Shiv Chhatrapati Shikshan Sanstha's

Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

Structure and Curriculum of Four year Multidisciplinary Degree (Honors/Research) Programme with Multiple Entry and Exit option

Undergraduate Programme of Science and Technology

B.Sc. (Honors/Research) in Zoology

Board of Studies

in

Zoology

Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

[UG III Year]

W.e.f. June, 2025

(In Accordance with NEP-2020)

Review Statement

The NEP Cell reviewed the Curriculum of **B.Sc. (Honors/Research) in Zoology** to be effective from the **Academic Year 2025-26.** It was found that, the structure is as per the NEP-2020 guidelines of Govt. of Maharashtra.

Date: 11/04/2025

Place: Latur

NEP CELL

Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

CERTIFICATE

I hereby certify that the documents attached are the Bonafide copies of the Curriculum of **B.Sc. (Honors/Research) in Zoology** to be effective from the **Academic Year 2025-26.**

Date:

Place: Latur

(Dr. D.S.Rathod)
Chairperson
Board of Studies in Zoology
Rajarshi Shahu Mahavidyalaya, Latur
(Autonomous)

Shiv Chhatrapati Shikshan Sanstha's

Rajarshi Shahu Mahavidyalaya, Latur

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Members of Board of Studies in Zoology

Under the Faculty of Science

Sr. No.	Name	Designation	In position
1	**Dr. D.S.Rathod** Head, Department of Zoology Rajarshi Shahu Mahavidyalaya (Autonomous), Latur	Chairperson	HoD
2	**Prof. S. P .Chavan** Director, School of Life Science Swami Ramanand Teerth Marathwada University, Nanded	Member	V.C. Nominee
3	**Prof. Ragvender Rao** Walchand Centre for Research in Nanotechnology & Bio-Nanotechnology Walchand College of Arts and Science, Ashok Chowk, Solapur – 413006 Maharashtra, India	Member	Academic Council Nominee
4	**Dr. Mamidala Estari** Head, Department of Zoology, Infectious Diseases & Metabolic Disorders Research Lab, Kakatiya University, Hanumakonda-506 009. Telangana State, India.	Member	Academic Council Nominee
5	**Prof. D. H. Jadhav** Head, Department of Zoology Maharashtra Mahavidyalaya, Nilanga	Member	Expert from outside for Special Course
6	**Mr. Ishrar Deshmukh** Pharma Pune, Maharashtra, India	Member	Expert from Industry
7	**Dr. Vinay Biradar** Department of Zoology, Savitribai Phule University ,Pune	Member	P.G. Alumni
8	**Dr. K. S. Raut**	Member	Faculty Member
	Mr. Datta Nalle	Member	Faculty Member
	Mrs. Dhanshree Jagtap	Member	Faculty Member
9	**Dr. A. A. Yadav**	Member	Member from same Faculty

From the Desk of the Chairperson…

The Department of Zoology was established in the year 1971. The department has been recognized by our parent University as Research center since 8th May 2003 and now it has been developed into center of teaching and research in Zoology.

To reach the mission of "Pursuit of Excellence" in higher education to make our students globally competent. The departmental staff is committed towards our work with dedication, determination and devotion.

National Education Policy NEP-2020 focuses more on practical rather than theoretical learning. It also focus on developing overall personality of students by incorporating Humanitarian and Constitutional values, creativity and critical thinking, harnessing innovation, use of modern technology and interaction with various stakeholders. It uses the practical based pedagogy to evolve and make education more experiential, holistic, integrated, learner-centric, flexible and developing skill etc. To skilled and trained students can accept the challenge of the future, as we know that the new policy also envisages the refinement and improvement in the Learning Outcome based Curriculum Framework.

The syllabus of B.Sc. I has been designed as per the National Education Policy (NEP), 2020, the present structure comprises Discipline specific courses (DSC), Discipline Specific Electives (DSE), Discipline Specific Minor Course (DSM), Generic/Open Electives (GE/OE), Vocational Specific Course (VSC), Skill Enhancement Course (SEC), Ability Enhancement Course (AEC) etc. The discipline specific courses (DSC) are compulsory and the elective courses can be chosen from the given Basket. Except Ability Enhancement courses, all other courses, comprise theory and practicals.

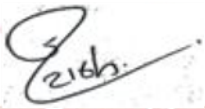
The project work is specially underlined in this structure. The project will mainly involve experimental work. The students will be asked their choice for project. The Generic Electives will be offered to the students of other departments of the college. The students will have the option to choose one generic elective from the given Basket. The generic elective comprises theory as well as practical. The students will also undertake one Vocational Specific Course (VSC) and one Skill Enhancement Course (SEC) of two credits each. The VSC and SEC also comprise theory and practicals. These courses will be chosen by the students from the concerned basket. One of the DSC is specified for Indian Knowledge Systems (IKS). Indian Knowledge Systems have a strong foundation in Indian Culture, Philosophy and Spirituality and have evolved through thousands of years.

B.Sc. Zoology course will help to understand the behaviour, structure and evolution of animals. Zoologists use a wide range of approaches to do this, from genetics to molecular and cellular biology, as well as physiological processes and anatomy, whole animals, populations, and their ecology. The scope of Zoology as a subject is very broad. The intention is to understand the subject of Zoology in

the evolving biological paradigm in modern times; where, living beings need to be understood at the level of atomic interactions; and comparative systems of organisms need to be studied through the prism of integrated chemical, physical, mathematical and molecular entities to appreciate the inner working of different organisms at morphological, cellular, molecular, interactive and evolutionary levels. The key areas of study within the disciplinary/subject area of Zoology comprise: animal diversity, principles of ecology, comparative anatomy and developmental biology of vertebrates, physiology and biochemistry, genetics and evolutionary biology, animal biotechnology, applied zoology, behaviour, immunology, reproductive biology, and insect, vectors and diseases. B.Sc. degree programme in Zoology also deals with skill enhancement courses such as apiculture, aquarium fish keeping, medical diagnostics, sericulture etc. The depth and breadth of study of individual topics dealt with would vary with the nature of specific Zoology programmes.

Our institution gives importance in mission to provide value and need based education which can be useful to students to get the skill for entrepreneurship and jobs or self-help for earnings. This institution is connected long back with anti-superstition activity to develop the scientific attitude among students.

As a part of the efforts to enhance the interest and employability of graduates of Zoology programmes, the curricula for these programmes are expected to include learning experiences that offer opportunities for higher studies and research at reputed laboratories.



Dr. D. S. Rathod
Chairperson
Board of Studies in Science
Rajarshi Shahu Mahavidyalaya, Latur
(Autonomous)

Shiv Chhatrapati Shikshan Sanstha's

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Rajarshi Shahu Mahavidyalaya, Latur

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Faculty of Science

Structure for Four Year Multidisciplinary Undergraduate Degree Programme in B.Sc. (Honors/Research) in Zoology Multiple Entry and Exit (In accordance with NEP-2020)

Year & Level	Sem	Major		Minor	GE/ OE	VSC/ SEC (VSEC)	AEC/ VEC	OJT,FP, CEP, RP	Credit per Sem.	Cum./Cr. per exit
		DSC	DSE							
1	**2**	**3**		**4**	**5**	**6**	**7**	**8**	**9**	**10**
III 5.5	V	DSC IX: 04 Cr. DSC X: 04 Cr.	DSE-I :04 Cr	DSM III: 04 Cr. DSM IV: 02 Cr.	NA	VSC III : 02 Cr	VEC II:02 Cr EVS	NA	22	132 Cr. UG Degree
	VI	DSC XI: 04 Cr. DSC XII: 04 Cr.	DSE-I :04 Cr	DSMV : 04 Cr.	NA	VSC IV : 02 Cr	NA	Academic Project: 04 Cr.	22	
	Cum . Cr.	16	08	10	-	06		04	44	
Exit Option**:** Award of UG Degree in Major with 132 Credits or continue with Major and Minor										

Abbreviations:

1. **DSC : Discipline Specific Core (Major)**
2. **DSE : Discipline Specific Elective (Major)**
3. **DSM : Discipline Specific Minor**
4. **GE/OE : Generic/Open Elective**
5. **VSEC : Vocational Skill and Skill Enhancement Course**
6. **VSC : Vocational Skill Course**
7. **SEC : Skill Enhancement Course**
8. **AEC : Ability Enhancement Course**
9. **MIL : Modern Indian Languages**
10. **IKS : Indian Knowledge System**
11. **VEC : Value Education Course**
12. **OJT : On Job Training**
13. **FP : Field Project**
14. **CEP : Fostering Social Responsibility & Community Engagement (FSRCE)**
15. **CC : Co-Curricular Course**
16. **RP : Research Project/Dissertation**
17. **SES : Shahu Extension Services**

Shiv Chhatrapati Shikshan Sanstha's

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Faculty of Faculty of Science and Technology

Programme Outcomes (POs) for B.Sc. Programme	
POs No.	After the completion of the B.Sc. programme, a student will have obtained:
PO 1	**Disciplinary Knowledge** Comprehensive knowledge of science subjects which constitute the graduate programme and execution of scientific knowledge in the specific area.
PO 2	**Scientific Outlook** The qualities of a science graduate such as observation, precision, analytical mind, logical thinking, clarity of thought and expression and systematic approach.
PO 3	**Self-Directed Life-long Learning** Ability to appear for various competitive examinations or choose the post graduate programme or other related programme of their choice.
PO 4	**Research Skills** Functional knowledge and applications of instrumentation and laboratory techniques to do independent experiments, interpret the results and develop research ethos.
PO 5	**Problem Solving Skills** Analytical and logical skills and critical thinking to extract information from qualitative and quantitative data, formulate and solve problems in a systematic and rational manner.
PO 6	**Professional Competence and Ethics** Aptitude and skills to perform the jobs in diverse fields such as science, engineering, industries, survey , education, banking, development and planning, business, public service, self-business etc. with human rationale and moral values.

