AC: 02.06.2025 ITEM NO: 26.2

Deccan Education Society's

Kirti M. Doongursee College of Arts, Science and Commerce (AUTONOMOUS)

Affiliated to

UNIVERSITY OF MUMBAI

Syllabus for
Program: Bachelors of Science
Course: S.Y.BSc.(NEP 2020)
Subject: ZOOLOGY

Choice Based Credit System (CBCS)
with effect from
Academic Year 2024-2025

PROGRAM OUTCOMES

PO	Description
A student completing Bachelor's Degree in **Science** Program will be able to	
PO1	**Disciplinary Knowledge:** Demonstrate comprehensive knowledge of the disciplines that form a part of a graduate Programme. Execute strong theoretical and practical understanding generated from the specific graduate Programme in the area of work.
PO2	**Critical Thinking and Problem solving:** Exhibit the skills of analysis, inference, interpretation and problem-solving by observing the situation closely and design the solutions.
PO3	**Social competence:** Display the understanding, behavioral skills needed for successful social adaptation, work in groups, exhibits thoughts and ideas effectively in writing and orally.
PO4	**Research-related skills and Scientific temper:** Develop the working knowledge and applications of instrumentation and laboratory techniques. Able to apply skills to design and conduct independent experiments, interpret, establish hypothesis and inquisitiveness towards research.
PO5	**Trans-disciplinary knowledge:** Integrate different disciplines to uplift the domains of cognitive abilities and transcend beyond discipline-specific approaches to address a common problem.
PO6	**Personal and professional competence:** Performing dependently and collaboratively as a part of team to meet defined objectives and carry out work across interdisciplinary fields. Execute interpersonal relationships, self-motivation and adaptability skills and commit to professional ethics.
PO7	**Effective Citizenship and Ethics:** Demonstrate empathetic social concern and equity centered national development, and ability to act with an informed awareness of moral and ethical issues and commit to professional ethics and responsibility.
PO8	**Environment and Sustainability:** Understand the impact of the scientific solutions in societal and environmental contexts and demonstrate the knowledge of and need for sustainable development.

Semester	Course Code	Course Title	Vertical	Credit
III	24 ZOO MJ 311	Diversity in Protochordates ,Chordates and Animal Type Study	Major	2
	24 ZOO MJ 312	Physiology-Controlling and Co-ordinating System	Major	2
	24 ZOO MJP 311	Practical based on Diversity in Protochordates ,Chordates and Animal Type Study	Major Practical	2
	24 ZOO MJP 312	Practical based on Physiology-Controlling and Co-ordinating System	Major Practical	2
	24 ZOO MR 321	Pollution and its Effect on Organisms	Minor	2
	24 ZOO MRP 31	Practical based on Pollution and its Effect on Organisms	Minor practical	2
	24 ZOO OE 331	Public Health and Hygiene	OE 1	2
	24 ZOO VC 341	Medical Diagnostics	VSC	1
	24 ZOO VCP 31	Practical Based on Medical Diagnostics	VSC Practical	1
I V	24 ZOO MJ 411	Cell biology	Major	2
	24 ZOO MJ 412	Basic biochemistry	Major	2

	24 ZOO MJP 411 1	Practical based on Cell biology	Practical	2
	24 ZOO MJP 412	Practical based on Basic biochemistry	Practical	2
	24 ZOO MR 421	Commercial Enzymology	Minor	2
	24 ZOO MRP 41	Practical based on Commercial Enzymology	Practical	2
	24 ZOO OE 431	Livestock and management	OE 2	2
	24 ZOO SE 451	Biofertilizers	SEC	2

Course Code	**MAJOR SEM – III –**	**Credits**	**Lectures/Week**
24 ZOO MJ 311	**Diversity in Protochordates ,Chordates and Animal Type Study**	**2**	

Course Outcomes:

After completion of this course learner will be able to -

- Acquire in depth knowledge on the diversity of chordates and their systematic position
- Understand the evolutionary importance of selected chordate groups.
- Acquire knowledge about the evolutionary history of earth
- Contribute to the critical societal goal of a scientifically literate citizenry.

