Punyashlok Ahilyadevi Holkar Solapur University, Solapur

NAACAccredited-2022
'B^{++}'Grade(CGPA2.96)

Name of the Faculty: Science & Technology

(As per New Education Policy 2020)

Syllabus: Zoology

Name of the Course: B.Sc. II (Sem. III &IV)

(Syllabus to be implemented w.e.f. from June 2025)

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
Faculty of Science and Technology
B. Sc. II NEP Syllabus Structure for Zoology Subject w.e.f. June 2025

Level / Difficulty	Sem.	Faculty		Generic/ Open Elective GE/OE	Vocational and Skill Enhancement Courses (SEC/VSC)	Ability Enhancement Course (AEC), IKS,	Field Project/ RP/ CC/ Internship/ Apprenticeship/Community Engagement & Services	Credits	Cumulative Credits
		Major	**Minor**						
5.0/200	**III**	**DSC1-3** (2+1) Cell Biology	**DSC2-3** (2+1) Introduction to Genetics	**GE 3/OE3** (2) Forensic Science	**VSC1 (2)** (DSC 1) Cell Biology & Fundamentals of Biochemistry **VSC2 (2)** (DSC 2) Introduction to Genetics & Techniques in Biology	**L2-1 (2)**	**CC2 (2)**	22	**44**
		DSC1-4 (2+1) Fundamentals of Biochemistry	**DSC2-4** (2+1) Techniques in Biology						
	IV	**DSC1-5** (2+1) Principles of Ecology	**DSC2-5** (2+1) Biological pest Management	GE4/ OE4 (2) Wildlife Photography	**VSC3 (2)** (DSC1) Principles of Ecology and Animal Physiology **VSC4 (2)** (DSC2) Biological pest Management and Endocrinology	**L2-2 (2)**	**FP1** / CEP 1 (2)	22	
		DSC1-6 (2+1) Animal Physiology	**DSC2-6** (2+1) Endocrinology						

पुण्यश्लोक अहिल्यादेवी होळकर सोलापूर विद्यापीठ ।। विद्यया संपन्नता ।।	**Punyashlok Ahilyadevi Holkar Solapur University, Solapur Faculty of Science & Technology Nep 2020 Compliant Curriculum B. Sc. (Zoology) Program Preamble** **Second Year B. Sc. (Zoology) Semester-III/IV**

The Bachelor of Science (BSc) in Zoology is a comprehensive and dynamic program designed to provide students with a deep understanding of the fundamental principles of Zoology, along with the practical skills required to apply this knowledge in various scientific and technological contexts. Aligned with the vision of the National Education Policy (NEP) 2020, the program offers a flexible, multidisciplinary, and learner-centric curriculum that encourages critical thinking, innovation, and holistic development. The BSc Zoology program spans four years, with each year offering a progressively advanced curriculum designed to build a strong foundation in Zoology while allowing for specialization and interdisciplinary learning. The curriculum is structured around several key components:

1. Major Courses: These core courses form the backbone of the program, providing in-depth knowledge and understanding of essential Zoology concepts, theories, and methodologies. Students will engage with topics ranging from classical mechanics, electromagnetism, and thermodynamics to quantum Zoology, relativity, and modern Zoology, ensuring a robust and comprehensive education in the discipline.

2. Minor Courses: Students have the opportunity to choose minor courses from related or distinct disciplines, promoting an interdisciplinary approach to learning. Thisflexibility allows studentsto complement their Zoology education with insights from fields such as mathematics, computer science, or engineering, enhancing their versatility and broadening their career prospects.

3. Open Electives/General Electives: The program encourages intellectual exploration beyond the core discipline by offering a wide range of elective courses. These electives enable students to pursue their interests in diverse subjects, fostering creativity, critical thinking, and a well-rounded educational experience.

4**. Vocational and Skill Enhancement Courses:**Practical skills and technical proficiency are integral to the program, with vocational and skill enhancement courses providing hands-on experience in areas such as computational Zoology, electronics, and instrumentation. These courses are designed to prepare students for immediate employment and equip them with the tools necessary for career advancement in various scientific and technological fields.

5. **Ability Enhancement Courses (AEC):** Indian Knowledge System (IKS), and Value Education Courses (VEC):In alignment with NEP 2020, the program integrates courses that emphasize the Indian Knowledge System, ethical values, and life skills. These courses foster a deep appreciation for India's rich cultural heritage, while also developing essential communication and ethical decision-making skills that are vital for personal and professional growth.

6. Field Projects/Internships/Apprenticeships/Community Engagement Projects/On-Job Training: To bridge the gap between theoretical knowledge and real-world applications, the program includes opportunities for field projects, internships, apprenticeships, and community engagement. These experiences provide students with practical insights, problem-solving abilities, and exposure to professional environments, enhancing their readiness for careers in

Zoology and related fields.

7. Research Methodology and Research Projects: Research is a critical component of the BSc Zoology program, with students acquiring skills in research methodology, data collection, analysis, and scientific inquiry. By engaging in Punyashlok Ahilyadevi Holkar Solapur University, Solapur Faculty of Science & Technology Nep 2020 Compliant Curriculum B. Sc. (Zoology) Program Preamble independent research projects, students are encouraged to develop innovative solutions to complex scientific problems, preparing them for advanced studies and research-oriented careers.

Multiple Entry and Multiple Exit Options

In accordance with the NEP 2020, the BSc Zoology program incorporates a Multiple Entry and Multiple Exit framework, offering students the flexibility to enter or exit the program at various stages. This approach ensures that students can tailor their educational journey according to their personal and professional goals, with options to earn certificates, diplomas, or degrees based on the duration of study completed.

- **Year1:** Upon completion of the first year, students may exit with a Certificate in Zoology.
- **Year2:** After two years, students may choose to exit with a Diploma in Zoology.
- **Year3:** Completion of the third year qualifies students for a BSc Degree in Zoology.
- **Year4:** The fourth year offers an advanced curriculum with a focus on research, allowing students to graduate with an Honors Degree in Zoology.

Eligibility For BSc Zoology: A candidate should have bachelor's degree in Zoology/Life Sciences/Equivalent subjects (three years course after 10+2) from the recognized university.

The scheme of evaluation of performance of candidates shall be based on University assessment as well as College internal assessment as given below.

For B.Sc. Part-II Zoology sem III& IV the internal assessment will be based on Internal tests, Home assignment, Tutorials, Seminars, Group discussion, Brain storming sessions etc. as given below.

Scheme of Evaluation As per the norms of the grading system of evaluation, out of 100 marks, the candidate has to appear for college internal assessment of 40 marks and external evaluation (University assessment)of 60 marks.

Theory:(100marks) University Examination (60 marks):

No. of theory papers:2 (paper III and paper IV of 30 marks each)

Internal Continuous Assessment:(40 marks and 20 marks each for two papers)

(a) Internal test-Home assignment/tutorials/seminars/viva/group discussion/outreach programs. II Semester -Theory:(100marks)

(b) University Examination (60marks): No. of theory papers:2 (paper-III and paper –IV of 30 marks each) Internal Continuous Assessment:(40 marks and 20 marks each for two papers)

(c) Internal test-Home assignment/tutorials/seminars/viva/group discussion/outreach programs. Internal Continuous Assessment:(20marks):

(d) (a)Internal practical test-Scheme of marking:10marks
(b)Viva/group discussion/model or chart/ attitude/ attendance/ overall behavior:10marks

	**Punyashlok Ahilyadevi Holkar Solapur University, Solapur Faculty of Science & Technology Nep 2020 Compliant Curriculum B. Sc. (Zoology)** **Program Specific Outcomes (PSOs)**

Students graduating from BSc (Zoology) will able to :
PSO1: Mastery of Core Zoology Concepts: Techniques and Methodologies discussed in the vital topicslikeCell Biology, Genetics, Molecular Biology manifest the knowledge in research specific areas and studies by protection of endangered species, Wildlife Management, Climatic changes and Global Management are discussed as a paper to improvise the subject knowledge for identifying any problems related and in helping the impacted environment and biodiversity. **PSO2: Experimental and Analytical Skills:** demonstrate proficiency in designing and conducting experiments, using modern laboratory equipment, and employing analytical techniques to interpret and present scientific data effectively. **PSO3: Application of Zoology in Technology and Research:** Exhibit Skills in areas related to their individual specialization like genetic engineering, biotechnology, bioinformatics in relation to current developments and related fields in the domain; helps to apply the knowledge of internal structure of cell, its functions in control of various metabolic functions of organisms. **PSO4: Demonstrated Understanding of Animal Diversity:** • Knowledge of scientific classification and evolutionary relationships of major animal groups. • Appreciation of the breadth of animal diversity. **PSO5: Structure-Function Relationships:** • Recognized how structure relates to function across different biological levels (molecules, cells, organs, organisms, populations, species) for major animal groups. **PSO6: Applied Biological Sciences and Career Opportunities:** Familiarity with applied zoology fields (e.g., sericulture, apiculture, aquaculture, industrial microbiology, DNA technology, medicine) and their career prospects
Program Outcome (POs):
PO 1: Fundamental Knowledge: Gain a comprehensive understanding of the basic concepts and principles of zoology, including the classification, structure, function, and evolution of animals. This includes studying various animal phyla, their physiological processes, and ecological interactions. **PO 2: Laboratory Skills:** Develop proficiency in laboratory techniques and procedures essential for zoological research. This includes skills in microscopy, dissection, histology, and molecular biology techniques such as DNA extraction, PCR, and gel electrophoresis. **PO 3: Fieldwork Competence:** Acquire the ability to conduct field studies to observe and analyze animal behavior, population dynamics, and habitat interactions. This involves learning methods for sampling, data collection, and ecological surveying in various environments. **PO 4: Data Analysis:** Learn to analyze and interpret biological data using appropriate statistical methods and software. This includes understanding how to design experiments, collect data, perform statistical tests, and present findings in a scientifically rigorous manner.

PO 5: Research Skills: Develop the ability to design and conduct independent research projects in zoology. This involves formulating research questions, developing hypotheses, designing experiments, collecting and analyzing data, and drawing valid conclusions.

PO 6: Critical Thinking: Enhance critical thinking skills to evaluate scientific literature, research findings, and current issues in zoology. This includes the ability to critically assess the methodology, results, and implications of scientific studies.

PO 7: Ethical Practice: Apply ethical principles in the study and practice of zoology. This includes understanding the ethical considerations in animal research, conservation efforts, and the responsible use of biological resources.

PO 8: Communication: Develop effective communication skills to convey zoological concepts and research findings to both scientific and general audiences. This includes writing scientific reports, presenting research findings, and engaging in public outreach and education.

PO 9: Interdisciplinary Integration: Integrate knowledge from related fields such as genetics, ecology, environmental science, and biotechnology to enhance the understanding of zoological studies. This interdisciplinary approach helps in addressing complex biological questions and environmental issues.

