Importance and diagnostic characteristics of insects.

External anatomy: Regions of the body, segmentation and tagmosis.

Integuments: structure of cuticle, types of cuticle, sclerotization, epidermis and basement membrane, functions of cuticle and moulting. Coloration: optical and natural colours.

Head and its appendages, Thorax and its appendages, Abdomen and its appendages.

Unit-II **14 hours**

Internal anatomy and physiology: Locomotion; Crawling, wriggling, swimming, walking and flight.

Circulatory system: heart, haemolymph and circulation, phosphorescence.

Respiratory system: Spiracles and their general structure, trachea and tracheoles.

Gut, digestion and nutrition: Digestive canal and digestion in insects.

Unit- III **14 hours**

Glandular system: Salivary glands, poison glands, wax glands, coxal glands and scent glands.

Excretory system and waste disposal: Malpighian tubules and nitrogen excretion.

Nervous system: Brain, nerve centres and nerves of insects.

Sensory system: mechanical stimuli, sense of vision, organs of smell, tastes and hearing, sound reception and sound production.

Unit-IV **14 hours**

Reproductive system: The female and male reproductive systems, vitellogenesis.

Insect development and life history: growth, phases in insect ontogeny (embryonic, larval metamorphosis), voltinism and diapauses.

Introduction to applied entomology: common insects attacking human beings and domestic animals, disease etiology.

Bioluminescence: light producing organs and biochemistry of light production.

Reference Books:

1. Awasti V.B. 2009 Introduction to general entomology 3rd Ed. Scientific publication (India), Jodhpur
2. Awasti V.B.2007, Agricultural Insect Pests and their control. Scientific publishers (India) Jodhpur
3. Trigunayat M.M. 2009, A Manual of practical entomology, scientific publishers, Jodhpur, India.
4. Dhaliwal G.S. Ramsingh and B.S. Chillar 2006, Essentials of Agricultural entomology.

Kalyani Publishers, New Delhi.

5. L . K Jha. Applied Agricultural Entomology. New central book agency. Calcutta

6. Rajendra singh. 2007. Elements of Entomology. Published by Rakesh kumar. Rastogi and Rastogi Publications. Gangotri, Shivaji Road. Meerut.

7. Alpheus S. Packard, 1898, A text book of entomology, Macmillan company, London

Unit-I

14 hours

Transport of gases:

A) Respiration: The atmosphere, solubility of gases, respiration in water, respiratory organs, mammalian lungs, air breathing fish, bird respiration, respiration in eggs, insect respiration.

B) Blood: Oxygen transport in blood, Oxygen dissociation curves, facilitated diffusion, carbon dioxide transport in blood, Acid base balance regulation.

C) Circulation: General Principles, vertebrate circulation, the physics involved in tubes, invertebrate circulation, Homeostasis.

Unit-II

14hours

Food and Energy:

A) Feeding, digestion, nutrition, specific nutritional needs, chemical defense.

B) Energy Metabolism: Metabolic rate, energy storage (fat and glycogen), effect of oxygen concentration, problems of diving, metabolic rate and body size, size and problems of scaling, energy cost of locomotion, physiological time and effect of high altitude.

Temperature:

A) Temperature effects: effects of temperature change, extreme temperatures-limits to life, tolerance to high temperature, tolerance to cold and freezing temperature adaptation.

B) Temperature regulation: Body temperature of birds and mammals heat transfer, heat balance, torpor and hibernation, Body temperature in 'cold blooded' animals.

Unit-III

14hours

Water: Water and osmotic regulation; The aquatic environment, aquatic invertebrates and vertebrates, terrestrial environment, moist skinned animals, arthropods terrestrial vertebrates, marine air-breathing vertebrates. Hormones and osmoregulation **Excretion:** Nitrogen excretion-Patterns.

Enzyme catalysis:

Enzymes as catalysts, enzyme kinetics, regulation of enzyme activity, active sites, coenzymes, activators, inhibitors, isoenzymes, allosteric enzymes, ribozymes.