Unit	**Topics**	**No of Lecture**

	Diversity in Protochordates ,Chordates and Animal Type Study	s
I	**Diversity in Protochordates and Chordates Chordates** – Primitive Chordates and their affinities. Hemichordates, Urochordates and Cephalochordates. Advent of vertebrates: Cyclostomes, their evolutionary status and affinities. Basic organization and diversity of fishes, their evolutionary transitions. From Water to Land invasion - Early Tetrapodes. Amphibians diversity and adaptability to dual mode of life. Amniotes: the amniotic egg, adaptive radiations in reptiles; the avian ancestors. Birds: Adaptation from terrestrial to aerial mode of life. Origin of Mammals- Special features of Monotremes and Marsupials. Characteristics of other mammalian groups with special reference to primates	**15**
II	**Animal Type Study-Avian-Pigeon** Habit and Habitat,External Characteristics,Clasification,Digestive system,Respiratory system, Circulatory system ,Excretory system,Nervous system and reproductive system	**15**

References:-

- Young, J. Z. (2004). *The Life of Vertebrates*. III Edition. Oxford university press.
- Pough H. *Vertebrate life,* VIII Edition, Pearson International.
- Darlington P.J. *The Geographical Distribution of Animals*, R.E. Krieger Pub. Co.
- Hall B.K. and Hallgrimsson B. (2008). *Strickberger's Evolution*. IV Edition. Jones and Bartlett Publishers Inc.
- Vertebrates -R.L Kotpal

Course Code	MAJOR SEM – III –	Credits	Lectures/ Week
24ZOOMJ312	Physiology I & Endocrinology	2	

Course Outcomes:

After completion of this course learner will be able to -

- Recall terms , concepts pertaining to tissue , cartilage, nervous and endocrine system.
- Understand the functions of important nervous & endocrine system.
- Apply the knowledge for understanding functioning of nervous and endocrine system
- Evaluate various interdependence of systems

Unit	Topics Physiology I	No of Lectures
I	**1.1Tissues** Structure, location, classification and functions of epithelial tissue, connective tissue, muscular tissue and nervous tissue **1.2 Bone and Cartilage** Structure and types of bones and cartilages, Ossification, bone growth and resorption **Nervous System –** Structure & types of neuron, resting membrane potential, Origin of action potential and its propagation across the myelinated and unmyelinated nerve fibers; Synaptic transmission and, Neuromuscular junction; Neurotransmitters -Types and functions.	**15**
II	**2.1 Endocrinology** Physiology of endocrine glands - pineal, pituitary, thyroid, parathyroid, pancreas, adrenal; hormones secreted by them and their mechanism of action; Classification of hormones; Regulation of their secretion; Mode of hormone action,	**15**

	Signal transduction pathways for steroidal and non-steroidal hormones Hypothalamus (neuroendocrine gland) - principal nuclei involved in neuroendocrine control of anterior pituitary and endocrine system; Placental hormones	

References-

- Guyton, A.C. & Hall, J.E. (2006). Textbook of Medical Physiology. XI Edition. Hercourt Asia PTE Ltd. /W.B. Saunders Company.
- Tortora, G.J. & Grabowski, S. (2006). Principles of Anatomy & Physiology. XI Edition John Wiley & sons
- Victor P. Eroschenko. (2008). diFiore's Atlas of Histology with Functional correlations. XII Edition.Lippincott W. & Wilkins.
- Arey, L.B. (1974). Human Histology. IV Edition. W.B. Saunders

Course Code	**MAJOR SEM – III – Practical**	**Credits**	**Lectures/ Week**
24ZOOMJP31	Practical based on Diversity and distribution of Chordata	**2**	**4**

Course Outcomes:

After completion of this course learner will be able to -

- Acquire in depth knowledge on the diversity of chordates and their systematic position
- Understand the evolutionary importance of selected chordate groups.
- Be able to perform, analyze and report an experiment and observations in physiology.
- Be able to recognize and identify principal tissue structures.

