

**GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG
FOUR YEAR UNDERGRADUATE PROGRAM
DEPARTMENT OF ZOOLOGY
COURSE CURRICULUM 2025-26**

Courses(With Practical) of 4Credit

3C for Theory + 1C for Practical

Four Year Undergraduate Program

Semester V & VI

Session 2025-26

**Discipline Specific Course (DSC), Discipline Specific Elective (DSE)
and
General Elective Course (GEC)**

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FOUR YEAR UNDERGRADUATE PROGRAM
DEPARTMENT OF ZOOLOGY
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COURSE CODE: BZO501 (DSC-05) Biochemistry and Histology

Part A: Introduction			
Program: Bachelor in Science (Bio Group) Certificate/diploma/degree/honors		Class: B. Sc.	Semester - V Session: 2025-2026
1	Course Code	BZO501	
2	Course Title	Biochemistry and Histology	
3	Course Type	Discipline Specific Course (DSC05)	
4	Course Learning Outcome (CLO)	This Course will enable the students to: • Know about the importance and scope of biochemistry. • Gain knowledge about the structure and biological significance of Carbohydrate, Protein and Lipids. • Understand the histological structure and function of different tissues. • Comprehend the concept of enzyme, its mechanism of action and regulation. • Learn the preparation of models of biomolecules.	
5	Credit Value	3C	1 credit =15 Hours – Learning and Observation
6	Total Marks	Maximum Marks :100	Minimum Passing Marks:40

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Part B: Content of the Course		
Total no. of Teaching/ Learning Periods = 60 Periods (60 Hours)		
Unit	Topics (COURSE CONTENTS)	No. of Periods
I	Biochemistry of Carbohydrates: Introduction, scope and importance of Biochemistry. Carbohydrate: Structure and biological importance. Classification: Monosaccharides, Oligosaccharides (Disaccharides), Polysaccharides. Metabolism of carbohydrates, Glycolysis, Krebs cycle, Electron transport chain and ATP synthesis. Gluconeogenesis, Glycogenolysis and Glycogenesis.	12
II	Biochemistry of Lipids: Lipid structure and Biological significance. Fatty acids: Types and Classification- Triglycerides, Phospholipids, Sphingolipids, Cholesterol, β - oxidation and omega -oxidation of saturated fatty acids with even and odd number of carbon atoms. Ketogenesis.	12
III	Biochemistry of proteins: Structure and biological significance of proteins. Amino acids: Structure, classification and properties, Essential and non-essential amino acids. Catabolism of amino acids: Transamination, Deamination, Urea cycle. Enzymes: General properties, Nomenclature and classification: specificity, cofactors, isozymes, Mechanism of enzyme action, Regulation of enzyme activity	12
IV	Histology: Introduction to tissues. Epithelial tissue: types, structure and characteristics. Connective tissue: Structure and function of loose, dense and adipose tissue. Structure and function of Blood plasma, blood cells, lymph and Stem cell. Cartilage and bone: classification, and fine structure.	12
V	Muscular tissue: Ultrastructure of smooth, skeletal and cardiac muscles. Muscle-tendon attachment. Nerve Tissue: Structure and classification of neurons. Types of supporting (glial) cells and their function. Myelin sheath and its formation. Types of sensory nerve endings. Degeneration and regeneration of neurons. Membranes of the brain and spinal cord.	12

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Name & Signature of Members of Board of Studies

Chair person/HOD: Dr. Usha Sahu	Departmental Members
Subject Expert	1. Dr. Divya K. Minj
Subject Expert	2. Dr. Neeru Agrawal
VC Nominee	3. Ms. Mausumi Dey
Member of other Department	4. Dr. Sanju Sinha
Industrial Representative	5. Dr. Alka Mishra
Student Nominee	6. Mr. Sudesh Sahu
	7. Mr. Anurag Mishra

Part C - Learning Resource
Text Books, Reference Books, Other Resources
TEXT BOOKS Recommended : 1. Nelson, D.L. & Cox, M.M. (2017) Lehninger Principles of Biochemistry (7th edition)Worth. 2. Conn, E.E.; Stumpf, P.K.; Bruening, G. and Doi, R.H. (2006) Principles of Biochemistry(5th edition) Wiley. 3. Sangeeta M., Varalakshmi K.L. and Jyothi N. Nayak (2023) Text Book of Histology for Undergraduate. (2nd Edition) Medone Media. Reference Books : 1. Berg, J.M.; Tymoczko, J.L. and Stryer, L. (2012) Biochemistry (7th edition) Freeman. 2. Zubay, G. (2017) Biochemistry (4th edition) McGraw-Hill. Online Resources: (e- Resources/ e- Books/ e- Learning Portals) https://www.sciencedirect.com/topics/biochemistry-genetics-and-molecular-biology/biochemistry https://www.kenhub.com/en/library/anatomy/introduction-to-histology

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Part D: Assessment and Evaluation		
Suggested Continuous Evaluation Methods:		
Maximum Marks		100 Marks
Continuous Comprehensive Evaluation (CCE):		20 Marks
Semester End Exam (SEE):		80 Marks
Internal Assessment: Continuous Comprehensive Evaluation(CCE)	Internal Test – 02 of 10 Marks each + 01 Assignment/Seminar of 10 Marks	Best of test and Assignment shall be considered against 20 marks
Semester End Exam (SEE)	Pattern -FOUR Section A, B, C, D Each section will consist of questions from all 5 Units, Section C and D will have internal choices. Section-A & B: Very short answer type question- 02x02 = 04 x 5 unit = 20 Marks Section-C: Short answer type question 05 x 5 unit = 25 Marks Section-D: Long answer type question 07 x 5 unit = 35 Marks Total = 80 Marks	

Name & Signature of Members of Board of Studies

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Lab Course: BZOL501 (DSC-05) Biochemistry and Histology

Part A: Introduction				
Program: Bachelor in Science (Bio Group) Certificate/diploma/degree/honors		Class: B. Sc.	Semester - V	Session: 2025-2026
1	Course Code	BZOL501		
2	Course Title	Biochemistry and Histology		
3	Course Type	Discipline Specific Lab. Course		
4	Course Learning Outcome (CLO)	This Course will enable the students to: • Know about the importance and scope of biochemistry. • Gain knowledge about the structure and biological significance of Carbohydrate, Protein and Lipids. • Understand the histological structure and function of different tissues. • Comprehend the concept of enzyme, its mechanism of action and regulation. • Learn the preparation of models of biomolecules.		
5	Credit Value	1C	1 credit =15 Hours – Learning and Observation	
6	Total Marks	Maximum Marks :50		Minimum Passing Marks:20
S. No.		List of Experiments		
1.		Study of permanent slides of different tissues.		
2.		Biochemical detection of Carbohydrate, Protein and Lipid.		
3.		Determination of acid value of oil.		
4.		Blood group detection (A, B, AB, O)		
5.		R. B. C. and W.B.C count		

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6.	Blood coagulation time
7.	Preparation of hematin crystals from blood sample

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Part C - Learning Resource

Text Books, Reference Books, Other Resources

TEXT BOOKS Recommended :

1. Practical Biochemistry By Damodaran Geetha K. Publisher: Jaypee Brothers Ltd Pvt.
2. Essentials of Practical Biochemistry by Gupta Prem Prakash. Jaypee Brothers Medical Publishers.
3. Histological Techniques A Practical Manual by K. Lakshminarayanan (2020). Bhalani Publishing House

Online Resources: (e- Resources/ e- Books/ e- Learning Portals)

<https://www.amazon.in/PRACTICAL-BOOK-BIOCHEMISTRY-CLINICAL-PATHOLOGY/dp/B0D44Q89MD>

https://bookforest.in/products/histology-practical-manual-3rd-edition?sku_id=50937951&gad_source=1&gclid=Cj0KCQjw-ai0BhDPArisAB6hmP4gpkRECVQOelavluya7prcQcetWqfJBNZvcMJhgylCK8K3dOHCw2UaAgEJEALw_wcB

