PRATAP COLLEGE AMALNER(Autonomous)

Affiliated to

Kavayitri Bahinabai Chaudhari

NORTH MAHARASHTRA UNIVERSITY

JALGAON- 425001, INDIA

SYLLABUS UNDER

FACULTY OF SCIENCE & TECHNOLOGY

UNDER NEP- 2020

FOR COURSES RELATED TO SUBJECT

ZOOLOGY

F.Y.BSc.(Semester I and II)

(w.e.f. from 2023 – 2024)

ZOOMJ-101 Cell Biology

F.Y.B.Sc. Sem I DSC-1		
Zoo MJ- 101: Cell Biology		
Total Hours: 60	**Program specific objective-** • Students will understand the structures and purposes of basic components of prokaryotic and eukaryotic cells, especially macromolecules, membranes, and organelles • Students will understand the cellular components underlying mitotic cell division. • Students will apply their knowledge of cell biology to selected examples of changes or losses in cell function. These can include responses to environmental or physiological changes, or alterations of cell function brought about by mutation.	**Credi:2**
	Program specific outcomes- After successful completion of this course, students are expected to: • Enlighten themself with knowledge related to cell Biology. • Enrich themselves with understandings of cell organales. • Know the cell division their significance. • Understand the cell aging cell death and tumours.	**Lectures** 30
Unit	**Topics**	
Unit I	Introduction and scope of cell biology i) Generalstructureofanimalcell ii) Prokaryotic,eukaryoticcellandarchaeo bacteriastructure.	**12**
Unit II	Structure and functions of Plasma membrane– i) Unit membrane model of Robertson ii) Bilayer model of Danielli and Davson. iii)Fluid mosaic model of singer and Nicolson iv)OsmosisandDiffusion-Biologicalimportance	**12**
Unit III	Study of cellorganelles w.r.t. structure and functions. i) Nucleus ii)Mitochondria iii)Endoplasmicreticulum iv) Golgicomplex v) Ribosome vi) Lysosomes	**10**
Unit IV	Cell cycle and Divisions- i) Celldivision– a) Definition b) Stages of Mitosis and its significance c)stages of Meiosis and its significane d) Distinguish between mitosis and meiosis ii) Stages of Cellcycle-G1,S,G2,Mphase	**14**
Unit V	CellSignalingandCancer Intracellular signaling; Catagories of Signaling; Types of signal; Receptors; Signal transduction by hormones; Receptors of special importance i) Categories of signaling: a) Endocrine, b) Paracrine, c) Autocrineand d) Juxtacrine. ii) Regulation of cell cycle iii) Cancer: a) Introduction, b) Benign and Malignant tumour c) Properties of cancer cellsand d) Cell aging e) Cell death	**12**
Suggested	1) Lodishetal: Molecular and CellBiology (ScientificAmericanBook) 2) DeRobertiesandDeRoberties:CellandMolecularBiology(SaundersCollege)	

Readings	3) A C Giese: Cell Physiology 4) Prescott,D M: Reproductionineukaryoticcells(AcademicPress) 5) Wilson,EB:CellinDevelopment and Inheritance(MacMillan) 6) Edward Gasque: Manual of Laboratory Eology (W.C.BrownPublishers) 7) Stryer,L:Biochemistry(Freeman) 8) Connetal:OutlineofBiochemistry(Wiley)WatsonJ.D.etal:MolecularBiologyof Gene (Benzamin/Cummings)	

ZOOMJ - 102: Wonders of Animal World, Biodiversity and its Conservation

F.Y.B.Sc I Sem I DSC-2		
ZOOMJ - 102: Wonders of Animal World, Biodiversity and its Conservation		
Total Hours: 30	**Program specific objective-** • To take learners through a captivating journey of hoarded wealth of marvelous animal world. • To orient learners about rich heritage of Biodiversity of India and make them understand significance of its conservation.	**Credits: 2**
	Program specific outcomes- • Curiosity will be ignited in the mind of learners, to know more about the fascinating world of animals which would enhance their interest and love for the subject of Zoology. • Learners would appreciate treasure of Biodiversity, its importance and hence would contribute their best for its conservation.	**Lectures** 30
Unit	**Topics**	
Unit I	**Wonders of Animal World** i) Echolocation in Bats and Cetaceans - Dolphins and Whales ii) Mechanism of Pearl formation in Mollusca iii) Bioluminescence in Animals: Noctiluca, Glow worm, Firefly,Angler Fish (Mechanism and use for the animal) iv) Regeneration in Animals - Earthworm (Annelida),Hydra(Coelenterates),Starfish (Echinoderms) Lizard (Reptile) v) Mimicry in Butterflies and its significance: Great Egg fly and Common Crow, Common Palmfly and Plain Tiger. vi) Mechanism of Coral formation and types of Coral reefs vii) Bird migration: Definition, types and factors inducing bird migration, advantages and disadvantages of migration viii) Adaptive features of desert animals: Reptiles (Phrynosoma) and Mammals (Camel)	**08**
Unit II	**Wonders of Animal World** Breeding and Parental care in i) Pisces - Ovo-viviparous (Black Molly/Guppy), Mouth brooders (Tilapia), Brood pouches (Sea horse)	**07**

