



**SIR P. T. SARVAJANIK COLLEGE OF SCIENCE, (AUTONOMOUS)
ATHWALINES, SURAT-395001**

Sir P. T. Sarvajani College of Science

(Autonomous)

**Affiliated to Veer Narmad South Gujarat
University, Surat**

Re-Accredited 'A⁺' with CGPA 3.35

SYLLABUS

FOR

SEM IV

Program: B.Sc.

Course: ZOOLOGY

For

Academic year

2025-26

(NEP-2020)

Effective from June 2025-26



SIR P. T. SARVAJANIK COLLEGE OF SCIENCE, (AUTONOMOUS)
ATHWALINES, SURAT-395001

Board of Studies in Zoology
Undergraduate and Post graduate

	Name	Designation	Institute/Industry
Head of the Department			
1	Dr. Jaya Patel	Chairperson	Sir P. T. Sarvajani College of Science
Two experts from other than the parent University			
1	Dr. Nikunj Bhatt	Associate Professor	Department of Zoology, V. P. & R. P. T. P. Science College, (Autonomous), Vallabh Vidyanagar, Anand
2	Dr. Amol Patwardhan	Assistant Professor	K. J. Somaiya College of Science and Commerce (Autonomous), Mumbai
Subject Expert nominated by Vice-Chancellor			
1	Dr. Krupal Patel	Assistant Professor	Department of Zoology, Govt. Arts, Commerce & Science College, Limbayat, Surat
Meritorious Alumnus			
1	Mr. Bhavesh Chevli	Chief of Manufacturing	Envision Scientific Pvt. Ltd Sachin-Hazira Road
Experts from outside the Autonomous College, whenever special courses of studies are to be formulated, to be nominated by the Principal.			
1	Dr. Arun Dholakia	Retd. Associate Professor	Department of Zoology, Sir P. T. Sarvajani College of Science, Surat
Representative from Industry/corporate sector/allied area			
1	Ms. Pinal Patel	Board of Member	TINSA, Ecological Foundation Bhopal, Madhya Pradesh
Faculty of the specialization			
1	Dr. Jaya Patel	Associate Professor & Head	Sir P. T. Sarvajani College of Science
2	Dr. Nitin Solanki	Assistant Professor	Sir P. T. Sarvajani College of Science
3	Dr. Neelam Mishra	Adhyapak Sahayak	Sir P. T. Sarvajani College of Science



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Content

Sr. No	Semester	Course number	Course Code	Course Title
Core Course (CC)				
1	IV	CC VIII	ZOOMJ-S4P8-2CR25	Non Chordates and Chordates III
2		CC VIII	ZOOMJ-S4PR8-2CR25	Non Chordates and Chordates III
3		CC IX	ZOOMJ-S4P9-2CR25	Biochemistry and Physiology
4		CC IX	ZOOMJ-S4PR9-2CR25	Biochemistry and Physiology
5		CC X	ZOOMJ-S4P10-4CR25	Cell Biology and Genetics-II
6		CC III	ZOOMN-S4P3-2CR25	Non Chordates, Chordates II and Tissue System
7		CC III	ZOOMN-S4PR3-2CR25	Non Chordates, Chordates II and Tissue System
8		SEC IV	ZOOSec-S4P4-2CR25	Apiculture
9		IKS II	ZOOIKS-S4P2-2CR25	Indian Knowledge System- Ancient Zoology



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Detailed B. Sc. Zoology Syllabus

S. Y. B. Sc. Syllabus with effect from the Academic year 2025-26

Course No.	Course Title	Course Code	Credits	Hour	Module	Lectures per module (1 Hr)	Examination		
							Internal Marks	External Marks	Total Marks
SEMESTER IV									
Major Courses Theory and Practical									
CC VIII	Non Chordates and Chordates II	ZOOMJ-S4P8-2CR25	2	30	2	15	25	25	50
CC VIII	Non Chordates and Chordates II Practical Lab Course	ZOOMJ-S4PR8-2CR25	2	30	2	15	25	25	50
CC IX	Biochemistry and Physiology	ZOOMJ-S4P9-2CR25	2	30	2	15	25	25	50
CC IX Practical	Biochemistry and Physiology Lab Course	ZOOMJ-S4PR9-2CR25	2	30	2	15	25	25	50
CC X	Cell Biology and Genetics-II	ZOOMJ-S4P10-4CR25	4	60	4	15	50	50	100
ME CCIII	Non Chordates, Chordates II and Tissue System	ZOOMN-S4P3-2CR25	2	30	2	15	25	25	50
ME Practical	Non Chordates, Chordates II and Tissue System Practical Lab Course	ZOOMN-S4PR3-2CR25	2	30	2	15	25	25	50
SEC IV	Apiculture	ZOOSec-S4P4-2CR25	2	30	2	15	25	25	50
IKS II	Indian Knowledge System - Ancient Zoology	ZOOIKS-S4P2-2CR25	2	30	2	15	25	25	50