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Part D: Assessment and Evaluation	
Suggested Continuous Evaluation Methods: Maximum Marks: 50 Marks (Will include Internal assessment, Lab records and End Semester Viva/Voce and performance)	
Semester End Exam (SEE)	Laboratory performance: As per Dept. (LOCF)

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Course Code: BZO502 (DSE03) Applied Zoology

Part A: Introduction				
Program: Bachelor in Science (Bio Group) Certificate/diploma/degree/honors		Class: B. Sc.	Semester - V	Session:2025-2026
1	Course Code	BZO502		
2	Course Title	Applied Zoology		
3	Course Type	Discipline Specific Elective		
4	Course Learning Outcome (CLO)	This Course will enable the students to: - Understand the basic information about fishery, culture and harvesting methods of fishes, prawn and pearls - Learn about beekeeping and managing beehives for honey production and pollination. - Understand the biology and varieties of silkworms and the basic techniques of harvesting of cocoons and silk production. - Gain knowledge of poultry rearing and vermicompost technology and its applications. - Comprehend the economic perspectives of applied zoology.		
5	Credit Value	3C	1 credit =15 Hours – Learning and Observation	
6	Total Marks	Maximum Marks :100		Minimum Passing Marks:40
Part B: Content of the Course				
Total no. of Teaching/ Learning Periods = 60 Periods (60 Hours)				
Unit	Topics (COURSE CONTENTS)			No. of Periods
I	Aqua Culture: General Introduction. Prawn culture: Culture of fresh water prawn; culture of marine prawn; preparation of farm. preservation and processing of prawn. Export of prawn. Pearl Culture. Fish Culture: Breeding Pond, Hatchery, Fish Seed, Harvesting, preservation of fish. Composite fish farming. Common fish diseases.			14

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II	Apiculture: Species of honey bees in India. Life history of <i>Apis</i> . Methods of Bee keeping, Extraction of honey, Bee products and their uses. Natural enemies and their control. Medicinal value of honey; bee products.	12
III	Lac culture: Lac insect and its life cycle. Cultivation of lac insect, host plants, processing and uses of lac. Sericulture: Silkworms and their host plants, Life Cycle of silkworm, Mulberry silkworm culture, Types of silk, Natural enemies and their control.	12
IV	Poultry: Types of breeds. Rearing method. Incubation and hatching of eggs. Methods of brooding and Rearing, Debeaking. Feed formulations for chicks, Nutritive value of egg and meat. Diseases and control measures.	12
V	Vermiculture: Biology of <i>Eisenia foetida</i> . Rearing of earthworms, Equipments and devices used in vermiculture, Vermicompost Technology. Methods and products, Vermiwash Collection, Composition and use.	10

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Part C - Learning Resource
Text Books, Reference Books, Other Resources
TEXT BOOKS Recommended : 1. Shukla, G.S. and Upadhyaya, V.B. (1999-2000). Economic Zoology (Rastogi Publishers). 2. Mani, M.S. (2006). Insects, NBT, India. 3. Jabde, P.V. (2005) Text Book of Applied Zoology: Vermiculture, Apiculture, Sericulture, Lac culture. 4. Shrivastava, C.B.L. (1999). Fishery Science and Indian Fisheries. Kitab Mahal Publication. 5. Sardar Singh, Bee keeping in India, Indian Council of Agricultural research, New Delhi. 6. Dhyansingh Bisht, Apiculture, ICAR Publication. 7. Ahasan J., Sinha S.P. (2010). Handbook of Economic Zoology, S. Chand publication. Reference Books : 1. Prost, P.J. (1962) Apiculture. Oxford and IBH, New Delhi 2. Sericulture, FAO Manual of Sericulture. And Habiger Publishers. 3. Knobil, E. and Neill, J.D (2006). The physiology of Reproduction, Vol. II, ELSVIER Publisher. 4. Hafez, E.S.E (1962). Reproduction in Farm animals, Lea Online Resources: (e- Resources/ e- Books/ e- Learning Portals): 1. https://sist.sathyabama.ac.in/sist_coursematerial/upload/SVT1608.pdf 2. https://egov.uok.edu.in/elearning/tutorials/1011020512BR15103CR15Apiculture%20Lac%20culture%20and%20sericultureapiculture%20lac%20culture%20and%20sericulture%20upload.pdf.

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Part D: Assessment and Evaluation		
Suggested Continuous Evaluation Methods:		
Maximum Marks:		100 Marks
Continuous Comprehensive Evaluation (CCE):		20 Marks
Semester End Exam (SEE):		80 Marks
Internal Assessment: Continuous Comprehensive Evaluation(CCE)	Internal Test – 02 of 10 Marks each + 01 Assignment/Seminar of 10 Marks	Best of test and Assignment shall be considered against 20 marks
Semester End Exam (SEE)	Pattern -FOUR Section A, B, C, D Each section will consist of questions from all 5 Units, Section C and D will have internal choices. Section-A & B: Very short answer type question- 02x02 = 04 x 5unit = 20 Marks Section-C: Short answer type question 05 x 5 unit = 25 Marks Section-D: Long answer type question 07 x 5 unit = 35 Marks Total = 80 Marks	

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Course Code: BZOL502 (DSE03) Applied Zoology

Part A: Introduction				
Program: Bachelor in Science (Bio Group) Certificate/diploma/degree/honors		Class: B. Sc.	Semester - V	Session:2025-2026
1	Course Code	BZOL502		
2	Course Title	Applied Zoology		
3	Course Type	Discipline Specific Elective Lab. Course		
4	Course Learning Outcome (CLO)	This Course will enable the students to: • Understand the basic information about fishery, culture and harvesting methods of fishes, prawn and pearls • Learn about beekeeping and managing beehives for honey production and pollination. • Understand the biology and varieties of silkworms and the basic techniques of harvesting of cocoons and silk production. • Gain knowledge of poultry rearing and vermicompost technology and its applications. • Comprehend the economic perspectives of applied zoology.		
5	Credit Value	1C	1 credit =15 Hours – Learning and Observation	
6	Total Marks	Maximum Marks :50		Minimum Passing Marks:20
S. No.	List of Experiments			
1.	Morphological characterization of common fish species.			
2.	Mounting of the sting apparatus.			
3.	Castes (through charts/specimens) study of bees			
4.	Worker honey bee with emphasis on leg modifications (through specimens/charts)			
5.	Life cycle of mulberry silkworm, <i>Bombyx mori</i> (model/chart/specimens)			

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6.	Test for good quality eggs (Floating test, cracking test) and for fertilized and unfertilized eggs (Light test, Cracking test).
7.	External morphology of poultry birds (model).
8.	Project report on visit to Poultry farm (Poultry management and Poultry breeds).