	ii) Amphibia - Mouth brooders (Darwin's Frog), Egg carriers (Midwife Toad) iii) Mammals - Egg-laying (Duck-billed Platypus), Marsupials (Kangaroo) iv)Aves: Brood Parasitism (Cuckoo)	
Unit III	Biodiversity and its Conservation i) Introduction to Biodiversity - Definition, Concepts, Scope and Significance ii) Levels of Biodiversity - Introduction to Genetic, Species and Ecosystem Biodiversity iii) Introduction of Biodiversity Hotspots- (Western Ghats and Indo- Burma Border) iv) Values of biodiversity - Direct and Indirect use value	
Unit IV	Biodiversity and its Conservation i) Threats to Biodiversity - Habitat loss and Man-Wildlife conflict ii) Biodiversity conservation and management iii) Conservation strategies: in situ, ex-situ, National parks, Sanctuaries and Biosphere reserves. iv) Introduction to International efforts : Convention on Biological Diversity (CBD), International Union for Conservation of Nature and Natural Resources (IUCN), United Nations	**09**
Unit V	Biodiversity and its Conservation i)Environment Program - World Conservation Monitoring Centre (UNEP-WCMC) ii) National Biodiversity Action Plan, 2002 iii) Introduction to Indian Wildlife (Protection) Act, 1972 and Convention for International Trade of endangered species	**06**
Suggested Readings	• Wonders of the Animal World - University Text Book of Zoology, F.Y.B.Sc.Semester I Course 1. V.V. Dalvie, G.B. Raje, P. Sardesai, N.S. Prabhu,University Press. • Vertebrate Zoology Volume I- Jordan and Verma , S. Chand and Co. • Invertebrate Zoology Volume II- Jordan andVerma , S. Chand and Co. • Invertebrate Zoology- T. C. Majupuria , S. Nagin and Co. • Chordate Zoology- P. S. Dhami and J. K. Dhami , R. Chand and Co. • Invertebrate Zoology- P. S. Dhami and J. K. Dhami , R. Chand and Co. • Introduction to Vertebrates- Moore Cambridge University- Low Priced Edition • Zoology- S. A. Miller and J. B. Harley, Tata McGraw Hill • Modern Textbook of Zoology, Invertebrates, R. L. Kotpal • Fundamentals of Ecology- E. P. Odum , Sunders Publication • Fundamentals of Ecology- M.C.Dash-2nd edition, Tata McGraw Hill • Essentials of Ecology and Environmental Science - S.V.S Rana • Biodiversity- S.V.S Rana- Prentice Hall Publications • Modern Biology- V. B. Rastogi • Biology of Mollusca- D. R. Khanna	

ZOOMJ-103 Practicals based on Cell Biology and Wonders of Animal World, Biodiversity and its Conservation Sem-I

F.Y.Sc. Sem I DSC- 3		
ZooMJ - 103: Practicals based on Cell biology andWonders of Animal World, Biodiversity and its Conservation		
Lectures 30	**Program specific objective** • Describe the evolution, diversity and replication of cells; • Explain the role of compartmentalization and signaling in cellular biology; • Interpret and explain key experiments in the history of cell biology; • To take learners through a captivating journey of hoarded wealth of marvelous animal world.	**Credits: 2**
	Program specific outcomes • Evaluate and apply knowledge of modern techniques in cellular biology. • Curiosity will be ignited in the mind of learners, to know more about the fascinating world of animals which would enhance their interest and love for the subject of Zoology.	**Lectures** 30
	Cell Biology Practicals- 1. Studyofanimalcellandcellorganellesbyusingmicrophotographs– Mitochondria, Endoplasmic reticulum, Golgi complex, Nucleus, Lysosomes and ribosomes 2. Study of mitosis from any suitable material (E). 3. Study of meiosis from any suitable material(E) 4. Vital staining of mitochondria by Janus green (E) 5. Preparation of blood smears to study various blood corpuscles. 6. Studyofmammaliangametes-Spermandovum 7. Study of RBC membrane fragility-Isotonic, Hypotonic and Hypertonic solutions. **Wonders of Animal World, Biodiversity and its Conservation** 1. Mounting of foraminiferan shells from sand (any 3) 2. Study of types of Corals - Brain, Organ pipe, Stag Horn, Mushroom coral 3. Study of the following; a. Symbiosis (Termite and Trychonymph, hermit crab and sea anemone) b. Camouflage (leaf insect, chameleon) c. Cannibalistic mate-eating animals (Spider and Praying Mantis) d. Animal architects: Termites, Harvester ant and Baya weaver bird e. Study of bioluminescent organisms – Noctiluca, glow worm, fire fly,angler fish. 4. Breeding and parental care in Amphibia- Rhacophorus, Midwife toad, Darwin's frog, Caecilian. 5. Mounting of scales of fish (placoid, cycloid and ctenoid) 6 a) Study of Adaptive radiation in Reptiles - Turtle, Tortoise, Phrynosoma, Draco) b) Identification and differentiation of venomous and non-venomous snakes (Scales, Fangs, Bite marks, etc.) 7. Study of Types of feathers (contour, filoplume, down), beaks (Nectar feeding, Insect catching, Fruit eating, Scavenging, Filter feeding), claws(Perching, wading, swimming, hopping) in birds 8 a. Identification of birds - Coppersmith Barbet, Bulbul, Rose ringed Parakeet, Magpie Robin, two local birds. b. Field Report – To be done in a group of ten students (submission of written / typed report preferably along with photographs/ tables/ graphs.	

	Other Suggested topics for field observation/survey: Butterflies/ Fishes/ Migratory birds of local area. Variations in Human like Attached vs. Free Earlobes, Blood Groups, Eye colour, etc. using statistical method. 9. Observations of fauna in the field (with reference to theory syllabus).	