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Programme Specific Outcomes (PSOs) for B.Sc. Zoology (Honors/Research)	
PSO No.	Upon completion of this programme the students will be able to
PSO 1	The Students are expected to acquire the knowledge of animal Science, natural phenomenon, and manipulation of nature and environment by man.
PSO 2	Understanding the scientific terms, concepts, facts, phenomenon and their interrelationship.
PSO 3	Applications of the knowledge develop skills in practical work, experiments and laboratory materials.
PSO 4	Students followed and understood general laboratory practice guidelines, including safety.
PSO 5	They are able to handle instruments for basic and modern analysis.
PSO 6	To develop scientific attitude which is the major objective this makes the students open minded, critical observations, curiosity, thinking etc.
PSO 7	Abilities to apply scientific methods, collection of scientific data, problem solving.
PSO 8	Students are expected to work.
PSO 9	Utilize the developed expertise in concepts, theories, and emerging methodologies to succeed in tackling real-world issues in aquaculture and aquatic science.
PSO 10	Demonstrate advanced knowledge and competency in taxonomy and natural history of aquatic flora and fauna.
PSO 11	Demonstrate hands-on experience in aquatic sampling inventory and measurement techniques. Become an independent, self-motivated professional with the ability to recognize problems in their field of aquaculture and aquatic science and apply critical thinking and problem-solving skills.

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Faculty of Science

[UG III Year]

Year & Level	Semester	Course Code	Course Title	Credits	No. of Hrs.
I 5.5	V	_____ (DSC-IX)	Ecology and Evolution	04	60
		_____ (DSC-X)	Applied Zoology: Apiculture and Lac Culture	04	60
		_____ DSE-I(a)/ _____ DSE-I(b)	Animal Biotechnology-I Or Proteomic and Genomic	04	60
		_____ (DSM-III)	Freshwater Aquaculture	04	60
		_____ (DSM-IV)	Basics of Systematics and Classification	02	30
		_____ (VSC-III)	Ornamental freshwater fish Culture	02	30
		_____ (VEC-II)	From Basket	02	30
	Total Credits			**22**	
	VI	_____ (DSC-XI)	Ethology, Biometry and Bioinformatics	04	60
		_____ (DSC-XII) IKS	Poultry Farming and IKS- Indian traditional system of animal kingdom	04	60
		_____ DSE-II(a)/ _____ DSE-II(b)	Animal Biotechnology-II Or Wild Life Biology	04	60
		_____ (DSM-V)	Livestock Management and Animal Husbandry	04	60
		_____ (VSC-IV)	Vermiculture and Vermicomposting	02	30
		AIPC/OJT-I	Academic Project	04	60
	Total Credits			**22**	
Total Credits (Semester I & II)				**44**	

Curriculum

Major Courses

Semester - V

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Faculty of Science

Department of Zoology

Class: B.Sc. III Year, Semester: V

Course Type: DSC-IX

Course Title: Ecology and Evolution

Course Code:

Credits: 03 **Max. Marks: 75** **Lecture: 45 Hrs.**

Learning Objectives:

LO 1. To explain the fundamental principles of ecology, ecosystem, biogeochemical cycles.

LO 2. To apply population and community ecology principles to real-world scenarios

LO 3. To describe Applied and conservation ecology principles and practices

LO 4. To apply evolutionary principles to real-world scenarios

Course Outcomes:

After the completion of this course students will be able to:

CO 1. Explain the fundamental principles of ecology, ecosystem, and biogeochemical cycles.

CO 2. Apply population and community ecology principles to real-world scenarios

CO 3. Describe Applied and conservation ecology principles and practices

CO 4. Apply evolutionary principles to real-world scenarios

Unit No.	Title of Unit & Contents	Hrs.
I	**Fundamentals of Ecology**	**12**
	1. Introduction to Ecology-Definition, scope, and levels of organization. 2. Ecosystem Structure & Function – Biotic and abiotic components, ecological energetic, food chains, food webs, trophic levels. 3. Biogeochemical Cycles: Carbon, nitrogen, phosphorus, and water cycles	
	Unit Outcomes: UO 1. **After completion of the course the students will be able to-** Explain the fundamental principles of ecology, including ecosystem structure and function, biogeochemical cycles.	
II	**Population and Community of Ecology**	**11**
	1.Characteristics of Population Ecology, 2.Population growth models (exponential and logistic), 3. Carrying capacity, life history strategies (r/K selection). 4. Characteristics of Community Ecology, 5. Biotic interactions (competition, predation, mutualism Commensalism, parasitism), ecological succession, community stability.	
	Unit Outcomes:	

Unit No.	Title of Unit & Contents	Hrs.
	UO 1. After completion of the unit the students will be able to: Apply population and community ecology principles to real-world scenario	
III	**Applied and Conservation Ecology**	**11**
	1. Biodiversity and Conservation:-Definition, hotspots, threats to biodiversity, conservation strategies (in-situ and ex-situ). 2. Ecotoxicology:-Pollution, bioaccumulation, bio magnification, environmental risk assessment. 3. Climate Change Ecology:-Global warming, impacts on ecosystems, mitigation strategies. 4. Ecosystem Services:-Types, importance, human dependence.	
	Unit Outcomes: **UO 1.** After completion of the unit the students will be able to: Describe Applied and conservation ecology principles and practices	
IV	**Evolutionary Biology**	**11**
	1. Introduction to evolution (definition, evidence, and mechanisms) 2. Evidences of Evolution:-Paleontological, Embryological, Morphological 3. Lamarckism, Darwin's theory of Organic evolution, 4. Modern synthesis and the neo-Darwinian theory 5. Microevolution (genetic variation, mutation, gene flow, genetic drift) 6. Macroevolution (speciation, phylogeny, and evolutionary trends)	
	Unit Outcomes: **UO 1.** After completion of the unit the students will be able to: Apply evolutionary principles to real-world scenarios	

Learning Resources:

1. Odum, E.P. (2005). Fundamentals of Ecology. Brooks/Cole.

2. Molles, M.C. (2019). Ecology: Concepts and Applications. McGraw Hill.

3.Primack, R.B. (2020). Essentials of Conservation Biology. Sinauer Associates.

4. Krebs, C.J. (2016). Ecology: The Experimental Analysis of Distribution and Abundance. Pearson.

5. Krebs, J.R., & Davies, N.B. (2012). An Introduction to Behavioral Ecology. Wiley-Blackwell.

6. Smith, T.M., & Smith, R.L. (2014). Elements of Ecology. Pearson.

7. Futuyma, D.J. (2017). Evolution. Sinauer Associates.

8. Ridley, M. (2004). Evolution. Blackwell Publishing.

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Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

Faculty of Science

Department of Zoology

Class: B.Sc. III Year, Semester: V

Course Type: DSC-IX

Lab. Course Title: Ecology and Evolution

Course Code:

Credits: 01 **Max. Marks: 50** **Lecture: 30 Hrs.**

Learning Objectives:

LO 1. To apply the skills necessary to analyze chemicals parameter of water and Soil.

LO 2. To demonstrate the biotic interactions in an ecosystem

LO 3. To analyze the relationship among different organisms

LO 4. To understand the pathway of evolution

Course Outcomes:

After completion of the course the students will be able to-

CO 1. Apply the skills necessary to analyze chemicals parameter of water and Soil.

CO 2. Demonstrate the biotic interactions in an ecosystem

CO 3. Analyze the relationship among different organisms

CO 4. Understand the pathway of evolution

Unit No.	Title of Unit & Contents	Hrs.
I	**Practicals**	**12**
	1. Estimation of dissolved O_2/CO_2 of water sample 2. Estimation of Salinity/Chlorinity/ Alkalinity/BoD/of water sample 3. Determination of relative humidity 4. To determine pH/Temp/Water holding capacity/Moisture of soil 5. To determine the density/abundance of species occurring in given area 6. Biotic interactions- Mutualism, Commensalism, Parasitism, Predations 7. Examine fossil specimens & identify characteristics that provide evidence for evolution. 8. Observe & draw the embryological development of different organisms (e.g., chick, fish, human). 9. Measure & compare the morphological characteristics of different species (e.g., finches, mammals). 10. Create a phylogenetic tree using a set of organisms (e.g., mammals, birds). 11. To understand the concept of cladistics and phylogenetic analysis 12. Study of homology, analogy and connecting link from suitable specimens.	

