



પરિપત્ર:

ભક્તકવિ નરસિંહ મહેતા યુનિવર્સિટીની લાઈફ સાયન્સ વિદ્યાશાખાનાં અભ્યાસક્રમ ચલાવતી તમામ સંલગ્ન કોલેજોનાં આચાર્યશ્રીઓને સવિનય જણાવવાનું કે લાઈફ સાયન્સ વિદ્યાશાખા હેઠળનો NEP-૨૦૨૦ અંતર્ગત ઝૂલોજી વિષય સેમેસ્ટર-૬નો અભ્યાસક્રમ આ સાથે સામેલ છે.

માનનીય કુલપતિશ્રીની મંજૂરી અનુસાર સદર અભ્યાસક્રમ શૈક્ષણિક વર્ષ જુન, ૨૦૨૫ થી અમલવારી કરવાની રહે છે. લાઈફ સાયન્સ વિદ્યાશાખાનાં અભ્યાસક્રમ ચલાવતી તમામ સંલગ્ન કોલેજો ધ્વારા તેની અમલવારી કરવા જણાવવામાં આવે છે.




ખાસ ફરજ પરના અધિકારી
(એકેડેમિક)

ક્રમાંક/બીકેએનએમયુ/ એકેડેમિક/૭૪૯/૨૦૨૫

ભક્તકવિ નરસિંહ મહેતા યુનિવર્સિટી,

સરકારી પોલીટેકનિક કેમ્પસ,

ભક્તકવિ નરસિંહ મહેતા યુનિવર્સિટી રોડ,

ખડીયા, જૂનાગઢ-૩૬૨૨૬૩

તા.૦૩/૧૧/૨૦૨૫

પ્રતિ,

- ભક્તકવિ નરસિંહ મહેતા યુનિવર્સિટી સંલગ્ન લાઈફ સાયન્સ વિદ્યાશાખાનાં અભ્યાસક્રમો ચલાવતી તમામ કોલેજોના આચાર્યશ્રીઓ તરફ....

નકલ સાદર રવાના:-

- માન.કુલપતિશ્રી/ કુલસચિવશ્રીનાં અંગત સચિવશ્રી.
- પરીક્ષા નિયામકશ્રી, ભક્તકવિ નરસિંહ મહેતા યુનિવર્સિટી, જૂનાગઢ

નકલ રવાના જાણ તથા યોગ્ય કાર્યવાહી અર્થે:

- સીસ્ટમ મેનેજરશ્રી, આઈ.ટી.સેલ વિભાગ (વેબસાઇટ ઉપર પ્રસિદ્ધ થવા અર્થે.)



BHAKTA KAVI NARSINH MEHTA UNIVERSITY
JUNAGADH



BOARD OF STUDIES

FACULTY OF LIFE SCIENCE

SYLLABUS FOR ZOOLOGY (HONOURS)

PROGRAMME (SEMESTER- VI)

EFFECTIVE FROM JUNE, 2025

BHAKTA KAVI NARSINH MEHTA UNIVERSITY
Syllabus of B.Sc. (Honors) as per NEP-2020
Faculty of Lifesciences
Effective from June 2025
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FORWARD

In academics, syllabus serves as a roadmap for teaching various topics in a well-defined manner. Along with constant changes in the field of subject, it is always required to review and update the syllabus so as to meet changing scenario at regional, national and global levels. In science, higher education at degree level creates base for students to sharpen their skills and enable them for securing employment. Moreover, for a few this also opens a new realm of research and education at post-graduation level. Hence, finalizing degree level syllabus requires to keep all these facts in mind.

The NEP 2020 states, “Assessments of educational approaches in undergraduate education that integrate the humanities and arts with Science, Technology, Engineering and Mathematics (STEM) have consistently shown positive learning outcomes, including increased creativity and innovation, critical thinking and higher-order thinking capacities, problem-solving abilities, teamwork, communication skills, more in-depth learning and mastery of curricula across fields, increases in social and moral awareness, etc., besides general engagement and enjoyment of learning”.

Here, the current syllabus is finalized after elaborate discussions amongst well qualified and experienced teachers. The syllabus is prepared according to the guidelines of UGC under NEP 2020. We delighted to share the curriculum and credit framework for B.Sc. Zoology Sem-6. The present syllabus encompasses latest trends in the subject. We are hopeful that students will be able to enhance their knowledge and understating of the subject well.

