

PRATAPCOLLEGEAMALNER(Autonomous)

Affiliated to

KavayitriBahinabaiChaudhri

NORTHMAHARASHTRAUNIVERSITY

JALGAON 425001, INDIA



SYLLABUSUNDER

FACULTYOFSCIENCE&TECHNOLOGY

UNDERNEP-2020

FORCOURSESRELATEDTOSUBJECT

ZOOLOGY

B.Sc. Honor(SemesterI and II)

(w.e.f.from2023-2024)

ZOOMJ-501 Structure and Functional Anatomy of Invertebrates Sem-I

MSc I Sem I DSC-25		
ZooMJ - 501: Structure and Functional Anatomy of Invertebrates		
Total Hours: 60	Program specific objective- <ul style="list-style-type: none"> • To understand the structural and functional anatomy of non-chordates. • To acquire the knowledge about locomotory, nutritional and organs of digestion and its mechanism • To understand the respiratory, excretory and nervous coordinating organization • To learn about the larval forms, colonial and social life of invertebrates. 	Credits: 4
	Program specific outcomes- After successful completion of this course, students are expected to: <ul style="list-style-type: none"> • enlighten themselves with knowledge related to structural & functional anatomy of invertebrate animals. • enrich themselves with understandings of organs and systems of locomotory, nutrition, digestion and other vital process. • know the larval forms found in invertebrates and their significance. • understand the social life in honey bees. 	Lectures 60
Unit	Topics	
Unit I	A) Structural organization of invertebrates B) Diversity and phylogeny of invertebrate C) Organization of Coelom: i) Acoelomates, ii) Pseudocoelomates iii) Coelomates - Protostomia and Deuterostomia	12
Unit II	A) Locomotion: i) Locomotory organelles – Cilia, flagella ii) Flagella, Ciliary and amoeboid movement in protozoa B) Nutrition and Digestion: i) Pattern of feeding and digestion in lower metazoan, ii) Filter feeding in polychaeta, iii) Filter feeding and digestion in mollusca and deuterostoma	12
Unit III	Respiration: i) Organs of respiration- Gills and lophophores, ii) Gills and lungs in Mollusca, iii) Gills and trachea in Arthropoda, iv) Respiratory pigments in invertebrates. v) Mechanism of respiration in gastropoda and insecta.	10
Unit IV	A) Nervous system: i) Primitive nervous system- Coelenterates and Echinodermata,	14

	<p>ii) Advanced nervous system- Annelida, Arthropoda (Crustacea and Insecta) and Mollusca (Cephalopoda).</p> <p>iii) Trends in neural evolution.</p> <p>B) Excretion and osmoregulation:</p> <p>i) Organs and Mechanism of excretion - Coelom, Coelomoducts, Nephridia and Malpighian tubules,</p> <p>ii) Osmoregulation in terrestrial and aquatic invertebrates.</p>	
Unit V	<p>A) Invertebrate larvae:</p> <p>i) Larval forms of Platyhelminthes, Crustacea, Mollusca and Echinodermata.</p> <p>ii) Significance of larval forms.</p> <p>B) Colonial and social life:</p> <p>i) Protozoan, Sponge and Coelenterate colonies</p> <p>ii) social life in honey bee.</p>	12
Suggested Readings	<ul style="list-style-type: none"> • Barnes R. O.: The Invertebrates, W. B. Saunders and Co. • Barrington E.J.W.: Invertebrates, Structure and function, homes Nelson and Sons, Ltd., London • Hyman L.H.: The Invertebrate Volume 1 to 8, McGraw Hill Co. New York • Jordan, E. L.: The Invertebrates, S. C. Chand, New Delhi. • Kotpal R. L.: Modern Text book of Zoology: Invertebrates, Rastogi publications, Meerut • Kotpal R.L.: Protozoa to Echinodermata Series, • Marshall and William: A text book of Zoology: Invertebrate Vol. I, CBS publishers, New Delhi. • Prasad S. N.: Life of Invertebrates, Vikas publishing house, New Delhi. • Russel Hunter: A Biology of higher invertebrates, McMillon Co. Ltd. London 	