PO 10: Lifelong Learning: Foster a commitment to lifelong learning to stay updated with advancements in zoology and related fields. This includes engaging in continuous professional development, attending workshops and conferences, and staying informed about new research and technologies.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
B. Sc. II Zoology Syllabus Structure
(NEP 2020) w.e.f. 2025-26

Sr. No	Paper Code	Course/Title	Nature	Credit	Marks	
Semester III						
					CA	**UA**
1.	DSC -1 -3	**Major: Cell Biology**	Theory	2	20	30
2	DSC -1 -4	**Major: Fundamentals of Biochemistry**	Theory	2	20	30
3	DSC -1(3&4)	**Major**: Practical based on Major	Practical	1+1	20	30
4	DSC -2 -3	**Minor: Introduction to Genetics**	Theory	2	20	30
5	DSC -2 -4	**Minor: Techniques in Biology**	Theory	2	20	30
6	DSC-2 (3&4)	**Minor:** Practical based on **Minor**	Practical	1+1	20	30
7	GE -3	**GE: Forensic Science**	Theory	2	20	30
8	VSC 1	Practical based on Cell Biology and **Fundamentals of Biochemistry**	Practical	2	20	30
9	VSC 2	Practical based on **Introduction to Genetics and Techniques in Biology**	Practical	2	20	30
10	L2-1	English	Theory	2	20	30
11	CC-2	Environmental studies	Theory	2	20	30
		Semester III: Total credits with marks		**22**	**220**	**330**
		Total Marks				**550**
Semester IV						
1	DSC -1 --5	**Major: Principles of Ecology**	Theory	2	20	30
2	DSC -1- 6	**Major: Animal Physiology**	Theory	2	20	30
3	DSC-1(5 &6)	**Major:** Practical based on **Major**	Practical	!+1	20	30
4	DSC -2 -5	**Minor: Biological pest Management**	Theory	2	20	30
5	DSC -2 -6	**Minor: Endocrinology**	Theory	2	20	30
6	DSC-2 (5 &6)	**Minor:** Practical based Minor	Practical	1+1	20	30
7	GE -4	**GE**: **Wild life Photography**	Theory	2	20	30
8	VSC 3	Practical based on **Principles of Ecology and Animal Physiology**	Practical	2	20	30
9	VSC 4	Practical based on **Biological pest Management and Endocrinology**	Practical	2	20	30
10	L2-1	English	Theory	2	20	30
11	FP	**Field Projects**	Projects	2	20	30
		Semester IV: Total credits with marks		**22**	**220**	**330**
		Semester III: Total credits with marks		**22**	**220**	**330**
		Total Credits		**44**	**440**	**660**
			Total Marks			**1100**

पुण्यश्लोक अहिल्यादेवी होळकर सोलापूर विद्यापीठ ।। विद्यया संपन्नता ।।	**Punyashlok Ahilyadevi Holkar Solapur University, Solapur** **Second Year B. Sc. (Zoology) Semester-III** **Course Code: DSC1-3 (Major)** **Course Code: Cell Biology (Theory + Practical)**
***TeachingScheme** **Lectures:04 Hours/week, 04 Credits -2** **OR Practical:02Hours/week, 01Credit-2**	***Examination Scheme UA: 30 Marks CA: 20 Marks**

Program Specific Outcome (PSOs)of cell biology:

PSO1Understanding the structure and function of cells

PSO2Learning about cell organelles and how they relate to their functions

PSO3Understanding the process of central dogma

PSO4Learning about cell division, cell membranes,

Program Outcome:

PO1Understand the basic concepts of cell biology

PO2Understand the cell cycle and its phases

PO3Understand the concept of a cell and study ultrastructure of prokaryotic and eukaryotic cell

PO4Understand and implement basic concepts of biology and blend the knowledge with concepts from other branches of science to have proficiency in interdisciplinary branches

Course Objectives:

1 To Understand the concept of a cell and study ultrastructure of prokaryotic and eukaryotic cell

2To Describe various models of structure of plasma membrane with emphasis on Fluid Mosaic Model and understand various functions of plasma membrane

3To Understand the ultrastructure and functions of cell organelles

4ToUnderstand the cell cycle and its phases

Course Outcomes:

1Understand the cell cycle and its phases

2Describe various models of structure of plasma membrane with emphasis on Fluid Mosaic Model and understand various functions of plasma membrane

3Understand the ultrastructure and functions of smooth and rough endoplasmic reticulum; golgibodies; mitochondria

4Understand the structure, types of chromosomes

Section I

Unit 1	**Number of Lectures -2**	**Weightage 4**
Overview of Cells Prokaryotic and Eukaryotic cells, Virus		
Unit 2	**Number of Lectures 2**	**Weightage 4**
Plasma Membrane Singer & Nicholson's model of plasma membrane. An overview of active transport, passive transport across membranes: Uniport, Antiport, Symport		

Unit 3	Number of Lectures 6	Weightage 6
Endomembrane System Structure and Functions: Endoplasmic Reticulum, Golgi apparatus, Lysosomes		

Unit 4	Number of Lectures 4	Weightage 6
Unit 4: **Mitochondria** Mitochondria: Ultrastructure and function, Semi-autonomous nature, Endosymbiotic hypothesis and functions.		

Section II

Unit 1	Number of Lectures 6	Weightage 4
Cytoskeleton Structure and Functions: Microtubules, Microfilaments, Intermediate filaments		

Unit 2	Number of Lectures 6	Weightage 6
Nucleus Structure and functions of Nucleus, Nuclear envelope, Nuclear pore complex, Nucleolus, Chromatin: Euchromatin, Heterochromatin and nucleosome		

Unit 3	Number of Lectures 2	Weightage 4
Chromosome Structure and Types of chromosomes- Acrocentric chromosome, metacentric chromosome, telocentric chromosome, acentric chromosome		

Unit 4	Number of Lectures 2	Weightage 4-6
Cell Division Cell cycle, Mitosis and Meiosis		

College Level Assessment (CA) Activities: Home assignment, Review article, Class test, Field visit, Seminar

DSC-1-3 Major Practical Based On cell biology

Practical
1. Study of prokaryotic and eukaryotic cells using permanent slide / chart/ photograph 2. Preparation of temporary stained squash of onion root tip to study various stages of mitosis. 3. Study of various stages of meiosis in onion flower buds/ *Rhoea discolour.* 4. Demonstration observation of Barr body using oral mucosa 5.Study of selective permeability by using egg shell membrane. 6. Cytological preparation of Mitochnondria from Onion peel/ Hydrilla leaf using vital stain-Janus green-B 7Stainign of nucleus using methylene blue stain . 8. Study of C-bioportal and virtual cell biology (Simulator – V-Lab IIT Bombay).

References list

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2. Molecular Biology of the Cell, V Edition, Garland publishing Inc., New York and London.
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4. Lippincott Williams and Wilkins, Philadelphi
5. Cooper, G.M. and Hausman, R.E. (2009). The Cell: A Molecular Approach. V Edition. ASM
6. Press and Sunderland, Washington, D.C.; Sinauer Associates, MA.
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8. Edition. Pearson Benjamin Cummings Publishing, San Francisco
9. Bruce Albert, Bray Dennis, Levis Julian, Raff Martin, Roberts Keith and Watson James (2008).
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	Punyashlok Ahilyadevi Holkar Solapur University, Solapur **Second Year B. Sc. (Zoology) Semester-III** **Course Code: DSC1-4 (Major)** **Course Code: Fundamentals of Biochemistry (Theory + Practical)**
***Teaching Scheme** Lectures:04 Hours/week, 04 Credits -2 OR Practical:02Hours/week, 01Credit-2	***Examination Scheme UA: 30 Marks CA: 20 Marks**

Program Specific Outcome (PSOs):

PSO1-**Understanding chemical reactions**

Learning how different chemical reactions work and how living organisms use them

PSO2-**Understanding how molecules interact**

Learning how the chemical properties of molecules determine how they interact and react with each other

PSO3-**Understanding metabolism**

Learning how nutrient molecules are metabolized in physiological and pathological conditions

PSO4- **Identifying pathological processes**

Learning to identify pathological processes and correlate them with clinical symptoms and signs

Program Outcome:

PO1 **-Understanding chemical properties**: Students learn how chemical properties of molecules determine how they interact and react with each other.

PO2-**Understanding chemical reactions**: Students learn about different types of chemical reactions and how living organisms use them.

PO3-**Understanding the structure of molecules**: Students learn about the structure of amino acids, nucleotides,nucleic acids, DNA and RNA , lipids, and mono, di, and trisaccharides.

PO4-**Understanding the functions of molecules**: Students learn about the functions of vitamins, nucleic acids, DNA and RNA, lipids, and mono, di, and trisaccharides.

Course Objectives:

1.Understanding the relationship between structure and function-Students will learn how the structure of biomolecules determines their function and regulation.

2. Understanding the role of water and vitamins-Students will learn about the importance of water as a biological solvent and vitamins as vital ingredients of life.

3.Developing analytical and technical skills-Students will develop analytical, technical, and critical thinking skills.

- 4.Learning about the chemical nature of biological macromolecules-Students will learn about the chemical nature of biological macromolecules,

Course Outcomes:

1-**Developing scientific inquiry and problem-solving skills**: Students should develop the ability to conduct scientific inquiry and solve problems.

2-**Developing quantitative and analytical skills**: Students should develop quantitative and analytical skills.

3-**Developing communication skills**: Students should develop communication skills.

4-**Developing information literacy and ethical analysis skills**: Students should develop the ability to locate, understand, and evaluate scientific information.

Section I

Unit 1	**Number of Lectures 3**	**Weightage 2-4**
Biological-elements: Introduction, Biological Significance of Carbon, Oxygen, Hydrogen, Nitrogen and Phosphorus.		

Unit 2	Number of Lectures 4	Weightage 2-6
Carbohydrates : Structure and biological significance of Monosaccharides, Disaccharides and Polysaccharides		

Unit 3	Number of Lectures 5	Weightage 2-4
Lipids Structure and biological significance of physiologically important saturated and unsaturated fatty acids, Tri-acylglycerols, Phospholipids, and steroids.		

Unit 4	Number of Lectures 4	Weightage 2-4
Amino acids: Structure, Biological significance and Classification of amino acids		

Section II

Unit 1	Number of Lectures 4	Weightage 6
Proteins: Levels of organization in proteins (Primary, Secondary, Tertiary and Quaternary), simple and conjugate proteins with examples.		

Unit 2	Number of Lectures 4	Weightage 6
Nucleic acids: Structure, Composition and function of DNA and RNA- (Purines and Pyrimidines, Nucleosides, and Nucleotides), Forms of DNA (A, B and Z) and RNA		

Unit 3	Number of Lectures 4	Weightage 6
Vitamins : Definition and Classification, Source, functions and deficiency diseases.		

Unit 4	Number of Lectures 4	Weightage 6
Enzymes: Introduction and Classification, Cofactors, Mechanism of enzyme action and Factors affecting enzyme actions		

Practical in Fundamentals of Biochemistry

Practical
1. .Qualitative tests of functional groups in carbohydrates, proteins and lipids. 2. .Estimation of protein by colorimetric method (Any suitable method) 3. Estimation of carbohydrates by colorimetric method. 4. To study of the difference between water soluble and fat soluble vitamins. 5. Estimation of Vitamin C (Ascorbic Acid). 6. Effect of pH and temperature on enzyme activity- Amylase. 7. Isolation of DNA. 8. Separation of amino acids using paper chromatography. 9. Study and interpretation of blood and urine report. **10.** Visit to pathological lab or Blood Bank and submission of report.

