MAHARAJA SURAJMAL BRIJ UNIVERSITY
BHARATPUR (RAJASTHAN)

SYLLABUS FOR ZOOLOGY

(UNDER GRADUTE PROGRAMME)

(III & IV SEMESTER)

ACADEMIC SESSION 2024-25

Syllabus

ZOO-20T-301- Economic Zoology, Ecology & Ethology

ZOO-20P-302- Practicals based on Econpmic Zoology, Ecology & Ethology

III SEMESTER - Zoology

Semester	Code of the Course	Title of the Course/Paper				NHEQF Level	Credits
III	ZOO-20T-301 ZOO-20P-302	Economic Zoology, Ecology & Ethology Practicals based on Econpmic Zoology, Ecology & Ethology				6	4
Level of Course	Type of Course	Credit Distribution			Offered to NC Student	Course Delivery Method	
		Theory	Practical	Total			
6	Major	4	2	6	Yes	Lectures: 60 lectures including diagnostic and informative assessments during lecture hours and 30 Hours of practical training/demonstration.	
List of programme Codes in which Offered as Minor Discipline	B.Sc. Chemistry B.Sc. Botany						
Prerequisites	B.Sc. (Bio Group) II SEM						
Objectives of the Course:	• Gain knowledge about silkworms rearing and their products: Bee keeping equipment and apiary management. • Acquaint knowledge on dairy animal management, the breeds, and diseases of cattle and learn the testing milk quality. • Acquaint knowledge about the culture techniques of fish, prawn and poultry. • Acquaint knowledge about basic procedure and methodology of Vermiculture. Learn various concepts of lac cultivation. • Learn the various pests and diseases and their management strategies. • Students can start their own business i.e. self-employments. and Get employment in different applied sectors. • To equip learners with a sound knowledge of how animals interact with one another and their environment. • To enable the learners to understand different behavioral patterns.						

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DETAILED SYLLABUS

ZOO-20T-301:Economic Zoology, Ecology & Ethology

UNIT I

Sericulture: Silkworm species, host plants, types of silk, economic importance of silk, Moriculture: lifecycle of mulberry silk worm, silk production, processing of silk, associated enemies, diseases and their management. **3 Hrs**

Lac culture: Life cycle of lac insect, general practices and management of lac cultivation, processing of lac, composition, properties and products of lac, associated enemies, diseases and their management. **3 Hrs**

Apiculture: Species of domesticated honey bee, life cycle of honey bees, indigenous and artificial bee hives, management of bee keeping, by-products, associated enemies, diseases and their management, apiculture and apiary in India. **3 Hrs**

Vermiculture and Vermicomposting: Suitable and non-suitable species, conventional and commercial vcnni culturc (small-and large-scale vermicomposting), harvesting. processing. problems related to vemicomposting. **3Hrs**

Pisciculturc: Culturable species. Edible fishes, seed production, hatcheries, feeding of fishes.by
products of fish culture, associated diseases and their management.

3Hrs

UNIT II

Protozoan diseases: Malaria. African sleeping sickness, amoebic dysentery, Leishmaniasis
3Hrs

Helminth diseases: Outline of diseases caused by platyhelminthes and Aschelminthes.

3Hrs

Arthropod-borne diseases: Tick-bornediseases,Mite infestation. Insect-borne diseases.

4Hrs

Pest and their management: agricultural pests, stored grain pests, household pests, Integrated pest management

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UNIT III

1. Concepts in Ecology and various ecosystems- freshwater, marine, terrestrial. Biotic and Abiotic factors. 3Hrs
2. Biogeochemical cycles of O_2, CO_2, H_2O, N and P. 3Hrs
3. Population interactions, ecological pyramids, energy flow, food chain and food webs. 3Hrs
4. Environmental pollution- water, air and land. 3Hrs
5. Greenhouse effect, Ozone layer depletion.

UNIT IV

Ethology: Introduction & history of Ethology.

Brain & behaviour, Limbic system And Hypothalamus. 3Hrs

Concepts of ethology: Fixed action pattern, sign stimulus, innate releasing mechanism, action specific energy, motivation, imprinting and learning. 3Hrs

Orientation- Kinesis and taxis.
Communication: auditory, tactile, visual and chemical Societies: Characteristics and advantage with special reference to honey bee and monkeys. 4 Hrs

Biological clocks and animal behaviour: Biological rhythms and biological clocks. Methods of studying animal behaviour. 4 Hrs

Suggested Book sand References:

1 .Economic Zoology, Biostatistics & Animal behaviour, S. Mathur, 2009, Deep & Deep Publicatons.
2. Economic Zoology, Shukla G.S.& Upadhyay V.B., 2017, Rastogi Publications.
3. Vennicomposting for sustainable agriculture, Gupta P.K.2003, Agrobios India
4. A hand book of economic zoology, Ashan J. and Sinha S.P, 2010. S. Chand and Company
5. Perspectives in Indian Apiculture, Mishra R.C. ,1999, Allied scientific publ. Bikaner India
6. A Text book of Applied Entomology, Srivastava, K.P. ,1988., Publ. Kalyani Publishers, New Delhi.
7. Animal Behavior: An Evolutionary Approach, Alcock J., 2013,Sinauer Associates.
8. Animal Societies and Evolution: Reading from Scientific America, 1981, Tophoff H.R., W.H. Freedman and Co. Ltd.
9. Animal Behavior, Breed M.D. and Moore J., 2015, Academic Press.
10. Animal Behavior, Mathur R, 2010, Rastogi Publications.
11. The ecology & Evolution of Animal Behavior, Werlace R.A., 1979, GoodYear Publishing Co., Inc.
12. Biological Rhythms, Kumar V., 2002, Narosa Publishing House, Delhi/Springer- Verlag.
13. Odum: Fundamental of Ecology : Thomson Books.
14. Odum: Ecology Abridge between science and society sinauer Associates 1997.
15. Rastogi VB and Jayaraj MS: Animal Ecology and distribution at Animal Kedarnath R. Publication Meerut.
16. Sharma PD- Environmental Biology and Toxicology 3rd Edition Rastogi publication -2013.
17. Sharma PD-Ecology and Environment 12th Revised Edition Rastogi publication -2014-15.

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SuggestedE-Rrsourrcs:

1. https://vidyamilrn.intlihnct.ac,in/cnnlcnl/indcx/6018c55f8007bcclc2216(,b0/ET
2. https://vidyamilrn.inllibncl,nc.in/conlcnt/indcx/6018c69d8007bc8bc42166af/ET
3. https://vidynmilra.inflibncl,nc.in/indcx.php/content/indcx/5fc.19fl678007bcf4453dc567
4. https://vidyamitra.intlibnct.ac.in/indc.php/content/indcx/6018dbb48007bc63cl2166nc

Course Learning Outcome: Upon completion of the course, students will be able to:

- Understand the economic importance of non-chordates and chordates and their significance in the ecosystem.
- Comprehend the lifecycle of specific parasites, the symptoms of the disease and its treatment and apply simple preventive measures for the same.
- Gain knowledge on animals useful to mankind and the means to make the most of it.
- Learn the modern techniques in various industries of beneficial animals.
- Pursuing entrepreneurship as careers
- Understand the main historical ideas that underpin animal behavior theory.
- Critically review hypotheses to explain animal behaviour.
- Gain an insight into different types of animal behavior and their role in biological adaptations.

PRACTICAL SYLLABUS

ZOO-20P-302-Practicals based on Economic Zoology, Ecology & Ethology

1. Study of 'Microscopic Slides/models/ photographs of the following: Plasmodium. Giardia. Toxop/asma. Trypanosoma, Bedbugs, mosquito (any). Pediculus humanus capitis. Xenop.s:vllacheopis,aphid,Tribo/ium,Teniaso /ium, Fasciola hepatica, Ascaris, Waucheria,
2. Study of' Museum Specimens/photographs/Models of following: silk moth species. earthworm species. Prawn, Pearl oyster, poisonous spiders, scorpion, ants. Centipede, ear wig, types of honey bees, cockroach, crickets, grasshopper, edible fishes, fur, feathers, corals, cowrie.
3. To study life cycle or silk worm and different types or silk yarns available in the market.
4. To study the qualitative analysis of honey.
5. To study the construction of vermi-composting bins and devices used for vermi-composting.
6. Analysis of soil p^H
7. Water analysis: p^H, alkalinity, acidity, dissolved O_2, free CO_2, Salinity (chloride)
8. To study the food preference and response to light in any of the stored insect pest.
9. To study the antennal grooming in cockroach.
10. Study of chemical communication behavior in Ants/earthworm.
11. Educational tour: Visit to any sericulture research and training Institute/ Apiary/ Aquaculture and report submission (Candidates are expected to submit a detailed report of such visit)

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Scheme of Practical Examination and Distribution of Marks

S.No.	Practical Exercises	Regular Students	Ex./N.C. Students
1.	Exercise based on sericulture, apiculture, lac culture.	6	12
2.	Exercise based on vermiculture, pearl culture, aquaculture.	4	6
3.	Exercise based on ethology	4	6
4.	Identification and comments on Spots (1 Ito 8)	16	16
5.	Viva-Voce	5	10
6.	Class Record and report	5	
7.		10+40	50

Note:

***internal marks for regular students only.**

1. With reference to microscopic slides, in case of non-availability, the exercise should be substituted with diagrams/photographs.
2. Candidates must keep a record of all work done in the practical class and submit the same for inspection at the time of the practical examination.
3. It should be ensured that animals used in the practical exercises are not covered under the wild life Act1972 and amendments made

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Syllabus

ZOO-20T-401- Cell Biology, Genetics & Biostatistics

ZOO-20P-402- Practical based on Cell Biology & Genetics & Biostatistics

IV Semester-Zoology

Semester	Code of the Course	Title of the Course/Paper				NHEQF Level	Credits
IV	ZOO-20T-401 ZOO-20P-402	Cell Biology, Genetics & Biostatistics. Practical based on Cell Biology & Genetics & Biostatistics				6	6
Level of Course	Type of Course	Credit Distribution			Offered to NC Student	Course Delivery Method	
		Theory	Practical	Total			
6	Major	4	2	6	Yes	Lectures: 60 lectures including diagnostic and informative assessments during lecture hours and 30 Hours of practical training/demonstration.	
List of programme Codes in which Offered as Minor Discipline	B.Sc. Chemistry B.Sc. Botany						
Prerequisites	B.Sc. (Bio Group) III SEM						
Objectives of the Course:	This course will provide with a deep knowledge of Cell Biology, Genetics and Biotechnology. • Understand the role of different cell organelles in the maintenance of life activities, the history and basic concepts of heredity, variations and gene interaction, the application of biotechnology in the fields of industry and agriculture. • In addition to this, the course is aimed at nurturing skills of conducting scientific inquiry and experimentation in the field of recent advancements, recent trends and technologies. • Students can start their own business i.e. self-employments. and get employment in different applied sectors.						

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Detailed syllabus

ZOO-20T-401-Cell Biology, Genetics & ~~Biotechnology~~ Biostatistics

UNIT I

Introduction to cell: Morphology, size, shape, characteristics and structure of prokaryotic and eukaryotic animal cells; basic idea of virus and cell theory.

3Hrs

Plasma membrane: Composition. Fluid mosaic model; Transport across the membrane: active and passive transport, facilitated transport, diffusion, osmosis.

4Hrs

Cell Organelles: Structure and functions of nucleus, mitochondria, endoplasmic reticulum. ribosome (prokaryotic and eukaryotic), Golgi complex, lysosome. Microbodies and centrioles. Structure and functions of cilia, flagella. and microvilli.

8Hrs

UNIT II

Cell Division: Mitosis, Meiosis, cell cycle. **4Hrs**

Prokaryotic chromosomes and eukaryotic chromosomes: Morphology, telomeres, primary and secondary constrictions, chromatids; Giant chromosome types: Polytene and Lampbrush. **4Hrs**

Chromosomal organization: Euchromatin, heterochromatin, folded fiber model and nucleosome concept. **4 Hrs**

Cell-Cell Junctions: Structure and Functions- Tight junctions, Desmosomes, Gap junctions.

3 Hrs

UNIT III

Mendel's law of Inheritence: Principle of segregation. independent asortment. dominance. Mendelian genetics in humans, Variety of gene expression- modifiers, suppressors. plciotropic gene, multiple alleles, Interaction of gene epistasis, complimentarygene, duplicate gene. **4 Hrs**

Linkage: Definition, coupling and repulsion hypothesis, linkage groups. Crossing over-mechanism and theory: structure of chromosomes. Extra chromosomal inheritance-mitochondrial and plastids. **4 Hrs**

Mutation: Definition, basic concept, also include types (spontaneous and induced): mechanism of mulagenesis: base analogues, nitrous acid, hydroxyl a mine, alkylating agent. Acridine dyes. U.V. light. **4 Hrs**

Genetic disorders: Down's, Turner's and Klinefelter's syndromes, Color blindness. Hemophilia and Phenylketonuria. **3 Hrs**

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UNIT IV

Biostatistics and its applications, variable and attributes, population v/s sample, arrangement of data, frequency distribution. **3 Hrs**

Graphical representation of data: Line diagram, bar diagram, pie chart, histogram and polygon. **4Hrs**