**S. Y. B. Sc. (Zoology) SEMESTER IV
Course Name: Non Chordates and Chordates III [CC VIII]
Course Code: ZOOMJ-S4P8-2CR25
Theory [Credits - 02]**

Course learning outcome		
After successfully completing this course, students will be able to: <ul style="list-style-type: none"> Understand the general taxonomic rules on animal classification. The principles and methods of taxonomy and the general characters of phylum. Identify a range of invertebrate and vertebrate animals. 		
Module 1	Classification up to subclass of Phyla	[15L]
Learning Objective		
<ul style="list-style-type: none"> To differentiate animals as per taxonomy. 		
Learning Outcomes:		
<ul style="list-style-type: none"> Explain the general characteristics and classification of Mollusca, Arthropoda, Echinodermata, and Hemichordata Describe the external and internal morphology of representative organisms from each phylum. 		
1.1	Classification up to subclass of Phyla 1.1.1 Arthropoda 1.1.2 Mollusca 1.1.3 Echinodermata 1.1.4 Hemichordata	
Module 2	Type Study: Calotes	15L
Learning Objective		
Ensure acquiring the awareness on the basics of the zoology and to understand the different features and diversities of Chordates		
Learning Outcomes:		
<ul style="list-style-type: none"> Understand the taxonomy, classification, and distinguishing characteristics of Calotes species. Describe the morphological and anatomical adaptations of Calotes related to its habitat and lifestyle. Explain the physiological processes, including digestion, respiration, and reproduction in Calotes. 		
2.1	External features and Digestive System with digestion process	
2.2	Respiratory system	



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2.3	Circulatory System
2.4	Urinogenital System
2.5	Brain

References:

1. Living Invertebrates, 1987: Pearse, Buchsbaum, Blackwell Scientific Publication, California.
2. A Text book of Zoology Invertebrates, Vol. I 1992, 7th Edn. Parker and Haswell edited by Marshall William, C B S publishers and distributors, New Delhi.
3. Invertebrate Zoology, 1992; S. N. Prasad, Vikas Publishing House, New Delhi.
4. Life of Invertebrates, 1992; S.N. Prasad, Vikas Publishing House, New Delhi.
5. Invertebrate Zoology, 1992 4th Edn., reprint, P.S. Dhami and J. K. Dhami, R. Chand and Co., New Delhi.
6. Modern text book of Zoology, Invertebrates 10th Edn., 2009, R.L. Kotpal, Rastogi publ., Meerut.
7. Invertebrates Structure and Function, 2nd Edn. 1979, EJW Barrington, John Wiley and Sons Inc.
8. Invertebrates Zoology, 1994, 6th Edition, Ruppert, E. Edward, R. D. Barnes; Saunders college Publishing, USA.
9. Invertebrate Zoology, 1991, P.A. Meglitsch and F. R. Schram, Oxford University Press; New York.
10. Invertebrate: A New synthesis, 1988, R.S.K. Barnes, P. Calow and P.J.W., Olive Blackwell Scientific, U.K.
11. An Introduction to Protochordata, 1990, H. S. Bhamrah and Kavita Juneja, Anmol publication, New Delhi.
12. The invertebrates: Protozoa through Ctenophora Vol.I, 1959, Hyman, Libbie Henrietta, McGraw-Hill Book Co., Inc. New York.
13. A text book of Zoology, Vol.II, 1990, T. J. Parker and W. A. Haswell, Low price Publication, Delhi.
14. A text book of Zoology, Vol.II, 1990, T. J. Parker and W. A. Haswell, Low price Publication, Delhi.
15. Modern Text Book of Zoology, 1992, R. L. Kotpal, Rastogi Publication, Meerut.
16. Chordate Zoology, 1982, P. S. Dhami and J. K. Dhami, R. Chand and Co., New Delhi.
17. The life of Vertebrates, 3rd edn. 1993, J. Z. Young, Oxford University Press, USA.
18. The Phylum Chordata: Biology of Vertebrates and their Kin, 1987, H. H. Newman, Distributor Satish book enterprise, Agra.
19. A text book of Zoology, 1984, R. D. Vidyarthi, S. Chand and Co., New Delhi.
20. Comparative Anatomy of the Vertebrates, G. C. Kent, R. K Carr, 9th Edn., 2001, McGraw Hill, Boston, USA
21. Practical Zoology Invertebrates, 11th revised Edn., 2014, S. S. Lal, Rastogi publ., Meerut.



