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

DEPARTMENT OF ZOOLOGY

B.Sc. Zoology
Honours
&
Honours with Research
VI Semester
(FYUGP/LOCF)

(Syllabus Based on UGC-LOCF Curriculum)

(2025 – 2026)

(Approved by Board of Studies)
Effective from July 2025-26
As Per provisions of NEP 2020 to be implemented from academic year 2022-23

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

Department of Zoology

Syllabus of FYUGP/LOCF Curriculum

B.Sc. Honours with Research Course

VI Semester Syllabus

Session: 2025-26

Sem	Course	Course Name	Credit	Lecture	Internal Marks	ESE Max Marks	M.M.
VI	DSC -VI	Applied Zoology	3	45	20	80	100
		Lab Course	1	15	-	-	50
	SEC-VI	Environmental Audit	2	30	10	40	50
	DSE -V	Animal Biotechnology	3	45	20	80	100
		Lab Course	1	15	-	-	50
	DSE -VI	Environment & Public Health	3	45	20	80	100
		Lab Course	1	15	-	-	50
Total			14	210	70	200	500

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

FYUGP (CBCS and LOCF Pattern)

Department of Zoology

Session: 2025-26	**Program: B.Sc.**
Semester: VI	**Subject: Zoology**
Course type: DSC- VI	**Course Code:**
Course Title : Applied Zoology	
Credit: 04 (03+01)	**Lecture – 60 (45+15)**
MM: 100 = (ESE 80+IA 20)	**Minimum Passing Marks: 40%**

Title	**Applied Zoology**
Course Learning Outcome:	• Provide knowledge on economic aspects of zoology. • Make available information on lucrative facets of animal rearing and goods obtained. • Familiarize the learner with apiculture, sericulture, aquaculture and Dairy with poultry farming features.
Program Specific Outcome:	• Foundation through skilled learning for entrepreneurship. • Acquire skills in developing economically viable ventures.

Unit	Lectures	Topics	Credits
I	10	**Aquaculture:**Induced breeding of fish; Management of hatchery of fish; Management of nursery, rearing and stocking ponds; Preparation and maintenance of fish aquarium; Preparation of compound diets for fish; Role of water quality in aquaculture; Fish diseases: Bacterial, viral and parasitic; Preservation and processing of harvested fish; Fishery by-products. Prawn farming; Culture of crab; Pearl culture.	0.75
II	10	**Silk and Silk Production (Sericulture)** Different types of silk and silkworms in India; Rearing of Bombyxmori, Rearing racks and trays, disinfectants, rearing appliances, black boxing, Chawki rearing, bed cleaning, mountages, harvesting of cocoons; Silkworm diseases: Pebrine, Flacherie, Grasserie, Muscardine and Aspergillosis, and their management; Silkworm pests and parasites: Uzi fly, Dermestid beetles and their management; Silk reeling techniques and Quality assessment of silk fibre.	0.75
III	10	**Apiculture** History, Classification and Biology of Honey Bees, Beehives – Newton and Langstroth, Methods of Extraction of Honey (Indigenous and Modern), Diseases and Enemies. Products of Apiculture Industry and its Uses (Honey, Bees Wax, Propolis), Pollen etc.	0.75
IV	15	**Dairy and Poultry Farming** Introduction; Indigenous and exotic breeds; Rearing, housing, feed and rationing; Commercial importance of dairy and poultry farming; Varietal improvement techniques; Diseases and their management; Dairy or poultry farm management and business plan; Visit to any dairy farm or Poultry farm.	0.75
Lab course	15	1. Maintenance of freshwater aquarium. 2. Study of the life cycle of different species of silk moths - *Bombyx mori*, *Philosamia ricini*,*Antherea paphia/Antherea mylitta*, *Antherea assama* and silk secreted by them. 3. Study of the sexual dimorphism in caterpillar, pupae and adults of *Bombyx mori*. 4. Identification of various types of natural silks. 5. Study of the structure of silk gland of mulberry silk worms.	01

