

NEP 2020

FOUR YEAR UNDERGRADUATE PROGRAM (NEP-2020)

Program: Bachelor in Science (2024 -28)

DISCIPLINE – ZOOLOGY

FOUR YEAR UNDERGRADUATE PROGRAM (NEP-2020)

Program: Bachelor in Science (2024 -28)

DISCIPLINE – ZOOLOGY

Session – 2024 -25

DSC -01 to 08		DSE -01 to 12	
Code	Title	Code	Title
ZOSC -01T	Life on Earth and Unique Attributes of Animal Kingdom	ZOSE -01T	Parasitology
ZOSC -01P	Life on Earth and Unique Attributes of Animal Kingdom	ZOSE -01P	Parasitology
ZOSC -02T	Cell Biology and Histology	ZOSE -02T	Ecology and Wild life Conservation & Management
ZOSC -02P	Cell Biology and Histology	ZOSE -02P	Ecology and Wild life Conservation & Management
ZOSC -03T	Diversity of Invertebrates	ZOSE -03T	Biochemistry
ZOSC -03P	Diversity of Invertebrates	ZOSE -03P	Biochemistry
ZOSC -04T	Diversity of Chordates and Comparative Anatomy	ZOSE -04T	Evolutionary Biology
ZOSC -04P	Diversity of Chordates and Comparative Anatomy	ZOSE -04P	Evolutionary Biology
ZOSC -05T	Vertebrate Physiology	ZOSE -05T	Endocrinology
ZOSC -05P	Vertebrate Physiology	ZOSE -05P	Endocrinology
ZOSC -06T	Genetics	ZOSE -06T	Immunology
ZOSC -06P	Genetics	ZOSE -06P	Immunology
ZOSC -07T	Biosystematics and Taxonomy	ZOSE -07T	Biotechnology and Genetic Engineering
ZOSC -07P	Biosystematics and Taxonomy	ZOSE -07P	Biotechnology and Genetic Engineering
ZOSC -08T	Biotechniques	ZOSE -08T	Applied Zoology
ZOSC -08P	Biotechniques	ZOSE -08P	Applied Zoology
		ZOSE -09T	Basics of Computer & Biostatistics
		ZOSE -09P	Basics of Computer & Biostatistics
		ZOSE -10T	Behaviour & Chronobiology
		ZOSE -10P	Behaviour & Chronobiology
		ZOSE -11T	Developmental Biology
		ZOSE -11P	Developmental Biology
		ZOSE -12T	Molecular Biology
		ZOSE -12P	Molecular Biology
GE -01 & 02		VAC	
ZOGE -01T	Life on Earth and Unique Attributes of Animal Kingdom	ZOVAC-01	Public health and Hygiene
ZOGE -01P	Life on Earth and Unique Attributes of Animal Kingdom	SEC	
ZOGE -02T	Cell Biology and Histology	ZOSEC-01	Vermiculture
ZOGE -02P	Cell Biology and Histology		

Program Outcomes (PO):

- Demonstrate and apply the fundamental knowledge of the basic principles of major fields of Zoology and Modern tools and techniques
- Analyse complex interactions among the various animals of different phyla, their distribution and their relationship with the environment.
- Gain knowledge of small scale industries like sericulture, fish farming, bee keeping, aquaculture, animal husbandry, poultry farm.
- Apply the knowledge and understanding of Zoology to one's own life and work.
- Develops empathy and love towards the animals and consciousness for wild life conservation

Program Specific Outcomes (PSO):

- Perform procedures as per laboratory standards in the areas of Taxonomy, Physiology, Ecology, Cell biology, Genetics, Applied Zoology, Behaviour, Endocrinology, Immunology, Biostatistics, Parasitology, Biochemistry, Evolution, Developmental Biology, Animal biotechnology, Tools and Techniques of Zoology.
- Understand the applications of biological sciences in Apiculture, Aquaculture, Sericulture, Animal Husbandry, Poultry Farm.
- Understand the applications of Zoology in Medicine and daily life
- Contributes the knowledge for Nation building and sustainable development

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF ZOOLOGY
Course Curriculum

PART- A: Introduction			
Program: Bachelor in Life Science (Certificate / Diploma / Degree/Honors)		Semester - I	Session: 2024-2025
1	Course Code	ZOSC-01T / ZOGE 01T	
2	Course Title	Life on Earth and Unique Attributes of Animal Kingdom	
3	Course Type	Discipline Specific Course	
4	Pre-requisite (if, any)	<i>As per program</i>	
5	Course Learning Outcomes (CLO)	After successfully completing this course, the students will be able to- ➤ Develop an understanding of concepts, mechanisms, evolutionary significance and relevance of Origin of life. ➤ Understand General Idea about Invertebrate and Vertebrate animals with special reference and their specific qualities. ➤ Understand and appreciate diversity of life forms. ➤ Apply the knowledge about animals Sciences in daily life.	
6	Credit Value	3 Credits	Credit = 15 Hours - learning & Observation
7	Total Marks	Max. Marks: 100	Min Passing Marks: 40
PART -B: Content of the Course			
Total No. of Teaching-learning Periods (01 Hr. per period) - 45 Periods (45 Hours)			
Unit	Topics (Course contents)		No. of Period
I	Origin of life: Theories of Origin of life: Ancient Theory Theory of Special Creation (Mythological approach), Theory of Panspermia or Cosmozoic Theory, Theory of Directed Panspermia, Theory of Catastrophism, Theory of Spontaneous Generation (Abiogenesis or Autogenesis), Theory of Biogenesis: Redi's Experiment and Pasteur's Experiment. Modern Theory: Origin of Universe: Big Bang Hypothesis in Brief, Origin of Solar System and The Earth: Nebular hypothesis, Atmosphere and Energy Sources on Primitive Earth, Biochemical Origin of Life: Oparin and Haldane Theory, Chemogeny: Formation of simple and complex organic compounds (Stanely Miller and Ure's Experiment), Formation of Coacervates, Nucleic Acids. Biogeny: Origin of primitive prokaryotic cell. Evolution of modes of Nutrition: Chemoheterotrophs, Anaerobic and Aerobic Photoautotrophs. Evolution of Eukaryotes.		12
II	Systematics & Unique attributes of Invertebrate and Vertebrate animals with special reference to Coelentrata, Mollusca and Pisces: Definition and difference between Invertebrate and Vertebrate. Nomenclature: Binomial and Trinomial Nomenclature and International code of Nomenclature Corals: Meaning of Coral, Structure of Coral polyp, Coral Skeleton, Types of corals: Hydrozoan Coral, Example- Millipora, Octocorallian Coral, Example- Alcyonium, Hexacorallian Corals, Example- Gorgonia. Torsion in Mollusca: Definition, Mechanism of Torsion, Effects of Torsion, Significance of Torsion. Pisces: Migration in fishes: Catadromous: Eel fish and Anadromous: Salmon fish and Parental care in fishes: By nest formation, Coiling round eggs, Attachment to body, Integumentary cups, Shelter in mouth, Brood pouch, Mermaids purses, Viviparity.		11
III	Unique attributes of Vertebrate animals with special reference to Amphibia & Reptilia: Parental care in Amphibia: by Nest, by Nursery or Shelter and by Parents Neoteny in Amphibia: Definition, Partial and Total Neotony, Factors Affecting Neotony, Examples- Axolotl larva, Necturus and Siren. Reptilia: Venomous & Non-venomous Snakes: Identification, Poison apparatus: Poison Glands, Poison ducts and Fangs, Biting Mechanism.		11
IV	Unique attributes of Vertebrate animals with special reference to Aves and Mammals: Birds: Flight Adaptation, Migration and Perching Mechanism, Flightless Birds (Morphology and Special Characters of Emu, Ostrich and Penguins), Discuss-Birds are glorified reptiles: Archaeopteryx. Monotremes or Egg laying mammals: Morphology and Special Characters of Echidna and Duck bill platypus. Aquatic Mammals: Morphology and Special Characters of Whale and Dolphin. Mammals: Flying Mammals: Morphology and Special Characters of Bat.		11
Keywords	<i>Origin of life, Invertebrate, Vertebrate, Corals, Torsion, parental care, Neotony, Fangs, Aves, Mammals</i>		

Signature:

PART-C: Learning Resources

Text Books Recommended

- E. J. W. Barrington , Invertebrate structure and function, English Language Book Society UK
- Robert Barnes, Invertebrate Zoology, Robert Barnes IVth edition Holt Saunders International Edition Japan
- Park Haswell, Marshall and Williams, A textbook on Zoology Invertebrate, AITBS Publishing and Distributers, Delhi
- Park Haswell, Marshall and Williams, A textbook on Zoology Vertebrate, AITBS Publishing and Distributers, Delhi