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22. Vertebrate Practical Zoology, 11th revised Edition, 2014, S. S. Lal, Rastogi publ., Meerut.
23. Practical Zoology, 2004, Vijay Laxmi Sharma, Paragon International Publishers.
24. The anatomy of Garden Lizard, 1974, S.Y. Paranjape, Pune University Publication, Pune.
25. Chordate Zoology, 2009 reprint, E. L. Jordan, S. Chand and Co., New Delhi.
26. Text book of Zoology, Vertebrates, Vol. II, T.J. Parker and W.A. Haswell, edited by Marshall and Williams, CBS Publications, New Delhi.
27. Young, J. Z. (2004). The Life of Vertebrates. III Edition. Oxford university press.
28. Pough H. Vertebrate life, VIII Edition, Pearson International.
29. Hall B.K. and Hallgrimsson B. (2008). Strickberger's Evolution. IV Edition. Jones and Bartlett Publishers Inc.
30. Outline of comparative anatomy of vertebrate Kingsley J.S. Central book depot. Allahabad
31. Kardong, K.V. (2005) Vertebrates' Comparative Anatomy, Function and Evolution. IV Edition. McGraw-Hill Higher Education.
32. Kent, G.C. and Carr R.K. (2000). Comparative Anatomy of the Vertebrates. IX Edition. The McGraw-Hill Companies.
33. Hilderbrand, M and Gaslow G.E. Analysis of Vertebrate Structure, John Wiley and Sons.
34. Walter, H.E. and Sayles, L.P; Biology of Vertebrates, Khosla Publishing House.
35. JUNQUEIRA'S Basic Histology Text & Atlas by Anthony L. Mescher
36. Histology: Arthur W. Ham, M. B.
37. Vertebrate Zoology: An Experimental Field Approach-Nelson G. Hairston. Cambridge University Press, 1994
38. Chordate Zoology E.L Jordan & P. S. Verma. S. Chand
39. Vertebrate Zoology: An Experimental Field Approach-Nelson G. Hairston. Cambridge University Press, 1994
40. Text Book of Zoology - Dalela and Verma. Jay Prash Nath & co. Meeru
41. Text Book of Zoology - S.N. Prasad. Vikas Publishing House pvt. ltd. Delhi
42. Chordate Zoology - Agrawal and Dalela. Jay Prash Nath & co. Meerut
43. Text book of Zoology - R. D. Vidyarthi. S. Chand
44. Jiv Vignan-2 (Gujarati) – Nirav Prakashan.
45. Text Book of General Biology – Tomer & Singh. Rastogi Publication, Meerut
46. Text Book of Chordates - A. Thangamani, S. Prasanna Kumar
47. Prushthvanshi Praniyoane Garbhvidya - A. B. Vyas. Guj. Granthnirman Board.
48. Utkrushtha Aprushthvanshi Praniyo - U. M. Rawal. Guj. Granthnirman Board.
49. Chordate Zoology - Majupuria.
50. A Manual of Zoology Vol. I & II – Ekamernath Ayar. S. Vishwanathan Chennai.



Mapping of COs and POs

Course Outcomes	Programme Outcomes					
	1	2	3	4	5	6
Explain the general characteristics and classification of Mollusca, Arthropoda, Echinodermata and Hemichordata.		X				
Describe the external and internal morphology of representative organisms from each phylum.		X				

Unit	Remembering (1)	Understanding (2)	Applying (3)	Analyzing (4)	Evaluating (5)	Creating (6)	Total
I	30%	70%	-	-	-	-	100%
II	30%	50%	20%	-	-	-	100%

**S. Y. B. Sc. (Zoology) SEMESTER IV
Course Name: Non Chordates and Chordates III [CC VIII]
Course Code: ZOOMJ-S4PR8-2CR25
Practical [Credits - 02]**

Course Learning Outcome	
After the successful completion of the Course, the learner will be able to:	
<ul style="list-style-type: none"> • Identify various animals based on morphological features of non- chordate animals. • Apply taxonomic tools, identification keys, and modern classification methods. • Comment on the modifications of common animal forms of the groups studied. • Conduct practical observations (Virtual) to understand internal structures • Study of all systems of Calotes (Virtual). 	
Practical Module – I (ZOOMJ-S3PR5-2CR25) [10L]	
The following practicals are to be taught / studied only with the help of charts, models, videos, photographs, permanent slides, working models etc.	
1	Classification of following animals up to sub class: I. Arthropoda: Peripetus, Hermit crab, Julus, Palaemon, Termite II. Mollusca: Chaetoderma, Unio, Aplysia, Sepia III. Echinodermata: Anthena, Ophiocoma, Cucumaria, Feather star
2	The following practical of Calotes to be taught/studied only with the help of Charts/models/videos/photographs/permanent slides, working models, simulators etc.



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		I. External characters II. Digestive system III. Respiratory system IV. Circulatory system V. Urinogenital system VI. Brain	

Mapping of CLOs and PSOs

Course Learning Outcomes	Programme Outcomes					
	1	2	3	4	5	6
Identify various animals based on morphological features of non-chordate animals.		X				
Apply taxonomic tools, identification keys, and modern classification methods.			X			
Comment on the modifications of common animal forms of the groups studied.		X				
Conduct practical observations (Virtual) to understand internal structures and Study of all systems of Calotes (Virtual).		X				

S. Y. B. Sc. (Zoology) SEMESTER IV

Course Name: Biochemistry and Physiology [CC IX]

Course Code: ZOOMJ-S4P9-2CR25

Theory [Credits - 02]

Course learning outcome	
After successfully completing this course, students will be able to: <ul style="list-style-type: none"> • Understand the structure and function of carbohydrates and proteins. • Identify properties and differences between biomolecules. 	
Module 1	Biochemistry [15L]
Learning Objective	
<ul style="list-style-type: none"> • Understand the basic structure, classification, and biological significance of carbohydrates, proteins and lipid. 	
Learning Outcomes:	
<ul style="list-style-type: none"> • Understand the classification and structure of carbohydrates, proteins, and lipids. • Explain the biological functions and significance of carbohydrates, proteins, and lipids in metabolism. 	