	Topics	No of Lectures
Paper I	**Study of classification , general characteristics , habit and habitat of the following** **1. Protochordata** *Balanoglossus, Herdmania, Branchiostoma,* Colonial Urochordata, **2. Agnatha** *Petromyzon, Myxine* **3. Fish (Pisces)** *Scoliodon, , Torpedo, Chimaera, Mystus, , Labeo, Exocoetus, Echeneis, Anguilla, Hippocampus, Anabas,* Flat fish **4. Amphibia** *Ichthyophis/Ureotyphlus, Necturus, Bufo, Hyla, Alytes, Salamandra* **5. Reptilia** *Chelone, Trionyx, Hemidactylus, Varanus, Uromastix, Chamaeleon, Ophiosaurus, Draco, Bungarus, Vipera, Naja, Hydrophis, Zamenis, Crocodylus* **6. Aves** Study of six common birds from different orders. Types of beaks and claws **7. Mammalia** *Sorex*, Bat (Insectivorous and Frugivorous), *Funambulus, Loris, Herpestes, Erinaceous.* 8.Key for Identification of poisonous and non-poisonous snakes 9. Field visit and submission of report. Note Power point presentation on study of any two animals from two different classes by students (may be included if dissections not given permission)	
Course Code	**MAJOR SEM – III – Practical-2**	**Credits**
24 ZOO MJP 312	Practical based on Physiology I & Endocrinology -Controlling and Co-ordinating System	**2**
	Course Outcomes After completion of this course learner will be able to – ● Recall the location of target organs. ● Understand the functions of tissues target organs , endocrine glands ● Examining the neuroendocrine function and coordination ● Analyse the difference between normal resting muscle and stimulated muscle.	

Paper II	1. Study of simple muscle twitch with electrical stimulation (or Virtual) 2. Study of the unconditioned reflex action (Deep tendon reflex such as knee jerk reflex) 3. Preparation of temporary mounts: Squamous epithelium 4. Study of permanent slides of Mammalian skin, Cartilage, Bone, Spinal cord, Nerve cell 5.Study of histology of endocrine glands - pituitary, thyroid, pancreas, adrenal 5. Power point presentation on study of any two animals from two different classes by students (may be included if dissections not given permission) 6. Study of nervous system of Earthworm , cockroach and Sepia. 7. Study of different parts of human brain . 8. Mounting of temporary slide -Striated muscle fibres	
	References:- ● Young, J. Z. (2004). *The Life of Vertebrates*. III Edition. Oxford university press. ● Pough H. *Vertebrate life,* VIII Edition, Pearson International. ● Darlington P.J. *The Geographical Distribution of Animals*, R.E. Krieger Pub. Co. ● Hall B.K. and Hallgrimsson B. (2008). *Strickberger's Evolution*. IV Edition. Jones and Bartlett Publishers Inc. ● Vertebrates -R.L Kotpal ● Guyton, A.C. & Hall, J.E. (2006). Textbook of Medical Physiology. XI Edition. Hercourt Asia PTE Ltd. /W.B. Saunders Company. ● Tortora, G.J. & Grabowski, S. (2006). Principles of Anatomy & Physiology. XI Edition John Wiley & sons ● Victor P. Eroschenko. (2008). diFiore's Atlas of Histology with Functional correlations. XII Edition.Lippincott W. & Wilkins. ● Arey, L.B. (1974). Human Histology. IV Edition. W.B. Saunders ● Practical zoology (2009-10), S.S. Lal, Rastogi Publication	

Course Code	MINOR SEM – III –	Credits	Lectures/ Week
24ZOOMR321	Pollution and its Effect on Organisms	2	2

Course Outcomes:

After completing this course, the student will be able to:

- Memorize the terms, concepts and theories with respect to pollution.
- Understand various types of pollutants and its adverse effects on various organisms.
- Implement the knowledge to control pollution at individual level
- Analyse the anthropogenic activities leading to pollution

Unit	Topics	No of Lectures
I	**1.1Air Pollution** 🎬 Types and sources of air pollutants 🎬 Effects of air pollution on organisms, its control and abatement measures **Water Pollution** 🎬 Types and sources of water pollutants 🎬 Effects of water pollution on organisms, its control and abatement measures **Soil Pollution** 🎬 Types and sources of soil pollutants 🎬 Effects of soil pollution on organisms, its control and abatement measures	15
II	**2.1 Sound pollution** 🎬 Different sources of sound pollution 🎬 Effects of sound pollution on organisms, its control and abatement measures **2.2 Pollution by radioactive substances** **2.3 Pollution by solid wastes** 🎬 Types and sources,	15