Reference Books Recommended

- Prof R. L. Kotpal, Protozoa to Echinodermata, Rastogi Publication Meerut
- E.L. Jordan, Dr. P. S. Verma, Invertebrate Zoology , S. Chand Publications, New Delhi
- N. Arumugam, N. C. Nair S. - Invertebrate Zoology, Saras Publication.
- N. Arumugam, N. C. Nair S. - vertebrate Zoology, Saras Publication.
- Barrington E. J. W., Invertebrate Structure and Function, Nelson London
- Barnes, R. D., Invertebrate Zoology –Saunders Philadelphia
- R. L. Kotpal, Invertebrate, Rastogi Publications
- R. L. Kotpal, Vertebrate, Rastogi Publications
- H. S. Bhampah, KavitaJuneja, Recent trends in vertebrates vol 1 – 9, Anmol Publication
- S. N. Prasad, Life of invertebrates, Vikash Publication House Pvt Ltd New Delhi
- G. S. Sandhu, Harshwardhan Bhagskar – Advanced invertebrate zoology –Campus books international

Online Resources–

- <https://www.coursera.org/lecture/emergence-of-life/4-5-invertebrates-successes-of-life-without-a-backbone-WQHqS>
- <https://www.shiksha.com/online-courses/introduction-to-biology-biodiversity-course-courl5385>
- <https://www.youtube.com/watch?v=k121Qv6loBA>
- https://www.youtube.com/watch?v=uK-Xx_OCYcI
- <https://www.youtube.com/watch?v=vybbBil5Elk>
- <https://www.youtube.com/watch?v=WxMSckEeio4>

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 100 Marks

Continuous Internal Assessment (CIA): 30 Marks

End Semester Exam (ESE): 70 Marks

Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz-(2): 20 +20	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 30 Marks
	Assignment / Seminar - 10 Total Marks - 30	
End Semester Exam (ESE):	Two section – A & B Section A: Q1. Objective – 10 x1= 10 Mark ; Q2. Short answer type- 5x4 =20 Marks Section B: Descriptive answer type qts., 1out of 2 from each unit- 4x10=40 Marks	

Signature:

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
DPARTMENT OF ZOOLOGY
COURSE CURRICULUM

PART- A: Introduction			
Program: Bachelor in Life Science (Certificate / Diploma / Degree / Honors)		Semester - I	Session: 2024-2025
1	Course Code	ZOSC-01P/ ZOGE 01P	
2	Course Title	Life on Earth and Unique Attributes of Animal Kingdom	
3	Course Type	Discipline Specific Lab Course	
4	Pre-requisite (if, any)	<i>As per Program</i>	
5	Course Learning Outcomes (CLO)	After successfully completing this course, the students will be able to- ➤ To demonstrate comprehensive understanding of the current theories and hypotheses regarding the origin of life on Earth, ➤ Understand diversity of life forms ➤ Identify some distinctive invertebrate and vertebrate animals ➤ Apply this Understanding to broader context of life	
6	Credit Value	1 Credits	Credit =30 Hours Laboratory or Field learning/Training
7	Total Marks	Max. Marks: 50	Min Passing Marks: 20
PART -B: Content of the Course			
Total No. of learning-Training / performance Periods: 30 Periods (30 Hours)			
Module	Topics (Course Contents)		No. of Period
Lab./Field Training/ Experiment Contents of Course	➤ Study of origin of life through chart and models ➤ Study of different Invertebrates and Vertebrates animals through models and museum specimens in the laboratory with details of biogeography and diagnostic features: Millipora, Alcyonium, Gorgonia, Hippocampus, Ichthyophis (Female), Alytes (Male), Axolotal larva, Necturus, Siren, Cobra, Viper (pit & Pitless), Sea Snake, Rattle Snake, Archaeopteryx, Emu, Ostrich and Penguins, Echidna and Duck bill platypus, Whale, Dolphin, Bat. ➤ Preparation and Demonstration of Key for Identification of Venomous and Non-venomous snakes. ➤ Study of Coral Reefs through Models, Photographs ➤ Study of Fossils through chart/ Models ➤ An “Animal album or Practical Record” containing sketches, photographs, cut outs, with appropriate write up about the above mentioned taxa. ➤ Study of some videos to develop understanding and acquired knowledge on the animals salient features as mentioned above. ➤ Group discussion/Viva or Seminar presentation on related topics mentioned in Theory paper.		30
Keywords	Museum specimens, Invertebrates, Vertebrates, Venomous and Non-venomous, Seminar		

Signature:

PART-C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

- S.S. Lal, Practical Zoology, Invertebrate. 12th Edition Rastogi Publications, Meerut, New Delhi.
- A manual of practical Zoology. Dr. P.S Verma, S. Chand Publication, New Delhi

Reference Books Recommended –

- Park Haswell, Marshall and Williams, A textbook on Zoology Invertebrate, AITBS Publishing and Distributors, Delhi
- Park Haswell, Marshall and Williams, A textbook on Zoology Vertebrate, AITBS Publishing and Distributors, Delhi

Online Resources–

- http://ndl.iitkgp.ac.in/he_document/swayamprabha/swayam_prabha/gc5ua6m873i?e=3|*|||
- <https://www.youtube.com/watch?v=JUdp3U6A1EA>

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 50 Marks

Continuous Internal Assessment (CIA): 15 Marks

End Semester Exam (ESE): 35 Marks

Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz-(2): 10 & 10	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 15 Marks
	Assignment/Seminar +Attendance - 05	
	Total Marks - 15	
End Semester Exam (ESE):	Laboratory / Field Skill Performance: On spot Assessment	
	A. Performed the Task based on lab. work - 20 Marks	Managed by Course teacher as per lab. status
	B. Spotting based on tools & technology (written) – 10 Marks	
	C. Viva-voce (based on principle/technology) - 05 Marks	

Signature:

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF ZOOLOGY
COURSE CURRICULUM

PART- A: Introduction			
Program: Bachelor in Life Science (Certificate / Diploma / Degree / Honors)		Semester - II	Session: 2024-2025
1	Course Code	ZOSC- 02T	
2	Course Title	Cell Biology and Histology	
3	Course Type	Discipline Specific Course	
4	Pre-requisite (if, any)	<i>As per Program</i>	
5	Course Learning Outcomes (CLO)	After successfully completing this course, the students will be able to- ➤ Acquire knowledge of Cell membrane and function ➤ Understand the functioning of nucleus and extra nuclear organelles and understand the intricate cellular mechanisms involved. ➤ Gain Knowledge of key processes like cell division, ➤ Learn about various tissues of body their structural significance	
6	Credit Value	3 Credits	<i>Credit = 15 Hours - learning & Observation</i>
7	Total Marks	Max. Marks: 100	Min Passing Marks: 40
PART -B: Content of the Course			
Total No. of Teaching-learning Periods (01 Hr. per period) - 45 Periods (45 Hours)			
Unit	Topics (Course contents)		No. of Period
I	Cell Structure, Cell Membrane and Extra Nuclear Cell Organelles: General structure of Prokaryotes and Eukaryotes. Cell membrane organization: Origin, structure (Lipid-Lipid Bilayer Model, Dannelli & Davson Model, Unit Membrane Model and Fluid mosaic model), chemical composition and function of cell membrane, Specialization of cell membrane: microvilli desmosomes, Hemidesmosome, Septate Desmosome, plasmodesmata, tight and gap junction. Extra Nuclear Cell Organelles: Ultra structure and functions of Endoplasmic reticulum and Golgi apparatus.		11
II	Extra Nuclear Cell Organelles: Ultra structure and functions of Ribosome, Lysosome, Peroxisomes, Mitochondria: Origin, structure and function.		11
III	Nuclear Organization and Cell Division: Size, shape, structure and functions of interphase nucleus. Ultra structure of nuclear membrane and pore complex. Nucleolus: general organization, chemical composition and functions, Chromosome Morphology, Cell cycle, Cell division- Mitosis and Meiosis. Cell division checks points and their regulation. Programmed cell death (Apoptosis).		12
IV	Introduction to tissues. Epithelial tissue: types, structure and characteristics. surface modifications. Basement membrane: structure and characteristics. Connective tissue cells. Structure and function of loose, dense and adipose tissue. Cartilage and bone: classification, and fine structure. Blood: plasma, blood cells, lymph- their structure and function. Bone marrow and haemopoiesis. Structure and function of spleen. Muscular tissue: ultrastructure of smooth, skeletal and cardiac muscles. Muscle-tendon attachment. Structure and classification of neurons.		11
Keywords	Cell Biology, Cell Membrane, Cell organelle, Nucleus, endoplasmic reticulum and Golgi apparatus, ribosome, lysosome, peroxisomes, Mitochondria, tissues.		

