

**GOVT. DIGVIJAY P.G. AUTONOMOUS
COLLEGE RAJNANDGAON (C.G.)**

DEPARTMENT OF ZOOLOGY

**B.Sc. Zoology Semester Exam
(I – VI Semester)
FYUGP/LOCF Pattern
(Syllabus Based on UGC-LOCF Curriculum)
(2024 – 2025)**

**(Approved by Board of Studies)
Effective from July 2024-25**

As Per provisions of NEP 2020 to be implemented from academic year 2022

GOVT. DIGVIJAY AUTONOMOUS PG COLLEGE RAJNANDGAON (C.G.)

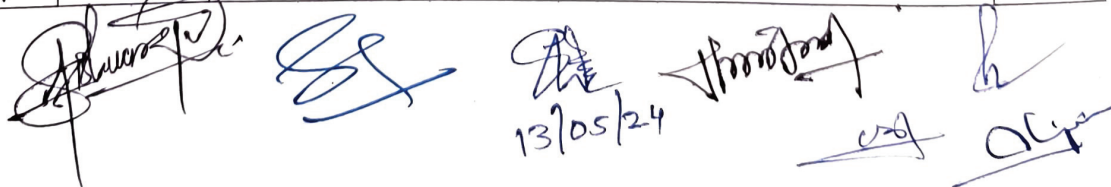
FYUGP (CBCS and LOCF Pattern)

Department of Zoology

Session: 2024-25	Program: B.Sc.
Semester: III	Subject: Zoology
Course type: DSC- III	Course Code:
Course Title : Diversity of Chordates & Embryology	
Credit: 04 (03+01)	Lecture – 60 (45+15)
MM: 100 = (ESE 80+IA 20)	Minimum Passing Marks: 40%

Title	Diversity of Chordates & Embryology
Course Learning Outcome:	<ul style="list-style-type: none"> Understand different classes of chordates, level of organization and evolutionary relationship between different subphyla and classes, within and outside the phylum. Study about diversity in animals making students understand about their distinguishing features. Understand the events that lead to formation of a multicellular organism from a single fertilized egg, the zygote. Acquire basic knowledge of the cellular processes of development and the molecular mechanisms underlying these. Describe the general patterns and sequential developmental stages during embryogenesis; and understand how the developmental processes lead to establishment of body plan of multicellular organisms.
Program Specific Outcome:	<ul style="list-style-type: none"> Appreciate similarities and differences in life functions among various groups of animals in Phylum Chordata. Comprehend the circulatory, nervous and skeletal system of chordates. Know about the habit and habitat of chordates in marine, freshwater and terrestrial ecosystems. Discuss the general mechanisms involved in morphogenesis and to explain how different cells and tissues interact in a coordinated way to form various tissues and organs. Understand about the evolutionary development of various animals.

Unit	Lectures	Topics	Credits
I	10	Introduction to Chordates & origin of Chordata General characteristics and outline classification, Dipleurula concept and the Echinoderm theory of origin of chordates. Urochordata - Retrogressive metamorphosis in Urochordata. Cephalochordata - Type Study of Amphioxus.	0.75
II	10	Agnatha - General characteristics and classification of cyclostomes up to class, Comparative study of Myxine & Petromyzon. Pisces - General characteristics of Chondrichthyes and Osteichthyes, classification up to order, Migration and Parental care in fishes. Amphibia - General characteristics and classification up to order; Parental care and Neoteny in Amphibians.	0.75
III	10	Reptilia - General characteristics and classification up to order, poisonous and non-poisonous snakes, Poison apparatus, Biting mechanism in snake and snake Venom. Aves - General characteristics and classification up to order <i>Archaeopteryx</i> -- a connecting link, Flight adaptations and Migration in birds. Mammals - General characters and classification up to order; Affinities of Prototheria, Metatheria and Eutheria.	0.75
IV	15	Chordate Embryology	0.75