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Part C - Learning Resource	
Text Books, Reference Books, Other Resources	
TEXT BOOKS Recommended : 1. Upadhyay, Economic Zoology 2. Salvamani, V.R. Mahadevan, R.K. Aquaculture Trends and Issues. 3. Jabde, P.V. (2005) Text Book of Applied Zoology: Vermiculture, Apiculture, Sericulture, Lac culture. Online Resources: (e- Resources/ e- Books/ e- Learning Portals) 1. https://sist.sathyabama.ac.in/sist_coursematerial/upload/SVT1608.pdf 2. https://egov.uok.edu.in/elearning/tutorials/1011020512BR15103CR15Apiculture%20Lac%20culture%20and%20sericultureapiculture%20lac%20culture%20and%20sericulture%20upload.pdf	
Part D: Assessment and Evaluation	
Suggested Continuous Evaluation Methods: Maximum Marks: 50 Marks (Will include Internal assessment, Lab records and End Semester Viva/Voce and performance)	
Semester End Exam (SEE)	Laboratory performance: As per Dept. (LOCF)

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Course Code: BZO503 (DSE04) Ethology

Part A: Introduction			
Program: Bachelor in Science (Bio Group) Certificate/diploma/degree/honors		Class: B. Sc.	Semester - V Session: 2025-2026
1	Course Code	BZO503	
2	Course Title	Animal Behaviour	
3	Course Type	Discipline Specific elective	
4	Course Learning Outcome (CLO)	This Course will enable the students to: - Learn the concept and principles of biological evolution. - Understand types of animal behaviour and their importance to the organisms. - Enhance their observation, analysis, interpretation and documentation skills by taking short projects pertaining to Animal behaviour. - Relate animal behaviour with other subjects such as Animal biodiversity, Evolutionary biology, Ecology, Conservation biology and Genetic basis of the behaviour.	
5	Credit Value	3C	1 credit =15 Hours – Learning and Observation
6	Total Marks	Maximum Marks :100	Minimum Passing Marks:40
Part B: Content of the Course			
Total no. of Teaching/ Learning Periods = 60 Periods (60 Hours)			
Unit	Topics (COURSE CONTENTS)		No. of Periods
I	Scope and importance of animal behaviour study. Ethology: History and branches. Stimulus: Definition, Types of stimuli (internal and external). Pattern of behaviour: Foregoing, aggressive, territorial, stereotype (taxis, kinesis and reflexes). Types of Reflexes. Neural and hormonal control of behavior.		12

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II	Innate or instinctive behaviour: Definition and characteristics, innate releasing mechanism and action specific energy. Biological clocks: Advantages of biological rhythms. Bird migration, navigation and orientation.	10
III	Learning Behaviour: Classical conditioning (Pavlov experiment). Types of conditioning: forward, backward, simultaneous and temporal conditioning. Properties of conditioning: generalization, discrimination, extinction, recovery from extinction, acquisition, reinforce, positive and negative. Habituation. Instrumental learning (trial and error). Filial and sexual Imprinting. Reasoning and insight learning. Neural mechanism of learning.	14
IV	Social behaviour: Social organisation in honey bee and primates. Elements of socio-biology: Eusociality, Selfishness, co-operation, Altruism and kingship, Communication: Chemical, visual, light, tactile and audio.	12
V	Evolutionary aspects of behaviour: Feeding strategies, mimicry and coloration, evolution of reproductive behaviour. Theory of sexual selection, Mate selection and courtship behaviour Secondary sex characteristics, parental care in fish and amphibia.	12

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Part C - Learning Resource	
Text Books, Reference Books, Other Resources	
TEXT BOOKS Recommended : 1. Reena Mathur. Animal Behaviour: A text Book for University Student, Sixth Edition, 2021, Rastogi Publication. 2. Harjindra Singh. A Text Book of Animal Behaviour. 3rd Edition (2003). Anmol Publication. 3. M.M. Ranga, Animal Behaviour. Published by Student Edition. 4. McFarland, D. (1999) Animal Behaviour (3rd edition) Pitman Publishing Limited, London, UK. 5. Manning, A. and Dawkins, M. S. (2012) An Introduction to Animal Behaviour (6th edition) Cambridge, University Press, UK. 6. Alcock, J. (2005) Animal Behaviour (8th edition) Sinauer Associate Inc., USA. Reference Books : 1. Sherman, P. W. and Alcock, J. (2013) Exploring Animal Behaviour (6th edition) Sinauer Associate Inc., Massachusetts, USA. 2. Hall, B.K. and Hallgrimson, B (2008) Evolution (4th edition) Jones and Barlett Publishers. 3. Douglas, J.F. (1997) Evolutionary Biology. Sinauer Associates. Online Resources: (e- Resources/ e- Books/ e- Learning Portals) https://www.bbau.ac.in/dept/dz/TM/ZL%20202%20Animal%20Behaviour.pdf https://www.khanacademy.org/science/ap-biology/ecology-ap/responses-to-the-environment/a/intro-to-animal-behavior	
Part D: Assessment and Evaluation	
Suggested Continuous Evaluation Methods:	
Maximum Marks:	100 Marks
Continuous Comprehensive Evaluation (CCE): 20 Marks	
Semester End Exam (SEE):	80 Marks

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Internal Assessment: Continuous Comprehensive Evaluation(CCE)	Internal Test – 02 of 10 Marks each + 01 Assignment/Seminar of 10 Marks	Best of test and Assignment shall be considered against 20 marks
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Course Code: BZOL503 (DSE04) Animal Behaviour

Part A: Introduction			
Program: Bachelor in Science (Bio Group) Certificate/diploma/degree/honors		Class: B. Sc.	Semester - V Session: 2025-2026
1	Course Code	DSE04	
2	Course Title	Animal Behaviour	
3	Course Type	Discipline Specific Elective Lab. Course (DSE08)	
4	Course Learning Outcome (CLO)	This Course will enable the students to: • Learn the concept and principles of biological evolution. • Understand types of animal behaviour and their importance to the organisms. • Enhance their observation, analysis, interpretation and documentation skills by taking short projects pertaining to Animal behaviour. • Relate animal behaviour with other subjects such as Animal biodiversity, Evolutionary biology, Ecology, Conservation biology and Genetic basis of the behaviour.	
5	Credit Value	1C	1 credit =15 Hours – Learning and Observation
6	Total Marks	Maximum Marks :50	Minimum Passing Marks:20
S.No.	List of Experiments		
1.	Nests and nesting habits of the birds and social insects		
2.	To study geotaxis behaviour in earthworm.		
3.	To study the phototaxis behaviour in insect larvae/earth worm.		
4.	Study of conditioning behaviour in fishes.		
5.	Study of habituation in milliped.		
6.	Study of circadian functions in humans (daily eating, sleep and temperature patterns).		

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7.	Visit to Forest/ Wild life Sanctuary/Biodiversity Park/Zoological Park/Zoo to study Animal behaviour and prepare a short report.
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Industrial Representative	5. Dr. Alka Mishra
Student Nominee	6. Mr. Sudesh Sahu
	7. Mr. Anurag Mishra

Part C - Learning Resource

Text Books, Reference Books, Other Resources

TEXT BOOKS Recommended :

1. Reena Mathur. Animal Behaviour: A text Book for University Student, Sixth Edition, 2021, Rastogi Publication.
2. Harjindra Singh. A Text Book of Animal Behaviour. 3rd Edition (2003). Anmol Publication.
3. M.M. Ranga, Animal Behaviour. Published by Student Edition.