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	<ul style="list-style-type: none"> Differentiate between various types of carbohydrates, proteins, and lipids based on their chemical properties. Differentiate between various types of carbohydrates (monosaccharides, disaccharides, polysaccharides) and proteins (based on structure and function).
1.1	Carbohydrates, proteins and lipids – Structure and functions.
1.2	Classification of carbohydrates, proteins and lipids
Module 2	Physiology of Digestion, absorption and assimilation in Human
	15L
Learning Objective	
To provide in-depth knowledge of the physiological processes involved in digestion, absorption, and assimilation.	
Learning Outcomes:	
<ul style="list-style-type: none"> Understand the physiological processes involved in digestion, including the role of the digestive system and digestive enzymes Describe the mechanisms of absorption in the small intestine, including nutrient transport systems. Explain the process of assimilation and the role of the liver, pancreas, and other organs in metabolism. 	
2.1	Carbohydrates
2.2	Proteins
2.3	Lipid
2.4	Nucleic acids
2.5	Regulation of metabolism
References:	
1. Guyton. A.C. & Hall, J.E. (2006). Textbook of Medical Physiology. XI Edition. Harcourt Asia PTE Ltd. /W.B. Saunders Company.	
2. Tortora, G.J. & Grabowski, S. (2006). Principles of Anatomy & Physiology. XI Edition John Wiley & sons.	
3. Text Book of Medical Physiology – A. C. Guyton (Holt Saunders)	
4. Ganong's Review of Medical Physiology – (McGraw Hill)	
5. Biochemistry – D. Das (Academic Publishers)	
6. Lehninger Principle of Biochemistry – D. L. Nelson & M. M. Cox (Maxmillan)	

Mapping of COs and POs

Course Outcomes	Programme Outcomes					
	1	2	3	4	5	6
Understand the classification and structure of carbohydrates, proteins, and lipids.	X					



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Explain the biological functions and significance of carbohydrates, proteins, and lipids in metabolism.		X				
Differentiate between various types of carbohydrates, proteins, and lipids based on their chemical properties.	X		X			
Differentiate between various types of carbohydrates (monosaccharides, disaccharides, polysaccharides) and proteins (based on structure and function).			X			
Understand the physiological processes involved in digestion, including the role of the digestive system and digestive enzymes	X					
Describe the mechanisms of absorption in the small intestine, including nutrient transport systems.		X				
Explain the process of assimilation and the role of the liver, pancreas, and other organs in metabolism.		X				

Unit	Remembering (1)	Understanding (2)	Applying (3)	Analyzing (4)	Evaluating (5)	Creating (6)	Total
I	10%	50%	40%	-	-	-	100%
II	25%	75%	-	-	-	-	100%

**S. Y. B. Sc. (Zoology) SEMESTER IV
Course Name: Biochemistry and Physiology [CC IX]
Course Code: ZOOMJ-S4PR9-2CR25
Practical [Credits - 02]**

Course Learning Outcome

After the successful completion of the Course, the learner will be able to:

- Identify and analyse the functional groups of biomolecules, qualitative tests will be conducted on various carbohydrate and protein solutions
- Understand digestion involves both mechanical and chemical processes that break down food into absorbable nutrients.
- Understand the atomic models of various monosaccharides, disaccharides and amino acids.

Practical Module – I (ZOOMJ-S3PR5-2CR25)

[10L]

The following practicals are to be taught / studied only with the help of charts, models, videos, photographs, permanent slides, working models etc.

1	Preparation of atomic models: Monosaccharide:
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	<ul style="list-style-type: none"> • Glucose • Galactose • Fructose Disaccharides: <ul style="list-style-type: none"> • Maltose • Lactose • Sucrose Amino acid: <ul style="list-style-type: none"> • Alanine • Aspartic acid • Glutamic • Tyrosine 	
2	Qualitative estimation of functional groups of carbohydrates from given solutions (Glucose, Fructose, Sucrose, Lactose).	
3	Qualitative estimation of functional groups of proteins from given solutions.	
4	To study the process of digestion (mechanical and chemical digestion).	
5	Qualitative estimation of amylase.	

Mapping of CLOs and PSOs

Course Learning Outcomes	Programme Outcomes					
	1	2	3	4	5	6
To identify and analyse the functional groups of carbohydrate and protein solutions		X				
To understand digestion of both mechanical and chemical processes that break down food into absorbable nutrients.	X					
To understand of biomolecules, atomic models of various monosaccharides, disaccharides, and amino acids will be constructed.	X					

**S. Y. B. Sc. (Zoology) SEMESTER IV
Course Name: Cell Biology and Genetics - II [CC X]
Course Code: ZOOMJ-S4P10-4CR25
Theory [Credits - 04]**

Course learning outcome

After successfully completing this course, students will be able to:

- Define and describe the endomembrane system.
- Sketch and explain mitochondria and elaborate its function.



