

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

DEPARTMENT OF ZOOLOGY

**B.Sc. Zoology FYUGP/LOCF
(Bachelor in Science)
II, IV & VI Semester
(2026 – 2027)**

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

**As Per provisions of NEP 2020 to be implemented from academic year 2024-
2028**

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

Dr. Shubhada
Rahalkar
10.06.2024

Shobha Ram
Yedate

Dr. Anurag
Mishra

Dr. Ajit Kumar

Dr. Rajesh Kumar

Dr. Lalitha Meshram

GOVT. DIGVIJAY AUTONOMOUS P.G.COLLEGE, RAJNANDGAON (C.G.)**Department of Zoology****Syllabus of FYUGP/LOCF Curriculum****B.Sc. Zoology I – VI Semester Session: 2026-27****(B.Sc. Honours with Research Course)**

Sem	Course	Course Name	Credit	Lecture	Internal Marks	ESE Max Marks	M.M.
II	DSC -II	Cell Biology and Histology	3	45	30	70	100
		Lab Course	1	15	-	-	50
	GE- II	Cell Biology and Histology	3	45	30	70	100
		Lab Course	1	15	-	-	50
	SEC-I	Vermiculture& Vermicomposting	2	30	15	35	50
Total			10	150	75	175	350
IV	DSC -IV	Diversity of Chordates & Comparative Anatomy	3	45	30	70	100
		Lab Course	1	15	-	-	50
	DSE - II	Ecology and Wildlife Conservation and Management	3	45	30	70	100
		Lab Course	1	15	-	-	50
	SEC-I	Vermiculture& Vermicomposting	2	30	15	35	50
Total			08	150	75	175	350
VI	DSC -VI	Genetics	3	45	30	70	100
		Lab Course	1	15	-	-	50
	DSE IV	Evolutionary Biology	3	45	30	70	100
		Lab Course	1	15	-	-	50
	SEC-I	Vermiculture & Vermicomposting	2	30	15	35	50
Total			10	150	75	175	350

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)	As per Program	
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	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	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.		
Name and Signature of Convener & Members of CBoS:			

SR Raghavan

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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/Qkh4R2FGUkRNZjFicFUvWmpzQ2loY0poaUVtYlByc1BZNXk3TnZMWVFzQXpZNjhhQUplR1BTOERHelZXZUp5Nw>
2. <http://ndl.iitkgp.ac.in/document/Qkh4R2FGUkRNZjFicFUvWmpzQ2loZFJyVGFmaDFwbXpBS0kwNi9tb91UGYxaFl6OC9Sb25QWUIXLzF1V3NUZw>
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:

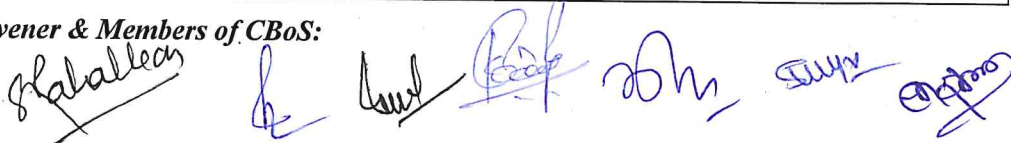
Maximum Marks: 100 Marks

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 Assignment / Seminar - 10 Total Marks - 30	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 30 Marks
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	

Name and Signature of Convener & Members of CBoS:



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.		
Signature of Convener & Members (CBoS) :			

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 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

Name and Signature of Convener & Members of BoS :

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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	ZOG - 02T		
2	Course Title	Cell Biology and Histology		
3	Course Type	General Elective		
4	Pre-requisite (if, any)	As per Program		
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	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	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.			
Name and Signature of Convener & Members of CBoS:				

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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 excovatus</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 vermiwash. 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 & vermiwash 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 vermiwash 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, Vermiwash, Grow Bags, NADEP.		
Signature of Convener & Members (CBoS):			

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

Name and Signature of Convener & Members of CBoS:

Dr. Subhash Chandra Rahalkar

Dr. Naseem Ahmed
Mansuri

Dr. Ajit Kumar

Shobha Ram Yadav

Dr. Lata Meshram

Dr. R.K. Tamboli

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 of Convener & Members (CBoS) :			

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:

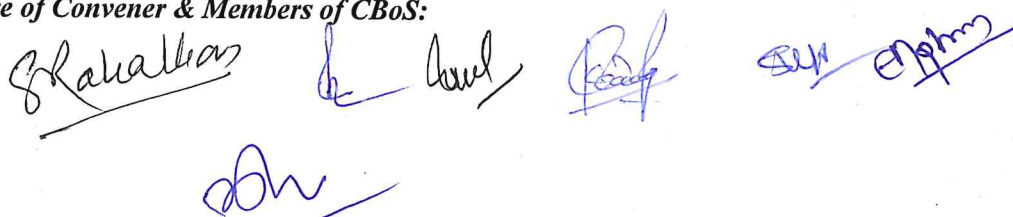
Maximum Marks: 100 Marks

Continuous Internal Assessment (CIA): 30 Marks

End Semester Exam (ESE): 70 Marks

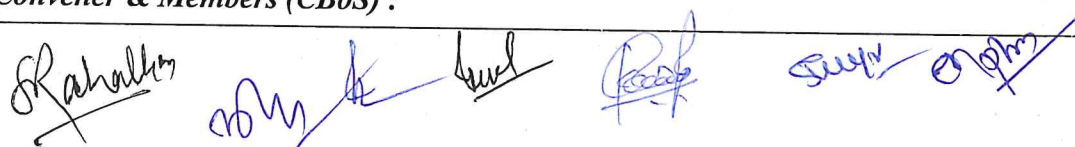
Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz-(2): 20 +20	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 30 Marks
	Assignment / Seminar - 10	
	Total Marks - 30	
End Semester Exam (ESE):	Two section – A & B	
	Section 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	

Name and Signature of Convener & Members of CBoS:



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 of Convener & Members (CBoS) :			



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

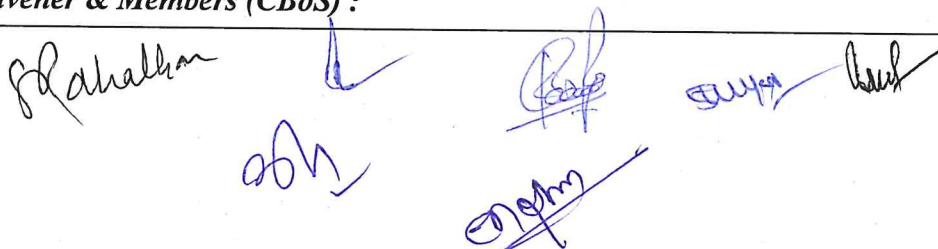
Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz-(2): 10 & 10	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 15 Marks
	Assignment/Seminar +Attendance - 05 Total Marks -	

Name and Signature of Convener & Members of CBoS:



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)	As per Program	
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	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	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
Keywords Ecology, Biome, Abiotic, Biotic factors, Nutrient Cycle, Population, Wildlife conservation, In Situ & Ex Situ			
Signature of Convener & Members (CBoS) :			



Signature of Convener & Members (CBoS) :

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://ndl.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
Assignment / Seminar - 10
Total Marks - 30

Better marks out of the two Test / Quiz
+ obtained marks in Assignment shall be
considered against 30 Marks

End Semester Exam (ESE):

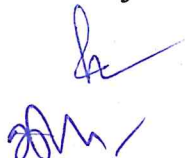
Two section – A & B

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

Name and Signature of Convener & Members of CBoS:





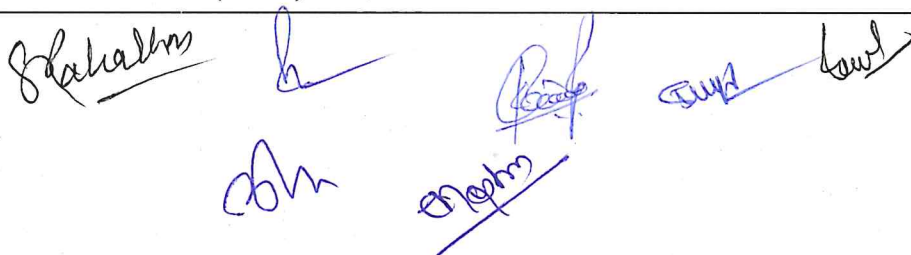






FOUR YEAR UNDERGRADUATE PROGRAM(2024 – 28)
DEPARTMENT OF ZOOLOGY
COURSE CURRICULUM

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 faunaand 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 oftheCourse			
TotalNo.of learning-Training/performancePeriods:30 Periods (30 Hours)			
Module	Topics(Coursecontents)		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 quadrate 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, Sechhi disc,		
SignatureofConvener&Members (CBoS):			



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:

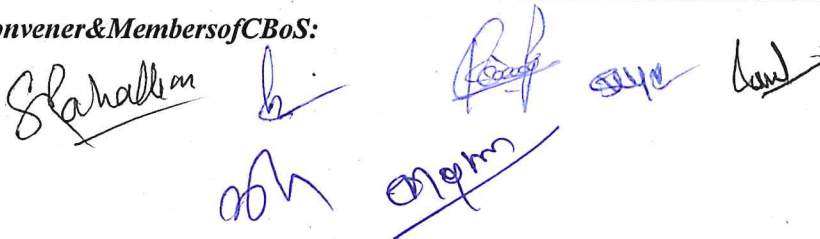
Maximum Marks: 50 Marks

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

Name and Signature of Convener & Members of CBoS:



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 excovatus</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 vermiwash. 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 & vermiwash 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 vermiwash 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, Vermiwash, Grow Bags, NADEP.		
Signature of Convener & Members (CBoS):			

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

Name and Signature of Convener & Members of CBoS:

Dr. Subhash Chandra Rahalkar

(Dr. Nazim Ahmed Masani)

Dr. Ajit Kumar

Shobha Ram Yadav

(Dr. Lata Meshram)

Dr. R.K. Tamboli

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

PART- A: Introduction				
Program: Bachelor in Life Science (Degree / Honors)		Semester - VI		Session: 2024-2025
1	Course Code	ZOSC-06T		
2	Course Title	Genetics		
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: ➤ Understand and grasp the principles of Mendelian inheritance and interaction of genes. ➤ Understand the sources and consequences of genetic variation, including mutations, genetic recombination, and gene flow. ➤ Know various methods of sex determination in animal kingdom. ➤ Analyse the cause and effect of alterations in chromosome number and structure ➤ Understand DNA structure and function, gene expression, and genetic inheritance patterns ➤ Know the Recent Assisted Reproductive Techniques		
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	Concept of Genes and Genomics: Scope and importance. Elements of heredity and variation: Classical and Modern concept of Gene (Cistron, Muton, Recon), Alleles. Mendel's laws of inheritance, Chromosomal basis of inheritance and its applications. Exceptions to Mendelian Inheritance: Incomplete dominance, Codominance, Multiple allelism. Interaction of Gene- Lethal alleles, Pleiotropy, Epistasis- Dominant and Recessive, Supplementary, Complementary, Inhibitory gene and polygene. Define Penetrance, Expressivity and Phenocopy.			12
II	The recombination and interaction of Genes: Linkage and crossing over, cytological basis of crossing over. Organelle inheritance (Mitochondrial), Sex Chromosomes and sexlinked Gene X-linked dominant and X-linked recessive. Sex determination: Theories of sex determination: Chromosomal Theory (XX/XO, XX/XY, ZZ/ZW, ZZ/ZO), Genetic balance theory, intersex, Haplodiploidy, Gynandromorphs. Hormonal influence on sex determination- Freemartin and sex reversal. Role of environmental factors- Bonellia and Crocodile. Eugenics. Mutation, Chromosomal and Gene Mutation, Structural and numerical alterations of chromosomes.			11
III	Regulation of Gene expression, regulation and mapping: Gene Expressions and regulation: One gene-one enzyme hypothesis /one polypeptide hypothesis. Concept of operon of bacteria (Lac Operon) and bacteriophages. Bacterial transposons. Vertical and horizontal gene transfer. Transformation, transfection and transduction. Genetic mapping. RNA-inheritance, FLP-FRT. Utility of the model organisms: Escherichia coli, Drosophila melanogaster & Mus musculus			11
IV	Population Genetics and Genetic Counselling: Human Genetics: Pedigree analysis; Karyotype, Genetic disorders: chromosomal aneuploidy (Down, Edward, Patau, Turner and Klinefelter syndromes), chromosome translocation (Chronic Myeloid Leukemia) and deletion ("cry of cat" syndrome). Single Gene Disorder: gene mutation (sickle cell anemia,) and Genetic counselling, Gene isolation Manipulation and techniques. Basic concept of Polymerase Chain Reaction. DNA Sequencing; Southern, Western & Northern Blots. In situ Hybridization, FISH, RFLPs and Oligonucleotide arrays. Gene Cloning vs Animal Cloning, Nuclear transplantation,			11
Keywords	Genetics, Mendel's law, Interaction of Gene, Sex Linkage, Sex Determination, Operon, Genetic Screening, Pedigree Analysis, Aneuploidy			
Signature of Convener & Members (CBoS) :				