Unit-IV

14 hours

Movement: Muscle and movement, skeletons, Locomotion: biomechanics, buoyancy, Control and Integration: Neuronal circuits, neurotransmitters, transmission of nerve impulses in nerves and across synapses (excitation, inhibition and computation). Information and Senses: General principles, chemical senses, vibration, pressure and sound, Light and vision, transmission and sorting of sensory information.

Books :

1. Neilsen, K.S. Animal Physiology: Adaptation & Environment. IV Ed. Cambridge University Press, 1995.
2. Prakash, M & Arora, C.K. Encyclopedia of Animal Physiology. Anmol Publications, New Delhi, 1998.
3. Pestonjee, D.M. Stress and Coping. Sage Publications, London, 1999.
4. Poole, M.C., Pilkey Grant and Johnson.E.C. Biology in Action. Harcourt Brace, Canada, 1995.
5. Hoar, W.S. General and Comparative Animal Physiology. Prentice Hall Inc, New Delhi, 1983.
6. Guyton C. Arthur and Hall J.E. Textbook of Medical Physiology. W.B.Saunders C. London, 1996.
7. Randall David., Burggren. W and French, K. Animal Physiology. W.H. Freeman and Co. New York, 1997

ZOT : SCT-3.3- (I) Environmental Pollution / Eco-Toxicology

56 hours

Unit-I

14hours

Our Environment: Atmosphere, Hydrosphere, Lithosphere; Biogeographical realms.

- a) Development and evolution of ecosystem; Components of ecosystem; Types of ecosystem including habitats.
- b) Energy flow in ecosystem: Food chain, food web; Trophic structure and energy pyramids; ecological energetics.
- c) Hydrologic cycle ; Biogeochemical cycles (N,C,P cycles).

Unit-II

14hours

Natural resources; Renewable and Non –renewable resources.

- a) Forest resources; use and overexploitation; deforestation; conservation and sustainable management.
- b) Water resource; use and overutilization of surface and ground water; Floods; Drought; Conflicts over water usage; Dams -benefits and problems; conservation and sustainable management.
- c) Food resources: World food scenario; Effects of modern agriculture ; Fertilizer – pesticide problems
- d) Land resource: Land classification and use ; Land degradation induced landslides, soil erosion, desertification.
- e) Mineral resources (Metallic and Non metallic): Distribution, utilization, conservation and management.
- e) Energy resources: Conventional and non-conventional resources; Growing energy needs and sustainable management.

Unit-III

14hours

a) Environmental pollution: definition, causes, effects and control measures of:-

- i) Air Pollution, ii) Water Pollution, iii) Soil pollution, iv) Noise pollution, v) Thermal Pollution
- vi) Nuclear hazards
- b) Solid waste management; Causes, Effects and control measures.
- c) Biomedical waste management: Causes, effects and control measure
- a) Human ecology: values and ethics of human environment; Population growth and related issues;
- b) Environment and human health; Human rights.

Unit-IV**14 hours**

- a) Toxic Pollutants and their impact on non-target flora, fauna and humans.
- b) Biodegradation, biotransformation, biomagnification and bioaccumulation of toxicants.
- c) Monitoring environmental pollutants : Physical and chemical methods ; Biological indicators and monitoring.
- a) Disaster management: Floods, Earthquake, Cyclone and Landslides.
- b) Climate change – global warming, Ozone layer depletion, acid rain
- a) Environment and Social issues:
 - i) Resettlement and rehabilitation of people
 - ii) Wasteland reclamation
 - iii) Environmental ethics.
- b) Environmental awareness ; environmental education - role of educational institutes and Other agencies.
- c) Environmental Protection Act and related Acts.