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		<ul style="list-style-type: none"> • Gametogenesis, Fertilization. • Development of frog upto formation of three germ layers. • Development of Chick upto formation of three germ layer, Extra embryonic membranes. • Placenta in mammals.. 	
Lab course	15	<ul style="list-style-type: none"> • Study of Museum Specimen of Vertebrates.(Protochordata to Mammalian) • Key preparation for Identification of poisonous and non-poisonous snakes. • Temporary mount of Fish Scales and age Determination. • Study of six common birds from different orders. Types of beaks and claws. • Permanent mount of Birds Feathers. • Study of Migratory Birds. • Power point presentation on study of any two animals from two different classes by students.(may be included if dissections not given permission) • Study and Collection of Embryology through Slides (Vertebrate). • Study of Embryological development of chick according to hours of incubation. • Collection and Mounting of Talepole Larvae. 	01
Recommended Books		<ul style="list-style-type: none"> • Young, J. Z. (2004). <i>The Life of Vertebrates</i>. III Edition. Oxford university press. • Pough H. <i>Vertebrate life</i>, VIII Edition, Pearson International. • Darlington P.J. <i>The Geographical Distribution of Animals</i>, R.E. Krieger Pub Co. • Hall B.K. and Hallgrimsson B. (2008). <i>Strickberger's</i> 	

Evaluation Scheme

Evaluation Scheme	Sections in Question Paper	Question type	Word Limit	No. of Questions	Marks per Question	Total
External	A	Very Short answer type	50	8	2	16
	B	Short answer type	100	4	6	24
	C	Long answer type	200	4	10	40
Internal	Based on CT & Assignment/Project					20
Total =						100

Evaluation Scheme of Practical

Practical	Experiment 01	12
	Experiment 02	08
	Experiment 03	04
	Spotting	16
	Viva	05
	Sessional	05
Total -		50

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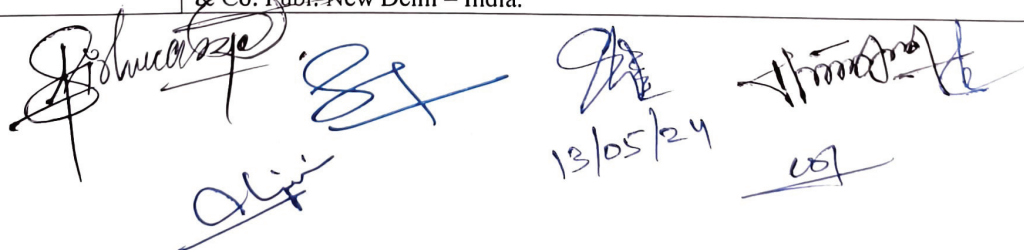
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GOVT. DIGVIJAY AUTONOMOUS PG COLLEGE RAJNANDGAON (C.G.)
FYUGP (CBCS and LOCF Pattern)
Department of Zoology

Session: 2024-25	Program: B.Sc.
Semester: III	Subject: Zoology
Course type: SEC- III	Course Code:
Course Title : Public Health & Hygiene	
Credit: 02	Lecture – 30
MM: 50 = (ESE 40+IA 10)	Minimum Passing Marks: 40%

Title	Public Health & Hygiene
Course Learning Outcome:	<ul style="list-style-type: none"> • Know various waste management technologies and their utility. • Understand the diagnostic methods of various diseases and ways to prevent them. • Realize the importance of nature conservation for betterment of human race and all living beings.
Program Specific Outcome:	<ul style="list-style-type: none"> • Recognize the climate change due to human activities. • Be aware about the various impacts of environmental degradation on human health through case studies and how it can be prevented. • Learn about the nuclear and chemical disaster;s and their after effects through cases studies.