	🎬 Effects of solid waste pollution, its control and abatement Measures **Pollution –** Climate Change and Global Warming	
	References 1. Air Pollution,KudesiaV.P. PragatiPrakasan,Meerut 2. Fundamentals of Air PollutionDanielA.Vallero,Academic press 5th Edition 3. Principles and Practices of Air Pollution Control and Analysis J.R. MudakaniI KInternational Pub. House Pvt. Ltd. 4. Text Book of Air Pollution and its Control,S.C.Bhatia Atlantic 5. Water Pollution,KudesiaV.P.,PragatiPrakasan,Meerut 6. A text book of Environmental Chemistry and Pollution 7. Control,S.S.Dogra,SwasticPub,New Delhi 8. Practical Methods for water and Air Pollution Monitoring,S.K.Bhargava,New Age International 9. Hand Book of Water and waste water Analysis,KanwaljitKaur,Atlantic 10. Aquatic Pollution by Edward A.Laws 11. Environmental Science and Technology,StanelyE.Manahan 12. Environmental Chemistry,A.K.De, New Age International 13. A Text Book of Environmental Studies,GurdeepR.Chatwal,HarishSharma,MadhuArora	

Course Code	MINOR – III – Practical	Credits	Lectures/ Week
24ZOOMRP31	Practicals based on Pollution and its effect on organisms	2	4

Course
After completion of this course learner will be able to -

- **Recall the concepts, terminologies , involved in various types of pollution**
- **Understand procedures involved monitoring of pollution.**
- **Collection of data with respect to various types of pollution**
- **Analysis of reports to keep check on levels of various pollutants.**

	Topics	No of Lectures
	1. Study of air microflora. **2.** Estimation of dissolved oxygen from the given water sample. **3.** Estimation of salinity by refractometer from the given water sample. **4 .** Estimation of conductivity by conductometer from the given water sample. **5.** Study of physical properties of soil: Temperature, Moisture and Texture **6** . Study of chemical properties of soil- pH, organic matter **7.** Study of sound pollution monitoring device. 8. Collection of data and analysis of the Air Quality Index report of various regions in Mumbai 9. Visit to any polluted site and submit report.	

References:-

- Air Pollution,KudesiaV.P. PragatiPrakasan,Meerut
- Fundamentals of Air PollutionDanielA.Vallero,Academic press 5th Edition
- Principles and Practices of Air Pollution Control and Analysis J.R. MudakaniI KInternational Pub. House Pvt. Ltd.
- Text Book of Air Pollution and its Control,S.C.Bhatia Atlantic
- Water Pollution,KudesiaV.P.,PragatiPrakasan,Meerut
- A text book of Environmental Chemistry and Pollution
- Control,S.S.Dogra,SwasticPub,New Delhi
- Practical Methods for water and Air Pollution Monitoring,S.K.Bhargava,New Age International

- Hand Book of Water and waste water Analysis,KanwaljitKaur,Atlantic
- Aquatic Pollution by Edward A.Laws
- Environmental Science and Technology,StanelyE.Manahan
- Environmental Chemistry,A.K.De, New Age International
- A Text Book of Environmental Studies,GurdeepR.Chatwal,HarishSharma,MadhuArora,

Course Code	**OE SEM – III –**	**Credits**	**Lectures/ Week**
24ZOOOE331	**Communicable and Non communicable diseases**	**2**	**2**

Course Outcomes:

After completion of this course learner will be able to -

- Identify current national and global public health problems.
- Aware about the issues of food safety, water safety, vaccination, exercise and obesity, exposure to toxins.
- frame a public health plan during any epidemic or spread of infectious disease etc.
- Analyze case studies of infant mortality and obesity.
- Assess the health inequalities with regard to gender, race, ethnicity, income etc.

Unit	**Topics**	**No of Lectures**
I	**Communicable diseases** 2.1 Infectious agents responsible for diseases in humans. 2.2 Communicable viral diseases- measles, chicken pox, poliomyelitis, swine flu, dengue, chickungunya, rabies, leprosy and hepatitis. 2.3 Communicable bacterial diseases- tuberculosis, typhoid, cholera, tetanus, plague, whooping cough, diphtheria, leprosy. sexually transmitted diseases- AIDS, syphilis and gonorrhoea. 2.4 Health education and preventive measures for communicable diseases.	**15**
II	**Non-communicable diseases**	**15**

	Causes , Preventive measures and treatment of – Diabetes- types and their effect on human health Hypertension, stroke, coronary heart disease, myocardial infarction , Metabolic syndrome – Concept (WHO) Osteoporosis, osteoarthritis and rheumatoid arthritis Gastrointestinal disorders- acidity, peptic ulcer, constipation, piles Mental illness (depression and anxiety). Oral and lung cancer and their preventive measures	
	References:- 1. Mary Jane Schneider (2011) Introduction to Public Health. 2. Muthu, V.K. (2014) A Short Book of Public Health. 3. Detels, R. (2017) Oxford Textbook of Public Health (6th edition). 4. Gibney, M.J. (2013) Public Health Nutrition. 5. Wong, K.V. (2017) Nutrition, Health and Disease.	