ZooMN: 111: Frog-The Chordate

F.Y.B.Sc. Sem-I MIN-1		
ZooMN: 111: Frog-The Chordate		
Total Hours: 60	**Program specific objective-** • To understand habit, habitat and taxonomic status of vertebrates. • To explain the basic aspects of structural and functional details of Frog.	**Credits: 2**
	Program specific outcomes- • After successful completion of this course, students are expected to: Understand the systematic position, habit and habitat of Frog. • Acquire the knowledge about structural and functional details about Frog.	**Lectures** 30
Unit	Study of Frog (*Hoplobatrachus tigerinus*) with respect to following points	
Unit I	i) External Characters and sexual dimorphism a) Shape, size and Colour. b) Division of the body. c) Sexual dimorphism ii) Digestive system: a) Alimentary canal b) Digestive glands, c) Food, feeding and	**06**

	d) Digestion	
Unit II	i) Respiratory system: a) Types and process of respiration ii) Circulatory system: a) Heart- External structure, Internal structure, Working of heart b) Arterial system, c) Venous system, d) Blood- Composition and functions	**06**
Unit III	i) Nervous system: a) Brain, b) Ventricles and c) Spinal cord. ii) Sense organs: a) Eye and b) Ear. iii) Excretory system: a) Kidney. b) Ureters. c) Urinary bladder. d) Cloaca.	**10**
Unit IV	Reproductive system: i) Male Reproductive system: Testes, Vasa efferentia, Urino-genital duct and Cloaca. ii) Female Reproductive system: Ovaries, Oviduct, Cloaca.	**4**
Unit V	Frog Development: i) Structure of egg and sperm, ii) Amplexus and Fertilization. iii) Cleavage, Tadpoles. d) Metamorphosis.	**4**
Suggested Readings	• Robert Rugh: The Frog: Its reproduction and development - Tata McGraw Hill Edition, New Delhi. Ganguly, B.B., Sinha, A.K., Adhikari, S.: Biology of Animals - New Central Book Agency, Kolkata. Bhamrah, MS and Juneja, K.: Introduction to Amphibia - Amol Publications, Delhi. • Young, J. Z.: Life of Vertebrates - III Edition, Clarendon Press, London. • Goodnight and others: General Zoology, IBH Publishing Co. • Prasad, ASN. : Life of Vertebrates - Vikas Publishing House, New Delhi. • Prasad, S. N. and Kashyap V.: Textbook of Vertebrate Zoology - New Age India Publishers, New Delhi. • Kotpal, R. L: Modern Text-Book of Zoology, Vertebrates, Rastogi and Co., Meerut. • Jhingran, JG.: Fish and Fisheries of India, Hindustan Publishing corporation, New Delhi. • Kershaw, D. R.: Animal Diversity, Redwood Burn Ltd, Trowbridge. • Parker J. and Haswell, W.: Text-Book of Zoology, ELBS Edition. • Vidyarthi: Text-Book of Zoology - Agrasia Publishers, Agra. • Jordan E.L and Verma P.S.: Chordate Zoology, S. Chand and Co., New Delhi. Nigam, HC and Sobti, R.: Functional Organization of Chordate (parts I and II), S.¬ Chand and Co., New Delhi.	

ZOOMN-112 Practicals based on Frog -The Chordate

F.Y.B. Sc Sem-I MIN-2		
ZooMN - 112: Practicals based on Frog -The Chordate		
Lectures 60	**Program specific objective-** • To observe and explore the internal and external anatomy of the frog as well as understand the function of these structures. • We also learned the sounds and calls of various frog species.	**Credits: 2**
	Program specific outcomes- • After successful completion of this course, students understand the different systems in amphibian animal. • Acquire the knowledge about the developmental stages in frog.	**Lectures** 60
	Study of Frog with the help of diagrams / chart / Model / simulations / etc. 1. External characters and sexual dimorphism 2. Digestive system 3.Respiratory system 4. Circulatory system – Arterial and Venous system 5. Excretory and Reproductive system – Male and Female 6) Brain – Dorsal and Ventral view 7) Permanent slides of – Sperm, Egg, Blastula and Gastrula, Tadpole Larvae 8) Report on compulsory visit to a Zoo/Sanctuaries.	

ZOO-OE-121 Vermitechnique

F.Y.B.Sc. Sem-I OE-1
Zoo –OE- 121: Vermitechnique

Total Hours: 30	**Program specific objective** • Students will understand the Scope of vermiculture and also the utility of vermitechnology in India and its significance. • Be aware of a broad array of career options and entrepreneurship possibilities in the area of vermiculture and vermitechnique for the organic manure preparation	**Credits: 2**
	Program specific outcomes • Understand the culture techniques of various species like *Lumbricus terrestris, Eisenia eugenia*, *Eudrilus, Amynthas gracilus, Perionyx excavates* etc. • Management of vermicomposting wastes in field pits, ground heaps, tank method, roof shed method etc. • Harvesting the vermin-compost and its storage, vermiwash preparation and their application.	**Lectures** 30
Unit	**Topics**	
Unit I	**Vermiculture Definition**, **scope and importance-** i) Useful species for vermiculture ii) Environmental parmeters iii) Culture methods – wormery – breeding techniques; iv) Indoor and outdoor cultures v)Monoculture and polyculture – merits and demerits.	
Unit II	**Biology of Earthworms Morphology & Anatomy-** **i)** Earthworms- Taxonomic position, external features- shape, size, colour, segmentation, setae & clitellum. Body wall, coelom, locomotion, ii) Life Cycle of Earthworm iii) Digestive, circulatory, respiratory, excretory & nervous system. Reproductive system-Male & Female, iv)copulation, cocoon formation & fertilization, development of earth worm.	
Unit III	**A)Vermicomposting preparation methods-** i)Vermicomposting of wastes in field pits, ground heaps, tank method, roof shed method, static pile windrows, top fed windrows, wedges & bin method, ii) harvesting the compost, storage, iii)Vermiwash-Preparation and application. B) **Applications of vermiculture** – i)Vermiculture Bio-technology, ii) Vermicomposting, use of vermicastings in organic, farming/horticulture iii)earthworms for management of municipal/selected biomedical solid wastes; iv) As feed/bait for capture/culture fisheries; v) Forest regeneration.	
Unit IV	**A) Vermitechnology Definition, history, growth and development in other countries & India, significance.** **B) Economic importance of Earthworms** In sustainable agriculture, organic farming, earthworm activities, soil fertility & texture, soil aeration, water impercolation, decomposition & moisture, bait & food. C) Nutrient composition of vermicompost	
Unit V	**Entrepreneurship prospects in vermiculture** i) Prospectus of vermiculture in India: employment strategies ii)Future perspectives – Predator / pathogen control in wormeries	