References list

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2. Berg, J.M., Tymoczko, J.L. and Stryer, L. (2007). Biochemistry, VI Edition, W.H. Freeman and Co., New York.
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7. Handbook of Biochemistry and Molecular Biology by Roger L. Lundblad (Editor); Fiona MacDonald (Editor)

"Biochemistry" by Satyanarayana

	Punyashlok Ahilyadevi Holkar Solapur University, Solapur **Second Year B. Sc. (Zoology)** **Semester-III** **Course Code: DSC2-3 (Minor)** **Course Code: Introduction to Genetics (Theory)**
***Teaching: Scheme Lectures:04 Hours/week, 04 Credits -2 OR Practical:02Hours/week, 01Credit-2**	***Examination Scheme UA:30 Marks CA: 20 Marks**

Program Specific Outcome (PSOs):

PSO1**:-Understanding Genetic Principles**: Ability to explain and apply fundamental genetic concepts and theories.

PSO2:-**Research Skills**: Proficiency in designing and conducting genetic research, including data analysis and interpretation.

PSO3:- **Technological Proficiency**: Competence in using modern genetic and bioinformatics software.

PSO4:- **Problem Solving**: Capability to solve complex genetic problems and develop innovative solutions.

Program Outcome:-

PO1:**Understand Basic Genetic Concepts** - Grasp fundamental principles of genetics, including inheritance patterns.

PO2:**Analyze Genetic Data** - Develop skills in collecting, analyzing, and interpreting genetic data.

PO3: **Apply Genetic Knowledge** - Use genetic concepts to solve basic problems and understand genetic variation in populations.

PO4: **Use Genetic Tools** - Gain proficiency in using common genetic tools and techniques - karyotyping.

PO5: **Explore Genetic Disorders** - Learn about common genetic disorders and their impact on individuals and families.

Course Objectives:

CO-1: **Explore Genetic Disorders** - Learn about common genetic disorders and their impact on individuals and families.

CO-2: Develop skills in collecting, analyzing, and interpreting genetic data.

CO-3: Apply genetic knowledge to solve basic problems and understand genetic variation within populations.

CO-4: Recognize and discuss ethical, legal, and social implications of genetic research and technologies.

Course Outcomes:

CO-1: Demonstrate understanding of fundamental genetic principles, including inheritance patterns, DNA structure, and gene function.

CO-2: Collect, analyze, and interpret genetic data effectively.

CO-3: Apply genetic knowledge to solve basic problems and understand genetic variation within populations.

CO-4: Utilize common genetic tools and techniques.

UNIT I:- Introduction to Genetics	**Number of Lectures 08**	**Weightage of Marks** 2 **to** 6

1.1.Mendelian Genetics:- Genetics examples based on Monohybrid cross.

Introduction about Mendelian work: Genotype, Phenotype, test cross, back cross.

1.2.Monohybrid cross- Law of dominance, Law of segregation, Incomplete Dominance, Co-dominance

1.3.Dihybrid Cross- Law of Independent Assortment 1.4 Multiple alleles with coat colour in rabbit and blood group.

UNIT II: - Gene interaction	**Number of Lectures 07**	**Weightage of Marks 2 to 6**
Supplementary, Complimentary and Epistatsis- Dominant and Recessive.		

Section II

UNIT III: - Sex Determination	**Number of Lectures 08**	**Weightage of Marks 2 to 6**
Chromosomal Mechanism of sex determination in *Drosophila* and Human, Genetic Disorder: Klinefelters Syndrome and Turners Syndrome.		

UNIT IV: - Linkage, Crossing Over	**Number of Lectures 07**	**Weightage of Marks** 2 **to** 4
2.1. Linkage – Complete and Incomplete Linkage with suitable example, Importance of Linkage **2.2. Crossing Over** – Mechanism of Crossing over, Cytological Proof of Crossing Over, Importance of Crossing Over		

DSC-2-4 Practical Based On Introduction to genetics

1. Genetic examples based on Monohybrid cross (Any 4).
2. Genetic examples based on Dihybrid cross (Any 2).
3. Genetic examples based on multiple allele (Examples based on coat colour in rabbit and blood groups.
4. Genetic examples based on interaction of gene cross (Any 3).
5. Study of Karyotype (Normal karyotype, Chrosomal aberrations – Turner syndrome and Klinfilter syndrome.
6. Example based on Linkage.
7. Example based on Crossing over.

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2. Snustad, D.P., Simmons, M.J. (2009). Principles of Genetics. V-Edition. John Wiley and Sons Inc
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	Punyashlok Ahilyadevi Holkar Solapur University, Solapur **Second Year B. Sc. (Zoology)** **Semester-III** **Course Code: DSC2-4** **Course Code: Techniques in Biology (Minor)**
***Teaching Scheme Lectures:04 Hours/week, 04 Credits -2 OR Practical:02Hours/week, 01Credit-2	***Examination Scheme UA: 30 Marks CA: 20 Marks**

Program Specific Outcome (PSOs):

PSO1: Graduate students will be able to demonstrate and apply the knowledge of sterilization techniques in for performing biological experiments.

PSO2: Graduate students will be able to demonstrate and apply the principles of microscopy for making microscopic observations.

PSO3: Students will be able to gain the knowledge of Photometric techniques and its applications and hematological techniques.

PSO4: Student will be able to use techniques like centrifugation, chromatography electrophoresis for isolation of bio molecules.

Program Outcome:

PO 1: Fundamental Knowledge: Gain a comprehensive understanding of the basic concepts and principles of zoology, including the classification, structure, function, and evolution of animals. This includes studying various animal phyla, their physiological processes, and ecological interactions.

PO 2: Laboratory Skills: Develop proficiency in laboratory techniques and procedures essential for zoological research. This includes skills in microscopy, dissection, histology, and molecular biology techniques such as microscopy and gel electrophoresisetc.

PO 3: Data Analysis: Learn to analyze and interpret biological data using appropriate statistical methods and software. This includes understanding how to design experiments, collect data, perform statistical tests, and present findings in a scientifically rigorous manner.

PO 4: Research Skills: Develop the ability to design and conduct independent research projects in zoology. This involves formulating research questions, developing hypotheses, designing experiments, collecting and analyzing data, and drawing valid conclusions

Course Objectives:

1 To inculcate the knowledge of sterilization techniques.
2 To enable students to handle compound microscope at different resolutions.
3 To understand the mechanism of working of colorimeter.
4 To understand the separation mechanism of biomolecules by using chromatography.

Course Outcomes:

1 Students will be able to use sterilization techniques while performing biological experiments.
2 Students will be able to operate microscope to observe microscopic things.
3 Students will be able to use colorimeter for component analysis in samples.
4 Students will be able to isolate biomolecules by using chromatography technique.

Section I

Unit 1	Number of lectures- 3	Weightage 2-4
Introduction to Biological Techniques • Importance of biological techniques in research, health and industry with suitable example's.		

Unit 2	Number of lectures-4	Weightage 4-6
Microscopy 2.1 Brief history of Microscopes. 2.2 Principles of Microscopy 2.3 Simple microscope 2.4 Compound microscope		

Unit 3	Number of lectures-4	Weightage 4-6
Separation Technique -Chromatography 3.1Principle 3.2 Types of Chromatography: a. Paper chromatography b. Thin layer chromatography		

Unit 4	Number of lectures-4	Weightage 4
Sterilization Methods in Biology 4.1Sterilization by heat • Autoclave • Pasteurization • Radiations • Chemical disinfectants		

Section II

Unit 1	Number of lectures-2	Weightage 4-6
Separation Technique- Centrifugation 5.1 Principle of Centrifugation 5.2 Application of Centrifugation.		

Unit 2	Number of lectures- 4	Weightage 4-6
Hematological Techniques Principal and applications of 6.1 Hemocytometer 6.2 Hemoglobinometer		
Unit 3	**Number of lectures-3**	**Weightage 2-4**
Photometric Technique: Colorimeter 3.1 Principles 3.2 Colorimeter: Parts, Instrumental design, working mechanism, applications.		
Unit 4	**Number of lectures-4**	**Weightage 2-4**
Separation Technique- Electrophoresis • Definition and principle of electrophoresis • Types of electrophoresis - Gel - electrophoresis PAGE electrophoresis		
College Level Assessment (CA) Activities: Home assignment, Review article, Class test, Field visit, Seminar		

References list
1. Boyer, R. (2000) Modern Experimental Biochemistry (3rd edition) Benjamin-Cummings.
2. Pearse, A.G.E. (1980-1993) Histochemistry - Theoretical and applied, Volume I-III, Churchill-Livingstones.
3. Plummer, D. (2017) An Introduction to Practical Biochemistry (3 rd edition) McGraw Hill.
4. Wilson, K. and Walker, J. (2010) Experimental Biochemistry, Cambridge.
5. Biotechniques -N.Arumugam and V.Kumaresan ,Saras publication
6. Biochemistry Dr.N. Arumugam,Dulsy Fatima,L.M .Narayanan,Prof. K.Nallisingam,Dr.R.P Meyyan Pillai ,Prof.S.Prasannakumar , Saras publication
7. Biological Techniques By P.R. Yadav Discovery Publishing House Pvt. Limited

Practical Based On Techniques in Biology (Minor)

Practical's
1. Isolation of amino acids by using Paper Chromatography. 2. Study of Colorimetric estimation of protein concentration from the given sample by suitable method. 3. Study of spectrophotometric estimation of glucose concentration from the given sample by DNSA method. 4. Study of Centrifuge machine and isolation of cell constituents. 5. Preparation of blood smear and identification of WBCs (leucocytes). 6. Study of Neubauer chamber for RBC cell count 7. Study of Neubauer chamber for WBC cell count 8. Study of Osmotic fractionation of RBC.

	Punyashlok Ahilyadevi Holkar Solapur University, Solapur **Second Year B. Sc. (Zoology) Semester-III/IV** **Vertical : Open Elective – III General Elective- III** **Course Code:- GE-OE** **Course Code: Forensic science (Theory)**
***Teaching SchemeLectures:04 Hours/week, Credits 02**	***Examination Scheme UA: 30 Marks CA: 20 Marks**

Program Specific Outcome (PSOs):

PSO1. To provide a platform for students and forensic scientist to exchange views, checkouts collaborative programs and work in holistic manner for the advancement of Forensic Science

PSO2. To understand skills for Detection of crime with scientific aid.

PSO3. To emphasize on forensic entomology assists in death investigations.

PSO4. To review the steps necessary for achieving highest excellence in forensic science.

Program Outcome:

PO1. To understand wildlife forensics aid in conserving natural resources

PO2. To generate talented human resource, commensuration with latest requirements of forensic science.

PO3. How wildlife forensics aid in conserving natural resources.