Online Resources: (e- Resources/ e- Books/ e- Learning Portals)

<https://www.bbau.ac.in/dept/dz/TM/ZL%20202%20Animal%20Behaviour.pdf>

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Part D: Assessment and Evaluation	
Suggested Continuous Evaluation Methods: Maximum Marks: 50 Marks (Will include Internal assessment, Lab records and End Semester Viva/Voce and performance)	
Semester End Exam (SEE)	Laboratory performance: As per Dept. (LOCF)

Name & Signature of Members of Board of Studies

Chair person/HOD: Dr. Usha Sahu	Departmental Members
Subject Expert	1. Dr. Divya K. Minj
Subject Expert	2. Dr. Neeru Agrawal
VC Nominee	3. Ms. Mausumi Dey
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COURSE CODE: GEC05 Biochemistry and Histology

Part A: Introduction			
Program: Bachelor in Science (Bio Group) Certificate/diploma/degree/honors		Class: B. Sc.	Semester - V Session: 2025-2026
1	Course Code	GEC05	
2	Course Title	Biochemistry and Histology	
3	Course Type	General Elective Course	
4	Course Learning Outcome (CLO)	This Course will enable the students to: • Know about the importance and scope of biochemistry. • Gain knowledge about the structure and biological significance of Carbohydrate, Protein and Lipids. • Understand the histological structure and function of different tissues. • Comprehend the concept of enzyme, its mechanism of action and regulation. • Learn the preparation of models of biomolecules.	
5	Credit Value	3C	1 credit =15 Hours – Learning and Observation
6	Total Marks	Maximum Marks :100	Minimum Passing Marks:40

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Part B: Content of the Course		
Total no. of Teaching/ Learning Periods = 60 Periods (60 Hours)		
Unit	Topics (COURSE CONTENTS)	No. of Periods
I	Biochemistry of Carbohydrates: Introduction, scope and importance of Biochemistry. Carbohydrate: Structure and biological importance. Classification: Monosaccharides, Oligosaccharides (Disaccharides), Polysaccharides. Metabolism of carbohydrates, Glycolysis, Krebs cycle, Electron transport chain and ATP synthesis. Gluconeogenesis, Glycogenolysis and Glycogenesis.	12
II	Biochemistry of Lipids: Lipid structure and Biological significance. Fatty acids: Types and Classification- Triglycerides, Phospholipids, Sphingolipids, Cholesterol, β - oxidation and omega -oxidation of saturated fatty acids with even and odd number of carbon atoms. Ketogenesis.	12
III	Biochemistry of proteins: Structure and biological significance of proteins. Amino acids: Structure, classification and properties, Essential and non-essential amino acids. Catabolism of amino acids: Transamination, Deamination, Urea cycle. Enzymes: General properties, Nomenclature and classification: specificity, cofactors, isozymes, Mechanism of enzyme action, Regulation of enzyme activity	12
IV	Histology: Introduction to tissues. Epithelial tissue: types, structure and characteristics. Connective tissue: Structure and function of loose, dense and adipose tissue. Structure and function of Blood plasma, blood cells, lymph and Stem cell. Cartilage and bone: classification, and fine structure.	12
V	Muscular tissue: Ultrastructure of smooth, skeletal and cardiac muscles. Muscle-tendon attachment. Nerve Tissue: Structure and classification of neurons. Types of supporting (glial) cells and their function. Myelin sheath and its formation. Types of sensory nerve endings. Degeneration and regeneration of neurons. Membranes of the brain and spinal cord.	12

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Name & Signature of Members of Board of Studies

Chair person/HOD: Dr. Usha Sahu	Departmental Members
Subject Expert	8. Dr. Divya K. Minj
Subject Expert	9. Dr. Neeru Agrawal
VC Nominee	10. Ms. Mausumi Dey
Member of other Department	11. Dr. Sanju Sinha
Industrial Representative	12. Dr. Alka Mishra
Student Nominee	13. Mr. Sudesh Sahu
	14. Mr. Anurag Mishra

Part C - Learning Resource
Text Books, Reference Books, Other Resources
TEXT BOOKS Recommended : - Nelson, D.L. & Cox, M.M. (2017) Lehninger Principles of Biochemistry (7th edition)Worth. - Conn, E.E.; Stumpf, P.K.; Bruening, G. and Doi, R.H. (2006) Principles of Biochemistry(5th edition) Wiley. - Sangeeta M., Varalakshmi K.L. and Jyothi N. Nayak (2023) Text Book of Histology for Undergraduate. (2nd Edition) Medone Media. Reference Books : - Berg, J.M.; Tymoczko, J.L. and Stryer, L. (2012) Biochemistry (7th edition) Freeman. - Zubay, G. (2017) Biochemistry (4th edition) McGraw-Hill. Online Resources: (e- Resources/ e- Books/ e- Learning Portals) https://www.sciencedirect.com/topics/biochemistry-genetics-and-molecular-biology/biochemistry https://www.kenhub.com/en/library/anatomy/introduction-to-histology

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Part D: Assessment and Evaluation		
Suggested Continuous Evaluation Methods:		
Maximum Marks:		100 Marks
Continuous Comprehensive Evaluation (CCE):		20 Marks
Semester End Exam (SEE):		60 Marks
Internal Assessment: Continuous Comprehensive Evaluation(CCE)	Internal Test – 02 of 10 Marks each + 01 Assignment/Seminar of 10 Marks	Best of test and Assignment shall be considered against 20 marks
Semester End Exam (SEE)	Pattern - FOUR Section A, B, C, D Each section will consist of questions from all 5 Units, Section C and D will have internal choices. Section-A & B: Very short answer type question- 02x02 = 04 x 5unit = 20 Marks Section-C: Short answer type question 05 x 5 unit = 25 Marks Section-D: Long answer type question 07 x 5 unit = 35 Marks Total = 80 Marks	

Name & Signature of Members of Board of Studies

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Lab Course: GECL05 Biochemistry and Histology

Part A: Introduction			
Program: Bachelor in Science (Bio Group) Certificate/diploma/degree/honors		Class: B. Sc.	Semester - V Session: 2025-2026
1	Course Code	GECL05	
2	Course Title	Biochemistry and Histology	
3	Course Type	General elective Lab. Course	
4	Course Learning Outcome (CLO)	This Course will enable the students to: • Know about the importance and scope of biochemistry. • Gain knowledge about the structure and biological significance of Carbohydrate, Protein and Lipids. • Understand the histological structure and function of different tissues. • Comprehend the concept of enzyme, its mechanism of action and regulation. • Learn the preparation of models of biomolecules.	
5	Credit Value	1C	1 credit =15 Hours – Learning and Observation
6	Total Marks	Maximum Marks :50	Minimum Passing Marks:20
S. No.	List of Experiments		
1.	Study of permanent slides of different tissues.		
2.	Biochemical detection of Carbohydrate, Protein and Lipid.		
3.	Determination of acid value of oil.		
4.	Blood group detection (A, B, AB, O)		
5.	R. B. C. and W.B.C count		

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6.	Blood coagulation time
7.	Preparation of hematin crystals from blood sample

Name & Signature of Members of Board of Studies

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Part C - Learning Resource

Text Books, Reference Books, Other Resources

TEXT BOOKS Recommended :

4. Practical Biochemistry By Damodaran Geetha K. Publisher: Jaypee Brothers Ltd Pvt.
5. Essentials of Practical Biochemistry by Gupta Prem Prakash. Jaypee Brothers Medical Publishers.
6. Histological Techniques A Practical Manual by K. Lakshminarayanan (2020). Bhalani Publishing House

Online Resources: (e- Resources/ e- Books/ e- Learning Portals)

<https://www.amazon.in/PRACTICAL-BOOK-BIOCHEMISTRY-CLINICAL-PATHOLOGY/dp/B0D44Q89MD>

https://bookforest.in/products/histology-practical-manual-3rd-edition?sku_id=50937951&gad_source=1&gclid=Cj0KCQjw-ai0BhDPArisAB6hmP4gpkRECVQOelavluya7prcQcetWqfJBNZvcMJhgylCK8K3dOHCw2UaAgEJEALw_wcB

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Part D: Assessment and Evaluation	
Suggested Continuous Evaluation Methods: Maximum Marks: 50 Marks (Will include Internal assessment, Lab records and End Semester Viva/Voce and performance)	
Semester End Exam (SEE)	Laboratory performance: As per Dept. (LOCF)

Name & Signature of Members of Board of Studies

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Course Code: BZO601 (DSC06) Reproductive and Developmental Biology

