

Theory

Part- A Introduction		
Program: Honors/Research	Class: B.Sc.	Year : IV
Session : 2024 - 25		
Subject : ZOOLOGY		
1.	Course Code :	S4-ZOOL1D
2.	Course Title :	Ethology (Animal Behavior) and Biostatistics
3.	Course Type :	DSE TH-1
4.	Prerequisite (if any) :	To study this course, student must have had Zoology in BSC III rd . Year / Degree.
5.	Course Learning Outcomes (CLO) :	<p>Upon completion of this course, learners will be able to :</p> <ol style="list-style-type: none"> 1. To understand and apply the knowledge of Behavior and Biometry. 2. To study and analyze the complex and diverse approaches of animal behavior. 3. To enumerate biological rhythms, communication in animals and their social organization. 4. To know the scope and develop entrepreneurship by understanding behavior, statistical interpretation of data which will help them to select future career opportunities. 5. To apply statistical methods to analyze and interpret the biological data.
6.	Credit Value :	3
7.	Total Marks :	Max Marks- 30 + 70 Min Passing Marks - 35

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Dr. Shampa Jain

P. S. Saxena
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Ms. Amita Saxena.

Dr. P. Saxena
Amun Singh
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Mr. Amun Singh Bais

Dr. Mayu Datta
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Dr. Mayu Datta

Part – B CONTENT OF THE COURSE

Total No. of Lectures – Tutorials - Practical (2 hours per week)

L-T-P Total Number of Lectures: 45

Unit/ S.No.	Topic	No of Lectures (1 Hour Each)
I	<p>Ethology – Concept and Patterns</p> <ol style="list-style-type: none"> 1. Historical Background and Concept of Ethology, Stimulus response concept. 2. Fixed Action Plan (FAP), Innate and acquired behavior 3. Kinesis, Taxes, reflexes, Tropism, Instincts, motivation. 4. Neurological control of Behaviour. 5. Hormonal control of Behaviour. 6. Biological clocks and rhythmic behavior – Circadian, Circannual, circalunar rhythms <p>Keywords/ Tags : Ethology, Innate, Instincts, circadian, Kinesis, Tropism</p>	13
II	<p>Learning, Memory and Social Behaviour</p> <ol style="list-style-type: none"> 1. Trial and Error Learning, Imprinting, habituation, conditional reflexes. 2. Reasoning and cognitive skills in behavior. 3. Memory basic concept and types. 4. Social behavior – Homing, territoriality, Aggression, Altruism communication in animals 5. Social organization in Insects and Primates and courtship behaviour <ol style="list-style-type: none"> 1. Parental care, dance and Pheromone in Bees. <p>Keywords : Imprinting, Habituation, Cognitive, Altruism, Pheromones, Courtship</p>	12
III	<p>Basic Concept of Biostatistics</p> <ol style="list-style-type: none"> 1. Preliminary Concept and Development of Biostatistics (Scope, Statistical Methods and Experimental Problems) 2. Central Tendency, Characteristics and Measures with Statistical Problems 3. Calculation of Mean, Median and Mode by different methods 4. Measures of Variations, Co-Variance and Analysis of variance by ANOVA technique 5. Test Methods : Z-test, F-test, T-test, Standard Deviation (SD), Standard Error (SE) and Experimental Problems 	10

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	Keywords : Central Tendency, Standard Deviation, Kurtosis, Co- variance	
IV	Graphical Representation of Data <ol style="list-style-type: none"> 1. Theoretical Distribution- Monomial and Binomial 2. Correlation 3. Tabulation/ Statistical Tables 4. Presentation of Data- Line Diagram, Graphs, Histograms, Bar Diagrams, Pictograms, Cartograms 5. Chi Square Test 6. Probability Keywords: Correlation, Tabulation, Cartograms, Probability	10

Part – C LEARNING RESOURCES

Text Books, Reference Books, Other resources

Suggested Readings:-

ANIMAL BEHAVIOUR :

1. Hilgard R Earnest, Bower H Gordon, "Theories of Learning", Prentice Hall of India, 1969
2. Holiday T.R and Slater PJB, "Study of Communication", Blackwell Scientific Publication, Oxford London 1983
3. Prasad S.N, Kashyap Vasantika, "Animal Behaviour", Kitab Mahal Agencies Ashok Rajpath, Patna 1991
4. Bhaskar H.V, "Human and Animal Behaviour", Campus Book International 4831/24 Prahlad Road, Daryaganj New delhi 2007
5. Mathur Reena, "Animal Behaviour", Rastogi Publication Shivaji Road, Meerut 1996
6. Arora M.P, "Animal Behaviour", Himalaya Publishing House, New Delhi 2006
7. Gorey Manish Mohan, "Concept of Animal Behaviour", Rastogi Publication, Meerut 2010
8. Singh S.P and Tomar B.S, "Evolution and Behaviour", Rastogi Publication, Meerut 2005

BIOSTATISTICS :

1. Banerjee Pranab Kumar, "Introduction to Biostatistics", S Chand and Co Ltd Ram Nagar, New Delhi 2010
2. Arora P.N and Malhan P.K, " Biostatistics", S Chand and Co Ltd Ram Nagar, New Delhi 2010
3. Bhattacharya D and Choudhury R, "Statistics Theory and Practise", S Chand and Co Ltd Ram Nagar, New Delhi 2009
4. Saxena H.C, "Elementary Statistics", S Chand and Co Ltd Ram Nagar, New Delhi 2005
5. Shukla G.S, " Economic Zoology, Biostatistics and Animal Behaviour", Rastogi Publication 2014
6. Prasad Satguru, "Elements of Biostatistics", Rastogi Publication, Meerut 1997