Course Code	**VSC – III –**	**Credits**	**Lectures/ Week**
24ZOOVC341	**Practical** **Medical Diagnostics**	**2**	**4**

Course Outcomes:

After completion of this course learner will be able to -

- Basic understanding and analysis of the excretory products and other body fluids.

- Basic understanding of hematology, immunology, clinical biochemistry, and microbiology with emphasis placed on point of care testing in all areas of the laboratory.
- Demonstrates proper handling of patients/specimens and evaluates situations that may cause adverse issues in the diagnostic division.
- Demonstrate skill with the microscope, centrifuge, and other laboratory equipment.

Unit	Topics	No of Lectures
	1.Sterilization: Hot Air Oven, Autoclave, Incubator **2.**Media Preparation(LB and Minimal)-Demo 3.Study of culture & isolation process of bacteria-(Theory) 4.Blood grouping and Rh factor 5.Estimation of Hb and its clinical significance. 6.Bleeding time and Clotting time 7.Blood Parasites.-P*lasmodium ,Wuchereria,,*	

Course Code	MAJOR SEM – IV –	Credits	Lectures/ Week
24ZOOMJ411	Cell Biology	2	2

Course Outcomes:

After successfully completing this course, the students will be able to:

- Memorize the concepts of basic structure of cell and cell organelles.
- Understand the functions of various cell organelles and endomembrane system
- Applying knowledge to understand active and passive cellular transport
- Analyse various metabolic pathways which generate energy rich molecules like ATPs , NADPH+

Unit	Topics	No of Lectures
I	**Cell organelle** **1.1 Introduction to cell biology** ● Definition and scope ● Cell theory ● Generalized prokaryotic, eukaryotic cell: size, shape and structure **1.2 Nucleus** ● Size, shape, number and position ● Structure and functions of interphase nucleus ● Ultrastructure of nuclear membrane and pore complex ● Nucleolus: general organization, chemical composition & functions ● Nuclear sap/ nuclear matrix ● Nucleocytoplasmic interactions **1.3 Plasma membrane** ● Fluid Mosaic Model ● Junctional complexes ● Membrane receptors ● Modifications: Microvilli and Desmosomes **1.4 Transport across membrane**	15

	• Diffusion and Osmosis • Transport: Passive and Active • Endocytosis and Exocytosis **1.5 Cytoskeletal structures** • Microtubules: Composition and functions • 🎬 Microfilaments: Composition and functions	
II	Endomembrane System - General morphology of endomembrane system, ultrastructure, **Endoplasmic reticulum (ER):** types of ER and biogenesis of ER 🎬 Functions of Rough Endoplasmic Reticulum(RER) and Smooth Endoplasmic Reticulum(SER) **Golgi complex:** Ultrastructure of Golgi complex, functions of Golgi complex (protein glycosylation, lipid and polysaccharide metabolism,protein sorting and secretion, Golgi Anti-Apoptotic Protein -GAAP) **Lysosomes:** Origin, occurrence, polymorphism and functions; Peroxisomes: Origin, morphology & functions **Mitochondria:** Ultrastructure, chemical composition,functions of mitochondria and bioenergetics (Chemical energy & ATP, Krebs cycle,respiratory chain and oxidative phosphorylation)	**15**
	References 1. Weichert, C.K. (1970) Anatomy of Chordates (4th edition). 2. Jordan, E. L. and Verma, P. S. (2013) Chordate Zoology (14th edition). 3. Saxena, R. K. and Saxena, S. (2015) Comparative Anatomy of Vertebrates (2nd edition). 4. Vander, A.; Sherman, J. and Luciano, D. (2003) Human Physiology (9th edition). 5. Randall, D. *et al.* (2002) Eckert Animal Physiology (5th edition) Freeman. 6. Hill, R.W. *et al.* (2008) Animal Physiology (3rd edition) Sinaur Associates.	