PART-C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

- Arora M.P. and Sandhu G.S. Genetics, Himalayan Publishing House
- Winter P.C. Et al, Genetics Viva Publication
- Gupta P.K., Cell and Molecular Biology Rastogi Publication

Reference Books Recommended –

- Gardner, E.J. *et al.* (2006) Principles of Genetics (John Wiley).
- Russell, P.J. (2010) Genetics (Benjamin Cummings).
- Gardner, E.J., Simmons, M.J., Snustad, D.P. (2008). Principles of Genetics. (VIII edition) Wiley India.
- Snustad, D.P. and Simmons, M.J. (2009). Principles of Genetics. (V edition) John Wiley and Sons Inc.
- Klug, W.S., Cummings, M.R. and Spencer, C.A. (2012). Concepts of Genetics. (X edition) Benjamin Cummings.
- Carroll S.B.; Doebley J.; Griffiths, A.J.F. and Wessler, S.R. (2018) An Introduction to Genetic Analysis. W. H. Freeman and Co. Ltd.
- Campbell, N. and Reece, J. (2014) Biology (10th edition). Benjamin Cummings

Online Resources–

- National digital Library.
- <http://ndl.iitkgp.ac.in/document/Rm5qb3lqRngwWDZ2Tnl6UXl4VU9YR201R0cwYXJHV25HSHFacGxtSlh3REZGd1ByL28xcmlleEFFZU5najlCZl1HdXBBTzBlTBVVRGIDSFhkMETuUkE9PQ>
- E-PG Pathshala.
- <https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=2rAslPuvga4LW93zMe83aA>
- eGyankosh- Genetics and Evolutionary Biology
- eGyanKosh: BZYCT-137 Genetics and Evolutionary Biology

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 100 Marks

Continuous Internal Assessment (CIA): 30 Marks

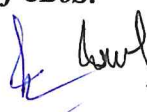
End Semester Exam (ESE): 70 Marks

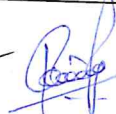
Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz-(2): 20 +20	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 30 Marks
	Assignment / Seminar - 10 Total Marks - 30	
End Semester Exam (ESE):	Two section – A & B Section A: Q1. 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	

Name and Signature of Convener & Members of CBoS:





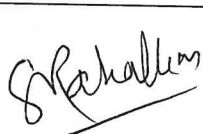




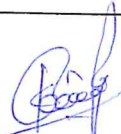


FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF ZOOLOGY
COURSE CURRICULUM