Part A: Introduction			
Program: Bachelor in Science (Bio Group) Certificate/diploma/degree/honors		Class: B. Sc.	Semester - VI Session: 2025-2026
1	Course Code	BZO601	
2	Course Title	Reproductive and Developmental Biology	
3	Course Type	Discipline Specific Course (DSC)	
4	Course Learning Outcome (CLO)	This Course will enable the students to: • Understand the functional anatomy of male and female reproduction and write the process of fertilization in reproductive biology. • Describe the gonadal hormones and the mechanism of hormones action in reproduction. • Explain the development of multicellular organisms from a single cell zygote. • Describe the history and different stages of embryonic development and its implications. • Identify the various developmental stages and the possible defects in growth.	
5	Credit Value	3C	1 credit =15 Hours – Learning and Observation
6	Total Marks	Maximum Marks :100	Minimum Passing Marks:40
Part B: Content of the Course			
Total no. of Teaching/ Learning Periods = 60 Periods (60 Hours)			
Unit	Topics (COURSE CONTENTS)		No. of Periods
I	Structure and function of Male reproductive system Structure and function of Female reproductive system		12

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II	Oogenesis: Origin of germ primordial cell in mammal, yolk formation, physico-chemical nature of yolk, function of yolk, Types of eggs. Process of oogenesis Spermatogenesis: Origin of germ primordial cell in mammal, formation of spermatids, spermiogenesis. Fertilization: mechanism of fertilization, activation of ovum, amphimixis, post fertilization changes in egg, types and significance of fertilization.	12
III	Cleavage: types and patterns. Peculiarities of cell division involved in cleavage, significance of cleavage. Morulation and Blastulation: Blastulation in Amphioxus, Frog and Chick. Fate Map.	12
IV	Gastrulation: Germ layer differentiation. Epiboly, emboly/ invagination, involution. Extraembryonic membrane in chick. Tubulation.	12
V	Embryonic induction: Experimental evidences to induction, Characteristics of organizer, Types of organizers, Genic and Gradient theory of induction. Competence: Molecular biology of competence.	12

Name & Signature of Members of Board of Studies

Chair person/HOD: Dr. Usha Sahu	Departmental Members
Subject Expert	1. Dr. Divya K. Minj
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DEPARTMENT OF ZOOLOGY
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Part C - Learning Resource							
Text Books, Reference Books, Other Resources							
TEXT BOOKS Recommended : 1. Thomas W.S. (2014) Langman's Medical Embryology (13th edition) Lippincott, Williams & Wilkins, Baltimore. 2. Gary C.S.; Steven B.B.; Philip R.B. and Philippa H.F. (2014) Larsen's Human Embryology (5th edition) Elsevier. 3. Gilbert, S.F. (2016) Developmental Biology (11th edition) Sinauer. 4. Sastry, K.V. and Shukla Vinita (2018) Developmental Biology (2nd Revised Edition) Rastogi Publication. 5. Verma, P.S. and Agrawal V.K. (2014) Chordate Embryology (Developmental Biology) 4th Edition. S. Chand Publication. Reference Books : 1. Thomas W.S. (2014) Langman's Medical Embryology (13th edition) Lippincott, Williams & Wilkins, Baltimore. 2. Gary C.S.; Steven B.B.; Philip R.B. and Philippa H.F. (2014) Larsen's Human Embryology (5th edition) Elsevier. Online Resources: (e- Resources/ e- Books/ e- Learning Portals) https://www.eshiksha.mp.gov.in/mpdhe/course/view.php?id=254 https://www.sciencedirect.com/topics/medicine-and-dentistry/reproductive-biology							
Part D: Assessment and Evaluation							
Suggested Continuous Evaluation Methods: <table> <tr> <td>Maximum Marks:</td><td>100 Marks</td></tr> <tr> <td>Continuous Comprehensive Evaluation (CCE):</td><td>20 Marks</td></tr> <tr> <td>Semester End Exam (SEE):</td><td>80 Marks</td></tr> </table>		Maximum Marks:	100 Marks	Continuous Comprehensive Evaluation (CCE):	20 Marks	Semester End Exam (SEE):	80 Marks
Maximum Marks:	100 Marks						
Continuous Comprehensive Evaluation (CCE):	20 Marks						
Semester End Exam (SEE):	80 Marks						

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Internal Assessment: Continuous Comprehensive Evaluation(CCE)	Internal Test – 02 of 10 Marks each + 01 Assignment/Seminar of 10 Marks	Best of test and Assignment shall be considered against 20 marks
Semester End Exam (SEE)	Pattern -FOUR Section A, B, C, D Each section will consist of questions from all 5 Units, Section C and D will have internal choices. Section-A & B: Very short answer type question- 02x02 = 04 x 5unit = 20 Marks Section-C: Short answer type question 05 x 5 unit = 25 Marks Section-D: Long answer type question 07 x 5 unit = 35 Marks Total = 80 Marks	

Name & Signature of Members of Board of Studies

Chair person/HOD: Dr. Usha Sahu	Departmental Members
Subject Expert	1. Dr. Divya K. Minj
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DEPARTMENT OF ZOOLOGY
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Lab Course: BZOL601 (DSC) Reproductive and Developmental Biology

Part A: Introduction			
Internal Assessment: Continuous Comprehensive Evaluation(CCE)		Internal Test - One of 15 Marks + Assignment/Seminar- One of 15 Marks	Best of test and Assignment shall be considered against 15 marks
1	Course Code	BZOL601	
2	Course Title	Reproductive and Developmental Biology	
3	Course Type	Discipline Specific Lab. Course	
4	Course Learning Outcome (CLO)	This Course will enable the students to: - Understand the functional anatomy of male and female reproduction and write the process of fertilization in reproductive biology. - Describe the gonadal hormones and the mechanism of hormones action in reproduction. - Explain the development of multicellular organisms from a single cell zygote. - Describe the history and different stages of embryonic development and its implications. - Identify the various developmental stages and the possible defects in growth.	
5	Credit Value	1C	1 credit =15 Hours – Learning and Observation
6	Total Marks	Maximum Marks :50	Minimum Passing Marks:20
S.No.	List of Experiments		
1.	Identification of stages of oogenesis & spermatogenesis.		
2.	Histological study of gonads through permanent slides in vertebrates.		
3.	Study of extra-embryonic membrane in chick.		
4.	Study of embryological slides of Amphioxus/frog/chick.		

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COURSE CURRICULUM 2025-26

Name & Signature of Members of Board of Studies

Chair person/HOD: Dr. Usha Sahu	Departmental Members
Subject Expert	1. Dr. Divya K. Minj
Subject Expert	2. Dr. Neeru Agrawal
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Part C - Learning Resource
Text Books, Reference Books, Other Resources
TEXT BOOKS Recommended : 1. Thomas W.S. (2014) Langman's Medical Embryology (13th edition) Lippincott, Williams & Wilkins, Baltimore. 2. Gary C.S.; Steven B.B.; Philip R.B. and Philippa H.F. (2014) Larsen's Human Embryology (5th edition) Elsevier. 3. Gilbert, S.F. (2016) Developmental Biology (11th edition) Sinauer. 4. Sastry, K.V. and Shukla Vinita (2018) Developmental Biology (2nd Revised Edition) Rastogi Publication. 5. Verma, P.S. and Agrawal V.K. (2014) Chordate Embryology (Developmental Biology) 4th Edition. S. Chand Publication. Online Resources: (e- Resources/ e- Books/ e- Learning Portals) https://www.eshiksha.mp.gov.in/mpdhe/course/view.php?id=254 https://www.sciencedirect.com/topics/medicine-and-dentistry/reproductive-biology

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Part D: Assessment and Evaluation	
Suggested Continuous Evaluation Methods:	
Maximum Marks: 50 Marks	
(Will include Internal assessment, Lab records and End Semester Viva/Voce and performance)	
Semester End Exam (SEE)	Laboratory performance: As per Dept. (LOCF)

Name & Signature of Members of Board of Studies

Chair person/HOD: Dr. Usha Sahu	Departmental Members
Subject Expert	1. Dr. Divya K. Minj
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Course Code: BZO602 (DSE05) Ecology