Board of Studies, Zoology
Bhakta Kavi Narsinh Mehta University,
Junagadh.

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SUMMARY OF THE SYLLABUS

Sem. No.	Sr. No.	Category of Course	Course Title	Course Level	Credit	Teaching Hrs.	SEE Marks	CCE Marks	Total Marks	Exam Duration
Sem-6	1	Major-14	Biochemistry and Molecular Biology	5.5	04	60 Hrs.	50	50	100	02:00 Hrs.
	2	Major-15	General Account of Non-Chordata and Chordata, Immunology, Embryology and Developmental Biology	5.5	04	60 Hrs.	50	50	100	02:00 Hrs.
	3	Major-16	Practical: Biochemistry and Molecular Biology, General Account of Non-Chordata and Chordata, Immunology, Embryology and Developmental Biology	5.5	04	120 Hrs.	50	50	100	04:00 Hrs.
	4	Minor-6	Non-Chordates-III, Ecology and Economic Zoology	5.5	04 (3T + 1P)	75 Hrs. (45 + 30 Hrs.)	50	50	100	04:00 Hrs. (2:00 + 2:00 Hrs.)
				Total	16					

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Pattern of Examination for Major-14/15

EVALUATION OF 100 MARKS (4 CREDIT PAPER)

Continuous and Comprehensive Evaluation (CCE)-50 Marks		Semester End Evaluation (SEE)-50 Marks
Mid Semester Exam (Mandatory)-25 Marks	1. Class assignment -- 05 2. Home assignment -- 05 3. Field assignment -- 05 4. Viva/Oral exam -- 05 5. Attendance -- 05	Semester End Theory Examination 50 Marks
Total 25 Marks	Total 25 Marks	Total 50 Marks

Pattern of Examination for Major-16

EVALUATION OF 100 MARKS (4 CREDIT PAPER-PRACTICAL BASED)

Continuous and Comprehensive Evaluation (CCE)-50 Marks		Semester End Evaluation (SEE)-50 Marks
Mid Semester Exam (Mandatory)-25 Marks	1. Class assignment -- 05 2. Home assignment -- 05 3. Field assignment -- 05 4. Viva/Oral exam -- 05 5. Attendance -- 05	Semester End Practical Examination 50 Marks
Total 25 Marks	Total 25 Marks	Total 50 Marks

Pattern of Examination for Minor-6

EVALUATION OF 100 MARKS (3+1 CREDIT PAPER)

Continuous and Comprehensive Evaluation (CCE)-50 Marks		Semester End Evaluation (SEE)-50 Marks
Practical Mid Semester Exam (Mandatory)-25 Marks	1. Class assignment -- 05 2. Home assignment -- 05 3. Field assignment -- 05 4. Viva/Oral exam -- 05 5. Attendance -- 05	Semester End Theory Examination 50 Marks
Total 25 Marks	Total 25 Marks	Total 50 Marks

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Course Level	5.5		Internal Marks	50
Programme	Zoology		External Marks	50
Semester	VI		Practical Internal	--
Category of Course	Discipline Specific Major Courses (Major-14)		Practical External	--
Course Credit	04		Prac. External Exam Duration	--
Teaching Hours	60		Total	100
Course Code			Exam Duration	02:00 Hours
Course Title	Biochemistry and Molecular Biology			

Course Objectives: This course aims to:

- Explain the chemical structures, classifications, and biological roles of the major building blocks of life: carbohydrates and proteins.
- Explore the diversity, functions, and metabolic importance of lipids and to understand the catalytic role and regulation of enzymes in biochemical processes.
- Elucidate the structure, types, and functions of nucleic acids and to provide an overview of major metabolic pathways and their interconnections in energy production.
- Introduce the fundamental molecular mechanisms and analytical and molecular biology tools used in biological research.

Course Learning Outcomes: After completion of the course students will be able to:

- Classify and illustrate carbohydrates and proteins and their functions.
- Identify types of lipids and enzymes, explain factors influencing enzyme activity, and interpret the role of lipids and enzymes in metabolism and regulation.
- Describe structural variations in DNA and RNA and summarize key biochemical pathways such as glycolysis, gluconeogenesis, and fatty acid metabolism.
- Explain the central dogma processes of replication, transcription, and translation, and demonstrate conceptual understanding of molecular techniques such as electrophoresis, chromatography, recombinant DNA technology, and cloning.