Signature:

PART-C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

1. Gupta P.K. Cell and Molecular Biology, Himalaya Publication
2. Arumugam.N, Cell biology and Molecular Biology, Saras Publication
3. Rastogi V.B. Cell Biology, Rastogi Publication
4. Verma P.S. and Agrawal Cell Biology, S. Chand Publication

Reference Books Recommended –

5. Karp, G. (2010) Cell and Molecular Biology: Concepts and Experiments (6th edition) John Wiley & Sons. Inc.
6. De Robertis, E.D.P. and De Robertis, E.M.F. (2006) Cell and Molecular Biology (8th edition) Lippincott Williams and Wilkins, Philadelphia.
7. Cooper, G.M. and Hausman, R.E. (2009) The Cell: A Molecular Approach. (5th edition) ASM Press & Sunderland, Washington, D.C.; Sinauer Associates, MA.
8. Becker, W.M.; Kleinsmith, L.J.; Hardin. J. and Bertoni, G. P. (2009) The World of the Cell. (7th edition) Pearson Benjamin Cummings Publishing, San Francisco. Practical

Online Resources–

1. National digital Library.-
<http://ndl.iitkgp.ac.in/document/Qkh4R2FGUkRNZjFicFUvWmpzQ2loY0poaUVtYIByc1BZNXk3TnZMWVfzQXpZNjhhQUplR1BTOERHelZXZUp5Nw>
2. <http://ndl.iitkgp.ac.in/document/Qkh4R2FGUkRNZjFicFUvWmpzQ2loZFJyVGFmaDFwbXpBS0kwNi9tbi9lUGYxaFI6OC9Sb25QUiXlZlV3NUZw>
3. <https://www.youtube.com/watch?v=GYy627IeAKg>
4. E-PG Pathshala.
<https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=2rAs1Puvga4LW93zMe83aA==>

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 100 Marks

Continuous Internal Assessment (CIA): 30 Marks

End Semester Exam (ESE): 70 Marks

Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz-(2): 20 +20	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 30 Marks
	Assignment / Seminar - 10 Total Marks - 30	
End Semester Exam (ESE):	Two section – A & B Section A: Q1. Objective – 10 x1= 10 Mark ; Q2. Short answer type- 5x4 =20 Marks Section B: Descriptive answer type qts., 1out of 2 from each unit- 4x10=40 Marks	

Signature:

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
Department of ZOOLOGY
Course Curriculum

PART- A: Introduction			
Program: Bachelor in Life Science (Certificate / Diploma / Degree / Honors)		Semester - II	Session: 2024-2025
1	Course Code	ZOSC-02P	
2	Course Title	Cell Biology and Histology	
3	Course Type	Discipline Specific Lab Course	
4	Pre-requisite (if, any)	<i>As per Program</i>	
5	Course Learning Outcomes (CLO)	After successfully completing this course, the students will be able to- ➤ Understand ultra structure of prokaryote and Eukaryote cell, undertake microscopic study to gain knowledge ➤ learn to identify cell organelles ➤ Explain and demonstrate mitosis and meiosis division in onion root tip, Grass hopper testis, etc ➤ Gain knowledge of Microtomy	
6	Credit Value	1 Credits	<i>Credit =30 Hours Laboratory or Field learning/Training</i>
7	Total Marks	Max. Marks: 50	Min Passing Marks: 20
PART -B: Content of the Course			
Total No. of learning-Training/performance Periods: 30 Periods (30 Hours)			
Module	Topics (Course contents)		No. of Period
Lab./Field Training/ Experiment Contents of Course	1. Study of prokaryotic and eukaryotic cell types with the help of chart, slide and video. 2. Separation and isolation of cells by sedimentation velocity in unit gravity. 3. Disruption of cells, isolation and identification of subcellular components, isolation of nuclei. 4. Isolation of mitochondria by differential centrifugation and identification of succinic dehydrogenase in the mitochondrial pellet. 5. Chromosome segregation in mitosis and meiosis. 6. Preparation of chromosome squashes from Onion Root tip for observation of stages of Mitosis 7. Preparation of chromosome squashes from grasshopper/cockroach testes for the observation of stages of meiosis. 8. Isolation and estimation of DNA. 9. Study of types of tissue through permanent slides: epithelial, connective, muscular, Nervous etc. 10. Preparation of Practical Record 11. Group discussion/Viva or Seminar presentation on related topics mentioned in Theory paper		30
Keywords	Prokaryote, Eukaryote, cell division, Mitosis, Meiosis, DNA Separation, Histology of Tissue, Microtomy.		

PART-C: Learning Resources**Text Books, Reference Books and Others****Text Books Recommended –**

1. Debarati Das Essential Practical Handbook of Cell Biology & Genetics, Biometry & Microbiology, A Laboratory Manual, Academic Publishers.
2. Mohan P Arora Cytogenetics:, Himalayan Publishing House

Reference Books Recommended –

3. Karp, G. (2010) Cell and Molecular Biology: Concepts and Experiments (6th edition) John Wiley & Sons. Inc.

Online Resources– National Digital Library

- http://ndl.iitkgp.ac.in/he_document/inflibnet_epgp/inflibnet_epgp/IN_I_e_P_P_1_Z_51296_P_1_P_o_e_51600_M_0_P_g_51604_51605?e=13|*|||

PART -D: Assessment and Evaluation**Suggested Continuous Evaluation Methods:****Maximum Marks: 50 Marks****Continuous Internal Assessment (CIA): 15 Marks****End Semester Exam (ESE): 35 Marks**

Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz-(2): 10 & 10	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 15 Marks
	Assignment/Seminar +Attendance - 05	
	Total Marks - 15	
End Semester Exam (ESE):	Laboratory / Field Skill Performance: On spot Assessment	
	A. Performed the Task based on lab. work - 20 Marks	Managed by Course teacher as per lab. status
	B. Spotting based on tools & technology (written) – 10 Marks	
	C. Viva-voce (based on principle/technology) - 05 Marks	

Signature:

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF ZOOLOGY
COURSE CURRICULUM

PART- A: Introduction			
Program: Bachelor in Life Science (Diploma / Degree/ Honors)		Semester - III	Session: 2024-2025
1	Course Code	ZOSC-03T	
2	Course Title	Diversity of Invertebrates	
3	Course Type	Discipline Specific Course	
4	Pre-requisite (if, any)	<i>As per Program</i>	
5	Course Learning Outcomes (CLO)	After successfully completing this course, the students will be able to - ➤ Develop understanding on Invertebrate Animals on the basis of classification and Nomenclature. ➤ Develop understanding how simple/unicellular animals changed into multicellular and diploblastic forms through their anatomy and physiology. ➤ Gain Knowledge of key processes like formation of triploblastic animals (simple to complex form of body plan). ➤ Develop understanding on parasitic adaptations and life cycle of Helminthes. ➤ Develop understanding on the diversity in Artropoda, Mollusca and Echinodermata.	
6	Credit Value	3 Credits	Credit = 15 Hours - learning & Observation
7	Total Marks	Max. Marks: 100	Min Passing Marks: 40
PART -B: Content of the Course			
Total No. of Teaching-learning Periods (01 Hr. per period) - 45 Periods (45 Hours)			
Unit	Topics (Course contents)		No. of Period
I	General Characters, Classification up to order and Type Study of Phylum Protozoa and Porifera with some special features: Protozoa: General Characters and Classification of Phylum Protozoa up to order. Type study: Paramoecium, Protozoa and Disease. Porifera: General Characters and Classification of Phylum Porifera up to order. Type study: Sycon.		11
II	General Characters, Classification and Type Study of Phylum Coelenterata, Helminthes and Annelida: Coelenterata - General Characters and Classification of Phylum Coelenterata up to order. Type Study: Obelia. Helminthes - Classification of Phylum Helminthes up to order. Type study: Fasciola. Annelida- Classification of Phylum Annelida up to order. Type study: Pheretima (Earthworm).		11
III	General Characters, Classification and Type Study of Phylum Arthropoda and Mollusca: Arthropoda - General Characters and Classification of Phylum Arthropoda up to order. Type study: Prawn. Mollusc- General Characters and Classification of Phylum Mollusca up to order. Type study: Pila.		12
IV	General Characters, Classification and Type Study of Phylum Echinodermata and Hemichordata: General Characters and Classification of Phylum Echinodermata up to order. Type Study: Asterias (Starfish). General Characters and Classification of Phylum Hemichordata Type Study: Balanoglossus		11
Keywords	Taxonomy, Nomenclature, Canal System, Protozoa, Balanoglossus, Torsion		