PO4. The forensic significance of DNA typing.

Course Objectives: After studying this paper the students will know –

1. To disseminate information on the advancements in the field of forensic science.
2. Acquaint the student with Role of forensic science in crime detection
3. The fundamental principles and functions of forensic science.
4. To emphasize the importance of scientific methods in crime identification and detection

Course Outcomes:

1. To create awareness of techno crimes and use of new emerging techniques in crime detection.
2. To use technological advancements in the investigation of crimes and its occurrences.
3. To make them aware about starting private detective agencies in future.
4. To highlight the importance of Forensic Science for perseverance of the society.

Section I

Unit 1	**Number of lectures 7 L**	**Weightage 2-4**

Introduction to Forensic Science: Definition of forensic science, History and development of forensic science, Concepts in forensic science; scope and need of forensic science.

Branches of Forensic Science: Overview of various disciplines, such as forensic biology, chemistry, toxicology, pathology, anthropology, odontology, digital forensics, psychology, entomology, document examination, and ballistics

Unit 2	**Number of lectures 8 L**	**Weightage 4-6**

Types of Evidence:

- Physical evidence: Weapons, tools, and other tangible objects.
- Biological evidence: Blood, hair, bodily fluids, and tissues.
- Chemical evidence: Drugs, explosives, and trace substances.
- Digital evidence: Data from electronic devices and online sources.

Forensic Analysis Techniques:

- DNA profiling and its significance in identifying suspects and victims

Section II

Unit 3	**Number of lectures -8 L**	**Weightage 4-6**

Forensic entomology:

Roles of Insects in Forensic Science (Blow Flies (Family Calliphoridae), Flesh Flies (Family Sarcophagidae), House Flies (Family Muscidae), Carrion Beetles (Family Silphidae) and Rove Beetles (Family Staphylinidae).

Applications of Forensic Science:

- Criminal investigations
- Legal proceedings
- Identification of unknown individuals
- Counterterrorism and national security
- Environmental forensics
- medical and health applications
- Educational and research.

Unit 4	**Number of lectures 7**	**Weightage 4-6**

Applications of Forensic Science in Wildlife:

- Poaching and illegal wildlife trade
- Tracking wildlife trafficking and identifying species.
- Monitoring endangered species and investigating habitat destruction
- Environmental crimes.

forensic laboratories in India:

- Central Forensic Science Laboratories (CFSL)
- State Forensic Science Laboratories (SFSL)
- Regional Forensic Science Laboratories (RFSL)
- Mini Forensic Science Laboratories (MFSL)

College Level Assessment (CA) Activities: Home assignment, Review article, Class test, Field visit, Seminar

Reference Books

1. S. Chowdhuri, Forensic Biology, BPRD, New Delhi (1971).
2. R. Saferstein, Forensic Science Handbook, Vol. III, Prentice Hall, New Jersey (1993).
3. J.M. Butler, Forensic DNA Typing, Elsevier, Burlington (2005).
4. B.B. Nanda and R.K. Tiwari (2001). Forensic Science in India: A Vision for the Twenty First century, Select Publishers, New Delhi
5. Richard Li (2015), "Forensic Biology", CRC Press, Boca Raton, 2nd Edition.
6. Jason H. Byrd, James L. Castner (2009), "Forensic Entomology: The Utility of Arthropods in Legal Investigations", CRC Press, Boca Raton, 2 nd Edition.
7. L. Stryer, Biochemistry, 3rd Edition, W.H. Freeman and Company, New York (1988).
8. S.H. James and J.J. Nordby, Forensic Science: An Introduction to Scientific and Investigative Techniques, 2nd Edition, CRC Press, Boca Raton (2005).
9. Eckert, W. G. (1997). *Introduction to Forensic Sciences (2nd Edition)*. CRC Press.
10. Sharma, B. R. (2019). *Forensic Science in Criminal Investigation & Trials*. Universal Law Publishing Company.
11. Nath, S., & Nath, R. C. (2013). *Forensic Science and Crime Investigation*. Abhijeet Publications.

VSC 1 Practical based on (Major) DSC-1 (3 and 4) Cell Biology and Fundamentals of Biochemistry

1. Study of cytoskeleton with help of slide, photographs, charts

2) Study of nucleus using methylene blue stain.

3) Study of Osmosis using blood cells.

4) Study of types of chromosomes with the help of photographs and charts.

5) Study of C-biportal

6) Virtual lab cell biology

7) Study of qualitative test for bioelements (C, O, H)

8) Estimation of carbohydrates by colorimetric method.

9) Separation of Amino acids by using paper chromatography.

10) Action of amylase or papain enzyme under optimum conditions.

11) Study and interpretation of blood and urine sample analysis report

12) Visit to pathology laboratory/ blood bank,/review article/projects.

VSC 2 Practical Based on (Minor)DSC-2 (3 and 4) Introduction to Genetics and Techniques in Biology

1. Study of DNA and RNA Model
2. Study of Klinefelter's Syndrome and Turner's Syndrome using chart/model/photograph .
3. Genetic examples based on Multiple alleles with coat colour in rabbit and blood group.
4. Genetic examples based on Monohybrid cross (Any 2).
5. Genetic examples based on Dihybrid cross (Any 2).
6. Genetic examples based on multiple allele (Examples based on coat colour in rabbit and blood groups.
7. Genetic examples based on interaction of gene (Any one).
8. Study of Centrifuge machine and isolation of cell constituents..
9. Separation of Plant Pigments Using Paper Chromatography
10. Observation of Cell Structures Using Compound Microscopy (Tissue Permanent slide/ photograph/Chart)
11. Determination of enzyme Activity and effect of Temperature and pH.

Semester IV

	Punyashlok Ahilyadevi Holkar Solapur University, Solapur **Second Year B. Sc. (Zoology) Semester-IV** **Course Code: DSC 1-5 (Major)** **Course Code: Principles of Ecology (Theory + Practical)**
***Teaching Scheme Lectures:04 Hours/week, 04 Credits -2 OR Practical:02Hours/week, 01Credit-2**	***Examination Scheme UA:30 Marks CA: 20 Marks**

Program Specific Outcome (PSOs):

PSO1 Investigate the complexities of the natural environment and our relationship

PSO2 Explore the problems we face in understanding our natural environment.

PSO3 Use computer-based geographical information systems to study environmental

PSO4 Develop scientific, interpretive and creative thinking skills in living sustainability

Program Outcome:

PO1 Learn to apply quantitative analysis and field research techniques

PO2 Imbibe moral and social values in personal and social life leading to protection of ecosystems.

PO3 Understand the issues of environmental contexts and sustainable development

PO4 To learn various ecosystems and their components

Course Objectives:

1 Understand the key principles of ecology at the individual, population, community, and ecosystem levels.

2Analyze the flow of energy and matter in ecosystems.

3 Examine the diversity and distribution of life on Earth.

4 Evaluate the effects of human activity on ecological processes.

5 Develop skills in ecological research methods (if lab/fieldwork is included

Course Outcomes:

1. Understanding ecological organization at different levels (organism, population, community, ecosystem, biome)

2. Ability to explain the importance of biotic and abiotic factors in shaping ecosystems.

3. Students will be able to explain core ecological concepts, including energy flow, nutrient cycling, and the structure and function of ecosystems.

3. Students will describe and analyze different types of species interactions (e.g., predation, competition, mutualism, parasitism) and their impact on community structure.

4. Students will understand the importance of biodiversity and its role in ecosystem stability and resilience, and will be able to assess threats to biodiversity.

5. Students will critically assess human activities, such as urbanization, agriculture, and deforestation, and their effects on ecosystems and biodiversity.

Section I

Unit 1	**Number of Lectures 02**	**Weightage : 02**
Introduction to Ecology - Definition and scope of ecology, History of ecology, Autecology and synecology		
Unit 2	**Number of Lectures 04**	**Weightage 02-4**
Population Ecology **Brief idea about attributes of population:** Density, natality, mortality, life tables, survivorship curves.		

Unit 3	**Number of Lectures 02**	**Weightage**
Animal Associations- Brief idea and definitions • Intraspecific associations: Courtship behaviour in birds, groupism and social behaviour • Interspecific associations: Commensalism, mutualism, predation and parasitism		
Unit 4	**Number of Lectures 06**	**Weightage 4-6**
The Physical Environment and Abiotic Factors • Climate, weather, and biomes - Temperature, light, water hardness, humidity, soil, oxygen, carbon dioxide. And nutrients as environmental factors.		

Section II

Unit 1	**Number of Lectures 04**	**Weightage 4-6**
Community Ecology Community characteristics: species richness, dominance, diversity indices and abundance.		
Unit 2	**Number of Lectures 04**	**Weightage**
Ecosystem **General characteristics & faunal adaptations in:** • Aquatic (freshwater ecosystem: lotic and lentic) • Terrestrial (grassland and desert ecosystem)		
Unit 3	**Number of Lectures 04**	**Weightage 4**
Ecosystem Ecology • Energy flow in ecosystems (trophic levels, food chain, food webs) • Biogeochemical cycles (carbon, nitrogen, phosphorus)		
Unit 4	**Number of Lectures 04**	**Weightage 4**
Applied Ecology, **Biodiversity and Conservation** • **Brief idea of: Biodiversity hot-spots and sacred groves in India with examples** • Biodiversity hotspots and the importance of conservation • Human impacts on biodiversity (habitat loss, invasive species, climate change)		

College Level Assessment (CA) Activities: Home assignment, Review article, Class test, Field visit, Seminar

DSC-1-5 Practical Based on Principles of Ecology (Major)

Practical
1. Study and construction of ecological pyramid from grassland ecosystem : i) Members of Grass land ecosystem – Grasshopper, Rat Snake, Grass, Herbs, Shrubs, Weeds, Trees, Vulture, Squirrel, Centipede, Scorpion , Hare and Indian Bustard. **2.** Study and construction of ecological pyramid from Pond ecosystem. Members of Pond ecosystem – Sponge, Nepa, *Leech, Planaria, Hydra, Lymnea, Planorbis, Heron, Kingfisher, Cyclops, Daphnia,* Tortoise , Diatoms *Vallisneria, Hydrilla, Chara* and *Spirogyra*

3. Plankton collection tools and technique..

4. Study of an aquatic ecosystem: Collection and Identification of Zooplankton.

5. Estimation of Dissolved Oxygen (Winkler's method) from given sample

6. Estimation of free carbon dioxide (CO_2) from given sample

7. Estimation of Total Hardness content from given water sample.

8. Collection of data and calculation of Shannon-Weiner diversity index..

9. Estimate population density of a particular species with quadrat-method.

10. Study of Diversity of invertebrates from college campus.

11. Study of ecological succession in aquatic ecosystem.

12. Construct the Survivorship Curves (Use hypothetical or real population data)

13. Study Visit: Report on a visit to National / Central / State institutes / Local water bodies/National Park/Biodiversity Park/Wild life sanctuary, / Review article.