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(Autonomous)

Faculty of Science
Department of Zoology
Class: B.Sc. III Year, Semester: V

Course Type: DSC-X

Course Title: Applied Zoology: Apiculture and Lac Culture

Course Code:

Credits: 03 **Max. Marks: 75** **Lecture: 45 Hrs.**

Learning Objectives:

LO 1. To explain the apiculture, colony of Honeybees, pollination & Beehive management

LO 2. To apply Apiculture Products and Disease Management

LO 3. To describe Fundamentals of Lac Culture

LO 4. To apply Lac Culture Management and Pest Control

Course Outcomes:

After the completion of this course students will be able to:

CO 1. Explain the apiculture, colony of Honeybees, pollination & Beehive management

CO 2. Apply population and community ecology principles to real-world scenarios

CO 3. Describe Applied and conservation ecology principles and practices

CO 4. Apply evolutionary principles to real-world scenarios

Unit No.	Title of Unit & Contents	Hrs.
I	**Fundamentals of Apiculture**	**12**
	1. Introduction to Apiculture :-History, scope, and significance of beekeeping. 2. Types of Honeybees – *Apisdorsata, Apiscerana, Apismellifera, Apisflorea*, stingless bees. 3. Honeybee Colony and Social Organization – Caste system, division of labor, communication (waggle dance). 4. Beehive Management – Types of beehives (traditional and modern), handling bee colonies, seasonal management. 5. Pollination and Economic Importance – Role of bees in pollination, contribution to agriculture.	
	Unit Outcomes: UO 1. After completion of the unit the students will be able to: To explain the fundamental principles of apiculture, including Types and	

Unit No.	Title of Unit & Contents	Hrs.
	colony of Honeybees, pollination and Beehive management	
II	**Apiculture Products and Disease Management**	**11**
	1. Honey and Its Properties – Chemical composition, nutritional value, medicinal uses. 2. Bee Products – Wax, royal jelly, Propolis, bee venom, their extraction and applications. 3. Bee Diseases and Pests – Bacterial, viral, fungal diseases, and their control. 4. Artificial Queen Rearing and Swarming Control – Techniques for colony division, queen production. 5. Economic and Commercial Aspects – Apiculture as an industry, marketing of bee products.	
	Unit Outcomes: UO 1. After completion of the unit the students will be able to: To apply Apiculture Products and Disease Management	
III	**Fundamentals of Lac Culture**	**11**
	1. Introduction to Lac Culture – History, significance, and distribution of lac insects 2. Lac Insect Biology – Life cycle, host plants, varieties of lac insects (*Kerrialacca*). 3. Lac Cultivation Techniques – Selection of host plants, inoculation, pruning, harvesting. 4. Lac Processing and Value Addition – Stick lac, seed lac, shellac, commercial processing. 5. Economic Importance of Lac – Industrial applications, role in varnishes, adhesives, cosmetics.	
	Unit Outcomes: UO 1. After completion of the unit the students will be able to: To understand Lac culture and describe Fundamentals of Lac Culture	
IV	**Lac Culture Management and Pest Control**	**11**
	1. Host Plant Management – Important host species, agroforestry integration. 2. Lac Insect Enemies and Pest Control – Predators (Eublemmaamabilis, Pseudohypatopapulverea), biological control. 3. Modern Techniques in Lac Cultivation – Biotechnological	

Unit No.	Title of Unit & Contents	Hrs.
	advancements, genetic improvement. 4. Lac Industry and Trade – Indian and global market trends, export potential. 5. Sustainability and Conservation in Lac Culture – Environmental impact, sustainable production methods.	
	Unit Outcomes: UO 1. After completion of the unit the students will be able to: To apply Lac Culture Management and Pest Control	

Learning Resources:

1. Singh, S. (2018). Beekeeping in India. ICAR Publications.
2. Crane, E. (1990). Bees and Beekeeping: Science, Practice, and World Resources. Heinemann.
3. Ruttner, F. (1988). Biogeography and Taxonomy of Honeybees. Springer.
4. Gupta, J.K. (2011). Advances in Beekeeping. Oxford Book Company.
5. Jaiswal, A.K. (2000). Lac Cultivation and Processing in India. International Books & Periodicals.
6. Sharma, K.K. (2016). Lac Culture: Principles and Applications. Biotech Books.
7. Srivastava, A.K., & Sharma, K.K. (2013). Recent Advances in Lac Culture Research. Springer.
8. Thakur, N.S.A. (2001). Handbook of Lac Culture Techniques. ICAR.

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Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)
Faculty of Science
Department of Zoology
Class: B.Sc. III Year, Semester: V

Course Type: DSC-X
Lab. Course Title: Applied Zoology: Apiculture and Lac Culture
Course Code:
Credits: 01 **Max. Marks: 50** **Lecture: 30 Hrs.**

Learning Objectives:

LO 1. To analyze types and colony of Honeybees, different bee hives and apiculture equipment.
LO 2. To develop Skill of Extraction of honey and wax from honey comb
LO 3. To control insect pests and diseases of honeybees and their managements
LO 4. To describe Fundamentals of Lac Culture and Lac insects-biology

Course Outcomes:

After completion of the course the students will be able to-

CO 1. Analyze types and colony of Honeybees, different bee hives and apiculture equipment.
CO 2. Develop Skill of Extraction of honey and wax from honey comb
CO 3. Control insect pests and diseases of honeybees and their managements
CO 4. Describe Fundamentals of Lac Culture and Lac insects-biology

Unit No.	Title of Unit & Contents	Hrs.
I	**Practicals**	**12**
	1. Study of castes in honey bees 2. Structural organization of honey bees 3. To study on honey bee colony establishment. 4. To study on seasonal management of colony. 5. To study on honey extraction and bottling techniques. 6. Extraction of honey and wax from honey comb. 7. To study of insect pests and diseases of honeybees and their managements 8. Study of Parthenogenesis in honey bees 9. Study of life history stages of Lac insect. Male and female insect dimorphism study. 10.Lac culture tools Axe, scrapper, Shear, Secaturs etc. 11.To study on natural enemies of lac insects. 12.Genetics of lac insects 13.Marketing of bee and lac products 14.To visit research and training institutions devoted to beekeeping, lac culture and natural enemies 15.Familiarization with Lac insects-biology	

Shiv Chhatrapati Shikshan Sanstha's

Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

Faculty of Science
Department of Zoology
Class: B.Sc. III Year, Semester: V

Course Type: DSE-I (a)

Course Title: Animal Biotechnology

Course Code:

Credits: 03 **Max. Marks: 75** **Lecture: 45 Hrs.**

Learning Objectives:

LO 1. To explain the fundamental principles of recent advances in Animal biotechnology.
LO 2. To study different approaches to animal cell and tissue
LO 3. To describe fundamental concept of animal cell culture and its importance
LO 4. To study different cell types

Course Outcomes:

After the completion of this course students will be able to:

CO 1. Explain the fundamental principles of recent advances in Animal biotechnology.
CO 2. Study different approaches to animal cell and tissue
CO 3. Describe fundamental concept of animal cell culture and its importance
CO 4. Study different cell types

Unit No.	Title of Unit & Contents	Hrs.
I	**Introduction to Animal Biotechnology**	**12**
	1. Origin of Biotechnology 2. History and Scope 3. Importance of Biotechnology	
	Unit Outcomes: UO 1. After completion of the unit the students will be able to: To explain the fundamental principles of recent advances in Animal biotechnology	
II	**Animal cell and Tissue culture**	**11**
	1. Definition, History of Animal Tissue culture 2. Equipment's and materials for animal cell culture technology 3. Laminar flow hoods, Centrifuge, Incubator, 4. Work area and flooring, Plastics ware and Glassware 5. Substrate (Glass, Metals, plastics, Agar-agar) Extraction and applications.	
	Unit Outcomes: UO 1. After completion of the unit the students will be able to:	

Unit No.	Title of Unit & Contents	Hrs.
	To study different approaches to animal cell and tissue	
III	**Cell Culture technique**	**11**
	1.Cell Culture initiation 2. Preparation and sterilization of media 3. Sterilization of Substrate and Glassware's 4. Isolation of explants, Disaggregation of explants Culture 5. Subculture, Prevention of contamination **Unit Outcomes:** UO 1. After completion of the unit the students will be able to: To describe fundamental concept of animal cell culture and its importance.	
	Unit Outcomes: UO 1. After completion of the unit the students will be able to: To describe fundamental concept of animal cell culture and its importance	
IV	**Cell types**	**11**
	1. Cultured animal cell Based on Morphology and Functional characteristics. Epithelial –like cells, Lymphoblast-like cell, and Fibroblast-like cells 2. Cultured animal cell Based on Functional characteristics Finite cells, Continuous cell lines, Immortal cell lines, Transformed cell lines Cell lines 3. Evolution of cell lines and their maintenance Large scale culture of cell lines (Monolayer cell culture and immobilized cell culture	
	Unit Outcomes: UO 1. After completion of the unit the students will be able to: To study different cell types	

Learning Resources

1. Animal Biotechnology" by H. S. Singh
2. "Animal Cell and Tissue Culture" by A. G. Jhingran
3. "Cell Culture Techniques" by J. W. Halver
4. "Animal Cell Types and Characteristics" by T. V. R. Pillay

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Faculty of Science

Department of Zoology

Class: B.Sc. III Year, Semester: V

Course Type: DSE-I (a)

Lab. Course Title: Animal Biotechnology

Course Code:

Credits: 01 **Max. Marks: 50** **Lecture: 30 Hrs.**

Learning Objectives:

LO 1. To make the students to understand Packing and sterilization

LO 2. To understand the understand Preparation of reagents and media

LO 3. To understand basic knowledge of Primer culture technique

LO 4. To learn Isolation and cultivation of lymphocytes

Course Outcomes:

After completion of the course the students will be able to-

CO 1. Make the students to understand Packing and sterilization

CO 2. Understand the understand Preparation of reagents and media

CO 3. Understand basic knowledge of Primer culture technique

CO 4. Learn Isolation and cultivation of lymphocytes

Unit No.	Title of Unit & Contents	Hrs.
I	**Practicals**	12
	1. Packing and sterilization of glass and plastic wares for cell culture. 2. Preparation of reagents and media for cell culture. 3. Primer culture technique chicken embryo fibroblast. 4. Secondary culture of chicken embryo fibroblast. 5. Cultivation of continuous cell lines. 6. Quantification of cells by trepan blue exclusion dye. 7. Isolation of lymphocytes and cultivation of lymphocytes 8. Study of effect of toxic chemicals on cultured mammalian cells 9. Study of effect of virus on mammalian cells	

Shiv Chhatrapati Shikshan Sanstha's

Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)
Faculty of Science
Department of Zoology
Class: B.Sc. III Year, Semester: V

Course Type: DSE-(b)
Course Title: Proteomic and Genomics
Course Code:
Credits: 03 **Max. Marks: 75** **Lecture: 45 Hrs.**

Learning Objectives:

LO 1. To explain the fundamental principles of apiculture, including Types and colony of Honeybees, pollination and Beehive management
LO 2. To apply Apiculture Products and Disease Management
LO 3. To describe Fundamentals of Lac Culture
LO 4. To apply Lac Culture Management and Pest Control

Course Outcomes:

After the completion of this course students will be able to:

CO 1. Explain the fundamental principles of ecology, including ecosystem structure and function, biogeochemical cycles.
CO 2. Apply population and community ecology principles to real-world scenarios
CO 3. Describe Applied and conservation ecology principles and practices
CO 4. Apply evolutionary principles to real-world scenarios
CO 5.

