Darrang College (Autonomous), Tezpur-784001

Syllabus for FYUGP

B.Sc. Zoology (SEC)

Approved by :

Board of Studies meeting held on 31-07-2025

&

Academic Council vide Resolution no. 04, dated- 12-08-2025

FOUR-YEAR UNDERGRADUATE PROGRAMME (FYUGP) IN ZOOLOGY, Darrang College (Autonomous)

Introduction:

The Zoology syllabus at Darrang College (Autonomous) has been developed in accordance with the visionary framework of the National Education Policy (NEP) 2020, which advocates for a holistic, multidisciplinary and adaptable education system grounded in Indian values and aimed at cultivating globally competent individuals.

This curriculum is designed to equip students with a solid understanding of the principles and applications of Zoology, while encouraging scientific thinking, critical analysis, creativity and problem-solving skills. In line with NEP 2020, it incorporates flexible entry and exit points, skill-based learning, interdisciplinary connections and continuous formative assessments.

The programme follows a learner-centric structure that integrates core theoretical concepts, hands-on laboratory training, environmental and ethical awareness, and the enhancement of communication and research capabilities. It ensures students not only acquire zoological knowledge but also learn to apply it responsibly in real-life situations, thereby supporting sustainable development and societal well-being.

Darrang College (Autonomous) remains committed to academic excellence, innovation and contributing to nation-building by preparing students to tackle the scientific and technological demands of the modern world.

The Four-Year Undergraduate Programme (FYUGP) in Zoology is crafted to foster comprehensive and in-depth understanding of biological sciences, while encouraging interdisciplinary engagement, research orientation and employability. It aims to develop students' foundational knowledge, technical proficiency and ethical consciousness, preparing them for roles in academia, industry and society.

Aims of the Four-Year Undergraduate Programme (FYUGP) in Zoology:

The FYUGP in Zoology is designed with the following core objectives:

1. To build a solid foundation in the fundamental principles of Zoology and their applications across various branches, including Cell and Molecular Biology, Animal Physiology, Biochemistry, Fish Biology and Fishery Science, Animal Ecology, Wildlife Biology, Immunology, Entomology and Animal Biotechnology.
2. To cultivate critical thinking, scientific reasoning and analytical abilities, enabling students to address scientific challenges with both creativity and systematic approaches.
3. To promote hands-on learning through laboratory experiments, fieldwork and research activities, fostering innovation, curiosity and practical competence.
4. To encourage interdisciplinary learning and curricular flexibility, in line with NEP 2020, by facilitating connections between Zoology and other disciplines such as Botany, Biotechnology, Physics, Chemistry, Environmental Science, Materials science and computational fields.
5. To strengthen communication abilities and ethical awareness, empowering students to share scientific knowledge effectively and apply it responsibly for societal and environmental benefit.
6. To prepare students for a variety of career opportunities—including higher education, research, teaching, industry, entrepreneurship and public service—through skill-based training and value-added courses.
7. To nurture a mindset of lifelong learning and intellectual curiosity aligned with the broader goal of developing capable, compassionate and self-reliant individuals who can contribute meaningfully to national and global progress.

Through these aims, the FYUGP in Zoology at Darrang College seeks to develop graduates who are not only proficient in the Zoology, but also engaged citizens dedicated to sustainable and inclusive development.

Programme Outcome (PO) of (FYUGP) in Zoology:

- PO1 - Students gain knowledge and skill in the fundamentals of animal sciences, understands the complex interactions among various living organisms.
- PO2 – Students gain knowledge about various animals of different phyla, their distribution and their relationship with the environment.
- PO3 – Understanding the importance of conservation works related to environment and biodiversity .
- PO4 – Foster practical competencies by integrating field visits and hands-on training in real vermicomposting units.
- PO6 - Apply ethical principles and commit to professional ethics and responsibilities in delivering his duties.
- PO7 – Promote awareness of laboratory ethics and safety standards, preparing students for higher- level research environments.
- PO8- Apply the knowledge and understanding of Zoology to one's own life and work.
- PO9- Empower students with vocational skills in vermitechnology and organic agriculture for potential employment or entrepreneurship.
- PO10- Contribute to national priorities like Swachh Bharat, sustainable agriculture, and Atmanirbhar Bharat through skill-based biological education.