References list

1. Colinvaux, P. A. (1993). Ecology. II Edition. Wiley, John and Sons, Inc.
2. Concept of Ecology, N Arumugam, Saras Publication
3. Krebs, C. J. (2001). Ecology. VI Edition. Benjamin Cummings.
4. Odum, E.P., (2008). Fundamentals of Ecology. Indian Edition. Brooks/Cole
5. Robert Leo Smith Ecology and field biology Harper and Row publisher
6. Ricklefs, R.E., (2000). Ecology. V Edition. Chiron Pres

	Punyashlok Ahilyadevi Holkar Solapur University, Solapur **Second Year B. Sc. (Zoology) Semester-IV** **Course Code: DSC1-6 (Major)** **Course Code: Animal Physiology (Theory + Practical)**
*Teaching Scheme Lectures:04 Hours/week, 04 Credits -2 OR Practical:02Hours/week, 01Credit-2	***Examination Scheme UA:30 Marks CA: 20 Marks**

Program Specific Outcome (PSOs):

PSO1 Perform procedures as per laboratory standards in the areas of Taxonomy, Physiology, Ecology, Cell biology, Genetics, Applied Zoology, Toxicology, Entomology, Sericulture, Biochemistry, Fish biology, Animal breeding and Clinical Pathology.

PSO2 Analyze the mechanisms involved in life processes up to the molecular level.

PSO3 To have competent problem-solving skills in the basic area of zoology.

PSO4 Acquire skills about team work and ethical awareness and adopt scientific temper and leadership concerned for nation building.

Program Outcome:

PO1 Students learn to communicate physiological knowledge clearly and effectively

PO2 Students develop writing skills, such as publishing research articles in physiology

PO3 Students learn about the molecular and cellular basis of physiological functions in animals

PO4: Apply their knowledge of fundamental principles in biological sciences to pursue higher studies in interdisciplinary subjects

Course Objectives:

1The course deals with various physiological functions in mammals.

2The course highlights on some of the important aspects viz. tissues, histology of the mammalian organs, nervous and muscular system.

3The course highlights on some of the important aspects viz., Reproductive Physiology and cycle.

4The course highlights on some of the important aspects viz.In-vitro Fertilization and Endocrine System

Course Outcomes:

1Classify cells and tissue

2Understand the functioning of nerve cells& muscle cells.

3Interpolate the coordination of hormones involved in reproductive physiology

4Understand the importance of IVF

Section I

Unit 1	**Number of Lectures 04**	**Weightage 4-6**
Tissues : Structure, location, classification and functions of: epithelial tissue, connective tissue, muscular tissue and nervous tissue. Blood –Types of blood cells (RBC,WBC ,Platelets , Plasma), functions of blood cells		

Unit 2	Number of Lectures 4	Weightage 4-6
Histology of following mammalian organs i) Tooth ii) Salivary gland iii) Stomach iv) Ilium v) Kidney vi) Liver vii) Pancreas viii Testis ix Ovary x Uterus		
Unit 3	**Number of Lectures 4**	**Weightage 4-6**
Physiology of Digestion: • Structural organization and functions of gastro- intestinal tract. • Mechanical and chemical digestion of food. • Digestion and absorption of food in stomach and intestine.		
Unit 4	**Number of Lectures 4**	**Weightage 4-6**
Nerve Physiology • Resting membrane Potential • Origin of action potential and it's propagation across the nerve fibres ; Structure of Synapse and Synaptic transmission		

Section II

Unit 1	Number of Lectures 04	Weightage 4
Excretory System- • Structure of kidney, • Types of excretory wastes • Ultra structure of Nephron • Mechanism of Urine formation		

Unit 2	Number of Lectures 04	Weightage 3-6
Reproductive Physiology Reproductive Cycle- a. Oestrous cycle b. Menstrual cycle		
Unit 3	**Number of Lectures 04**	**Weightage 4-6**
Contraception methods: Physical, oral contraceptives pills, IUD, surgical methods		

Unit 4	Number of Lectures 02	Weightage 4
In-vitro Fertilization - Technique of IVF and its applications		

College Level Assessment (CA) Activities: Home assignment, Review article, Class test, Field visit, Seminar

References list

1. Textbook of Medical Physiology, Guyton, A.C. & Hall, J.E. (2006). XI Edition. Hercourt Asia PTE Ltd. /W.B. Saunders Company
2. Principles of Anatomy & Physiology. Tortora, G.J. & Grabowski, S. (2006). XI Edition John Wiley & sons
3. De Fiore's Atlas of Histology with Functional correlations. Victor P. Eroschenko. (2008). XII Edition. Lippincott W. & Wilkins
4. .Randall, D. et al. (2002) Eckert Animal Physiology (5th edition) Freeman.
5. Hill, R.W. et al. (2008) Animal Physiology (3rd edition) Sinaur Associates.
6. Prosser C. L. and F. A. Brown – Comparative Animal Physiology; Saunders
7. Randall D ,Burggren W. 2001. Eckert Animal Physiology by. 4th edition. W. H. Freeman.
8. Refinetti R. 2000. Circadian Physiology. CRC Press, Boca Raton

Practical DSC-1-6 Animal physiology (Major)

1. Observation and detail explanation of following tissue with reference to structure, location and functions (with CD/Slide/Model/Chart).

i)Epithelial ii) Connective iii) Muscular iv) Nervous

2.Study of histological structures (T.S./V,S.) - of Mammalian organs using permanent slides (Spotters):i)Tooth ii) Salivary gland iii) Stomach iv) Ilium v)

3. Describe role of – 1). Kidney 2). Liver 3). Pancreas 4.) Testis 5. Ovary 6).Uterus (use chart/ photographs/ models)

4. Study of ABO blood group system from given blood sample .

5. Total count of WBC from a given blood sample by using Neubauer chamber.

6). Study of following abnormal urine constituents: Glucose, Bile, Blood and Albumin

7 Microtomy: Study of principle , procedure and mechanism of micro-technique for the preparation of permanent slides:

a)Fixation of tissue

b)Embedding wax and Preparation of blocks

c) Demonstration of Gradient hydration and dehydration and staining with HE

8. Study of contraceptives: Oral contraceptives (pills),Intra -uterine device, Condom using chart/Photographs.

9. Study visit: Preparation of models, R&D labs, medical college, pathology laboratory and blood bank OR Preparation and submission of small project/ review on topics related to cell biology, biochemistry and physiology/Visit to IVF center.

	Punyashlok Ahilyadevi Holkar Solapur University, Solapur **Second Year B.Sc.(Zoology) Semester- IV** **Course Code :DSC 2-5 (Minor)** **Course Code : Biological Pest Management**
Teaching Scheme Lectures:04 Hours/ week, 04 Credits- 2 OR Practical: 02 Hours/ week, 01 Credit- 2	**Examination Scheme UA:30 Marks CA: 20Marks**

Program Specific Outcome (PSOs) :
PSO1:- Deep Introduction to Entomology
PSO2 :- Role of Insects in Agriculture
PSO3 :- Study of Pest Management
PSO4:- Study of different types of Pests and their Habitat.

Program outcome :
PO1:- To study Taxonomy of Insects.
PO2:- To study Advance technique of Pest control.
PO3:- Importance of Evaluation of Pest Management.
PO4:- Study of Pesticides and their Effects on Human Health.

Course Objectives:
CO1:- Study of different categories of Pests.
CO 2:- Study of Pest control Strategies.
CO 3:- Sustainable development of Pest Management.
CO 4:- Awareness of Biological Pest Control.

Section I

Unit 1	**Number of Lectures 02**	**Weightage 04**

Introduction to Toxicology

- Definition of Toxicology, History of Toxicology
- Concept and scope of Toxicology.

Unit 2	**Number of Lectures 04**	**Weightage 04**

a. Ecological and economic importance of insects
a. Decomposers- Beetles
b. Burrowing bug- Ants
c. Pollinators- Honey bee, wasps,
d. Essential insects- Butterflies, Dragonflies, lacewings, lac insect.

Unit 3	**Number of Lectures 04**	**Weightage 04**

Insect as diseases carriers or an intermediate host
a. *Anopheles* Mosquito- Malaria
b. *Aedes* Mosquito- Dengue, Yellow fever, Viral fever.
c. *Culex* Mosquito- Filaria
d. Tsetse fly- Sleeping sickness.
e. Sand fly (Phlebotomus)- *Lieshmania* (Kalaazar)
f. Housefly –Diarrhea, Cholera.

Unit 4 :	Number of Lectures 02	Weightage 04
Classification of insect pest on the basis of nature of damage to crop a) Defoliators: Caterpillars, beetles, grasshoppers. b) Sap Suckers: Aphids, whiteflies, c) Borers: Stem borers, fruit borers, root borers. d) Seed and Grain Feeders: grain weevils e) Flower Feeders: Thrips.		

Section II

Unit 1	Number of Lectures 04	Weightage 04
Study of Mouth parts of Insect pests. **1.** Chewing & Mandibulate type-Cockroach. 2. Sponging type of mouth part- Housefly 3. Siphoning type of mouth part - Butterfly **4.** Piercing and sucking type of mouth parts- Mosquito		
Unit 2	**Number of Lectures 04**	**Weightage 04**
Insecticides • Types of insecticides / Pesticides : Pyrethrods, Organochlorine, Organophosphate, Carbonate Insecticide. (Chemical nature and mode of action of insecticide)		
Unit 3	**Number of Lectures 04**	**Weightage 04**
Biological Control Agents • Predator (e.g., ladybird beetle) • Parasitoid (e.g., wasp) • Pathogens (e.g., fungi- Trichoderma, bacteria- B*acillus thiruingensis*, viruses- Baculo virus)		

Unit 4	Number of Lectures 6	Weightage 04
Integrated Pest Management (IPM) • **Monitoring and Identification**- Regular scouting, Traps and Tools • **Cultural Controls**-Crop Rotation, Intercropping, Sanitation • **Biological Controls**- Natural Enemies, Habitat Management • **Mechanical and Physical Controls**-Barriers and Traps- Handpicking, Tillage • **Genetic Controls**- Resistant Varieties, Sterile Insect Technique (SIT) • **Chemical Controls**- Selective Pesticides, Timed Applications, Reduced Usage		

College Level Assessment (CA) Activities: Home assignment, Review article, Class test, Field visit, Seminar

DSC-2-5 Practical Based on Biological pest Management

Practical (Charts, Models, Photograph & Virtual)

1 External morphology of Insect (Grasshopper/Cockroach).

2. Study of mouth parts of insects.

3. Demonstration of collection of Insect Pest by using sweep net.

4. Identification of insect pest up to order by using standard key (any two)

5. Study of insect crop pest (any 2)

a. Common Grain Pest – Lesser grain borer, Beetle, Moth & weevil.

b. Legume Insects Pests - Leaf hoppers, Aphids, Armyworm, Fruit fly, Slug.

c. Corn Insects Pests – Cutworm, Flea beetle, Corn borer, Click beetle, Grasshopper, Chinch bug & Thrips.

d. Vegetable- Insects Pests - Cabbage looper, Caterpillars, Cutworm, Locusts, White fly, Mits & Snail

6. Study of biological pest regulators
   a. Lady Bird Beetle
   b. Spider
   c. Damsel fly and Dragon fly

7. Insect as diseases carriers

1. *Anopheles* Mosquito
2. *Aedes* Mosquito
3. *Culex* Mosquito
4. Tsetse fly
5. Sand fly
6. Housefly

8. Study of life cycle of butterfly
9. Field study - Documentation of insect pests including immature stages.
10. Diversity of butterfly and Host plants within the college campus
11. Survey of Pesticides and Insecticides used by the farmers in the market or Survey of organic/ Traditional pest control methods used by the farmers. (Any one)

Reference list

1. Biopesticides and Pest Management - G S Dahiwal and O.Koul
2. Handbook of Agriculture - ICAR Publication
3. Handbook of Pest Management in Agriculture - A.Pinrental
4. Principles of Insect Pests - Dahiwal and Arora
5. Agricultural Pest of India - A A Satwal

	Punyashlok Ahilyadevi Holkar Solapur University, Solapur **Second Year B. Sc. (Zoology) Semester-IV** **Course Code: DSC 2-6 (2+1) (Minor)** **Course Code: Endocrinology (Theory + Practical)**
***TeachingScheme** **Lectures:04 Hours/week, 04 Credits -2** **OR Practical:02Hours/week, 01Credit-2**	***Examination Scheme UA: Marks CA: Marks**

Program Specific Outcome (PSOs):

PSO1 Students perform and analyze endocrine biochemical tests.
PSO2 Students understand endocrine physiology.
PSO3 Students learn how to perform research in endocrinology.
PSO4 Enhance general medical knowledge.