		6. Study of different types of mountages from specimen/photographs. 7. Field study of Pisiculture sites of Rajnandgaon District. 8. Submission of report on anyone field visits related to Aquaculture/Apiculture/ Sericulture/Poultry/ Dairy farm. 9. Study of different types of bees (Queens, Drones and Worker bees). 10. Study of different types of pearls. 11. Study of different types of fish diseases. 12. Identification of different types of scales in fishes. 13. Study of different types of fins. 14. Study of different modified structures of fishes (Saw of sawfish, Hammer of hammer head fish, tail of sharks etc.)	
Recommended Books		• Sarkar, Kundu and Chaki. (2014)Introduction to Economic Zoology. NCBA • Publisher. • T.V.R. Pillay (Author), M.N. Kutty (2011) Aquaculture: Principles and Practices, Wiley India Pvt Ltd; Second edition. • Dhyan Singh Bisht, Apiculture, ICAR Publication. • Dunham RA (2004) Aquaculture and Fisheries Biotechnology – Genetic Approaches. CABI publications, U.K. • Hafez ESE (1962) Reproduction in Farm Animals. Lea and Fabiger Publishers. • Knobil E and Neill JD (2006) The Physiology of Reproduction. Vol.2. Elsevier Publishers, USA.	

Evaluation Scheme

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

Evaluation Scheme of Practical

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

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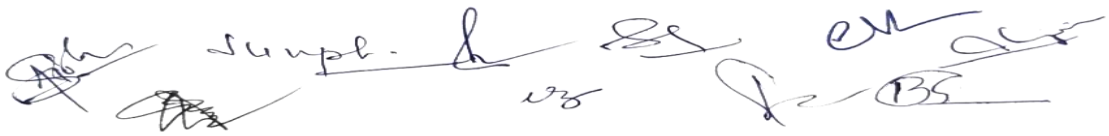

GOVT.DIGVIJAY AUTONOMOUS PG COLLEGE RAJNANDGAON (C.G.)

FYUGP (CBCS and LOCF Pattern)

Department of Zoology

Session: 2025-26	**Program: B.Sc.**
Semester: VI	**Subject: Zoology**
Course type: SEC- VI	**Course Code:**
Course Title : Environmental Audit	
Credit: 02	**Lecture – 30**
MM: 50 = (ESE 40+IA 10)	**Minimum Passing Marks: 40%**

Title	**Environmental Audit**
Course Learning Outcome:	An environmental audit is defined as a systematic, documented verification process of objectively obtaining and evaluating audit evidence to determine, whether specified environmental activities, events, conditions, management systems, or information about these matters conform with audit criteria, and communicating the results of this process.
Program Specific Outcome:	• To provide understanding by the students of general chronology of audit, audit strategy, audit program and audit procedures. • To provide comprehensive idea to the students on the ethical principles of audit profession. • To develop an appropriate documentation for an environmental impact statement and to introduce the types of audit reports. • To understand how the environmental commitments by industry can be monitored and audited. • How potential environmental impacts are described in Environmental Impact Assessments (EIA).

Unit	Lectures	Topics	Credits
I	07	**Understanding Pollution** Definition; pollution, Air Pollution: Air pollutants- Sources, primary and secondary pollutants and particulate matter, HAPs (hazardous air pollutants), Indoor pollution- different sources. Water Pollution: Sources- direct and indirect, impact of pollution on water bodies groundwaterpollution – sources and effects. Wastes: Source, characteristics, types, and fate of solid wastes. Metal pollution: Metals in soil, food and water, elementary idea on metal pollution.	0.50
II	07	Noise Pollution: General features, sources, noise classification, effects of sound pollution. Radiation Pollution: Man-made radiation, radiation hazards, nuclear accidents. Pesticide Pollution: Definition; sources, categories, pesticides in water and effects; elementary idea on IPM. Soil Pollution: Sources, types, effects of soil pollution.	0.50
III	07	**Protection of Environment** International concerns and efforts for environmental protection; role of United Nations; Stockholm summit; priority issues; Rio Summit: Sustainable development; Earth day; Environment day; Ecotourism.	0.50
IV	09	**Environmental Audit** Introduction: Definition; types of auditing, Features of Effective Auditing, Programme planning and organization of Auditing Programme, Pre-visit data collection, Auditing Protocol, Onsite Audit; Data Sampling; Inspection, Evaluation and Presentation, Audit Report;	0.50

		Action Plan, Management of Audit, Benefits of Environmental Audit, Environmental Audit Programme in India.	
Recommended Books		• Vasudevan, N. (2006) Essentials of Environmental Science. Narosa Publishing house, Delhi. • Liu, J, Zhang, L, Liu, Z (2017) Environmental Pollution Control • Srivastava, A.K. (2003) Environmental Auditing, A.P.H. Publishing Corporation, ISBN 81-7648-443-1. • CPCB (1997) "Pollution Control acts, Rules and Notifications issues there under "Pollution Control Series – PCL/2/1992, Central Pollution Control Board, Delhi. • Barrow, C.J. (2005) Environmental Management and Development, Taylor & FrancisGroup. Tiwari RK (2007) Global Environmental Policies. ABD Publishers.	