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<ul style="list-style-type: none"> • Describe the semiautonomous nature of mitochondria. • Explain the structure, origin, occurrence and function of eukaryotic ribosomes. • Describe structure, origin, occurrence and function of peroxisomes. • Understand and explain exceptions to Mendelian inheritance. • Explain Chromosome theory of inheritance. • Describe Pedigree analysis. • Illustrate autosomal dominant and autosomal recessive, X-linked dominant, and X-linked recessive. • Explain multiple alleles and polygenic inheritance • Understand the concept of pleiotropy. 		
Module 1	Endomembrane system	[07L]
Learning Objective		
<ul style="list-style-type: none"> • Understand the cell organelles 		
Learning Outcomes:		
<ul style="list-style-type: none"> • Define and describe the endomembrane system 		
1.1	Endoplasmic reticulum: Structure, types, occurrence and function.	
1.2	Golgi complex: Structure, Origin, Occurrence, Function	
1.3	Lysosome: Structure, Origin, Occurrence and Function.	
Module 2	Mitochondria, Ribosomes and Peroxisomes	[15L]
Learning Objective		
Cell organelle		
Learning Outcomes:		
<ul style="list-style-type: none"> • Sketch and explain mitochondria and elaborate its function. • Describe the semiautonomous nature of mitochondria. • Explain the structure, origin, occurrence and function of eukaryotic ribosomes. • Describe structure, origin, occurrence and function of peroxisomes. 		
2.1	Mitochondria: Origin, occurrence, structure and functions, semi-autonomous nature of mitochondria	
2.2	Ribosomes: Structure, origin, occurrence and function of eukaryotic ribosomes	
2.3	Peroxisomes: Structure, origin, occurrence and function.	
Module 3	Exceptions to Mendelian Inheritance	[15L]
Learning Objectives:		
This module is intended to		
<ul style="list-style-type: none"> • Understand Mendelian inheritance 		
Learning Outcome:		



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<p>After the successful completion of the module, the learner will be able to</p> <ul style="list-style-type: none"> • Understand and explain exceptions to Mendelian inheritance. • Explain Chromosome theory of inheritance. • Describe Pedigree analysis. • Illustrate autosomal dominant and autosomal recessive, X-linked dominant and X-linked recessive. 		
3.1	Exceptions to Mendelian Inheritance: Incomplete dominance, Codominance, Lethal alleles, Epistasis - Recessive, Double recessive, dominant and double dominant.	
3.2	Chromosome theory of inheritance.	
3.3	Pedigree analysis - Autosomal dominant and autosomal recessive, X-linked dominant, and X-linked recessive	
Module 4	Multiple alleles and Polygenic inheritance	[15L]
<p>Learning Objectives:</p> <p>This module is intended to</p> <ul style="list-style-type: none"> • Define and explain alleles 		
<p>Learning Outcome:</p> <p>After the successful completion of the module, the learner will be able to</p> <ul style="list-style-type: none"> • Explain multiple alleles and polygenic inheritance • Understand the concept of pleiotropy. 		
4.1	Concept of multiple alleles, Coat colour in rabbit, ABO and Rh blood group systems	
4.2	Polygenic inheritance with reference to skin colour and eye colour in man.	
4.3	Concept of pleiotropy	
<p>References:</p> <ol style="list-style-type: none"> 1. Cell and Molecular Biology. Concepts and Experiments, Gerald Karp. John Wiley and Sons, Inc. New York. 2. Essentials of Cell and Molecular Biology. De Robertis E. D. P. and De Robertis E.M. F. 3. Inside the Living Cell, J. A. V. Buttlar 4. Cell Function, L. L. Langley 5. Cytology, P. S. Verma and V. K. Agarwal 6. Introductory Cytology, Veer Bala Rastogi 7. General Genetics, Adrian M. SRB Ray, D. Owen 8. Genetics, P. K. Gupta 9. Genetics, P. S. Verma and V. K. Agarwal 10. Human Heredity, C. O. Carter 11. Genetics, Edgar Altenburg 12. Heredity, David M. Bonner 		



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13. Janin vidya (Gujarati), Dr. B. S. Vaidya

Mapping of COs and POs

Course Outcomes	Programme Outcomes					
	1	2	3	4	5	6
Define and describe the endomembrane system.	X					
Sketch and explain mitochondria and elaborate its function.			X			
Describe the semiautonomous nature of mitochondria.		X				
Differentiate between various types of carbohydrates (monosaccharides, disaccharides, polysacchar) Explain the structure, origin, occurrence and function of eukaryotic ribosomes.			X			
Describe structure, origin, occurrence and function of peroxisomes.		X				
Understand and explain exceptions to Mendelian inheritance.	X					
Explain Chromosome theory of inheritance.		X				
Describe Pedigree analysis.		X				
Illustrate autosomal dominant and autosomal recessive, X-linked dominant, and X-linked recessive.		X				
Explain multiple alleles and polygenic inheritance		X				
Understand the concept of pleiotropy (and proteins (based on structure and function)).	X					