ZOOMJ-502 Cellular organization and Developmental Biology Sem-I

MSc I Sem I DSC-26 Credit-2

ZooMJ - 502: Cellular organization and Developmental Biology

Total Hours: 60	<p>Program specific objective-</p> <ul style="list-style-type: none"> • To understand the cellular organization with specific reference to plasma membrane, cell organelles and cell cycle. • To acquire the knowledge about basic concept of gametogenesis, fertilization and embryonic development. • To understand the concept of aging, apoptosis and senescence • To learn about the morphogenesis and organogenesis in specific animals. 	Credits: 2
	<p>Program specific outcomes- After successful completion of this course, students are expected to:</p> <ul style="list-style-type: none"> • Enrich themselves with the cellular organization with specific reference to plasma membrane, cell organelles and cell cycle. • acquire the knowledge about basic concept of gametogenesis, fertilization and embryonic development. • understand the concept of aging, apoptosis and senescence • know about the morphogenesis and organogenesis in specific animals. 	Lectures 30
Unit	Topics	
Unit I	<p>A) Structure and function of Plasma Membrane: i) Different models of Plasma Membrane ii) Functions of Plasma Membrane –diffusion, osmosis, ion channels, active and passive transport, ion pumps B) Structural organization and function of intracellular organelles: i) Nucleus, Mitochondria, Golgi bodies, Lysosomes, Endoplasmic reticulum, ii) Structure and function of cytoskeleton and its role in motility, iii) Structure and function of filaments</p>	07
Unit II	<p>A) Cell cycle: i) Steps in cell cycle ii) Regulation of cell cycle. B) Cell signaling: i) Signaling molecules – Hormones, neurotransmitters, second messengers. ii) Types of signaling receptors - Extra cellular and intra cellular. iii) Signal transduction pathways, signaling through G- protein coupled receptors, regulation of signaling pathways.</p>	07
Unit III	<p>Gametogenesis, fertilization and early development: i) Formation of gametes, ii) Cell surface molecules in sperm-egg recognition in animals; iii) Zygote formation, Cleavage, Blastulation, Gastrulation</p>	07
Unit IV	<p>A) Basic concepts of development: i) Potency, commitment, specification, induction, competence, determination and differentiation; ii) Morphogenetic gradients; cell fate and cell lineages; iii) Stem cells; genomic equivalence and the cytoplasmic</p>	06

	determinants; imprinting B) Aging, Apoptosis and Senescence	
Unit V	Morphogenesis and Organogenesis in animals: i) Cell aggregation and differentiation in <i>Dictyostelium</i> ; ii) Axes and pattern formation in <i>Drosophila</i> , frog and chick; iii) Organogenesis – vulva formation in <i>Caenorhabditis elegans</i> ; eyelens induction, limb development and regeneration in <i>Planaria</i> and <i>Hemidactylus flaviviridis</i> . iv) Differentiation of neurons, post embryonic development- larval formation, metamorphosis; environmental regulation of normal development; sex determination.	3
Suggested Readings	<ul style="list-style-type: none"> • De Roberts: Cell biology • Du Praw E.J.: Cell and Molecular biology • J. D. Watson: Molecular Biology of the gene • Prakash S. Lohar : Cell and Molecular Biology, MJP Publishers, Chennai • J. R. Baker: Cytological techniques • Gerald Karp: Cell and Molecular Biology, John Wiley and Sons International, London • Arumugum: Developmental Biology • Mourice: Animal growth and development • David R. Newth: Animal growth and development • Gilbert: Developmental Biology • B.M. Patten: Early embryology of Chick • B.M. Patten: Foundation of embryology • M. Sussaman: Animal growth and development 	

ZOOMJ-503 Goatery Sem-I

MSc I Sem I DSC-27

ZooMJ - 503: Goatery

Total Hours: 60	<p>Program specific objective-</p> <ul style="list-style-type: none"> ● To start Goat rearing as a small business enterprise by liaising with different stake holders ● To manage Goat rearing effectively as a small business enterprise 5. ● To gain all round knowledge of Goat rearing as a business enterprise rather than as a community profession 	Credits: 4
	<p>Program specific outcomes- After successful completion of this course, students are expected to:</p> <ul style="list-style-type: none"> ● Understand, appreciate and develop the self-confidence for embarking on self-employment / entrepreneurship. ● Understand various breeds of Goat, their characteristics and their adaptability. ● gain the knowledge related to Goat rearing, to devise a simple marketing and sales strategies and plan for a small business. 	Lectures 60
Unit	Topics	
Unit I	<p>Professional Knowledge and Entrepreneurship</p> <ol style="list-style-type: none"> i) Knowledge of self-confidence, attitude ii) Entrepreneurial competencies iii) Banking, insurance, financial accountancy and management iv) Legal aspects, regulatory aspects 	10
Unit II	<p>Domain/Technical Knowledge</p> <ol style="list-style-type: none"> i) History of Goat breeding – practices, present scenario, prospects ii) Various breeds of Goat, their characteristics, and their adaptability iii) Up gradation of Goat breeds, recent introductions iv) Housing in Goat rearing v) Common diseases in Goat, diagnosis and remedies vi) Feed and Feeding vii) Fodder and Fodder crops viii) Systems of Goat rearing, management practices for lambrearing to produce healthy adults 	20
Unit III	<p>Professional Skills</p> <ol style="list-style-type: none"> i) Engage in rearing of Goat ii) Select appropriate breeds of Goat for the purpose iii) Feed the Goat iv) Manage the Pest and Diseases affecting Goat v) De-worming of Goat vi) Collection of Samples of diseased Goat vii) Build Goat Housing viii) Manage the young ones ix) Sheering of Goat 	15