Signature:

PART-C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

- R.L. Kotpal, Modern Textbook of Zoology Invertebrates. Rastogi Publication, Gangotri, Shivaji Road, Meerut
- V.K. Tiwari, Unified Zoology, Shival Agrawal and Company, Pustak Prakashak, Khajuri Bazar, Indore.
- Dr. S.M. Saxsen, Zoology, Ist Year, by a, Ram Prasad and Sons, Aagra and Bhopal.
- N. Arumugam, M.G. Ragunathan, T. Murugan, B. Ramnathan, A Textbook of Invertebrates by Saras Publication

Reference Books Recommended –

- Barrington, E.J.W. (1979). Invertebrate Structure and Functions. II Edition. E.L.B.S. and Nelson.
- Boradale, L.A. and Potts, E.A.(1961) Invertebrates: A Manual for the use of Students. Asia Publishing Home.
- Bushbaum, R. (1964). Animals without Backbones. University of Chicago Press.
- Hyman, L H. (1940-67). The Invertebrates, Vol. I-VI. McGraw-Hill, New York.
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Online Resources–

- http://ndl.iitkgp.ac.in/he document/inflibnet epgp/inflibnet epgp/IN I e P P 1 Z 512 96 P 0 B o p 51542 M 1 M L c P D a P o E P 1 51562 51563?e=9|*|||

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 100 Marks

Continuous Internal Assessment (CIA): 30 Marks

End Semester Exam (ESE): 70 Marks

Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz-(2): 20 +20	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 30 Marks
	Assignment / Seminar - 10	
	Total Marks - 30	
End Semester Exam (ESE):	Two section – A & B Section A: Q1. Objective – 10 x1= 10 Mark ; Q2. Short answer type- 5x4 =20 Marks Section B: Descriptive answer type qts., 1out of 2 from each unit- 4x10=40 Marks	

Signature:

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF ZOOLOGY
COURSE CURRICULUM

PART- A: Introduction			
Program: Bachelor in life Science (Diploma / Degree/ Honors)		Semester - III	Session: 2024-2025
1	Course Code	ZOSC-03P	
2	Course Title	Diversity of Invertebrates	
3	Course Type	Discipline Specific Lab Course	
4	Pre-requisite (if, any)	<i>As per Program</i>	
5	Course Learning Outcomes (CLO)	After successfully completing lab course the students will be able to- ➤ Develop understanding on the diversity of life with regard nonchordates. ➤ Gain Knowledge of grouping of animals on the basis of their morphological characteristics. ➤ Develop critical understanding how animals have changed from simple form to complex body plan. ➤ Acquired the detailed knowledge to think and interpret different animal species individually.	
6	Credit Value	1 Credits	Credit =30 Hours Laboratory or Field learning/Training
7	Total Marks	Max. Marks: 50	Min Passing Marks: 20
PART -B: Content of the Course			
Total No. of learning-Training/performance Periods: 30 Periods (30 Hours)			
Module	Topics (Course contents)		No. of Period
Lab./Field Training/ Experiment Contents of Course	List of labs to be conducted • Study of different non-chordate taxa animals through models, slides and museum specimens in the laboratory. Emphasising classification, biogeography and diagnostic features of: Protozoa, Porifera, Coelenterata (also with special reference to Corals of Cnidarians), Helminthes, Annelida, Arthropoda, Mollusca and Echinodermata. • Histological slides of different Non chordate Taxa, slides of various larval forms of Helminthes, Crustacea and Echinodermata • Dissection of <i>Pheretima</i> to expose Alimentary canal and circum pharyngeal ganglia through Alternative methods of dissection. • Dissection of <i>Periplaneta</i> to expose the digestive system, salivary glands and Mouth Parts through Alternative methods of dissection. • Dissection of Prawn to expose appendages and statocyst through Alternative methods of dissection • Dissection of <i>Pila</i> to expose Nervous System through Alternative methods of dissection. • Study of Invertebrate animals in nature during a survey of a National Park/ Forest area/College campus. • Group discussion/Viva or Seminar presentation on two related topics: Polymorphism, Parasitic adaptations, Freshwater sponges, Biodiversity and climate change, Tree of Life, Marine zooplanktons and their ecological importance including oxygen evolution. • An “animal album or Practical Record” containing sketches, photographs, cut outs, with appropriate write up about the above mentioned taxa. • Study of some videos to develop understanding on the animals of different taxa.		30
Keywords	Museum specimens, Histological slides, Alternative of Dissection, Animal album		

Signature:

PART-C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

- S.S. Lal, Practical Zoology, Invertebrate. 12th Edition Rastogi Publications, Meerut, New Delhi.
- A manual of practical Zoology. Dr. P.S Verma, S. Chand Publication, New Delhi

Reference Books Recommended-

- Barrington, E.J.W. (1979). Invertebrate Structure and Functions. II Edition. E.L.B.S. and Nelson.
- Hyman, L.H. (1940-67). The Invertebrates, Vol. I-VI. McGraw-Hill, New York.

Online Resources–

- <https://www.youtube.com/watch?v=GC5Ua6m873I>
- <https://www.youtube.com/watch?v=-qyM2Hskj84>

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 50 Marks

Continuous Internal Assessment (CIA): 15 Marks

End Semester Exam (ESE): 35 Marks

Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz-(2): 10 & 10 Assignment/Seminar +Attendance - 05 Total Marks - 15	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 15 Marks
End Semester Exam (ESE):	Laboratory / Field Skill Performance: On spot Assessment A. Performed the Task based on lab. work - 20 Marks B. Spotting based on tools & technology (written) – 10 Marks C. Viva-voce (based on principle/technology) - 05 Marks	Managed by Course teacher as per lab. status

Signature:

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF ZOOLOGY
COURSE CURRICULUM

PART- A: Introduction			
Program: Bachelor in Life Science (Diploma / Degree/Honors)		Semester - III	Session: 2024-2025
1	Course Code	ZOSE- 01T	
2	Course Title	Parasitology	
3	Course Type	Discipline Specific Elective	
4	Pre-requisite (if, any)	As per Program	
5	Course Learning Outcomes (CLO)	➤ Students should comprehend the life cycles of various parasites, including their modes of transmission, intermediate hosts, and definitive hosts. ➤ Gain insights into the interactions between parasites and their hosts; including mechanisms of host invasion, evasion of host defenses, and pathogenesis. ➤ Develop the ability to recognize clinical manifestations associated with parasitic infections ➤ Understand the epidemiology of parasitic diseases ➤ Communicate effectively about parasitic diseases, including educating the public.	
6	Credit Value	3 Credits	Credit = 15 Hours - learning & Observation
7	Total Marks	Max. Marks: 100	Min Passing Marks: 40
PART -B: Content of the Course			
Total No. of Teaching-learning Periods (01 Hr. per period) - 45 Periods (45 Hours)			
Unit	Topics (Course contents)		No. of Period
I	Viral diseases: General characters, Structure and Classification of virus, A brief account of pathogenic viruses. Brief history of microbiology: germ theory of disease, Host pathogen interaction: invasion, antigenic heterogeneity, toxins and enzymes secretions. Viral diseases: hepatitis, influenza, AIDS, Covid -19 with emphasis on their causative agents, pathogenesis, diagnosis, prophylaxis and chemotherapy.		12
II	Bacterial & Fungal diseases: General characters, Structure and Classification of bacteria. Bacterial Diseases: A brief account of pathogenic bacteria, discovery of penicillin, diseases caused by <i>Streptococcus pneumonia</i> , <i>Salmonella typhi</i> , <i>Escherichia coli</i> , <i>Mycobacterium tuberculosis</i> , <i>Rickettsia</i> , <i>Spirochaetes</i> Fungal diseases: Ringworm infection, <i>Aspergillosis</i> , <i>candidiasis</i> .		11
III	Protozoan parasites: An overview of protozoa & disease. Introduction to parasites and parasitic diseases. Mode of transmission, portals of entry and implications of parasitism. Parasitic adaptations. Concept of zoonotic diseases. Protozoan diseases of medical importance: Brief account of life History, pathogenicity of the following Protozoa with reference to Man, prophylaxis and treatment: <i>Entamoeba histolitica</i> , <i>Trypanosoma gambiens</i> , <i>Plasmodium vivex</i> , <i>Giardia</i> .		11
IV	Helminth parasites: An overview of Helminthic diseases. Brief account of life History, pathogenicity of the following Helminths with reference to Man, prophylaxis and treatment. <i>Taenia solium</i> , <i>Schistosoma haematobium</i> , <i>Ascaris lumbricoides</i> , <i>Wuchereria branrofti</i> . Vector insects.		11
Keywords	Micrology, pathogenic bacteria, Protozoan parasites, Helminth parasites, Toxicology, toxic againts		