Evaluation Scheme

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

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

FYUGP (CBCS and LOCF Pattern)

Department of Zoology

Session: 2025-26	**Program: B.Sc.**
Semester: VI	**Subject: Zoology**
Course type: DSE- V	**Course Code:**
Course Title : Animal Biotechnology	
Credit: 04 (03+01)	**Lecture – 60 (45+15)**
MM: 100 = (ESE 80+IA 20)	**Minimum Passing Marks: 40%**

Title	**Animal Biotechnology**
Course Learning Outcome:	Biotechnology is the advanced branch of biological sciences which mostly deals with technological application on biological systems. It is basically the management of biological processes for industrial and other human welfare purposes. The present paper on biotechnology attempts to give a wholesome idea of biotechnology at a basic level. It provides a tool kit in the form of a number of various techniques and processes developed over time to solve problems involving primarily human welfare with focus on health and medicine.
Program Specific Outcome:	• Use or demonstrate the basic techniques of biotechnology like DNA isolation, PCR, transformation, restriction digestion etc. • Make a strategy to manipulate genetic structure of an organism for the improvement in any trait or its well-being based on the techniqueslearned during this course. • Understand better the ethical and social issues regarding GMOs. • Use the knowledge for designing a project for research and execute it.

Unit	Lectures	Topics	Credits
I	10	**Introduction and Techniques in Gene manipulation** Concept and Scope of Biotechnology, Outline process of genetic engineering and recombinant DNA technology, Isolation of genes, Concept of restriction and modification: Restriction endonucleases, DNA modifying enzymes, Cloning Vectors: Plasmids, Phage vectors, Cosmids, Phagemids, BAC, YAC, HAC. Shuttle and Expression Vectors**,** Construction of Genomic libraries and cDNA libraries, Transformation techniques: microbial, plants and animals: Cloning in mammalian cells, Integration of DNA into mammalian genome-Electroporation and Calcium, Phosphate Precipitation method.	0.75
II	10	**Animal cell Culture** Basic techniques in animal cell culture and organ culture, Primary Culture and Cell lines, Culture media- Natural and Synthetic, Stem cells, Cryopreservation of cultures. Agarose and Polyacrylamide Gel Electrophoresis, Southern, Northern and Western blotting, DNA sequencing: Sanger method, Polymerase chain reaction, DNA Fingerprinting and DNA microarrays.	0.75
III	10	**Fermentation** Different types of Fermentation: Submerged & Solid state; batch, Fed batch & Continuous; Stirred tank, Air Lift, Fixed Bed and Fluidized, Downstream Processing: Filtration, centrifugation, extraction, chromatography, spray drying and lyophilization	0.75
IV	15	**Transgenic Animal Technology and Application in Health** Production of transgenic animals: nuclear transplantation, retroviral method, DNA microinjection method, Dolly and Polly, Development of recombinant Vaccines, Hybridoma technology, Gene Therapy,	0.75

		Production of recombinant Proteins: Insulin and growth hormones.	
Lab course	15	1. Packing and sterilization of glass and plastic wares for cell culture. 2. Preparation of culture media. 3. Preparation of genomic DNA from E. coli/animals/ human. 4. Plasmid DNA isolation (pUC 18/19) and DNA quantitation using agarose gel electrophoresis (by using lambda DNA as standard). 5. Restriction digestion of lambda (λ) DNA using EcoR1 and Hind III. 6. Preparation of competent cells and Transformation of E. coli with plasmid DNA using 7. CaCl2, Selection of transformants on X-gal and IPTG (Optional). 8. Techniques: Western Blot, Southern Hybridization, DNA Fingerprinting, PCR, DNA 9. Microarrays. 10. To demonstrate following techniques: (Optional) a. Southern/ Northern/Western blotting (Any one) b. PCR c. DNA fingerprinting d. DNA Sequencing (Sanger's Method) 11. Project report on animal cell culture OR on a visit to any biotechnology Institute.	01
Recommended Books		• Brown, T.A. (2010) Gene Cloning and DNA Analysis. VI Edition,Wiley-Blackwell publishing (Oxford, UK), ISBN: 978-1-4051-8173-0. • Glick, B.R., Pasternak, J.J. and Patten, C.L. (2010). Molecular Biotechnology - Principles and Applications of Recombinant DNA. IV Edition, ASM press, Washington, USA. ISBN: 978-1- 55581-498-4 (HC). • Primrose, S.B., and Twyman, R. M. (2006). Principles of Gene Manipulation and Genomics.VIIEdition, Blackwell publishing (Oxford, UK) ISBN: 13: 978-1-4051-35443.	