Unit	Lectures	Topics	Credits
I	07	<ul style="list-style-type: none"> • Scope of Public health and Hygiene • nutrition and health – classification of foods • Nutritional deficiency diseases- Vitamin deficiency diseases. 	0.50
II	07	<ul style="list-style-type: none"> • Environment and Health hazards: Environmental degradation – Pollution – Air, Water, Land and Noise-associated health hazards. • Communicable diseases and their preventive and control measures. (Measles, Malaria, Hepatitis, Cholera, Filariasis, HIV /AIDS.) 	0.50
III	07	<ul style="list-style-type: none"> • Non-Communicable diseases and their preventive measures. • Genetic diseases (Hemophilia, Thalassemia, Colour Blindness), Cancer, Diabetes, Leprosy. 	0.50
IV	09	<ul style="list-style-type: none"> • Health Education in India – WHO Programmes – Government and Voluntary Organizations and their health services. • Precautions, First Aid and awareness on epidemic/sporadic diseases. 	0.50
Recommended Books	<p>Text Books:</p> <ol style="list-style-type: none"> 1. Park and Park, 1995: Text Book of Preventive and Social Medicine – Banarsidas Bhanot Publ. Jodhpur – India. <p>Reference Books :</p> <ol style="list-style-type: none"> 1. Verma, S. 1998 : Medical Zoology, Rastogi publ. – Meerut – India 2. Singh, H.S. and Rastogi, P. 2009 : Parasitology, Rastogi Publ. India. 3. Dubey, R.C and Maheswari, D.K. 2007 : Text Book of Microbiology- S. Chand & Co. Publ. New Delhi – India. 		



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Evaluation Scheme

Evaluation Scheme	Sections in Question Paper	Question type	Word Limit	No. of Questions	Marks per Question	Total
External		Short Answer type	250	8	5	40
Internal	Based on CT & Assignment/Project (5+5)					10
Total =						50

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GOVT. DIGVIJAY AUTONOMOUS PG COLLEGE RAJNANDGAON (C.G.)

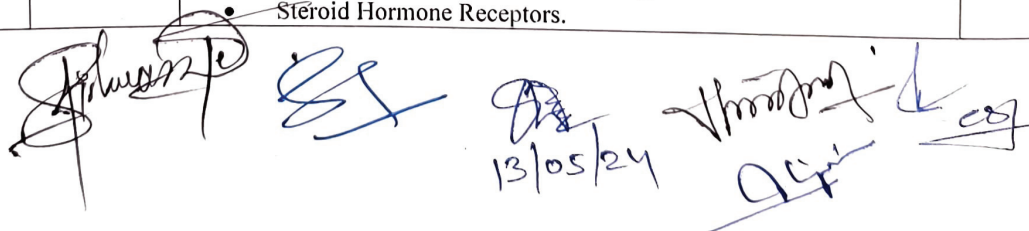
FYUGP (CBCS and LOCF Pattern)

Department of Zoology

Session: 2024-25	Program: B.Sc.
Semester: III	Subject: Zoology
Course type: DSE- I	Course Code:
Course Title : Endocrinology of Vertebrates	
Credit: 04 (03+01)	Lecture – 60 (45+15)
MM: 100 = (ESE 80+IA 20)	Minimum Passing Marks: 40%

Title	Endocrinology of Vertebrates
Course Learning Outcome:	The main goal of this Discipline Specific Elective (DSE) paper is to provide students with a basic understanding of human endocrine glands, neuro-endocrine glands and their structure, function and signalling pathways. Students will also study the influence of biological rhythm on hormones secretion. In addition, the course will facilitate the understanding of the biosynthesis and biochemistry of hormones. Also, emphasis would be laid on understanding the maintenance of homeostasis by the hormones.
Program Specific Outcome:	<ul style="list-style-type: none"> • Understand endocrine system and the basic properties of hormones. • Appreciate the importance of endocrine system and the crucial role it plays along with the nervous system in maintenance of homeostasis. • Gain insight into the molecular mechanism of hormone action and its regulation. • Know the regulation of physiological process by the endocrine system and its implication in diseases. • Gain knowledge about the prevalent endocrine disorders and critically analyze their own and their family's health issues.