	7. Guyton, A.C. *et al.* (2008) Textbook of Medical Physiology (12th edition) W.B. Saunders Co. 8. Withers, P.C. *et al.* (1992) Comparative Animal Physiology (1st edition) Brooks Cole.	

Course Code	**MAJOR SEM – IV –**	**Credits**	**Lectures/ Week**
24ZOOMJ412	Biomolecules	**2**	**2**

Course Outcomes:

After successfully completing this course, the students will be able to:

- Memorize the concepts , terms of biomolecules
- Understand the structure of various biomolecules
- Apply the knowledge of various biomolecules to understand their biological role in metabolism
- Analyse the clinical significance of biomolecules based upon variation in the range from normal

Unit	**Topics**	**No of Lectures**
I	**Biomolecules**: Concept of micromolecules and macromolecules **Carbohydrates:** Definition classification, properties and isomerism, glycosidic bond Structure of Monosaccharides (glucose and fructose); Disaccharides (lactose and sucrose); Polysaccharides (cellulose, starch, glycogen and chitin) , Homo polysaccharides Biological role and clinical significance **Lipids:**	**15**

	▪ Definition, classification of lipids with examples, ester linkage, ▪ Physical and chemical properties of lipids, ▪ Saturated and unsaturated fatty acids, ▪ Essential fatty acids; Triacylglycerols; Phospholipids (lecithin and cephalin); Steroids (cholesterol). ▪ Biological role and clinical significance **Vitamins**: ▪ Water soluble vitamins(e.g. Vit C, Vit B12) ▪ Lipid soluble vitamins (e.g. Vit A, Vit D) ▪ Biological role and clinical significance	
II	**Amino Acids and Proteins:** ▪ Basic structure, classification of amino acids, ▪ Essential and Non-essential amino acids, Peptide bond, Disulphide bond ▪ Protein conformation: Primary, Secondary, Tertiary, Quaternary ▪ Types of proteins – Structural (collagen) and functional proteins (haemoglobin) **Nucleic acid** Structural component of DNA - Nucleosides , Nucleotides , Phosphodiester bond, Double helix nature of DNA, ▪ Types of DNA – A, B, Z & H forms ▪ DNA in Prokaryotes -Chromosomal and Plasmid ▪ Extra nuclear DNA -Mitochondria and Chloroplast ▪ RNA as a genetic material in viruses ▪ Types of RNA: Structure and function ▪ Biological role and clinical significance **Concept of Genetic Code, Codon**	**15**
	References • Principles of Biochemistry, 2005, 2nd and 3rd edn. Lehninger A.L. Nelson D.L. and Cox M.M • Biochemistry-Satyanarayan • An introduction to practical biochemistry ,3rd edition,David Plummer	

Course Code	MAJOR SEM – IV–Practical	Credits	Lectures/ Week
24ZOOMJP41	Practical based on Cell biology & Biomolecules	2	4

Course Outcomes:

After successfully completing this course, the students will be able to:

- Develop an understanding of the evolution of vertebrates thus integrating structure, function and development.
- Have an overview of the evolutionary concepts including homology and homoplasy, and detailed discussions of major organ systems.
- Have a solid foundation in all aspects of biochemistry.
- Be able to apply mathematical tools and computational methods to biochemical problems.
- Understand the problems in another biological science that biochemical techniques help solve.

Topics

1.Study of permeability of cell through plasma membrane (osmosis in
blood cells)
2 Measurement of cell diameter by occulometer (by using permanent
slide)
3.Ultrastructure of cell organelles (Electron micrographs) of:
a. Nucleus
b. Endoplasmic reticulum (Smooth and Rough)
c. Mitochondria.
d. Golgi apparatus
e. Lysosomes
4. Study of Mitosis in onion root tip
5. Mounting of Barr bodies using buccal smear
6.Study of Polytene chromosome in *Chironomus* larva
7. Study of Human Karyotype.
8. Gram staining of Bacteria.