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Sem.	Unit No.	Syllabi	Teaching Hours
6	1	1.1 Carbohydrates: Classification (monosaccharides, oligosaccharides, polysaccharides), structures (glucose, fructose, maltose, lactose, sucrose, starch, cellulose, glycogen, Hyaluronic acid, Chondroitin sulphate), and functions 1.2 Proteins: Structure (primary, secondary, tertiary, quaternary), Classification (Based on shape; Based on composition and solubility; Bases on functions)	15
	2	2.1 Lipids: Classification (triglycerides, phospholipids, steroids), properties, biological roles, essential and non-essential fatty acids 2.1 Enzyme: - Introduction, Definition and chemical nature, Nomenclature and classification; Factors affecting enzyme activity (Temperature, pH, Enzyme concentration, substrate concentration); Enzyme inhibition	15
	3	3.1 Nucleic acids: Structure and function of DNA, types of DNA (A-DNA, B-DNA, Z-DNA); RNA; types of RNA (mRNA, tRNA, rRNA) 3.2 Metabolic Pathways: The tricarboxylic acid (TCA) cycle, Glycolysis, Gluconeogenesis, Urea cycle, Glycerol Metabolism, Fatty acid Metabolism (β – oxidation of fatty acid)	15
	4	4.1 Fundamental Molecular Processes: Central Dogma of molecular biology: DNA Replication and Protein synthesis 4.2 Analytical and Molecular Techniques: Paper chromatography, Gel electrophoresis; Recombinant DNA technology; vectors, restriction enzymes	15

Suggested Reading:

1. Biochemistry (4th Edition) - U. Satyanarayana, U. Chakrapani - Elsevier India
2. Fundamentals of Molecular Biology - Veer Bala Rastogi - Ane Books India
3. Cell Biology, Genetics, Molecular Biology, Evolution and Ecology - P.S. Verma, V.K. Agarwal - S. Chand & Company
4. A Textbook of Molecular Biology - Dr. Chandrashekhar Upasani, Prof. Hitesh Shahare - Everest Publishing House
5. Textbook of Biochemistry for Medical Students - D.M. Vasudevan, Sreekumari S, Kannan Vaidyanathan - Jaypee Brothers Medical Publishers

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6. Human Biochemistry and Physiology Text Book of Zoology - Awadhesh Singh Yadav, Rajesh Kumar Dubey, Sanjai Kumar Gupta - Walnut Publication
7. Biochemistry - N. Arumugam, S. Prasanna Kumar, L.M. Narayanan, R.P. Meyyan, K. Nallasingam - Saras Publication
8. Textbook of Medical Biochemistry (8th Edition) - M.N. Chatterjea, Rana Shinde - Elsevier India
9. Lehninger Principles of Biochemistry - Nelson & Cox - W. H. Freeman (Macmillan)
10. Biochemistry - Berg, Tymoczko, & Stryer - W. H. Freeman (Macmillan)
11. Molecular Biology of the Gene - Watson, Baker, et al. - Pearson Education

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Course Level	5.5		Internal Marks	50
Programme	Zoology		External Marks	50
Semester	VI		Practical Internal	--
Category of Course	Discipline Specific Major Courses (Major-15)		Practical External	--
Course Credit	04		Prac. External Exam Duration	--
Teaching Hours	60		Total	100
Course Code			Exam Duration	02:00 Hours
Course Title	General Account of Non-Chordata and Chordata, Immunology, Embryology and Developmental Biology			

Course Objectives: This course aims:

- To understand reproduction, developmental stages, regeneration capabilities, and excretory systems of Non-Chordata.
- To introduce chordate diversity with emphasis on adaptation, morphological structures, organ systems, and evolution, including a detailed study of *Rattus rattus*.
- To familiarize students with basic concepts in immunology, types of immunity, immunological organs and cells, and antigen-antibody interactions.
- To provide foundational knowledge of early development, extra-embryonic membranes, mammalian placentation, and reproductive cycles.

Course Learning Outcomes: After completion of the course students will be able to:

- Identify and describe major reproductive processes, larval forms, regeneration abilities, and excretory mechanisms in non-chordate animals.
- Demonstrate ability to discuss flight adaptation and migration in birds, integumentary system diversity, cardiac evolution, and organ systems in *Rattus rattus*.
- Classify immunity types, describe functions of immune organs and cells, explain antibody structure and classes, and outline antigen-antibody interaction mechanisms.
- Explain stages of chick development, enumerate membranes and placental types, menstrual and oestrous cycles, and discuss the physiological changes and significance of menopause in mammals.