	iii)Potentials and constraints for vermiculture in India. iv) Marketing the products of vermiculture – quality control, market research, marketing techniques – creating the demand by awareness and demonstration, advertisements, packaging and transport, direct marketing. v)Visit to relevant Labs/Field Visits	
Suggested Readings	1. Sultan Ahmed Ismail, 2005. The Earthworm Book, Second Revised Edition. Other India Press, Goa, India. 2. Bhatnagar & Patla, 2007. Earthworm vermiculture and vermin-composting, Kalyani Publishers, New Delhi. 3. Jordan & Verma, 2009. Invertebrate Zoology, Chand & Company Ltd. 5. Mary Violet Christy,2008. Vermitechnology, MJP Publishers, Chennai 6. Edwards, C.A & P.J Bohlen, 1996. Biology and ecology of earthworms III Edn. Chapman & Hall N.Y.U.S.A. 7. Edwards, C.A & J.R Lofty Vermicoloogy – The Biology of earthworm, 1997 Chapman & Hall Publications N.Y.U.S.A. 8. Lee, K.E. 1985. Earthworms their ecology and relationships 9. Aravind Kumar, 2005.Verms & Vermitechnology, A.P.H. Publishing Corporation, New Delhi	

ZOO-SEC-104 : Laboratory safety and Instrumentation

F.Y.B.Sc. Sem-I SEC-1		
ZOO-SEC-104: Laboratory safety and Instrumentation		
Total Hours: 30	**Program specific objective** • To make learners aware of risks involved in handling of different hazardous chemicals, sensitive (electrical/electronic) instruments and infectious biological specimens especially during practical sessions in the laboratory and to train them to avoid mishap. • To provide all learners a complete insight about the structure and train them with operational skills of different instruments required in Zoology.	**Credits: 2**
	Program specific outcomes-: • Learners would work safely in the laboratory and avoid occurrence of accidents (mishaps) which will boost their scholastic performance and economy in use of materials/chemicals during practical session • Students will be skilled to select and operate suitable instruments for the studies of different components of Zoology of this course andalso of higher classes including research.	**Lectures** 30
Unit	**Topic**	
Unit I	**Introduction to good laboratory practices** i) Use of safety symbols: meaning, types of hazards and precautions ii) Units of measurement- iii) Calculations and related conversions of each: Metric system-length (meter to micrometer); weight (gram to microgram), Volumetric (Cubic measures) iv) Temperature: Celsius, Fahrenheit, Kelvin	

	v) Concentrations: Percent solutions, ppt, ppm, ppb dilutions, Normality, Molarity and Molality.	
Unit II	**Health and Health care-** i) Basic structure and functioning of the human body health care in india ii) Biomedical technology and abbreviation	
Unit III	**Instrumentation** i) Construction, principle and applications of dissecting and compound microscope ii) Colorimetry and Spectroscopy - Principle and applications. iii) pH - Sorenson's pH scale, pH meter - principle and applications. iv) Centrifuge - Principle and applications (clinical and ultra centrifuges). v) Chromatography - Principle and applications (Partition and Adsorption)	
Unit IV	**Instrumentation** i) Electrophoresis - Principle and applications (AGE and PAGE) ii) Fundamental of Electrolyte Analyser iii) Blood gas analyser iv) Incubator and water bath	
Suggested Readings	1. Basic Laboratory Techniques, Instrumentation and Biotechnology- University Text Book of Zoology, F.Y.B.Sc. Semester I Course 2. V.V. Dalvie, R. G. Deshmukh, R. D'souza and H.U. Shingadia University Press. 2. Introduction to Practical Biochemistry – David T. Plummer (Tata McGrawHill Publishing Co. Ltd.) 3. Introductory Practical Biochemistry – S.K. Sawhney and Randhir Singh(Narosa Publishing House) 4. Methods in Biostatistics – B. K. Mahajan, (Jaypee Publications) 5. Microscopy and Cell Biology - V. K. Sharma, (Tata McGraw Hill PublishingCo. Ltd.) 6. Bioinstrumentation – L. Veerakumari, (M.J.P. Publishers) 7. Principles and Techniques of Practical Biochemistry – Keith Wilson and JohnWalker, (Cambridge University Press) 8. Biotechnology- Thieman and Pallidino, Pearson edu. 9. Biotechnology –Glick and Pasternak 10.Biochemistry –Satyanarayana 11.Understanding biotechnology- AluizioBorem ,David Bowe-Low price edition–Pearson Publication 12.A Textbook of Biotechnology – R. C. Dubey, S. Chand Publication. 13.A Manual of Medical Laboratory Technology -A. H. Patel, Navneet PrakashanLtd. 14.Biological instruments and methodology – Dr. P. K. Bajpai, S. Chandcompany Ltd. 15.Calculations in Molecular biology and Biotechnology – Frank H. Stephenson,Academic Press.	