Unit	Lectures	Topics	Credits
I	10	Introduction to Endocrinology <ul style="list-style-type: none"> • Overview of the endocrine system. • Classification of hormones. • Biosynthesis of Thyroid, Testosterone, Oestrogen. • Mode of Transportation of Hormones. 	0.75
II	10	Neuroendocrinology <ul style="list-style-type: none"> • Structure of pineal gland, Secretions and their functions in biological rhythms and reproduction. • Structure of hypothalamus, Hypothalamic nuclei and their functions, Regulation of neuroendocrine glands, Feedback mechanisms. • Structure of pituitary gland, Hormones and their functions, Hypothalamo-hypophyseal portal system, Disorders of pituitary gland. 	0.75
III	10	Peripheral Endocrine Glands <ul style="list-style-type: none"> • Structure & Function of Thyroid, Parathyroid, Thymus. • Structure & Function of Endocrine Pancreas, Endocrine Kidney, Adrenal, Gonads. • Disorders related to hypersecretion and hyposecretion of hormones. 	0.75
IV	15	Molecular Endocrinology <ul style="list-style-type: none"> • Hormone receptors and regulation. • Mechanism of Hormone action at Molecular level. • Molecular mediators (GPCR Family) • Steroid Hormone Receptors. 	0.75



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Lab course	15	<ol style="list-style-type: none"> 1. Display of Endocrine glands in laboratory bred rat*/Human model. 2. Study of the permanent slides of all the endocrine glands. 3. Compensatory ovarian/adrenal hypertrophy <i>in vivo</i> bioassay in laboratory bred rat* 4. Demonstration of Castration/ Ovariectomy in laboratory bred rat* 5. Estimation of plasma level of any hormone using ELISA. 6. Chromatographic separation of steroid hormones using paper chromatography. 7. Survey based project on any prevalent endocrine disorder. <p>*Depending on availability as per UGC guidelines.</p>	01
Recommended Books		<ul style="list-style-type: none"> • J. Larry Jameson Leslie De Groot (2010). Endocrinology. VI Edition. • David O. Norris. Vertebrate Endocrinology. V Edition, Elsevier Academic press. • Franklin F. Bolander. Molecular Endocrinology. III Edition, Academic Press, USA. • Hand Book of Physiology published by American Physiological Society by Oxford University Press, Section 7: Multiple volumes set, 1998. • C. Donnell Turner. General Endocrinology. VI Edition, Saunders Toppan. • Stephen Nussey and Saffron Whitehead (2001). Endocrinology: An Integrated Approach. BIOS Scientific Publishers (https://www.ncbi.nlm.nih.gov/books/NBK22/) • Hadley, M.E. and Levine J.E. (2009). Endocrinology. VI Edition. Pearson PrenticeHall, Pearson Education Inc., New Jersey. 	

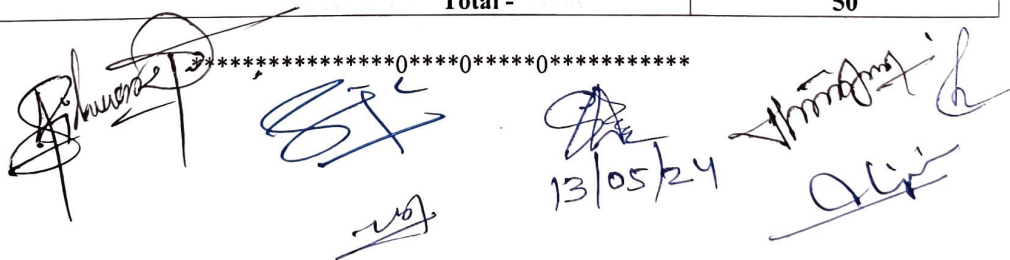
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Total =						100

Evaluation Scheme of Practical

Practical	Experiment 01	12
	Experiment 02	08
	Experiment 03	04
	Spotting	16
	Viva	05
	Sessional	05
Total -		50

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FYUGP (CBCS and LOCF Pattern)

Department of Zoology

Session: 2024-25	Program: B.Sc.
Semester: IV	Subject: Zoology
Course type: DSC- IV	Course Code:
Course Title : Comparative Anatomy of Vertebrates	
Credit: 04 (03+01)	Lecture – 60 (45+15)
MM: 100 = (ESE 80+IA 20)	Minimum Passing Marks: 40%

