



Hindi Vidya Prachar Samiti's
Ramniranjan Jhunjhunwala College
of Arts, Science & Commerce
(Empowered Autonomous College)

Affiliated to
UNIVERSITY OF MUMBAI

Syllabus for T.Y.B.Sc (under NEP)

PROGRAM: B.Sc. ZOOLOGY

PROGRAM CODE: RJSUZOO

(Implemented in 2025-2026 in alignment with the NEP 2020 facilitating the inter-and multidisciplinary learning and multiple entry and exit of the students)

(CBCS 2025-2026)

PREAMBLE

The National Education Policy 2020 aims at imparting skill-based learning and caters to the multiple entry and exit facility for the students thus empowering them to acquire knowledge at their pace. In the three-year UG program, the student has two exit options. Students also have the option of choosing the Honors program of four years study in a given discipline and later converting it to five-year integrated PG degree program.

As an undergraduate student, he/she learns the core subject (Major), subject complementing the core subject (Minor), a course from other discipline; open elective course (OEC or GEC) and Vocational and Skill Enhancement course from the Major (VSEC). The remaining verticals under NEP 2020 are IKS (Indian Knowledge System), AEC (Ability Enhancement Course), VEC (Value Enhancement Course) and with progressive three years of UG, student also completes at different levels OJT (On Job Training), FP (Field Projects), CEP (Community Engagement Program), RP (Research Project) which helps him/her in understanding their roots, application of the knowledge for the benefit of self and the society. Vertical CC (Co-curricular activities and activities related to yoga and human well-being) helps in preparing youth with good character and interpersonal relationships.

The subject of Zoology offers the basic understanding about the vast diversity of the animal kingdom across the globe. It enables the students to strengthen their knowledge in Animal Sciences and in the other allied branches of Zoology. Keeping the interest of learner in mind, the syllabus has been carefully designed. It has a balance of the classical aspects of Zoology which includes topics like taxonomy, ecology, ethology, developmental biology, physiology, fishery science, animal husbandry and economic entomology. The syllabus also includes applied subjects like biochemistry, pathology, immunology, molecular biology and epidemiology.

The undergraduate curriculum has been meticulously designed by considering the need for the subject development, industry requirement, research outlook, competitive exams and entrepreneurship skills. Each unit included in the syllabus has clearly defined objectives. It focuses on outcome-based learning. It aims at inculcating the critical thinking, enhancing the analytical ability, developing writing skills of the students. The syllabus includes field trips to ecological habitats, agrofarms, national parks, sanctuaries, natural history museum, reputed research institutes and industries to widen the student's horizon. The students are encouraged to participate in various project-based activities.

Owing to the current needs of the industry and other sectors, the syllabi is designed in a manner that the learner will be able to apply the knowledge and skills acquired in varied fields. The course encourages a sense of responsibility and empathy towards all living beings, promoting sustainable practices in the learner.

PROGRAMME OUTCOMES (PO) OF UNDERGRADUATE DEGREE PROGRAMMES

Program outcome refers to the overall characteristic an individual is supposed to acquire on completion of the three-year degree program in Bachelor of Science. The attributes based on acquisition, accumulation, and processing of knowledge of the subject are transferable beyond the discipline and useful in different domains of life.

Critical Thinking: Concepts, methodology and ability to formulate questions stimulate the inquisitiveness and critical thinking amongst the students.

Scientific Temperament: The nurturing of the young minds to observe and analyse the experiments in the laboratory or a phenomenon occurring around them to obtain a logical scientific explanation for it.

Analytical Thinking: The ability to think analytically can be developed by training and practice. The syllabus offers the student to understand the concept and design projects or experiments based on them.

Domain knowledge: The domain knowledge is the key to the understanding of advances and complex subject matter.

Social Ethics: The students are exposed to different problems caused due to human activity. They learn to conduct themselves without creating a damage to fellow beings.

Animal Ethics: The sensitization towards ethical issues associated with use of animals in the laboratory is highlighted and the solutions to overcome it are introduced.

Problem Solving: The ability to handle a situation is enhanced in the students by problem solving assignments, case studies, projects to make them competent, conscious and creative individual.

Environmental Sustainability: Environment related issues are addressed through workshops, Guest lectures and field studies.

PROGRAMME SPECIFIC OUTCOMES (PSOS)-BSc PROGRAMME IN ZOOLOGY

PSO1	Understands the nature and basic concepts of systematic classification, ecology, biomolecules, animal biotechnology, cell biology, and genetics.
PSO2	Analyse and comprehend the concepts of developmental biology, genetics and molecular biology. Acquaint with the skills in fishery biology, animal husbandry and economic entomology to boost entrepreneurship skills.
PSO3	Acquire skills and necessary training for techniques in haematology, immunology, physiology, endocrinology, enzymology, molecular biology, toxicology, cancer biology and field biology. Enhance knowledge on biostatistics, alternate energy, Wild-life tourism. Wildlife conservation and epidemiology to provide wider job prospects in the realm of Zoology.
PSO4	Perform laboratory procedures as per standard protocols in the areas of animal diversity, genetics, biochemistry, molecular biology, physiology, immunology, developmental biology, environmental Science and pollution.
PSO5	Apply ethical principles and knowledge in understanding of Zoology to one's own life and work. Applications of biological sciences in different areas that contributes towards nation building.

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T.Y.B.Sc NEP Zoology VSC Syllabus Semester -V & VI

SEMESTER	:	V
TITLE OF THE SUBJECT/COURSE	:	VSC ECONOMIC ZOOLOGY
COURSE CODE	:	RJVSCZOO351
CREDITS	:	03
DURATION	:	45 HRS

LEARNING OBJECTIVES	
1	To understand the life histories of different economically important insects.
2	To understand the beneficial and harmful role of insects in agriculture, industry, and human welfare.
3	To become familiar with various breeds of cattle and poultry and comprehend the management practices associated with their care and rearing.
4	To learn about commercially important fin fish and non-fin fish species in India and understand their economic significance.

COURSE OUTCOMES	AFTER COMPLETING THE COURSE, THE LEARNER WILL BE ABLE TO:	PSO ADDRESSED	BLOOM'S TAXONOMY LEVEL
CO1	understand the life cycles and ecological roles of economically important insects and differentiate between beneficial and harmful species.	1,2,5	BT level II, III & IV Understand, apply and analyse
CO2	Identify major breeds of cattle and poultry in India and describe scientific practices involved in their breeding, nutrition, and health management.	1,2 & 5	BT Level I, II, III remember, understand and apply
CO3	Classify commercially important fin fish and non-fin fish species in Indian fisheries and analyze their contributions to the economy.	1,2	BT Level I, II, IV remember, understand and analyse

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T.Y.B.Sc ZOOLOGY SEMESTER-V (THEORY)	HRS	Credits
VSC- ECONOMIC ZOOLOGY Course Code: RJDSCZOO351	60	3
UNIT I: ECONOMIC ENTOMOLOGY	15	
1.1 Honey bee: Social life and communication, Apiculture, Types of honey, Economic Importance 1.2 Silk moth: Life history, Sericulture, types of silk, Economic Importance 1.3 Life history and control measures of Locust, Aphids, Rice Weevil. 1.4 Methods of insect control: Chemical control (synthetic and natural), Biological control *Case study; - National Bee Board : The Economic impact of Apiculture (Beekeeping) in India - National Sericulture Development Programme :Sericulture (Silkworm Farming) and Its Economic Role in India - Pest of Rice		
UNIT II: ANIMAL HUSBANDRY	15	
2.1 Poultry 2.1.1 Definition, nomenclature, factors affecting egg quality , hatching of eggs 2.1.2 Housing and equipments, brooding and rearing. 2.1.3 Poultry diseases- Coccidiosis, Avian flu. 2.2. Cattle breeds : Draught, Milch, Dual Purpose. 2.2.1 Cross breeds : Sunandini , Karan Frie 2.2.2 Dairy Science: composition of milk, types of milk : A1 and A2, methods of milk preservation. *Case Study: Success story: Venkateshwara Hatcheries (Venky's), The White Revolution in India (Operation Flood).		
UNIT III: FISHERIES	15	
3.1 Overview of Indian coastline & Brief classification of fisheries 3.2 Commercially Important fisheries 3.2.1- Fin fish fisheries: Bombay duck, Pomfret. 3.2.2- Non-fin fish Fisheries: Prawns, Loligo. 3.3 Methods of fish preservation. 3.4 Basic plan of fish processing plant and introduction to HACCP standards for seafood products *Case study: Koli community-past & present scenario, Impact of El Nino on Indian fisheries.		

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SEMESTER	:	V
TITLE OF THE SUBJECT/COURSE	:	ECONOMIC ZOOLOGY PRACTICAL COMPONENT
COURSE CODE	:	RJVSCZOOP351
CREDITS	:	01
DURATION	:	30 HRS

LEARNING OBJECTIVES	
1	To understand the life history and importance of different economically important insects.
2	To acquire comprehensive knowledge of various cattle and poultry breeds, including best practices for their effective management and rearing.
3	To learn about the economic significance of fin fish and non-fin fish species in India.

COURSE OUTCOMES	AFTER COMPLETING THE COURSE, THE LEARNER WILL BE ABLE TO:	PSO ADDRESSED	BLOOM'S TAXONOMY LEVEL
CO1	describe the biology, anatomy, and commercial importance of honey bees, cattle, poultry, and fisheries.	1,2,5	BT level II, III & IV Understand, apply and analyse.
CO2	acquire skills of extraction and qualitative testing of paneer and casein from milk,	1,2	BT Level III and V, apply and evaluate
CO3	give detailed report based on field visits to farms, markets, or apiaries.	1,2,5	BT level II, III, IV & V Understand, apply, analyse and evaluate.

SEMESTER V
VSC- ECONOMIC ZOOLOGY PRACTICAL COMPONENT
PAPER CODE: RJVSCZOOP351
1.Study of Honey Bee : Life Cycle, Bee Hive, Mouthparts , Legs and Sting Apparatus
2.Study of Poultry breeds (Aseel, Kadaknath, Leghorn, Rhode Island red)
3. Detection of egg protein by Biuret test.
4 Extraction of Casein from Milk and its qualitative test.
5. Study Cattle breeds: Red Sindhi, Sahiwal, Khillari, Exotic –Holstein–Friesian, Jersey, breeds of Buffalo: Murrah, Jaffrabadi.
6. Identification of commercially important fisheries- Oil sardine, Mackerel, Lobster, Crab, Clams, Edible oyster.
7. Visit to fish market/poultry/dairy centre/apiary and submission of report on it.

REFERENCES

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2. A Text Book of Entomology- 1974 Mathur V. K. and Upadhyay K Goel Printing press, Barani.
3. Bee and Bee Keeping- Roger A. Morse, Cornell University Press London
4. Economic Zoology- Shukla G.S. & Upadhyay V.B., Rastogi Publications.
5. A handbook on Economic Zoology, S. Chand & Co.
6. Candler, W., & Kumar, N. (1998). India: The dairy revolution: The impact of dairy development in India and the World Bank's contribution. World Bank Publications.
7. Park, Y. W., & Haenlein, G. F. (Eds.). (2013). Milk and dairy products in human nutrition: production, composition and health. John Wiley & Sons.
8. Shrivastava, J. S. M. (2008). Dairy Development In The New Millennium (The Second White Revolution). Deep and Deep Publications
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12. Candler, W., & Kumar, N. (1998). India: The dairy revolution: The impact of dairy
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14. in India and the World Bank's contribution. World Bank Publications.
15. Park, Y. W., & Haenlein, G. F. (Eds.). (2013). Milk and dairy products in human nutrition:
16. production, composition and health. John Wiley & Sons.
17. Shrivastava, J. S. M. (2008). Dairy Development In The New Millennium (The Second White
18. Revolution). Deep and Deep Publications

SKELETON PAPER FOR VSC PRACTICAL -SEMESTER V

Total Marks 25

Q.1. Detection of egg protein by Biuret test. 08M

OR

Extraction of casein from milk and its qualitative test

Q.2. Identification: 10M

- A. Sketch and label -mouthparts/ legs/ sting apparatus of honey bee.
- B. Poultry breeds (Aseel, Kadaknath, Leghorn, Rhode Island red),
- C. And D : Cattle Farming: Red Sindhi, Sahiwal, Khillari, Exotic –Holstein–Friesian, Jersey, Various breeds of Buffalo: Murrah, Jaffrabadi.
- E. commercially important fisheries- Oil sardine, Mackerel, Lobster, Crab, Clams, Edible oyster.

Q.3. Field visit- Report Writing 05M

Q4 Journal 02M

Skeleton Paper Theory

SCHEME OF EXAMINATION FOR VSC

Internal examination

There would be one internal class tests comprising of 25 marks.

Internal test shall be conducted in the form of MCQ Test/ Assignments/Presentations

Question paper pattern for external theory

Total: 50 marks

Q.1 Based on Unit I..... 10 M

a,b,c- Attempt any two questions out of three

Q.2 Based on Unit II.....10M

a,b,c- Attempt any two questions out of three

Q.3 Based on Unit III.....10M

a,b,c- Attempt any two questions out of three

Q.4 Mixed questions from all Units.....20M

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Mapping of the course to Local/ Regional/National/International relevance

Class	Course Name	Course Code	Local relevance	Regional relevance	National relevance	International relevance
T.Y B Sc Zoology	VSC Economic Zoology Practical	RJVSCZOO P351	empower student with skills in apiculture, sericulture, poultry, dairy, and fisheries, enhancing local livelihoods and sustainable practices.	strengthens regional economies by pest management, livestock rearing, and coastal fisheries.	supports India's food security and economic growth by advancing knowledge in agriculture, animal husbandry, and seafood production.	It equips students to contribute to global markets in honey, silk, dairy, and seafood, promoting sustainable practices and trade competitiveness.

Mapping of the course to Employability/ Entrepreneurship/Skill development

Class	Course Name	Course Code	Topic focussing on Employability/ Entrepreneurship/ skill development	Employability/Entrepreneurship/Skill development	Specific activity
T Y B Sc Zoology	ECONOMIC ZOOLOGY	RJVSCZOOP351	All topics	Apiculture and Sericulture. Poultry farming fishery management skills.	Fostering entrepreneurial opportunities in honey, silk, Poultry and preparing students for seafood industry roles

Integration of Cross cutting Issues

Class	Course Code	Cross Cutting Issues
T. Y B Sc Zoology	RJVSCZOOP351	Sustainability, economic development, food security, biodiversity conservation UNSDG 1,2,8,12,14,15

SEMESTER VI

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T.Y.B.Sc NEP Zoology VSC Syllabus Semester -V & VI

SEMESTER	:	VI
TITLE OF THE SUBJECT/COURSE	:	VSC Environmental Science and Pollution
COURSE CODE	:	RJVSCZOO361
CREDITS	:	02
DURATION	:	60 Hrs.

LEARNING OBJECTIVES	
1	To impart understanding of physico-chemical properties of sewage and effluent water.
2	To familiarize the learner, the techniques for soil quality assessment.
3	To introduce the use of microbiological methods such as MPN for water quality assessment. .
4	To provide hands on training for use of instruments like a lux meter.
5.	To acquaint learners on the role of bioindicators and indoor plants in pollution monitoring.

COURSE OUTCOMES	AFTER COMPLETING THE COURSE, THE LEARNER WILL BE ABLE TO:	PSO ADDRESSED	BLOOM'S TAXONOMY LEVEL
CO1	Analyze physico-chemical and microbiological parameters of water and soil.	1,4	BT level IV & V Analyse, draw connections among ideas and Evaluate
CO2	perform MPN analysis and use lux meter	1,2	BT Level III apply
CO3	evaluate the ecological significance of bioindicators and indoor plants in pollution detection and mitigation strategies.	1,5	BT I, V Remember and Evaluate

SEMESTER VI
VSC- ENVIRONMENTAL SCIENCE AND POLLUTION
PAPER CODE: RJVSCZOOP361
1) Study of Physico-chemical properties of sewage/ effluent water : Conductivity, Dissolved oxygen, BOD, COD, heavy metal (Lead).
2) Study of chemical properties of soil: Organic matter and Calcium carbonate.
3) Microbiological parameters: MPN (Demonstration-Identification)
4) Measurement of intensity of light by Lux meter
5) Study of logistic services for medical, toxic waste (Incinerator, Autoclave).
6) Study of indicator species (River Otter, Spotted owl, Lichen).
7) Study of indoor plants for reduction of pollution (<i>Adiantum</i> , <i>Cactus</i> , <i>Chlorophytum</i> , <i>Pachira</i>).

REFERENCES

1. Pollution Control in Process Industries, S.P. Mahajan, TMH 1988.
2. Practical Methods in Ecology & Environmental Science, Trivedi, Goel & Trisal, Environmental Publications, Karad 1987.
3. Text book of Environmental Chemistry & Pollution Control. Revised edition, Dara S.S. & Mishra D.D., S. Chand Publications.
4. Waste Water Treatment for Pollution Control, Soli J. Arcivala, TMH 1986.
5. Water & Water Pollution Handbook, L.L. Caccio, Marcel Dekker Inc. N.Y. 1971.

SKELETON PAPER FOR VSC PRACTICAL -SEMESTER VI

PAPER CODE: RJVSCZOO361

Total Marks 50

Q.1. Major Experiment **18M**

Determine BOD/COD/Organic matter /heavy metal (Lead) from the given water/soil sample.

Q.2. Minor Experiment **10M**

Determine Calcium carbonate / Dissolved oxygen / Conductivity from the given soil/water sample

OR

Measurement of intensity of light by Lux meter

Q.3. Identification: **12M**

a) MPN

b) Logistic services for medical, toxic waste (Incinerator, Autoclave)

c) Indicator species (River Otter, Spotted owl, Lichen).

d) Indoor plants for reduction of pollution (*Adiantum*, *Cactus*, *Chlorophytum*, *Pachira*)

Q.4 Viva **05M**

Q5 Journal **05M**

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Class	Course Name	Course Code	Local relevance	Regional relevance	National relevance	International relevance
T.Y B Sc Zoology	VSC- ENVIRONMENTAL SCIENCE AND POLLUTION	RJVSCZOO P361	enables students to check local water, soil, and air quality to improve community health.	monitoring of regional pollution and ecosystems for better environmental care.	Supports India's environmental goals by training students in pollution control.	Builds skills for global pollution and conservation challenges.

Mapping of the course to Local/ Regional/National/International relevance

Mapping of the course to Employability/ Entrepreneurship/Skill development

Class	Course Name	Course Code	Topic focussing on Employability/ Entrepreneurship/ skill development	Employability/Entrepreneurship/Skill development	Specific activity
T Y B Sc Zoology	ENVIRONMENTAL SCIENCE AND POLLUTION	RJVSCZOO P361	All topics	Builds employability in environmental monitoring or water treatment industries	site visits or simulations of waste disposal logistics. Training students in water quality assessment techniques. Providing practical microbiology skills.

Integration of Cross cutting Issues

Class	Course Code	Cross Cutting Issues
T Y B Sc Zoology	RJVSCZOO P361	Environmental Sustainability, Pollution Control, Ecosystem Health, Waste Management UNSDG 3, 6,11,12,13,14