ZOOMJ-151Morphology and Anatomy of Grasshopper Sem-II

	F.Y.B.Sc. Sem-II DSC-4	**Credit-2**
	ZOOMJ-151 Morphology and Anatomy of Grasshopper (*Poekiloceruspictus*)	**Lectures30**
	Courseobjective: • Toprovidethoroughknowledgeaboutexternalmorphologicalfeaturesofgrasshopper • To develop an understanding about internalstructuralandfunctionaldetailsofgrasshopper includingitsreproductivesystemandlifecycle	
	Learningoutcomes: Aftersuccessfulcompletionofthiscourse,studentsareexpectedto: • Acquireknowledgeaboutexternalmorphologicalfeaturesofgrasshopper • Understandinternalstructuralandfunctionaldetailsofgrasshopper Developdeeperknowledgeaboutreproductionandlifecycle of grasshopper	
Unit	**Topics**	
Unit-1	**A) ExternalCharactersandsexualdimorphism** i)Shape,sizeandColour ii)Divisionofthebody iii)Sexualdimorphism **B)Digestivesystem:** i) Mouthparts ii) Alimentary canal,Digestiveglands, iii) Food,feedingandDigestion	**06**
Unit-2	**Respiratorysystem:** i)Trachealsystem ii) Typesofspiracles iii) Mechanismofrespiration	**06**
Unit-3	**Circulatorysystem**: i)Typeofcirculatorysystem ii)Heart,sinuses iii) Haemolymph-Compositionandfunctions	**08**
Unit-4	**A) Nervoussystem**: Brain,nervecordandsenseorgans **B) Excretion**ingrasshopper	**04**
Unit-5	i)**Male&FemaleReproductivesystem** **ii)Lifecycleofgrasshopper** **iii) Ecological Significance of Grasshopper** a) Grasshoppers in ecosystems: roles and interactions b) Grasshoppers as indicators of environmental health c) Economic importance of grasshopper	**06**

Suggested Readings	➢ ParkerJ.andHaswell,W.:Text-BookofZoology,ELBSEdition ➢ Vidyarthi:Text-BookofZoology-AgrasiaPublishers,Agra. ➢ RuppertandBarnes,R.D.(2006).*InvertebrateZoology*,VIIIEditi on.HoltSaundersInternationalEdition. ➢ KotpalRL(2009):ModerntextbookofZoologyInvertebrates,Rastogi Publication. ➢ KotpalR.L.:Arthropods ➢ PrasadS.N.:LifeofInvertebrates,VikasPublishinghouse,NewDelhi. ➢ Jorden,E.L.:TheInvertebrates,S.C.Chand,NewDelhi. ➢ ProfPSLohar*etal*:FYBSz Zoo101&102:AtahrvaPublication,Jalgaon	

ZOOMJ-152 Parasitology

F.Y.B.Sc. Sem-II DSC- 5		
ZooMJ - 152: Parasitology		
Total Hours: 30	**Program specific objective** ● To understand the basic terminologies in parasitology. ● To understand the concepts of animal association with examples. ● To understand the morphology and life cycle of common parasites (Protists and Platyhelminthes). ● To understand the phenomenon of Host-parasite relationship. ● Explain the importance of arthropod vectors with examples.	**Credits: 2**
	Program specific outcomes • The students will be able to learn about basics and scope of parasitology. • The students will be able to learn the types of host and parasite with	**Lectures** 30

	examples. • he students will be able to learn about the morphology, life cycle, pathogenicity and treatment of common parasites (Protists and Platyhelminthes). • The students will be able to learn about host -parasite relationships and their effects on host body. • The students will be able to learn about the arthropod parasites and their role as vector.	
Unit	**Topics**	
Unit I	**Introduction, Scope and Branches of Parasitology**: i) Definition: host, parasite, vector, commensalisms, mutualism and parasitism. ii) Branches of parasitology	**02**
Unit II	**Types of Parasites and Hosts**: i) Ectoparasites. 3 L CBCS: ii)Endoparasites and its subtypes. Gut,Haemo,Tissueand Lymphparasites iii) Types of hosts - Intermediate, definitive, paratenic and reservoir	**03**
Unit III	**Host - Parasite relationship**: i)Host specificity. ii)Types of host specificity: structural specificity, physiological specificity and ecological specificity. iii)Effects of parasite on host.	**03**
Unit IV	**A) Study of Parasitic Protists:** i) Entamoeba histolytica - Morphology, Life Cycle, Prevalence, Epidemiology, Pathogenicity, Diagnosis, Prophylaxis and Treatment. ii) Plasmodium vivax - Morphology, Life Cycle, Prevalence, Epidemiology, Pathogenicity, Diagnosis, Prophylaxis and Treatment. **B) Study of Parasitic worms:** i) Ascaris lumbricoides - Study of Morphology, Life Cycle, Prevalence. ii)Epidemiology, Pathogenicity, Diagnosis, Prophylaxis and Treatment. iii)Taenia solium (Tapeworm) - Study of Morphology, Life Cycle, Prevalence, Epidemiology, Pathogenicity, Diagnosis, Prophylaxis and Treatment.	**18**
Unit V	Study of Parasitic Arthropoda: Morphology, Pathogenicity and Control measures of – i) Soft tick. ii) Head louse. iii) Rat flea. iv) Bed bug	**04**
Suggested Readings	1. Parasitology: K. D. Chatterjee. 2. Parasites: ecology, diseases, and management (2013). 3. Parasitic Helminths: Targets, Screens, Drugs, and Vaccines, 201. 4. Parasitism: The Diversity and Ecology of Animal Parasites (2014) Tim Goater, Timothy M. Goater, Cameron P. and Esch, Gerald W. Cambridge University Press. 5. Principles of Veterinary Parasitology (2016), 1 st Edn, Dennis E. Jacobs, Mark Fox, Lynda M. Gibbons, Carols Hermosilla, John Wiley & Sons. 6. Veterinary Parasitology (2013), Hany M. Elsheikha, Jon S. Patterson, CRC Press Taylor & Francis Group 7. Textbook of medical parasitology – C. K. Jayaram Panikar. 8. Textbook of medical parasitology – Arora & Arora.	