Unit No.	Title of Unit & Contents	Hrs.
I	**Introduction to Proteomics and Genomics**	**12**
	1.Definition and scope of proteomics and genomics 2. History and importance of proteomics and genomics 3. Overview of proteomic and genomic techniques 4. Bioinformatics tools and databases in proteomics and genomics	
	Unit Outcomes: UO 1. After completion of the unit the students will be able to: To understand the principles and concepts of proteomics and genomics	
II	**Proteomics**	**11**
	1. Protein structure and function 2. Protein separation and identification techniques (2D-PAGE, MS, etc.) 3. Protein sequencing and characterization 4. Proteomic databases and bioinformatics tools	
	Unit Outcomes: UO 1. After completion of the unit the students will be able to: learn about the techniques and tools used in proteomics and genomics	
III	**Genomics**	**11**
	1. Genome structure and organization 2. DNA sequencing and assembly 3. Gene expression and regulation 4. Genomic databases and bioinformatics tools	

Unit No.	Title of Unit & Contents	Hrs.
	Unit Outcomes: UO 1. After completion of the unit the students will be able to: To apply proteomic and genomic principles to solve biological problems	
IV	**Applications of Proteomics and Genomics**	**11**
	1. Applications in medicine and disease diagnosis 2. Applications in agriculture and biotechnology 3. Applications in environmental science and conservation 4. Future directions and challenges in proteomics and genomics	
	Unit Outcomes: UO 1. After completion of the unit the students will be able to: To apply proteomic and genomic principles to solve biological problems	

Learning Resources:

1."Proteomics: A Guide to Study Proteins" by S. K. Singh

2. "Genomics: The Science and Technology Behind the Human Genome Project" by C. R. Cantor

3."Proteomics and Genomics: A Practical Approach" by J. S. Yadav

4."Bioinformatics: A Practical Approach" by A. K. Singh

5. "Proteomics and Genomics: Principles and Applications" by R. K. Gupta

Shiv Chhatrapati Shikshan Sanstha's

Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)
Faculty of Science
Department of Zoology
Class: B.Sc. III Year, Semester: V

Course Type: DSE-(b)
Lab. Course Title: Proteomic and Genomics
Course Code:
Credits: 01 **Max. Marks: 50** **Lecture: 30 Hrs.**

Learning Objectives:

LO 1. To understand the principles and techniques of proteomics and genomics
LO 2. To learn to extract, purify, and analyze proteins and DNA
LO 3. To apply proteomics and genomics concepts to solve biological problems
LO 4. To analyze and interpret proteomic and genomic data

Course Outcomes:

After completion of the course the students will be able to-

CO 1. Understand the principles and techniques of proteomics and genomics
CO 2. Learn to extract, purify, and analyze proteins and DNA
CO 3. Apply proteomics and genomics concepts to solve biological problems
CO 4. Analyze and interpret proteomic and genomic data

Unit No.	Title of Unit & Contents	Hrs.
I	**Practicals**	**12**
	1. Extraction of proteins from different sources (e.g. plant, animal, bacterial) 2. Purification of proteins using different techniques (e.g. centrifugation, filtration, chromatography) 3. SDS-PAGE and Western Blotting 4. Protein sequencing using Edman degradation 5. Characterization of proteins using mass spectrometry 6. Extraction of genomic DNA from different sources (e.g. plant, animal, bacterial) 7. Purification of genomic DNA using different techniques (e.g. centrifugation, filtration, chromatography) 8. PCR amplification of DNA fragments 9. DNA sequencing using Sanger sequencing 10. RNA extraction and purification 11. cDNA synthesis and qRT-PCR analysis 12. Use of bioinformatics tools for protein-protein interaction analysis 13. Introduction to genomic data analysis 14. Use of bioinformatics tools for genomic data analysis 15. Proteomic Data Analysis (1.5 Lecture) 16. Gene cloning using PCR and restriction enzymes 17. Gene expression using recombinant DNA technology	

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Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

Faculty of Science

Department of Zoology

Class: B.Sc. III Year, Semester: V

Course Type: DSM-IV

Course Title: Freshwater Aquaculture

Course Code:

Credits: 03 **Max. Marks: 75** **Lecture: 45 Hrs.**

Learning Objectives:

LO 1. To understand the principles and significance of freshwater aquaculture
LO 2. To gain knowledge about various freshwater aquaculture species and their culture techniques
LO 3. To develop skills in water quality management, nutrition, and disease control
LO 4. To learn about sustainable aquaculture practices and environmental management.

Course Outcomes:

After the completion of this course students will be able to:

CO 1. Understand the principles and significance of freshwater aquaculture
CO 2. Gain knowledge about various freshwater aquaculture species and their culture techniques
CO 3. Develop skills in water quality management, nutrition, and disease control
CO 4. Learn about sustainable aquaculture practices and environmental management

Unit No.	Title of Unit & Contents	Hrs.
I	**Introduction to Freshwater Aquaculture**	**12**
	1. Definition and scope of aquaculture 2. History and development of freshwater aquaculture 3. Importance of freshwater aquaculture in food security and economy 4. Different types of freshwater aquaculture systems: ponds, tanks, raceways, recirculation	
	Unit Outcomes: UO 1. After completion of the unit the students will be able to: understand the principles and significance of freshwater aquaculture	
II	**Freshwater Aquaculture Species and Culture Techniques**	**11**
	1. Major freshwater aquaculture species: Indian Major Carps, Exotic Carps, Catfishes, Tilapia, Prawns, and Ornamental Fish 2. Seed production techniques: Induced breeding, hatchery management, nursery rearing 3. Grow-out culture practices for different fish species 4. Integrated fish farming (paddy-cum-fish, fish-cum-livestock)	

Unit No.	Title of Unit & Contents	Hrs.
	5. Water quality management in aquaculture	
	Unit Outcomes: UO 1. After completion of the unit the students will be able to: To gain knowledge about various freshwater aquaculture species and their culture techniques	
III	**Nutrition, Health Management, and Harvesting**	**11**
	1. Fish nutrition: Types of feeds, feeding strategies, and feed formulation 2. Common diseases in freshwater aquaculture: Bacterial, fungal, viral, and parasitic diseases 3. Disease diagnosis, prevention, and control measures 4. Harvesting methods, post-harvest handling, and marketing of freshwater fish 5. Economics and financial management in freshwater aquaculture	
	Unit Outcomes: UO 1. After completion of the unit the students will be able to: To develop skills in water quality management, nutrition, and disease control	
IV	**Sustainability, Policies, and Future Trends**	**11**
	1. Environmental impact of freshwater aquaculture and mitigation measures 2. Sustainable aquaculture practices and certification 3. Government policies, regulations, and support for freshwater aquaculture 4. Advances in freshwater aquaculture technology (biofloc, RAS, aquaponics) 5. Future prospects and challenges in freshwater aquaculture	
	Unit Outcomes: UO 1. After completion of the unit the students will be able to: To learn about sustainable aquaculture practices and environmental management	

Learning Resources:

1. Jhingran, V.G. – Fish and Fisheries of India

2. Pillay, T.V.R. – Aquaculture: Principles and Practices

3. Boyd, C.E. – Water Quality Management for Pond Fish Culture

4. Santhanam, R., Sukumaran, N., & Natarajan, P. – Aquaculture

5. Bardach, J.E., Ryther, J.H., &McLarney, W.O. – Aquaculture: The Farming and Husbandry of Freshwater and Marine Organisms

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Faculty of Science
Department of Zoology
Class: B.Sc. III Year, Semester: V

Course Type: DSM-IV
Lab. Course Title: Freshwater Aquaculture
Course Code:

Credits: 01 **Max. Marks: 50** **Lecture: 30 Hrs.**

Learning Objectives:

LO 1. To Develop practical skills in identification, pond management, and water quality monitoring
LO 2. To understand seed production, breeding techniques, and feeding practices
LO 3. To gain hands-on experience in disease diagnosis and treatment in aquaculture
LO 4. To learn fish harvesting, post-harvest handling, and marketing strategies
LO 5. Acquire knowledge of sustainable and integrated aquaculture systems

Course Outcomes:

After completion of the course the students will be able to-

CO 1. Develop practical skills in identification, pond management, and water quality monitoring
CO 2. Understand seed production, breeding techniques, and feeding practices
CO 3. Gain hands-on experience in disease diagnosis and treatment in aquaculture
CO 4. Learn fish harvesting, post-harvest handling, and marketing strategies

Unit No.	Title of Unit & Contents	Hrs.
I	**Practicals**	**12**
	1. Identification of freshwater fish & prawn , fish eggs, fry, fingerlings 2. Structural and functional components of culture systems 3. Criteria for site selection and Design and layout of fish ponds 4. Pond preparation techniques (liming, fertilization, etc.) 5. Estimation of Temp/ pH/O2/ammonia, hardness) 6. Handling, transportation, and acclimatization of fish seed 7. Study of fish breeding techniques (Hypophysation) 8. Identification of brood stock and spawning techniques 9. Formulation and preparation of artificial fish feed 10. Calculation of feed conversion ratio (FCR) 11. Identification of common fish diseases (bacterial/viral/parasitic 12. Processing, preservation, and transportation techniques 11. Demonstration of fish cum livestock/paddy farming 12. Visit to freshwater aquaculture systems (ponds, tanks, biofloc, RAS	

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(Autonomous)

Faculty of Science

Department of Zoology

Class: B.Sc. III Year, Semester: V

Course Type: DSM-IV
Course Title: Basics of Systematics and Classification
Course Code:

Credits: 03 **Max. Marks: 75** **Lecture: 45 Hrs.**

Learning Objectives:

LO 1. To explain the fundamental principles of systematics and classification.