Course Code	**MAJOR SEM – IV –Practical**	**Credits**	**Lectures/ Week**
24ZOOMJP42	Biomolecules	**2**	**2**

Course outcome

After successfully completing this course, the students will be able to:

- Recall the principles of various experiments in biochemistry
- Understand the procedures to perform qualitative estimation of various biomolecules.
- **Perform the biochemical experiments to study qualitative and quantitative estimations**
- **Analysis of clinical report**

	Topics
	1.Qualitative tests for carbohydrates (Molisch‘s test, Benedicts test, Barfoed‘s test, Anthrone test) 2.Qualitative tests for protein (Ninhydrin test, Biuret test, Millon‘s test, Xanthoproteic test) 3.Qualitative test for lipids (Solubility test, Sudan III test) Study of rancidity of lipids by titrimetric method 4. To study clinical disorders - Diabetes, Atherosclerosis, Merasmus , Scurvy , Rickets , Osteoporosis. 5 .Isolation of DNA by SDS method and detection by Diphenyl amine reagent. 6.Problems based on Genetic Code – (Codon- Anticodon , mRNA Transcription, Amino acid sequence sums) **7. Separation of amino acids by paper chromatography.** **8. Colorimetric Estimation of Proteins in two different egg varieties by Biuret method** **9. Analysis of pathological report wrt glucose (Fasting , PP, Hb1Ac), Lipid (total Cholesterol , Total Tryglyceride , Total HDL, Tryglyceride : HDL ratio,** **LDL: HDL ratio,** **Total cholersterol : LDL ratio) , Protein (Albumin: Globulin ratio, Creatinine level)** **10. Institutional visit and submission of report.**

References

- Jordan, E. L. and Verma, P. S. (2013) Chordate Zoology (14th edition).
- Vertebrates -R.L Kotpal

- Anatomy of vertebrates -George. C. Kent
- Comparative Anatomy:The Vertebrate Body,Alfred Romer,Saunders publication
- Principles of Biochemistry, 2005, 2nd and 3rd edn. Lehninger A.L. Nelson D.L. and Cox M.M
- Biochemistry-Satyanarayan
- An introduction to practical biochemistry ,3rd edition,David Plummer

Course Code	MINOR SEM – IV –	Credits	Lectures/ Week
24ZOOMR321	**Commercial enzymology**	1	1

Course Outcomes:

After completion of this course learner will be able to -

- Recall basic concepts in Enzymology
- Understand effects of various factors on enzymes
- Application of knowledge in clinic diagnostics
- Analyze the options for applying enzymes in various industrial processes

Unit	Topics	No of Lectures
I	a. **Basic introduction to enzymes** b. **Enzyme as biocatalyst** c. **Enzyme specificity** d. **Enzyme nomenclature** e. **Lock and key model ,** f. **Induced fit model ,** g. **Isozymes of LDH and its clinical significance Properties of enzymes and their applications,** h. **Different factors affecting enzyme activity- pH, Temp, Substrate concentration, substrate inhibition.**	15

II	**Commercial use of enzymes preparation of bio enzymes and cleaners using different biological products, Bioenzymes for enhancing fertility of soil . Bioenzymes in bioremediation Biodetergents Papain as meat tenderizer**	**15**
	References:- ● **Industrial enzymes,Springer,Julio Polaina,Andre MacCabe** ● **Enzymes in Food technology,2nd Edition, Robert Whitehurst,Maarten van Oort**	

Course Code	**Minor SEM – IV –**	**Credits**	**Lectures/ Week**
24ZOOMRP31	**Practicals based on Commercial enzymology**	**2**	**4**

Course Outcomes:

After completion of this course learner will be able to -

- Learn the basic knowledge and concept about the enzyme activity
- To have a deep understanding about the effect of various pH of substrate on the activity of enzyme.
- Develop their understanding on the concept of bio-enzymes
- Analyze the options for applying enzymes in various industrial processes

Topics

1.Meat tenderization by papain
2.Making of bio-enzymes
3.Comparison between biological and non-biological detergent
4.Effects of bio-detergents on surface tension of water.
5.Demonstration action of salivary amylase enzyme
6.Effect of pH on amylase activity
7.Detection of digestive enzymes in the gut of cockroach
8.Study of different industrial processes based on enzymes- Baking brewing detergent fermented products pharmaceuticals textiles leather processing.