Title	Comparative Anatomy of Vertebrates
Course Learning Outcome:	This course aims to provide the undergraduate students a thorough knowledge of structural details and comparative account of the different organ systems of the body from lower to higher vertebrates, and protochordates, thus enabling them to appreciate the incredible vertebrate diversity. The course furnishes an understanding of evolutionary basis of morphological and anatomical differences as well as similarities that occur among vertebrates. It helps students propose possible homology between structures, and understand how they evolved as the vertebrates dwelled different habitats. The structural modifications of digestive, circulatory, respiratory and skeletal system relates to the distribution of animals in their different comfort zones of habitat and ecological niches.
Program Specific Outcome:	<ul style="list-style-type: none"> Explain comparative account of the different vertebrate systems Understand the pattern of vertebrate evolution, organisation and functions of various systems. Learn the comparative account of integument, skeletal components, their functions and modifications in different vertebrates. Understand the evolution of heart, modification in aortic arches, structure of respiratory organs used in aquatic, terrestrial and aerial vertebrates; and digestive system and its anatomical specializations with respect to different diets and feeding habits. Learn the evolution of brain, sense organs and excretory organs to a complex, highly evolved form in mammals.

Unit	Lectures	Topics	Credits
I	10	Integumentary System - Integument & its derivatives: Structure of scales, hair and feathers. Digestive System - Alimentary canal and digestive glands in Vertebrates. Respiratory System - Accessory respiratory organs, Gills, Lungs and Air Sac in Birds.	0.75
II	10	Skeletal System - Axial and appendicular skeleton: basic plan of bones of skull, girdles and limbs of Vertebrates. Circulatory System - Evolution of heart and aortic arches.	0.75
III	10	Urinogenital System - Evolution of Urinogenital ducts, Kidney & excretory ducts. Gonads & Genital ducts.	0.75
IV	15	Nervous System - Comparative account of brain; Autonomic nervous system, Spinal cord, Cranial nerves in Fishes. (Scoliodon). Sense Organs - Classification of receptors; Visual and auditory receptors of Vertebrates.	0.75
Lab course	15	1. Study of placoid, cycloid and Ctenoid scales of fish through permanent slides/photographs. 2. Study of different types of feathers of birds. 3. Disarticulated skeleton of Frog and Rabbit (Skull, Limb bones,	01



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	<p>Vertebral Column, Sternum, Girdles, and Ribs).</p> <p>4. Study of Carapace and plastron of turtle/tortoise.</p> <p>5. Mammalian skulls: One herbivorous and one carnivorous animal.</p> <p>6. Study of digestive, circulatory and urinogenital system of frog/rat through videos or through virtual dissections.</p> <p>7. Study of anatomical details of any two organs (brain, heart, lung, kidney, eye and ear) through videos.</p> <p>8. Project on modifications in skeletal structures/GI tract/Respiratory organs in vertebrates.</p> <p>9. Documentary film show on vertebrates/Visit to Zoological Park, Biodiversity Park or Sanctuary.</p>
Recommended Books	<ul style="list-style-type: none"> • Kardong, K.V. (2005). Vertebrate's Comparative Anatomy, Function and Evolution. IV Edition. McGraw-Hill Higher Education. • Kent, G.C. and Carr R.K. (2000). Comparative Anatomy of the Vertebrates. IX Edition. The McGraw-Hill Companies. • Lejem C.F., Bermis W.E, Walker, W.F, Grande, L. (2001). Functional anatomy of the vertebrates, An evolutionary perspective. III Edition, Brookes/Cole, Cengage Learning. • C.K Weichert and W. Presch (1970). Elements of Chordate Anatomy, IV Edition, McGraw- Hill. • Pough.H. (2018). Vertebrate Life.X Edition. Pearson International.