Reference Books:

1. Willmer, P., Stone, G and Johnston, I. Environmental Physiology of animals. Blackwell Science Ltd.
2. McKinney, M.L and Schoch, R.M. Environmental Science: Systems and Solutions. Jones & Bartlett Publishers, 1998.
3. Cunningham, W.P. Environmental Science-V Ed. WCB McGraw Hill, 1999.
4. Clesceri, L.S., Greenberg, A.E and Eaton, A.D. Standard Methods for the Examination of Water & Waste Water-XX Ed. American Public Health Association, 1998.
5. Arora, R.K. Air Pollution. Causes & Effective control. Mangal Deep Publications, Jaipur, 1999.
6. Chakraborti, N.K. Environmental Protection and Law. 1994.
7. Chitkara, M.G. Encyclopedia of Ecology, Environment and Pollution. Vol. IXIII, 1997.
8. Chapman, J.L and Reiss, M.J. Ecology: Principles and Applications. Cambridge University Press, 1999.
9. Eldon, D Enger and Bradley F. Smith. Environmental Sciences, 1995.

ZOT: SCT-3.3- (II) EVOLUTIONARY BIOLOGY

56 hours

Unit-I

14 hours

Introduction: An overview of landmarks in Evolutionary Biology

Concept of organic evolution: Origin of life. Evolution through ages - Geological time scales. Evidences of organic evolution. Evolution of man through ages. **Unit-II 14 hours**

Darwinism: Contributions of Charles Darwin, Alfred Russell Wallace and Thomas Malthus. Postulates of Darwinism - objectives and evidences. Recent developments on Lamarkian concepts.

Speciation: Biological and phylogenetic concepts of species. Pattern and mechanisms of reproductive isolation. Models of speciation - Allopatric, Sympatric and Strasipatric.

Unit-III

14 hours

Origin of higher categories: Phyletic gradualism and punctuated equilibrium.

Major trends in the origin of higher categories. Micro and macro evolution.

The evolution of life histories: Basic questions in the evolution of life history.

Evolutionary age and size at maturation. Life history trade offs - optimality arguments and trade off surfaces. Empirical evidences of life history trade offs. Evolution of clutch size and reproductive investment. Evolutionary life span and ageing.

Unit-IV

14 hours

Evolution of sex: The problem with sex. Sex and recombination. Hypothesis and advantage of sex and recombination. Sex ratio, sex allocation and sex determination. Evolution of inbreeding and out breeding.

Impact of evolutionary biology on medicine.

Reference Books:

1. Futuyama, D.J. Evolutionary Biology- III Ed. Sinauer Associates Inc. Massachusetts, 1998.
2. Gerhart, J and Kirchner, M. Cell, Embryos & Evolution. Blackwell Science Publishers, 1997.
3. Keynes, R. Charles Darwin's Zoology Notes & Specimen List from H.M.S Beagle. Cambridge University Press, 2000.
4. Price, P.W. Biological Evolution. Saunders College Publishing, 1995.
5. Smith, J.M. Evolutionary Genetics. Oxford University Press, 19

Unit-I**14hours**

Sericulture: Modern rearing methods for chawki and lateage silkworm, procurement and incubation of eggs, synchronization of hatching, brushing and feeding leaf quality and its preservation. Rearing from brushing to mounting for seed production and silk production.

Apiculture: Importance, history and development of bee keeping. Different species of honeybees and their distribution. Management of bees, product and by product of apiculture and their use.

Unit-II**14 hours**

Vermiculture: Introduction and importance of vermiculture, Uses of earthworms for biodegradation of organic waste materials, Earthworms as protein source, Vermiculture technique.

Aquaculture:

- a) Fin-fish Culture: Freshwater, brackish-water and marine fish culture in India.
- b) Shell-fish Culture: Prawn edible bivalve and Pearl culture.

Unit-III**14 hours**

Dairy: History, Importance and scope of Dairy

- a) Dairy breeds and Management : Cattle breeds: Milk breeds, Draught breeds, Exotic breeds Buffalo breeds: Swamp buffaloes and Riverine Buffaloes
- b) Principles and methods of breeding: Inbreeding, out breeding and cross breeding. Fertility and breeding efficiency, artificial insemination
- c) Dairy products: Physico-chemical properties of cow and buffalo milk, Processing, preservation and marketing of milk and milk products.
- d) Dairy pathology: Viral, Bacterial, parasites (Endo-Ecto) and vaccination programs **Lac culture:** Lac insect (Scientific name), composition of Lac, strains of Lac insect, cultivation of Lac host plants (in brief) processing of Lac and uses of Lac

Unit-IV**14 hours**

Poultry: History and Importance and Scope of poultry.