LO 2. To describe taxonomic hierarchy and rules of nomenclature.

LO 3. To differentiate various classification approaches and their significance.

LO 4. To understand the applications of systematics in biodiversity and conservation.

Course Outcomes:

After the completion of this course students will be able to:

CO 1. Eexplain the fundamental principles of systematics and classification.

CO 2. Describe taxonomic hierarchy and rules of nomenclature.

CO 3. Differentiate various classification approaches and their significance.

CO 4. Understand the applications of systematics in biodiversity and conservation.

Unit No.	Title of Unit & Contents	Hrs.
I	**Fundamentals of Systematics and Classification**	**12**
	1. Definition, scope, and significance of systematics 2. Relationship between taxonomy, systematics, and phylogenetic 3. Historical development of classification systems (Artificial, Natural, and Phylogenetic classification)	
	Unit Outcomes: UO 1. After completion of the unit the students will be able to: To explain the fundamental principles of systematics and classification	
II	**Taxonomic Hierarchy and Nomenclature**	**11**
	1. Concept of species and speciation 2. Taxonomic hierarchy: Kingdom to species level 3. Principles of binomial nomenclature (ICZN, ICN, ICBN) 4. Rules of priority, typification, and validity of names	
	Unit Outcomes:	

Unit No.	Title of Unit & Contents	Hrs.
	UO 1. After completion of the unit the students will be able to: To describe taxonomic hierarchy and rules of nomenclature	
III	**Approches and Methods in Classification**	**11**
	1. Approaches to classification: Phonetics (Numerical taxonomy), Cladistics (Phylogenetic systematics), and Molecular systematics 2. Morphological, anatomical, and biochemical markers in taxonomy 3. Molecular tools in systematics: DNA barcoding, sequencing, and phylogenetic	
	Unit Outcomes: UO 1. After completion of the unit the students will be able to: To differentiate various classification approaches and their significance	
IV	**Methods and Applications in Systematics**	**11**
	1. Role of herbariums, museums, and culture collections in taxonomy 2. Applications of systematics in biodiversity conservation and ecological research 3. Use of bioinformatics and computational tools in taxonomy	
	Unit Outcomes: UO 1. After completion of the unit the students will be able to: To understand applications of Systematics in biodiversity and conservation.	

Learning Resources

1. "Systematics and Classification" by H. S. Singh
2. "Principles of Systematics" by A. G. Jhingran
3. "Classification and Systematics" by J. W. Halver
4. "Systematics and Biodiversity" by T. V. R. Pillay
5. MEGA (Molecular Evolutionary Genetics Analysis): A software tool for analyzing molecular data.
6. PAUP (Phylogenetic Analysis Using Parsimony)*: A software tool for phylogenetic analysis.
7. RDP (Ribosomal Database Project): A software tool for analyzing ribosomal RNA sequences.

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(Autonomous)

Faculty of Science

Department of Zoology

Class: B.Sc. III Year, Semester: V

Course Type: VSC-III
Course Title: Ornamental freshwater fish Culture
Course Code:

Credits: 02 **Max. Marks: 30** **Lecture: 45 Hrs.**

Learning Objectives:

LO 1. To understand Introduction, Types and Biology of Ornamental Fish Culture
LO 2. To develop skills in Nutrition, Fish Health, and Disease Management
LO 3. To learn to monitor fish breeding, larval rearing and manage water quality and fish health
LO 4. To develop skills in fish health monitoring and fish disease diagnosis and treatment

Course Outcomes:

After the completion of this course students will be able to:

CO 1. Understand Introduction, Types and Biology of Ornamental Fish Culture
CO 2. Develop skills in Nutrition, Fish Health, and Disease Management
CO 3. Learn to monitor fish breeding, larval rearing and manage water quality and fish health
CO 4. Develop skills in fish health monitoring and fish disease diagnosis and treatment

Unit No.	Title of Unit & Contents	Hrs.
I	**Introduction, Types and Biology of Ornamental Fish Culture**	**08**
	1. Introduction to ornamental fish culture 2. Types of ornamental freshwater fish 3. Biology and ecology of ornamental freshwater fish	
	Unit Outcomes: UO 1. After completion of the unit the students will be able to: To understand Introduction, Types and Biology of Ornamental Fish Culture	
II	**Nutrition, Fish Health, and Disease Management**	**07**
	1. Fish nutrition and feeding habits 2. Fish health and disease management	
	Unit Outcomes: UO 1. After completion of the unit the students will be able to: To develop skills in Nutrition, Fish Health, and Disease Management	
III	**Practical-Aquarium Management and Water Quality**	**15**
	1. Setting up and maintaining aquarium systems 2. Fish breeding and larval rearing 3. Water quality testing and management (6 Lecture) 4. Fish stocking and quarantine procedures (6 Lecture)	

Unit No.	Title of Unit & Contents	Hrs.
	5. Monitoring and maintenance of aquarium systems (6 Lecture)	
	Unit Outcomes: UO 1. After completion of the unit the students will be able to: To learn to monitor fish breeding, larval rearing and manage water quality and fish health	
IV	**Practical -Fish Health and Disease Management**	**15**
	1. Fish disease diagnosis and treatment 2. Quarantine and isolation procedures 3. Fish vaccination and immunization 4. Water quality management and disease prevention 5. Fish health monitoring and record keeping	
	Unit Outcomes: UO 1. After completion of the unit the students will be able to: To develop skills in fish health monitoring and fish disease diagnosis and treatment	

Learning Resources:

1. "Ornamental Fish Culture" by E. W. McCoy: A comprehensive textbook covering various aspects of ornamental fish culture.

2. "Aquarium Fish: A Comprehensive Guide" by G. A. Lewbart: A detailed guide to aquarium fish, covering biology, ecology, and husbandry.

3. "Fish Disease: Diagnosis and Treatment" by J. C. Eiras: A comprehensive guide to fish disease diagnosis and treatment, covering various diseases and treatment options.

4. "Aquarium Management" by J. R. Tucker: A practical guide to aquarium management, covering topics like water quality management, filtration, and circulation systems

Software and Tools:

1. Aquarium Water Quality Simulator: A software tool for simulating aquarium water quality.
2. FishSim: A software tool for simulating fish growth and behavior.
3. Aquaculture Management Software: A software tool for managing aquaculture operations.

YouTube Channels:

1. Aquarium Co-op: A YouTube channel that provides information on aquarium fish care and culture.
2. Fish Geeks: A YouTube channel that provides information on aquarium fish care and culture.
3. The Spruce Pets: A YouTube channel that provides information on ornamental freshwater fish culture.

Semester - VI

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Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)
Faculty of Science
Department of Zoology
Class: B.Sc. III Year, Semester: VI

Course Type: DSC-XI

Course Title: Ethology, Biometry and Bioinformatics

Course Code:

Credits: 03 **Max. Marks: 75** **Lecture: 45 Hrs.**

Learning Objectives:

LO 1. To understand the fundamental principles of animal behavior, including ethology,
LO 2. To apply statistical concepts to analyze and interpret biological data
LO 3. To understand the importance of bioinformatics in biological research and its applications
LO 4. To develop skills in programming languages and using bioinformatics tools.

Course Outcomes:

After the completion of this course students will be able to:

CO 1. Understand the fundamental principles of animal behavior, including ethology, communication, and biometry
CO 2. Apply statistical concepts to analyze and interpret biological data
CO 3. Understand the importance of bioinformatics in biological research and its applications
CO 4. Develop skills in programming languages and using bioinformatics tools

Unit No.	Title of Unit & Contents	Hrs.
I	**Animal Behaviour**	**12**
	1. Introduction to Ethology 2. History of ethology 3. Types of Animal Behavior: Stereotyped animal behavior and acquired animal behavior 4. Stereotyped animal behavior – Taxis and Instincts with examples. 5. Acquired animal behavior – Imprinting, Conditioning, Habituation, and Reasoning.	
	Unit Outcomes: UO 1. After completion of the unit the students will be able to: understand the fundamental principles of animal behavior, including ethology,	
II	**Animal Communication, Mimicry and Coloration**	**11**
	1. Types of communication, signal transmission and reception, animal language 2. Auditory Communication and Chemical Communication 3. Visual Communication and Tactile Communication 5. Mimicry and Coloration	
	Unit Outcomes:	

Unit No.	Title of Unit & Contents	Hrs.
	UO 1. After completion of the unit the students will be able to: apply statistical concepts to analyze and interpret biological data	
III	**Biometry**	**11**
	1. Introduction to biometry 2. Importance of statistics in biology 3. Types of data and variables 4. Collection, Tabulation and Classification of Data 5. Methods of collection of data 6. Measures of Central Tendency: Arithmetic Mean, Median and Mode 7. Measures of Variability – Standard Deviation 8. Graphical Representation of Data: Histogram, Pie Diagram and Polygon Frequency Curve	
	Unit Outcomes: UO 1. After completion of the unit the students will be able to: understand the importance of bioinformatics in biological research and its applications	
IV	**Bioinformatics**	**11**
	1. Introduction to bioinformatics 2. Importance of bioinformatics in biological research 3. Biological Database and Its Significance 4. Overview of bioinformatics tools and databases 5. Basic concepts of programming languages used in bioinformatics (Python, R, Perl) 6. Application of Bioinformatics	
	Unit Outcomes: UO 1. After completion of the unit the students will be able to: Develop skills in programming languages and using bioinformatics tools.	