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Evaluation Scheme of Practical

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	Experiment 02	08
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	Spotting	16
	Viva	05
	Sessional	05
Total -		50

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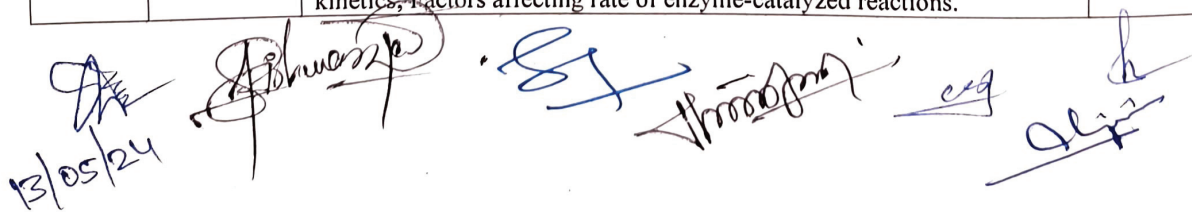
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FYUGP (CBCS and LOCF Pattern)

Department of Zoology

Session: 2024-25	Program: B.Sc.
Semester: IV	Subject: Zoology
Course type: SEC- IV	Course Code:
Course Title : Fundamentals of Biochemistry	
Credit: 02	Lecture – 30
MM: 50 = (ESE 40+IA 10)	Minimum Passing Marks: 40%

Title	Fundamentals of Biochemistry
Course Learning Outcome:	<ul style="list-style-type: none"> This paper is designed to give the fundamentals of biochemistry and biological macromolecules like protein, lipid, carbohydrates and nucleic acids. To provide the structure, classification and properties of proteins, lipids & nucleic acids and their biological significance. To the bonds involved in stabilizing protein structure, its level of organization. To know the nomenclature, classification and mechanism of enzyme action, regulation and its kinetics.
Program Specific Outcome:	<ul style="list-style-type: none"> Explaining the Structural features and biological importance of different class of carbohydrates, lipids and nucleic acids. Providing the knowledge and understanding on types of amino acids and its polymeric form. Learning the structure and pairing of nucleotides, denaturation and denaturation kinetics of DNA. Obtaining knowledge on enzymes and isoenzymes, specificity and inhibition, derivation of Michaelis-Menten equation and significance.

Unit	Lectures	Topics	Credits
I	07	Carbohydrates & Lipids <ul style="list-style-type: none"> Structure and Biological importance: Monosaccharides, Disaccharides, Polysaccharides and Glycoconjugates. Structure and Significance: Physiologically important saturated and unsaturated fatty acids, Tri-acylglycerols, Phospholipids, Glycolipids, Steroids. 	0.50
II	07	Proteins <ul style="list-style-type: none"> Amino acids: Structure, Classification and General properties of a-amino acids; Physiological importance of essential and non-essential a-amino acids. Proteins: Bonds stabilizing protein structure; Levels of organization in proteins; Renaturation, Denaturation; Introduction to simple and conjugate proteins. Immunoglobulins: Basic Structure, Classes and Function, Antigenic Determinants. 	0.50
III	07	Nucleic Acids - <ul style="list-style-type: none"> Structure: Purines and pyrimidines, Nucleosides, Nucleotides, Nucleic acids Cot Curves: Base pairing, Denaturation and Renaturation of DNA. Types of DNA and RNA. Complementarity of DNA. Hpyo-Hyperchromaticity of DNA. 	0.50
IV	09	Enzymes - Nomenclature and classification; Cofactors; Specificity of enzyme action; Isozymes; Mechanism of enzyme action; Enzyme kinetics; Factors affecting rate of enzyme-catalyzed reactions.	0.50