Unit IV	<p>Core Skills</p> <ul style="list-style-type: none"> i) Business Opportunity Identification ii) Market Survey and Business Plan Development iii) Planning and Risk Assessment iv) Problem solving v) Time management vi) Communication vii) Business Management skills 	15
Suggested Readings	<ul style="list-style-type: none"> • <u>Frank H. Baker and Mason E. Miller: Sheep And Goat Handbook, Vol. 4.CRC Press.</u> • <u>Mohan Chand Rajbar:Commercial Goat Farming in India-Guide: An entrepreneur manual to successful goat production and marketing in India Kindle Edition.</u> • <u>Board EiriHand Book of Goat Farming, Engineers India Research Institute.</u> Carol A. Amundson: How to Raise Goats: Third Edition, Everything You Need to Know. <u>Atlantic Publishers and Distributors.</u> 	

ZOOMJP-504 Practicals based on Structure and Functional Anatomy of Invertebrates Sem-I

MSc I Sem I DSC-28		
ZooMJP - 504: Practicals based on Structure and Functional Anatomy of Invertebrates		
Lectures 60	<p>Program specific objective-</p> <ul style="list-style-type: none"> • To acquire the practical skill about dissection of Grasshopper or Cockroach related to their digestive, nervous and reproductive system. • To perform mountings of various significant parts of Grasshopper/Cockroach • understand the concept of systematics or taxonomic features of invertebrate animals. 	Credits: 2
	<p>Program specific outcomes-</p> <p>After successful completion of this course, students are expected to:</p> <ul style="list-style-type: none"> • perform dissection of Grasshopper or Cockroach related to their digestive, nervous and reproductive system. • acquire practical skills for mountings of various significant parts of Grasshopper/Cockroach • Classify the invertebrate animals belonging to phylum Porifera to Hemichordata. 	Lectures 60
	<ol style="list-style-type: none"> 1. Dissection of Grasshopper/Cockroach so as to expose its – (E) <ol style="list-style-type: none"> i) Digestive system ii) Nervous System iii) Reproductive system (Male and Female) 2. Mounting of following – (E) <ol style="list-style-type: none"> i) Nephridia and Spermatheca of earthworm, ii) Mouthparts of Grasshopper/Cockroach, iii) Cornea and Wings of Grasshopper/ Cockroach iv) Tracheal and spiracles of Grasshopper/ Cockroach v) Ommatidium of Cockroach 3. Classification of Invertebrates - Porifera to Annelida up to order (one example from each order) 4. Classification of Invertebrates -Arthropoda to Hemichordata up to order (one example from each order) 	

ZooMJP-505 Practicals based on Cellular organization and Developmental Biology Sem-I

MSc I Sem I DSC-29		
ZooMJP - 505: Practical II (Practicals based on Cellular organization and Developmental Biology Zoo-112)		
Total Hours: 60	<p>Program specific objective-</p> <ul style="list-style-type: none"> • To acquire knowledge about various cell organelles by studying their micro-photographs. . • To understand the principle PAS reaction. • To understand the process of preparation of mitotic spindle from cell material. • To learn technical skill to detect DNA and Protein in the given sample. • To acquire the skill related to detection of Mitochondria. 	Credits: 2
	<p>Program specific outcomes-</p> <p>After successful completion of this course, students are expected to:</p> <ul style="list-style-type: none"> • learn about various cell organelles by studying their micro-photographs. . • acquire the principle and protocol of PAS reaction. • gain the skill of preparation of mitotic spindle from cell material. • acquire technical skill to detect DNA and Protein in the given sample. • gain the skill related to detection of Mitochondria. 	Lectures 60
Cellular organization	<ol style="list-style-type: none"> 1. Study of electron microphotographs of various cell organelles. 2. Preparation of mitotic Chromosomes from any suitable cell material 3. Detection of carbohydrates by PAS reaction. 4. Detection of protein by bromophenol blue reaction. 5. Detection of DNA by Feulgen reaction. 6. Detection of Mitochondria by Janus green method 	
Developmental Biology	<ol style="list-style-type: none"> 1. Preparation of Permanent slide of Chick Embryo 2. Study of different types of eggs – on the basis of amount of yolk, distribution of yolk, presence and absence of shell. 3. Study of Cleavages- Snail, Amphioxus, fish, frog, birds and mammals 4. Study of Blastulae- Amphioxus, frog and birds. 5. Study of Gastrulae- Amphioxus, frog and birds. 6. Study of types of placenta - Based on Distribution of villi on chorion, Histological types of placenta 	