Part A: Introduction			
Program: Bachelor in Science (Bio Group) Certificate/diploma/degree/honors		Class: B. Sc.	Semester - VI Session: 2025-2026
1	Course Code	BZO602	
2	Course Title	Ecology	
3	Course Type	Discipline Specific Elective (DSE)	
4	Course Learning Outcome (CLO)	This Course will enable the students to: 1. Know the evolutionary and functional basis of animal ecology. 2. Understand what makes the scientific study of animal ecology a crucial and exciting endeavor. 3. Engage in field-based research activities to understand well the theoretical aspects taught besides learning techniques for gathering data in the field. 4. Analyse a biological problem, derive testable hypotheses and then design experiments and put the tests into practice. 5. Solve the environmental problems involving interaction of humans and natural systems at local or global level.	
5	Credit Value	3C	1 credit =15 Hours – Learning and Observation
6	Total Marks	Maximum Marks :100	Minimum Passing Marks:40
Part B: Content of the Course			
Total no. of Teaching/ Learning Periods = 60 Periods (60 Hours)			
Unit	Topics (COURSE CONTENTS)		No. of Periods
I	Introduction and scope of Ecology. Multidisciplinary relevance in current perspective. Structure and function of ecosystem; Major ecosystems of the world. Energy flow in ecosystem, food chain and food web. Productivity.		

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II	Ecology of populations: Characteristics and attributes of population: Density, natality, mortality, life tables, fecundity tables, survivorship curves. Unique and group attributes of population: mortality, age ratio, sex ratio, dispersal. Factors regulating population dispersal and growth: Exponential and logistic growth. Population regulation: density-dependent and independent factors; r and K strategies.	
III	Community characteristics: stratification; Dominance, diversity, species richness, abundance, Evenness, Similarity. Ecotone and edge effect; Types of interaction: Positive interactions: Commensalism, proto-cooperation and mutualism. Negative interactions: parasitism and allelopathy; predation and predator-prey dynamics. Interspecific competition and coexistence, Inter and intra-specific; abundance. Niche overlap and segregation. Gause's Principle with laboratory and field examples.	
IV	Ecological succession: Definition, Process, types, theories of succession. Pollution: Air, water and noise pollution and their control; Natural resources: Mineral, water and forest, their significance and conservation; Types of biodiversity, Hotspots, threat and conservation strategies of biodiversity.	
V	Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational value. Environmental ethics; Environmental movements: Bishnois. Chipko, Silent valley, Big dam movements. Environmental education and public awareness,	

Name & Signature of Members of Board of Studies

Chair person/HOD: Dr. Usha Sahu	Departmental Members
Subject Expert	1. Dr. Divya K. Minj
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DEPARTMENT OF ZOOLOGY
COURSE CURRICULUM 2025-26

Part C - Learning Resource							
Text Books, Reference Books, Other Resources							
TEXT BOOKS Recommended : 1. Colinvau, P. A. (1993) Ecology (2nd edition) Wiley, John and Sons, Inc. 2. Krebs, C. J. (2001) Ecology (6th edition) Benjamin Cummings. 3. Odum, E.P., (2008) Fundamentals of Ecology. Indian Edition. Brooks/Cole. 4. Ricklefs, R.E. (2000) Ecology (5th edition) Chiron Press. 5. Southwood, T.R.E. and Henderson, P.A. (2000) Ecological Methods (3rd edition)Blackwell Sci. 6. Kendeigh, F C. (1984) Ecology with Special Reference to Animal and Man. PrenticeHall Inc. 7. Stiling, P. D. (2012) Ecology Companion Site: Global Insights and Investigations.McGraw Hill Education. Reference Books : 1. Odum, E.P., (2008) Fundamentals of Ecology. Indian Edition. Brooks/Cole. 2. Ricklefs, R.E. (2000) Ecology (5th edition) Chiron Press. 3. Kendeigh, F C. (1984) Ecology with Special Reference to Animal and Man. PrenticeHall Inc. 4. Stiling, P. D. (2012) Ecology Companion Site: Global Insights and Investigations.McGraw Hill Education. Online Resources: (e- Resources/ e- Books/ e- Learning Portals) https://byjus.com/biology/ecology/ https://www.merriam-webster.com/dictionary/ecology							
Part D: Assessment and Evaluation							
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Continuous Comprehensive Evaluation (CCE):	20 Marks						
Semester End Exam (SEE):	80 Marks						

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Internal Assessment: Continuous Comprehensive Evaluation(CCE)	Internal Test – 02 of 10 Marks each + 01 Assignment/Seminar of 10 Marks	Best of test and Assignment shall be considered against 20 marks
Semester End Exam (SEE)	Pattern -FOUR Section A, B, C, D Each section will consist of questions from all 5 Units, Section C and D will have internal choices. Section-A & B: Very short answer type question- 02x02 = 04 x 5unit = 20 Marks Section-C: Short answer type question 05 x 5 unit = 25 Marks Section-D: Long answer type question 07 x 5 unit = 35 Marks Total = 80 Marks	

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Lab Course: BZOL602 Ecology

Part A: Introduction			
Program: Bachelor in Science (Bio Group) Certificate/diploma/degree/honors		Class: B. Sc.	Semester - VI Session: 2025-2026
1	Course Code	BZOL602	
2	Course Title	Ecology	
3	Course Type	Discipline Specific Elective Lab. Course	
4	Course Learning Outcome (CLO)	This Course will enable the students to: • Know the evolutionary and functional basis of animal ecology. • Understand what makes the scientific study of animal ecology a crucial and exciting endeavor. • Engage in field-based research activities to understand well the theoretical aspect taught besides learning techniques for gathering data in the field. • Analyse a biological problem, derive testable hypotheses and then design experiments and put the tests into practice. • Solve the environmental problems involving interaction of humans and natural systems at local or global level.	
5	Credit Value	1C	1 credit =15 Hours – Learning and Observation
6	Total Marks	Maximum Marks :50	Minimum Passing Marks:20
S.No.	List of Experiments		
1.	Constructing a food web by observing and collecting organisms from a given area.		
2.	Estimation of Population Density, Frequency, and abundance in given habitat.		
3.	Studying animal diversity in a habitat.		
4.	Study of Ecosystem through models/ pictures/field visit.		
5.	Study of pollution of different ecosystem through personal observation.		
6.	Study of pollution indicator species in given samples.		

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Name & Signature of Members of Board of Studies

Chair person/HOD: Dr. Usha Sahu	Departmental Members
Subject Expert	1. Dr. Divya K. Minj
Subject Expert	2. Dr. Neeru Agrawal
VC Nominee	3. Ms. Mausumi Dey
Member of other Department	4. Dr. Sanju Sinha
Industrial Representative	5. Dr. Alka Mishra
Student Nominee	6. Mr. Sudesh Sahu
	7. Mr. Anurag Mishra

Part C - Learning Resource

Text Books, Reference Books, Other Resources

TEXT BOOKS Recommended :

1. Colinvau, P. A. (1993) Ecology (2nd edition) Wiley, John and Sons, Inc.
2. Krebs, C. J. (2001) Ecology (6th edition) Benjamin Cummings.
3. Odum, E.P., (2008) Fundamentals of Ecology. Indian Edition. Brooks/Cole.
4. Ricklefs, R.E. (2000) Ecology (5th edition) Chiron Press.
5. Southwood, T.R.E. and Henderson, P.A. (2000) Ecological Methods (3rd edition) Blackwell Sci.
6. Kendeigh, F C. (1984) Ecology with Special Reference to Animal and Man. PrenticeHall Inc.
7. Stiling, P. D. (2012) Ecology Companion Site: Global Insights and Investigations. McGraw Hill Education.