References

- **https://edu.rsc.org/experiments/detergents-soaps-and-surface-tension/1719.article**
- **Application of meat tenderizer by Al.Tapple , D.S. Miyada Clarence Sterling and VP Miller**
- **https://prezi.com/is0wi2ezrgix/experiment-between-biological-and-non-biological-washing-pow/**

Course Code	OE SEM – IV –	Credits	Lectures/ Week
24ZOOOE331	Livestock	2	2

Course Outcomes:

After successfully completing this course, the students will be able to:

- Understand skills and requirements necessary to find and maintain a job.
- Select and develop a breeding system for a livestock enterprise.
- Identify common problems associated with livestock and horse herd health and solutions.
- Identify current and future issues relating to animal husbandry.
- Understand different marketing opportunities available for livestock production

Unit	Topics	No of Lectures
I	**Introduction to livestock** Scope of Livestock Industry; Common Breeds of Livestock: Breeds of Cattle, swine, sheep, goat and poultry: Selecting live stocks Livestock Enterprises; Issues in Animal Agriculture.	**15**
II	**Maintenance of breeds and animal products** Facilities and Equipment; Housing, Maintenance and health care; Management of breeding stocks and products. Vaccination programmes and Deworming programmes. Animal Products: Importance of Animal Products; Beef; Pork; Lamb; Poultry Products	**15**
	References 1. Taylor, R.E and Field, T.G. (2004).Scientific Farm Animal Production: An Induction to Animal Science. Prentice-Hall 2. Acker, D. and Cunningham, M. (1998). Animal Science & Industry. Prentice-Hall. 3. Blakely, J. and Bade, D. (1985). The Science of Animal Husbandry. Prentice-Hall. 4. Cambell, J. and Lasley, J. (1975).The Science of Animals that Serve Mankind. McGraw-Hill. 5. Cooper, E. L. (1990). Agriscience: Fundamentals & Applications Delmer: Albany. 6. American Youth Horse Council (1999) Handbook: A Guide to Equine Care and Management. 7. Morrison, F. (1949). Feeds and Feeding (8th edition) Morrison: Ithaca	

Course Code	**SEC – IV –**	**Credits**	**Lectures/ Week**
24ZOOSE451	**Biofertilizer**	**2**	**2**

Course Outcomes:

After completion of this course learner will be able to -

- Develop their understanding on the concept of bio-fertilizer
- Identify the different forms of biofertilizers and their uses
- Compare between the Green manuring and organic fertilizers
- Interpret and explain the components, patterns, and processes of bacteria for growth in crop production

Unit	Topics	No of Lectures
	1.Field trip for collection of endemic species of Earthworm **2.Study scientific classification of different sps earthworms** **3. External Morphology of earthworms. Pheretima posthuma** **4.Study of life cycle and development in earthworms** **5.Study of small scale vermicompost and vermiwash equipments** **6.Study of enemies of earthworm red ants, carnivorous birds** **7. Demonstration of Vermicompost and vermiwash**	**15**
	References 1. NIIR Board. (2012). The complete Technology Book on Biofertilizer and organic farming. 2nd Edition. NIIR Project Consultancy Services.	

	2. Sathe, T.V. (2004) Vermiculture and Organic Farming. Daya publishers. 3. Subba Rao, N.S. (2017). Biofertilizers in Agriculture and Forestry. Fourth Edition. Medtech. 4. Vayas, S.C.; Vayas, S. and Modi, H.A. (1998). Bio-fertilizers and organic Farming Akta Prakashan, Nadiad 5. The complete technology book on vermiculture and vermicompost earthworm utility, Asia Pacific Business Press. 6. A textbook of Vermicompost:- vermicompost and biopesticides biotech books	

Evaluation Scheme for Second Year (UG) under NEP (2 credits)

I. Internal Evaluation for Theory Courses – 20 Marks

1) Continuous Internal Assessment(CIA) Assignment - Tutorial/ Case Study/ Project / Presentations/ Group Discussion / Ind. Visit. – 10 marks

2) Continuous Internal Assessment(CIA) ONLINE Unit Test – 10 marks

II. External Examination for Theory Courses – 30 Marks

Duration: 1 Hours

Theory question paper pattern: All questions are compulsory.

Question	Based on	Marks
Q.1	Unit I	15
Q.2	Unit II	15

- All questions shall be compulsory with internal choice within the questions.
- Each Question may be sub-divided into sub questions as a, b, c, d, etc. & the allocation of Marks depends on the weightage of the topic.

III. Practical Examination

- Each core subject carries 50 Marks.
- Duration: 2 Hours for each practical course.
- Minimum 80% practical from each core subjects are required to be completed.
- Certified Journal is compulsory for appearing at the time of Practical Exam

NOTE: To pass the examination, attendance is compulsory in both Internal & External (Theory + Practical) Examinations.