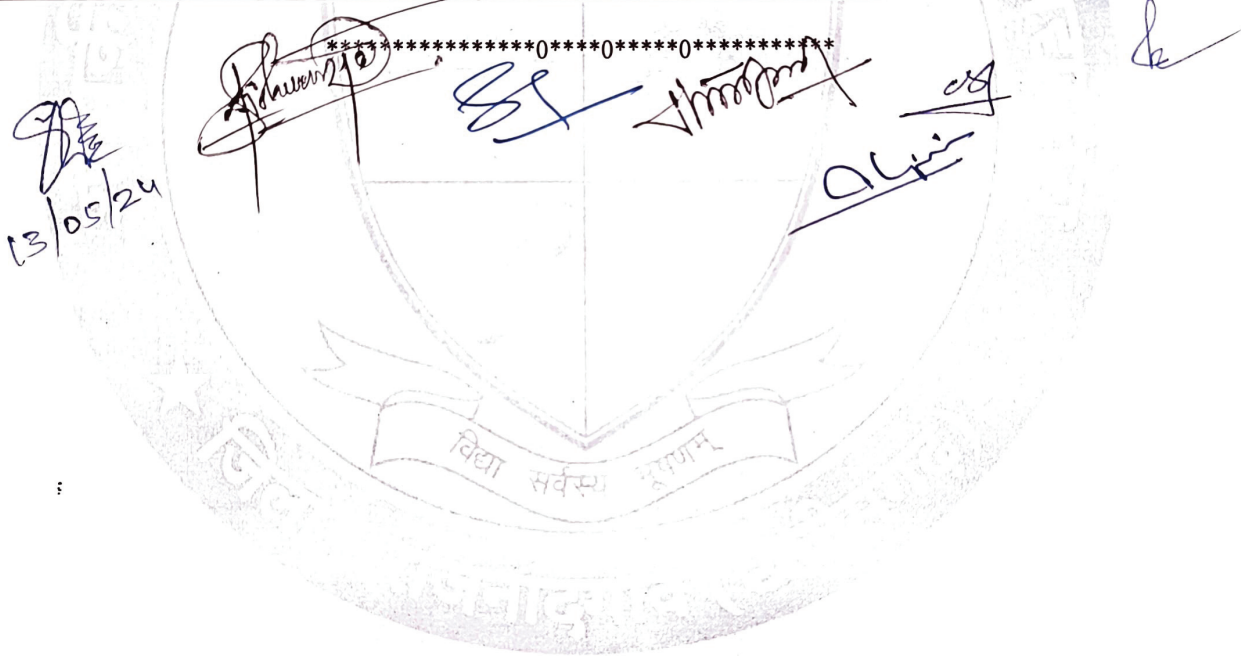
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Recommended Books	<ul style="list-style-type: none"> • Satyanarayan and Chakrapani , (2017) Biochemistry, Elsevier; Fifth edition • Cox, M.M and Nelson, D.L. (2008). Lehninger's Principles of Biochemistry, V Edition, W.H. Freeman and Co., New York. • Jeremy M. Berg, Lubert Stryer, John L. Tymoczko, Gregory J. Gatto, Biochemistry, 8th edition, 2015. • Victor W., Rodwell, David A., Bender, Kathleen M., Botham, Peter J., Kennelly, P. Anthony, Harper's Illustrated Biochemistry, 31st edition. • Murray, R.K., Bender, D.A., Botham, K.M., Kennelly, P.J., Rodwell, V.W. and Well, P.A. (2009). Harper's Illustrated Biochemistry, XXVIII Edition, International Edition, The McGraw- Hill Companies Inc. • Watson, J.D., Baker, T.A., Bell, S.P., Gann, A., Levine, M. and Losick, R. (2008). • Molecular Biology of the Gene, VI Edition, Cold Spring Harbor Lab. Press, Pearson Publication.
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Evaluation Scheme

Evaluation Scheme	Sections in Question Paper	Question type	Word Limit	No. of Questions	Marks per Question	Total
External		Short Answer type	250	8	5	40
Internal	Based on CT & Assignment/Project (5+5)					10
Total =						50

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विद्या सर्वस्य भूषणम्

GOVT. DIGVIJAY AUTONOMOUS PG COLLEGE RAJNANDGAON (C.G.)

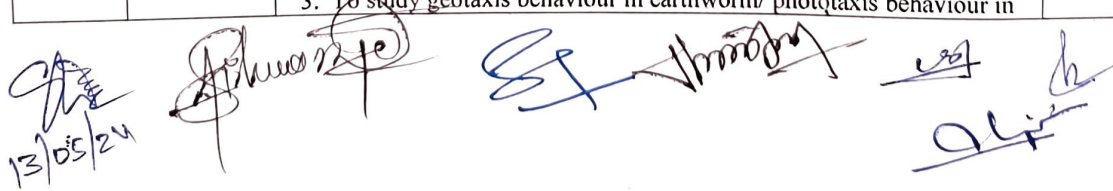
FYUGP (CBCS and LOCF Pattern)