Online Resources: (e- Resources/ e- Books/ e- Learning Portals)

<https://byjus.com/biology/ecology/>

<https://www.merriam-webster.com/dictionary/ecology>

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Part D: Assessment and Evaluation	
Suggested Continuous Evaluation Methods: Maximum Marks: 50 Marks (Will include Internal assessment, Lab records and End Semester Viva/Voce and performance)	
Semester End Exam (SEE)	Laboratory performance: As per Dept. (LOCF)

Name & Signature of Members of Board of Studies

Chair person/HOD: Dr. Usha Sahu	Departmental Members
Subject Expert	1. Dr. Divya K. Minj
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Course Code: BZO603 (DSE06) Chronobiology

Part A: Introduction			
Program: Bachelor in Science (Bio Group) Certificate/diploma/degree/honors		Class: B. Sc.	Semester - VI Session: 2025-2026
1	Course Code	BZO603	
2	Course Title	Chronobiology	
3	Course Type	Discipline Specific Elective (DSE06)	
4	Course Learning Outcome (CLO)	This Course will enable the students to: • Learn about the Biological Clocks and its importance. • Study how Biological Rhythm influence animal behaviour. • Interpreting the cause and effect of lifestyle disorders. • Understand Social and Sexual Behaviour of animals. • Comprehend the Behaviour Patterns of human and animals.	
5	Credit Value	3C	1 credit =15 Hours – Learning and Observation
6	Total Marks	Maximum Marks :100	Minimum Passing Marks:40
Part B: Content of the Course			
Total no. of Teaching/ Learning Periods = 60 Periods (60 Hours)			
Unit	Topics (COURSE CONTENTS)		No. of Periods
I	Introduction to Chronobiology. Historical developments in chronobiology, Biological Oscillation: the concept of Average, amplitude, phase and period. Adaptive significance of biological clocks. Scope of Chronobiology.		12
II	Biological Rhythm, Characteristics of biological rhythms; Short-and Long-term rhythms; Circadian rhythms; Tidal rhythms and Lunar rhythms; Suprachiasmatic nucleus as mammalian circadian clock.		14

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III	Concept of synchronization and masking; Photic and nonphotic zeitgebers; Circannual rhythms; Photoperiod and regulation of seasonal reproduction of vertebrates; Role of melatonin.	14
IV	Hormonal biorhythms and their significance: adrenocortical, pineal and prolactin. Neural basis of biological clock and role of suprachiasmatic nuclei. Sleep-wakefulness cycle. Body temperature rhythm. Time keeping genes. Jet-lag and shift work	14
V	Chronopharmacology: General history, significance and Applications Chronotherapeutics, Chronokinetics, Chronesthesia, Chronergy and Chronotoxicity. Chronomedicine.	06

Name & Signature of Members of Board of Studies

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Part C - Learning Resource	
Text Books, Reference Books, Other Resources	
TEXT BOOKS Recommended: 1. Insect Photoperiodism: Stanley D. Beck, Academic Press, New York and London 2. Chapter 1, The Clocks that Time Us, Moore-Ede, MC, Sulzman, FM and Fuller, CA (1982) Harvard University Press, Cambridge. 3. C. S. Pittendrigh, S. Daan (1976c) A functional analysis of circadian pacemakers in nocturnal rodents. V. Pacemaker structure: a clock for all seasons. J. Comp. Physiol. [A]106:333-355. 4. M. Menaker (1968) Extraretinal light perception in the sparrow. I. Entrainment of the biological clock. Proc. Natl. Acad. Sci. 59:414-421. 5. J.C. Dunlap (1999) Molecular bases for circadian clocks. Cell 96:271-290. Reference Books: 1. Chronobiology Biological Timekeeping: Jay. C. Dunlap, Jennifer. J. Loros, Patricia J. DeCoursey (ed). 2004, Sinauer Associates, Inc. Publishers, Sunderland, MA, USA 2. The Physiological Clock (3rd edition), Erwin Bunning, The English Universities Press Ltd. London, Springer- Verlag New York, Berlin Heidelberg 3. Circadian Physiology: Roberto Refinetti, CRC Press (3rded) 2016. 4. Introducing Biological Rhythms: Willard L. Koukkari, Robert B. Sothorn, 2006, Springer 5. Biological Timekeeping: Clock, Rhythms and Behaviour, Vinod Kumar (ed. 2017) Springer India Pvt Limited. Online Resources: (e- Resources/ e- Books/ e- Learning Portals) https://www.sciencedirect.com/topics/neuroscience/chronobiology https://www.sciencedirect.com/topics/neuroscience/chronobiology	
Part D: Assessment and Evaluation	
Suggested Continuous Evaluation Methods:	
Maximum Marks:	100 Marks
Continuous Comprehensive Evaluation (CCE): 20 Marks	
Semester End Exam (SEE):	80 Marks

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Internal Assessment: Continuous Comprehensive Evaluation(CCE)	Internal Test – 02 of 10 Marks each + 01 Assignment/Seminar of 10 Marks	Best of test and Assignment shall be considered against 20 marks
Semester End Exam (SEE)	Pattern - FOUR Section A, B, C, D Each section will consist of questions from all 5 Units, Section C and D will have internal choices. Section-A & B: Very short answer type question- 02x02 = 04 x 5unit = 20 Marks Section-C: Short answer type question 05 x 5 unit = 25 Marks Section-D: Long answer type question 07 x 5 unit = 35 Marks Total = 80 Marks	

Name & Signature of Members of Board of Studies

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Lab Course: BZOL603 (DSE06)

Part A: Introduction			
Program: Bachelor in Science (Bio Group) Certificate/diploma/degree/honors		Class: B. Sc.	Semester - VI Session: 2025-2026
1	Course Code	BZOL602	
2	Course Title	Chronobiology	
3	Course Type	Discipline Specific Elective Lab. Course	
4	Course Learning Outcome (CLO)	This Course will enable the students to: • Learn about the Biological Clocks and its importance. • Study how Biological Rhythm influence animal behaviour. • Interpreting the cause and effect of lifestyle disorders. • Understand Social and Sexual Behaviour of animals. • Comprehend the Behaviour Patterns of human and animals.	
5	Credit Value	1C	1 credit =15 Hours – Learning and Observation
6	Total Marks	Maximum Marks :50	Minimum Passing Marks:20
S.No.		List of Experiments	
1.		Circadian changes in the volume of nuclei in onion peel (<i>Allium cepa</i>) cells (microscopic observation)	
2.		Observation of leaf movement of a plant on circadian and longitudinal time scales	
3.		Study of circadian functions in human (daily eating, sleep and temperature patterns).	

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Name & Signature of Members of Board of Studies

Chair person/HOD: Dr. Usha Sahu	Departmental Members
Subject Expert	1. Dr. Divya K. Minj
Subject Expert	2. Dr. Neeru Agrawal
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	7. Mr. Anurag Mishra

Part C - Learning Resource
Text Books, Reference Books, Other Resources
TEXT BOOKS Recommended : 1. Insect Photoperiodism: Stanley D. Beck, Academic Press, New York and London 2. Chapter 1, The Clocks that Time Us, Moore-Ede, MC, Sulzman, FM and Fuller, CA (1982) Harvard University Press, Cambridge. 3. C. S. Pittendrigh, S. Daan (1976c) A functional analysis of circadian pacemakers in nocturnal rodents. V. Pacemaker structure: a clock for all seasons. J. Comp. Physiol. [A]106:333-355. Online Resources: (e- Resources/ e- Books/ e- Learning Portals) https://www.sciencedirect.com/topics/neuroscience/chronobiology https://www.sciencedirect.com/topics/neuroscience/chronobiology
Part D: Assessment and Evaluation
Suggested Continuous Evaluation Methods: Maximum Marks: 50 Marks (Will include Internal assessment, Lab records and End Semester Viva/Voce and performance)