Program Outcome:

PO1 Provide skills to effectively communicate complex endocrine conditions to patients.
PO2 Addressing hormonal issues related to fertility, menstrual irregularities, menopause, and male reproductive health
PO3 Working as an consultant endocrinologist in hospitals
PO4 Familiarity with specialized diagnostic tests like hormone assays

Course Objectives:

1The course will provide information about diagnosis and management of endocrine disorders.
2 The course will provide information in endocrine biochemistry.
3Students learn about Hormonal Replacement Therapy.
4Course provide knowledge in the field of endocrine research and development.

Course Outcomes:

1Students learn about endocrine glands and their functions.
2Students learn about action and, mechanism of different hormones.
3Students learn about endocrine disorders.
4Students will analyze metabolic laboratory data.

Section I

Unit 1	**Number of Lectures 02**	**Weightage 2-4**
Introduction - Definition of Hormone and scope of Endocrinology		

Unit 2	**Number of Lectures 02**	**Weightage 4-6**
Pituitary gland hormones – chemical composition and functions of pituitary gland hormones		

Unit 3	**Number of Lectures 04**	**Weightage 2-4**
Male sex hormones and female sex hormones – chemical composition and functions		

Unit 4	**Number of Lectures 04**	**Weightage 2-4**
Detailed account of hormones in digestion – Enterokinine, Cholecystokinin, Secretin		

Section II

Unit 1	**Number of Lectures 04**	**Weightage 4-6**
Classification of Hormones, Protein hormones and steroid hormones		

Unit 2	**Number of Lectures 04**	**Weightage 4-6**
Hormones in Reproductive physiology – Hormonal control of pregnancy, parturition and lactation;		

Unit 3	**Number of Lectures 06**	**Weightage 4-6**
Hormonal Disorders – 1. Pituitary hormones and disorders 2. Thyroid hormones and disorders 3. Adrenal Gland hormones and disorders		

Unit 4	**Number of Lectures 04**	**Weightage 4-6**
Therauptic use of hormone Hormone replacement therapy Risks and benefits of Hormone replacement therapy Other hormones: Rennin- angiotensin, antinatri uretic factor (ANF), Erythropoietin, serotonin and Dopamine.		

College Level Assessment (CA) Activities: Home assignment, Review article, Class test, Field visit, Seminar

Practical Based DSC 2-6 Endocrinology: Endocrinology

(Use Charts/ Photograph/ Models)

1. Identification of hormone secreting glands, write its location, hormones secreted and write its function
2. Demonstrations of urine hcg test by using kit-based photograph.
3. Analytical determination of presence of glucose in urine (Study of pathological urine report)
4. Analytical determination of presence of glucose bile in urine (Study of pathological urine report)
5. Study of hormonal disorders of – Goiter, Gigantism, Dwarfism. by using chart/ model
6. Study of metamorphosis in tadpole with reference to hormonal regulation. by using chart/ model
7. Study of hormones in insect metamorphosis by using chart/ model
8. Study of role melatonin in the regulation of seasonal breeding in birds and mammals.

9. Preparation of charts or models showing hormonal changes during menstrual and oestrus cycle.

10. Study of reference range of different hormones in normal and pathological conditions in men and woman.

11. Study visit: medical college, pathology laboratory/ /Visit to IVF center. and blood bank OR Preparation and submission of small project/ review on topics related to physiology

References list
1. Human Physiology- C. C. Chatterji Vol. I and II
2. Comparative Vertebrate Endocrinology, Bentley: Cambridge University Press, 1998
3. Fundamentals of Comparative Endocrinology, Chester-Jones et al.: Plenum Press, New York, London, 1987.
4. Comparative Endocrinology, Gorbman et al.: John Wiley & Sons, New York, 1983
5. Vertebrate Endocrinology, Norris: (2nd ed.), Lea & Febiger, 1997.
6. Vertebrate Endocrinology Schreibman & Pang: Vol. I-IV, Fundamentals & Biomedical Implications, Academic Press, 1985 & onwards
7. Endocrinology, Hadley: Prentice hall. International Edition. 2000
8. Human Physiology- C. C. Chatterji Vol. I and II
9. Textbook of Endocrinology, 2013: Buy Textbook of Endocrinology, 2013 by N. K. Pandey, R. Radheshyam

	Punyashlok Ahilyadevi Holkar Solapur University, Solapur **Second Year BSc (Zoology) Semester-IV** **Vertical :Open Elective-I / General Elective -1** **Course Code: GE/OE** **Course Code: OE / GE :Wild life photography - (Theory)**
Teaching Scheme Lectures:04 Hours/week, 04 Credits	***Examination Scheme UA:30 Marks CA: 20 Marks**

Program Specific Outcome (PSOs):

PSO 1: Technical Proficiency: Students will develop advanced skills in using photography equipment, including cameras, lenses, and lighting, to capture high-quality wildlife images.

PSO 2: Fieldwork Expertise: Students will gain hands-on experience in conducting fieldwork, including tracking, observing, and photographing wildlife in their natural habitats.

PSO 3: Ethical Practices: Students will understand and apply ethical guidelines for wildlife photography, ensuring minimal disturbance to animals and their environments.

PSO 4: Post-Processing Skills: Students will learn techniques for editing and enhancing wildlife photographs using software tools to produce professional-quality images.

PSO 5: Ecological Knowledge: Students will acquire knowledge of animal behavior, ecology, and conservation, which will inform their photographic practices and storytelling.

Program Outcome:

PO1: Comprehensive Knowledge: Understand avian biology, ecology, behaviour, and evolution.

PO2: Field Research: Conduct and design bird surveys and habitat assessments.

PO3: Data Analysis: Analyze ecological data using statistical and GIS tools.

PO4: Ethical Awareness: Understand and uphold ethical standards in ornithological research and conservation practices

Course Objectives:

The students will be able:

COs 1 - To understand the concept, scope and significance of Photography.

COs 2 - To distinguish between various types of photography.

COs 3 - To demonstrate lighting techniques for different photographic scenarios.

COs 4 - To understand the concept the techniques of Photo Journalism and provide an Opportunity to pursue their areas of interest

Course Outcomes:

CO 1: Proficiency in using photography equipment to capture high-quality wildlife images.

CO 2: Effective planning and conducting of fieldwork for wildlife observation and photography.

CO 3: Application of ethical guidelines to minimize disturbance to wildlife.

CO 4: Skills in editing and processing wildlife photographs using industry-standard software.

CO 5: Understanding animal behavior and ecology to enhance photographic practices.

Unit 1: History of photography and equipment's of photography.	**No. of lectures-08**	**Weightage of Marks**
1.1 Brief history of photography.	**3**	**2-4**
1.2 Types of photographic cameras and their applications.	**3**	**2-6**
1.3 Understanding various functions of camera.	**2**	**2-4**
Unit 2: Equipment's used in photography	**No. of lectures -07**	
2.1 Types of lenses and their Use.	**3**	**2-6**
2.2 Lighting equipment three-point lighting technique and metering for light, filters and use of a flash unit.	2	**2-4**

2.3 Optional Accessories like recording media, filters, tripods, cards, etc.	*2*	**2-6**

Unit 3: Techniques in photography	**No. of lectures-07**	**Weightage of Marks**
3.1 Study about the right Exposure- Controlling Light with Shutter Speed, Aperture and ISO. Adjusting Light and Colors, Auto, Aperture, Shutter Speed and Manual Modes.	4	**2-4**
3.2 Significance of ISO, Correct Focus and suitable White Balance Using right ISO in various conditions.	3	2-6
Unit 4: Photo editing and Maintenance of camera	No. of lectures-08	**Weightage of Marks**
4.1 Understanding Photo Editing and video Editing Software and Installation: a. **Photo Editing**: Adobe Photoshop, Picasso, Coral draw, Photo editor, Mobile phone apps, etc. b. **Video Editing:** Adobe Primer Pro, Kinemaster, Filmora, mobile phone apps, etc	4	2-6
4.2 Care and maintenance of camera.	2	3
4.3 Requirements of wildlife photography and Ethics of wildlife photography. **4.4 Carrer opportunity in wildlife photography.**	2	3-6

Suggested Reading:

1. Anderson, Grey H (1993). Video Editing and Post Production London: Focal Press
2. Gupta, R. G(2000). Audio and Video System, New Delhi: Tata Mc Graw – Hill
3. Millerson, Gerald(2003) Video Camera Techniques (Media Manuals), Focal Press: London
4. Musberger, Robert B(2008). Single-Camera Video Production, New Delhi: Tata Mcgraw

Field project - Shooting

VSC-3 Practical Based on DSC-1 (5 &6)
Principles of Ecology & Animal Physiology

1. Estimation of Population Density by quadrat method.
2. Study of Food Web Construction from members of grassland ecosystem- Grasshopper, Rat Snake, Grass, Herbs, Shrubs, Weeds, Trees, Vulture, Squirrel, Snake, Centipede, Scorpion , Hare Deer, Tiger.
3. Study and construction of ecological pyramid from Pond ecosystem.

Members of Pond ecosystem – Sponge, Nepa, *Leech, Planaria, Hydra, Lymnea*, *Planorbis, Heron, Kingfisher, Cyclops, Daphnia*, Tortoise , Diatoms *Vallisneria, Hydrilla, Chara* and *Spirogyra.*

Plankton collection tools and technique..