Unit	Remembering (1)	Understanding (2)	Applying (3)	Analyzing (4)	Evaluating (5)	Creating (6)	Total
I	30%	70%	-	-	-	-	100%
II	50%	50%	-	-	-	-	100%
III	35%	65%	-	-	-	-	100%
IV	30%	70%	-	-	-	-	100%

S. Y. B. Sc. (Zoology) SEMESTER IV

Course Name: Non Chordates, Chordates II, Tissue System [CC III]

Course Code: ZOOMN-S4P3-2CR25

Theory [Credits - 02]

Course learning outcome

After successfully completing this course, students will be able to:



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- Understand the general taxonomic rules on animal classification,
- Understand the principles and methods of taxonomy and the general characters of phylum Protozoa
- Understand the Protozoan parasites of human.
- Classify the phylum Porifera & Coelenterata using examples
- Understand the canal system of Porifera and polymorphism in Coelenterates.
- Classify phylum Helminthes & Annelida and metamerism in Annelids and parasitic adaptations of Helminthes
- Understand the taxonomy, classification, and distinguishing characteristics of Calotes species.
- Describe the morphological and anatomical adaptations of Calotes related to its habitat and lifestyle.
- Explain the physiological processes including digestion, respiration and reproduction in Calotes.
- Differentiate simple and compound microscope
- Different parts of microscope and their function.
- Describe location & function of tissues.
- Draw the structures of various tissues and label them.
- Sketch and label the microscopic details of tissues
- Differentiate between different types of microscopes.

Module 1 Classification up to subclass of Phyla [07L]

- Learning Objective**
- Understand the taxonomy, classification, and distinguishing characteristics of Calotes species.
 - Understand the general taxonomic rules on animal classification,

- Learning Outcomes:**
- Understand the general taxonomic rules on animal classification,
 - The principles and methods of taxonomy and the general characters of phylum
 - Explain the physiological processes, including digestion, respiration, and reproduction in Calotes.

1.1	1.1.1 Protozoa 1.1.2 Porifera 1.1.3 Coelenterata 1.1.4 Platyhelminthes 1.1.5 Aschelminthes 1.1.6 Annelida
1.2	Type Study: Calotes 1.2.1 External features and Digestive System with digestion process 1.2.2 Respiratory system 1.2.3 Circulatory System 1.2.4 Urinogenital System 1.2.5 Brain



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Module 2 Tissue system		[15L]
Learning Objective		
<ul style="list-style-type: none"> Explain the fundamental tissues in details Illustrate the working of microscopes 		
Learning Outcomes:		
<ul style="list-style-type: none"> Differentiate Simple and Compound microscope Different parts of microscope and their function. Describe location & function of tissues. Draw the structures of various tissues and label them Sketch and label the microscopic details of tissues Differentiate between types of Microscopes, their structure and working 		
1.1	Microscopy: 1.1.1 History of microscope (Simple and Compound microscope) 1.1.2 Structural Parts 1.1.3 Optical Parts 1.1.4 Focusing System 1.1.5 Practical Applications and Techniques 1.1.6 Resolution vs. Magnification 1.1.7 Difference between Simple and Compound microscope	[7L]
1.2	Tissue System: 1.2.1 Epithelial tissue: structure, location, classification and functions	[8L]
References:		
<ol style="list-style-type: none"> 1. Bamji, M.S., K. Krishnaswamy & G.N.V. Brahmam (2009) Textbook of Human Nutrition (3rd edition) Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi 2. Swaminathan (1995) Food & Nutrition (Vol I, Second Edition) The Bangalore Printing & Publishing Co Ltd., Bangalore 3. Vijaya Khader (2000) Food, nutrition & health, Kalyan Publishers, New Delhi 4. Srilakshmi, B., (2010) Food Science, (5th Edition) New Age International Ltd., New Delhi 5. S.S. Lal, S. Kumar, Immunology 2nd edition 		

Mapping of COs and POs

Course Outcomes	Programme Outcomes					
	1	2	3	4	5	6
Understand the general taxonomic rules on animal classification, The principles and methods of taxonomy and the general characters of phylum	X					
Protozoa and understand the protozoan's parasites of human.	X					



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Classify the phylum Porifera & Coelenterata using examples		X				
Understand the canal system of sponges and Polymorphism in Coelenterates.	X					
Phylum helminthes & Annelida with taxonomic keys, and a basic idea of metamerism in Annelids and parasitic adaptations of helminthes.	X					
Understand the taxonomy, classification, and distinguishing characteristics of Calotes species.	X					
Describe the morphological and anatomical adaptations of Calotes related to its habitat and lifestyle.		X				
Explain the physiological processes, including digestion, respiration, and reproduction in Calotes.		X				
Differentiate Simple and Compound microscope	X		X			
Different parts of microscope and their function.	X		X			
Describe location & function of tissues.		X				
Draw the structures of various tissues and label them			X			
Sketch and label the microscopic details of tissues			X			
Differentiate between types of Microscopes, their structure and working		X	X			