Signature:

PART-C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

- Agrawal Anju Principles of Toxicology
- Parija, S. C. (2013) Textbook of Medical Parasitology, Protozoology & Helminthology (Text and colour Atlas), IV Edition, All India Publishers & Distributors, New Delhi.
- Ichhpujani, R.L. and Bhatia, R. (2009) Medical Parasitology. III Edition, Jaypee Brothers Medical Publishers (P) Ltd., New Delhi
- Ahmed, N., Dawson, M., Smith, C. and Wood, Ed. (2007) Biology of Disease. Taylor and Francis Group.
- Chatterjee, K. D. (2009). Parasitology: Protozoology and Helminthology. XIII Edition, CBS Publishers & Distributors (P) Ltd.
- Arora, D. R and Arora, B. (2001) Medical Parasitology. II Edition. CBS Publications and Distributors
- Chatterjee, K.D (2015) Parasitology (13th edition)

Reference Books Recommended –

- Jawetz, M. and Adelberg (2015) Medical Microbiology (27th edition)
- Noble, E.R. and Noble, G.A. (1989) Parasitology: The Biology of Animal Parasites. VI Edition, Lea and Febiger

Online Resources–

- http://ndl.iitkgp.ac.in/he document/inflibnet epgp/inflibnet epgp/IN I e P P 1 Z 512 96 P 0 B o p 51542 M 1 M L c P D a P o E P 1 51562 51563?e=9|*||
- http://ndl.iitkgp.ac.in/he document/inflibnet epgp/inflibnet epgp/IN I e P P 1 Z 512 96 P 0 B o p 51542 M 2 P d a p o w b 51594 51595?e=3|*||

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 100 Marks

Continuous Internal Assessment (CIA): 30 Marks

End Semester Exam (ESE): 70 Marks

Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz-(2): 20 +20	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 30 Marks
	Assignment / Seminar - 10 Total Marks - 30	
End Semester Exam (ESE):	Two section – A & B Section A: Q1. Objective – 10 x1= 10 Mark; Q2. Short answer type- 5x4 =20 Marks Section B: Descriptive answer type qts., 1out of 2 from each unit-4x10=40 Marks	

Signature:

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF ZOOLOGY
COURSE CURRICULUM

PART- A: Introduction			
Program: Bachelor in Life Science (Diploma / Degree/ Honors)		Semester - III	Session: 2024-2025
1	Course Code	ZOSE- 01P	
2	Course Title	Parasitology	
3	Course Type	Discipline Specific Elective Lab Course	
4	Pre-requisite (if, any)	<i>As per Program</i>	
5	Course Learning Outcomes (CLO)	At the end of this course, the students will be able - ➤ Identify common parasitic Protozoa and Helminth. ➤ Learn techniques for studying growth of bacteria and its staining. ➤ Learn the techniques for examine Sputum, Blood, Urine and Stool samples for pathology	
6	Credit Value	1 Credits	<i>Credit =30 Hours Laboratory or Field learning/Training</i>
7	Total Marks	Max. Marks: 50	Min Passing Marks: 20
PART -B: Content of the Course			
Total No. of learning-Training/performance Periods: 30 Periods (30 Hours)			
Module	Topics (Course contents)		No. of Period
Lab./Field Training/ Experiment Contents of Course	➤ Study of permanent slides and specimens of parasitic Protozoans and Helminthes. ➤ Pathological examination of sputum, blood, urine and stool. ➤ Blood: Erythrocyte Sedimentation Rate (ESR), Haematocrit. ➤ Staining and identification of Gram positive and Gram negative bacteria. ➤ Preparation of thin and thick blood films to diagnose Plasmodium infections/ or permanent slides. ➤ Preparation of temporary and permanent slides of faecal matter by saline preparation and concentration techniques to identify cysts of parasitic Protozoans and Helminthes eggs /or parmanant slides studies. ➤ Study Kinetics of bacterial growth and staining techniques. ➤ Group discussion or Seminar presentation on one or two related topics ➤ Group discussion/quiz/seminar on topics related to theory. ➤ Preparation of practical record or Album of parasites.		30
Keywords	Parasitic protozoa, helminth, ESR, Gram positive and Gram negative		

Signature:

PART-C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

- Ghosh Saugala, Panikar's Text book of Parasitology. Jaipye Brothers
- Ananthanarayan and Paniker's Textbook of Microbiology, Twelfth Edition, Universities press

Reference Books Recommended –

- K.D. Chattargee, Parasitology . CBS Publisher

Online Resources–

- http://ndl.iitkgp.ac.in/he document/swayam ugc moocs/swayam ugc moocs/IN S U M 1 U C 17 A D 4127 M L h o A L w P A o A L 34326 34327?e=7|*||
- http://ndl.iitkgp.ac.in/he document/swayam ugc moocs/swayam ugc moocs/IN S U M 1 U C 17 A D 4127 M L h o T s a F h 10250 10251?e=8|*||

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 50 Marks

Continuous Internal Assessment (CIA): 15 Marks

End Semester Exam (ESE): 35 Marks

Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz-(2): 10 & 10	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 15 Marks
	Assignment/Seminar +Attendance - 05 Total Marks - 15	
End Semester Exam (ESE):	Laboratory / Field Skill Performance: On spot Assessment	
	A. Performed the Task based on lab. work	

Signature:

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF ZOOLOGY
COURSE CURRICULUM

PART- A: Introduction			
Program: Bachelor in Life Science (Diploma / Degree/ Honors)		Semester - IV	Session: 2024-2025
1	Course Code	ZOSC-04T	
2	Course Title	Diversity of Chordates and Comparative Anatomy	
3	Course Type	Discipline Specific Course	
4	Pre-requisite (if, any)	As per Program	
5	Course Learning Outcomes (CLO)	After successfully completing this course, the students will be able to: ➤ Develop understanding of the characters used to classify and differentiate the organisms belonging to different taxa and the evolutionary history and relationship between the different classes of chordates. ➤ Acquire knowledge and Develop critical understanding of the comparative anatomy and functioning of complex systems of Pisces to Mammalia. ➤ Learn the comparative account of integument with its derivatives, digestive system and Skeletal and Muscular System. ➤ Understand the Digestive system and its anatomical specializations with respect to different diets and feeding habits and respiratory organs in vertebrates used in aquatic, terrestrial and aerial vertebrates. ➤ Understand the evolution of heart, aortic arches, and Learn the evolution of brain, sense organs and urinogenital system.	
6	Credit Value	3 Credits	Credit = 15 Hours - learning & Observation
7	Total Marks	Max. Marks: 100	Min Passing Marks: 40
PART -B: Content of the Course			
Total No. of Teaching-learning Periods (01 Hr. per period) - 45 Periods (45 Hours)			
Unit	Topics (Course contents)		No. of Period
I	Diversity in Protochordates and Chordates: General characteristics & classification of Chordata up to orders with examples. Cephalochordates: Type study – Amphioxus and its affinities, Agnatha: Comparative account of Petromyzon and Myxine		11
II	Structure and function of integument and skeletal systems Alimentary canal: Structure of integument from fishes to mammals with an account on epidermal and dermal derivatives and their functional significance, Anatomy of Axial skeleton from fishes to mammals. Comparative anatomy of appendicular skeleton: limbs and girdles from fishes to mammals. Comparative account with structure of alimentary canal and digestive glands in vertebrates.		11
III	Comparative anatomy and functional Significance of, Respiratory organs, Heart Aortic Arches and Endocrine Glands: Structure of Gills, Lungs, Air sacs and Swim bladder in Vertebrates, Structure and evolution of heart in vertebrates, Evolution of aortic arches and their significance in vertebrates. Endocrine Glands & their function. Disorders of Thyroid, Adrenal, Pancreas and Pituitary.		11
IV	Comparative anatomy and functional Significance of Urinogenital System, Brain & Sense Organ: Types and development of kidneys and their ducts in anamniotes and amniotes. Nephron- structure, types and their function, Comparative anatomy of Urinogenital system. Comparative anatomy of Brain of vertebrates, Structure of Ear and Eye.		12
Keywords	Chordates, Protochordates, Petromyzon And Myxine, Comparative Anatomy, Integument Lungs, Air Sacs Aortic Arches, Kidney, Brain		

Signature:

PART-C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

- Jordan, E. L. and Verma, P. S. (2013) Chordate Zoology (14th edition).
- Saxena, R. K. and Saxena, S. (2015) Comparative Anatomy of Vertebrates (2nd edition).
- R.L. Kotpal, Modern Text Book of Zoology, Vertebrates, Rastogi Publication, Merut
- Tiwari, V.K. Unified Zoology, B.Sc. Part I, Shivalal Agarwal and Company, Indore

Reference Books Recommended –

- Young, J. Z. (2004). *The Life of Vertebrates*. III Edition. Oxford university press.
- Weichert, C.K. (1970) Anatomy of Chordates (4th edition).