ZOOEC-521 Wildlife Conservation and Management Sem-I DSE-5

MSc I Sem I DSE-5		
ZooEC - 521: Wildlife Conservation and Management		
Total Hours: 60	Program specific objective- <ul style="list-style-type: none"> • To provide graduates in Biology a specialization in the field of Biodiversity, Conservation and Wildlife Management • To generate qualified students who can directly get jobs in the allied fields of Biodiversity, Conservation and Wildlife Management; • To generate qualified postgraduates who can be part professional organizations working in the field of conservation and environment protection. • To generate a team of post graduates who can take up jobs related to the environment in educational institutions. 	Credits: 4
	Program specific outcomes- <ul style="list-style-type: none"> • Skilled post graduates who can undertake research in the field of Biodiversity, Wildlife biology and Nature conservation. • An alternate avenue to Biology graduates to specialize as “environmental entrepreneurs” in areas such as Environmental audits, Environmental education, Ecotourism etc. • Awareness about Biodiversity and Nature Conservation. 	Lectures 60
Unit	Topics	
Unit I	Concept of Biodiversity. i) What is biodiversity ii) Types of Biodiversity iii) Climatic Zones and Biodiversity iv) Biodiversity as a natural resource	04
Unit II	Threats to Biodiversity. i) Biodiversity of Indian subcontinent ii) India as a mega diversity nation iii) Factors causing biodiversity degradation iv) Concept of species extinction.	04
Unit III	Species Conservation Techniques i) In situ conservation (Biosphere Reserves, National Parks, Wildlife Sanctuaries, Conservation Reserves, Community reserves). ii) Ex-situ conservation (Botanical & Zoological Gardens, Gene Banks, Seed and Seedling Banks, Pollen Culture, Tissue Culture and DNA banks, Butterfly Gardening) iii) Concept of Biodiversity Hotspots and Mega-diversity Country; Role of captivity In wildlife management.	05
Unit IV	Habitat Conservation Techniques i) Concept of Habitat ii) Habitat Management	04

	<p>iii)Habitat Edge improvement iv)Role of Corridor in Wildlife Management, v)Ecological Restoration Programme; Social Forestry; Agro Forestry; Joint Forest</p>	
Unit V	<p>Wildlife Management i)Principles of wildlife management ii)Wildlife management techniques iii)Prey-predator ratio iv)Improving carrying capacity Water holes, salt licks, stall feeding v)Controlled grazing, controlled fire Culling & translocation</p>	04
Unit VI	<p>Wildlife conflicts i)Dealing with Human–Wildlife conflicts Compensating losses ii) Regulating forest usage (e.g. grazing at Keoladeo / Gir, Fishing in Sunderbans, Mahua collection in Kanha)</p>	03
Unit VII	<p>People’s participation in managing protected areas i)Integrating Local Community in conservation (e.g. Kaziranga, Eagle’s Nest) ii)Training & skill development of local human resource iii)Interpretation Centers & Interpretation to visitors Case studies of success stories: (e.g., Ranthambor, Periyar, Lakswadweep, Van samitis).</p>	04
Unit VIII	<p>Wildlife Trade and Laws i)Wildlife protection Act of India ii)CITES iii)TRAFFIC iv)RED Data Book v) Measures to control poaching & wildlife trad</p>	02
Suggested Readings	<ul style="list-style-type: none"> • Fundamentals of Wildlife Management, Gopal, Rajesh Justice Home, Allahabad, India. • Wildlife Ecology, Conservation and Management, Anthony R.E. Sinclair, John M. Fryxell and Graeme Caughly, Blackwell Publishing, U.S.A. • Wild Animals in Central India, Brander, A.A, Natraj Publisher, Dehradun. • Wild Animals, Their Minds and Manners, Hornaday, W.T. IBD, Dehradun. • Concepts in Wildlife Management, Hosetti, B.B. Daya Publishing House, Delhi. • Handbook of Environment, Forest and Wildlife Protection Laws in India, Justice Kuldip Singh, Natraj Publishers, Dehradun. • Biodiversity conservation in managed and protected areas, Katwal/Banerjee, Agrobios, India. • Wildlife Issues in a Changing World, Moulton, M. P. & J. Sanderson, St. Lucie Press • Biodiversity and its conservation in India, Negi, S.S. International Book Distributor, Dehradun. • Manual for Wildlife Management in India, Negi, S.S. 	

	<p>International Book Distributor, Dehradun.</p> <ul style="list-style-type: none">• Fundamentals of Ecology, Odum, Eugene P, Natraj Publishers, Dehradun.• Essentials of Conservation Biology, Primack, R.B., Sinauer Associates, Inc. Nederland, MA• Wildlife management, Robert, G.H, W.H. Freeman and Co., San Francisco, U.S.A.	
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ZOORM-541 ResearchMethodology Sem-I RM