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Course Contents

Sem	Unit No.	Syllabi	Teaching Hours
6	1	General account of Non-Chordata 1.1 Reproduction in Porifera: Asexual reproduction (budding, gemmule formation) and sexual reproduction; Larval forms of Porifera (Amphiblastula, Parenchymula). 1.2 Regeneration in Annelida 1.3 Larval forms of Crustacea: Nauplius, Metanauplius, Protozoa, Zoea, Mysis and Megalopa 1.4 Regeneration in Echinodermata 1.5 Excretion in Non-chordates: Protonephridia and Metanephridia; Coxal Glands; Malpighian Tubules; Coelomoducts of Molluscs	15
	2	General account of Chordata 2.1 Integumentary systems in Chordata: Glands and digital tips, Nails, Claws, Horns, Hoofs 2.2 Origin and evolution of heart and aortic arch. 2.3 Type Study: <i>Rattus rattus</i> : Systematic position; Habits and Habitat; External morphology; Digestive system; Respiratory system; Arterial and venous systems; Excretory system; Nervous system; Reproductive system	15
	3	Immunology 3.1 Introduction to Immunology; types of immunity: Innate and acquired, natural and artificial immunity 3.2 Immune cells: T-cells, B-cells, macrophages, dendritic cells, Natural Killer cells 3.3 Antigens: Definition, types, properties 3.4 Antibody: Immunoglobulin classes (IgG, IgM, IgA, IgE, IgD), structure and function 3.5 Antigen-antibody interactions (agglutination, precipitation, opsonization)	15
	4	Embryology and Developmental Biology 4.1 Chick Embryology: Structure of egg and fertilisation, cleavage, blastulation, gastrulation, fate maps, salient features of 18, 24, 33, 48 and 72 hour chick embryo; extra-embryonic membranes (Amnion, Chorion, Allantois, and Yolk Sac). 4.2 Placenta in Mammals: Structure, types and functions. 4.3 Reproductive Cycles in Mammals: Menstrual cycle and estrous cycle 4.4 Menopause	15

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Suggested Readings:

1. Modern Textbook of Zoology: Invertebrates – R.L. Kotpal – Rastogi Publications, Meerut
2. Invertebrate Zoology – E.L. Jordan & P.S. Verma – S. Chand & Company, New Delhi
3. Non-Chordate Zoology – P.S. Dhami & J.K. Dhami – R. Chand & Co., New Delhi
4. Biology of Non-Chordates – Fatik Baran Mandal – PHI Learning Pvt. Ltd., New Delhi
5. Invertebrates Zoology: A Functional Evolutionary Approach – Ruppert, E.E., Fox, R.S. & Barnes, R.D. – Thomson Brooks/Cole
6. Biology of the Invertebrates – Jan A. Pechenik – McGraw Hill Education
7. Chordate Zoology – P.S. Verma – S. Chand & Company, New Delhi
8. A Text Book of Chordates – N. Arumugam, A. Thangamani, S. Prasanna Kumar & L.M. Narayanan – Saras Publication
9. Chordate Embryology – P.S. Verma & V.K. Agarwal – S. Chand & Company
10. The Life of Vertebrates – J.Z. Young – Oxford University Press
11. Practical Zoology: Vertebrates – H.T. Bhamrah & K. Juneja – Rastogi Publications
12. Immunology: A Textbook – N.S. Subba Rao – Oxford & IBH Publishing
13. Immunology – Judith Kuby – W.H. Freeman & Company
14. Foundations of Immunology – C.P. Chandrashekar & M.P. Chandrashekar
15. Chordate Embryology – P.S. Verma & V.K. Agarwal – S. Chand & Company
16. A Textbook of Embryology (Developmental Zoology) – P.S. Verma – Saras Publication
17. Developmental Biology – N. Arumugam – Saras Publication
18. Developmental Biology – Scott F. Gilbert – Sinauer Associates, Oxford University Press.

