

BHAKTA KAVI NARSINH MEHTA UNIVERSITY, JUNAGADH



BOARD OF **ZOOLOGY STUDIES**

FACULTY OF SCIENCE

SYLLABUS FOR

BACHELOR OF SCIENCE IN

****ZOOLOGY (HONOURS)** PROGRAMME**

(SEMESTER- VIII)

****MAJOR MINOR & SEC****

EFFECTIVE FROM JUNE, 2026

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 are delighted to share the curriculum and credit framework for B.Sc. Zoology (Honours) Sem-8. The present syllabus encompasses latest trends in the subject. We are hopeful that students will be able to enhance their knowledge and understanding of the subject well.

Board of Studies, Zoology
Bhakta Kavi Narsinh Mehta University,
Junagadh – 362 001

BHAKTA KAVI NARSINH MEHTA UNIVERSITY
Syllabus of B.Sc. (Honours) as per NEP-2020
Faculty of Lifesciences
Effective from June 2026
Subject: Zoology
SEMESTER- VIII

INDEX

No.	Content		Page No.
1	Summary of the Syllabus Sem-8		4
2	Pattern of Examination Sem-8		5
3	Course structure and syllabus		
SEMESTER-VIII	Major-20	Course details, objectives and outcomes	6
		Course content	7
		Reference Books	8
	Major-21	Course details, objectives and outcomes	9
		Course content	10
		Reference Books	11
	Major-22	Course details, objectives and outcomes	12
		Course content	13
		Reference Books	14
	Minor-08	Course details, objectives and outcomes	15
		Course content	16
		Reference Books	17
		Practical	18
	On Job Training/Major	Course details, objectives and outcomes	19
		Course content	20
		Reference Books	21
		Practical	21
	On Job Training/SEC	Course details, objectives and outcomes	22
		Course content	23
		Reference Books	24
		Practical	25
4	Examination Paper style		
	Theory Examination Paper Style : Major- 20, Major-21; Minor-08, OJT/Major		26
	Practical Examination Paper Style : Major- 22, Minor-08, OJT/Major		27
	Theory & Practical Examination Paper Style : SEC		28

BHAKTA KAVI NARSINH MEHTA UNIVERSITYSyllabus of **B.Sc. (Honours)** as per NEP-2020Faculty of **Lifesciences**

Effective from June 2026

Subject: Zoology**SEMESTER- VII****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
8	1	Major-20	Analytical Techniques	6	4	60 Hrs.	50	50	100	2:00 Hrs.
	2	Major-21	Marine Biology, Forestry and Wildlife	6	4	60 Hrs.	50	50	100	2:00 Hrs.
	3	Major-22	Combined Practical : Analytical Techniques, Marine Biology, Forestry and wildlife	6	4	120 Hrs.	50	50	100	4:00 Hrs.
	4	Minor-8	Environmental Biology	6	4 (3T+1P)	75 Hrs. (45T+30P)	50	50	100	4:00 Hrs.
	5	OJT/Major	Biodiversity and Conservation	6	4 (3T+1P)	75 Hrs. (45T+30P)	50	50	100	4:00 Hrs.
	6	OJT/SEC	Intellectual Property Rights	6	2	30 Hrs.	25	25	50	2:00 Hrs.
				Total	22					

*Select **On Job Training (OJT)** as per NEP 2020 and BKNMU guideline **OR** select one **Major +SEC** as per the syllabus

BHAKTA KAVI NARSINH MEHTA UNIVERSITY
Syllabus of **B.Sc. (Honours)** as per NEP-2020
Faculty of **Lifesciences**
Effective from June 2026
Subject: Zoology
SEMESTER- VIII

Pattern of Examination for Major-20/21

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-22

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-8 and OJT/Major

EVALUATION OF 100 MARKS (3+1 CREDIT PAPER)

Continuous and Comprehensive Evaluation (CCE)-50 Marks		Semester End Evaluation (SEE)-50 Marks
Practical Exam (Mandatory)-25 Marks	1. Class assignment -- 05 2. Home assignment -- 05 3. Test -- 10 4. Attendance -- 05	Semester End Theory Examination 50 Marks
Total 25 Marks	Total 25 Marks	Total 50 Marks

BHAKTA KAVI NARSINH MEHTA UNIVERSITYSyllabus of **B.Sc. (Honours)** as per NEP-2020Faculty of **Lifesciences**

Effective from June 2026

Subject: Zoology**SEMESTER- VIII**

Course Level	6	Internal Marks	50
Programme	B.Sc. Zoology (Honours)	External Marks	50
Semester	VIII	Practical Internal	--
Category of Course	Discipline Specific Major Courses (Major-20)	Practical External	--
Course Credit	04	Prac. External Exam Duration	--
Teaching Hours	60	Total	100
Course Code		Exam Duration	2.0 hrs
Course Title	Analytical Techniques		

Course Objectives:

This course aims to

- Understand the principles, fundamentals, and applications of microscopy and autoradiography.
- Describe the principles and instrumentation of spectroscopic techniques.
- Apply chromatographic and electrophoresis methods for the separation and analysis of biomolecules.

Course Learning Outcomes:

After completion of the course:

- Explain and understand the principles of microscopy and autoradiographic techniques.
- Understand and interpret spectroscopy for biomolecular analysis.
- Apply chromatographic and electrophoresis methods for separation and quantification.

Course Contents**Major-20**

Sem.	Unit No.	Syllabi	Teaching Hours
8	1	Microscopy and Autoradiography 1.1 Principles of tissue fixation and staining techniques. 1.2 Principles and applications of Transmission and Scanning Electron Microscopy. 1.3 Principles and applications of Phase Contrast and Fluorescence Microscopy. 1.4 Principles and applications of Autoradiography.	15
	2	Spectroscopy	15

		2.1 Principles and applications of spectroscopy: UV-Visible, IR (Infrared) and Raman spectroscopy. 2.2 ESR (Electron Spin Resonance), ORD (Optical Rotatory Dispersion) and Circular Dichroism (CD) in biomolecular studies. 2.3 NMR (Nuclear Magnetic Resonance), X-ray diffraction and neutron diffraction for 3D structural elucidation. 2.4 Molecular modelling and principles of Mass Spectrometry	
	3	Chromatographic techniques 1.1 Basic principles and types of chromatography. 1.2 Ion Exchange, Gel Permeation and Affinity Chromatography. 1.3 Gas Chromatography, HPLC and FPLC. 1.4 Advanced analytical systems: GC-MS, LC-MS/MS and MALDI-TOF.	15
	4	Centrifugation and Electrophoretic Techniques 4.1 Principles and applications of centrifugation and cell fractionation. 4.2 Basic principles of electrophoresis: Agarose gel, Native PAGE and SDS-PAGE. 4.3 Isoelectric focusing and 2D-PAGE in protein analysis. 4.4 Blotting techniques and their applications in biomolecular detection.	15

Suggested Reading:

1. Principles and Techniques of Biochemistry and Molecular Biology by Keith Wilson & John Walker.
2. Introduction to Spectroscopy by Donald L. Pavia.
3. Chromatography: Concepts and Contrasts by James M. Miller.
4. Principles of Instrumental Analysis by Douglas A. Skoog, F. James Holler & Stanley R. Crouch.
5. An Introduction to Practical Biochemistry by D. T. Plummer.
6. Lehninger Principles of Biochemistry by David L. Nelson & Michael M. Cox.
7. Electron Microscopy: Principles and Techniques for Biologists by John J. Bozzola & Lonnie D. Russell.
8. Biophysical Chemistry by Charles R. Cantor & Paul R. Schimmel.
9. Quantitative Chemical Analysis by Daniel C. Harris.
10. Protein Purification: Principles and Practice by Robert K. Scopes.
11. Molecular Biology of the Cell by Bruce Alberts et al.
12. Cell and Molecular Biology: Concepts and Experiments by Gerald Karp.

BHAKTA KAVI NARSINH MEHTA UNIVERSITYSyllabus of **B.Sc. (Honours)** as per NEP-2020Faculty of **Lifesciences**

Effective from June 2026

Subject: Zoology**SEMESTER- VIII**

Course Level	6	Internal Marks	50
Programme	B.Sc. Zoology (Honours)	External Marks	50
Semester	VIII	Practical Internal	--
Category of Course	Discipline Specific Major Courses (Major-21)	Practical External	--
Course Credit	04	Prac. External Exam Duration	--
Teaching Hours	60	Total	100
Course Code		Exam Duration	2.0 hrs
Course Title	Marine Biology, Forestry and Wildlife		

Course Objectives: This course aims to:

- Provide students with an understanding of oceanographic processes, seawater properties, marine ecosystems, and ecological characteristics of coastal and oceanic environments.
- Develop knowledge of marine biodiversity, marine biotechnology, marine bio-resources, and conservation of important marine organisms with special reference to India.
- Familiarize students with forest ecosystems, forest conservation methods, protected area networks, and sustainable management of forest resources.
- Introduce wildlife population sampling methods and ecological field techniques used in biodiversity assessment and conservation studies.

Course Learning Outcomes: After completion of the course:

- Explain oceanographic principles, physical and chemical properties of seawater, and ecological significance of coastal and marine ecosystems.
- Analyze marine biodiversity, conservation status of endangered marine fauna, and applications of marine biotechnology in resource management.
- Evaluate forest ecosystem structure, conservation strategies, protected areas, and approaches for sustainable forest management.
- Apply wildlife population sampling techniques and field methods used for ecological monitoring of invertebrates and vertebrates.

BHAKTA KAVI NARSINH MEHTA UNIVERSITYSyllabus of **B.Sc. (Honours)** as per NEP-2020Faculty of **Lifesciences**

Effective from June 2026

Subject: Zoology**SEMESTER- VIII****Course Contents****Major-21**

Sem.	Unit No.	Syllabi	Teaching Hours
8	1	Oceanography 1.1 Introductory Oceanography • Origin and evolution of oceans; Oceans of the world • Physical and chemical properties of seawater: Salinity, pH, temperature, density, pressure, dissolved oxygen, nutrients, and light penetration • Oceanic zones and ocean stratification • Waves and tides; Ocean currents and circulation patterns 1.2 Coastal and Marine Ecosystems • Intertidal ecosystems: Rocky shores, sandy shores, and mudflats • Estuaries, mangroves, salt marshes, and coral reefs • Marine Protected Areas of India	15
	2	Marine Biodiversity and Biotechnology 2.1 Marine Biodiversity • Marine biodiversity: Microorganisms, phytoplankton, seaweeds, seagrasses, marine invertebrates, and vertebrates • Ecological and economic importance of marine biodiversity, Threats to marine biodiversity • Status and conservation of marine biodiversity: Whale shark conservation in Gujarat, Olive Ridley turtle conservation in Odisha, Dugong conservation in Gulf of Mannar, Coral reef conservation in Gulf of Kachchh, and mangrove conservation in Gujarat and Sundarbans. 2.2 Marine Biotechnology • Marine bio-resources: Bioactive compounds and their applications • Seaweed biotechnology and cultivation • Marine fisheries biotechnology • Environmental and industrial applications of marine biotechnology: Biofilms, biofouling, biosurfactants, bioremediation, biofuels, and waste management	15
	3	Forestry and Forest Ecosystems 3.1 Introduction to Forestry and Forest Ecosystems • Definition, scope, and importance of forestry • Forest ecosystem structure and functions • Forest succession • Classification of forests in India and Gujarat 3.2 Forest Conservation and Management • Role of forests in wildlife conservation	15

		• National Parks, Wildlife Sanctuaries, Biosphere Reserves, and Conservation Reserves • Protected Area network in Gujarat and India • Deforestation and forest degradation • Afforestation, reforestation, social forestry, and agroforestry • Principles of forest management	
	4	Wildlife population sampling techniques 4.1 Invertebrate Sampling Techniques: Flight interception traps for flying insects, Light traps for nocturnal insects, Sugaring for moths, Pitfall traps, Beating, Sweep netting, Suction sampling, Bait traps. 4.2 Vertebrate Sampling Techniques • Amphibia: Toe clipping, Drift fencing, Trapping. • Reptiles: Hand capturing, Noosing, Trapping, Marking. • Birds: nest counts, roost counts, lek count, migrant count, point count, transect surveys, flock count, catch per unit effort, response to playback. • Mammals: herd/group counts, trapping and capture methods, point count, line transects, catch per unit effort, Indirect evidence, and sign survey.	15

Suggested Readings

1. Introduction to Marine Biology – 4th Edition – George Karleskint, Richard Turner and James Small – Brooks/Cole Publishing – USA
2. Essentials of Oceanography – 13th Edition – Alan P. Trujillo and Harold V. Thurman – Pearson Education – New York
3. Marine Biology: Function, Biodiversity, Ecology – 5th Edition – Jeffrey S. Levinton – Oxford University Press – New York
4. Marine Ecology: Processes, Systems and Impacts – 3rd Edition – Michael J. Kaiser, Martin J. Attrill, Simon Jennings, David N. Thomas and David K.A. Barnes – Oxford University Press – United Kingdom
5. Marine Biotechnology – 1st Edition – Se-Kwon Kim (Ed.) – Wiley-Blackwell Publications – United Kingdom
6. Handbook of Marine Biotechnology – 1st Edition – Se-Kwon Kim (Ed.) – Springer Publications – New York
7. The Practice of Silviculture: Applied Forest Ecology – 10th Edition – Mark S. Ashton and Matthew J. Kelty – Wiley Publications – USA
8. Introduction to Forestry and Natural Resources – 1st Edition – Donald L. Grebner, Pete Bettinger and Jacek P. Siry – Academic Press – London
9. Forest Ecology: A Foundation for Sustainable Forest Management – 3rd Edition – J.P. Kimmins – Pearson Education – Canada

10. Research and Management Techniques for Wildlife and Habitats – 6th Edition – Terry A. Bookhout (Ed.) – The Wildlife Society – Maryland, USA
11. Measuring and Monitoring Biological Diversity: Standard Methods for Amphibians – 1st Edition – William R. Heyer, Maureen A. Donnelly, Roy W. McDiarmid, Lee-Ann C. Hayek and Mercedes S. Foster – Smithsonian Institution Press – Washington D.C.
12. Wildlife Study Design – 2nd Edition – Michael L. Morrison, William M. Block and Kevin A. Strickland – Springer Publications – New York
13. Ecological Methodology – 2nd Edition – Charles J. Krebs – Benjamin Cummings Publishers – California
14. Ecological Methods – 3rd Edition – T.R.E. Southwood and Peter A. Henderson – Wiley-Blackwell Publications – Oxford
15. Fundamentals of Ecology – 5th Edition – Eugene P. Odum and Gary W. Barrett – Cengage Learning – USA
16. Marine Biodiversity of Indian Seas – Various Editions – Zoological Survey of India – Government of India Publications – Kolkata
17. India State of Forest Report – Latest Edition – Forest Survey of India – Ministry of Environment, Forest and Climate Change – Dehradun
18. Wildlife Survey Techniques Manual – Various Editions – Wildlife Institute of India – Government of India Publications – Dehradun
19. Forestry Research Manuals – Various Editions – Indian Council of Forestry Research and Education – Government of India Publications – Dehradun
20. Biodiversity Conservation and Protected Area Reports – Latest Edition – Ministry of Environment Forest and Climate Change – Government of India – New Delhi

BHAKTA KAVI NARSINH MEHTA UNIVERSITYSyllabus of **B.Sc. (Honours)** as per NEP-2020Faculty of **Lifesciences**

Effective from June 2026

Subject: Zoology**SEMESTER- VIII**

Course Level	6	Internal Marks	50
Programme	B.Sc. Zoology (Honours)	External Marks	--
Semester	VIII	Practical Internal	--
Category of Course	Discipline Specific Major Courses (Major-22)	Practical External	50
Course Credit	04	Prac. External Exam Duration	4 hrs
Teaching Hours	120	Total	100
Course Code		Exam Duration	4 hrs
Course Title	Combined Practical : Analytical Techniques, Marine Biology, Forestry and Wildlife		

Course Objectives: This course aims to

- Develop practical skills in analytical techniques including microscopy, spectrophotometry, chromatography and centrifugation for biological sample analysis.
- Enable students to study marine, coastal and forest ecosystems and analyze biodiversity, environmental parameters and ecological characteristics.
- Train students in field-based biological investigations, wildlife sampling methods and scientific report preparation for research and conservation studies.

Course Learning Outcomes: After completion of the course:

- Perform analytical laboratory techniques for separation, estimation and interpretation of biological samples using modern instruments.
- Analyze marine and terrestrial ecosystems by evaluating biodiversity components and basic environmental parameters.
- Apply field sampling techniques, assess conservation issues of fauna and ecosystems, and prepare scientific field reports.

BHAKTA KAVI NARSINH MEHTA UNIVERSITY
Syllabus of B.Sc. (Honours) as per NEP-2020
Faculty of Lifesciences
Effective from June 2026
Subject: Zoology
SEMESTER- VIII

Course Contents

Major-22

Sem.	Practical no.	Syllabi	Teaching Hours
8	1.	Calibration and operation of light microscope.	120
	2.	To study the Beer-Lambert Law using a colorimetric assay.	
	3.	UV-Visible spectrophotometric estimation of proteins.	
	4.	Determination of DNA concentration by spectrophotometry.	
	5.	Separation of amino acids by ascending paper chromatography	
	6.	Separation of amino acids by TLC methods.	
	7.	To interpret the HPLC data.	
	8.	To perform the separation technique by using centrifugation.	
	9.	Study of basic oceanographic concepts, ocean distribution on world map, and major ocean basins.	
	10.	Measurement and analysis of basic physical and chemical properties of seawater including temperature, salinity, pH, dissolved oxygen (DO), etc.	
	11.	Study of coastal ecosystems: rocky shores, sandy shores and mudflats.	
	12.	Study of estuarine, mangrove, salt marsh and coral reef ecosystems	
	13.	Identification of marine biodiversity: phytoplankton, seaweeds, seagrasses and marine fauna.	
	14.	Case study analysis of endangered marine fauna and ecosystem of India: Whale Shark, Olive Ridley Sea Turtle, Dugong, Coral Reefs and Mangroves.	
	15.	Study of marine biotechnology: seaweed culture, bioactive compounds and resource use.	
	16.	Study of forest ecosystems: forest types in Gujarat and India and forest structure.	
	17.	Study of wildlife sampling techniques for invertebrates and vertebrates.	
	18.	Field visit to marine, forest or coastal ecosystem and preparation of a detailed field report.	

Suggested Readings:

1. Principles and Techniques of Biochemistry and Molecular Biology by Keith Wilson & John Walker.
2. Introduction to Spectroscopy by Donald L. Pavia.
3. Chromatography: Concepts and Contrasts by James M. Miller.
4. Instrumental Methods of Analysis by H. H. Willard, L. L. Merritt & J. A. Dean.
5. Marine Biology by Peter Castro & Michael E. Huber.
6. Introduction to Oceanography by Harold V. Thurman & Alan P. Trujillo.
7. Fundamentals of Ecology by Eugene P. Odum & Gary W. Barrett.
8. Ecology and Environment by P. D. Sharma.
9. Wildlife Ecology and Management by Eric G. Bolen & William L. Robinson.
10. Marine Ecology: Processes, Systems and Impacts by Michel Kaiser, Martin Attrill & Simon Jennings.
11. Biodiversity and Conservation by K. V. Krishnamurthy.
12. A Textbook of Biotechnology by R. C. Dubey.

BHAKTA KAVI NARSINH MEHTA UNIVERSITYSyllabus of **B.Sc. (Honours)** as per NEP-2020Faculty of **Lifesciences**

Effective from June 2026

Subject: Zoology**SEMESTER- VIII**

Course Level	6	Internal Marks	25
Programme	B.Sc. Zoology (Honours)	External Marks	50
Semester	8	Practical Internal	25
Category of Course	Discipline Specific Minor Courses (Minor-8)	Practical External	--
Course Credit	04 (3+1)	Prac. External Exam Duration	2 Hrs.
Teaching Hours	75 Hrs.	Total	100
Course Code		Exam Duration	2 Hrs.
Course Title	Environmental Biology		

Course Objectives:

This course aims to:

- Provide understanding of organism–environment interactions, physiological adaptation, homeostasis, and stress responses in plants and animals.
- Develop knowledge of environmental microbiology, microbial diversity, ecological roles, and microbial applications in environmental management.
- Familiarize students with environmental toxicology, major pollutants, ecotoxicological processes, and their effects on organisms and human health.
- Introduce modern environmental biology tools including biotechnology applications, DNA-based identification methods, environmental monitoring, and conservation technologies.

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

- Explain environmental factors affecting organisms and analyze adaptation, acclimatization, homeostasis, and stress response mechanisms.
- Evaluate microbial diversity and explain the ecological and applied roles of microorganisms in environmental sustainability.
- Interpret basic toxicology concepts and assess the biological effects of pollutants and environmental health risks.
- Apply environmental biotechnology, DNA-based tools, eDNA, bioindicators, and conservation approaches for biodiversity monitoring.

BHAKTA KAVI NARSINH MEHTA UNIVERSITYSyllabus of **B.Sc. (Honours)** as per NEP-2020Faculty of **Lifesciences**

Effective from June 2026

Subject: Zoology**SEMESTER- VIII****Course Contents****Minor-8**

Sem.	Unit No.	Syllabi	Teaching Hours
8	1	Environmental Physiology and Adaptation 1.1 Organism and environment: environmental factors affecting organisms; tolerance limits; acclimatization, adaptation and homeostasis 1.2 Plant responses to environmental stress: effects of temperature, water, salinity and light; drought and salinity tolerance mechanisms 1.3 Animal adaptations: thermoregulation and osmoregulation; adaptations in desert, aquatic, polar and high-altitude animals 1.4 Stress biology: abiotic stress responses; oxidative stress; heat shock proteins; antioxidant defense mechanisms	10
	2	Environmental Microbiology 2.1 Microbial diversity and habitats: soil, water and air microorganisms 2.2 Microbial roles in environment: decomposition and nutrient transformation (basic concepts only) 2.3 Beneficial applications: biofertilizers and biopesticides 2.4 Environmental applications: wastewater treatment; basic bioremediation concepts	11
	3	Environmental Toxicology and Health Biology 3.1 Basic toxicology: toxic agents; dose-response relationship; concept of toxicity 3.2 Major pollutants: heavy metals and pesticides (mercury, lead, cadmium, arsenic) 3.3 Ecotoxicology basics: bioaccumulation and biomagnification 3.4 Environmental health: water-borne, air-borne and vector-borne diseases; occupational and indoor pollution	12
	4	Environmental Biology Tools and Applications 4.1 Basic environmental biotechnology: biosensors and bioindicators 4.2 DNA-based tools: DNA barcoding and species identification 4.3 Environmental DNA (eDNA): basic concept and applications in biodiversity monitoring 4.4 Conservation applications: gene banks and wildlife forensics	12

Suggested Reading:

1. Ecology and Environment – Sharma, P.D. Rastogi Publications, Meerut.
2. Environmental Biology – Verma, P.S. and Agarwal, V.K. S. Chand Publications.
3. Fundamentals of Ecology – Odum, E.P. and Barrett, G.W. Cengage Learning.
4. Environmental Microbiology – Pepper, I.L., Gerba, C.P. and Gentry, T.J.. Academic Press.
5. Principles of Ecotoxicology – Walker, C.H., Hopkin, S.P., Sibly, R.M. and Peakall, D.B.
Principles of Ecotoxicology. CRC Press.
6. Molecular Ecology – Freeland, J.R. Wiley-Blackwell.
7. Biotechnology – Satyanarayana, U.
8. Conservation Biology – Primack, R.B.. Sinauer Associates.
9. Environmental Toxicology – Manahan, S.E. CRC Press.
10. Biotechnology Expanding Horizons – Singh, B.D. Kalyani Publishers.

BHAKTA KAVI NARSINH MEHTA UNIVERSITYSyllabus of **B.Sc. (Honours)** as per NEP-2020Faculty of **Lifesciences**

Effective from June 2026

Subject: Zoology**SEMESTER- VIII****Suggested Practical****Minor-8**

No.	Syllabi	Teaching hours
1.	Study of environmental factors affecting organisms and demonstration of tolerance limits using suitable biological examples.	30
2.	Analysis of plant responses to environmental stress such as temperature, water, salinity and light using experimental or observational methods.	
3.	Study of plant adaptation mechanisms to drought and salinity stress through morphological and physiological observations.	
4.	Study of animal adaptations in relation to thermoregulation and osmoregulation with reference to desert, aquatic, polar and high-altitude environments.	
5.	Demonstration of basic stress physiology in biological systems with reference to oxidative stress and antioxidant activity (concept-based practical).	
6.	Study of microbial diversity from soil, water and air samples using simple microscopic observation and culture-based methods.	
7.	Demonstration of microbial role in decomposition using organic matter degradation or related laboratory/field observations.	
8.	Study of biofertilizers and biopesticides and their application in environmental and agricultural systems (demonstration/field-based study).	
9.	Basic analysis of water quality parameters and identification of indicators of waste-water pollution.	
10.	Study of simple bioremediation concepts through demonstration or case-based study of pollutant degradation.	
11.	Determination of basic toxicological concepts using dose-response relationships through graphical interpretation and case studies.	
12.	Study of effects of major pollutants such as heavy metals and pesticides through case-based analysis and literature review.	
13.	Assessment of bioaccumulation and biomagnification using food chain models or diagrammatic representation.	
14.	Study of environmental health issues including water-borne, air-borne and vector-borne diseases using case studies.	
15.	Study of biosensors and bioindicators for environmental monitoring through examples and demonstrations.	
16.	Introduction to environmental DNA (eDNA) concept and its applications in biodiversity monitoring through case studies.	
17.	Study of conservation biology tools including gene banks and wildlife forensics through case-based learning.	

BHAKTA KAVI NARSINH MEHTA UNIVERSITYSyllabus of **B.Sc. (Honours)** as per NEP-2020Faculty of **Lifesciences**

Effective from June 2026

Subject: Zoology**SEMESTER- VIII**

Course Level	6	Internal Marks	25
Programme	B.Sc. Zoology (Honours with Research)	External Marks	50
Semester	8	Practical Internal	25
Category of Course	OJT/Major	Practical External	--
Course Credit	04 (3T+1P)	Prac. External Exam Duration	2 Hrs.
Teaching Hours	75	Total	100
Course Code		Exam Duration	2 Hrs.
Course Title	Biodiversity and Conservation		

Course Objectives: This course aims to:

- Provide understanding of biological diversity from genetic, species, and ecosystem levels, including the classification and characteristics of major groups of microorganisms, fungi, and plants.
- Develop knowledge of global and Indian biodiversity patterns, biodiversity hotspots, and the ecological and economic importance of plant diversity.
- Familiarize students with principles of conservation biology, major threats to biodiversity, conservation strategies, and ecosystem restoration approaches.
- Introduce international and Indian conservation frameworks, institutions, legislation, and major biodiversity conservation initiatives at national and global levels.

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

- Explain levels of biodiversity, identify biodiversity hotspots, and describe the characteristics and classification of major microbial, fungal, and plant groups.
- Evaluate ecological and economic importance of plant diversity and understand patterns of biological diversity in India and worldwide.
- Analyze threats to biodiversity and explain principles, strategies, and applications of species conservation and ecosystem restoration.
- Interpret major conservation frameworks, institutions, laws, and important national and international biodiversity conservation initiatives.

BHAKTA KAVI NARSINH MEHTA UNIVERSITY

Syllabus of **B.Sc. (Honours)** as per NEP-2020

Faculty of **Lifesciences**

Effective from June 2026

Subject: Zoology

SEMESTER- VIII

Course Contents

OJT/Major

Sem.	Unit No.	Syllabi	Teaching Hours
8	1	Diversity of Life-I 1.1 Genetic diversity, species diversity and ecosystem diversity 1.2 Biodiversity hotspots of India and the world 1.3 Introduction to viruses, archaea, bacteria and cyanobacteria 1.4 General characteristics and classification of fungi	15
	2	Diversity of Life-II 2.1 General characteristics and classification of algae and lichens 2.2 General characteristics and classification of bryophytes and pteridophytes 2.3 General characteristics and classification of gymnosperms and angiosperms 2.4 Ecological and economic importance of plant diversity	15
	3	Conservation Biology 3.1 Scope, importance and basic principles of conservation biology 3.2 Threats to Biodiversity: Habitat destruction, habitat fragmentation, overexploitation, Pollution, invasive alien species and emerging diseases 3.3 Conservation priority species: flagship, keystone, umbrella and indicator species 3.4 In-situ conservation and ex-situ conservation: Captive breeding, species reintroduction and translocation; Genebank	15
	4	Conservation Frameworks and Initiatives 4.1 International conservation frameworks: Convention on Biological Diversity, Convention on International Trade in Endangered Species of Wild Fauna and Flora, Ramsar Convention, Convention on the Conservation of Migratory Species of Wild Animals, Conference of the Parties and Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services – global biodiversity governance. 4.2 Indian conservation institutions and laws: Ministry of Environment, Forest and Climate Change, Zoological Survey of India, Botanical Survey of India, Forest Survey of India, National Biodiversity Authority, Wildlife Institute of India and major laws – Biological Diversity Act, Wildlife Protection Act, Indian Forest Act. 4.3 International initiatives: Amazon Rainforest conservation, Great Barrier Reef – coral restoration, Giant Panda recovery programme in China, California Condor Recovery Programme, Great Green Wall – ecosystem restoration in Africa	15

		4.4 Indian initiatives: Project Tiger, Cheetah reintroduction project, Ganges River Dolphin project, Great Indian Bustard Conservation	
--	--	---	--

Suggested Reading:

1. Biodiversity and Conservation – Krishnamurthy, K.V. *An Advanced Textbook on Biodiversity: Principles and Practice*. Oxford and IBH Publishing.
2. Ecology and Environment – Sharma, P.D. *Ecology and Environment*. Rastogi Publications, Meerut.
3. Fundamentals of Ecology – Odum, E.P. and Barrett, G.W. *Fundamentals of Ecology*. Cengage Learning.
4. Biodiversity – Wilson, E.O. *Biodiversity*. National Academies Press.
5. Plant Systematics – Singh, G. *Plant Systematics: Theory and Practice*. Oxford and IBH Publishing.
6. Microbiology – Pelczar, M.J., Chan, E.C.S. and Krieg, N.R. *Microbiology*. McGraw Hill Education.
7. Introduction to Fungi – Webster, J. and Weber, R. *Introduction to Fungi*. Cambridge University Press.
8. Conservation Biology – Primack, R.B. *Conservation Biology*. Sinauer Associates.
9. Biology of Plants – Raven, P.H., Evert, R.F. and Eichhorn, S.E. *Biology of Plants*. W.H. Freeman.
10. Biodiversity Conservation – Agarwal, S.K. *Biodiversity Conservation*. APH Publishing Corporation.
11. Websites
 - CBD – Biodiversity conservation framework
 - CITES – Wildlife trade regulation
 - Ramsar Convention – Wetland conservation
 - CMS Convention – Migratory species conservation
 - IPBES – Biodiversity science and policy

BHAKTA KAVI NARSINH MEHTA UNIVERSITYSyllabus of **B.Sc. (Honours)** as per NEP-2020Faculty of **Lifesciences**

Effective from June 2026

Subject: Zoology**SEMESTER- VIII****Suggested Practical****OJT/Major**

No.	Syllabi	Teaching hours
1.	Study of biodiversity hotspots of India and the world using maps and distribution records.	30
2.	Study and identification of major groups of fungi, algae, bryophytes, pteridophytes, gymnosperms and angiosperms using preserved specimens/herbarium/slides.	
3.	Study of threatened species categories and conservation priority species using International Union for Conservation of Nature Red List categories and case studies.	
4.	Comparative study of in-situ and ex-situ conservation methods – protected areas, captive breeding, botanical gardens, zoos and gene banks.	
5.	Documentation of biodiversity threats – habitat loss, invasive species, pollution and overexploitation through case studies.	
6.	Case study analysis of Indian conservation initiatives – Project Tiger, Cheetah reintroduction, Great Indian Bustard conservation	
7.	Case study analysis of global conservation initiatives – Amazon Rainforest conservation, Great Barrier Reef restoration, California Condor Recovery Programme, Great Green Wall programme	
8.	Preparation of biodiversity conservation awareness material – posters, infographics or presentations on endangered species and conservation programmes.	
9.	Assignment on protected areas and conservation success stories from India and other countries.	
10.	Preparation of species conservation status report using published biodiversity databases and case studies.	
11.	Field visit/report preparation on local biodiversity assessment or conservation management practices.	

BHAKTA KAVI NARSINH MEHTA UNIVERSITYSyllabus of **B.Sc. (Honours)** as per NEP-2020Faculty of **Lifesciences**

Effective from June 2026

Subject: Zoology**SEMESTER- VIII**

Course Level	6	Internal Marks	25
Programme	B.Sc. Zoology (Honours)	External Marks	25
Semester	8	Practical Internal	--
Category of Course	OJT/Skill Enhancement Course	Practical External	--
Course Credit	02	Prac. External Exam Duration	--
Teaching Hours	30	Total	50
Course Code		Exam Duration	02 hrs
Course Title	Intellectual Property Rights		

Course Objectives: This course aims to,

- Understand the basic concepts, importance, and different forms of Intellectual Property Rights and their role in scientific research and innovation.
- Develop awareness about national and international Intellectual Property protection systems, organizations, and legal frameworks governing Intellectual Property Rights.
- Apply knowledge of Intellectual Property Rights in protection of biodiversity, biological resources, scientific publications, technology transfer, and innovation-based entrepreneurship.

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

- Explain the concepts, scope, types, and significance of Intellectual Property Rights in research, higher education, and innovation.
- Describe the patent system, copyright protection, plagiarism, publication ethics, and the role of national and international organizations involved in Intellectual Property protection.
- Analyze the applications of Intellectual Property Rights in life sciences for protection of biodiversity, biological resources, technology transfer, commercialization, and innovation management.

BHAKTA KAVI NARSINH MEHTA UNIVERSITYSyllabus of **B.Sc. (Honours)** as per NEP-2020Faculty of **Lifesciences**

Effective from June 2026

Subject: Zoology**SEMESTER- VIII****Course Contents****OJT/SEC**

Sem.	Unit No.	Syllabi	Teaching Hours
8	1	Fundamentals of Intellectual Property Rights 1.1 Introduction to Intellectual Property Rights: Meaning, concept and importance of IPR. 1.2 Types of Intellectual Property: Patents, Copyright, Trademark, Industrial Design, Geographical Indications and Traditional Knowledge. 1.3 Importance of IPR in scientific research, innovation, higher education and entrepreneurship. 1.4 National and international organizations related to IPR and overview of IPR protection system in India, including role of World Intellectual Property Organization and World Trade Organization. 1.5 Intellectual Property in life sciences: Protection of biodiversity, animal resources, medicinal plants, microorganisms and indigenous biological knowledge.	8
	2	Applications and Protection of Intellectual Property Rights 2.1 Patent system: Criteria of patentability, patent filing process and rights of patent holders. 2.2 Copyright protection in scientific publications: Plagiarism, fair use policy, publication ethics and research misconduct. 2.3 Technology transfer, licensing, commercialization and IPR management. 2.4 Case studies on IPR disputes, innovation protection and role of IPR in startup ecosystem.	7

Suggested Reading:

1. IPR, Biosafety and Bioethics, Goel and Parashar, Person
2. A Book on Indian Patenting System and Patent Agent Examination, Sheetal Chopra, Notion Press
3. Fundamentals of Intellectual Property Rights: For Students, Industrialist and Patent Lawyers, Anil Kumar, Ramakrishna, Notion Press
4. Intellectual Property Rights (IPRs): TRIPS Agreement & Indian Laws, E. T. Lokganathan, New Century Publications
5. How to Patent an Idea in India, Prasad Karhad
6. Building Biotechnology: Biotechnology Business, Regulations, Patents, Law, Policy and Science – Yali Friedman – Logos Press
7. IPR, Biosafety and Bioethics – Goel and Parashar – Pearson
8. Intellectual Property Rights in Agricultural Biotechnology by F.H. Erbis
9. Intellectual Property Rights by Neeraj Pandey
10. WIPO Intellectual Property Handbook, World Intellectual Property Organization

BHAKTA KAVI NARSINH MEHTA UNIVERSITYSyllabus of **B.Sc. (Honours)** as per NEP-2020Faculty of **Lifesciences**

Effective from June 2026

Subject: Zoology**SEMESTER- VIII****Suggested Practical****OJT/SEC**

No.	Syllabi	Teaching hours
1.	Study of different forms of Intellectual Property Rights: Patent, Copyright, Trademark, Geographical Indications, Industrial Design and Traditional Knowledge with suitable examples.	15
2.	Patent search exercise using online patent databases: Google Patents, WIPO PATENTSCOPE and Intellectual Property India Portal.	
3.	Study of patent application format including title, abstract, claims, inventor details and basic patent filing procedure.	
4.	Identification of innovative ideas from biological products, laboratory techniques and day-to-day products with discussion on patentability.	
5.	Case study analysis of important IPR disputes: Turmeric patent, Neem patent and Basmati rice patent controversy.	
6.	Plagiarism checking exercise and study of publication ethics, copyright protection and fair use policy in scientific research.	
7.	Documentation of traditional knowledge related to medicinal plants, animal resources, local biodiversity and indigenous biological knowledge systems.	
8.	Study of IPR in life sciences through analysis of patents related to biotechnology, pharmaceuticals, veterinary products, aquaculture and wildlife conservation technologies.	
9.	Trademark identification exercise: Study of logos, trademarks and protected products of pharmaceutical, biotechnology and agricultural companies.	
10.	Preparation of mini project/report on converting a scientific idea, biological product or research concept into innovation, start-up or protected intellectual property.	

BHAKTA KAVI NARSINH MEHTA UNIVERSITY
Syllabus of B.Sc. (Honours) as per NEP-2020
Faculty of Lifesciences
Effective from June 2026
Subject: Zoology
SEMESTER- VIII

Theory Examination Paper Style NEP 2020
SEMESTER – VIII
Major- 20, 21/Minor-8/OJT-Major (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

BHAKTA KAVI NARSINH MEHTA UNIVERSITY
Syllabus of **B.Sc. (Honours)** as per NEP-2020
Faculty of **Lifesciences**
Effective from June 2026
Subject: Zoology
SEMESTER- VIII

Practical Examination Paper Style NEP 2020

Major-22: Analytical Techniques, Marine Biology, Forestry and Wildlife

Time: 4 Hours

Total Marks: 50

Que. No.	Particulars	Marks
Que-1	Do as per instruction and show it to examiner.	08
Que-2	Do as per instruction and show it to examiner.	08
Que-3	Do as per instruction and show it to examiner.	08
Que-4	Do as per instruction and show it to examiner.	08
Que-5	Do as per instruction and show it to examiner.	08
Que-6	Certified Journal.	05
Que-7	Viva-voce.	05

Practical Examination Paper Style NEP 2020

Minor-08: Environmental Biology

Time: 2 Hours

Total Marks: 25

Que. No.	Particulars	Marks
Que-1	Do as per instructions and show it to examiner.	04
Que-2	Do as per instructions and show it to examiner.	04
Que-3	Do as per instructions and show it to examiner.	04
Que-4	Do as per instructions and show it to examiner.	04
Que-5	Certified Journal.	04
Que-6	Viva-voce.	05

Practical Examination Paper Style NEP 2020

OJT/Major: Biodiversity and Conservation

Time: 2 Hours

Total Marks: 25

Que. No.	Particulars	Marks
Que-1	Do as per instructions and show it to examiner.	04
Que-2	Do as per instructions and show it to examiner.	04
Que-3	Do as per instructions and show it to examiner.	04
Que-4	Do as per instructions and show it to examiner.	04
Que-5	Certified Journal.	04
Que-6	Viva-voce.	05

BHAKTA KAVI NARSINH MEHTA UNIVERSITYSyllabus of **B.Sc. (Honours)** as per NEP-2020Faculty of **Lifesciences**

Effective from June 2026

Subject: Zoology**SEMESTER- VIII****Examination Paper Style NEP 2020****SEC: Intellectual Property Rights**

INTERNAL ASSESSMENT		
No.	Particulars	Weightage
1	Internal test (Theory or practical)	13
2	Assignment/practical assignment	5
3	Field visit report/ class presentation	5
4	Attendance	2
	Total	25

Paper Style:

EXTERNAL ASSESSMENT			
Ques. No.	Particulars	From which Unit	Marks
Que.1	Question 1 (1) (2)	1	05 05
	Or		
	Question 1 (1) (2)		05 05
Que.2	Question 2 (1) (2)	2	05 05
	Or		
	Question 2 (1) (2)		05 05
Que.3	Question 1	From Any Unit	05
	Or		
	Question 2		
Total			25