	9. Textbook of medical parasitology – S. C. Parija. 10. Veterinary Parasitology, 2013 - (Taylor, M. A.). 11. Encyclopedia of parasitology, 2008. 12. The Biogeography of Host-Parasite Interactions by Serge Morand, Boris R. Kransov, Oxford University Press. 13. Textbook of medical microbiology – Rajesh Bhatia &Itchpujani.	

ZOOMJP-153 Practicals based Morphology and Anatomy of Grasshopper and Parasitology Sem-II

F.Y.B.Sc. Sem-II DSC- 6		
ZooMJP - 153: Practical I (Practicals based Morphology and Anatomy of Grasshopper and Parasitology)		
Hours 30	**Course objective:** • To explain the basic aspects of structural and functional details of grasshopper.	**Credits: 2**
	Learning outcomes: ge about structural and functional aspects of grasshopper	**Lectures 30**
	StudyofGrasshopperwithrespecttofollowing 1. Externalcharactersandsexualdimorphism 2. Mountingofmouthparts,wings,legs,trachea and spiracles,gizzard,Malpighiantubulesootheca 3. Digestivesystem 4. Circulatorysystem 5. Nervoussystem 6.Maleandfemalereproductivesystem 7.Lifecycleofgrasshopper **Practicals on Parasitology** 1. Studyofexternalcharacters andlifecycleof*Plasmodiumvivax,Fasciolahepatica,Wuchereriabancrofti andPediculushumanis*(D) **2.** Studyofinsectsvectors:houseflyand mosquito(D) **3.** Identify and mention its pathogenicity and control measures of- *Entamoeba histolytica,Taeniasolium, Ascaris lumbricoides*,Tick (D) **4.** Identify and mention its pathogenicity and control measures of- *Entamoeba histolytica,Taeniasolium, Ascaris lumbricoides*,Tick (D) 5. StudyoflarvalformsofCestodes,Trematodesand Nematodes(D) 7. Demonstrationofendoparasitesfromthe fish/chick/goat/sheepintestine(D) 8. StudyofBedbug,Housefly,MosquitoandHeadlouse(D) 9.Studyofrectalparasitesfromcockroach/anysuitableanimal(D)	

ZOOMN-161- Forensic Zoology Sem-II

F.Y.B.Sc. Sem-II MIN-3		
ZooMN - 161: Forensic Zoology		
Total Hours: 30	**Program specific objective** • To understand the scope, need and History of Forensic Science • To understand the role of different institutes & allied institutes of Forensic Science. • To understand the various branches of Forensic Sciences from Life Sciences. • To understand human physiology, post mortal investigations. • To understand knowledge of handling different types of evidences and their examinations	**Credits: 2**
	Program specific outcomes • The students will be able to understand the basics principles of Medical and Forensic Zoology. • The students will able to understand scientific methods in crime detection. • The students will be able to understand the advancements in the field of Medical and Forensic Zoology. • The students will be able to understand modern tools, techniques and skills in forensic investigations. • The students will be able to describe the fundamental principles and functions of forensic science and its significance to human society	**Lectures** 30
Unit	**Topics**	
Unit I	**Introduction to Forensic Science** i) Definition and Scope of Forensic Science and Zoology. ii) Forensic Laboratories in India. iii) Role and Responsibility of a Forensic Scientist iv)Different branches of Forensic Science	**03**
Unit II	**Legal Aspects of Forensic Science** i) Role of Forensic Science in the Legal System. ii)Rules of Evidence. iii)Expert Witness Testimony: Duties, Responsibilities, and Ethics iv) Basic Principles of Crime Investigation	**06**
Unit III	**Forensic Entomology** i) Role of insects in forensic investigations ii)Stages of decomposition and insect succession. iii)Collecting and analyzing entomological evidence	**06**
Unit IV	**Basics of Forensic Biology** i)Introduction to Forensic Biology ii)Types and Structure of Hair, Fibers, and Textiles iii)Forensic Serology: Blood, Semen, Saliva, normal and abnormal constituents of Urine..	**8**
Unit V	**Forensic toxicology** i) Introduction to Forensic toxicology ii) Basic Concepts of Toxicology and Drugs	**7**