4. Study of an aquatic ecosystem: Collection and Identification of Zooplankton.
5. Measurement of TDS of water sample by using TDS meter
6. Study of pH of water sample using pH meter/ litmus paper.
7. Estimation of Total Hardness content from water sample by titrimetric method .
8. Study of BMI
9. study of Blood pressure using Manual or Digital Sphygmomanometer.
10. Demonstration of reflex action.
11. Study of histological structures (T.S./V,S.) - of Mammalian organs using permanent slides (Spotters):i)Tooth ii)

Salivary gland iii) Stomach iv) Ilium v)

12. Describe role of – 1). Kidney 2). Liver 3). Pancreas 4.) Testis 5. Ovary 6).Uterus (use chart/ photographs/ models)
13. Study of ABO blood group system from given blood sample.
14. Study of contraceptives: Oral contraceptives (pills), Intra-uterine device, Condom using chart/Photographs.

VSC-4 Practical Based DSC2-(5&6)
Biological Pest Management and Endocrinology

1. Identify three common predators or parasitoids from preserved specimens or field samples, and note their target pests.
2. Demonstrate the correct method of releasing Trichogramma wasps in a crop field.
3. Set up and explain the working of a pheromone trap for monitoring a specific pest species.
4. **Identify** and record the presence of natural enemies in a field/ Campus.
5. Study of Insect crop pest.
    - White grub,
    - Pod borer,
    - Armyworm,
    - Aphid
6. **Biological Control Agents**

- Predator (e.g., ladybird beetle)
- Parasitoid (e.g., wasp)
- Pathogens (e.g., fungi- Trichoderma)
  bacteria- (eg.B*acillus thiruingensis, Holotrichia serrate*)

7. **Study of tools use for insecticide sprey**
    1. **sprayer**
    2. **Bucket pump sprayer**
    3. **Stirrup pump sprayer**
    4. **Knapsack / Backpack sprayer** –

8. Estimate the blood glucose level by glucometer
9. Study of hormones in insect metamorphosis by using chart/ model
10. Study of role melatonin in the regulation of seasonal breeding in birds and mammals.
11. Study of reference range of different hormones in normal and pathological conditions in men and woman.
12. Study visit: medical college, pathology laboratory/ /Visit to IVF center. and blood bank OR Preparation and submission of small project/ review on topics related to physiology.
13. Certified Record book

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
Guidelines for: Field Project (FP)
B.Sc.-Part-II; Semester-IV

Credits: 2 **Marks: 50** **Contact Hours: 60**

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1) Nature of Course

1) Name of the Course:	Field Project (FP)
2) Class:	Second Year of UG
3) Semester:	UG-Third Semester
4) No. of Credits:	UG 02 Credits
5) Total Contact Hours:	UG (60 Hours)
6) Nature:	Field Based Learning/Project
7) Type:	Compulsory Course
8) Total Marks:	Under Graduation: 50 (20 for IE + 30 for ESE)
9) Credit:	Total Credits = 2 (1 Credit = 30 Contact Hours)

2) Course Outcomes (COs):

CO-1: Understanding the different socio-economic contexts and observe situation in urban and rural contexts.

CO-2: Fostering the capability to identify and address scientific problems or challenges at the local, regional and national level.

CO-3 Acquiring the methodical research skills to innovatively address the issue based problems and give solutions for long-term benefits of the society.

CO-4: Improvement in scientific communication through literature survey, technical writing, publication and presentation skills.

CO-5: Developing the power of critical& logical thinking skills, analysis and ability to present data as policy document.

CO-6: Enhancing the employability through acquisition of practical knowledge and experiences.

3) Objectives:

1) To develop ability to identify real life challenges faced by society and devise hypothesis to answer these challenges.
2) To prepare methodology to explicitly work on the identified problems in scientific way.
3) To collect field and laboratory based data, compile, organize, analyze and interpret the data
4) To prepare a scientific document as a policy document based on primary field generated data for innovative solutions.

4) Learning Outcomes: After completing this course, student will be able:

1) PSO-1: Understand methodology for field based research work.
2) PSO-2: Develop core skills to work with local community.
3) PSO-3: Contribute towards national development through community engagement.
4) PSO-4: Learn to link and extend research problems and share the knowledge for the benefit of society.
5) PSO-5: Gaining mutual learning and respect about community and fostering social responsibility and community engagement, promoting deeper interactions with locals, extending higher education skills for the benefit of local communities and catalysing acquisition of values of public service and active citizenship to evolve into responsible citizens.

5) Credit Guidelines for Field Project:

The field-based learning/project attempts to provide opportunities for students to understand the different socio-economic contexts and observe situation in rural, urban, sub-urban and peri-urban locales. The students is supposed to identify local and regional problems in their respective areas of subject and work under the supervision of faculty mentor to grasp the issues, challenges of the question in a scientific manner.

Total Credits	Classroom and Tutorial	Field Engagement
02	01 Credit	01 Credit

6) Evaluation of Field Project / Regional Case Study:

Module	Unit	IE (20)	ESE (30)
1	**Basic structure of field/society**: key definitions of problem area, analysis of preliminary data	5	-----
2	**Classroom work:** Correspondence (if any), formats for data collection, interactions and liaising	5	-----
3	**Field-work** and data collection	5	10
4	**Field Report:** 1) Data organization, analysis and report preparation 2) Preparation and Presentation of Outcome in Examination 3) Feedback to Community	5	20

7) Steps for the Implementation Field Project under the Mentorship of Faculty:

1) Classroom Discussion: Making students aware on the various topics that can be explored for Field Project on various topics related to subject and its extension to society

2) Assignments: Giving assignments to students on Field Project related topics

3) Group Discussion: Discussion with students in classroom to finalize tentative topics for Filed Project

4) Field Visit: Understanding the topic through field visit. Giving an integrated approach to the topic related to subject so that science, community, research and policy can be studied together.

5) Classroom and Field Assignments: Distribution of field based topics to students either in group or individually.

6) Field Visits, Data Collection: Regular field visits for collection of data on selected topic

7) Finalization of FP Report: Data organization, data analysis and preparation of report based on the data consisting of:

a) Title Page
b) Certificate
c) Acknowledgement
d) Index
e) Introduction
f) Literature Review
g) Methodology
h) Result
i) Discussion and Conclusion
j) References

OR

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
Guidelines for: Community Engagement Services (CEP)
B.Sc.-Part-II; Semester: IV

Credits: 2 Marks: 50 Contact Hours: 60

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1) Nature of Course

1) Name of the Course:	Community Engagement and Services
2) Class:	Second Year of B.Sc.
3) Semester:	IV
4) No. of Credits:	02 (1 Credit = 30 contact hours)
6) Nature:	Field Based Learning/Project
5) Total Contact Hours:	60 Hours

Total Credits	Classroom and Tutorial	Field Engagement
02	01 Credit (30 Hours)	01 Credit (30 Hours)

2) Course Outcomes (COs):

CO-1: Contributing to socio-economic development of India through active community engagement.
CO-2: Enabling students to become socially productive.
CO-3: Make students understand India's rural society, rural development schemes and contribute to the betterment of the same.
CO-4: Provide community engagement to all Undergraduate & Post Graduate students

3) Objectives:

1) To develop an appreciation of rural culture, life-style and wisdom amongst students
2) To learn about the status of various agricultural and development programmes
3) To understand causes for distress and poverty faced by vulnerable households and explore solutions for the same
4) To apply classroom knowledge of courses to field realities and thereby improve quality of learning

4) Learning Outcomes: After completing this course, student will be able:

PSO-1: To Gain an understanding of rural life, Indian culture & ethos and social realities
PSO=2: Develop a sense of empathy and bonds of mutuality with local community
PSO-3: Appreciate significant contributions of local communities to Indian society and economy
PSO-4: Learn to value the local knowledge and wisdom of the community
PSO-5: Identify opportunities for contributing to community's socio-economic improvements

5) Evaluation Pattern: Total Marks: 50

Internal Evaluation (IE): 20 Marks	
1) Participation in CEP	10 Marks
2) Group Discussion/Assignments on CEP related activities/Seminar etc. 3) Group Discussion Involves both field based discussions and classroom discussions	10 Marks
End Semester Examination: 30 Marks	
1) Overall Participatory Performance	10 Marks
2) Preparation and presentation of Report in Standard Format Consisting of: i) Title Page ii) Certificate iii) Acknowledgement iv) Index v) Introduction vi) Literature Review vii) Methodology viii) Result ix) Discussion and Conclusion x) References	20 Marks

6) Examples of Recommended Field Based Activities under Zoology Subject or Any other Topics of Significance to Community Can be Selected

Teaching Learning Methods	
1	Available on-line modules for self paced learning on UGCs platform
2	Classroom Discussions
3	Reading
4	Participatory Research Methods & Tools
5	Community Dialogues
6	Oral History
7	Social & institutional Mapping
8	Interactions with elected Panchayat Leaders & Govt. officers
9	Observation of Gram Sabha
10	Field visits to various village institutions
Recommended Activities	
	• Environment awareness camp; • Conservation of biodiversity; • Significance of green spaces; • Awareness on health & hygiene; • Applied component of agriculture such as apiculture, sericulture, pisciculture & dairy; • Awareness camps in sustainability and development; • Promotion of practices for sustainable development through management of ecosystem services of local forest & wildlife; • Awareness of locals on pollution and its impact; • Organization of camps on role of biological control agents for pest control & aspects of organic farming/IPM; • Collaborating with government and Forest Department for Survey of animals and other species etc.;

	• Awareness drive on ecotourism potential of villages for green economy; • Implementation of SDGs at the local level; Solutions to human-wildlife conflict etc…
	• SHG Women Members • MGNREGS project • Swachh Bharat project • Rural Schools / mid-day meal centres • Schemes for urban informal workers and migrants and • Other similar Governmental & Non-governmental Social and Extension Projects for the benefit of rural society

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
Faculty of Science
:B.Sc. II (Sem. III &IV)

Examination:----------Class: Semester:----------
Subject:--------Paper:----------
Time: 1.5 hrs Marks: 30

Instructions: 1. All questions are compulsory.
2. Draw neat and labeled diagram and give equations wherever necessary.
3. Figures to the right indicate full marks.
4. Use of logarithmic table and non-programmable calculator is allowed.

Q. No.1 Select the most correct alternative from among those given below **06**

i)
a) b) c) d)
ii)
iii)
iv)
v)
vi)

Q. No.2 Attempt the following (Any three) **06**

i)
ii)
iii)
iv)
v)

Q. No.3 Write short note OR Attempt the following (Any two) **06**

i)
ii)
iii)

Q. No.4 Attempt the following (Any two) **06**

i)
ii)
iii)

Q. No.5 Attempt the following (Any one) **06**

i)
ii)

Practical Key – Semester -III and IV

PUNYASHLOK AHILYADEVI HOLAKR SOLAPUR UNIVERSITY, SOLAPUR

B. Sc. Part- II: Semester III Practical Examination in Zoology NEP-2020

(Practical Based on Major DSC 1-(3 and 4)

Cell Biology and Fundamentals of Biochemistry

Centre- **Date & Time**

Total Marsk: 30

Instructions

1. Draw neat and labeled diagram wherever necessary.

3. Perform the experiment as per the instructions given by the examiners.

4. Use Chart/photograph /models/etc.

Maks

Q1. Prepare a temporary squash preparation of onion root tip using proper stain……**05 Marks**

and show various stages of mitosis.