MSc I Sem I RM

ZooRM - 541: ResearchMethodology

<p>Total Hours: 60</p>	<p>Program specific objective-</p> <ul style="list-style-type: none"> • To understand some basic concepts of research and its methodologies. • To select and define appropriate research problem and parameters. • Understand the various techniques of Data Collection- Observation, Questionnaire, Interview Schedule; Case Study, Social Survey, Content Analysis. • Describing various types of Sampling • Elaborate on Data Processing and Data Analysis • Writing of dissertations, project proposals, project reports, research papers. 	<p>Credits : 4</p>
	<p>Learning outcomes- After successful completion of this course, students are expected to:</p> <ul style="list-style-type: none"> • understand some basic concepts of research and its methodologies. • differentiate between the Quantitative and Qualitative Research and understand different types of Research Design • select and define appropriate research problem and parameters. • organize and conduct research project in a more appropriate manner. • writing of dissertations, project proposals, project reports, research papers. • understand intellectual Property Rights – Biopiracy, copyrights, patent and traditional knowledge and plagiarism. 	<p>Lectures 60</p>
<p>Unit</p>	<p align="center">Topics</p>	
<p>Unit I</p>	<p>Foundations of Research</p> <ol style="list-style-type: none"> i) Meaning of research ii) Objectives of research iii) Motivation in research iv) Research methods versus methodology v) Types of research <ol style="list-style-type: none"> a) Analytical vs Descriptive b) Quantitative vs Qualitative c) Basic vs Applied d) Conceptual vs Empirical 	<p>10</p>
<p>Unit II</p>	<p>Research Design</p> <ol style="list-style-type: none"> i) Meaning of research design ii) Need of research design iii) Features of good design iv) Importance concepts of research design <ul style="list-style-type: none"> • Observation and Facts • Prediction and Explanation • Development of Models v) Developing a research plan by using <ul style="list-style-type: none"> • Problem identification 	<p>20</p>

	viii) Impact factor ix) h-index	
Suggested Reading	<ul style="list-style-type: none"> • Research Methodology, Methods and Techniques. C.R. Kothari • Handbook of Research methodology, modern methods and New Techniques. M. N. Borse • Research Methodology A Handbook. Prof. R.P. Misra • Writing good reports. John Bowden • How to write and publish a Scientific paper (4th edition). Robert A. Day. • Statistical methods for Research workers. M. L. Bansal • Better Thesis Writing. Tejinder Singh & N.G. Madhav. • Research writings and methodology - Ramdas 	

ZOOMJ-551 Structure and Functional Anatomy of Vertebrates Sem-II

MSc I Sem II DSC-30

ZooMJ - 551: Structure and Functional Anatomy of Vertebrates

Total Hours: 60	Program specific objective- <ul style="list-style-type: none"> • To understand habit, habitat and taxonomic status of vertebrate animals. • To know the basic aspects of structural and functional anatomy of vertebrate animals. • To learn about adaptive radiation in vertebrates 	Credits: 4
	Program specific outcomes- After successful completion of this course, students are expected to: <ul style="list-style-type: none"> • gain the knowledge of the systematic position, habit and habitat of vertebrate animals • acquire the knowledge about structural and functional anatomy of vertebrates • understand distinguishing features between structure and function of vertebrates 	Lectures 60
Unit	Topics	
Unit I	A) Organization of Protochordates: i) Urochordata with respect to <i>Salpa</i> : Morphology and Anatomy ii) Cephalochordata with respect to <i>Amphioxus</i> : Morphology and Anatomy B) Origin and Phylogeny of Vertebrates: C) Cyclostomata: Affinities and Phylogenetic status of Cyclostomata	12
Unit II	Concept of Adaptive Radiation: A) Fishes: Adaptive radiation in Chondrichthyes and Ostiochthyes B) Amphibia: Origin and evolution of Amphibia C) Reptilia: Evolution and adaptive radiation in Reptiles. D) Aves: i) Affinities of birds, ii) Origin and ancestry of birds, iii) Birds as glorified reptiles E) Mammals: i) Origin and ancestry of mammals, ii) Adaptive radiations in Prototheria, Metatheria and Eutherian Mammals.	12
Unit III	Study of Endoskeleton of Human: A) Axial Skeleton: Skull, Vertebral Column, Rib Cage B) Appendicular Skeleton: Shoulder Girdle, Skeleton of Upper limb, Pelvic Girdle,	12

	Skeleton of Lower limb C) Functions of Human Skeleton.	
Unit IV	A) Comparative account of Vertebrate Systems: i) Circulatory system ii) Urogenital system iii) Nervous system B) Neuro-endocrine interrelationship of Vertebrates	12
Unit V	Receptor organs in Vertebrates: Dogfish, Frog, Lizard, Pigeon, Rabbit: i) Olfactory ii) Gustatory iii) Photoreceptors (Eye) iv) Statoacoustic (Ear)	12
Suggested Readings	<ul style="list-style-type: none"> • Alexander, R. M.: The chordate. Cambridge University press London. • Ballairs: Reptiles (Hutchinson) • Bourne, G. M.: The structure and function of nervous tissue. Academic Press, New York. • Carter, G. S.: Structure and Habit in vertebrate evolutions. Sedgwich and Jackson, London. • Eccles, J. C.: The understanding of the brain. McGraw Hill Co., New York. • Green: Anatomy of Rat (Hafner) • Hyman: Comparative vertebrate Anatomy, University of Chicago Press. • Kingsley J. S.: Outlines of Comparative Anatomy of Vertebrates, Central book Depot, Allahabad. 	