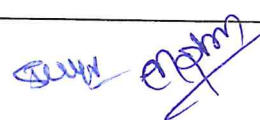
PART- A: Introduction			
Program: Bachelor in Life Science (Degree / Honors)		Semester - VI	Session: 2024-2025
1	Course Code	ZOSC- 06P	
2	Course Title	Genetics	
3	Course Type	Discipline Specific Lab Course	
4	Pre-requisite (if, any)	<i>As per Program</i>	
5	Course Learning Outcomes (CLO)	After successfully completing this course, the students will be able to- ➤ Able to understand and explain Mendel's Law of Inheritance ➤ Capable to analyze inheritance of gene by pedigree analysis. ➤ Know laboratory culture of <i>Drosophila</i>. ➤ Understand and configuration for animal life. ➤ Capable to understand Human karyotype and Numerical alteration in chromosomes	
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	➤ Application of probability in the law of segregation with coin tossing. ➤ Study of mode of inheritance of the following traits by pedigree charts – attached ear lobe, widow's peak. ➤ Familiarization with techniques of handling <i>Drosophila</i>, identifying males and females; observing wild type and mutant (white eye, wing less) flies, and setting up cultures. ➤ Study of human karyotypes and numerical alterations (Down syndrome, Klinefelter syndrome and Turner syndrome). ➤ Demonstration of law of segregation (monohybrid and test cross) sex-linked inheritance in <i>Drosophila</i> making a cross between white eye dumpy winged or sepia eyed and wild type flies (criss-cross inheritance) Explain with Model ➤ Study of structural chromosome aberrations (dicentric, ring chromosomes and inversions in polytene chromosomes) from prepared slides/photograph ➤ Extraction of Genomic DNA from bacteria. ➤ Group discussion/ Seminar/ Quiz presentation on one or two related topics		30
Keywords	<i>Mendel's Law, Human Karyotype, Drosophila Culture, Pedigree</i>		
Signature of Convener & Members (CBoS) :			











PART-C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

- Practical Hand Book of Genetics: Vikas Pali Kalyani Publication
- Essential Practical Handbook of Cell Biology & Genetics, Biometry & Microbiology, A Laboratory Manual Debarati Das, Academic Publishers.
- Cytogenetics: Mohan P Arora, Himalayan Publishing House

Reference Books Recommended –

- Klug, W.S., Cummings, M.R. and Spencer, C.A. (2012). Concepts of Genetics. (X edition) Benjamin Cummings.
- Carroll S.B.; Doebley J.; Griffiths, A.J.F. and Wessler, S.R. (2018) An Introduction to Genetic Analysis. W. H. Freeman and Co. Ltd.

Online Resources–

- <https://jru.edu.in/studentcorner/lab-manual/agriculture/Fundamentals%20of%20Genetics.pdf>

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

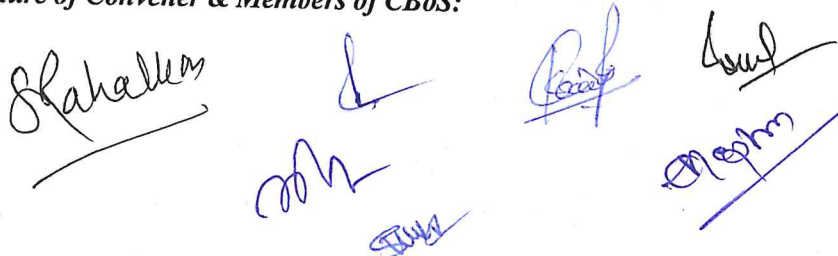
Maximum Marks: 50 Marks

Continuous Internal Assessment (CIA): 15 Marks

End Semester Exam (ESE): 35 Marks

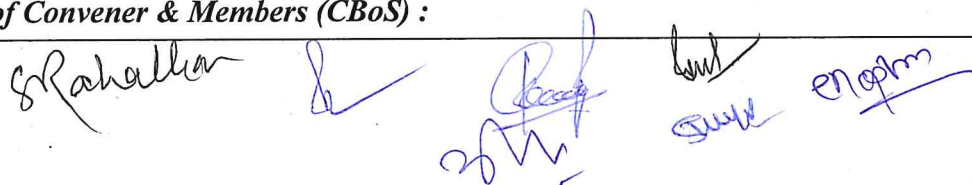
Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz-(2): 10 & 10	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 15 Marks
	Assignment/Seminar +Attendance - 05 Total Marks - 15	
End Semester Exam (ESE):	Laboratory / Field Skill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