- a) Poultry Breeds
- b) Principles and techniques and methods of breeding
- c) **Poultry products:** Egg, Meat, feather, excreta, nutritive value of egg and meat.
- d) **Poultry pathology:** Viral, Bacterial, fungal and protozoan diseases and their control, vaccines and for infections.

Fur Animal farming - Rabbit meat production. Disposal and utilization of fur and wool and recycling of waste by products. Grading of wool.

ZOT HCP. 3.5 Practical based on 3.1

ZOT: HCP. 3.6 Practical based on 3.2

ZOT: HCP. 3.7 Practical based on 3.3

M Sc, ZOOLOGY IV SEMESTER (CBCS)

ZOT: HCT-4.1- BIODIVERSITY

56 hours

Code :ZOT-4.1

Univ Code :

Contact Hours : 56

Work load : 4 hours per week

Credit Points : 4

Evaluation: Continues Internal Assessment - 30 marks
Semester and Examination - 70 marks

Unit-I

14 hours

- a) Biodiversity: Concepts, Definition.
- b) Values of biodiversity: Consumptive use and Productive use ; Social, Ethical, Aesthetic, Option & Environment service values.
- a) Biodiversity at global, national and local levels.
- b) Hot spots of biodiversity; India as a megadiversity nation.
- c) Endemism and endemic species.

Unit-II

14 hours

- a) Genetic diversity: Nature and origin of genetic variations; Measurement of genetic diversity.
- b) Species diversity: History and origin of species diversity; Species diversity indices ; Measures of diversity – Alpha, Beta & Gamma diversity.
- c) Ecosystem diversity: Classification and nature of ecosystems (in brief); Ecosystem diversity of India (in brief)
- d) Agro- biodiversity: Origin and evolution of cultivated species diversity ; Vavilovian centers ; Diversity in domesticated animal species.

Unit-III

14 hours

- a) Threats to biodiversity: Deforestation & habitat destruction, Hunting & Overexploitation; Introduction of exotic species, Pollution.
 - b) Endangered, Vulnerable, Rare and Threatened species.
 - c) Conservation of Biodiversity: Objectives and action plans; Strategies – In-situ and Ex- situ conservation; Peoples movement, Role of educational Institutions and NGO's, Biodiversity Awareness programmes
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- a) Biodiversity legislation: Legal aspects with special reference to India; CITES; Traderealted Intellectual Property Rights.
 - b) Biodiversity conventions: Earth Summit and other conventions; Convention on Biological Diversity.

Unit-IV

14 hours

Biodiversity and Biotechnology: Role of Biotechnology in

- a) Assessment of biodiversity and bioresources ;
- b) Biodiversity conservation ;

- c) Utilization of Biodiversity / Bioresources. GMO's and their impact on biodiversity .
- a) Biodiversity Management: Organizations associated with biodiversity management – IUCN, UNEP, UNESCO, WWF, FAD, WCMC –their role and contributions.
- b) Bioprospecting ; Biopiracy ; Biosafety.
- c) Future strategies for Biodiversity Conservation in India.

Books:

1. Dasmann. F Raymond. Wildlife Biology. Wiley Eastern Ltd. India. 1982.
2. Encyclopedia of Nature and Science. Vols 1-18. Bay Books Pvt.Ltd. Sydney, 1974.
3. Burnie. D. (Ed). Animal: the Definitive Visual Guide to the Worlds Wildlife. D.K.Publications, 2001.

ZOT: HCT-4.2- ANIMAL BEHAVIOUR

56 hours

Unit-I

14 hours

Introduction: The science of animal behaviour-brief history. Diversity and unity in the study of behaviour and complex behaviour.