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Evaluation Scheme of Practical

Practical	Experiment 01	12
	Experiment 02	08
	Experiment 03	04
	Spotting	16
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Total -		**50**

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FYUGP (CBCS and LOCF Pattern)

Department of Zoology

Session: 2025-26	**Program: B.Sc.**
Semester: VI	**Subject: Zoology**
Course type: DSE-VI	**Course Code:**
Course Title : Environment & Public Health	
Credit: 04 (03+01)	**Lecture – 60 (45+15)**
MM: 100 = (ESE 80+IA 20)	**Minimum Passing Marks: 40%**

Title	**Environment & Public Health**
Course Learning Outcome:	Health is wealth but this wealth is directly affected by the environment. Environmental issue that affects human health is the most important trigger that has led to the urgency of conservation of environment. All the aspects of human health, including quality of life are determined by physical, chemical, biological, social and psychological factors in environment. The sustenance of environment is the key to development of future of mankind.
Program Specific Outcome:	• Get familiarized with various aspects of environmental risks and hazards. • Recognize the climate change due to human activities. • Be aware about the various impacts of environmental degradation on human health through case studies and how it can be prevented. • Learn about the nuclear and chemical disasters and their after effects through cases studies. • Know various waste management technologies and their utility.

Unit	Lectures	Topics	Credits
I	10	**Introduction-** Sources of Environmental hazards, Hazard identification and accounting, Bioaccumulation, Biomagnification, Dose Response Evaluation, exposure Assessment.	0.75
II	10	**Climate Change** Greenhouse gases and global warming, Acid rain, Ozone layer destruction, *El Nino La Nina*, Southern Oscillation (ENSO), Effect of climate change on public health.	0.75
III	10	**Pollution** Air, water, noise pollution: Sources, effects and control Smog: Causes and its effect on human health, Effect of noise on Human health, Water borne diseases, Respiratory ailments (Asthma). Nuclear accidents and holocaust. Case Histories and their aftermath of: Bhopal gas tragedy, Chernobyl disaster, Seveso disaster and Three Mile Island accident.	0.75
IV	15	**Waste Management Technologies** Classification and Characteristics of solid and hazardous waste, Sewage treatment and its management, Solid waste management, Handling and disposal: Biomedical waste and Nuclear waste, Health risk due to hazardous waste (Minamata disease). Causes, symptoms and control of tuberculosis, Vector borne diseases (Dengue, Malaria), Typhoid, Cholera, Cancer, Infectious diseases.	0.75
Lab course	15	1. To determine pH, Cl, SO_4 , NO in soil samples from different locations. 2. To determine pH, Cl, SO_4, NO_3 in water samples from different locations. 3. To determine dissolved oxygen in water samples collected from different water bodies by Winkler's Method.	1

		4. To measure the COD of water sample from various sources. 5. To study the methods adopted for segregation of domestic and hospital wastes into different categories. 6. A report based on a visit to thermal power plant/ solid waste management site/ Sewage Treatment Plant.	
Recommended Books		1. Vasudevan, N. (2006)., Essentials of Environmental Science, Narosa Publishing house, Delhi, 2. Park, K., Parks (2016). Text Book of Preventive & Social Medicine, 23rd Edition, Banarsidas Bhanot Publishers 3. N. S. Subrahmanyam and A. V. S. S. Sambamurty (2017). Ecology, Second Edition Reprint Narosa Publishing house, ISBN: 978-81-7319-740-6. 4. Kolluru Rao, Bartell Steven, Pitblado R and Stricoff (1996). Risk Assessment and Management Handbook. McGraw Hill Inc., New York. 5. Kofi Asante Duah (1998). Risk Assessment in Environmental Management. John Wiley and sons, Singapore.	

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	Viva	05
	Sessional	05
Total -		**50**

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