Online Resources–

e-Resources / e-books and e-learning portal

- <https://swayamias.com/zoology-optional-coaching/>
- <https://www.swayamprabha.gov.in/index.php/program/archive/9>
- <https://www.acsedu.co.uk/Courses/Environmental/VERTEBRATE-ZOOLOGY-BEN104-528.aspx>
- <https://www.nu.edu/degrees/mathematics-and-natural-sciences/courses/bio416/>
- <https://www.youtube.com/watch?v=qSY5iXHHi88>
- <https://www.youtube.com/watch?v=tz8liJXbBCQ>
- <https://www.youtube.com/watch?v=mXECx3s8yEQ>

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 100 Marks

Continuous Internal Assessment (CIA): 30 Marks

End Semester Exam (ESE): 70 Marks

Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz-(2): 20 +20	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 30 Marks
	Assignment / Seminar - 10	
	Total Marks - 30	
End Semester Exam (ESE):	Two section – A & B Section A: Q1. Objective – 10 x1= 10 Mark; Q2. Short answer type- 5x4 =20 Marks Section B: Descriptive answer type qts., 1out of 2 from each unit-4x10=40 Marks	

Signature:

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF ZOOLOGY
COURSE CURRICULUM

PART- A: Introduction			
Program: Bachelor in Life Science (Diploma / Degree / Honors)		Semester - IV	Session: 2024-2025
1	Course Code	ZOSC-04P	
2	Course Title	Diversity of Chordates and Comparative Anatomy	
3	Course Type	Discipline Specific Lab Course	
4	Pre-requisite (if, any)	As per Program	
5	Course Learning Outcomes (CLO)	After successfully completing lab course the students will be able to - ➤ Develop understanding on the diversity of life with regard to different classes of vertebrates. ➤ Gain knowledge to identify and classify the animals on the basis of their morphological characteristics. ➤ Acquire the detailed knowledge about evolutionary history and relationship between the different classes of vertebrates through salient features some important animals. ➤ Learn comparative account of various systems in all the classes of vertebrates.	
6	Credit Value	1 Credits	Credit =30 Hours Laboratory or Field learning/Training
7	Total Marks	Max. Marks: 50	Min Passing Marks: 20
PART -B: Content of the Course			
Total No. of learning-Training/performance Periods: 30 Periods (30 Hours)			
Module	Topics (Course contents)		No. of Period
Lab./Field Training/ Experiment Contents of Course	List of labs to be conducted ➤ Study of animals through models, slides and museum specimens in the laboratory with details on their classification, biogeography and diagnostic features of different class of Vertebrate. ➤ Study of histological slides of different class of Vertebrate. ➤ Study of Axial skeleton of Amphibia, Reptilia, Aves and Mammals. Comparative study of Appendicular skeleton Girdles and limb bones) of Amphibia, Reptilia, Aves and Mammals. ➤ Comparative study of heart of Fish, Amphibia, Reptilia, Aves and Mammals with the help of models and charts. ➤ Comparative study of Aortic Arches Fish, Amphibia, Reptilia, Aves and Mammals with the help of models and charts. ➤ Comparative study of brain of Fish, Amphibia, Reptilia, Aves and Mammals with the help of models and charts. ➤ Comparative study of Urinogenital system of Fish, Amphibia, Reptilia, Aves and Mammals with the help of models and charts. ➤ Histological study of Endocrine tissue ➤ Study of Vertebrate animals in nature during a survey of a National Park/ Forest area/College campus. ➤ Group discussion/Viva or Seminar presentation on any one of above topics ➤ An “animal album or Practical Record” containing sketches, photographs, cut outs, with appropriate write up about the above mentioned taxa. ➤ Study of some videos to develop understanding on the animals of different taxa.		30
Keywords	Museum specimens, Histological slides, Alternative of Dissection, Practical Record		

Signature:

PART-C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

- S.S. Lal, Practical Zoology, Vertebrate. 12th Edition Rastogi Publications, Meerut, New Delhi.
- A manual of practical Zoology. Dr. P.S Verma, S. Chand Publication, New Delhi
- Saxena, R. K. and Saxena, S. (2015) Comparative Anatomy of Vertebrates (2nd edition).
- R.L. Kotpal, Modern Text Book of Zoology, Vertebrates, Rastogi Publication, Merut
- Tiwari, V.K. Unified Zoology, B.Sc. Part I, Shivalal Agarwal and Company, Indore

Reference Books Recommended –

- Young, J. Z. (2004). *The Life of Vertebrates*. III Edition. Oxford university press.
- Weichert, C.K. (1970) *Anatomy of Chordates* (4th edition).

Online Resources–

- <https://www.youtube.com/watch?v=W4gQxADcryw>
- <https://www.youtube.com/watch?v=Ts9GsrBviI8>

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 50 Marks

Continuous Internal Assessment (CIA): 15 Marks

End Semester Exam (ESE): 35 Marks

Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz-(2): 10 & 10	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 15 Marks
	Assignment/Seminar +Attendance - 05 Total Marks - 15	
End Semester Exam (ESE):	Laboratory / Field Skill Performance: On spot Assessment	
	A. Performed the Task based on lab. work - 20 Marks B. Spotting based on tools & technology (written) – 10 Marks C. Viva-voce (based on principle/technology) - 05 Marks	Managed by Course teacher as per lab. status

Signature:

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF ZOOLOGY
COURSE CURRICULUM

PART- A: Introduction			
Program: Bachelor in Life Science (Diploma / Degree/Honors)		Semester -IV	Session: 2024-2025
1	Course Code	ZOSE-02T	
2	Course Title	Ecology and Wildlife Conservation & Management	
3	Course Type	Discipline Specific Elective	
4	Pre-requisite (if, any)	<i>As per Program</i>	
5	Course Learning Outcomes (CLO)	After successfully completing this course, the students will be able to: ➤ Understand the concepts of fundamental ecological principles, including energy flow, nutrient cycling, and population dynamics. ➤ Apply the knowledge of ecology to understand equilibrium of nature. ➤ Analyze the strategies of Populations to survive and sustain. ➤ Evaluate the significance of biodiversity and its conservation. ➤ Create awareness about wildlife and nature.	
6	Credit Value	3 Credits	<i>Credit = 15 Hours - learning & Observation</i>
7	Total Marks	Max. Marks: 100	Min Passing Marks: 40
PART -B: Content of the Course			
Total No. of Teaching-learning Periods (01 Hr. per period) - 45 Periods (45 Hours)			
Unit	Topics (Course contents)		No. of Period
I	An overview of Ecology and Biomes: Aims and scope of Ecology. Difference between Auto-ecology and Synecology. Abiotic & Biotic factors. Ecosystem and Ecological Pyramids. Bio-geo chemical cycles. Energy flow in ecosystem: Trophic levels. Food Chain, Food Web, Food chain in fresh water ecosystem. Laws of limiting factor: Leibig's Law of Minimum, Shelford Law of tolerance. Major Biomes of the world. Biogeographic zones of India.		11
II	Population ecology: Population characteristics: Density, Measurement of Population Density (Quadrat method and tagging method) Mortality, Natality, Age Pyramids, Migration and Dispersal. Life tables. Survivorship curves. Population Growth: Types of Population Growth, Growth Curves (S shaped & J shaped), Mathematical Expression of population growth: logistic & stochastic. R and K strategies. Carrying Capacity. Population Regulation: extrinsic & intrinsic factors.		12
III	Biotic community and Environmental degradation: Biotic community characteristics and attributes: Stratification; Dominance, diversity, species richness, abundance, Evenness, Similarity. Ecotone and edge effect. Ecological succession. Species interaction: Positive interactions: commensalism, proto-cooperation and mutualism. Negative interactions: parasitism. Competition: Interspecific and Intraspecific, Lotka Volterra Model, Gause's Principle. Prey-Predator Model. Environmental degradation: Air, water and noise pollution and their control. Natural resources: Mineral, water and forest, their significance and conservation.		11
IV	Biodiversity & Wildlife management: Biodiversity: Concept and characteristics. Levels of Biodiversity (Genetic Diversity, Species Diversity & Ecosystem Diversity), Hotspots of Biodiversity. Major National Parks of Chhattisgarh and their biodiversity. Endemic animal species of Chhattisgarh. IUCN red list categories and criteria. Conservation of Biodiversity (In Situ, & Ex Situ Conservation). Major international & national treaties, laws and regulations for conserving biodiversity. Important conservation projects undertaken in India: Project Tiger & Project Elephant. Tiger Census and Estimation (Techniques and Findings). Cheetah re-introduction plan. Captive breeding and Propagation: Founder population, rehabilitation, education, utilization, gene banks. GIS and other technologies in Forest & Wild life conservation.		11

Signature:

PART-C: Learning Resources**Text Books, Reference Books and Others****Text Books Recommended –**

- Sharma, P.D. Ecology and Environment, Rastogi Publication.
- Kumar Pranav, Meena Usha. Fundamentals of Ecology and Environment.
- Mathur Reena. Wildlife Conservation and Management, Rastogi Publication.
- Singh S.K., Text book of Wildlife Management, CBC Publishers and Distributors

Reference Books Recommended –

- Chapman, J.L. & M.J. Reiss. 1998. Ecology: Principles and Applications. Cambridge Univ. press. 2nd edition.
- Odum, E. P. (2004). Fundamentals of Ecology, Oxford and IBH Publishing Co. Pvt. Ltd.
- Smith, TM and Smith RL 2015. Elements of Ecology, Pearson Education, India.