Teaching-Learning Process:

The Four-Year Undergraduate Programme (FYUGP) in Zoology adopts a diverse range of pedagogical methods to enhance student engagement and understanding, both in classroom settings and laboratory environments. These include:

- Traditional lectures
- Tutorials for concept clarification
- PowerPoint presentations for visual learning
- Project work and dissertations to encourage independent research
- Participation in seminars, workshops, and conferences for academic exposure

- Industry visits and field trips to connect theoretical knowledge with real-world applications

Teaching-Learning Tools:

To support effective delivery of the curriculum, a variety of instructional tools are utilized:

- Whiteboard/Green board/Blackboard
- LCD projectors and monitors
- Smart boards for interactive teaching
- Demonstration models
- Laboratory experiments to reinforce practical learning
- Industry and field visits for experiential learning

Assessment Methods:

Student progress is continuously evaluated through a combination of formative and summative assessment techniques, including:

- Home assignments
- Reports based on projects, industry visits, or fieldwork
- Seminar presentations to develop communication skills
- In-semester/Sessional examinations (both theory and practical)
- End-semester examinations (theory and practical)

CURRICULUM COMPONENTS

Distribution of Credits in first 3 years

Serial No.	Type	Credit
1	Major (15 x 4)	60
2	Minor (6 x 4)	24
3	AEC (4+4)	08
4	SEC (3+3+3)	09
5	MDC (3+3+3)	09
6	VAC (2+2+2)	06
7	Internship	04
	Total	120

1 CREDIT = 15 hours (one hour of classroom instruction per week)

B.Sc. Course distribution for first year

Semester-1			Semester-2		
Type	Course	Credit	Type	Course	Credit
Major	Major-1	4	Major	Major-2	4
Minor	Minor-1	4	Minor	Minor-2	4
SEC	SEC-1 (Major oriented) *	3	SEC	SEC-2 (Major oriented) *	3
AEC	AEC-1 (Languages/Alt. English)	4	AEC	AEC-2 (English Communication)	4
MDC	MDC-1	3	MDC	MDC-2	3
VAC	VAC-1	2	VAC	VAC-2	2
	Total	20		Total	20

NEP-FYUGP Course Distribution for Honours in Zoology

Year	Semester	Course Title	Paper Code	Credit
Year 01	1st Semester	Zoology-1	ZOO-MJ-01014	4
		Zoology-1	ZOO-MN-01014	4
		SEC-1	ZOO-SEC-01013	3
	2nd Semester	Zoology-2	ZOO-MJ-02014	4
		Zoology-2	ZOO-MN-02014	4
		SEC-2	ZOO-SEC-02013	3

FYUGP 1st Semester Skill Enhancement Course
Zoology
Detailed Syllabus of 1st Semester

Title of the Course	Zoology –I/ Basics of Laboratory Practices in Zoology
Paper Code	**ZOO-SEC-01013**
Teaching Method	**L-T-P**
Total Credits	**3 (Theory: 02, Practical: 01)**
Distribution of Marks	30 (End Semester Theory) + 25 (End Semester Practical) + 20 (Internal)
Course Outcomes	By the end of this course/module, students will be able to: ➢ CO1: Identify various types of biological laboratories and demonstrate knowledge of specimen cataloging and taxidermy techniques. (Cognitive Level: Remembering & Understanding) ➢ CO2: Explain the principles and uses of common bio-instruments such as microscopes, colorimeters, autoclaves, and pH meters. (Cognitive Level: Understanding, Skill development) ➢ CO3: Apply mathematical skills in preparing different types of chemical solutions like molar, normal, and buffer solutions. (Cognitive Level: Applying, Skill development) ➢ CO4: Demonstrate calibration and use of laboratory instruments with accuracy and precision. (Cognitive Level: Applying, Skill development) ➢ CO5: Analyze laboratory safety protocols and evaluate proper storage and handling procedures for chemicals and reagents. (Cognitive Level: Analyzing & Evaluating) ➢ CO6: Prepare and present a field/project report on an advanced laboratory visit, integrating observational data and practical understanding. (Cognitive Level: Creating)
Contact hours	**30 (Theory) + 30 (Practical)**

SEC
Basics of Laboratory Practices in Zoology
CODE- SEC01013
CREDIT- 3 (2+1)

THEORY **Credit- 2/ Hours- 30**

UNIT	CONTENT	HOURS
Unit 1	**Introduction to Biological Laboratories** ➢ Types of Biological laboratories. ➢ Practical notebook maintenance. ➢ Glassware cleaning & Maintenance of lab instruments. ➢ Museum specimens: Cataloguing and preservation through taxidermy.	8
Unit 2	**Solution preparation** ➢ General Math skills in reagent preparation ➢ Percent solutions, molarity, molality, normality, buffer solutions, reagents, and stains.	7
Unit 3	**Bioinstrumentation** ➢ Basics of pH meter, Autoclave, Incubator & Laminar air flow. ➢ Principles and Applications of Microscopy, Microtomy, Colorimetry, Chromatography, Electrophoresis and Centrifugation	8
Unit 4	**Laboratory safety** ➢ Basics of laboratory safety. ➢ Handling and storage of chemicals and reagents, precautions in handling hazardous chemicals.	7

PRACTICALS (CREDIT- 1)	Hours

1. Instrument calibration- Microscope (simple and compound), pH meter, Autoclave, Incubator, Centrifuge, Colorimeter, Microtome.
2. Handling of Pipettes: Pasteur's Pipette, Glass Pipette & Micropipette **30**
3. Preparation of buffers, stains and reagents
4. Submission of project report on visit to Biological advanced laboratory.

Suggested Readings:

1. Ananta Swargiary. Biological Tools and Techniques. Kalyani Publications.
2. S.C. Nigam and Omkar. Experimental Animal Physiology and Biochemistry. New Age International Publishers.
3. Gerardus Blokdyk. Good Laboratory Practice - A complete guide. 5 Star Cooks Publishers.

Unit	Content	Lecture	Tutorial	Practical	Total hours
1	**Introduction to Biological Laboratories** ➢ Types of Biological laboratories. ➢ Practical notebook maintenance. ➢ Glassware cleaning & Maintenance of lab instruments. ➢ Museum specimens: Cataloguing and preservation through taxidermy.	**08**	**--**	**--**	**08**
2	**Solution preparation** ➢ General Math skills in reagent preparation ➢ Percent solutions, molarity, molality, normality, buffer solutions, reagents, and stains.	**07**	**--**	**--**	**07**
3	**Bioinstrumentation** ➢ Basics of pH meter, Autoclave, Incubator & Laminar air flow. ➢ Principles and Applications of Microscopy, Microtomy, Colorimetry, Chromatography, Electrophoresis and Centrifugation	**08**	**--**	**--**	**08**

4	**Laboratory safety** ➢ Basics of laboratory safety. ➢ Handling and storage of chemicals and reagents, precautions in handling hazardous chemicals.	**07**	**--**	**--**	**07**
5	**Practical** **1.** Instrument calibration- Microscope (simple and compound), pH meter, Autoclave, Incubator, Centrifuge, Colorimeter, Microtome. **2.** Handling of Pipettes: Pasteur's Pipette, Glass Pipette & Micropipette **3.** Preparation of buffers, stains and reagents **4.** Submission of project report on visit to Biological advanced laboratory.	**--**	**--**	**30**	**30**

SEC

Vermicomposting and Organic Farming

CODE-(ZOO-SEC-02013) (based on Bloom' s Taxonomy)

CREDIT- 3 (2+1)

Title of the Course	Zoology –II/ Vermicomposting and Organic Farming
Paper Code	**ZOO-SEC-02023**
Teaching Method	**L-T-P**
Total Credits	**3 (Theory: 02, Practical: 01)**
Distribution of Marks	30 (End Semester Theory) + 25 (End Semester Practical) + 20 (Internal)
Course Outcomes	By the end of this course/module, students will be able to: ➢ CO1: Identify different types of biodegradable organic wastes suitable for vermicomposting. (Cognitive Level: Remembering) ➢ CO2: Understand the biology, ecology, and selection criteria of

	earthworm species appropriate for vermicomposting. (Cognitive Level: Understanding) ➢ CO3: Apply appropriate methods to set up and maintain vermicomposting units at small and large scale levels. (Cognitive Level: Applying) ➢ CO4: Analyze the physico-chemical characteristics of vermicompost and assess compost maturity using scientific parameters like C/N and C/P ratio. (Cognitive Level: Analyzing) ➢ CO5: Evaluate the role of organic farming in sustainable agriculture, including its relevance, advantages, disadvantages, and real-life success stories. (Cognitive Level: Evaluating) ➢ CO6: Create strategies for entrepreneurship through vermicomposting and organic farming as viable self-employment options. (Cognitive Level: Creating).
Contact hours	**30 (Theory) + 30 (Practical)**

Vermicomposting and Organic Farming
Paper Code- ZOO- SEC02013
Total Credit-3 (2+1)

THEORY **CREDIT-2/ HOURS- 30**

UNIT	CONTENT	HOURS
Unit 1	**Introduction to Vermicomposting** Vermicomposting - Definition, history, scope, economic importance. Significance of vermicompost in the maintenance of soil structure and management of solid organic wastes with special reference to four R's principles.	7
Unit 2	**Vermicomposting Types and Methods** Types of vermicomposting- Bed method, pit method, tank method, roof shed method and bin method. Setting up Vermicomposting Unit- Basic Requirements and maintenance, Preparation of vermicomposting bed, small and large scale vermicomposting; Size and dimensions of the vermicomposting unit.	8

	Earthworm Species for Vermicomposting Criteria for selecting suitable earthworm species for vermicomposting, Ecological Categories of Earthworms, Local and Exotic species of earthworms frequently used in vermicomposting, Enemies of earthworms.	
Unit 3	**Principles of Vermicomposting, Harvesting Techniques and its application** Phases of vermicomposting- Initial activation, thermophilic, mesophilic. Factors affecting vermicomposting process - pH, temperature, moisture content and total organic carbon. Techniques of harvesting vermicompost and earthworms. Humification index, C/N ratio, C/P ratio as maturity assessment of vermicompost. Post Harvest preservation and application strategies.	8
Unit 4	**Organic Farming** Introduction- Basic concept, principles, history, scope, importance and relevance in Indian Agriculture System. Component of organic farming; Green manuring and organic fertilizers. Organic insecticides and pesticides; Case studies and success stories. Advantages and disadvantages of organic farming. Recent development in organic farming with special reference to GMO.	7

PRACTICALS (CREDIT- 1)	Hours
1. Maintenance of earthworm culture for vermicomposting. 2. Physico-Chemical characterization of vermicompost. 3. Preparation of vermi tea and vermi-wash. 4. Visit to vermicomposting unit and submission of report.	**30**

SUGGESTED READINGS:

- Tripathi, Y. C., Hazaria, P., Kaushik, P. K., & Kumar, A. (2005). Vermitechnology and waste management. Verms and Vermitechnology, SB Nangia. APH Publishing Corp., New Delhi.
- Edwards, C. A., & Lofty, J. R. (1977). Biology of Earthworms, Chapman and Hall. London, UK.
- Lee, K. E. (1985). Earthworms: their ecology and relationships with soils and land use. Academic Press Inc. Sydney, Australia.
- Munroe, G. (2007). Manual of on-farm vermicomposting and vermiculture. Organic Agriculture Centre of Canada.

- Singh, K., Nath, G., Shukla, R. C., Bhartiya, D. K. (2014). A Textbook of Vermicompost: Vermiwash and Biopesticides. Astral International, New Delhi.

Unit	Content	Lecture	Tutorial	Practical	Total hours
1	**Introduction to Vermicomposting** Vermicomposting - Definition, history, scope, economic importance. Significance of vermicompost in the maintenance of soil structure and management of solid organic wastes with special reference to four R's principles.	**07**	**--**	**--**	**07**
2	**Vermicomposting Types and Methods** Types of vermicomposting- Bed method, pit method, tank method, roof shed method and bin method. Setting up Vermicomposting Unit- Basic Requirements and maintenance, Preparation of vermicomposting bed, small and large-scale vermicomposting; Size and dimensions of the vermicomposting unit. **Earthworm Species for Vermicomposting** Criteria for selecting suitable earthworm species for vermicomposting, Ecological Categories of Earthworms, Local and Exotic species of earthworms frequently used in vermicomposting, Enemies of earthworms.	**08**	**--**	**--**	**08**
3	**Principles of Vermicomposting, Harvesting Techniques and its application** Phases of vermicomposting- Initial activation, thermophilic, mesophilic. Factors affecting vermicomposting process - pH, temperature, moisture content and total organic carbon. Techniques of harvesting vermicompost and earthworms. Humification index, C/N ratio,	**08**	**--**	**--**	**08**

	C/P ratio as maturity assessment of vermicompost. Post-Harvest preservation and application strategies.				
4	**Organic Farming** Introduction- Basic concept, principles, history, scope, importance and relevance in Indian Agriculture System. Component of organic farming; Green manuring and organic fertilizers. Organic insecticides and pesticides; Case studies and success stories. Advantages and disadvantages of organic farming. Recent development in organic farming with special reference to GMO.	**07**	**--**	**--**	**07**
5	**Practical** 1. Maintenance of earthworm culture for vermicomposting. 2. Physico-Chemical characterization of vermicompost. 3. Preparation of vermi tea and vermi-wash. 4. Visit to vermicomposting unit and submission of report.	**--**	**--**	**30**	**30**