Measures of central tendency: Arithmatic mean, mode, median. **4Hrs**

Standard deviation, standard error of mean **4Hrs**

Suggested Books-

1. Lodish. H Berk. A Zipursky. S.L. Mntsudaira. P. Baltimore, D. and James Darnell. J. Molecular Cell Biology. Freeman. 7th edition 2013.
2. Cell Biology. Genetics. Molecular biology. Evolution and Ecology (2022) P.S. Verma. V.K. Agarwal.
3. Cross A.E. and Nagle R.B. (2006). Cell Adhesion and Cytoskeletal Molecules in Metastasis.Vol. XII. Springer Publication.
4. Karp G.John. (2013).Cell and Molecular Biology. Concepts and Experiments.7thEdition.Wiley & Sons Inc., New York.
5. Griffiths A J.F. Miller. Suzuki. D.T., Lewontin, R.C. and Gelbart, W.M. (2009).An Introduction to Genetic Analysis. IX Edition. freeman and Co.,N.Y.. USA.
6. Brown. T.A. (2015). Gene Cloning and DNA Analysis.7thEdition, Academic Press. California. USA.
7. Gardner E.J. (2008). Principles of Genetics. VIII Edition, Simmons M.J. and Snustad D.P. Willey. India.
8. Pierce B.A.(2008). Genetics- A Conceptual Approach. W.H. Freeman & Co., New York.
9. Watson, J.D. Myers, R.M., Caudy, A. and Witkowski, J.K.(2007). Recombinant DNA- Genes and Genomes- A Short Course.III Edition, Freeman and Co., **N.Y.,** USA.
10. Biotechnology by U. Satyanarayan. (2010).
11. B.D. Singh. (2004). Biotechnology - Expanding Horizons. Kalyani Publishers, New Delhi. India.
12. Current Frontiers and Perspectives in Cell Biology (2012). Stevo Najman.
13. Cooper, G.M., and Hausman, R.E.(2013).The Cell :A Molecular Approach (6thEd.).Washington: ASM: Sunderland.
14. Principles of Genetics_by Gardner (2008)(8thEdition)
15. Pagana M., & Gauvreau, K. (2018) Principles of Biostatistics 2nd Ed), CRC Press.
16 Rosner, B. (2015), Fundamentals of Biostatistics (8th Ed). Cengage learning.
17 Genetics (2009) P.K. Gupta. Rastogi Publications.
18 Primrose S.B. and Twy man R.M: Principles of Gene Manipulation and Genomics. John Wiley & Sons.2013.

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Suggested E-Resources:

1. The Cell : A Molecular Approach (2013) Geoffrey M. Cooper and Robert E. Hausman. Sixth Edition. Simrner Associates.
2. Principles of Molecular Biology (2023) Veer Bala Rastogi. Second Edition. Med tech.
3. Genetics and Molecular Biology (Volumel) Kohji Hasanuma. Encyclopedia of Life Support Systems. UNESCO-EOLSS.
4. https://egyankosh.ac.in/handle/l23456789/5504

Course Learning Outcome: Upon completion of the course, students will be able to:

- Students will be able to explain the basic concepts of Cell Biology.
- Have an understanding of classical genetics.
- To impart knowledge and practical training in various techniques to develop research in commercial and scientific application.
- Learn about biotechnology and its concepts as well as various scopes in Biotechnology.

Practical Syllabus

ZOO-20P-402-Practicals based on Cell Biology, Genetics& Biostatistcs

Exercises in Cell Biology:

1. Principle and uses of Microscopy.
2. Squash preparation for the study of mitosis in the onion root tip. permanent slides of mitosis (all stages).

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3. Squash preparation for the study of meiosis in grasshopper or cockroach testes, permanent slides of meiosis (all stages).
4. Study of giant chromosomes in salivary glands of *Chironomus* or *Drosophila* larva.
5. Preparation of blood smear and differential staining of blood cells.

Exercises in Genetics:

6. Life cycle of *Drosophila* and an idea about its culture.
7. Identification of male and female *Drosophila.*
8. Identification of wild and mutant (yellow body ebony, vestigial wing and white eye).
9. Study of permanent prepared slides: Sex comb and salivary gland chromosomes.
10. Numerical exercises on Monohybrid and dihybrid cross.

Exercises in Biostatistics :

11. Representation of data by using bar diagram and pie-chart.
12. Numerical based on bio-statistical measurement- mean, mode and median.
13. Numerical based on standard Deviation, Student's Test and Chi- square test

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Scheme of Practical Examination and Distribution of Marks

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S.No.	Practical Exercises	Regular Students	Ex. /N.C. Students
1.	Exercise in Cell Biology	6	12
2.	Exercise in Genetics	4	6
3.	Exercise in Bio-statistics	4	6
4.	Identification and comments on Spots (1 to 8)	16	16
5.	Viva Voce	5	10
6.	Class Record and report	5	
		10*+40=50	**50**

Notes:

***Internal marks for regular students only**

1. With reference to microscopic slides, in case of non-vailability.the exercise should be substituted with diagrams / photographs.
2. Candidates must keep a record of all work done in the practical class and submit the same for inspection at the time of the practical examination.
3. Mounting material for permanent preparations would be as per the syllabus or as available through collection and culture methods.

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