Online Resources–

- https://epgp.inflibnet.ac.in/epgpdata/uploads/epgp_content/S000035ZO/P000891/M020617/ET/1498712980Ecosystemprocesses-IPart-1Quad1.pdf
- https://epgp.inflibnet.ac.in/epgpdata/uploads/epgp_content/S000035ZO/P000891/M020612/ET/1498710746CommunitycharacteristicsstratificationPart4Quad1.pdf
- http://ndi.iitkgp.ac.in/he_document/swayam_prabha/cao2zsydjqu

Online Resources–

- <https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1788373>
- https://epgp.inflibnet.ac.in/epgpdata/uploads/epgp_content/S000032SW/P001702/M020403/ET/14969150701-

PART -D: Assessment and Evaluation**Suggested Continuous Evaluation Methods:****Maximum Marks:** 100 Marks**Continuous Internal Assessment (CIA):** 30 Marks**End Semester Exam (ESE):** 70 Marks

Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz-(2): 20 +20	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 30 Marks
	Assignment / Seminar - 10	
	Total Marks - 30	
End Semester Exam (ESE):	Two section – A & B Section A: Q1. Objective – 10 x1= 10 Mark; Q2. Short answer type- 5x4 =20 Marks Section B: Descriptive answer type qts., 1out of 2 from each unit-4x10=40 Marks	

Signature:

FOUR YEAR UNDERGRADUATE PROGRAM(2024 – 28)
DEPARTMENT OF ZOOLOGY
COURSE CURRICULUM

PART-A: Introduction			
Program: Bachelor in Life Science(Diploma / Degree/ Honors)		Semester -IV	Session: 2024-2025
1	CourseCode	ZOSE-02P	
2	CourseTitle	Ecology and Wildlife Conservation & Management	
3	CourseType	Discipline Specific Elective Lab Course	
4	Pre-requisite(if, any)	As per Program	
5	Course Learning Outcomes(CLO)	After successfully completing this course, the students will be able to: ➤ Understand practical fieldwork skills, including sampling techniques, data collection and methods of analysis used in ecological research. ➤ Learn to design and implement ecological experiments. ➤ Understand soil profile and characteristics. ➤ Analyse chemical parameters of various water bodies. ➤ Create awareness about local fauna and evaluate biodiversity of an area.	
6	CreditValue	1 Credits	Credit =30 Hours Laboratory or Field learning/Training
7	TotalMarks	Max.Marks:50	Min Passing Marks:20
PART -B: Content of the Course			
TotalNo.of learning-Training/performancePeriods:30 Periods (30 Hours)			
Module	Topics(Course contents)		No. of Period
Lab./Field Training/ Experiment Contents of Course	• Study of biodegradable and non-biodegradable pollutants in the locality. • Study of a representative type of ecosystem. • Determination of pH of water samples from various water bodies. • To determine the transparency of water of Pond ecosystem by Secchi disc. • To study the profile of soil in the field/ Soil sampling by V- cut method. • To study the zooplankton communities in a fresh water ecosystem. • To prepare a checklist of birds/Insects in and around college campus. • Estimation of ecological density, diversity and frequency of college premises by quadrat method. • Estimation of Shannon – Weiner index of a given area. • Estimation of Simpson– biodiversity index of a given area. • Study of strategy for preventing and managing human-wildlife conflicts. • Project Work / Quiz / Poster / Model preparation/Viva. • Practical Record		30
Keywords	Density, Diversity, Frequency, Biodegradable, Non- biodegradable, Pollutants, Secchi disc,		

Signature:

PART-C: Learning Resources		
Text Books, Reference Books and Others		
Text Books Recommended –		
➤ Yadav Vikas, Yadav Parul; 2022 Modern Practical Zoology; Kedar Nath Ram Nath. ➤ Verma P.S. A Manual of Practical Zoology Chordates, S.Chand. ➤ Lal S.S. Practical Zoology Vertebrate; Rastogi Publications. ➤ Jayasurya, Arumugam N.: Practical Zoology: Saras Publication.		
Reference Books Recommended –		
➤ Odum, E.P. 1971 Fundamentals of Ecology; W.B. Saunders ➤ Beard, J.M. 2013 Environmental Chemistry in Society (2nd Edition). CRC Press.		
Online Resources–		
➤ https://www.statology.org/simpsons-diversity-index/ ➤ https://www.statology.org/shannon-diversity-index/		
Online Resources–		
➤ https://epgp.inflibnet.ac.in/epgpdata/uploads/epgp_content/S000014ER/P000280/M026066/ET/1520505951paper10_Module27_etext.pdf		
PART-D: Assessment and Evaluation		
Suggested Continuous Evaluation Methods:		
Maximum Marks: 50 Marks		
Continuous Internal Assessment (CIA): 15 Marks		
End Semester Exam (ESE): 35 Marks		
Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz-(2): 10 & 10 Assignment/Seminar + Attendance- 05 Total Marks -15	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 15 Marks
End Semester Exam (ESE):	Laboratory / Field Skill Performance: On spot Assessment A. Performed the Task based on lab. work - 20 Marks B. Spotting based on tools & technology (written) – 10 Marks C. Viva-voce (based on principle/technology) - 05 Marks	Managed by Course teacher as per lab. status

Signature:

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF ZOOLOGY
COURSE CURRICULUM

PART-A: Introduction			
Program: Bachelor (Certificate / Diploma / Degree)		Semester – I/III/V	Session: 2024-2025
1	Course Code	ZOVAC-01	
2	Course Title	Public Health and Hygiene	
3	Course Type	Value Added Course	
4	Pre-requisite(if, any)	As per Program	
5	Course Learning Outcomes(CLO)	➤ Understand the importance of hygiene. ➤ Identify current national and global public health problems. ➤ Aware about the issues of food safety, water safety, vaccination, and obesity. ➤ Create general medical awareness in daily life. ➤ Analyze the measures to live a healthy life.	
6	Credit Value	2 Credits	Credit = 15 Hours -learning & Observation
7	Total Marks	Max.Marks:50	Min Passing Marks:20
PART -B: Content of the Course			
Total No. of Teaching-learning Periods (01 Hr. per period) - 30 Periods (30 Hours)			
Unit	Topics (Course Contents)		No. of Period
I	Maintenance of personal hygiene: Introduction to public health and hygiene: determinants and factors. Pollution and health hazards: Water and air borne diseases. Radiation hazards: Network Towers and electronic gadgets (recommended levels, effects and precaution). Personal hygiene: Oral hygiene, Menstrual Hygiene, Ideal hand washing methods, Ideal food keeping methods.		07
II	Nutrition and Health: Classification of food into micro and macro nutrients. Balanced diet. Importance of dietary fibres. Significance of breast feeding. Malnutrition anomalies: Anaemia (Iron and B12 deficiency), Kwashiorkor, Marasmus, Rickets, Goiter (cause, symptoms, precaution and cure).		07
III	Communicable/Contagious and Non-Communicable Diseases: Communicable viral diseases: measles, chicken pox, swine flu (their causal agents, symptoms and prevention). Communicable bacterial diseases: tuberculosis, typhoid, cholera (their causal agents, symptoms and prevention). Sexually transmitted diseases: AIDS, Syphilis (their causal agents, symptoms and prevention). Non-communicable diseases: hypertension, arthritis, Diabetes, peptic ulcer, obesity, depression and anxiety (their causal agents, symptoms and prevention).		09
IV	Public Health Management & General Medical Awareness: Vaccination, Benefits of institutional deliveries, Deworming drive: Use of Albendazole. First Aid: Electrocution, Road Accident, Burn, Lightning Strike, Envenomation. Importance of Cardiopulmonary resuscitation (CPR). Blood Donation: Eligibility, Health Screening. Road Safety: Good Samaritan, General safety precautions on Road and Motion Sickness. Fire Safety: Fire Control and Fire Extinguisher Categories.		07
Keywords	Health, Hygiene, Nutrition, Disorders, Vaccination, Safety, Fire, Blood, Medication.		