Or

To prepare a temporary slide of suitable material and show different stages of meiosis.

Q2. Detect the mitochondria from given material by using specific staining method. **05 Marks**

Or

Cytological preparation of nucleus from given material by using specific staining method.

Q3. Isolation of DNA? **05 Marks**

Q4. Proceed to estimate vitamin C content in given sample by using titration method **05 Marks**

Or

Proceed to demonstrate water soluble and fat soluble vitamins

Or

Write disorders and symptoms of vitamin deficiency (any two)

Q5. Laboratory Record/Journal **05 Marks**

Q5 . Viva Voce **05 Marks**

PUNYASHLOK AHILYADEVI HOLAKR SOLAPUR UNIVERSITY, SOLAPUR

B. Sc. Part- II: Semester III Practical Examination in Zoology NEP-2020

(Based on Minor: DSC-2-(3 and 4)

Introduction to Genetics and Techniques In Biology

Centre- **Date & Time**

Total Marsk: 30

Instructions

1. Draw neat and labeled diagram wherever necessary.

3. Perform the experiment as per the instructions given by the examiners.

4. Use Chart/photograph /models/etc.

Q.1. Solve the given genetic example. **10 Marks**

Example from journal. (Based on monohybrid cross, Dihybrid cross)

Or.

Solve the genetic example (Example from journal based on multiple allele or interaction of genes).

Q.2. identify the given karyotype whether it is normal or abnormal and justify. **05 Marks**

Or .

Solve the genetic example. Example from journal based on linkage or crossing over)

Q3. (Write- Aim, Principle, Requirements, Protocol, Observation, Result/ Interpretation Preparation of blood smear and identification of WBCs (leucocytes). **05 Marks**

Or

.

Study of Neubauer chamber for WBC/RBC cell count

Q4. **Spotting** **05Marks**

1. Identify and Describe – Chromatograph/Centrifuge
2. Identify and Describe – Spectrophotometer/Colorimeter
3. Identify, Sketch and label – Neubauer Chambe (Slide)
4. Identify and Describe – Haemocytometer
5. Identify and Describe – - Effect of hypertonic/isotonic/ hypotonic solution on RBC

Q5. Certified record book/ Journal **05 Marks**

PUNYASHLOK AHILYADEVI HOLAKR SOLAPUR UNIVERSITY, SOLAPUR
B. Sc. Part- II: Semester IV Practical Examination in Zoology (NEP-2020)

Practical Based on Major DSC-1-(5 and 6)
Principles of Ecology and Animal Physiology

Centre- **Date & Time**
Total Marsk: 30
Instructions
1. Draw neat and labeled diagram wherever necessary.
3. Perform the experiment as per the instructions given by the examiners.

Q1. Estimation of Oxygen/Carbon dioxide/ Hardness of given water sample. **05 Marks**

Or

Construction of ecological pyramid from given data (Any one example from Journal)

Q2. Calculate the Shannon-Weiner diversity index (Any one example from Journal) **05 Mark**

Or

Identification of Zooplankton (Any two -permanent slide/ Photograph)

Q3 Study of histological structures (T.S./V.S.) of Mammalian organs using permanent slides (By using Chart/photograph /model V. S. of Tooth/T. S. of Salivary gland/Stomach/ T. S. of Ilium/T. S. of Liver/ T. S. of Pancreases. **05 Marks**

Or.

Identify, sketch and label the tissue and write their location, structure and functions.
(By using Chart/photograph /model T. S. of Kidney/T. S. of Testis/ T.S. of Ovary/ T. S. of Uterus

Q4. **Submission of Report-** **05 Marks**

Q.5 Certified Journal / **05 Marks**

(on a visit to National / Central / State institutes / Local water bodies/National Park/Biodiversity Park/Wild life sanctuary, Observation of zooplanktons. Plankton collection tools and technique/ Review article)

Q6. Certified Journal/ record book **05 Mark**

PUNYASHLOK AHILYADEVI HOLAKR SOLAPUR UNIVERSITY, SOLAPUR
B. Sc. Part- II: Semester IV Practical Examination in Zoology (NEP-2020)

Practical Based on Minor DSC-2-(5-6)

Biological Pest Management and Endocrinology

Centre- **Date & Time**
Total Marsk: 30
Instructions:
1. Draw neat and labeled diagram wherever necessary.
3. Perform the experiment as per the instructions given by the examiners.

Q1. Identify sketch and label the parts (Grasshopper/Cockroach). **5 Marks**

Or

Identify and describe the Life cycle (Grasshopper/ white grub/ termite)

Q2. Identification (By Using Chart/Model/ Photographs) **5 Marks**

a. Identify & classify -	Cockroach/ Rat / Housefly.
b. Identify & describe -	Rice weevil / Silver Fish / Aphid.
c. Identify & Sketch the label-	Duster / Sprayer.
d. Identify & state function -	Hand net/ Pheromones
e. Identify, describe and state its function -	T. S. Of Thyroid gland / Adrenal gland

Q.3 Identify, write the location and functions of endocrine glands (Any two). **5 Marks**

Q4. Identify and mention the role of hormone in metamorphosis in a frog tadpole. **5 Marks**

(by using a chart or model)

Q5 **Field visit** -Submission of report and Viva voce **5 Marks**

(Apiculture center/Sericulture center/ Vermiculture Unit) / Documentation of insect (Any Five) ./ Diversity of butterfly and Host plants within the college campus/ Survey of Pesticides and Insecticides used by the farmers in the market or Survey of organic/ Traditional pest control methods used by the farmers. (Any one)

Q6. Certified Record book/ Journal **5 Marks**

PUNYASHLOK AHILYADEVI HOLAKR SOLAPUR UNIVERSITY, SOLAPUR
B. Sc. Part- II: Semester III Practical Examination in Zoology (NEP-2020)
VSC-1 (Practical Based on Major DSC 1-(3 and 4)
Cell Biology and Fundamentals of Biochemistry

Centre- Date & Time
Total Marsk: 30
Instructions
1. Draw neat and labeled diagram wherever necessary.
3. Perform the experiment as per the instructions given by the examiners.

Marks

Q1. Prepare a temporary squash preparation of onion root tip using proper stain and show various stages of mitosis. 10

Or

To prepare a temporary slide of suitable material and show different stages of meiosis.

Or

Cytological preparation of mitochondria from Onion peel using Janus green-B.

Q2. Study of permeability by using egg shell membrane 05

Q3. Qualitative tests of functional groups in carbohydrates, proteins and lipids 10

Or

Write disorders and symptoms of vitamin deficiency (any two)

Q4 . Journal and Viva Voce 05

PUNYASHLOK AHILYADEVI HOLAKR SOLAPUR UNIVERSITY, SOLAPUR
B. Sc. Part- II: Semester III Practical Examination in Zoology (NEP-2020)

VSC-2 based DSC-2-(3 and 4) Introduction to Genetics and Techniques In Biology

Centre- Date & Time
Total Marsk: 30
Instructions
1. Draw neat and labeled diagram wherever necessary.
3. Perform the experiment as per the instructions given by the examiners.

Q1. Identify and describe DNA / RNA Model. **05 Marks**

Or

Identify and describe Klinefelter's Syndrome / Turner's Syndrome using chart/model/photograph **.**

Q2. Genetic examples based on Multiple alleles with coat colour in rabbit and blood group. **05 Marks**

Or

Genetic examples based on Monohybrid cross (Any one).

Or

Genetic examples based on interaction of gene (Any one).

Q3. Study of Centrifuge machine and isolation of cell constituents. **05Marks**

Or

Separation of Amino acid using Paper Chromatography.

Q4. Estimation of carbohydrates by colorimetric method **05Marks**

Or

Estimation of protein by colorimetric method

Q5. Submission of report and Viva Voce **05 Marks**

Q6. Certified record book/ Journal **05 Marks**

PUNYASHLOK AHILYADEVI HOLAKR SOLAPUR UNIVERSITY, SOLAPUR
B. Sc. Part- II: Semester IV Practical Examination in Zoology (NEP-2020)

VSC-3 Practical Based on DSC-1-(5 and 6) Principles of Ecology and Animal Physiology

Centre- **Date & Time**
Total Marsk: 30
Instructions
1. Draw neat and labeled diagram wherever necessary.
3. Perform the experiment as per the instructions given by the examiners.
4. Use Chart/photograph /models/etc.

Q1. Estimation of Oxygen/Carbon dioxide/ Hardness of given water sample. **05 Marks**

Or

Construction of ecological pyramid from given data (Any one example from Journal)

Q2. Identification of Zooplankton (Any two -permanent slide/ Photograph) **05 Marks**

Q3. Study of histological structures (T.S./V.S.) of Mammalian organs permanent **05 Marks**
Using slides V. S. of Tooth/T. S. of Stomach/ T. S. of Ilium/T. S. of Liver/
T. S. of Pancreases

Or
Total count of WBC from a given blood sample by using Neubauer chamber.

Q4, Detect abnormal urine constituents from the sample provided **05 Marks**

(Glucose, Bile, Blood and Albumin)
Or

Write aim principle and procedures for microtomy

Q5. Report submission **05 Marks**
(Preparation of models, R&D labs, medical college, pathology laboratory and blood bank OR Preparation and submission of small project/ review on topics related to cell biology, biochemistry and physiology/Visit to IVF center)

Q.6 Certified Journal / **05 Marks**

PUNYASHLOK AHILYADEVI HOLAKR SOLAPUR UNIVERSITY, SOLAPUR
B. Sc. Part- II: Semester IV Practical Examination in Zoology (NEP-2020)

VSC-4 Practical Based on DSC-2 (5 and 6) Biological Pest Management and Endocrinology

Centre- **Date & Time**

Total Marsk: 30

Instructions

1. Draw neat and labeled diagram wherever necessary.
3. Perform the experiment as per the instructions given by the examiners.
4. Use Chart/photograph /models/etc.

Q1. Identify sketch and label the parts (Grasshopper/Cockroach). 5 Marks

Or

Identify and describe the Life cycle (Grasshopper/ white grub/ termite)

Q2. Identification (By Using Chart/Model/ Photographs) **5 Marks**

a. Identify & classify - Cockroach/ Rat / Housefly.

b. Identify & describe - Rice weevil / Silver Fish / Aphid.

c. Identify & Sketch the label- Duster / Sprayer

d. Identify and Sketch and label -T. S. of Testis of Mammal/ T. S. of ovary of Mammal

e. . Identify & describe T.S. of Pancreas/ T. S of Adrenal gland

Q 3. Identify, write the location and functions of endocrine glands (Any two). 5 Marks

Or

Detection of glucose in urine sample by Benedicts qualitative test.

Q4 Identify and describe life cycle of Honey bee/ Silk moth **5 Marks**

Or.

Identify and mention the role of hormone in metamorphosis in a frog tadpole.

Q5 **Field visit** -Submission of report and Viva voce **5 Marks**

Q6. Certified Record book/ Journal **5 Marks**