ZOOMJ-552 Tools and Techniques in Life Sciences Sem-II

MSc I Sem II DSC-31

ZooMJ - 552:Tools and Techniques in Biology

Total Hours: 60	Program specific objective- <ul style="list-style-type: none"> • To know basic terms of biological techniques. • To study the applications of the various biological techniques. • To know the principle, working and applications of basic techniques used in biology. 	Credits: 2
	Program specific outcomes- After successful completion of this course, students are expected to: <ul style="list-style-type: none"> • Explain the importance and applications of biological techniques. • Illustrate the principle, working, materials used and applications of various biological techniques. • gain the knowledge related to radio activity and immunological techniques. 	Lectures 30
Unit	Topics	
Unit I	Principle, parts and applications of Microscopic Techniques: i) Mircoscope: Light, phase contrast, interference, fluorescence, polarization, ii) Inverted and electron microscopy. Principles and applications of Instruments: i) UV-Vis spectrometry ii) Colorimeter iii) Fluorimeter	06
Unit II	Principles and Uses of analytical instruments: i) Balances, pH meter, ii) Densitometric scanner, chemiluminometer. iii) Radioactivity counter, Differential scanning calorimeter. iv) ESR and NMR spectrometers.	06
Unit III	Cell culture Techniques: i) Design and functioning of tissue culture laboratory ii) Cell proliferation measurement iii) Cell viability testing iv) Culture media preparation and cell harvesting methods	06
Unit IV	Separation Techniques: i) Centrifugation techniques: Principles and working of centrifuge, RPM, rotors and its types, types of centrifuge (high speed centrifuge, ultra - centrifuge and gradient centrifuge) ii) Chromatographic techniques: Basic principles of chromatography, Rf value calculation, adsorption, absorption, solvents and solutes iii) Paper chromatography, column chromatography, gel filtration, ion exchange chromatography, HPLC, gas ch	06

	<p>designsromatography.</p> <p>iv) Electrophoresis: Gel electrophoresis (one and two dimensional) SDS-PAGE, AGAROSE. Various methods and agents used in detection of bands.</p> <p>v) Blotting techniques: Southern blotting, northern blotting, and western blotting, south western blotting.</p>	
Unit V	<p>Radio Activity and Immunological techniques</p> <p>i) Radio labeling and radioactive techniques</p> <p>ii) Properties of different types of radioisotopes in biological system, radio degradation, half-life period, auto radiography, safety guidance.</p> <p>iii) Rocket immune-electrophoresis and Ouchterlony double diffusion method</p> <p>iv) Biosensors</p>	06
Suggested Readings	<ul style="list-style-type: none"> • Bullock, J. D., Kristiansen, B.: Basic Biotechnology, 1987, Academic press, New York. • D. B. Tembhare: Techniques in Life Sciences, Himalaya Publishing House. • Keith Wilson, John Walker: Principles and Techniques of Practical Biochemistry • Keshav Trehan: Biotechnology. Wiley Eastern Limited, Bangalore, 1990. • Plummer, L: Practical Biochemistry Tata McGraw-Hill. • Prave, P. Faust, V., Sitting, W and Sukatsch, D.A.: Fundamental of Biotechnology, VCL Publishers, New York. 1987. • Spier, R. E. and Griffins, J.B.: Animal Cell Biotechnology, Vol. I&II, Academic Press, Orlande, 1985. • T. Poddar, S. Mukhopadhyay, S. K. Das: An Advanced Laboratory Manual of Zoology, MacMillan. • Wilson: Principles and Techniques of Practical Biochemistry 	

ZOOMJ-553Biochemistry Sem-II

MSc I Sem II DSC-32

Zoo MJ- 553: Biochemistry

Total Hours: 60	Program specific objective- <ul style="list-style-type: none"> • To know fundamental aspects of Biochemistry. • To study different biological reaction mechanism. • To know the importance of metabolism. • To study the biochemical molecules and their interactions 	Credits: 4
	Program specific outcomes- After successful completion of this course, students are expected to: <ul style="list-style-type: none"> • understand the basic terms related to biochemistry • illustrate the importance of pH, buffer and water in living systems • acquire the knowledge of structure and functions of various biomolecules and their interactions. • gain the facts about different forms of DNA, chemistry of hormones and vitamins. 	Lectures 60
Unit	Topics	
Unit I	Basics of Biochemistry i) Covalent and Non-covalent bonds. ii) Acids and bases: Proton donors and acceptors; strong/weak acids/bases; ionization of water and the ion product. iii) pH scale and the physiological pH range; dissociation constant - K_a and pK_a ; iv) Henderson-Hasselbalch equation; buffer solutions; Normality and Molarity	12
Unit II	Chemistry of biomolecules and their significance: i) Carbohydrates: a) Classification of carbohydrates; b) Derivatives of monosaccharides: Phosphate esters, acids and lactones; amino sugars; c) Oligosaccharides – Important disaccharides. d) Polysaccharides: Storage and structural polysaccharides; ii) Lipids: Definition, classification, structure of fatty acids, triacylglycerols, phospholipids and sphingolipids, Steroid hormones; Lipids as constituents of biological membranes iii) Amino acids: Structure, classification; non-protein amino acids, essential and non-essential amino acids; modified amino acids and function. iv) Nucleic acids: Structure of bases, nucleosides and nucleotides; importance of nucleic acids.	12
Unit III	Protein Structure: a) Primary, secondary, tertiary and quaternary structures. b) Fibrous proteins and globular proteins- examples and biological significance.	12