Department of Zoology

Session: 2024-25	Program: B.Sc.
Semester: IV	Subject: Zoology
Course type: DSC- IV	Course Code:
Course Title : Animal behavior & Chronobiology	
Crédit: 04 (03+01)	Lecture – 60 (45+15)
MM: 100 = (ESE 80+IA 20)	Minimum Passing Marks: 40%

Title	Animal behaviour & Chronobiology
Course Learning Outcome:	<ul style="list-style-type: none"> Understand types of animal behavior and their importance to the organisms. Enhance their observation, analysis, interpretation and documentation skills by taking short projects pertaining to Animal behavior and Chronobiology.
Program Specific Outcome:	<ul style="list-style-type: none"> Relate animal behaviour with other subjects such as Animal biodiversity, Evolutionary biology, Ecology, Conservation biology and Genetic basis of the behavior. Understand various process of chronobiology in their daily life such as jet lag. Learn about the biological rhythm and their application in pharmacology and modern medicine.

Unit	Lectures	Topics	Credits
I	10	Introduction to Animal Behavior <ul style="list-style-type: none"> Origin and history of Ethology; Pioneers of Modern Ethology: Karl von Frisch, Ivan Pavlov, Konrad Lorenz, Niko Tinbergen. Proximate and ultimate causes of behaviour. Tools, techniques and methods used in studying animal behavior. 	0.75
II	10	Patterns of Behaviour <ul style="list-style-type: none"> Stereotyped behaviours (Orientation, Reflexes). Individual behavioural patterns; Instinct <i>versus</i> Learned behaviour; Associative learning, Classical and Operant conditioning, Habituation, Imprinting. 	0.75
III	10	Social and Sexual Behaviour <ul style="list-style-type: none"> Social Behaviour: Concept of Society, Communication and the senses (Chemical, Tactile, Auditory, Visual). Altruism, Inclusive fitness, Hamilton's rule; Insects' society (Example: Honey bee); Foraging in honey bee and advantages of the waggle dance. Sexual Behaviour: Asymmetry of sex, Sexual dimorphism, Mate choice, Intra-sexual Selection (male rivalry), Inter-sexual selection (female choice), Courtship behaviour; Parental care. 	0.75
IV	15	Introduction to Chronobiology & Biological Rhythm <ul style="list-style-type: none"> Historical developments in chronobiology. Significance of biological clocks, Characteristics of biological rhythms. Short-and Long-term rhythms; Circadian rhythms; Tidal rhythms and Lunar rhythms. Role of melatonin & Biological clocks 	0.75
Lab course	15	<ol style="list-style-type: none"> To study nests and nesting behavior of the birds and social insects. To study the behavioural responses of wood lice to dry and humid conditions. To study geotaxis behaviour in earthworm/ phototaxis behaviour in 	01



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	<p>insect larvae.</p> <p>4. Study of courtship behaviour in birds and insects from short videos/films.</p> <p>5. Visit to Forest/Wild life Sanctuary/Biodiversity Park/Zoological Park to study and record the behavioural activities of animals and prepare a short report.</p> <p>6. To study circadian functions in humans. (daily eating, sleep and temperature patterns).</p>
Recommended Books	<ul style="list-style-type: none"> • John A (2009) Animal Behaviour. 9th edition, Sinauer Associate Inc., USA. • Vinod Kumar (2002) Biological Rhythms: Narosa Publishing House, Delhi/ Springer-Verlag, Germany. • AK Pati. Chronobiology: The Dimension of Time in Biology and Medicine. PINSA (Biological Sciences). Part B 67 (6). 323-372, Dec., 2001. • David McF. Animal Behaviour. Pitman Publishing Limited, London, UK. • Manning A and Dawkins MS. An Introduction to Animal Behaviour. Cambridge University Press, USA. • Paul WS and John A (2013) Exploring Animal Behaviour. 6th Edition. Sinauer Associate Inc., Massachusetts, USA. • Jay. C. Dunlap, Jennifer. J. Loros, Patricia J. DeCoursey (ed). 2004, Chronobiology • Biological Timekeeping: J, Sinauer Associates, Inc. Publishers, Sunderland, MA, USA.

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