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Semester End Exam (SEE)	Laboratory performance: As per Dept. (LOCF)

Name & Signature of Members of Board of Studies

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Course Code: GEC07 Reproductive and Developmental Biology

Part A: Introduction			
Program: Bachelor in Science (Bio Group) Certificate/diploma/degree/honors		Class: B. Sc.	Semester - VI
		Session: 2025-2026	
1	Course Code	GEC07	
2	Course Title	Reproductive and Developmental Biology	
3	Course Type	General Elective Course (GEC)	
4	Course Learning Outcome (CLO)	This Course will enable the students to: • Understand the functional anatomy of male and female reproduction and write the process of fertilization in reproductive biology. • Describe the gonadal hormones and the mechanism of hormones action in reproduction. • Explain the development of multicellular organisms from a single cell zygote. • Describe the history and different stages of embryonic development and its implications. • Identify the various developmental stages and the possible defects in growth.	
5	Credit Value	3C	1 credit =15 Hours – Learning and Observation
6	Total Marks	Maximum Marks :100	Minimum Passing Marks:40
Part B: Content of the Course			
Total no. of Teaching/ Learning Periods = 60 Periods (60 Hours)			
Unit	Topics (COURSE CONTENTS)		No. of Periods
I	Structure and function of Male reproductive system Structure and function of Female reproductive system		12

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II	Oogenesis: Origin of germ primordial cell in mammal, yolk formation, physico-chemical nature of yolk, function of yolk, Types of eggs. Process of oogenesis Spermatogenesis: Origin of germ primordial cell in mammal, formation of spermatids, spermiogenesis. Fertilization: mechanism of fertilization, activation of ovum, amphimixis, post fertilization changes in egg, types and significance of fertilization.	12
III	Cleavage: types and patterns. Peculiarities of cell division involved in cleavage, significance of cleavage. Morulation and Blastulation: Blastulation in Amphioxus, Frog and Chick. Fate Map.	12
IV	Gastrulation: Germ layer differentiation. Epiboly, emboly/ invagination, involution. Extraembryonic membrane in chick. Tubulation.	12
V	Embryonic induction: Experimental evidences to induction, Characteristics of organizer, Types of organizers, Genic and Gradient theory of induction. Competence: Molecular biology of competence.	12

Name & Signature of Members of Board of Studies

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Part C - Learning Resource							
Text Books, Reference Books, Other Resources							
TEXT BOOKS Recommended : 6. Thomas W.S. (2014) Langman's Medical Embryology (13th edition) Lippincott, Williams & Wilkins, Baltimore. 7. Gary C.S.; Steven B.B.; Philip R.B. and Philippa H.F. (2014) Larsen's Human Embryology (5th edition) Elsevier. 8. Gilbert, S.F. (2016) Developmental Biology (11th edition) Sinauer. 9. Sastry, K.V. and Shukla Vinita (2018) Developmental Biology (2nd Revised Edition) Rastogi Publication. 10. Verma, P.S. and Agrawal V.K. (2014) Chordate Embryology (Developmental Biology) 4th Edition. S. Chand Publication. Reference Books : 3. Thomas W.S. (2014) Langman's Medical Embryology (13th edition) Lippincott, Williams & Wilkins, Baltimore. 4. Gary C.S.; Steven B.B.; Philip R.B. and Philippa H.F. (2014) Larsen's Human Embryology (5th edition) Elsevier. Online Resources: (e- Resources/ e- Books/ e- Learning Portals) https://www.eshiksha.mp.gov.in/mpdhe/course/view.php?id=254 https://www.sciencedirect.com/topics/medicine-and-dentistry/reproductive-biology							
Part D: Assessment and Evaluation							
Suggested Continuous Evaluation Methods: <table style="width: 100%;"> <tr> <td>Maximum Marks:</td><td style="text-align: right;">100 Marks</td></tr> <tr> <td>Continuous Comprehensive Evaluation (CCE):</td><td style="text-align: right;">20 Marks</td></tr> <tr> <td>Semester End Exam (SEE):</td><td style="text-align: right;">80 Marks</td></tr> </table>		Maximum Marks:	100 Marks	Continuous Comprehensive Evaluation (CCE):	20 Marks	Semester End Exam (SEE):	80 Marks
Maximum Marks:	100 Marks						
Continuous Comprehensive Evaluation (CCE):	20 Marks						
Semester End Exam (SEE):	80 Marks						

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COURSE CURRICULUM 2025-26

Internal Assessment: Continuous Comprehensive Evaluation(CCE)	Internal Test – 02 of 10 Marks each + 01 Assignment/Seminar of 10 Marks	Best of test and Assignment shall be considered against 20 marks
Semester End Exam (SEE)	Pattern -FOUR Section A, B, C, D Each section will consist of questions from all 5 Units, Section C and D will have internal choices. Section-A & B: Very short answer type question- 02x02 = 04 x 5unit = 20 Marks Section-C: Short answer type question 05 x 5 unit = 25 Marks Section-D: Long answer type question 07 x 5 unit = 35 Marks Total = 80 Marks	

Name & Signature of Members of Board of Studies

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Subject Expert	8. Dr. Divya K. Minj
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Lab Course: GECL07 Reproductive and Developmental Biology

Part A: Introduction			
Program: Bachelor in Science (Bio Group) Certificate/diploma/degree/honors		Class: B. Sc. Semester - VI	
		Session: 2025-2026	
1	Course Code	GECL07	
2	Course Title	Reproductive and Developmental Biology	
3	Course Type	General Elective Lab. Course	
4	Course Learning Outcome (CLO)	This Course will enable the students to: • Understand the functional anatomy of male and female reproduction and write the process of fertilization in reproductive biology. • Describe the gonadal hormones and the mechanism of hormones action in reproduction. • Explain the development of multicellular organisms from a single cell zygote. • Describe the history and different stages of embryonic development and its implications. • Identify the various developmental stages and the possible defects in growth.	
5	Credit Value	1C	1 credit =15 Hours – Learning and Observation
6	Total Marks	Maximum Marks : 50	Minimum Passing Marks:20
S.No.	List of Experiments		
1.	Identification of stages of oogenesis & spermatogenesis.		
2.	Histological study of gonads through permanent slides in vertebrates.		
3.	Study of extra-embryonic membrane in chick.		
4.	Study of embryological slides of Amphioxus/frog/chick.		

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Part C - Learning Resource
Text Books, Reference Books, Other Resources
TEXT BOOKS Recommended : 6. Thomas W.S. (2014) Langman's Medical Embryology (13th edition) Lippincott, Williams & Wilkins, Baltimore. 7. Gary C.S.; Steven B.B.; Philip R.B. and Philippa H.F. (2014) Larsen's Human Embryology (5th edition) Elsevier. 8. Gilbert, S.F. (2016) Developmental Biology (11th edition) Sinauer. 9. Sastry, K.V. and Shukla Vinita (2018) Developmental Biology (2nd Revised Edition) Rastogi Publication. 10. Verma, P.S. and Agrawal V.K. (2014) Chordate Embryology (Developmental Biology) 4th Edition. S. Chand Publication. Online Resources: (e- Resources/ e- Books/ e- Learning Portals) https://www.eshiksha.mp.gov.in/mpdhe/course/view.php?id=254 https://www.sciencedirect.com/topics/medicine-and-dentistry/reproductive-biology

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COURSE CURRICULUM 2025-26

Part D: Assessment and Evaluation	
Suggested Continuous Evaluation Methods:	
Maximum Marks: 50 Marks	
(Will include Internal assessment, Lab records and End Semester Viva/Voce and performance)	
Semester End Exam (SEE)	Laboratory performance: As per Dept. (LOCF)

Name & Signature of Members of Board of Studies

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