Name and Signature of Convener & Members of CBoS:



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

PART- A: Introduction			
Program: Bachelor in Life Science (Degree/Honors)		Semester - VI	Session: 2024-2025
1	Course Code	ZOSE-04T	
2	Course Title	Evolutionary Biology	
3	Course Type	Discipline Specific Elective	
4	Pre-requisite (if, any)	As per Program	
5	Course Learning Outcomes (CLO)	After successfully completing this course the students will be able to- ➤ Understanding the historical concept of Evolution. ➤ Develop an understanding on the Evolutionary Concept and theories in evolution. ➤ Understanding on the different interacting evolutionary process by various examples. ➤ Learn animal phylogeny and adaptations. ➤ Develop an interest in the debates and discussion taking place in the field of evolutionary biology.	
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	Historical review of evolutionary concept: Evidences in favor of Evolution: Evidences from morphology and comparative anatomy (Homology, Analogy and Vestigial organs), Evidences from Paleontology, Connecting Links, Embryology, Taxonomy, Cytology, Biochemistry & physiology and from Genetics. Theories of Evolution: Lamarckism, Neo-Lamarckism and Darwinism (Basic Postulates of Darwinism, Supplementary theories of Darwin, Support & Criticism of Darwinism) Modern Synthetic theory of Evolution: Gene and Chromosomal Mutation.		12
II	Evolutionary forces: Natural Selection, Genetic variation, Genetic drift (mechanism, founder's effect, bottleneck phenomenon), Gene Migration. Hardy-Weinberg Law, Molecular clock (example of globin gene family) rRNA/cyt c). Isolation: Pattern & mechanism of isolation.		11
III	Products of evolution: speciation mechanisms: Quantitative traits, Species Concept: Morphological, Biological, Genetical and phylogenetic species concept. Species Categories: Geographical races, Demes, Clines, Ecological races, Semi species, Speciation: Phyletic speciation, Gradual speciation: Allopatric, sympatric, peripatric, parapatric, Alloparapatric. Theories of speciation: Classical theory of Gradualism, Founder flush speciation theory. Mimicry: Protective, Aggressive, Batesian & Mullerian mimicry and significance of mimicry, Aposematic coloration, Thanatosis, Extinctions: massextinctions (causes and effects), detailed example of K-T extinction.		11
IV	Basic patterns of Evolution: Micro & Macro Evolution. Phylogenetic Tree: Its construction and Interpretation. Fossils and fossilization, dating and significance of fossil. Geological Time Scale, Evolution of Man and Evolution of Horse.		11
Keywords	Homology, Analogy, Natural Selection, Genetic variation, Genetic drift, Speciation, Mimicry.		
Signature of Convener & Members (CBoS) :			



PART-C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

- Rastogi, Veerbala, Organic Evolution (2018). Third Revised Edition. MEDTECH.
- Singh, S.P., Tomar, B.S., Evolutionary Biology, Rastogi Publication
- Verma P.S., Agrawal V.K., Cell Biology, Genetics, Evolution & Ecology, S.Chand Publication

Reference Books Recommended –

- Ridley, M. (2004). *Evolution*. III Edition. Blackwell Publishing
- Barton, N. H., Briggs, D. E. G., Eisen, J. A., Goldstein, D. B. and Patel, N. H. (2007). *Evolution*. Cold Spring, Harbour Laboratory Press.
- Hall, B. K. and Hallgrimsson, B. (2008). *Evolution*. IV Edition. Jones and Bartlett Publishers.
- Douglas, J. Futuyma (1997). *Evolutionary Biology*. Sinauer Associates.
- Campbell, N.A. and Reece J.B (2011) Biology (9th edition) Pearson, Benjamin, Cummings
- De Robertis, E.D.P. and De Robertis, E.M.F. (2006) Cell and Molecular Biology (8th edition) Lippincott Williams and Wilkins, Philadelphia.