Learning Resources:

1. "Animal Behaviour" by J. R. Krebs and N. B. Davies
2. "Ethology: The Biology of Behaviour" by K. Z. Lorenz
3. "Behavioral Ecology: An Evolutionary Approach" by J. R. Krebs and N. B. Davies
4. "The Study of Animal Behaviour" by F. R. Gehlbach
5. "Applied Ethology: Understanding Animal Behaviour for Animal Welfare" by D. M. Broom and A. F. Fraser
6. "Statistics for Biology and Health" by L. D. Fisher and G. Van Belle
7. "Biostatistics: A Foundation for Analysis in the Health Sciences" by W. W. Daniel
8 "Bioinformatics: A Comprehensive Approach" by S. S. Rao (University of Hyderabad)
9. "Bioinformatics and Computational Biology" by R. K. Singh (Indian Institute of Technology, Kanpur)
10. "Bioinformatics: Methods and Protocols" by S. K. Saxena (Indian Institute of Technology, Bombay)
11. "Bioinformatics: An Introduction to Computational Molecular Biology" by A. K. Sharma (University of Delh

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Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

Faculty of Science

Department of Zoology

Class: B.Sc. III Year, Semester: VI

Course Type: DSC-XI

Lab. Course Title: Ethology, Biometry and Bioinformatics

Course Code:

Credits: 01 **Max. Marks: 50** **Lecture: 30 Hrs.**

Learning Objectives:

LO 1. To observe biological phenomena of behaviour, coloration, mimicry in animals.

LO 2. To apply statistical concepts, for draw results.

LO 3. To use bioinformatics tools, to analyze and compare nucleotide sequences

LO 4. To develop Practical Skills in Biological Research

Course Outcomes:

After completion of the course the students will be able to-

CO 1. Observe biological phenomena of behaviour, coloration, mimicry in animals

CO 2. Apply statistical concepts, for draw results.

CO 3. Use use bioinformatics tools, to analyze and compare nucleotide sequences

CO 4. Develop Practical Skills in Biological Research: Develop practical skills in biological

Unit No.	Title of Unit & Contents	Hrs.
I	**Practicals**	**12**
	1. Study of Phototropism 2. Study of coloration in animal 3. Mimicry in animals 4. Communication in animals 5. Problems on Central tendency: Mean, Mode and Median 6. Representation of Data by Histogram, Polygram Frequency Curve, Pie diagram etc. 7. BLAST Similarity Search for Nucleotide Sequence 8. BLAST Similarity Search for Amino acid Sequences 9. FASTA Similarity Search for Nucleotide Sequence 10. FASTA Similarity Search for Amino acid Sequences	

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Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)
Faculty of Science
Department of Zoology
Class: B.Sc. III Year, Semester: VI

Course Type: DSC-XII

Course Title: Poultry Farming and Indian traditional system of animal kingdom (IKS)

Course Code:
Credits: 03 **Max. Marks: 75** **Lecture: 45 Hrs.**

Learning Objectives:

LO 1. To understand Nutrition, Diseases of Poultry, and Market Trends
LO 2. To identify and describe of common Breeds of Fowl and Rearing Methods
LO 3. To understand the concept of ethno zoology and its significance in human-animal relationships
LO 4. To develop skills in documenting and analyzing traditional knowledge related to anim

Course Outcomes:

After the completion of this course students will be able to:

CO 1. Understand Nutrition, Diseases of Poultry, and Market Trends
CO 2. Identify and describe of common Breeds of Fowl and Rearing Methods
CO 3. Understand the concept of ethno zoology and its significance in human-animal relationships
CO 4. Develop skills in documenting and analyzing traditional knowledge related to animals

Unit No.	Title of Unit & Contents	Hrs.
I	**Common Breeds of Fowl and Rearing methods in Poultry Housing and Equipments**	**12**
	American Class, Asiatic Class, Mediterranean Class, English Class, Indigenous breeds. Commercial strains of chickens: Broiler, Layer, Grower Essential of good housing; housing requirements; Poultry equipment (egg collector, incubator, Chick cage); Housing systems: Free range system, Semi intensive system, folding unit system, Deep litter system, Cage system (battery).	
	Unit Outcomes: UO 1. After completion of the unit the students will be able to: To understand Nutrition, Diseases of Poultry, and Market Trends.	
II	**Nutrition, Diseases of Poultry and their control measures, Poultry market in India**	**11**
	Nutrition, Feed formulation for chicks Viral disease, parasitic disease, fungal disease and their control, Size, growth and trends; poultry market opportunity and challenges	
	Unit Outcomes:	

Unit No.	Title of Unit & Contents	Hrs.
	UO 1. After completion of the unit the students will be able to: To identify and describe of common Breeds of Fowl and Rearing Methods	
III	**Traditional Indian Classification and Understanding of the Animal Kingdom**	**11**
	1. Introduction to the traditional Indian classification of animals (e.g. PanchaBhuta, Triguna) 2. Understanding of the animal kingdom in Indian mythology and folklore 3. Traditional Indian understanding of animal behavior and ecology 4. Comparison with modern Western classification systems	
	Unit Outcomes: UO 1. After completion of the unit the students will be able to: To understand the concept of ethno zoology and its significance in human-animal relationships	
IV	**Cultural and Spiritual Significance of Animals in Indian Tradition**	**11**
	1. Role of animals in Hindu mythology and worship (e.g. sacred cows, temple elephants, tortoise) 2. Significance of animals in Indian festivals and celebrations (e.g. Nag Panchami, MakarSankranti) 3. Traditional Indian art and literature related to animals (e.g. Panchatantra, Jataka tales) 4. Animals in Indian astrology and astronomy (e.g. zodiac signs, planetary associations)	
	Unit Outcomes: UO 1. After completion of the unit the students will be able to: To develop skills in documenting and analyzing traditional knowledge related to animals	

Learning Resources:

1. "Poultry Farming: Principles and Practices" by G. M. Singh
2. "Ethno zoology: The Study of Human-Animal Relationships" by R. K. Singh
3. "Traditional Poultry Keeping Practices" by S. C. Jain
4. "Poultry in Human Culture and Economy" by A. K. Sharma
5. The Panchatantra" translated by Arthur W. Ryder
6. "The Jataka Tales" translated by H.T. Francis and E.J. Thomas
7. "The Cultural Heritage of India" by Haridas Bhattacharyya
8. "Traditional Indian Knowledge and Practices Related to Animals" by S.C. Jain

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Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

Faculty of Science

Department of Zoology

Class: B.Sc. III Year, Semester: VI

Course Type: DSC-XII

Lab. Course Title: Poultry Farming and Indian traditional system of animal kingdom (IKS

Course Code:

Credits: 01 **Max. Marks: 50** **Lecture: 30 Hrs.**

Learning Objectives:

LO 1. To develop practical skills in poultry farming and animal husbandry
LO 2. To learn breeds selection, nutrition, and health in poultry farming and animal husbandry
LO 3. To apply practical skills in farm management and marketing of poultry and livestock products
LO 4. To understand traditional Indian classification of animal

Course Outcomes:

After completion of the course the students will be able to-

CO 1. Develop practical skills in poultry farming and animal husbandry
CO 2. Learn breeds selection, nutrition, and health in poultry farming and animal husbandry
CO 3. Apply practical skills in farm management and marketing of poultry and livestock products
CO 4. Understand traditional Indian classification of animal kingdom

Unit No.	Title of Unit & Contents	Hrs.
I	**Practicals**	**12**
	1. Identify different breeds of poultry (chickens, turkeys, ducks, geese) 2. Prepare different types of poultry feed (starter, grower, layer) 3. Identify common diseases in poultry (Newcastle disease, infectious bronchitis 4. Develop skills in handling and restraining poultry 5. Visit a poultry 6. Documentation of traditional Indian classification systems 7. Analyze the role of animals in Indian mythology and folklore, including stories and legends. 8. Observe and document traditional Indian understanding of animal behavior and ecology. 9. Participate in Indian festivals and celebrations, including Nag Panchami and MakarSankranti. 10. Analyze traditional Indian art and literature related to animals, including Panchatantra and Jataka tales.	

