



**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 III

Program: B.Sc.

Course: ZOOLOGY

For

Academic year

2025-26

(NEP-2020)

Effective from June 2025-26



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



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

Content

Sr. No	Semester	Course number	Course Code	Course Title
Core Course (CC)				
1	III	CC V	ZOOMJ-S3P5-2CR25	Non Chordates and Chordates II
2		CC V	ZOOMJ-S3PR5-2CR25	Non Chordates and Chordates II
3		CC VI	ZOOMJ-S3P6-2CR25	Microscopy, Tissue system and Cell Cycle
4		CC VI	ZOOMJ-S3PR6-2CR25	Microscopy, Tissue system and Cell Cycle
5		CC VII	ZOOMJ-S3P7-4CR25	Cell Biology and Genetics-I
6		MDC III	ZOOMDC-S3P3-4CR25	Nutrition, Health and Hygiene
7		SEC III	ZOOSec-S3P3-2CR25	Vermiculture
8		IKS I	ZOOIKS-S3P1-2CR25	Indian Knowledge System- Ancient Zoology



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 III									
Major Courses THEORY and PRACTICAL									
MJ: CC V	Non Chordates and Chordates II	ZOOMJ-S3P5-2CR25	2	30	2	15	25	25	50
Practical	Non Chordates and Chordates II Lab Course	ZOOMJ-S3PR5-2CR25	2	30	2	15	25	25	50
MJ:CC VI	Microscopy, Tissue system & Cell Cycle	ZOOMJ-S3P6-2CR25	2	30	2	15	25	25	50
Practical	Microscopy, Tissue system & Cell Cycle Lab Course	ZOOMJ-S3PR6-2CR25	2	30	2	15	25	25	50
MJ:CC VIII	Cell Biology and Genetics	ZOOMJ-S3P7-4CR25	4	60	4	15	50	50	100
MDC III	Nutrition, Health and Hygiene	ZOOMDC-S3P3-4CR25	4	60	4	15	50	50	100
SEC III	Vermiculture	ZOOSec-S3P3-2CR25	2	60	2	15	25	25	50
IKS I	Indian Knowledge System - Ancient Zoology	ZOOIKS-S3P1-2CR25	2	30	2	15	25	25	50



S. Y. B. Sc. (Zoology) SEMESTER III
Course Name: Non Chordates and Chordates II [CC V]
Course Code: ZOOMJ-S3P5-2CR25
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• Learn the principles and methods of taxonomy and the general characters of phylum• Identify a range of invertebrate and vertebrate animal• Gain knowledge about earthworm		
Module 1	Classification up to subclass of Phyla	[15L]
Learning Objective		
<ul style="list-style-type: none">• Differentiate animals as per taxonomy.		
Learning Outcomes:		
<ul style="list-style-type: none">• 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 phylum Porifera and Polymorphism in Coelenterates.• Understand Phylum Helminthes & Annelida with taxonomic keys and a basic idea of metamerism in Annelids and parasitic adaptations of Helminthes.• Gain knowledge about morphology and physiology of earthworm.• Understand the ecology and breeding of earthworms.• Study all the systems and nephridia of earthworm (Virtual).• Study T.S. through pharynx, gizzard, and typhlosolar intestine of earthworm.		
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	[7L]
1.2	Type Study: Earthworm 1.2.1 External features and Digestive System with digestion process 1.2.2 Blood vascular system 1.2.3 Excretory System 1.2.4 Nervous system,	[8L]



	1.2.5 Reproductive System 1.2.6 Economic importance of Earthworm	
Module 2	Classification up to subclass of Class	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"> • Identify the taxonomic status and evolutionary significance of entire Chordates. • Gain basic knowledge of Pisces and their anatomical features. • State the animal classification. • Enlist the examples of the phylum and classes studied. • Comment on the modifications of common animal forms of the groups studied 		
	2.1 Protochordates 2.2 Pisces 2.3 Amphibia 2.4 Reptiles 2.5 Aves 2.6 Mammals	[15L]
References:		
<ol style="list-style-type: none"> 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. Modern Text Book of Zoology, 1992, R. L. Kotpal, Rastogi Publication, Meerut.
 15. Chordate Zoology, 1982, P. S. Dhami and J. K. Dhami, R. Chand and Co., New Delhi.
 16. The life of Vertebrates, 3rd edn.1993, J. Z. Young, Oxford University Press, USA.
 17. The Phylum Chordata: Biology of Vertebrates and their Kin, 1987, H. H. Newman, Distributor Satish book enterprise, Agra.
 18. A text book of Zoology, 1984, R. D. Vidyarthi, S. Chand and Co., New Delhi.
 19. Comparative Anatomy of the Vertebrates, G. C. Kent, R. K Carr,9thEdn., 2001, McGraw Hill, Boston, USA
 20. Practical Zoology Invertebrates, 11th revised Edn., 2014, S. S. Lal, Rastogi publ.,Meerut.
 21. Vertebrate Practical Zoology, 11th revised Edition, 2014, S. S. Lal, Rastogi publ., Meerut.
 22. Practical Zoology, 2004, Vijay Laxmi Sharma, Paragon International Publishers.
 23. The anatomy of Garden Lizard, 1974, S.Y. Paranjape, Pune University Publication, Pune.
 24. Chordate Zoology, 2009 reprint, E. L. Jordan, S. Chand and Co., New Delhi.
 25. Text book of Zoology, Vertebrates, Vol. II, T.J. Parker and W.A. Haswell, edited by Marshall and Williams, CBS Publications, New Delhi.
 26. Young, J. Z. (2004). The Life of Vertebrates. III Edition. Oxford university press.
 27. Pough H. Vertebrate life, VIII Edition, Pearson International.
 28. Hall B.K. and Hallgrimsson B. (2008). Strickberger's Evolution. IV Edition. Jones and Bartlett Publishers Inc.
 29. Outline of comparative anatomy of vertebrate Kingsley J. S. Central book depot. Allahabad
 30. Kardong, K.V. (2005) Vertebrates' Comparative Anatomy, Function and Evolution. IV Edition. McGraw-Hill Higher Education.
 31. Kent, G.C. and Carr R.K. (2000). Comparative Anatomy of the Vertebrates. IX Edition. The McGraw-Hill Companies.
 32. Hilderbrand, M and Gaslow G.E. Analysis of Vertebrate Structure, John Wiley and Sons.
 33. Walter, H.E. and Sayles, L.P; Biology of Vertebrates, Khosla Publishing House.
 34. JUNQUEIRA'S Basic Histology Text & Atlas by Anthony L. Mescher
 35. Vertebrate Zoology: An Experimental Field Approach-Nelson G. Hairston. Cambridge University Press, 1994
 36. Chordate Zoology E.L Jordan & P. S. Verma. S.Chand
 37. Vertebrate Zoology: An Experimental Field Approach-Nelson G.Hairston. Cambridge University Press, 1994
 38. Text Book of Zoology - Dalela and Verma. Jay Prash Nath & co. Meeru
 39. Text Book of Zoology - S.N. Prasad. Vikas Publishing House pvt.ltd. Delhi
 40. Chordate Zoology - Agrawal and Dalela. Jay Prash Nath& co. Meerut
 41. Text book of Zoology - R. D. Vidyarthi. S.Chand
 42. Jiv Vignan-2 (Gujarati) - NiravPrakashan.
 43. A Text Book of General Biology – Tomer & Singh. Rastogi Publication, Meerut
 44. Text Book of Chordates - A. Thangamani, S. Prasanna Kumar
 45. Prushthvanshi Praniyoane Garbhvidya - A.B.Vyas. Guj.Granthnirman Board.



46. Utkrushtha Aprushthvanshi Praniyo - U.M.Rawal. Guj.Granthnirman Board.
 47. Chordate Zoology - Majupuria.
 48. A Manual of Zoology Vol. I & II - EkambarnathAyar. S. Vishwanathan Chennai.
 49. [Chromeextension://efaidnbmnnnibpcajpcglclefindmkaj/https://pvpkm.ac.in/upload/StudyMaterial/6.%20%20Non-Chordates%20concept%20\(Unit%20I\).pdf](https://pvpkm.ac.in/upload/StudyMaterial/6.%20%20Non-Chordates%20concept%20(Unit%20I).pdf)

Mapping of COs and POs

Course Outcomes	Programme Outcomes					
	1	2	3	4	5	6
Understand the general taxonomic rules on animal classification,	X					
Understand 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	X			
Gain knowledge about earthworm, morphology and their physiology			X			
Understand the ecology and breeding of earthworms		X				
Study of all systems, nephridia of earthworm (Virtual).			X			
T.S. through pharynx, gizzard, and typhlosolar intestine of earthworm.			X			
Identify the taxonomic status and evolutionary significance of entire Chordates.		X				
Gain basic knowledge of Pisces and their anatomical features.		X				
Enlist the examples of the phylum and classes studied.	X					

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



S. Y. B. Sc. (Zoology) SEMESTER III
Course Name: Non Chordates and Chordates II [CC V]
Course Code: ZOOMJ-S3PR5-2CR25
Practical [Credits - 02]

Course Learning Outcome

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

- Identify various animals based on morphological features of non- chordate and chordate animals.
- Comment on the modifications of common animal forms of the groups studied.
- Study all systems, nephridia of earthworm (Virtual).
- Understand T.S. through pharynx, gizzard and typhlosolar intestine of earthworm