Online Resources–

- Egyankosh-
- <https://egyankosh.ac.in/bitstream/123456789/16425/1/Unit-10.pdf>
- National Digital Library
- http://ndl.iitkgp.ac.in/he_document/libretexts/libretexts/2f661e95fc3f32dd7204f7188addec22?e=17|EVOLUTION|||
- http://ndl.iitkgp.ac.in/he_document/swayamprabha/swayam_prabha/1o8mxiahue8?e=1*|||

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 Assignment / Seminar - 10 Total Marks - 30	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 30 Marks
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., 1 out of 2 from each unit-4x10=40 Marks	

Name and Signature of Convener & Members of CBoS:

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

PART- A: Introduction			
Program: Bachelor in Life Science (Degree/Honors)		Semester - VI	Session: 2024-2025
1	Course Code	ZOSE-04P	
2	Course Title	Evolutionary Biology	
3	Course Type	Discipline Specific Elective 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- ➤ Understanding on the process evolutionary biology by the study of some animals. ➤ Learn the different interacting evolutionary process by various examples. ➤ Understand evolution through fossils Acquire an in-depth knowledge on the diversity and relationships in animal world through evolutionary process.	
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 homology (forelimbs, heart, brain in vertebrates) through models and charts. - Study of Analogy (wings of insect, birds and bat) through models and charts. - Study of Serial homology in appendages of <i>Palaemon</i>. - Study of Virus, Euglena, Peripatus, Balanoglossus, Chimaera, Lung fish, Archeopteryx, and Echidna on the basis of Evolution (connecting link). - Study of adaptive radiations in vertebrates and mouth parts of insects. - Exercise based on Hardy-Weinberg Law. - Demonstration of role of natural selection and genetic drift in changing allele frequencies using simulation studies. - Construction of phylogenetic trees and its interpretation. - Phylogenetic tree of Man and Horse - Study of fossils from models/pictures - Preparation of Practical Record - Group Discussion/Quiz/Seminar/Project on related topics.		
Keywords	Evolution, Homology, Analogy, Phylogenetic tree, Adaptive radiation		
Signature of Convener & Members (CBoS) :			

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PART-C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

- Rastogi, Veerbala, Organic Evolution (2018). Third Revised Edition. MEDTECH.
- 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 –

- Ridley, M. (2004). Evolution. III Edition. Blackwell Publishing
- Barton, N. H., Briggs, D. E. G., Eisen, J. A., Goldstein, D. B. and Patel, N. H. (2007).
- Evolution. Cold Spring, Harbour Laboratory Press.

Online Resources–

National Digital Library

- http://ndl.iitkgp.ac.in/he_document/libretexts/3d7e9973648c332bee5336b05c6cf84f

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

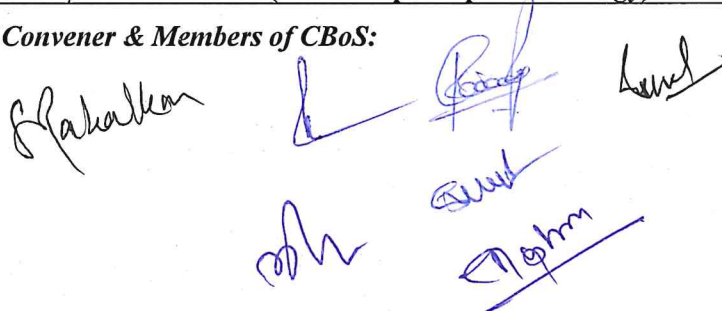
Maximum Marks: 50 Marks

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

Name and Signature of Convener & Members of CBoS:



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 excovatus</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 vermiwash. 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 & vermiwash 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 vermiwash 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, Vermiwash, Grow Bags, NADEP.		
Signature of Convener & Members (CBoS):			

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

Name and Signature of Convener & Members of CBoS:

Dr. Subhash Chandra Rahalkar

Dr. Naseem Ahmed
Mansuri

Dr. Ajit Kumar

Shobha Ram Yadav

Dr. Lata Meshram

Dr. R.K. Tamboli