Development of behaviour: Accommodative and Associate learning. Hormones and early development. Genetic basis of behaviour. Neural control of behaviour.

Stereotyped behaviour: Kinesis, taxis, orientation and reflexes.

Unit-II

14hours

Motivation and conflict behaviour: decision making on different scales, drive, models of motivation, stress, territorial conflicts, threat display, displacement activities and fighting as conflict behaviour.

Stimuli and communication: Diverse sensory capacities, sign stimuli, stimulus filtering. Communication.

Unit-III

14hours

Ecological aspects of behaviour: Habitat selection, food selection, optimal foraging theory, anti-predator defenses. Aggression, homing, territoriality, dispersal. Host-parasite relations.

Courtship and ritual behaviour: Mate selection, male-male selection, female choice and maternal behaviour.

Unit-IV

14 hours

Social organizations in insects and primates.

Biological rhythms: Circadian and circannual rhythms.

Hormones and behaviour: Pheromones and their biological actions in vertebrates and invertebrates. Chemical communication, body coloration, social life in insects (Termites and honey bees). Hormone in insect & crustacean metamorphosis.

Books:

1. Aubrey Manning and Marian. S. Dawkins. *An Introduction to Animal Behaviour*. Cambridge University Press, 1995.
2. McFarland. D. *The Oxford Companion to Animal Behaviour*.
3. McFarland.D. *Animal Behaviour Psychology, Ethology and Evolution*. Pitman Publications, 1985.
4. Slater.P.J.B. *Essentials of Animal Behaviour*. Cambridge University Press, 1999.
5. Krebs J.R and Davies, N.B. *An Introduction to behavioural Ecology-III* (Ed). Blackwell Science Ltd, 1993.

ZOT: SCT-4.4 (I) – ENDOCRINOLOGY

56 hours

Unit-I

14hours

Evolution of endocrine function. Hormones as biological signals. Classification of hormones. Parallelism in endocrine and nervous functions. The concept of neuroendocrine system. Methods in endocrine research.

Nature of hormone action: Hormone receptors- Membrane, cytosolic and nuclear receptors. Mechanism of signal transduction - role of G-proteins. Cyclic AMP and the second messenger concept. Prostaglandins and Calmodulin in hormone action. Structure of hypothalamohypophysial complex in vertebrates. Hypothalamic regulation of pituitary function-comparative account. The hormonal feedback systems. The caudal neurosecretory system in fish.

Unit-II

14 hours

The pineal gland: Comparative morphology in vertebrates. Biosynthesis and metabolism of melatonin. Pineal function in different vertebrates. The frontal and parietal organs. Pineal and biological rhythms. Evolution of melatonin.

The pituitary gland; Comparative morphology, chemistry and biological actions of anterior and posterior pituitary hormones

Unit-III

14 hours

Thyroid and parathyroid glands: Evolution of thyroid function in vertebrates.

Biosynthesis and biological actions of thyroid hormones. Parathyroid hormones and calcium homeostasis: parathormone, calcitonin, vitamin D and their interaction.

Adrenal glands: Comparative morphology. Biosynthesis and biological actions of corticosteroid hormones. The adrenal catecholamines their biosynthesis, physiological actions and metabolism. Cortico-medullary interrelation in vertebrates. The Corpuscles of Stanius in fish.

Unit-IV

14 hours

Structure of hypothalamohypophysial complex in vertebrates. Hypothalamic regulation of pituitary function-comparative account. The hormonal feedback systems. The caudal neurosecretory system in fish.

Hormones of the GI tract and pancreas, chemistry and physiological actions of GI hormones, insulin and glucagons. Glucose homeostasis.

Hormones in growth and development: Nerve growth factor (NGF), epidermal growth factor (EGF). Hormones and metabolism: Regulation of carbohydrate, lipid and protein metabolism.