PART-C: Learning Resources		
Text Books, Reference Books and Others		
Text Books Recommended –		
➤ Mary Jane Schneider (2011) Introduction to Public Health. ➤ Muthu, V.K. (2014) A Short Book of Public Health.		
Reference Books Recommended		
➤ Detels, R. (2017) Oxford Textbook of Public Health (6th edition). ➤ Gibney, M.J. (2013) Public Health Nutrition. ➤ Wong, K.V. (2017) Nutrition, Health and Disease.		
Online Resources–		
➤ https://www.fda.gov/drugs/investigational-new-drug-ind-application/general-drug-categories ➤ https://www.nfpa.org/news-blogs-and-articles/blogs/2023/08/01/fire-extinguisher-types ➤ https://www.redcross.org/take-a-class/cpr/performing-cpr/what-is-cpr#:~:text=What%20is%20the%20Purpose%20of,healthcare%20workers%20and%20emergency%20responders. ➤ https://unesdoc.unesco.org/ark:/48223/pf0000226792		
Online Resources–		
➤ https://epgp.inflibnet.ac.in/epgpdata/uploads/epgp_content/S001827/P001833/M029447/ET/15245666876.21Q1.pdf ➤ https://www.nhm.gov.in/images/pdf/programmes/mhs/Training_Materials/PDF_English/reading_material.pdf		
PART-D: Assessment and Evaluation		
Suggested Continuous Evaluation Methods:		
Maximum Marks: 50 Marks		
Continuous Internal Assessment (CIA): 15 Marks		
End Semester Exam (ESE): 35 Marks		
Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz-(2): 10 & 10 Assignment/Seminar + Attendance- 05 Total Marks -15	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 15 Marks
End Semester Exam (ESE):	Two section – A & B Section A: Q1. Objective – 05 x 1 = 05 Mark; Q2. Short answer type- 5 x 2 = 10 Marks Section B: Descriptive answer type qts., 1 out of 2 from each unit- 4 x 05 = 20 Marks	

Signature:

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF ZOOLOGY
COURSE CURRICULUM

PART-A: Introduction			
Program: Bachelor in Life Science (Certificate / Diploma / Degree)		Semester – II/IV/V/VI	Session: 2024-2025
1	Course Code	ZOSEC-01	
2	Course Title	Vermiculture and Vermicomposting	
3	Course Type	Skill Enhancement Course	
4	Pre-requisite (if, any)	As per Program	
5	Course Learning Outcomes (CLO)	After successfully completing this course, the students will be able to: ➤ Learn the identifiable features of earthworm species for vermiculture and vermicomposting. ➤ Cultivate the skills of vermiculture. ➤ Understand the challenges in vermiculture and vermicomposting. ➤ Analyze the features of different vermicomposting methods. ➤ Create entrepreneurial prospects in this field.	
6	Credit Value	2 Credits (1C + 1C)	Credit = 15 Hours –Theoretical learning and = 30 Hours Laboratory or Field learning/Training
7	Total Marks	Max.Marks:50	Min Passing Marks:20
PART -B: Content of the Course			
Total No. of Teaching-learning Periods: Theory–15 Periods (15 Hrs) and Lab. or Field learning/Training 30 Periods (30 Hours)			
Module	Topics (Course contents)		No. of Period
Theory Contents	General Introduction: Distribution and habit, habitat. Food: Phytophagous and Geophagous earthworm. Morphology of earthworm. Ecological categories: Epigeic, Endogeic and Anecic earthworms. Ecological requirements: moisture, temperature, light, pH and, organic matter. Ecosystem services: role played by earthworms in soil ecosystem. Difference between vermiculture and vermicomposting. Role of earthworm and vermicompost in growth of plants. Vermiculture: Definition and features. Selective features of earthworms for vermiculture. Vermiculture methods: Wormery, breeding techniques: indoor and outdoor cultures, monoculture and polyculture, merits and demerits. Obstacles in Vermiculture: Prevention and Management. Vermicomposting: Definition and features. Scientific names and distinguishing features of native and exotic vermicomposting earthworms (Native Indian earthworms. <i>Perionyx excavatus</i>, <i>Perionyx ceylanensis</i>, European earthworms. <i>Eisenia fetida</i>, <i>Eisenia andrei</i>, South African earthworms. <i>Eudriluseugeniae</i>), Principle of vermicomposting, Methods of vermicomposting: Low-cost Floor beds, Grow bags & Tank system. Management during vermicomposting (Physical and Biological). Products of vermicomposting, physiochemical features and their utility: earthworm biomass (vermiprotein), vermicompost and vermish. Harvesting the vermicompost & storage. Marketing prospects of Vermicomposting in Chhattisgarh and India.		15
Lab./Field Training Contents	➤ Key to identify different types of earthworms. ➤ Identification of materials/waste products for vermiculture and vermicomposting. ➤ Study of systematic position, habits, and habitat & External characters of <i>Eisenia fetida</i>. ➤ Study of Life stages & development of <i>Eisenia fetida</i>. ➤ Culture of earthworms in Grow Bags. ➤ Study of devices and instruments of Vermiculture and Vermicomposting. ➤ Preparation of vermibed, maintenance of vermicompost & management of climatic conditions. ➤ Study the effects of vermicompost & vermish on any two short duration plants. ➤ Study of different methods of vermicomposting (NADEP Composting, Bangalore Method, Coimbatore Method & Indore Method). ➤ Creation of set up for vermish collection. ➤ Field Visit to Vermiculture & Vermicomposting sites and interaction with self help groups/ personnel engaged in these activities. ➤ Projects/ Assignments/ Chart/ Model preparation. ➤ Practical Record		30
Keywords	Earthworm, Vermiculture, Vermicomposting, Vermish, Grow Bags, NADEP.		

PART-C: Learning Resources		
Text Books, Reference Books and Others		
Text Books Recommended –		
➤ Chauhan, A. (2012) Vermitechnology, Vermiculture, Vermicompost and Earthworms: Vermiculture, Vermicomposting, Vermitechnology and Microbes, Lambert Academic Publishing, Germany. ➤ National Institute of Industrial Research, (2010): The Complete Technology Book on Vermiculture and Vermicompost, Published by National Institute of Industrial Research, Delhi-7, India. ➤ Kumar, A. (2005) Verms and Vermitechnology, APH Publishing. ➤ Bhatnagar & Patla, 2007. Earthworm vermiculture and vermin-composting, Kalyani Publishers, New Delhi. ➤ Sultan Ahmed Ismail, 2005. The Earthworm Book, Second Revised Edition. Other India Press, Goa, India. ➤ Panda Himadri: The Complete Technology Book on Vermiculture and Vermicompost (Earthworm) with Manufacturing Process, Machinery Equipment Details & Plant Layout; Asia Pacific Business Press Inc. ➤ EIRI Board : Hand Book Of Biofertilizers & Vermiculture.		
Online Resources–		
➤ https://agritech.tnau.ac.in/org_farm/orgfarm_composting.html#:~:text=In%20the%20Bangalore%20method%20of,laid%20over%20the%20moistened%20layer. ➤ https://www.thepharmajournal.com/archives/2021/vol10issue12/PartAR/11-5-248-926.pdf		
Online Resources–		
➤ https://megbrdc.nic.in/publications/fliers-Pamphlets/nadep-composting-english.pdf		
PART-D: Assessment and Evaluation		
Suggested Continuous Evaluation Methods:		
Maximum Marks: 50 Marks		
Continuous Internal Assessment (CIA): 15 Marks		
End Semester Exam (ESE): 35 Marks		
Continuous Internal Assessment (CIA) By Course Coordinator)	Internal Test / Quiz-(2): 10 & 10 Assignment/Seminar + Attendance- 05 Total Marks - 15	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 15 Marks
End Semester Exam (ESE):	Laboratory / Field Skill Performance: On spot Assessment A. Performed the Task based on learned skill - 20 Marks B. Spotting based on tools (written) – 10 Marks C. Viva-voce (based on principle/technology) - 05 Marks	Managed by Coordinator as per skilling

Signature: