

**KAVAYITRI BAHINABAI CHAUDHARI NORTH
MAHARASHTRA UNIVERSITY, JALGAON**

॥ अंतरी पेटवू ज्ञानज्योत ॥



Faculty: Science and Technology

**Semester wise Code structure and Syllabus for
Bachelor of Science
(Honors and Honors with Research)**

F. Y. B. Sc. Zoology

As per NEP2020 for Affiliated Colleges

**With Effect From
June 2024**

Program at a Glance

Name of the program (Degree)	: B. Sc.
Subject	: Zoology
Faculty	: Science and Technology
Duration of the Program	: Three years (four semesters) / Four years (six semesters)
Medium of Instruction and Examination	: English
Credits of the program	: Total 176 credits
Examination Pattern	: The 30: 20 (30 marks University assessment (exam) and 20 marks continuous internal college assessment (exam))
Evaluation mode	: CGPA
Passing standards	: The 40% in each exam separately (separate head of passing)
Result	: As per the University's rules of CGPA system

1. Introduction to Program in B.Sc. (Hons. / Hons. With Research) Zoology

Welcome to the Graduate Program in Zoology! Our program offers an exciting and comprehensive curriculum designed to equip students with the knowledge, skills, and practical experience necessary to understand and contribute to the fascinating field of zoology. Zoology encompasses the study of animal life in all its diversity, from microscopic organisms to complex vertebrates.

As a graduate student in Zoology, you will have the opportunity to delve deep into the intricacies of animal biology, behavior, evolution, and ecology. Our program emphasizes a multidisciplinary approach, combining theoretical knowledge with hands-on experiences in the field and laboratory settings. You will have access to state-of-the-art facilities, research opportunities, and a dedicated faculty who are passionate about sharing their expertise and mentoring the next generation of zoologists.

Throughout your journey in our program, you will develop a strong foundation in core zoological concepts. You will explore topics such as taxonomy, physiology, anatomy, evolution, animal behavior, and ecological interactions. You will also gain a comprehensive understanding of the principles and methodologies employed in the study of animals, including data collection, analysis, and interpretation.

Fieldwork and practical experiences are integral to our program. You will have the opportunity to engage in field expeditions, ecological surveys, and hands-on research projects. These experiences will allow you to observe and study animals in their natural habitats, contributing to our understanding of biodiversity, conservation, and the ecological dynamics of various ecosystems.

Communication and critical thinking skills are emphasized throughout the program. You will learn to effectively communicate scientific concepts, both in written and verbal forms, and present your research findings to diverse audiences. We also encourage collaboration and interdisciplinary approaches, as zoology intersects with numerous other scientific disciplines, including genetics, ecology, physiology, and conservation biology.

Our program is designed to prepare you for a wide range of career paths. Whether you aspire to pursue further studies, conduct cutting-edge research, or work in fields such as wildlife management, conservation, education, or science communication, the Graduate Program in Zoology will provide you with the necessary skills and knowledge to succeed. You will also develop a deep appreciation for the ethical considerations associated with studying and working with animals and contribute to the responsible stewardship of our natural world.

We are excited to have you join our vibrant and dynamic community of zoologists. Together, we will explore the wonders of the animal kingdom, push the boundaries of scientific knowledge, and make meaningful contributions to the field of zoology. Get ready for an enriching and transformative journey in the Graduate Program in Zoology!

UG Department of ZOOLOGY - Programme Outcomes (PO)

PO No.	On completion of B.Sc. Degree programme, the graduates will be able to
PO-1	Thorough knowledge and understanding of the theories, models, concepts and principles of zoology and related zoological applications.
PO-2	Recognize the relationship between parts of different species, our physical, biological and cultural environment.
PO-3	Gain an understanding of the evolutionary history and key characteristics of animal groups.
PO-4	Understanding and critical analysis of population processes, dynamics and interactions, and related models.
PO-5	Comprehend the ecosystem, biogeography, diversity, and correlation with climatic, paleo-historic and evolutionary factors.

Programme Specific Outcomes (PSO)

PSO No.	On completion of B.Sc. Zoology Degree Programme, the graduates will be able to:	Mapping
PSO-1	To know the basic principles of zoology. Recognition, the relationship between structure and function, and biological organization of animals.	PO-2
PSO-2	Analyze animal theory, classification, form and function, and evolution, and compare the structures of prokaryotes and eukaryotes.	PO-3
PSO-3	Understand the diversity of animals with taxonomy and the classification of animals with diagnostic features.	PO-2
PSO-4	Apply knowledge and understanding of conservation and restoration Biodiversity, ecological integrity, and health.	PO-5
PSO-5	To understand practical biological sciences such as sericulture, Fish farming and beekeeping	PO-1
PSO-6	Collect, record and analyze data using relevant environmental, genetic, Physiological methods in the field and in the laboratory.	PO-3
PSO-7	Effectively use information technology systems to analyze and interpret Review of information and evidence.	PO-3
PSO-8	Develop writing skills required in this program; publish research papers, oral presentations and conference posters.	PO-1
PSO-9	Describe the molecular and cellular basis of animal physiological functions.	PO-3
PSO-10	Provide innovative skills which will enable the knowledge and skills required for employment.	PO-2
PSO-11	Perform practical skills in the areas of basic and applied zoology	PO-1

➤ **Curriculum in subjects has to follow these Model Program Structures. The Terminology used in these Program Structures is as under;**

- ✓ Discipline Core (DSC) refers to Core Courses/Papers in a Core Discipline/ Subject
- ✓ Discipline Elective (DSE) refers to Elective Courses/Papers in the Core Subject or Discipline.
- ✓ Open Elective (OE) refers to Elective Courses/Papers in a non-core Subject across all disciplines.
- ✓ Program Structures also contain Ability Enhancement Compulsory Courses (AECC), Languages,
- ✓ Skill Enhancement Courses (SEC) (Both skills and value-based).

Pedagogy involves L+T+P model. Generally subjects with practical involve L+P, while the subjects without practical involve L+T model. The numbers in parentheses indicate credits allotted to various courses/papers as per definitions of Choice Based Credit System (CBCS). Generally 1 hour of Lecture or 2 hours of practical per week in a semester is assigned one credit. Generally core subject theory courses/papers will have 3 or 4 credits, while practical are assigned 2 or 3 credits

Subject prerequisite: To study ZOOLOGY at the bachelor's level, a student must study Biology or any other equivalent subject in class 12th.

Duration

The duration of the B.Sc. degree program shall consist of three academic years divided into four semesters / four academic years divided into six semesters. Each Semester consists of 90 working days. Each theory and practical course should be completed in about 30 lectures (a 2-credit theory course should be completed in 30 lectures).

Medium of instruction

The medium of instruction and examination for each course shall be English.

Credit to contact hour

One credit is equivalent to 15 periods of 60 minutes each for a theory course lecture. One credit is equivalent to 30 periods of 60 minutes each for a practical course.

Attendance

The student enrolled for B.Sc. Zoology must have 75% attendance in each course in order to appear for term-end examinations, otherwise, the candidate may not be allowed to appear for term end examination as per ordinance.

Cognitive levels ranked are as under

Remembering,
Understanding,
Applying,
Analyzing,
Evaluating,
Creating

Credit distribution structure for Three/ Four year Honors/ Honors with Research Degree Programme with Multiple Entry and Exit

Level	Sem	Major Core Subjects		Minor Subjects (MIN)	VSC, SEC (VSEC)	GE/OE	AEC, VEC, IKS	CC, FP, CEP, OJT/Int/RP	Cumulative Credits/Sem	Degree/ Cumulative Credit
		Mandatory (DSC)	Elective (DSE)							
4.5	I	DSC-1(2T) DSC-2(2T) DSC-3(2T)	---	MIN-1(2T) MIN-2(2P)	SEC-1(2T)	OE-1(2T)	AEC-1(2T) (Eng) VEC-1(2T) (ES) IKS(2T)	CC-1(2T)	22	UG Certificate 44
	II	DSC-4(2T) DSC-5(2T) (IKS) DSC-6(2T)	---	MIN-3(2T) MIN-4(2P)	SEC-2(2T) SEC-3(2P)	OE-2(2T)	AEC-2(2T) (Eng) VEC-2(2T) (CI)	CC-2(2T)	22	
	Cum. Cr.	12	---	8	6	4	4+4+2	4	44	
Exit option: Award of UG Certificate in Major with 44 credits and an additional 4 credits core NSQF course/ Internship OR Continue with Major and Minor.										
5.0	III	DSC-7(2T) DSC-8(2T) DSC-9(2P) DSC-10(2P)	---	MIN-5(2T) MIN-6(2P)	VSC-1(2T) VSC-2(2P)	OE-3(2T)	AEC-3(2T) (MIL)	CC-3(2T)	22	UG Certificate 88
	IV	DSC-11(2T) DSC-12(2T) DSC-13(2P) DSC-14(2P)	---	MIN-7(2T) MIN-8(2P)	---	OE-4(4T)	AEC-4(2T) (MIL)	CC-4(2T) CEP (2T)	22	
	Cum. Cr.	28	---	16	6+4	10	8+4+2	8+2	88	
Exit option: Award of UG Diploma in Major and Minor with 88 credits and an additional 4 credits core NSQF course/ Internship OR Continue with Major & Minor.										
5.5	V	DSC-15(2T) DSC-16(2T) DSC-17(2T) DSC-18(2P) DSC-19(2P)	DSE-1(2T) DSE-2(2P)	MIN-9(2T)	VSC-3(2P)	---	---	FP (4)	22	UG Degree 132
	VI	DSC-20(2T) DSC-21(2T) DSC-22(2T) DSC-23(2P) DSC-24(2P)	DSE-3(2T) DSE-4(2P)	MIN-10 (2T)	VSC-4(2P)	---	---	OJT/Int (4)	22	
	Cum. Cr.	48	8	20	6+8	10	8+4+2	8+2+4+4	132	
Exit option: Award of UG Degree in Major with 132 credits OR Continue with Major and Minor										
6.0	VII	DSC-25(4T) DSC-26(2T) DSC-27(4T) DSC-28(2P) DSC-29(2P)	DSE-5(4T)	RM(4T)	---	---	---	---	22	UG Honours Degree 176
	VIII	DSC-30(4T) DSC-31(2T) DSC-32(4T) DSC-33(2P) DSC-34(2P)	DSE-6(4T)	---	---	---	---	OJT/Int (4)	22	
	Cum. Cr.	76	16	20+4	6+8	10	8+4+2	8+2+4+8	176	
Four Year UG Honors Degree in Major and Minor with 176 credits										
6.0	VII	DSC-25(4T) DSC-26(2T) DSC-28(2P) DSC-29(2P)	DSE-5(4T)	RM(4T)	---	---	---	RP(4)	22	UG Honours with Research Degree 176
	VIII	DSC-30(4T) DSC-31(2T) DSC-33(2P) DSC-34(2P)	DSE-6(4T)	---	---	---	---	RP(8)	22	
	Cum. Cr.	68	16	20+4	6+8	10	8+4+2	8+2+4+4+12	176	
Four Year UG Honours with Research Degree in Major and Minor with 176 credits										

Sem- Semester, **DSC-** Department Specific Course, **DSE-** Department Specific Elective, **OE/GE-** Open/Generic elective, **VSC-** Vocational Skill Course, **SEC-** Skill Enhancement Course, **VSEC-** Vocation and Skill Enhancement Course, **AEC-** Ability Enhancement Course, **IKS-** Indian Knowledge System, **VEC-** Value Education Course, **T-** Theory, **P-** Practical, **CC-** Cocurricular **RM-** Research Methodology, **OJT-** On Job Training, **FP-** Field Project, **Int-** Internship, **RP-** Research Project, **CEP-** Community Extension Programme, **ENG-** English, **CI-** Constitution of India, **MIL-** Modern Indian Language

Semester-wise Code structure for B. Sc (Honors/Research) Programme as per NEP2020, for Affiliated Colleges w.e.f – June 2024.											
B. Sc (Honors/Research) – First Year, SEMESTER – I, Level – 4.5											
Course	Course Type	Course Code	Course Title	Credits	Teaching Hours/Week			Marks (Total 100)			
					T	P	Total	Internal (CA)		External (UA)	
								T	P	T	P
DSC-1	DSC	ZO-111	Cell Biology	2	2	--	2	20	--	30	--
DSC-2	DSC	ZO-112	Pathological Fluid Study	2	2	--	2	20	--	30	--
DSC-3	DSC	ZO-113	Practicals based on Cell Biology and Pathological Fluid study	2	--	4	4	--	20	--	30
MIN-1	MIN	ZO -114	Fundamentals of Biochemistry	2	2	--	2	20	--	30	--
MIN-2	MIN	ZO -115	Practicals based on Fundamentals of Biochemistry	2	--	4	4	--	20	--	30
OE-1	OE	ZO -116	Vermitechnique	2	2	--	2	20	--	30	--
SEC-1	SEC	ZO -117	Biology Laboratory Safety and Management	2	2	--	2	20	--	30	--
VEC-1	VEC	EA-118	Environmental Awareness	2	2	--	2	20	--	30	--
IKS	IKS	IK-119	Ayurvedic Medicine in Ancient India	2	2	--	2	20	--	30	--
CC-1	CC	CC-120 (A/B)	Select any one of the following A) Sports B) Yoga	2	1	1	2	50	--	--	--
AEC-1	AEC	EG-101	English -1	2	2	--	2	20	--	30	--
B. Sc (Honors/Research) – First Year, SEMESTER – II, Level – 4.5											
DSC-4	DSC	ZO -121	Study of Grasshopper	2	2	--	2	20	--	30	--
DSC-5	DSC	ZO -122	Parasitology (with IKS related to Major)	2	2	--	2	20	--	30	--
DSC-6	DSC	ZO -123	Practicals based on Study of Grasshopper and Parasitology	2	--	4	4	--	20	--	30
MIN-3	MIN	ZO -124	Forensic Zoology	2	2	--	2	20	--	30	--
MIN-4	MIN	ZO -125	Practicals Based on Forensic Zoology	2	--	4	4	--	20	--	30
OE-2	OE	ZO -126	Public health and hygiene	2	2	--	2	20	--	30	--
SEC-2	SEC	ZO -127	Apiculture	2	2	--	2	20	--	30	--
SEC-3	SEC	ZO -128	Practicals based on Apiculture	2	--	4	4	--	20	--	30
VEC-2	VEC	CI-129	Constitution of India	2	2	--	2	20	--	30	--
CC-2	CC	CC-130 (A/B)	Select any one of the following A) NSS B) NCC	2	2	--	2	50	--	--	--
AEC-2	AEC	EG-102	English -2	2	2	--	2	20	--	30	--
Cumulative Credits For First Year – 44				<i>[Total Credit for Semester I: 22 (T = Theory: 18; P = Practical:4)]</i>							

* Students need to complete one month on job training (OJT) or internship in any industry related to major subject.

Assessment framework:

Type of Course	Credit	College Assessment Marks	University Assessment Marks
Theory	2	20	30
Theory	4	40	60
Practical	2	40	60
Projects	4	60	90

Examination

- ❖ For one credit, paper there shall be of 25 marks.
- ❖ For two credit, paper there shall be of 50 Marks.
- ❖ For 2-Credit paper, there shall be 50 marks. The 20 mark for internal assessment and 30 marks for external assessment. Semester end paper shall be of 1:5 hrs.
- ❖ For 4-Credit paper, there shall be 100 marks. The 40 marks for internal assessment and 60 marks for external assessment. Semester end paper shall be of two hrs.

Semester I

Course Title: Cell Biology

DSC-01 ZO-111 Cell Biology

Course Title/Code: DSC-01 Cell Biology	Course Credits: 2
Course Code: ZO- 111	L-T-P per week: 2-0-0
Total Contact Hours: 30	Duration of Lecture: 1 Hour
College Assessment (CA) Marks: 20	University Assessment (UA) Marks: 30

Course Objectives:

- Understand Cell Structure and Function: The course aims to provide students with a comprehensive understanding of the structure and function of cells.
- Students will learn about the different organelles, their roles, and how they contribute to the overall functioning of the cell, explore Cell Membrane and Transport Processes
- Understand Cell Cycle and Cell Division: Students will gain an understanding of the cell cycle and its regulation. Students will explore the processes of cell division, including mitosis and meiosis. They will understand the importance of cell division for growth, development, and reproduction in multicellular organisms.
- Investigate Cellular Communication and Signaling: The course will cover the mechanisms of cellular communication and signaling. Students will learn about different signaling molecules, receptors, signal transduction pathways, and the regulation of cellular responses.

Course Outcomes:

By the end of the Cell Biology course, students should be able to:

- Identify and describe the different organelles within a cell and explain their structure and functions.
- Understand the composition and properties of the cell membrane and explain the processes of passive and active transport across the membrane.
- Describe the stages of the cell cycle, including mitosis and meiosis, and explain the role of cell division in growth, development, and reproduction.
- Understand the concepts of cellular communication and signaling, including the different types of signaling molecules, receptors, and signal transduction pathways. Understand the processes of cellular aging and programmed cell death (apoptosis) and their roles in normal physiological processes and disease.

Zoology DSC-01
ZO - 111 Cell Biology

Unit	Topics	Periods	Marks
1.	The Cell 1.1 Introduction to Cell Biology 1.2 Scopes of Cell Biology 1.3 General organization of prokaryotic and eukaryotic cell 1.4 Structure of plasma membrane 1.4.1 Bilayer model of Danielli and Davson. 1.4.2 Unit membrane model of Robertson 1.4.3 Fluid mosaic model. 1.4.4 Functions of plasma membrane	07	12
2.	Cell organelles 2.1 Ultra structure and functions of Nucleus	08	13

	2.2 Ultra structure and functions of Endoplasmic Reticulum (S.E.R. & R.E.R.) 2.3 Ultra structure and functions of Golgi bodies 2.4 Ultra structure and functions of Lysosomes 2.5 Ultra structure and functions of Mitochondria 2.6 Ultra structure and functions of Ribosomes		
3.	Cell cycle and cell divisions 3.1 Stages of cell cycle – G ₁ , S, G ₂ and M- Phase 3.2 Cell Cycle Check points 3.3 Cell division & Its Importance 3.4 Mitosis and its significance 3.5 Meiosis and its significance	08	13
4.	Cell Signaling and Cancer 4.1 Cell signaling and Categories of Cell signaling: 4.1.1 Endocrine 4.1.2 Paracrine 4.1.3 Autocrine 4.1.4 Juxtacrine 4.2 Introduction to Cancer 4.2.1 Benign and Malignant tumor 4.2.2 Properties of cancer cell 4.3 Cell aging and Cell death	07	12
		30	50

Reference Books

- Lodish et al: Molecular and Cell Biology (Scientific American Book)
- De Robertis and De Robertis: Cell and Molecular Biology (Saunders College)
- A C Giese: Cell Physiology
- Prescott, DM: Reproduction in eukaryotic cells (Academic Press)
- Wilson, EB: Cell in Development and Inheritance (MacMillan)
- Edward Gasque: Manual of Laboratory Exp. in Cell Biology (W.C. Brown Publishers)
- Stryer, L: Biochemistry (Freeman)
- Conn et al: Outline of Biochemistry (Wiley)

CO No.	Upon completion of this course, students will be able to:	PSO addressed	Blooms taxonomy classification	Cognitive level
CO-1	Define the structures and purposes of basic Components of prokaryotic and eukaryotic cells, especially macromolecules and membranes.	3, 11	Remember	01
CO-2	Explain the structure and function of cell organelles.	3	Understand	02
CO-3	Compare the mitotic and meiotic cell division and describe the structure of chromosomes.	1,3	Understand	02
CO-4	Apply their knowledge to differentiate prokaryotic and eukaryotic cells.	6	Apply	03
CO-5	Recall the mechanism of plasma membrane model.	11	Remember	01

Semester I**Course Title: Pathological Fluids Study****DSC-02 ZO-112 Pathological Fluids Study**

Course Title/Code: DSC-02 Pathological Fluids Study	Course Credits: 2
Course Code: ZO- 112	L-T-P per week: 2-0-0
Total Contact Hours: 30	Duration of Lecture: 1 Hour
College Assessment (CA) Marks: 20	University Assessment (UA) Marks: 30

Course Objective:

- To provide body fluids knowledge
- To develop understanding about various body fluids and its functional role in daily human life

Course Outcome:

After successful completion of this course, students are expect to:

- Acquire knowledge about formation, composition and function of blood
- Acquire knowledge about formation, composition and abnormalities of Urine
- Develop deeper knowledge about how body fluids works, function and important role in daily human life with health implications

Zoology DSC-02**ZO- 112 Pathological Fluids Study**

Unit	Topics	Periods	Marks
1.	Introduction to Pathology 1.1 Introduction to Pathology 1.2 Historical Scenario of Pathology 1.3 Subdivisions of Pathology 1.4 Scopes and Importance of Pathology	04	06
2.	Blood 2.1 Composition of Blood 2.2 Formation Blood 2.3 Functions of Blood 2.4 Blood Disorders and their symptoms 2.4.1 Anemia 2.4.2 Sickle cell anemia 2.4.3 Malaria 2.4.4 Thrombocytopenia 2.4.5 Diabetes	09	18
3.	Urine 3.1 Composition of Urine 3.2 Formation Urine 3.3 Abnormalities in Urine 3.3.1 Visual examination 3.3.2 Dipstick test 3.3.3 Microscopic examination 3.4 Urine as Health Indicator	08	14
4.	Saliva and Semen 4.1 Composition of Saliva 4.2 Salivary Abnormalities	09	12

	4.3 Composition of Semen 4.4 Semen Abnormalities 4.4.1 Semen Volume and pH 4.4.2 Sperm Count, Motility and Morphology		
		30	50

Reference Books

- Text Book of Pathology by Harsh Mohan, Jaypee Pub. House
- Godkar P.B. and Godkar D.P. Textbook of Medical Laboratory Technology Vol 1 and 2, Bhalani Pub.House, Mumbai
- Robbins and Cortan, Pathologic Basis of Medical Physiology, Saunders
- Prakash,G. Lab Manual on Blood Analysis and Diagnostics, S.Chand and Co.Ltd.

CO No.	Upon completion of this course, students will be able to:	PSO addressed	Blooms taxonomy classification	Cognitive level
CO-1	Acquire knowledge about formation, composition and function of blood	3, 11	Remember	01
CO-2	Acquire knowledge about formation, composition and abnormalities of Urine	3	Understand	02
CO-3	Develop deeper knowledge about how body fluids works, function and important role in daily human life with health implications	1,3	Understand	02
CO-4	Apply their knowledge to observe and read the pathological reports.	6	Apply	03
CO-5	Recall the mechanism of various pathological fluids study.	11	Remember	01

Semester I **Course Title: Practical**
DSC-03 ZO-113 Practicals based on Cell Biology and Pathological Fluids study

Course Title: DSC-03 : Practicals based on Cell Biology and Pathological Fluids study	Course Credits: 2
Course Code: ZO- 113	L-T-P per week: 0-0-4
Total Contact Hours: 60	Duration of Practical: 4 Hours
College Assessment (CA) Marks: 20	University Assessment (UA) Marks: 30

Course Objectives:

- To understand the structure and function of different cell organelles by studying microphotographs.
- To comprehend the process of Mitosis through practical experimentation.
- To explore the process of Meiosis using practical techniques.
- To perform vital staining of mitochondria using Janus Green B stain.
- To prepare salivary gland chromosomes from *Chironomus* or *Drosophila* larva.
- To study and differentiate between benign and malignant tumors associated with cancer.

Course Outcomes:

Students will be able to:

- Identify and describe various cell organelles based on microphotographs.
- Understand the structure and function of different organelles within a cell.
- Identify the stages of mitosis and explain the changes occurring during each stage.
- Differentiate between mitosis and meiosis and explain the purpose of meiosis in sexual reproduction.
- Describe the unique characteristics and structure of salivary gland chromosomes.

Zoology DSC 03 Lab Course**ZO-113 Practicals based on Cell Biology and Pathological Fluids study**

- 1) Study of different cell organelles by using microphotographs (D)
- 2) Study of Mitosis by Suitable material (E)
- 3) Study of Meiosis by Suitable material (D)
- 4) Vital staining of mitochondria by using Janus Green B stain (E)
- 5) Preparation of salivary gland chromosome from chironomus or *Drosophila* larva. (D)
- 6) Study of cancer: Benign tumor and Malignant tumor (D)
- 7) Study of human blood groups and Rh Factor (E)
- 8) Estimation of Hemoglobin by Sahli's Method (E)
- 9) Estimation of RBC (E)
- 10) Estimation of WBC (E)
- 11) Blood Sugar Count with the help of a Gluco meter/ any other method (E)
- 12) Study of coloration of Urine (D)
- 13) Study the morphology of sperm (D)

Reference Books

- Edward Gasque: Manual of Laboratory Exp. in Cell Biology (W.C. Brown Publishers)
- Stryer, L: Biochemistry (Freeman)

- Robbins and Cortan, Pathologic Basis of Medical Physiology, Saunders
- Prakash,G. Lab Manual on Blood Analysis and Diagnostics, S.Chand and Co.Ltd.

CO No.	Upon completion of this course, students will be able to:	PSO addressed	Blooms taxonomy classification	Cognitive level
CO-1	Define the structures and purposes of basic Components of prokaryotic and eukaryotic cells, especially macromolecules and membranes and Acquire knowledge about formation, composition and function of blood	3, 11	Remember	01
CO-2	Explain the structure and function of cell Organelles and Acquire knowledge about formation, composition and abnormalities of Urine	3	Understand	02
CO-3	Compare the mitotic and meiotic cell division and describe the structure of chromosomes and Develop deeper knowledge about how body fluids works, function and important role in daily human life with health implications	1,3	Understand	02
CO-4	Apply their knowledge to differentiate prokaryotic and eukaryotic cells and Apply their knowledge to observe and read the pathological reports	6	Apply	03
CO-5	Recall the mechanism of plasma membrane model and Recall the mechanism of various pathological fluids study	11	Remember	01

Semester I

Course Title: Fundamentals of Biochemistry

MIN-1 ZO-114 Fundamentals of Biochemistry

Course Title/Code: MIN-1 Fundamentals of Biochemistry	Course Credits: 2
Course Code: ZO- 114	L-T-P per week: 2-0-0
Total Contact Hours: 30	Duration of Lecture: 1 Hour
College Assessment (CA) Marks: 20	University Assessment (UA) Marks: 30

Course Objectives:

- To learn about the various aspects of fundamental of Biochemistry
- To acquire a broad understanding on Biochemistry

Course Outcomes:

- To understand the structure and functioning of Biochemistry
- To gain the detail knowledge on Biochemistry

**Zoology MIN-1
ZO-114 Fundamentals of Biochemistry**

Unit	Topics	Periods	Marks
1.	Carbohydrates 1.1 Definition, classification and their biological importance. 1.2. Monosaccharides – trioses, tetraoses, pentoses, Hexoses sugars. 1.3 Disaccharides – Structure and significance of Lactose and Sucrose. 1.4 Polysaccharides- Starch, Glycogen, Cellulose and Chitin	07	11
2.	Lipids 2.1 Definition, classification with examples and their biological importance. 2.2 Fatty acids 2.2.1 Saturated OR Non-essential fatty acids 2.2.2 Unsaturated OR Essential fatty acids 2.2.3 Examples- Prostaglandins and waxes. 2.2.4 Physical properties of fatty acids	07	11
3.	Amino acids and Proteins 3.1 Definition, classification and biological importance of amino acids. 3.2 Essential, semi-essential and non-essential amino acids 3.3 Definition, biological significance of Proteins 3.4 Classification of proteins with examples- According to solubility, structure based on fibrous and globular proteins	08	14
4.	Vitamins and Minerals 4.1 Definition and classification of Vitamins 4.2 Dietary Sources of Vitamins 4.3 Hyper and Hypo Vitaminosis 4.4 Dietary Sources of Minerals (calcium, magnesium, phosphorus, potassium, sodium, and sulfur) 4.5 Hyper and Hypo Mineralosis	08	14
	Total	30	50

Reference Books

- Biochemistry: Lehninger, A. L.
- Biochemistry: Kulkarni, M. V., Thonte, S, S., Rathod and Ghiware (Nirali)
- Biochemistry: Hegde, M. V., Diwan, A. M. and Athwale, M. V.
- Biochemistry: Rastogi, S. C.
- Biochemistry: Satyanarayanan
- Outline of biochemistry: Cohn and Stumpt
- Biochemistry: Das, D.
- Practical biochemistry: Plummer, T.
- General and analytical methods in nutritional biochemistry: Gopal Krishna
- Standard methods of Biochemical analysis: R. Thimmaiah, Kalyani publishers, Ludhiana.
- Biochemistry J.L. Jain S. Chand Publication, Meerut.
- Biochemistry- C.B. Pawar (Himalaya Publication)
- Textbook of Biochemistry- Ranganatha Rao, Prentice Hall of India.
- Review of physiological chemistry- Harper H.A.

CO No.	Upon completion of this course, students will be able to;	PSO addressed	Blooms taxonomy classification	Cognitive level
CO-1	Understand the fundamental concepts of biochemistry	7	Understanding	02
CO-2	Understand the importance of bioenergetics.	7	Understanding	02
CO-3	Explain the role of proteins, lipids, nucleic acids, and carbohydrates in metabolic pathways.	7	Understanding	02
CO-4	Classify the biomolecules like proteins, carbohydrates and lipids.	2, 7	Understanding	02
CO-5	Make use of current biochemical and molecular techniques to carry out experiments in biochemical and Molecular biology.	2, 12	Apply	03

Semester I**Course Title: Practical****MIN-02 ZO-115 Practical based on Fundamentals of Biochemistry**

Course Title: MIN-02 : Practical based on Fundamentals of Biochemistry	Course Credits: 2
Course Code: ZO- 115	L-T-P per week: 0-0-4
Total Contact Hours: 60	Duration of Practical: 4 Hours
College Assessment (CA) Marks: 20	University Assessment (UA) Marks: 30

Course Objectives:

- To know the handling skill in laboratory methods of estimation and determination.
- To learn on the biochemical testing of Biochemistry.

Course Outcomes:

- Student will achieve the skill of handling of instruments.
- Student will gain the skill of conduction of estimation practical's.

Zoology MIN-02 Lab Course**ZO- 115 Practical based on Fundamentals of Biochemistry****Major experiments**

1. Identification of Carbohydrates (Mixtures not expected)
a) Solubility test, b) Molisch's test, c) Iodine test, d) Benedict's test e) Barfoed's test, f) Phosphoric acid test, g) Osazone test (any 3 test). (E)
2. Isolation of Casein from milk (E)
3. Qualitative Test for fats (E)

Minor experiments

1. Study of analytical instruments (Principles and uses) of pH meter, Colorimeter, Weighing Balance, Spectrophotometer, Incubator, Electrophoresis and Centrifuge. (D)
2. Isolation of starch from potato. (E)
3. Isolation of haemoglobin from blood sample. (E)
4. Preparation of solutions of given percentage, normality, and molarity (E)
5. Preparation of buffer solutions- acetate buffer/ phosphate or citrate buffer. (E)

Reference Books

- Practical biochemistry: Plummer, T.
- General and analytical methods in nutritional biochemistry: Gopal Krishna
- Standard methods of Biochemical analysis: R. Thimmaiah, Kalyani publishers, Ludhiana.
- Biochemistry: J.L. Jain S. Chand Publication, Meerut.

CO No.	Upon completion of this course, students will be able to:	PSO addressed	Blooms taxonomy classification	Cognitive level
CO-1	Understand the principles and techniques of various instruments.	11	Create	06
CO-2	Determine the qualitative analysis of biomolecules.	11	Evaluate	05
CO-3	Estimate the pH values of different water samples.	11	Create	06
CO-4	Prepare the different biochemical solutions.	3,4	Apply	03
CO-5	Apply the principles and working mechanism of different apparatus.	3,4	Apply	03

Semester I

Course Title: Vermitechnique

OE-1 ZO- 116 Vermitechnique

Course Category/ Title: OE-1 Vermitechnique	Course Credit: 2
of the Paper: ZO- 116	L-T-P per week: 2-0-0
Total Contact Hours: 30	Duration of Lecture :1 Hour
College Assessment (CA) Marks:20	University Assessment (UA) Marks:30

Course Objectives:

Upon successful completion students will –

- Acquire the knowledge on the culture of earthworm for the effective agriculture practices through vermitechnique methods.
- Benefitted by the course which is structured at the basic level for those coming from different discipline having broad scope for employability.
- Understand role of microbes in worms and in decomposition.
- To be able to maintain a small vermicompost bin as a simple method for converting the Kitchen waste.
- Get knowledge of vermiculture products and their benefits in agriculture practice, economics of vermitechnology, along with the practical difficulties;

Course Outcomes:

- This subject will describe soil earthworms, their characteristic features, occurrence, their influence on soil fertility and solid waste management.
- Provides knowledge of developing vermicompost unit for the production of vermicompost and vermiwash
- Provides employment opportunities
- Enhance Green revolution
- Develops practice of converting rural and urban biowastes into excellent manure.

Zoology OE-01**OE -1 - ZO-116 Vermitechnique**

Unit	Topics	Periods	Marks
1	Vermitechnology 1.1. Introduction to Vermitechnology, 1.2. Morphological and anatomical characteristics of Earth worm- <i>Eudrilus eugeniae</i> and <i>Esenia foetida</i> 1.3. Methods of Vermicomposting – Pit method and Bed Method 1.4. Vermicomposting Technology – steps	07	11
2	Harvesting 2.1 Vermiculture Techniques for harvesting Worm- Manual, Migration and Mechanical 2.2 Worm Cast 2.3 Vermicompost 2.4 Vermiwash	07	11
3	Role of Earth worms 2.1 Role of Earthworms in Soil Fertility 2.2. Use of Vermicompost for Crop Production	08	14

	2.3. Use of Vermicompost in Land improvement and Reclamation 2.4. Role of Earthworms in Waste Management 2.5 Earthworms as Bioreactors 2.6. Interaction of Earthworms with other Organisms 2.7. Influence of Chemical Inputs on Earthworm Activity		
4	Branding and Marketing 4.1. Organic farming 4.2. Marketing of Vermicomposting Products 4.3. Economics of Vermicomposting 4.4. Financial Support for Vermicomposting 4.4.1 Khadi and Village Industries Commission (KVIC) 4.4.2 National Bank for Agriculture and Rural Development (NABARD) 4.4.3 Eligibility for financial support	08	14
		30	50

Reference Books

- Arvind Kumar, A. (2005) Verms and Vermitechnology, APH Publishing Corporation.
- Ashok Kumar Rathour (2020) Vermitechnology, Farm and Fertilizer, Discovery Publishing House Pvt Ltd. India.
- Christy, M.V. (2008) Vermitechnology, 1st edition, MJP Publishers.
- Lekshmy, M. S., Santhi R. (2012) Vermitechnology, Sara Publications, New Delhi, India
- M SEETHALEKSHMY, R SANTHI (2012) Vermitechnology, 1st Edition Saras Publication.
- Sinha, R. K. et.al (2010) Vermitechnology-The Emerging 21st Century Bioengineering technology for sustainable development and protection of human health and environment Review, Dynamic Soil and Dynamic Plant, Global Science Books.

CO No.	Upon completion of this course, students will be able to:	PSO addressed	Blooms taxonomy classification	Cognitive level
CO-1	This subject will describe soil earthworms, their characteristic features, occurrence, their influence on soil fertility and solid waste management.	3, 11	Remember	01
CO-2	Provides knowledge of developing vermicompost unit for the production of vermicompost and vermiwash	3	Understand	02
CO-3	Provides employment opportunities	1,3	Understand	02
CO-4	Develops practice of converting rural and urban biowastes into excellent manure.	6	Apply	03
CO-5	Enhance Green revolution	11	Remember	01

Semester I **Course Title: Biology Laboratory Safety and Management**
SEC-01 ZO-117 Biology Laboratory Safety and Management

Course Title/Code: SEC-01 Biology Laboratory Safety and Management	Course Credits: 2
Course Code: ZO-117	L-T-P per week: 2-0-0
Total Contact Hours: 30	Duration of Lecture: 1 Hour
College Assessment (CA) Marks: 20	University Assessment (UA) Marks: 30

Course Objectives:

- To learn General lab safety rules that relate to almost Biology laboratory.
- To attain knowledge of the safety procedures carried out in Biology laboratory
- To familiarize the basic concepts of safety and biosafety guideline.
- To know General Features and Components of a Biology Laboratory
- To acquire knowledge of Basic Microscopes used in Biology Laboratory
- To know basics of Collection and preservation for Biological specimens

Course Outcomes:

After successful completion of this course, students are expected to:

- Understand the lab safety rules in laboratory
- Gain the skills and knowledge necessary to understand and work in a laboratory.
- Gain knowledge of the various safety procedures to be followed in laboratory.
- Get familiarize with the basic concepts of safety and biosafety guideline.
- Understand General Features and Components of a Biology Laboratory
- Acquire Basic knowledge of Microscopes used in Biology Laboratory
- Know basics of Collection and preservation for Biological specimens

Zoology SEC-1
ZO- 117 Biology Laboratory Safety and Management

Unit	Topics	Periods	Marks
1.	Laboratory Safety 1.1 Common rules that relate to almost every laboratory 1.2 Safety policies 1.3 First aid 1.4 Personal hygiene in Lab 1.5 Personal protective equipment's in Lab 1.6 Safety Symbols	06	11
2.	Biology laboratory and Its ancillaries 2.1 General Features of a Biology Laboratory 2.2 Components of a Biology Laboratory: Main Laboratory, Preparation Room, Store Room and Office 2.3 Main Ancillaries of a Bio Laboratory: Aquarium and Museum 2.4 Glassware 2.5 Equipments for Heating 2.6 Equipments for Weighing	08	13
3.	Equipments for Microscopy	08	13

	3.1 Stereo Microscope (Parts, Operation, Cleaning and Maintenance, Uses) 3.2 Compound Microscope (Parts, Operation, Cleaning and Maintenance, Uses) 3.3 Differences between Stereo and Compound Microscopes		
4.	Collection and preservation of Biological specimens 4.1 Sources of Specimens 4.2 Collection of Specimens 4.3 Identification of Specimens and Use of Keys 4.4 Humane Killing and Preservation of Animal Specimens 4.5 Arrangement in Museum	08	13
	Total Hours:	30	50

Reference Books

- Handbook Good Laboratory Practices-World health organization (WHO)
- Life science protocol manual (2018)-DBT star college scheme
- Guidelines for good laboratory practices-Indian council of medical research, New Delhi (2008)
- Hazardous Chemicals: Safety Management and Global Regulations, T.S.S. Dikshith, CRC press.
- Good Laboratory Practice Regulations, Sandy Weinberg Vol. 69, Marcel Dekker Series.
- Quality Assurance of Pharmaceuticals- A compedium of Guide lines and related materials Vol I & II, WHO Publications.
- How to Practice GMP's – P P Sharma, Vandana Publications, Agra

CO No.	Upon completion of this course, students will be able to:	PSO addressed	Blooms taxonomy classification	Cognitive level
CO-1	Understand the lab safety rules, General Features and Components of a Biology Laboratory	3, 11	Remember	01
CO-2	Understand the various safety procedures to be followed in laboratory.	3	Understand	02
CO-3	Get familiarize with the basic concepts of safety and biosafety guideline.	1,3	Understand	02
CO-4	Apply Basic knowledge of Microscopes used in Biology Laboratory	6	Apply	03
CO-5	Recall Know basics of Collection and preservation of Biological specimens	11	Remember	01

SEMESTER II

Semester II

Course Title: Study of Grasshopper

DSC-04 ZO-121 Study of Grasshopper

Course Title/Code: DSC-04 Study of Grasshopper	Course Credits: 2
Course code: ZO - 121	L-T-P per week: 2-0-0
Total Contact Hours: 30	Duration of Lecture: 1 Hour
College Assessment (CA) Marks: 20	University Assessment (UA) Marks: 30

Course Objective:

- To provide students with a comprehensive understanding of the morphology and anatomy of grasshoppers
- To familiarize students with the external morphology of grasshoppers.
- To explore the internal anatomy and organ systems of grasshoppers.
- To explore the physiological adaptations of grasshoppers for various environments.

Course Outcomes:

After successful completion of this course, students are expected to:

- Acquire knowledge about external morphological features of grasshopper.
- Understand internal structural and functional details of grasshopper.
- Develop deeper knowledge about reproduction and life cycle of grasshopper.

Zoology DSC-04
ZO – 121 Study of Grasshopper

Unit	Topic	Periods	Marks
1.	1.1 External features and sexual dimorphism 1.1.1 Shape, size and Colour 1.1.2 Division of the body 1.1.3 Sexual dimorphism 1.2 Digestive system: 1.2.1 Mouth parts 1.2.2 Alimentary canal and its components 1.2.3 Digestive glands 1.2.4 Food, feeding and Digestion	08	14
2.	Respiratory and Circulatory system 2.1 Respiratory System 2.1.1 Tracheal system 2.1.2 Types of spiracles 2.1.3 Mechanism of respiration 2.2 Circulatory system: 2.2.1 Type of circulatory system 2.2.2 Heart, sinuses 2.2.3 Haemolymph - Composition and functions	08	14
3.	Excretory and Reproductive system 3.1 Excretory system 3.2 Male reproductive System 3.3 Female reproductive System 3.4 Fertilization and Development	07	11

	3.5 Life Cycle		
4.	Nervous System and Sense organs 4.1 Nervous system : 4.1.1 Brain 4.1.2 Nerve cord 4.2 Sense organs 4.2.1 Photoreceptor 4.2.2 Compound Eyes 4.2.3 Olfactory and tactile receptors	07	11
		30	50

Reference Books

- Parker J. and Haswell, W.: Text-Book of Zoology, ELBS Edition
- Vidyarthi: Text-Book of Zoology - Agrasia Publishers, Agra.
- Ruppert and Barnes, R.D. (2006). Invertebrate Zoology, VIII Edition. Holt Saunders International Edition.
- Kotpal R L (2009): Modern textbook of Zoology Invertebrates, Rastogi Publication.
- Kotpal R.L.: Arthropods
- Prasad S.N.: Life of Invertebrates, Vikas Publishing house, New Delhi.
- Jorden, E.L.: The Invertebrates, S.C. Chand, New Delhi.

CO No.	Upon completion of this course, students will be able to:	PSO addressed	Blooms taxonomy classification	Cognitive level
CO-1	Develop deeper knowledge about life cycle of grasshopper	3, 11	Remember	01
CO-2	Explain the Acquire knowledge about external morphological features of grasshopper.	3	Understand	02
CO-3	Compare the Understand internal structural and functional details of grasshopper.	1,3	Understand	02
CO-4	Apply their knowledge to differentiate other invertebrate organisms.	6	Apply	03
CO-5	Recall the anatomical and physiological systems .	11	Remember	01

Semester II

Course Title: Parasitology

DSC-05 ZO-122 Parasitology

Course Title/Code: DSC-05 Parasitology	Course Credits: 2
Course code: ZO - 122	L-T-P per week: 2-0-0
Total Contact Hours: 30	Duration of Lecture: 1 Hour
College Assessment (CA) Marks: 20	University Assessment (UA) Marks: 30

Course Objectives:

- To provide students with a comprehensive understanding of parasite biology.
- To recognize and distinguish between different parasite species based on their morphological features and diagnostic characteristics.
- To understand the interactions between parasites and their hosts, as well as the pathogenesis of parasitic diseases.
- To familiarize with the diagnosis, control, and management strategies employed in parasitic diseases.

Course Outcomes:

Upon completion of the Parasitology course Students will,

- Demonstrate knowledge of the diversity and biology of parasites that infect animals in the field of zoology.
- Develop proficiency in identifying and classifying parasites.
- Gain a deep understanding of the interactions between parasites and their hosts, as well as the pathogenesis of parasitic diseases.
- Acquire knowledge of the diagnosis, control, and management strategies employed in parasitic diseases.

**Zoology DSC-05
ZO - 122 Parasitology**

Unit	Topics	Periods	Marks
1	Introduction, Scope and Importance of Parasitology 1.1 Definition: Host, Parasite, Vector 1.2 Animal Association 1.2.1 Intraspecific 1.2.2 Interspecific 1.2.2.1 Mutualism 1.2.2.2 Commensalism, Parasitism 1.3 History of Human Parasitology	05	09
2	Types of Parasites 2.1 According to habitat 2.1.1 Ectoparasite:- Tick, Mite, Lice 2.1.2 Endoparasite:- Gut Parasite, Haemoparasite, 2.1.3 Degree of Parasitism : Temporary, Permanent, Facultative and Obligatory 2.2 Types of Hosts 2.2.1 Definitive, Intermediate, Paratenic or Carrier, Reservoir and Accidental host	10	14

	2.2.2 Sources of infection: Soil, Water, Air, Food, Insect vectors, domestic and wild Animals 2.2.3 Mode of Transmission: Oral, Skin, Vector 2.2.4 Mosquitoes as a vector in the transmission of diseases- Malaria, Dengue fever, Chikungunia and control of mosquitoes. 2.2.4 Host specificity: Definition and Characters		
3	Parasitic Adaptions 3.1 Structural 3.2 Physiological 3.3 Effect of parasite on host 3.3.1 Mechanical 3.3.2 Nutritional 3.3.3 Obstructive 3.3.4 Biological	07	12
4	Important Parasites 4.1 Study of the following parasites with reference to Systematic position, Habit, Habitat, Morphology, life cycle, pathogenicity, prevention and control measures 4.1.1 <i>Plasmodium vivax</i> 4.1.2 <i>Ascaris lumbricoides</i>	08	15
		30	50

Reference Books

- Askew, R.R. (1971). Parasitic Insects. American Elsevier Publication Co. New York.
- Baer, J.G. (1951). The Ecology of Animal parasites. Unvana Unive of Illinois Press.
- Chandler, A.C. and Read C.P. (1961). Introduction to Parasitology. John, Wiley and Sons, Inc
- Nayar, K.K., Ananthakrishnan, T.N., Davied, B.V. (1976). General and Applied Entomology. Tata McGraw Hill Publishing Co Ltd., New Delhi.
- Noble, E.R. and Noble, G.A. (1976). Parasitology: The Biology of Animal Parasites. Lea and Febiger, Philadelphia.
- Parija, S.C. Review of Parasitic Zoonoses. A.I.T.B.S.Publishers and Distributors, Delhi.
- Read, Clerk P. (1977). Animal Parasitism. Prentice Hall of India PTL. New Delhi

CO No.	Upon completion of this course, students will be able to:	PSO addressed	Blooms taxonomy classification	Cognitive level
CO-1	Demonstrate knowledge of the diversity and biology of parasites that infect animals in the field of zoology.	3, 11	Remember	01
CO-2	Develop proficiency in identifying and classifying parasites.	3	Understand	02
CO-3	Deep understanding of the interactions between parasites and their hosts.	1,3	Understand	02
CO-4	Apply and differentiate between different parasite species.	6	Apply	03
CO-5	Recall the diagnosis, control, and management strategies employed in parasitic diseases.	11	Remember	01

Semester II **Course title: Practical**
DSC-6 ZO-123 Practicals based on Study of Grasshopper and Parasitology

Course Title: DSC-6 Practicals based on Study of Grasshopper and Parasitology	Course Credits: 2
Course Code: ZO- 123	L-T-P per week: 0-0-4
Total Contact Hours: 60	Duration of Practical: 4 Hours
College Assessment (CA) Marks: 20	University Assessment (UA) Marks: 30

Course Objectives:

- Identify and label the major external features of a grasshopper, including its head, thorax, abdomen, wings, and legs.
- Perform a dissection of the grasshopper specimen to reveal the internal organs.
- Identify and describe the functions of key internal structures, such as the digestive, circulatory, respiratory, and reproductive systems.
- Develop proficiency in using microscopes for observing and documenting microscopic details of grasshopper anatomy.
- Practice slide preparation and microscopy techniques to visualize tissues and organs at a cellular level.
- Explore the interactions between parasites and their host organisms.
- Learn diagnostic methods for identifying and quantifying parasites in clinical or environmental samples.

Course Outcomes:

- Students will be able to accurately identify and label the major external and internal features of a grasshopper, displaying their understanding of its morphology.
- Students will demonstrate the ability to perform a successful grasshopper dissection and articulate the functions of key internal structures within the grasshopper's body.
- Students will be capable of identifying various parasites, including protozoa, helminths, and arthropod parasites, through microscopic examination.
- Participants will have a comprehensive understanding of the interactions between parasites and their host organisms, recognizing their ecological and medical significance.
- Students will discuss and evaluate strategies for the control and prevention of parasitic diseases in humans and animals, recognizing the role of public health and veterinary interventions.

Zoology DSC-06 Lab Course**ZO- 123 Practicals based on Study of Grasshopper and Parasitology**

1. Study of external characters and sexual dimorphism of grasshopper with the help of Charts, Models or Pictures (D)
2. Study of digestive system of grasshopper with the help of Charts, Models or Pictures (D)
3. Study of heart and aorta of grasshopper with the help of Charts, Models or Pictures (D)
4. Study of nervous system of grasshopper with the help of Charts, Models or Pictures (D)
5. Study of male and female reproductive system of grasshopper with the help of Charts, Models or Pictures (D)
6. Make temporary slide/mountings from grasshopper of following: (E)
 - a) Haemocytes
 - b) Mouthparts,
 - c) Trachea & spiracles
 - d) Cornea and antenna
 - e) Wings

7. Study of External characters and life cycle of *Plasmodium vivax* and *Ascaris lumbricoides* (D)
8. Study of insect vectors: Tick, Mite, and Lice (D)
9. Study of rectal parasite from cockroach/ any suitable animal (E)
10. Study of Bedbug, Housefly and Mosquito (D)

Reference Books

- Parker J. and Haswell, W.: Text-Book of Zoology, ELBS Edition
- Vidyarthi: Textbook of Zoology - Agrasia Publishers, Agra.
- Ruppert and Barnes, R.D. (2006). Invertebrate Zoology, VIII Edition. Holt Saunders International Edition.
- Kotpal R L (2009): Modern textbook of Zoology Invertebrates, Rastogi Publication.
- Kotpal R.L.: Arthropods
- Prasad S.N.: Life of Invertebrates, Vikas Publishing house, New Delhi.
- Jordan, E.L.: The Invertebrates, S.C. Chand, New Delhi.
- Askew, R.R. (1971). Parasitic Insects. American Elsevier Publication Co. New York.
- Baer, J.G. (1951). The Ecology of Animal parasites. Unvna Unive of Illinois Press.
- Chandler, A.C. and Read C.P. (1961). Introduction to Parasitology. John, Wiley and Sons, Inc
- Nayar, K.K., Ananthkrishnan, T.N., Davied, B.V. (1976). General and Applied Entomology. Tata McGraw Hill Publishing Co Ltd., New Delhi.
- Noble, E.R. and Noble, G.A. (1976). Parasitology: The Biology of Animal Parasites. Lea and Febiger, Philadelphia.
- Parija, S.C. Review of Parasitic Zoonoses. A.I.T.B.S.Publishers and Distributors, Delhi.
- Read, Clerk P. (1977). Animal Parasitism. Prentice Hall of India PTL. New Delhi

CO No.	Upon completion of this course, students will be able to:	PSO addressed	Blooms taxonomy classification	Cognitive level
CO-1	Develop deeper knowledge about life cycle of grasshopper and Demonstrate knowledge of the diversity and biology of parasites that infect animals in the field of zoology.	3, 11	Remember	01
CO-2	Explain the Acquire knowledge about external morphological features of grasshopper and Develop proficiency in identifying and classifying parasites.	3	Understand	02
CO-3	Compare the Understand internal structural and functional details of grasshopper and Deep understanding of the interactions between parasites and their hosts, as well as the pathogenesis of parasitic diseases.	1,3	Understand	02
CO-4	Apply their knowledge to differentiate other invertebrate organisms and Apply They will be able to recognize and differentiate between different parasite species based on their morphological characteristics and diagnostic features..	6	Apply	03
CO-5	Recall the anatomical and physiological systems and Recall the the diagnosis, control, and management strategies employed in parasitic diseases .	11	Remember	01

Semester II

Course Title: Forensic Zoology

MIN-03 ZO-124 Forensic Zoology

Course Title/Code: MIN-03 Forensic Zoology	Course Credits: 2
Course: ZO - 124	L-T-P per week: 2-0-0
Total Contact Hours: 30	Duration of Lecture: 1 Hour
College Assessment (CA) Marks: 20	University Assessment (UA) Marks: 30

Course Objectives:

- To understand the scope, need and History of Forensic Science.
- To understand the role of different institutes & allied institutes of Forensic Science.
- To understand the various branches of Forensic Sciences from Life Sciences.
- To understand human physiology, post mortal investigations.
- To understand knowledge of handling different types of evidences and their examinations

Course Outcomes:

- The students will be able to understand the basics principles of Forensic Zoology.
- The students will able to understand scientific methods in crime detection.
- The students will be able to understand the advancements in the field of Forensic Zoology.
- The students will be able to understand modern tools, techniques, and skills in forensic investigations.
- The students will be able to describe the fundamental principles and functions of forensic science and its significance to human society.

Zoology MIN -03**MIN- 03 - ZO - 124 Forensic Zoology**

Unit	Topics	Periods	Marks
1	Introduction to Forensic Zoology: 1.1 Definition, Scope, and Application of Forensic Zoology. 1.2 Forensic Laboratories in India. 1.3 Basic Principles of Forensic Science with Examples.	07	11
2	Forensic Medicine: 2.1 Introduction to Forensic Medicine: Definitions of Forensic Medicine. 2.2 Medical Jurisprudence. 2.3 Medical evidence documentations	07	11
3	Forensic Analysis: 3.1 Detection of Biological Evidences: Hair, Teeth, Blood, Semen and Saliva. 3.2 Technique and Examination of Biological Traces: Liquid blood, blood stains & swabs, semen, tissues, Bones, Hairs, Saliva 3.3 DNA Fingerprinting	08	14
4	Forensic Importance of Insects: 4.1 Role of Blow flies and Dermestid Beetles in forensic 4.2 Insects as indicators of time of death	08	14

4.3 Evidence collection of insects		
	30	50

Reference Books

- Godkar P. B and Godkar D. P, Textbook of Medical Laboratory Technology, II Edition, Bhalani Publications
- Text book of pathology: Robbins & Cotran, Vol. 1 & 2, Tenth Edition, Elsevier Publication
- Essentials of medical microbiology: Apurba S. Sastry & Sandhya Bhat, Jaypee brothers.
- A textbook of Clinical pharmacology: Roger H. J., Spector R. G., Trounce J. R., Hodder & Stoughton publishers.
- Fundamentals of Forensic Science, Second Edition, Max M. Houck and Jay A Siegel, Academic Press.
- Forensic Science, Third Edition, Stuart H James and Jon. J. Nordby.
- Forensic Science in India and the World, Deepak Ratna and Mohd. Zaidi, Alia Law Agency, Allahabad.
- Forensic Science in India - A Vision for 21st Century, B. B. Nanda and Dr. R. K. Tewari, Select Publishers.
- Forensic Biology, Richard Li, CRC Press.
- Forensic Science: An introduction to Scientific and Investigative Techniques by S. H James, J. J. Nordby.
- Examination of Body Fluid: Blood, Semen and Saliva.

CO No.	Upon completion of this course, students will be able to:	PSO addressed	Blooms taxonomy classification	Cognitive level
CO-1	Understand the basics principles of Forensic Zoology.	3, 11	Remember	01
CO-2	Understand scientific methods in crime detection.	3	Understand	02
CO-3	Understand the advancements in the field of Forensic Zoology.	1,3	Understand	02
CO-4	Apply modern tools, techniques, and skills in forensic investigations.	6	Apply	03
CO-5	Describe the fundamental principles and functions of forensic science and its significance to human society.	11	Remember	01

Semester II**Course title: MIN-4: Practical****MIN-4 ZO_125 Practicals Based on Forensic Zoology**

Course Title/ Code : MIN-4: Practicals Based on Forensic Zoology	Course Credits: 2
Course : ZO - 125	L-T-P per week: 0-0-4
Total Contact Hours: 60	Duration of Practical: 4 Hours
College Assessment (CA) Marks: 20	University Assessment (UA) Marks: 30

Course Objective

- To know the handling skill in laboratory methods of forensic Zoology
- To learn on the biochemical testing of forensic Zoology

Course Outcomes:

- Student will achieve the skill of handling of instruments.
- Student will gain the skill of conduction of forensic Zoology practical's.

Zoology MIN-04 Lab Course**ZO - 125: Practicals Based on Forensic Zoology**

1. Examine human hair for cortex and medulla. (E)
2. Examine hair morphology and determine the species to which the hair belongs. (E)
3. To prepare slides of scale pattern of human hair. (E)
4. Identify and differentiate various types of Thumb prints. (E)
5. Detection Blood group (E)
6. Teichmann Crystal Test for dry Blood (E)
7. Acid phosphatase (AP) test for Semen (E)
8. Study of Life Cycle of Blow fly - *Glossina* (D)
9. Study of Life Cycle of Dermistid Beetle- *Dermestes maculatus* (D)

Reference Books

- Forensic Science in India and the World, Deepak Ratna and Mohd. Zaidi, Alia Law Agency, Allahabad.
- Forensic Science in India - A Vision for 21st Century, B. B. Nanda and Dr. R. K. Tewari, Select Publishers.
- Forensic Biology, Richard Li, CRC Press.
- Forensic Science: An introduction to Scientific and Investigative Techniques by S. H James, J. J. Nordby.
- Examination of Body Fluid: Blood, Semen and Saliva.

CO No.	Upon completion of this course, students will be able to:	PSO addressed	Blooms taxonomy classification	Cognitive level
CO-1	Understand the basics principles of Forensic Zoology.	3, 11	Remember	01
CO-2	Understand scientific methods in crime detection.	3	Understand	02
CO-3	Understand the advancements in the field of Forensic Zoology.	1,3	Understand	02
CO-4	Apply modern tools, techniques, and skills in forensic investigations.	6	Apply	03
CO-5	Describe the fundamental principles and functions of forensic science and its significance to human society.	11	Remember	01

Semester – II

Course Title-Public health and hygiene

OE 2 ZO-126 Public health and hygiene

Course Title/Code: OE 2- Public health and hygiene	Corse Credits: 2
Course: ZO- 126	L-T per week: 2-0-0
Total Contact Hours: 30	Duration of Lecture: 1 Hour
College assessment (CA) Marks: 20	University Assessment(UA):Marks: 30

Course Objectives:

- Public health tries to scope with such a variety of health problems by including scientific strategies from the epidemiological as well as from the social, biological and physical sciences.
- Public health promotes and protects the health of people and the communities where they live, learn, work and play.
- Public Health in India is a relatively emerging field. Master's in Public Health (M.P.H) is one such academic programme that probably has the scope as diverse as you want it to be.
- The scope of public health is not limited to the Medical professionals, in fact as diverse background (academic qualifications) the workforce has the better it is.

Course Outcomes:

- Students will get a holistic overview of the interdisciplinary nature of Public health and hygiene
- They will understand public health and hygiene issues in India particularly related to Malnutrition, sanitation issues and related burden of infectious disease, and the role of pollution as a public health concern.
- The students will also get an understanding of the public policies applicable and implemented in India.
- They will also be able to appreciate the social aspects that govern many public health issues and implementation of policies

Zoology OE-02
OE 2 ZO - 126 Public health and hygiene

Unit	Topics	Periods	Marks
1	Nutrition and health 1.1 Introduction: Scope and importance of Public health and hygiene. 1.2 Balanced diet, diet control for diabetics and cholesterol, etc. 1.3 Concept of energy, calories, daily food intake as per occupation, pregnancy and lactation. 1.4 Dietary requirements of infants, pre-school children, schoolchildren, adults.	08	14
2	Health Hazards 2.1 Health dynamicity – definition, factors influencing health, health as a medium of socio-economic development. 2.2 Diseases – Common food borne and water borne diseases (jaundice, cholera, diarrhoea and typhoid) – causative agents, symptoms, mode of transmission, prevention and control. 2.3 Lifestyle habits – excessive usage of T.V., computer, mobile phones, two wheelers, and their impacts on health.	08	14
3	Health hygiene	07	11

	3.1 Personal hygiene- body odour, oral hygiene and sexual hygiene, grooming, feminine hygiene, sleep hygiene, hand washing, toiletry. 3.2 Social hygiene –clean living movements, occupational hygiene, food and cooking hygiene, medical hygiene, excessive hygiene.		
4	Health Education 4.1 Definition, objectives, principles 4.2 Ill effects of smoking, alcoholism and drug abuse (hashish, opium, brown sugar). 4.3 Population control and family welfare- use of contraceptives 4.4 Importance of Body fitness 4.5 Importance of cycling and walking exercise. 4.5 Stress reduction management – Importance of yoga 4.6 Sickle Cell Disorder	07	11
		30	50

Reference Books

- Jatin V. Modi and Renjith S. Chawan. Essentials of Public Health and Sanitation – Part I-IV.
- Murray, C. J. L. and A.D. Lopez. (1996), The Global Burden Of Disease. World Health Organization.
- Park, J.E. and Park, K. Textbook of Community Health for Nurses.
- Swaminathan S. Principles of Nutrition and Dietetics.

CO No.	Upon completion of this course, students will be able to:	PSO addressed	Blooms taxonomy classification	Cognitive level
CO-1	Students will get a holistic overview of the interdisciplinary nature of Public health and hygiene	3, 11	Remember	01
CO-2	Understand public health and hygiene issues in India particularly related to Malnutrition, sanitation issues and related burden of infectious disease, and the role of pollution as a public health concern.	3	Understand	02
CO-3	Understand the public policies applicable and implemented in India.	1,3	Understand	02
CO-4	Apply the known knowledge to adopt health and hygiene.	6	Apply	03
CO-5	Recall to appreciate the social aspects that govern many public health issues and implementation of policies	11	Remember	01

Semester II

Course Title: Apiculture

SEC – 2 ZO-127 Apiculture

Course Title/Code: SEC – 2: Apiculture	Course Credits: 2
Course Code: ZO - 127	L-T-P per week: 2-0-0
Total Contact Hours: 30	Duration of Lecture: 1 Hour
College Assessment (CA) Marks: 20	University Assessment (UA) Marks: 30

Course Objectives:

- Understand the Biology and Behavior of Honey Bees
- Develop Practical Skills in Hive Management
- Familiarize with Beekeeping Equipment and Tools
- Learn Honey Production and Processing Techniques
- Understand the Role of Bees in Pollination
- Promote Safety and Ethical Practices

Course Outcomes:

- Students will acquire a comprehensive understanding of the biology and behavior of honeybees.
- Students will develop practical skills in managing honeybee colonies.
- Students will become familiar with the various tools and equipment used in beekeeping.
- Students will gain knowledge of honey production and processing methods.
- Students will learn about the vital role of honeybees in pollination and the importance of managed honey bee colonies for agricultural practices.
- Students will develop an understanding of common honeybee diseases, parasites, and pests.

Zoology SEC-02**SEC-2 ZO – 127: Apiculture**

Unit	Topics	Periods	Marks
1	Introduction, Taxonomy of Honey Bee 1.1. Importance and Scopes of beekeeping 1.2 Study of Bee species 1.2. 1. <i>Apis dorsata</i> 1.2.2. <i>Apis florea</i> 1.2.3. <i>Apis cerena indica</i> 1.2.4. <i>Apis mellifera</i>	08	14
2	Morphology, behavior and Communication of Honey bee 2.1. Study of mouthparts, legs, and sting apparatus of honeybee. 2.2. Cast differentiation, Colony organization and Polymorphism 2.3. Division of labor in honeybee 2.4. Life cycle of honeybee and nuptial flight 2.5. Absconding behavior 2.6. Communication in Honey Bee- Round, Circular, DVAV, Cleaning, Massage and Alarm dance.	09	16
3	Bee hiving and Equipment	07	11

	3.1. Bee Hive (ISI, Newton and Langstroth hives) 3.2. Hiving of Colony 3.3. Establishment of Bee colony 3.4. Equipment for improving efficiency of bees keepers		
4	Bee products and Bee diseases 4.1. Methods of collection, constituents and uses of bee products- Honey, Pollen, Royal jelly, Propolis, Bee wax and Bee venom 4.2. Pests, Predators and Diseases of Bees- Brood diseases, Adult bee diseases.	06	09
		30	50

Reference Books

- Introduction to disease of bee –Bailey ,L
- World of honeybee –Butter C. G.
- Beekeeping in India –Sardar Sing (ICAR)
- The Principle of Insect Physiology-Wigglesworth, V.S.
- Prof. Dr. B. B. Waykar, Dr. A. Y. Mahajan, Dr. B. C. More: Applied Zoology. (Prashant Publication Jalgaon)
- Dr. G.P. Vani, Dr. P. M. Vyawahare.: Applied Zoology. (Prashant Publication Jalgaon)
- Prost, P. J. (1962). Apiculture. Oxford and IBH, New Delhi.
- Bisht D.S., Apiculture, ICAR Publication.
- Singh S., Beekeeping in India, Indian council of Agricultural Research, New Delhi.

CO No.	Upon completion of this course, students will be able to:	PSO addressed	Blooms taxonomy classification	Cognitive level
CO-1	Acquire a comprehensive understanding of the biology and behavior of honeybees.	3, 11	Remember	01
CO-2	Develop practical skills in managing honeybee colonies.	3	Understand	02
CO-3	Become familiar with the various tools and equipment used in beekeeping and gain knowledge of honey production and processing methods.	1,3	Understand	02
CO-4	Apply role of honeybees in pollination and the importance of managed honey bee colonies for agricultural practices.	6	Apply	03
CO-5	Recall the common honeybee diseases, parasites, and pests.	11	Remember	01

Semester II**Course title: SEC-3 Practical****SEC-3 ZO-128 Practicals based on Apiculture**

Course Title / Code: SEC-3 Practicals based on Apiculture	Course Credits: 2
Course Code: ZO -128	L-T-P per week: 0-0-4
Total Contact Hours: 60	Duration of Practical: 4 Hours
College Assessment (CA) Marks: 20	University Assessment (UA) Marks: 30

Course Objective

- To know the handling skill in laboratory methods of forensic Zoology
- To learn on the biochemical testing of forensic Zoology

Course Outcomes:

- Student will achieve the skill of handling of instruments.
- Student will gain the skill of conduction of forensic Zoology practical's.