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Course Level	5.5		Internal Marks	50
Programme	Zoology		External Marks	--
Semester	6		Practical Internal	--
Category of Course	Discipline Specific Major Courses (Major-16)		Practical External	50
Course Credit	04		Prac. External Exam Duration	04:00 Hours
Teaching Hours	120		Total	100
Course Code			Exam Duration	04:00 Hours
Course Title	Biochemistry and Molecular Biology, General Account of Non-Chordata and Chordata, Immunology, Embryology and Developmental Biology			

Course Objectives: This course aims:

- To develop practical skills in detecting key biomolecules such as glucose, maltose, starch, proteins, and lipids in biological samples.
- To understand and prepare atomic models of carbohydrates, amino acids, and lipids to illustrate their structures.
- To study various biological processes and structures, including enzyme activity factors, types of DNA, and larval forms of invertebrates through observation and experimentation.
- To gain hands-on experience in analysing physiological structures and developmental stages of model organisms like *Rattus rattus* and chick embryos.

Course Learning Outcomes: After completion of the course students will be able to:

- Detect and qualitatively analyze carbohydrates, proteins, lipids, and amino acids using standard laboratory techniques.
- Construct and interpret atomic and molecular models of essential biomolecules.
- Understand the influence of environmental and biochemical factors on enzyme activity and identify different DNA forms and larval stages in invertebrates.
- Acquire practical knowledge of vertebrate and invertebrate anatomy and embryology, including immunoglobulin structure and chick embryonic development stages.

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Course Contents

Sem.	Practical No.	Syllabi	Teaching Hours
6	1	Detection of glucose.	4
	2	Detection of maltose.	4
	3	Detection of starch.	2
	4	Detection of protein from milk and egg.	4
	5	Detection of lipid.	2
	6	Preparation of the atomic models of Carbohydrates: Glucose, Fructose, Maltose, Lactose, Sucrose, Galactose	2
	7	Preparation of the atomic models of amino acid and lipids	4
	8	To study factors affecting enzyme activity: Temperature, pH, Substrate and Enzyme Concentrations	4
	9	To study different types of DNA (A-DNA, B-DNA and Z-DNA) through charts/models	2
	10	Detection of amino acid by paper chromatography	4
	11	To study agarose gel electrophoresis.	4
	12	To study larval forms of Porifera: Amphiblastula and Parenchymula through slide/chart	2
	13	To study larval forms of Crustacea Nauplius, Metanauplius, Protozoa, Zoa, Mysis and Megalopod through slide/chart	2
	14	To study excretory organs of non-chordates: Protonephridia and Metanephridia; Coelomoducts of Molluscs through slide/specimens/chart	2
	15	To study different integumentary derivatives of Chordata: Glands and digital tips, Nails, Claws, Horns, Hoofs through slide/specimens/chart	2
	16	To study origin and evolution of aortic arch through chart/model.	2
	17	To study various systems of <i>Rattus rattus</i> : External morphology; Digestive system; Arterial and venous systems; brain; urinogenital system	4
	18	To study the structure of immunoglobulins (IgG, IgM, IgA, IgE, IgD) through chart/models.	2
	19	To study structure of egg, cleavage, blastulation and gastrulation of chick	2
	20	To study various stages of chick embryo through slides (18,24,33,48,72 hrs).	4
	21	To study development of neurulation and heart in chick embryo through slide (T.S. of 24, 33 hrs).	2

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Suggested Readings:

1. Practical Textbook of Biochemistry for Medical Students - D.M. Vasudevan - Jaypee Brothers Publishers
2. Practical Manual of Biochemistry - Dr. G. Sattanathan, Dr. S.S. Padmapriya, Dr. B. Balamuralikrishnan Publisher- Skyfox
3. A Practical Book of Biochemistry for Pharmacy Students - Mrs. Mausmi Hiren Dhivar, Dr. Vikram M. Pandya - IP Innovative Publishers
4. Practical Biochemistry - Pamela Jha - Bentham Science Publishers
5. A Textbook of Practical Biochemistry - David Plummer - Tata McGraw Hill Education
6. Modern Text Book of Zoology: Vertebrates - R.L. Kotpal - Rastogi Publications
7. Practical Zoology - S.S. Lal - Rastogi Publications
8. Practical Zoology (Vol. 1) - Dr. Ajoy Paul - Academic Publishers (India)
9. A Manual of Practical Zoology: INVERTEBRATES - P.S. Verma – BooksIndia
10. Chordate Embryology – P.S. Verma & V.K. Agarwal – S. Chand & Company
11. The Life of Vertebrates – J.Z. Young – Oxford University Press
12. Practical Zoology: Vertebrates – H.T. Bhamrah & K. Juneja – Rastogi Publications
13. Immunology: A Textbook – N.S. Subba Rao – Oxford & IBH Publishing
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Course Level	5.5		Internal Marks	25
Programme	Zoology		External Marks	50
Semester	6		Practical Internal	--
Category of Course	Discipline Specific Minor Courses (Minor-6)		Practical External	25
Course Credit	04 (03T + 01P)		Prac. External Exam Duration	02:00 Hours
Teaching Hours	75 (45T + 30P)		Total	100
Course Code			Exam Duration	02:00 Hours
Course Title	Non-Chordates III, Ecology and Economic Zoology			

Course Objectives: This course aims to

- Understand the general characteristics and classification of key phyla and study specialized structures like the water vascular system and larval forms.
- Analyse the structure and function of different ecosystems, focusing on energy flow, food chains, and ecological pyramids.
- Gain knowledge of honey bee biology, artificial bee rearing, honey extraction, and pearl formation processes.
- Learn about silkworm life cycles, sericulture techniques, aquaculture practices, and fish disease management.

Course Learning Outcomes: After completion of the course student will be able to

- Classify molluscs, echinoderms, and hemichordates and describe important anatomical features and larval forms.
- Describe ecosystem dynamics, including food webs and energy flow patterns.
- Demonstrate skills in beekeeping practices, honey extraction, and explain pearl culture techniques.
- Apply sericulture and aquaculture methods, identifying fish diseases and post-harvest practices.

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Course Contents

Sem.	Unit No.	Syllabi	Teaching Hours
6	1	Mollusca, Echinodermata and Hemichordata 1.1 General characteristic and classification up to class 1.2 Economic importance of Mollusca 1.3 Shell in Mollusca 1.4 Water vascular system of starfish 1.5 Tornaria larva of Balanoglossus	10
	2	Ecology 2.1 Introduction and history of Ecology, Structure and function of Ecosystem 2.2 Marine Ecosystem; Fresh water (Pond Ecosystem); Terrestrial Ecosystem (Grassland) 2.3 Food chain and food web 2.4 Ecological Pyramids 2.5 Energy flow in ecosystem	11
	3	Economic Zoology-1 3.1 Apiculture: Classification and Life Cycle of Honey Bee; Social Organization of Bee Colony; Artificial Bee rearing (Apiary), Methods of Extraction of Honey; Products of Apiculture Industry and its Uses – Honey, Bees Wax, Propolis, Pollen etc. 3.2 Pearl culture: Important Pearl-Producing Oysters; Formation of Pearl; Artificial Pearl Culture	12
	4	Economic Zoology-2 4.1 Sericulture: Types of silkworms, Life cycle of Bombyx-mori; Silkworm rearing technology 4.2 Aquaculture: Basics of aquaculture, definition and scope; Culture practices: Indian major carps; shrimps and prawns.; Fish Diseases (Dropsy, Fungus infection, Gill rot, White spot, Costiasis, Argulus diseases); Fish By product and Post harvesting Techniques in fisheries	12

Course Contents: (Practical Minor-6)

No.	Syllabi	Teaching hours (30)
Practical 1	Identification and classification of Invertebrate animals: Phylum: Mollusca: Chiton, Chaetoderma, Pila, Aplysia, Unio, Mytilus, Dentalium, Octopus, Loligo	2
Practical 2	Identification and classification of Invertebrate animals:	4

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	(i) Phylum: Echinodermata : Star fish, Brittle Star, Sea Urchin, Sea Cucumber, Feather Star (ii) Phylum : Hemichordata : Balanoglossus, Rhabdopleura	
Practical 3	To study different types of shells of Mollusca.	2
Practical 4	To study biotic and abiotic components of Marine ecosystem, Fresh water ecosystem and grassland ecosystem	2
Practical 5	To study different types of food web and food chain as per theory syllabus	4
Practical 6	To study different bee species used in apiculture through specimen/chart.	2
Practical 7	To study life cycle and different castes of honey bee through specimen/chart.	2
Practical 8	To study different products of apiculture industry and its uses – Honey, Bees Wax, Propolis, Pollen etc.	2
Practical 9	To study life cycle of <i>Bombyx mori</i> through specimen/chart.	2
Practical 10	Important edible fishes and some invertebrate of Saurashtra sea-coast. (1) Prawn (2) Lobster (3) Loligo (4) Oyster (5) Pomfret (6) Bombay Duck (7) Ghol fish (8) Dara fish (9) Koth (10) Shark (11) Catla (12) Mrigal.	4
Practical 11	To determine age of fish by scales.	2
Practical 12	To study various fish by-products.	2
Practical 13	Visit to apiary, fish/prawn culture farm, fish processing plant or any educational institute which is relevant to the subject.	-