	iii) Different types of poisons.	
Suggested Readings	1. Text book of pathology: Robbins &Cotran, Vol. 1 & 2, Tenth Edition, Elsevier Publication. Essentials of medical pharmacology: K. D. Tripathi, 8th edition, Jaypee brothers publishers. 2. Review of pharmacology: K. D. Tripathi, Jaypee brothers publishers. 3. Essentials of medical microbiology: Apurba S. Sastry & Sandhya Bhat, Jaypee brothers. 4. W. G. Eckert and S. H. James, Interpretation of Bloodstain Evidence at Crime Scenes, CRC Press, Boca Raton (1989). 5. The essentials of forensic medicine & toxicology: K. S. Narayan Reddy. 6. A textbook of Clinical pharmacology: Roger H. J., Spector R. G., Trounce J. R., Hodder & Stoughton publishers. 7. Pharmacology & Pharmacotherapeutics: Satoskar R. S., Bhandarkar S. D., Popular Prakashan, Mumbai. 8. The synopsis of forensic medicine & toxicology: K. S. Narayan Reddy. 9. Textbook of pathology: Harsh Mohan. 10. G. T. Duncan and M. I. Tracey, Serology and DNA typing in, Introduction to Forensic Sciences, 2nd Edition, W. G. Eckert (Ed.), CRC Press, Boca Raton (1997). 11. T. Bevel and R. M. Gardner, Blood stain Pattern Analysis, 3rd Edition, CRC Press, Boca Raton (2008). 12. Arti Nigam and Archana Ayyagari, Lab manual in Biochemistry, immunology and biotechnology, McGraw Hill Publishing Company ltd. 13. Fundamentals of Forensic Science, Second Edition, Max M. Houck and Jay A Siegel, Academic Press. 14. Forensic Science, Third Edition, Stuart H James and Jon. J. Nordby. 15. Forensic Science in India and the World, Deepak Ratna and Mohd. Zaidi, Alia Law Agency, Allahabad. 16. Forensic Science in India - A Vision for the 21stCentury, B. B. Nanda and Dr. R. K. Tewari, Select Publishers. 17. Cell Biology, Sixth Edition International Students Edition, Gerald Karp, Wiley Publications, 2010. 18. Human Physiology: From Cells to Systems, Lauralee Sherwood, Cengage Learning, 2008. 19. Forensic Biology, Richard Li, CRC Press. 20. Human Anatomy Vol. 1,2,3,4, Chaurasia B. D. 21. Textbook of Medical Jurisprudence, Forensic Medicine and Toxicology by Parikh C. K. 22. Forensic Science: An introduction to Scientific and Investigative Techniques by S. H James, J. J. Nordby. 23. Parikh C. K., Medical Jurisprudence.	

ZOOMNP-162 Practicals Based on Forensic Zoology SEM-II

<table>
<tr><td colspan="3">F.Y.B.Sc. Sem-II MIN- 4</td></tr>
<tr><td colspan="3">ZooMNP - 162: Practicals Based on Forensic Zoology)</td></tr>
<tr><td>Hours
30</td><td>Course objective:
To develop the undergraduate level students with the specific knowledge of handling different types of evidences and their examinations.
To develop the laboratory skills in examining different types of evidences found at the crime scene.
To prepare the students to compete for employment in State and central level Organizations.</td><td>Credits: 2</td></tr>
<tr><td></td><td>Learning outcomes:
On completion of the programme students will Apply the Laboratory skills to participate in the career needs of Forensic community.
Become trained in the laboratory skills of different division of Forensic Science.
Be able to work with different R&D organizations.</td><td>Lectures 30</td></tr>
<tr><td></td><td>1. To examine human hair for cortex and medulla.
2. To Examination of hair Morphology and determine the species to which the hair belongs. of different domestic animals as cat, dog, cow, horse, and goat.
3. Determination of serum Urea (Kit method)
4. Determination of serum uric analysis. (Kit method)
5. Determination of serum calcium (Kit method)
6. To identify blood stains.(C)
7. To carry out routine analysis of given urine sample for -
i) Physical Properties: Volume, Colour, pH, Turbidity, Specific gravity.
ii) Chemical Properties: Sugars, Protein, Bile salts & bile pigments, Ketone bodies, Blood. (C)
8. To prepare slides of scale pattern of human hair.(C) E
9. To Visit a Forensic Laboratory and submission of the report.
10.To Identify and differentiate various types of Finger prints. (C) E
11.To prepare a case report on forensic entomology with respect to insect’s succession and its relationship to determine time since death.</td><td></td></tr>
</table>

ZOO-OE- 171:PublicHealthandHygiene

F.Y.B.Sc. Sem-II OE		
Zoo-OE-171:PublicHealth and Hygiene		
Total Hours: 60	**Course objective** • To provide knowledge and understanding regarding lifestyle diseases. • To promote anunderstanding of the value of good life style practices, physical fitness and healthy food habits for life style disease management. • To motivate them to practice yoga and meditation in day-to-day life	**Credits: 2**
	Learning out comes After successful completion of this course, students are expected to: • Get familiarized with various aspects of environmental risks and hazards. • Acquire knowledge regarding epidemiology, prevention, control and management of diseases of public health importance. • Learn about diagnosis of various diseases and Methods to prevent them.	**Lectures** 30
Unit	**Topics**	
Unit I	**Public Health and Hygiene:** i) Introduction and scope, ii)Nutrition and health, iii) Classification of food, iv) Nutritional deficiencies, v)Vitamin deficiencies, vi) Hygiene: Introduction, definition and t ypes of hygiene	**07**
Unit II	**Environment and health hazards:** i) Environmental degradation, ii) Pollution and associated health hazards	**05**
Unit III	**Sanitation and Diseases:** i)Definition and concept, ii) Disposal of human & animal waste ,refuse sewage	**05**
Unit IV	**Communicable disease andt heir control measures:** i) Malaria ii)Typhoid iii)Hepatitis-types i v) Tuberculosis v) Chikungunya vi) Dengue and vii) AIDS.	**07**
Unit V	**Non-communicable diseases** and **their preventive measures:** i)Hypertension, ii)Coronary Heart disease, iii) Stroke, iv)Obesity and v)Mental ill health	**06**
Suggested Readings	1) Basu, S.C. Preventive and Social Medicine. 2) Cliford Anderson R., Your Guide to Health. 3) Gibney, Clinical Health, Blackwell. 4) Gibney, Public Health Nutrition, Blackwell. 5) Goel, S.O.L. Public Health Administration. 6) Mahajan B.K., M.C. Gupta, Preventive and social medicine in India, 2013, 4thEdn.,JaypeeBroyhers Medical Publishers, New	