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7. Dr. Kothari, "Fundamentals of Biostatistics", Rastogi Publication, Meerut 2010

Suggestive Digital Platforms Web Links :

1. <https://www.easybiologyclass.com/category/biostatistics/>
2. <http://www.ppup.ac.in/e-Content/edetails.php?id=3771>
3. <https://mppgscience-e-content>
4. https://en.wikipedia.org/wiki/Animal_Diversity_Web
5. https://en.wikipedia.org/wiki/American_Institute_of_Biological_Sciences
https://onlinecourses.swayam2.ac.in/cec21_bt12/preview - Biostatistics and Mathematics
Biology By Dr.Felix Bast

Part – D ASSESSMENT AND EVALUATION

Suggested Continuous Evaluation Methods :

Maximum Marks : 100

Continuous Comprehensive Evaluation (CCE) : 30 Marks University Exam (UE) : 70 Marks

Internal Assessment : Continuous Comprehensive Evaluation (CCE)	Class Test, Assignment / Presentation	30
External Assessment : University Exam Section Time : 03:00 Hours	Section (A) : Very Short Questions Section (B) : Short Questions Section (C) : Long Questions	70
Any Remarks / Suggestions :		

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Practical

Part- A Introduction

Program : Honors/Research		Class: B.Sc.	Year : IV	Session : 2024 - 25
Subject : ZOOLOGY				
1.	Course Code :	S4-ZOOL1Q		
2.	Course Title :	Ethology (Animal Behavior) and Biostatistics		
3.	Course Type :	DSE PR-1		
4.	Prerequisite (if any) :	To study this course, student must have had Zoology in BSC III rd Year / Degree.		
5.	Course Learning Outcomes (CLO) :	Upon completion of this course, learners will be able to : 1. Gain practical knowledge and awareness of Animal Behavior. 2. Understand different types of practical work based on principle and concept of Biology, Behavior with statistical analysis. 3. Gain helpful resource for research and development. 4. Choose career opportunities associated with data scientist.		
6.	Credit Value :	1		
7.	Total Marks :	Max Marks- 100	Min Passing Marks - 35	

Part – B CONTENT OF THE COURSE

Total No. of Lectures – Tutorials - Practical (1 hours per week)

L-T-P Total Number of Lectures: 15

/Unit .S.NO	Topic	No of Lectures (2 Hours Each)
I	1. To study chemotaxis, Geotaxis, Phototaxis behaviour in Protozoa, Paramecium and Earthworm. 2. To study learning behaviour in Mice & Dog with bread. 3. To study schooling behavior of fishes. 4. To study nests and nesting behaviour of insects (Bees, Wasp, Spider) and Birds (Baya & Tailor bird) 5. Study of parental care in birds and brood parasitism in crow and koel 6. To study migration of fishes and birds.	5

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II	<ol style="list-style-type: none"> 1. To study the habituation to touch in garden snail. 2. To observe sleeping behavior in Dog. 3. To study foraging behavior in ants : orientation and cues. 4. To study Biological clock behavior in Hen. 5. Field study of behavior of any mammal or bird and preparation of short report. <p>Keywords : Chemotaxies, Geotaxies, Phototaxis, Brood Parasitism, foraging, Imprinting, Biological clock</p>	4
III	<p>Biostatistics</p> <ol style="list-style-type: none"> 1. Calculation of Mean, Median , Mode. 2. Explanation of Hardy-Weinberg Law, Chi-Square, Null Hypothesis in Drosophila. 3. Exercise on Coorelation. 4. Graphically representation of any given data line diagram, Bar Graph, Pie- chart. 5. Graphical representation of any given data on Histogram. 6. Problem analysis of variance by one way- ANOVA technique 	6

Part – C LEARNING RESOURCES

Text Books, Reference Books, Other resources

Suggested Readings:-

1. Lal S.S, " Practical Zoology" Vol III, Rastogi Publication, Meerut 2005
2. Silverman Paul, "Animal Behaviour in the Laboratory", Chapman Hall, London 1978
3. Manning Aubrey, "Introduction to Animal Behaviour", Cambridge University Press, 1992
4. Das D and Das A, "Statistics in Biology", S Chand and Co. Ram Nagar New Delhi 2010
5. Das N G, "Statistical Methods", S Chand and Co. Ram Nagar New Delhi
6. Miller S.H and Levontitis R.C, " Modern Genetic Analysis", S Chand and Co. Ram Nagar New Delhi
7. Mahajan B.K, " Solving Problems in Genetics", S Chand and Co. Ram Nagar New Delhi 2010
8. Zarjerrord H, "Biostatistical Analysis", S Chand and Co. Ram Nagar New Delhi
9. Dockery Michael and Reiss Michael, " Animal Behaviour, Practical Work" 2008
10. Banerjee Pranab Kumar, " Introduction to Biostatistics, S. Chand Publication 2009
11. Gupta B.N and Silwat S. T, " Principles of Statistics", SBPD Publishing House, Agra 2010

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Suggestive digital platforms web links:-

1. https://en.wikipedia.org/wiki/Animal_Diversity_Web
2. https://en.wikipedia.org/wiki/American_Institute_of_Biological_Sciences

Part – D ASSESSMENT AND EVALUATION

Internal Assessment	Marks	External Assessment	Marks
Class Interaction Quiz		Viva Voce	
Attendance		Practical Record File	
Assignment (Chart/Model/Rural Service/Technology Dissemination/ Report of Excursion/Lab Visit/ Survey/ Industrial Training)		Table Work / Experiment	
	30		70

Note : UGC guidelines should be followed for collection of animals

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