	<p>c) Conformation of protein - Ramachandran plot, secondary, tertiary and quaternary structure; domains; motif and folds.</p> <p>d) Stability of protein structures.</p>	
Unit IV	<p>Confirmation of Nucleic acids:</p> <p>a) A, B, Z-DNA, b) t-RNA, c) micro-RNA.</p> <p>Chemistry of Hormones:</p> <p>a) Types: Amine, peptide and steroids. b) Properties of hormones. c) Mode of action of peptide and steroid hormones.</p>	12
Unit V	<p>Vitamins (Structural formula not expected):</p> <p>a) Definition, Classifications: Fat and Water soluble vitamins. b) Fat soluble vitamins: A, D, E and K with respect to sources and daily requirements. c) Water soluble vitamins: B complex (B1, B2, B6 and B12) with respect to sources and daily requirements. d) Principle role in metabolism and Deficiency diseases.</p>	12
Suggested Readings	<ul style="list-style-type: none"> • Biochemical Calculations: Segel Irvin H., Publisher: John Wiley and Sons, New York, 2nd Ed., (1997). • Biochemistry: Berg Jeremy, Tymoczko John, Stryer Lubert, Publisher: W. H. Freeman, New York, 6th Ed, (2007). • Biochemistry: Geoffrey Zubay, William C Brown Pub; 4th edition (June 1999) • Biochemistry: Satyanarayan • Biochemistry: Stryer • Biochemistry: Voet Donald and Voet Judith G. John, Publisher: Wiley and Sons, New York, 3rd Ed. (2005). • Enzymes, Biochemistry, Biotechnology and Clinical chemistry: Palmer Trevor, Publisher: Horwood Pub. Co., England, (2001). • Harper's Biochemistry: Robert Murray, D. K. Granner, Peter A. Mayer and Victor W. Rodwell, International 25th edition. • Lehninger's Principles of Biochemistry: Nelson D. L. and Cox M. M. W. H. Freeman & Co. NY, 4th edition, (2005). • Principles and techniques of practical Biochemistry: K. Wilson and J. Walkar, ISBN edition 	

ZOOMJP-554 Practicals based on Structure and Functional Anatomy of Vertebrates sem-II

MSc I Sem II DSC- 33		
ZooMJP - 554: Practicals based on Structure and Functional Anatomy of Vertebrates		
Total Hours: 60	<p>Program specific objective</p> <ul style="list-style-type: none"> • To know anatomy and physiology of vertebrate animals. • Analysis of tissues / cells with reference to DNA, RNA, Protein, vitamins, etc. • To know biochemical processes their reactions and role in life. 	Credits: 2
	<p>Program specific outcomes</p> <p>After successful completion of this course, students are expected to:</p> <ul style="list-style-type: none"> • Acquire the knowledge related to characters, classification, anatomy and physiology of vertebrates. • Gain the knowledge related to principle, class, structure and functions of various biomolecules. • Understand the tools and techniques used in biology. 	Lectures 60
	Structural and Functional Anatomy of Vertebrates	
	<ul style="list-style-type: none"> • Classification of Vertebrates - Urochordata to Amphibia up to order (one example from each order) • Classification of vertebrates - Reptilia to Mammalia up to order (one example from each order) • Study of Axial and Appendicular skeleton of Rabbit. • Study of eye ball muscles of Scoliodon / Pecten from eye ball of hen. • Comparative study of Heart of Frog, Calotes, Pigeon, Rat. • Comparative study of Brain of Frog, Calotes, Pigeon, Rat. 	

MSc I Sem II DSC- 34		
ZooMJP - 555: PracticalsbasedonToolsandTechniquesin LifeSciences		
Total Hours: 60	Program specific objective- <ul style="list-style-type: none"> • To know anatomy and physiology of vertebrate animals. • Analysis of tissues / cells with reference to DNA, RNA, Protein, vitamins, etc. • To know biochemical processes their reactions and role in life. 	Credits: 2
	Program specific outcomes- After successful completion of this course, students are expected to: <ul style="list-style-type: none"> • Acquire the knowledge related to characters, classification, anatomy and physiology of vertebrates. • gain the knowledge related to principle, class, structure and functions of various biomolecules. • Understand the tools and techniques used in biology. 	Lectures 60
Tools and Techniques in Biology		
	1. Calibration of pH meter. 2. Study of Compound and Phase Contrast microscopy. 3. To verify Beer-Lamberts Law. 4. Cell fractionation by using density gradient centrifuge (any suitable gradient) 5. Test Cell viability and Counting. 6. Determination of Molecular Weight of DNA by electrophoresis 7. Study of agglutination reaction and its significance performing WIDAL test.	