	Delhi, India. 7) Park K. and Park S, 1995, Text Book of Preventive and Social Medicine. BanarsidasBhanot Publishers, 1167 Prem Nager, Jabalpur – 482001. 8) Sanitarians Hand Book. Theory and Administrative Practice. Pearles Publications, New Orleans, USA. 9) Seshu Babu V.V.R, Review of community medicine, 2006, 2ndEdn.,Paras Medical Books Pvt. Ltd., Hydrabad. 10) Shoryock Harold and Hubert O. Swartout You and Your Health illustrated Dealing with Diseases.. 11) Sobti R. C., Medical Zoology and Medical Technology, Shobanlal and Co., Jalandher.	

ZOO-SEC-154 Apiculture Sem-II

F.Y.Sc Sem-II SEC-2		
ZOO-SEC-154 : Apiculture		
Total Hours: 30	**Program specific objective** • Acquire knowledge about different species and casts of the honey bees. • Aware about economic importance of honey bees. • Identify role of honey bees in nature and in agricultural productivity • assess the pest, and enemies/ predator of honey bees.	**Credits: 2**
	Program specific outcomes • Use Apiculture for employment, self employment and conservation of nature.	**Lectures** 30

	• Apply knowledge and skill to establish its own apiary or provides services to apiary. • Learn various product of honey bees and value addition in these products, create scope for entrepreneurship. • understand the basics about beekeeping tools, equipment, and managing beehives. Manage beehives for honey production and pollination. • Do marketing of various bee products.	
Unit	**Topics**	
Unit I	i) Introduction to Apiculture ii) Study of habit, habitat and nesting behaviour of Apis dorsata, Apis indica, Apis floera, Apis mellifera.	**4**
Unit II	i) Life cycle- Egg larva Pupa Adult ii) Colony organization and division of labour. ii) Bee behaviour and communication.	**6**
Unit III	i) Artificial Bee rearing (Apiary), ii) Beehives – Newton and Langstroth Bee Pasturage iii) Selection of Bee Species for Apiculture, iv)) Bee keeping equipments: a) Bee box (Langstroth type) b) Honey extractor c) Smoker d) Bee-veil e) Gloves f) Hive tool g) Brush h) queen excluder. v)Bee keeping and seasonal management. vi) Methods of Extraction of Honey (Indigenous and Modern) vii) Bee pollination and management of bee colonies for pollination.	**7**
Unit IV	i) Diseases and enemies of Bees: Bee Diseases and Enemies Control and Preventive Measures. i) Diseases and enemies of Bees: a) Bee diseases- Protozoan, Bacterial, viral, Fungal. ii) Bee pests- Wax moth (Greater and Lesser), wax beetle. iii) Bee predators- Bee eater, King crow, Wasp, Lizard, Bear, Man.	**7**
Unit V	**Bee products** Products of Apiculture Industry and its Uses (Honey, Bees Wax, Propolis, Venom, Pollen, etc)	**6**
Suggested Readings	• Prost, P. J. (1962). Apiculture. Oxford and IBH, New Delhi. • Bisht D.S., Apiculture, ICAR Publication. • Singh S., Beekeeping in India, Indian council of Agricultural Research, NewDelhi.	

ZOO-SEC-155 Practicals based on Apiculture Sem-II

F.Y.B.Sc. Sem-II SEC- 3		
Zoo –SEC- 155: Practicals based on Apiculture)		
Hours 30	**Course objective:** • To inculcate importance of Bee keeping and honey processing in relation with entrepreneurship development. • To give students knowledge about various techniques of Bee keeping and honey processing and its marketing to make them self-sustainable after graduation.	**Credits: 2**
	Learning outcomes: • The learner will be able to understand the basics about beekeeping, tools equipments and managing bee hives	**Lectures 30**

	• The learner will be able to understand the basic life cycle of honey bees.	
	1. Study of systematic position and external morphology of honey bee D 2. Study of Apis species of honey bee and Study of life cycle of honey bee. D 3. Temporary mountings of pollen basket, sting apparatus and mouth parts. E 4. Study of architecture of honey comb and Study of bee box (Langstroth hive). D 5. Study of diseases, pests, parasites and predators of honey bee D 6. Study of bee keeping equipments and their uses D 7. Study of honey bee products and their uses D 8. Study of honey adulteration detection test E 9. Compulsory visit to an apiary	
Suggested Readings	• Prost, P. J. (1962). Apiculture. Oxford and IBH, New Delhi. • Bisht D.S., Apiculture, ICAR Publication. • Singh S., Beekeeping in India, Indian council of Agricultural Research, NewDelhi.	