Unit	Remembering (1)	Understanding (2)	Applying (3)	Analyzing (4)	Evaluating (5)	Creating (6)	Total
I	20%	60%	20%	-	-	-	100%
II	40%	60%	-	-	-	-	100%

S. Y. B. Sc. (Zoology) SEMESTER IV

Course Name: Non Chordates, Chordates II and Tissue System [CC III]

Course Code: ZOOMN-S4PR3-2CR25

Practical [Credits - 02]

Course learning outcome

After successfully completing this course, students will be able to:

- Understand the general taxonomic rules on animal classification,
- Understand the principles and methods of taxonomy and the general characters of phylum Protozoa
- Understand the Protozoan parasites of human.
- Classify the phylum Porifera & Coelenterata using examples
- Understand the canal system of Porifera and polymorphism in Coelenterates.



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- Classify phylum Helminthes & Annelida and metamerism in Annelids and parasitic adaptations of Helminthes
- Understand the taxonomy, classification, and distinguishing characteristics of Calotes species.
- Describe the morphological and anatomical adaptations of Calotes related to its habitat and lifestyle.
- Explain the physiological processes including digestion, respiration and reproduction in Calotes.
- Differentiate simple and compound microscope
- Different parts of microscope and their function.
- Describe location & function of tissues.
- Draw the structures of various tissues and label them.
- Sketch and label the microscopic details of tissues
- Differentiate between different types of microscopes.

Practical Module (ZOOMN-S3PR3-2CR25)

[10L]

The following practical are to be taught / studied only with the help of charts, models, videos, photographs, permanent slides, working models etc.

1	<p>Classification of following animals up to sub class:</p> <p>I. Protozoa: Trypanosoma, Monocystis, Vorticella II. Porifera: Grantia, Euplectella, Spongilla III. Cnidaria: Hydra, Cyanea, Gorgonia IV. Helminthes: Planaria, Taenia, Ascaris V. Annelida: Aphrodite, Tubifex, Hirudomedicinalis</p>
2	<p>The following practical of Calotes to be taught/studied only with the help of Charts/models/videos/photographs/permanent slides, working models, simulators etc.</p> <p>VII. External characters VIII. Digestive system IX. Respiratory system X. Circulatory system XI. Urinogenital system XII. Brain</p>
3	To Study different parts of microscope (Simple & Compound Microscope)
4	To study different types of epithelial tissues. (Slide/ photograph)
5	To study different types of glandular tissues. (Slide/ photograph)



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Mapping of COs and POs

Course Outcomes	Programme Outcomes					
	1	2	3	4	5	6
Understand the general taxonomic rules on animal classification, The principles and methods of taxonomy and the general characters of phylum	X					
Protozoa and understand the protozoan's parasites of human.	X					
Classify the phylum Porifera & Coelenterata using examples		X				
Understand the canal system of sponges and Polymorphism in Coelenterates.	X					
Phylum helminthes & Annelida with taxonomic keys, and a basic idea of metamerism in Annelids and parasitic adaptations of helminthes.	X					
Understand the taxonomy, classification, and distinguishing characteristics of Calotes species.	X					
Describe the morphological and anatomical adaptations of Calotes related to its habitat and lifestyle.		X				
Explain the physiological processes, including digestion, respiration, and reproduction in Calotes.		X				
Differentiate Simple and Compound microscope	X		X			
Different parts of microscope and their function.	X		X			
Describe location & function of tissues.		X				
Draw the structures of various tissues and label them			X			
Sketch and label the microscopic details of tissues			X			
Differentiate between types of Microscopes, their structure and working		X	X			

S. Y. B. Sc. (Zoology) SEMESTER IV

Course Name: Apiculture [SEC]

Course Code: ZOOSEC-S4P4-2CR25

Practical [Credits - 02]

Course learning outcome

After successfully completing this course, students will be able to:

- Understand the biology, behaviour and life cycle of honey bees.
- Identify different species of honey bees and their role in pollination and biodiversity.
- Explain beekeeping equipment, hive management and seasonal care.
- Demonstrate skills in honey extraction, processing and value-added bee products.
- Evaluate the economic and ecological importance of apiculture in agriculture.