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(Autonomous)

Faculty of Science

Department of Zoology

Class: B.Sc. III Year, Semester: VI

Course Type: DSE-II (a)

Course Title: Animal Biotechnology-II

Course Code:

Credits: 03 **Max. Marks: 75** **Lecture: 45 Hrs.**

Learning Objectives:

LO 1. To understand the principles and applications of animal biotechnology

LO 2. To develop skills in handling and maintaining cell and organ cultures

LO 3. To analyze the applications of animal biotechnology in research, medicine, and biotechnology

LO 4. Develop critical thinking and problem-solving skills in animal biotechnology

Course Outcomes:

After the completion of this course students will be able to:

CO 1. Understand the principles and applications of animal biotechnology

CO 2. Develop skills in handling and maintaining cell and organ cultures

CO 3. Analyze the applications of animal biotechnology in research, medicine, and biotechnology

CO 4. Develop critical thinking and problem-solving skills in animal biotechnology

Unit No.	Title of Unit & Contents	Hrs.
I	**Organ Culture**	**12**
	1. Methods of organ culture 2. Raft culture 3. Grid culture 4. Application of organ culture	
	Unit Outcomes: UO 1. After completion of the unit the students will be able to: To understand the principles and applications of animal biotechnology	
II	**Somatic Animal cell fusion**	**11**
	1. Introduction **2.** Somatic embryogenesis **3.** Somatic Hybridization	
	Unit Outcomes: UO 1. After completion of the unit the students will be able to: To develop skills in handling and maintaining cell and organ cultures	
III	**Hybridoma Technology**	**11**
	1. Monoclonal antibody, Production of Monoclonal Antibodies 2. Introduction of Hybridoma technology 3. Production of Hybridoma	

Unit No.	Title of Unit & Contents	Hrs.
	4. Application of Hybridoma Technology	
	Unit Outcomes: UO 1. After completion of the unit the students will be able to: To analyze the applications of animal biotechnology in research, medicine, and biotechnology	
IV	**Stem Cell Biology**	**11**
	1. Stem Cells 2. Embryonic Stem Cell Cultures 3. Method to produce differentiated cells 4. Maintenance of stem cells 5. Characteristics of stem cells 6. Application of stem cell biology	
	Unit Outcomes: UO 1. After completion of the unit the students will be able to: To develop critical thinking and problem-solving skills in animal biotechnology	

Learning Resources:

1. Biotechnology: An Introduction" by Susan R. Barnum
2. "Cell and Molecular Biology" by Gerald Karp
3. "Molecular Cell Biology" by Harvey Lodish, et al.
4. Organ Culture" by J. Paul (Editor)
5. "Cell and Tissue Culture" by John R. W. Masters
6. Somatic Cell Hybridization" by R. L. Davidson, F. H. Ruddle (Editors)
7. "Cell Fusion: Methods and Protocols" by Yuri E. Khudyakov, Howard L. Pletcher (Editors)
8. "Somatic Embryogenesis" by M. M. Yeoman (Editor)
9. Hybridoma Technology" by H. Zola (Editor)
10 . "Monoclonal Antibodies: Methods and Protocols" by Maher Albitar (Editor)
11. "Hybridoma Technology and Monoclonal Antibodies" by Sudhir Gupta (Editor)
12. Stem Cells: A Very Short Introduction" by Jonathan Slack

Shiv Chhatrapati Shikshan Sanstha's

Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

Faculty of Science

Department of Zoology

Class: B.Sc. III Year, Semester: VI

Course Type: DSE-II (a)

Lab. Course Title: Animal Biotechnology-II
Course Code:

Credits: 01 **Max. Marks: 50** **Lecture: 30 Hrs.**

Learning Objectives:

LO 1. To learn to prepare and maintain suspension cultures of animal cells
LO 2. Analyze the viability and growth characteristics of cryopreserved cells
LO 3. Understand the effects of viruses on cultured mammalian cells
LO 4. Cultivation of Normal Lymphocytes and Myeloma Cell Line
LO 5. Understand the principles of embryonic stem cell culture and maintenance

Course Outcomes:

After completion of the course the students will be able to-

CO 1. Learn to prepare and maintain suspension cultures of animal cells
CO 2. Aanalyze the viability and growth characteristics of cryopreserved cells
CO 3. Understand the effects of viruses on cultured mammalian cells
CO 4. Cultivation of Normal Lymphocytes and Myeloma Cell Line
CO 5. Understand the principles of embryonic stem cell culture and maintenance

Unit No.	Title of Unit & Contents	Hrs.
I	**Practicals**	**12**
	1. Suspension culture technique 2. Cryopreservation of cell primary cultures and cell lines. 3. Effect of viruses on cultured mammalian cells. 4. Cultivation of normal lymphocytes and myeloma cell line. 5. Somatic cell hybridization and production of Hybridoma. 6. Screening of hybrids for production of monoclonal antibodies 7. Culture of embryonic stem cell. 8. Characterization of embryonic stem cells.	

Shiv Chhatrapati Shikshan Sanstha's

Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

Faculty of Science

Department of Zoology

Class: B.Sc. III Year, Semester: VI

Course Type: DSE –II (b)

Course Title: Wild Life Biology

Course Code:

Credits: 03 **Max. Marks: 75** **Lecture: 45 Hrs.**

Learning Objectives:

LO 1. To understand the principles and concepts of wildlife biology
LO 2. To learn about the diversity of wildlife and their habitats
LO 3. To develop skills in wildlife conservation and management
LO 4. To apply scientific principles to solve wildlife-related problems

Course Outcomes:

After the completion of this course students will be able to:

CO 1. Understand the principles and concepts of wildlife biology
CO 2. Learn about the diversity of wildlife and their habitats
CO 3. Develop skills in wildlife conservation and management
CO 4. Apply scientific principles to solve wildlife-related problems

Unit No.	Title of Unit & Contents	Hrs.
I	**Introduction to Wildlife Biology**	**12**
	1. Definition and scope of wildlife biology 2. Importance of wildlife conservation 3. Overview of wildlife diversity and habitats	
	Unit Outcomes: UO 1. After completion of the unit the students will be able to: To understand the principles and concepts of wildlife biology	
II	**Wildlife Ecology**	**11**
	1. Principles of ecology and their application to wildlife 2. Population ecology and dynamics 3. Community ecology and interactions 4. Ecosystem ecology and conservation	
	Unit Outcomes: UO 1. After completion of the unit the students will be able to: To learn about the diversity of wildlife and their habitats	
III	**Wildlife Conservation and Management**	**11**
	1. Principles of wildlife conservation and management 2. Habitat management and restoration 3. Population management and control 4. Human-wildlife conflict and mitigation	
	Unit Outcomes:	

Unit No.	Title of Unit & Contents	Hrs.
	UO 1. After completion of the unit the students will be able to: To develop skills in wildlife conservation and management	
IV	**Wildlife Research and Monitoring**	**11**
	1. Research methods in wildlife biology 2. Data collection and analysis 3. Monitoring and surveillance techniques	
	Unit Outcomes: UO 1. After completion of the unit the students will be able to: To apply scientific principles to solve wildlife-related problems	

Learning Resources:

1. "Wildlife Biology" by Richard J. Gutierrez
2. "Wildlife Ecology and Management" by William F. Porter
3. "Wildlife Conservation and Management" by John G. Robinson
4. "Wildlife Research and Management" by Michael L. Morrison
5. "Wildlife Habitat Evaluation" by Leonard A. Brennan

Shiv Chhatrapati Shikshan Sanstha's

Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

Faculty of Science

Department of Zoology

Class: B.Sc. III Year, Semester: VI

Course Type: DSE –II (b)

Lab. Course Title: Wild Life Biology

Course Code:

Credits: 01 **Max. Marks: 50** **Lecture: 30 Hrs.**

Learning Objectives:

LO 1. To develop skills of Observation and Identification of Wildlife
LO 2. To apply Wildlife Habitat Assessment
LO 3. To analyze and estimation of Wildlife Population
LO 4. To develop skill of Wildlife Conservation and Management Planning

Course Outcomes:

After completion of the course the students will be able to-

CO 1. Develop skills of Observation and Identification of Wildlife
CO 2. Apply Wildlife Habitat Assessment
CO 3. Analyze and estimation of Wildlife Population
CO 4. Develop skill of Wildlife Conservation and Management Planning

Unit No.	Title of Unit & Contents	Hrs.
I	**Practicals**	**12**
	1. Observation and identification of wildlife species 2. Use of field guides and keys 3. Recording and documentation of observations 4. Assessment of wildlife habitats and ecosystems 5. Use of habitat evaluation indices 6. Identification of habitat features and characteristics 7. Estimation of wildlife population sizes 8. Use of mark-release-recapture and other methods 9. Data analysis and interpretation 10. Development of wildlife conservation and management plans 1. 11.. Use of decision-support tools and models 11. Stakeholder engagement and participation 12. Visit to wildlife sanctuary.	

Shiv Chhatrapati Shikshan Sanstha's

Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

Faculty of Science

Department of Zoology

Class: B.Sc. III Year, Semester: VI

Course Type: DSM-V

Course Title: Livestock Management and Animal Husbandry

Course Code:

Credits: 03 **Max. Marks: 75** **Lecture: 45 Hrs.**

Learning Objectives:

LO 1. To Understand the principles of livestock management and animal husbandry
LO 2. To Develop skills in managing and caring for livestock
LO 3. To Apply scientific principles to improve livestock production and management
LO 4. To Analyze and evaluate different livestock production systems

Course Outcomes:

After the completion of this course students will be able to:

CO 1. Understand the principles of livestock management and animal husbandry
CO 2. Develop skills in managing and caring for livestock
CO 3. Apply scientific principles to improve livestock production and management
CO 4. Analyze and evaluate different livestock production systems

Unit No.	Title of Unit & Contents	Hrs.
I	**Introduction to Livestock Management and** Animal Nutrition	**12**
	1. Definition and scope of livestock management 2. Importance of livestock in agriculture and economy 3. Overview of livestock production systems 4. Nutritional requirements of livestock 5. Types of feed and feeding systems 6. Nutritional disorders and their management	
	Unit Outcomes: UO 1. After completion of the unit the students will be able to: To Understand the principles of livestock management and animal husbandry	
II	**Animal Health and Hygiene**	**11**
	1. Common diseases of livestock 2. Vaccination and immunization programs 3. Hygiene and sanitation practices in livestock management	
	Unit Outcomes: UO 1. After completion of the unit the students will be able to: To Develop skills in managing and caring for livestock	
III	**Breeding and Genetics**	**11**
	1. Principles of breeding and genetics	