Zoology SEC-03 Lab Course**SEC-3 ZO – 128 Practicals based on Apiculture**

- 1) Study of external morphology of honeybee (D)
- 2) Study of species of honeybee (D)
- 3) Study of life cycle of honeybee (D)
- 4) Study of architecture of honey comb (D)
- 5) Mounting of Antenna cleaner and pollen basket (E)
- 6) Mounting of sting apparatus and mouthparts (E)
- 7) Study of artificial bee breeding technique (D)
- 8) Honey adulteration tests- Thumb test, Wick test, Matchstick test, filter paper test, water glass test (any three) (E)
- 9) Study of bee keeping equipment's and their uses (D)
- 10) Visit to an apiary

Reference Books

- Introduction to disease of bee –Bailey ,L
- World of honeybee –Butter C. G.
- Beekeeping in India –Sardar Sing (ICAR)
- The Principle of Insect Physiology-Wigglesworth, V.S.
- Prof. Dr. B. B. Waykar, Dr. A. Y. Mahajan, Dr. B. C. More: Applied Zoology. (Prashant Publication Jalgaon)
- Dr. G.P. Vani, Dr. P. M. Vyawahare.: Applied Zoology. (Prashant Publication Jalgaon)
- Prost, P. J. (1962). Apiculture. Oxford and IBH, New Delhi.
- Bisht D.S., Apiculture, ICAR Publication.
- Singh S., Beekeeping in India, Indian council of Agricultural Research, New Delhi.

CO No.	Upon completion of this course, students will be able to:	PSO addressed	Blooms taxonomy classification	Cognitive level
CO-1	Acquire a comprehensive understanding of the biology and behavior of honeybees.	3, 11	Remember	01
CO-2	Develop practical skills in managing honeybee colonies.	3	Understand	02

CO-3	Become familiar with the various tools and equipment used in beekeeping and gain knowledge of honey production and processing methods.	1,3	Understand	02
CO-4	Apply role of honeybees in pollination and the importance of managed honey bee colonies for agricultural practices.	6	Apply	03
CO-5	Recall the common honeybee diseases, parasites, and pests.	11	Remember	01

Abbreviations	
<ul style="list-style-type: none"> • T: Theory Course • P: Practical course • DSC: Discipline Specific Core Course • DSE: Discipline Specific Elective Course • MIN: Minor subject • VSEC: Vocational skill and Skill enhancement courses • VSC: Vocational Skill Courses • SEC: Skill Enhancement Courses • GE/OE: Generic/open elective • CI: Constitution of India • IKS: Indian Knowledge System • CEP: Community engagement and service • OJT: On Job Training: Internship/ Apprenticeship • RP: Research Project • RM: Research methodology • ES: Environment studies • ENG: English • MIL: Modern Indian language 	<ul style="list-style-type: none"> • Co-curricular Course (CC) <ul style="list-style-type: none"> a) CC-1: CC-120: Sports and Yoga b) CC-2: CC-130: Cyber Security c) CC-3: CC-220: Human Rights and Environment Law d) CC-4: CC-229: Communication Skills and Personality Development • Value Education Courses (VEC) <ul style="list-style-type: none"> a) VEC1: ES-118: Environmental Science b) VEC2: CI-129: Constitution of India • Indian Knowledge System (IKS): <ul style="list-style-type: none"> a) IK: 119: Ayurvedic Medicine in Ancient India • Ability Enhancement Courses (AEC) <ul style="list-style-type: none"> b) AEC-1: EG: 101 – English -1 c) AEC-2: EG: 102 – English -2 d) AEC-3: MR: 201 – Marathi -1 e) AEC-3: HN: 201 – Hindi -1 f) AEC-3: MR: 202 – Marathi -2 g) AEC-3: HN: 202 – Hindi -2

Semester-wise Code structure for B. Sc (Honors/Research) Programme as per NEP2020, for Affiliated Colleges w.e.f – June 2024.											
B. Sc (Honors/Research) – Second Year, SEMESTER – III, Level – 5.0											
Course	Course Type	Course Code	Course Title	Credits	Teaching Hours/Week			Marks (Total 100)			
					T	P	Total	Internal (CA)		External (UA)	
								T	P	T	P
DSC-7	DSC	ZO -211	Fundamentals of Genetics	2	2	--	2	20	--	30	--
DSC-8	DSC	ZO -212	Developmental biology	2	2	--	2	20	--	30	--
DSC-9	DSC	ZO -213	Practicals based on Fundamentals of Genetics	2	--	4	4	--	20	--	30
DSC-10	DSC	ZO -214	Practicals based on Developmental biology	2	--	4	4	--	20	--	30
MIN-5	MIN	ZO -215	Ecology	2	2	--	2	20	--	30	--
MIN-6	MIN	ZO -216	Practicals based on Ecology	2	--	4	4	--	20	--	30
OE-3	OE	ZO -217	Agricultural Pest management	2	2	--	2	20	--	30	--
VSC-1	VSC	ZO -218	Pearl Culture Techniques	2	2	--	2	20	--	30	--
VSC-2	VSC	ZO -219	Practicals based on Pearl Culture Techniques	2	--	4	4	--	20	--	30
CC-3	CC	CC-220 (A/B)	Select any one of the following A) Human Rights and Environment Law B) Cyber Security	2	2	--	2	50	--	--	--
AEC-3	AEC	MR-201	Marathi -1	2	2	--	2	20	--	30	--
		HN-201	Hindi -1	2	2	--	2	20	--	30	--
B. Sc (Honors/Research) – Second Year, SEMESTER – IV, Level – 5.0											
DSC-11	DSC	ZO -221	Animal Type – <i>Labeo rohita</i>	2	2	--	2	20	--	30	--
DSC-12	DSC	ZO -222	Animal behavior	2	2	--	2	20	--	30	--
DSC-13	DSC	ZO -223	Practicals based on Animal Type - <i>Labeo rohita</i>	2	--	4	4	--	20	--	30
DSC-14	DSC	ZO -224	Practicals based on Animal behavior	2	--	4	4	--	20	--	30
MIN-7	MIN	ZO -225	Food and Nutrition	2	2	--	2	20	--	30	--
MIN-8	MIN	ZO -226	Practicals based on Food and Nutrition	2	--	4	4	--	20	--	30
OE-4	OE	ZO -227	Ornamental Fish Culture	2	2	--	2	20	--	30	--
CEP	CEP	ZO -228	Approaches to Animal diversity conservation	2	2	--	2	20	--	30	--
CC-4	CC	CC-229 (A/B)	Select any one of the following A) Communication Skills and Personality Development B) Cultural	2	2	--	2	50	--	--	--
AEC-4	AEC	MR-202	Marathi -2	2	2	--	2	20	--	30	--
		HN-202	Hindi -2	2	2	--	2	20	--	30	--
Cumulative Credits For First Year – 44											

Semester-wise Code structure for B. Sc (Honors/Research) Programme as per NEP2020, for Affiliated Colleges w.e.f – June 2024.

B. Sc (Honors/Research) – Third Year, SEMESTER – V, Level – 5.5

Course	Course Type	Course Code	Course Title	Credits	Teaching Hours/Week			Marks (Total 100)			
					T	P	Total	Internal (CA)		External (UA)	
								T	P	T	P
DSC-15	DSC	ZO -311	Animal diversity of non-chordates	2	2	--	2	20	--	30	--
DSC-16	DSC	ZO -312	Molecular Biology	2	2	--	2	20	--	30	--
DSC-17	DSC	ZO -313	Microtechnique	2	2	--	2	20	--	30	--
DSC-18	DSC	ZO -314	Practicals based on Animal diversity of non-chordates	2	--	4	4	--	20	--	30
DSC-19	DSC	ZO -315	Practicals based on Molecular Biology and Microtechnique	2	--	4	4	--	20	--	30
DSE-1	DSE	ZO -316(A)	Endocrinology	2	2	--	2	20	--	30	--
DSE-1	DSE	ZO -316(B)	Evolutionary biology	2	2	--	2	20	--	30	--
DSE-2	DSE	ZO -317(A)	Practicals based on Endocrinology	2	--	4	4	--	20	--	30
DSE-2	DSE	ZO -317(B)	Practicals based on Evolutionary biology	2	--	4	4	--	20	--	30
MIN-9	MIN	ZO -318	Poultry	2	2	--	2	20	--	30	--
VSC-3	VSC	ZO -319	Practicals Based on Aquatic Biology	2	2	--	2	20	--	30	--
FP	FP	ZO -320	Field study: Zoology related industries, gardens, museums, zoo, etc and prepare report	4	--	8	8	--	100	--	--

B. Sc (Honors/Research) – Third Year, SEMESTER – VI, Level – 5.5

DSC-20	DSC	ZO -321	Animal Diversity of Chordates	2	2	--	2	20	--	30	--
DSC-21	DSC	ZO -322	Animal Physiology	2	2	--	2	20	--	30	--
DSC-22	DSC	ZO -323	Animal Biotechnology	2	2	--	2	20	--	30	--
DSC-23	DSC	ZO -324	Practicals based on Animal Diversity of Chordates	2	--	4	4	--	20	--	30
DSC-24	DSC	ZO -325	Practicals based on Animal Physiology and Animal Biotechnology	2	--	4	4	--	20	--	30
DSE-3	DSE	ZO -326(A)	Oceanography	2	2	--	2	20	--	30	--
DSE-3	DSE	ZO -326(B)	Basics of Animal Taxonomy	2	2	--	2	20	--	30	--
DSE-4	DSE	ZO -327(A)	Practicals based on Oceanography	2	--	4	4	--	20	--	30
DSE-4	DSE	ZO -327(B)	Practicals based on Basics of Animal Taxonomy	2	--	4	4	--	20	--	30
MIN-10	MIN	ZO -328	Medical Lab Techniques (MLT)	2	2	--	2	20	--	30	--
VSC-4	VSC	ZO -329	Practicals based on Wildlife Photography	2	2	--	2	20	--	30	--
*OJT/Int	OJT/Int	ZO -330	Medical Lab Techniques (MLT)	4	--	8	8	--	40	--	60

* Students need to complete one month on job training (OJT) or internship in any industry related to major subject.