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Module 1	Practical	[10L]
Learning Objective		
Introduction, construction of bee-hive and management of Apiculture.		
Learning Outcomes:		
<ul style="list-style-type: none"> Understand the biology, behaviour and life cycle of honey bees. Identify different species of honey bees and their role in pollination and biodiversity. Explain beekeeping equipment, hive management and seasonal care. Demonstrate skills in honey extraction, processing, and value-added bee products. Evaluate the economic and ecological importance of apiculture in agriculture. 		
Practicals:		
<ol style="list-style-type: none"> 1. To study different species of honeybee used in apiculture. 2. To study different caste of honeybee. 3. To study life history of honeybee. 4. To study economic importance of honey and wax. 5. To study structure of honey comb/bee hive. 		
References:		
<ol style="list-style-type: none"> 1. Economic Zoology: G.S. Shukla & V.B. Upadhyay, Rastogi Publication, Meerut. 2. https://www.fao.org/3/i3531e/i3531604.pdf 		

Mapping of COs and POs

Course Outcomes	Programme Outcomes					
	1	2	3	4	5	6
Understand the biology, behaviour and life cycle of honey bees.	X					
Identify different species of honey bees and their role in pollination and biodiversity.		X				
Explain beekeeping equipment, hive management and seasonal care.		X				
Demonstrate skills in honey extraction, processing, and value-added bee products.		X				
Evaluate the economic and ecological importance of apiculture in agriculture.			X			

**S. Y. B. Sc. (Zoology) SEMESTER IV
Course Code : ZOOIKS-S4P2-2CR25**



**Course Name: Indian Knowledge System – Ancient Zoology
Theory [Credits - 02]**

Course learning outcome		
After successfully completing this course, students will be able to: <ul style="list-style-type: none"> • Know Animals and its by-product uses in ancient India • Explain Indian traditional methods for agriculture pest control • Know and explain The Sacred animals of Hinduism <ul style="list-style-type: none"> • Describe The significance of animals in Hinduism 		
Module 1	Animals and its by-product uses in ancient India	[15L]
Learning Objective		
<ul style="list-style-type: none"> • Animal as therapy 		
Learning Outcomes:		
<ul style="list-style-type: none"> • Know Animals and its by-product uses in ancient India • Explain Indian traditional methods for agriculture pest control 		
1	1.1 As therapy - Leech and Magoot 1.2 By products – Honey, Cow dung, Natural dyes from plants and insects 1.3 Insect as food 1.4 Indian traditional method for agriculture pest control	
Module 2	Biodiversity in ancient India	[15L]
Learning Objective		
<ul style="list-style-type: none"> • The significance of animals in Hinduism 		
Learning Outcomes:		
<ul style="list-style-type: none"> • Know and explain The Sacred animals of Hinduism • Describe The significance of animals in Hinduism 		
2.1	2.1.1 The Sacred animals of Hinduism: Elephant, Horse, Cow, Bull, Tiger, Monkey, Snake, Buffalo, Dog, Rat, Lion, Cat, Peacock 2.1.2 Hindu Gods / Goddesses and their amazing animal vehicle Elephant, Horse, Bull, Tiger, Male Buffalo, Mouse, Lion, Peacock, Owl, Swan, Crow, Donkey, Eagle 2.1.3 The significance of animals in Hinduism: Spiritual nature of animals Classification of beings The value of interdependence The virtue of service to animals Symbolic importance Relationship with God Animals incarnations of God	[15L]



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References:

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2. Natural Dyeing Processes Of India (Standard Edition) By: B.C. Mohanty, K.V. Chandramouli and H.D.Naik
3. Handbook on Natural Dyes for Industrial Applications (Extraction of Dyestuff from Flowers, Leaves, Vegetables) 2nd Revised Edition By Dr. Padma S Vankar
4. Traditional Pest Control Methods: Old-style Ways of Controlling Your Insect Enemies by DweepJyot Singh (Author), John Davidson (Author), Mendon Cottage Books (Author)
5. Home Remedies Honey by Dr. Rajiv Sharma (Author)
6. Leech therapy in ayurveda By Dr.M.BhaskarRao (Author), Dr.Hemanth Kumar Kushwaha (Author)
7. Leech Therapy in Traditional Medicine: Hirudotherapy by Syed I. Hasan (Author), TanwirAlam (Author)
8. Animal Husbandry and Allied Technologies in Ancient India - Joglekar P. P.
9. Animal Husbandry in Ancient Indian Literature - Tomar Kumar Aruna
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12. History of Science in India - Plant and Animal Science (Volume IV in Two Parts)
13. <https://www.yourpetspace.info/hindu-animal-vehicles/>
14. <https://www.hinduwebsite.com/hinduism/essays/sacred-animals-of-hinduism.asp>
15. https://www.hinduwebsite.com/hinduism/h_animals.asp.
16. <https://www.hinduwebsite.com/hinduism/essays/animals.asp>

Mapping of COs and POs

Course Outcomes	Programme Outcomes					
	1	2	3	4	5	6
Know Animals and its by-product uses in ancient India	X					
Explain Indian traditional methods for agriculture pest Control		X				
Know and explain The Sacred animals of Hinduism		X				
Describe The significance of animals in Hinduism	X	X				
Know Animals and its by-product uses in ancient India	X					
Explain Indian traditional methods for agriculture pest Control		X				



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Unit	Remembering (1)	Understanding (2)	Applying (3)	Analyzing (4)	Evaluating (5)	Creating (6)	Total
I	50%	50%	-	-	-	-	100%
II	40%	60%	-	-	-	-	100%