Books:

1. Bentely, P.J. Comparative Vertebrate Endocrinology-III Ed. Cambridge University Press, 1998.
2. Degroot, L.J. & Neill, J.D. (Eds). Endocrinology Vol. I-III. W.B. Saunders Co, 2001.
3. Hadley. Mac.E. Endocrinology. Prentice Hall International Inc, 1992.
4. Knobil, E and Neill, J.D. (Eds). Encyclopedia of Reproduction. Vol I-IV. Academic Press, 1998.
5. Knobil, E and Neill, J.D. (Eds). The Physiology of Reproduction II. Vol. I and II. Raven Press Ltd, 1994.
6. Mandal, A. Handbook of Neuroendocrinology. EMKAY Publications, 1994.
7. Nelson, R.J. An introduction to Behavioural Endocrinology. Sinauer Associates Inc, 1995.
8. Turner, C.D and Bagnara,J.T. General and Comaparative Endocrinology, 1998.
9. Williams, R.H. Textbook of Endocrinology. W.B. Saunders.
10. Martin.C.R. Endocrine Physiology. Oxford University Press.

ZOT: SCT-4.4 (II) PARASITOLOGY

56 hours

Unit –I

14 hours

Origin and evolution of parasitism. Kinds of hosts and parasites.
Pathogenic microorganisms: Brief outline classification of microorganisms. Bacterial cell structure. Food and water-borne bacterial diseases. Sexually transmitted bacterial diseases. Skin and wound bacterial diseases.

Unit-II 14 hours Pathogenic Protozoa: Amoebiasis and differentiation of different amoebae. Giardiasis.

Trypanosomiasis of man and domestic animals. Haemosporidians of man and domestic animals. Coccidiosis of poultry. Myxosporians of fishes. *Nossema* and other pathogenic protozoa of insects.

Pathogenic Nematodes: etiology, epidemiology, pathogenesis, diagnosis, prevention and control of diseases due to *Wuchereria sp*, *Trichinella spiralis* and Hookworms

Unit-III

14 hours

Pathogenic trematodes: Etiology, epidemiology pathogenesis, diagnosis, prevention and control of diseases due to *Fasciola hepatica*, *Fasciolopsis buski* and *Systosoma sp*.

Pathogenic Cestodes: Etiology, epidemiology pathogenesis, diagnosis, prevention and control of diseases due to *Echinococcus*, *Hymenolepis* and *Diphylobothrium*

Unit-IV

14 hours

Arthropods as parasites and vectors: Kinds of vectors.

Blood sucking dipterans: Biology of mosquito. Role of blood sucking dipterans in transmission of diseases.

Soft and hard ticks: Biology of ticks. Role of ticks in transmission of diseases.

Crustacean parasites of fishes

Effects of parasitism on host. Effects of parasitism on parasites.

Reference Books:

1. Hoare C. A (1950) Handbook of Medical Protozoology, London: Baltimore, Tindall & Cox.
2. Levine. N.D. (1973) Protozoan Parasites of Domestic Animals and of Man. 2nd Ed. Minncapolis: Burgess.
3. Levine.N.D (1978) Textbook of Veterinary Parasitology. Minneapolis: Burgess.
4. Noble.E.R. And Noble. G.A. (1961) Parasitology. The Biology OF Animal Parasites. London: Kimpton.
5. Richards, W. and Devis, R.G. (1971) Imm's General Texbook OF Entomology. 10TH Ed. London: Chapman & Hall.
6. Smith.K.G.V. (1973) Insects and other Arthropods of Medical Importance. London:
7. Smyth, J.D. (1976) Introduction to Animal Parasitology. London: Hodder and Stoughton.
8. Soulsby, E.J.L (1965) Textbook of veterinary Clinical Parasitology. Vol. I Helminths.

Oxford:Blcakwell Scientific.

9. Soulsby, E.J.L. (1966) Biology of Parasites. New York: Academic Press.

ZOT: SCT. 4.5 Practical based on 4.1

ZOT: HCP. 4.6 Practical based on 4.2

ZOT: HCP. 4.7 Presentation, Colloquium & Viva

ZOT: HCP. 4.8 Practical based on 4.4