ZOOEC-571Aquaculture & Ecology Sem-II

MSc I Sem II DSE-6		
ZooEC - 571: Aquaculture and Ecology		
Total Hours: 60	<p>Program specific objective-</p> <ul style="list-style-type: none"> • To know the differentiating ability of abiotic and biotic components of ecosystem, interactions of various factors of ecosystem. • To know the various biodiversity, hotspot and conservation of ecosystems. 	Credits: 4
	<p>Program specific outcomes- After successful completion of this course, students are expected to:</p> <ul style="list-style-type: none"> • Acquire skills of analysis of abiotic and biotic factors present in environment and their interactions for various associations. • Understanding various biodiversity, hotspot and conservation of ecosystems. 	
	Aquaculture	
	<p>i) Aquaculture: Concept and its scope; Nutritional value of fish</p> <p>ii) Physicochemical parameter of water for fish culture: pH, Calcium, Total Alkalinity, Nitrate, Ammonia, Total hardness of fresh water</p> <p>iii) Construction and Management of Fish culture pond: Construction of ponds, management of ponds, Predatory and weed fishes and their control, Aquatic weeds and their control, Aquatic insects and their control, fish feeding: natural and artificial.</p> <p>iv) Fish breeding: Natural and Induced Natural breeding in pond water, Induced breeding- Pituitary extract, selection of breeders, injection of pituitary extract, spawning, Advantages of induced breeding.</p> <p>v) Transport of fish seed and Brood fish: Causes of mortality in transport, methods for packaging and transport, open systems, closed systems, use of chemicals in live fish transport, anesthetic drugs, antiseptics and antibiotics.</p> <p>vi) Fish Culture: Selection of cultivable fish, monoculture, composite culture, culture of Indian major carps, Culture of common carps, culture of cat fishes, paddy cum fish culture, mari culture, cage culture, integrated fish farming</p> <p>vii) Fish preservation, processing and byproducts Fish preservation techniques, fish byproducts</p> <p>viii) Fish pathology: Bacterial, fungal, protozoan and worm diseases of fish.</p> <p>ix) Technologies in Fisheries Development:</p>	30

	Geographic Information System (GIS) technology, Use of Information Communication Technology (ICT) in fishes: production aspects, marketing aspects.	
	Ecology	
	<p>i) Introduction: The Environment: Physical and Biotic environment; Biotic and Abiotic Interactions</p> <p>ii) Population Ecology: Characteristics of a population; population growth curves; population regulation; life history strategies (<i>r</i> and <i>K</i> selection); concept of metapopulation – demes and dispersal, interdemec extinctions, age structured populations.</p> <p>iii) Species Interactions: Types of interactions, interspecific competition, herbivore, carnivore, symbiosis. Levels of species diversity and its measurement.</p> <p>iii) Ecological Succession: Types; mechanisms; changes involved in succession; concept of climax.</p> <p>iv) Ecosystem: Structure and function; energy flow and mineral cycling (CNP); primary production and decomposition; structure and function of some Indian ecosystems: terrestrial (forest, grassland) and aquatic (fresh water, marine, eustarine).</p> <p>v) Applied Ecology: Environmental pollution; Global environmental change; Biodiversity- Concept, Patterns, Importance; Biodiversity Hotspots; Status, Monitoring and documentation; Major drivers of biodiversity change; Biodiversity management approaches.</p> <p>vi) Conservation Biology: Principles of conservation, Major approaches to management, Indian case studies on conservation / management strategy (Project Tiger, Biosphere reserves).</p>	30
Suggested Readings	<ul style="list-style-type: none"> • Bailey, N.T.J (1959): Statistical methods in Biology, ELBS and The English Universities Press Ltd. UK. • Khanna S.S.: An Introduction to fishes, Central Book Depot, Allahabad. • Sharma P.D.: Ecology, Rastogi publication, Meerut. • Talwar P.K. and A.G. Jhingran: Inland fishes Vol. I and II, Oxford and IBM Publishing Co. Pvt. Ltd. • Trivedi R. K., Goel P. K., Trisal C. L.: Practical methods in Ecology and Environmental Science Environmental Publishers, Karad. 	

ZOOOTJ-591 Zoology-related industries, gardens, museums, zoos, etc., and prepare thereport Sem-II

OJT/INT

Visit to the Zoology related Industries, Gardens, Museums, Zoos etc and prepare the report and submit.