Unit No.	Title of Unit & Contents	Hrs.
	2. Selection and breeding programs for livestock 3. Genetic disorders and their management	
	Unit Outcomes: UO 1. After completion of the unit the students will be able to: To Apply scientific principles to improve livestock production and management	
IV	**Livestock Production Systems**	**11**
	1. Extensive and intensive livestock production systems(Cow, buffalo, sheep etc) 2. Organic and conventional livestock production systems 3. Livestock production systems in different regions	
	Unit Outcomes: UO 1. After completion of the unit the students will be able to: To Analyze and evaluate different livestock production systems	

Learning Resources:

1. "Livestock Management" by G. M. Singh
2. "Animal Husbandry" by S. C. Jain
3. "Livestock Production and Management" by R. K. Singh
4. "Animal Breeding and Genetics" by H. K. Nearing
5. "Livestock Nutrition" by S. K. Gupta
6. "FAO Livestock Production and Management" by Food and Agriculture Organization (FAO)
7. "Livestock Development: A Review of Issues and Options" by World Bank
8. "Animal Health and Production" by World Organization for Animal Health (OIE)
9. "Sustainable Livestock Production" by International Livestock Research Institute (ILRI)
10. "Animal Husbandry and Veterinary Science" by Indian Council of Agricultural Research (ICAR)

Shiv Chhatrapati Shikshan Sanstha's

Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

Faculty of Science

Department of Zoology

Class: B.Sc. III Year, Semester: VI

Course Type: DSM-V

Lab. Course Title: Livestock Management and Animal Husbandry

Course Code:

Credits: 01 **Max. Marks: 50** **Lecture: 30 Hrs.**

Learning Objectives:

LO 1. To understand the principles of livestock management and animal husbandry
LO 2. To develop skills in managing and caring for livestock
LO 3. To apply scientific principles to improve livestock production and management
LO 4. To understand Livestock Production Systems

Course Outcomes:

After completion of the course the students will be able to-

CO 1. Understand the principles of livestock management and animal husbandry
CO 2. Develop skills in managing and caring for livestock
CO 3. Apply scientific principles to improve livestock production and management
CO 4. Understand Livestock Production Systems

Unit No.	Title of Unit & Contents	Hrs.
I	**Practicals**	**12**
	1. Handling and restraint of different livestock species 2. Safety precautions and emergency procedures 3. Preparation and feeding of different types of feed 4. Calculation of feed requirements for different livestock species 5. Vaccination and immunization programs 6. Hygiene and sanitation practices in livestock management 7. Selection and breeding programs for livestock 8. Genetic testing and evaluation 9. Visit to a livestock farm or production unit 10. Observation and recording of different livestock production systems	

Shiv Chhatrapati Shikshan Sanstha's

Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

Faculty of Science

Department of Zoology

Class: B.Sc. III Year, Semester: VI

Course Type: VSC-III

Course Title: Freshwater Pearls Culture
Course Code:

Credits: 02 **Max. Marks: 30** **Lecture: 45 Hrs.**

Learning Objectives:

LO 1. To understand the principles and practices of freshwater pearls culture
LO 2. To learn about the biology and ecology of freshwater pearl mussels
LO 3. To develop skills in freshwater pearls culture and harvesting
LO 4. To apply scientific principles to improve freshwater pearls culture practices

Course Outcomes:

After the completion of this course students will be able to:

CO 1. Understand the principles and practices of freshwater pearls culture
CO 2. Learn about the biology and ecology of freshwater pearl mussels
CO 3. Develop skills in freshwater pearls culture and harvesting
CO 4. Apply scientific principles to improve freshwater pearls culture practices

Unit No.	Title of Unit & Contents	Hrs.
I	**Introduction to Freshwater Pearls Culture**	**12**
	1. Definition and scope of freshwater pearls culture 2. History and importance of freshwater pearls culture 3. Biology and ecology of freshwater pearl mussels 4. Principles of freshwater pearls culture 5. Overview of freshwater pearls culture practices	
	Unit Outcomes: UO 1. After completion of the unit the students will be able to: To understand the principles and practices of freshwater pearls culture	
II	**Freshwater Pearl Mussel Culture**	**11**
	1. Collection and transportation of freshwater pearl mussels 2. Acclimatization and quarantine of freshwater pearl mussels 3. Culture of freshwater pearl mussels in tanks and ponds 4. Water quality management and monitoring 5. Feeding and nutrition of freshwater pearl mussels	
	Unit Outcomes: UO 1. After completion of the unit the students will be able to: To learn about the biology and ecology of freshwater pearl mussels	
III	**Pearl Induction and Cultivation**	**11**
	1. Pearl induction techniques 2. Pearl cultivation and growth monitoring 3. Pearl quality evaluation and grading	

Unit No.	Title of Unit & Contents	Hrs.
	4. Pearl harvesting and processing 5. Value addition and marketing of freshwater pearls	
	Unit Outcomes: UO 1. After completion of the unit the students will be able to: To develop skills in freshwater pearls culture and harvesting	
IV	**Freshwater Pearls Culture Farm Management**	**11**
	1. Farm design and layout 2. Water supply and treatment systems 3. Feed and nutrition management 4. Health and disease management 5. Record keeping and financial management	
	Unit Outcomes: **Unit Outcomes:** UO 1. After completion of the unit the students will be able to: To apply scientific principles to improve freshwater pearls culture practices	

Learning Resources:

1. "Freshwater Pearls Culture" by T. K. Singh
2. "Pearl Culture" by P. C. Thomas
3. "Freshwater Pearl Mussel Culture" by R. K. Gupta
4. "Pearl Farming" by J. S. Yadav
5. "Aquaculture and Pearl Culture" by S. K. Singh
6. Additional Resources:
7. National Institute of Oceanography. (nod.). Freshwater Pearls Culture.
8. Central Institute of Freshwater Aquaculture. (Nod.). Pearl Culture.
9. Food and Agriculture Organization. (nod.). Pearl Culture.

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Extra Credit Activities

Sr. No.	Course Title	Credits	Lecture T/P
1	MOOCs	Min. of 02 credits	Min. of 30 Hrs.
2	Certificate Courses	Min. of 02 credits	Min. of 30 Hrs.
3	IIT Spoken English Courses	Min. of 02 credits	Min. of 30 Hrs.

Guidelines:

Extra -academic activities

1. All extra credits claimed under this heading will require sufficient academic input/ contribution from the students concerned.
2. Maximum 04 extra credits in each academic year will be allotted.
3. These extra academic activity credits will not be considered for calculation of SGPA/CGPA but will be indicated on the grade card.

Additional Credits for Online Courses:

1. Courses only from SWAYAM and NPTEL platform are eligible for claiming credits.
2. Students should get the consent from the concerned subject Teacher/Mentor/Vice Principal and Principal prior to starting of the course.
3. Students who complete such online courses for additional credits will be examined/verified by the concerned mentor/internal faculty member before awarding credits.
4. Credit allotted to the course by SWAYAM and NPTEL platform will be considered as it is.

Additional Credits for Other Academic Activities:

1. One credit for presentation and publication of paper in International/National/State level seminars/workshops.
2. One credit for measurable research work undertaken and field trips amounting to 30 Lecture of recorded work.
3. One credit for creating models in sponsored exhibitions/other exhibits, which are approved by the concerned department.
4. One credit for any voluntary social service/Nation building exercise which is in collaboration with the outreach center, equivalent to 30 Lecture
5. All these credits must be approved by the College Committee.

Additional Credits for Certificate Courses:

1. Students can get additional credits (number of credits will depend on the course duration) from certificate courses offered by the college.
2. The student must successfully complete the course. These credits must be approved by the Course Coordinators.
3. Students who undertake summer projects/ internships/ training in institutions of repute through a national selection process, will get 2 credits for each such activity. This must be done under the supervision of the concerned faculty/mentor.

Note:

1. The respective documents should be submitted within 10 days after completion of Semester End Examination.
2. No credits can be granted for organizing or for serving as office bearers/ volunteers for Inter-Class / Associations / Sports / Social Service activities.
3. The office bearers and volunteers may be given a letter of appreciation by the respective staff coordinators. Besides, no credits can be claimed for any services/activities conducted or attended within the college.
4. All claims for the credits by the students should be made and approved by the mentor in the same academic year of completing the activity.
5. Any grievances of denial/rejection of credits should be addressed to Additional Credits Coordinator in the same academic year.
6. Students having a shortage of additional credits at the end of the third year can meet the Additional Credits Coordinator, who will provide the right advice on the activities that can help them earn credits required for graduation.

Shiv Chhatrapati Shikshan Sanstha's

Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

Examination Framework

Theory:

40% Continuous Assessment Tests (CATs) and 60% Semester End Examination (SEE)

Practical:

50% Continuous Assessment Tests (CATs) and 50% Semester End Examination (SEE)

Course	Marks	CAT & Mid Term Theory				CAT Practical		Best Scored CAT & Mid Term	SEE	Total
1	2	3				4		5	6	5 + 6
		Att.	CAT I	Mid Term	CAT II	Att.	CAT			
DSC/DSE/ GE/OE/Minor	100	10	10	20	10	-	-	40	60	100
DSC	75	05	10	15	10	-	-	30	45	75
Lab Course/AIPC/ OJT/FP	50	-	-	-	-	05	20	-	25	50
VSC/SEC/ AEC/VEC/CC	50	05	05	10	05	-	-	20	30	50

Note:

1. All Internal Exams are compulsory
2. Out of 02 CATs best score will be considered
3. Mid Term Exam will be conducted by the Exam Section
4. Mid Term Exam is of Objective nature (MCQ)
5. Semester End Exam is of descriptive in nature (Long & Short Answer)
6. CAT Practical (20 Marks): Lab Journal (Record Book) 10 Marks, Overall Performance 10 Marks