Suggested Reading:

1. Invertebrate Zoology - P.S. Verma - Chand Publishing
2. Modern Text Book of Zoology: Invertebrates - R.L. Kotpal - Rastogi Publications
3. Practical Zoology Invertebrates - Ajoy Kumar Das - Books & Allied
4. Economic Zoology - N. Balachandran - Saras Publication
5. Fundamentals of Ecology --- P. S. Odum, Saunders
6. Concepts of Ecology --- N. Arumugam, Saras Publication, Nagercoil
7. Ecology --- Ricklefs, W. H. Freeman
8. Elements of Ecology ---Sharma & Mishra
9. Ecology and Environment - P.D. Sharma - Rastogi Publications
10. Apiculture and Sericulture - R.K. Sharma - Agrobios (India)
11. Fisheries Science and Aquaculture - R.S. Yadava - Narendra Publishing House

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Theory Examination Paper Style NEP 2020

SEMESTER – V

Major- 14-15/Minor-6 (Theory)

Time: 2 Hours

Total Marks: 50

Instructions:

1. Illustrate your answer with neat and labelled diagrams.
2. Figure to the right side indicates full marks of questions.

EXTERNAL ASSESSMENT BY UNIVERSITY			
Que. No.	Particulars	Unit	Marks
Que. 1	(1)	Unit 1	05
	(2)		05
	OR		
	(1)		05
	(2)		05
Que. 2	(1)	Unit 2	05
	(2)		05
	OR		
	(1)		05
	(2)		05
Que. 3	(1)	Unit 3	05
	(2)		05
	OR		
	(1)		05
	(2)		05
Que. 4	(1)	Unit 4	05
	(2)		05
	OR		
	(1)		05
	(2)		05
Que. 5	(1)	Unit 1 & 2	05
	(2)		05
	OR		
	(1)	Unit 3 & 4	05
	(2)		05
Total			50

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Practical Examination Paper Style NEP 2020

Major-16: Biochemistry and Molecular Biology, General Account of Non-Chordata and Chordata, Immunology, Embryology and Developmental Biology

Time: 4 Hours

Total Marks: 50

Part-A (Practical 1-11)		
Que. No.	Particulars	Marks
Que-1	Detect the components with biochemical test from the given sample. Write each step-in answer book, show it to the examiner. (Practical-1-5)	06
Que-2	Prepare the atomic model and draw in answer book, show it to examiner. (Practical-6-7)	04
Que-4	Perform the practical as per instruction and write in answer book, show it to examiner. (Practical-8)	04
Que-5	Write as per instruction. A. Identify and Describe (Practical-9) B. Identify and Describe (Practical-10) C. Identify and Describe (Practical-11)	06
Que-6	Certified Journal.	02
Que-7	Viva-voice.	03
Part-B (Practical 12-21)		
Que. No.	Particulars	Marks
Que-1	Sketch and label _____ system of <i>Rattus rattus</i> . (Practical-17)	04
Que-2	Identify and draw labeled diagram of stage of chick embryo. (Practical-20)	04
Que-3	Write as per instruction. A. Identify and Describe (Practical-12/14) B. Identify and Describe (Practical-13) C. Identify and Describe (Practical-15) D. Identify and Describe (Practical-16) E. Identify and Describe (Practical-18) F. Identify and Describe (Practical-19/21)	12
Que-4	Certified Journal.	02
Que-5	Viva-voice.	03

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Practical Examination Paper Style NEP 2020

Minor-06: Non-Chordates-III, Ecology and Economic Zoology

Time: 2 Hours

Total Marks: 25

Que. No.	Particulars	Marks
Que-1	Sketch and label life cycle of _____. (Practical-7/9)	04
Que-2	Do as per instruction and show it to examiner. (Practical-11)	03
Que-3	Do as per instruction and show it to examiner. (Practical-4/5)	03
Que-4	Do as per instruction. A. Identify and Describe (Practical-1) B. Identify and Describe (Practical-2) C. Identify and Describe (Practical-3/8) D. Identify and Describe (Practical-10) E. Identify and Describe (Practical-12)	10
Que-5	Certified Journal.	02
Que-6	Viva-voice.	03