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. Protozoa: Trypanosoma, Monocystis, Vorticella II. Porifera: Grantia, Euplectella, Spongilla III. Cnidaria: Hydra, Cyanea, Gorgonia IV. Helminthes: Planaria, Taenia, Ascaris V. Annelida: Aphrodite, Tubifex, Hirudomedicinalis
2	The following practical of Earthworm to be taught/studied only with the help of Charts/models/videos/photographs/permanent slides, working models, simulators etc. I. External features II. Digestive system III. Reproductive system IV. Nervous system V. Mounting of blood glands VI. Mounting of setae VII. Mounting of septal nephridia VIII. Mounting of Spermatheca
3	Permanent slides of earthworm: I. T.S. passing through pharynx II. T.S. passing through gizzard III. T.S. passing through typhlosolar region IV. T.S. passing through testis V. T.S. passing through ovary
4	Classification of following animals up to sub class:



		I. Protochordata: Ascidian, Amphioxus II. Cyclostomata: Myxine III. Pisces: Stegostomata, Trygon, Chimaera, Protopterus, Polydon, Hilsa, Anabus, Opheocephalus IV. Amphibia: Uruaeotyphlus, Siren, Ambystoma, Rhacophorus, Frog V. Reptilia: Testudo, Varanus, Draco, Python VI. Aves: Vulture, Wood Packer, Kiwi, Koel VII. Mammalia: Echidna, American Koala, Porcupine, Dolphin	

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 and chordate animals.		X				
Comment on the modifications of common animal forms of the groups studied.		X				
Study of all systems, nephridia of earthworm (Virtual).			X			
T.S. through pharynx, gizzard, and typhlosolar intestine of earthworm			X			

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

Course Name: Microscopy, Tissue System and Cell Cycle [CC VI]

Course Code: ZOOMJ-S3P6-2CR25

Theory [Credits - 02]

Course learning outcome		
After successfully completing this course, students will be able to: <ul style="list-style-type: none"> • Review the principles of light microscopy and identify the major parts of the microscope. • Learn how to use the microscope to view slides of several different cell types • List the various types of tissues. 		
Module 1	Microscopy and 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 1.2.2 Muscular tissue: types, structure, location and functions 1.2.3 Connective tissues: Classification, Structure, Location and Functions 1.2.4 Nervous tissue: Types, Structure, Location and Functions	[8L]
Module 2	Cell division and Cell cycle	15L
Learning Objective		
Understand the mechanisms of cell division and control.		
Learning Outcomes:		
<ul style="list-style-type: none"> • Different phases of cell cycle • Define: Cell cycle, Interphase, Mitosis and Meiosis • Importance of cell cycle and check points • Differentiate between Mitosis and Meiosis • Sketch different phases of cell cycle 		
2.1	Mitosis and meiosis	
2.2	Phase of cell cycle	
2.3	Regulation and control of cell cycle	
References:		
<ol style="list-style-type: none"> 1. Dr. Ramesh Gupta (2006) Modern Zoology, Prakash Publication Muzaffarnagar 2. P.S.Dhami & H.N.Srivastava, (2003) A Text Book of Biology, pradeep publication 3. Guyton, A.C. & Hall, J.E. (2006). Textbook of Medical Physiology. XI Edition. Hercourt 		



Asia PTE Ltd. W.B. Saunders Company.

4. Tortora, G. J. & Grabowski, S. (2006). Principles of Anatomy & Physiology. XI Edition John Wiley & sons.
5. Vander A, Sherman J. and Luciano D. (2014). Vander's Human Physiology: The Mechanism of Body Function. XIII Edition, McGraw Hills.
6. Karp, G. (2010). Cell and Molecular Biology: Concepts and Experiments. VI Edition.
7. De Roberti's, E.D.P. and De Robertis, E.M.F. (2006). Cell and Molecular Biology. VIII Edition. Lippincott Williams and Wilkins, Philadelphia.
8. Cooper. G.M. and Hausman. R.E. (2009). The Cell: A Molecular Approach. V Edition ASM Press and Sunderland. Washington. D.C, Sinauer Associates, MA.
9. [Chromeextension://efaidnbmnnnibpcajpcglclefindmkaj/https://egyankosh.ac.in/bitstream/123456789/76467/1/Unit-1.pdf](https://egyankosh.ac.in/bitstream/123456789/76467/1/Unit-1.pdf)
10. [chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://webstor.srmist.edu.in/web_assets/srm_mainsite/files/downloads/Animal_Tissues.pdf](https://webstor.srmist.edu.in/web_assets/srm_mainsite/files/downloads/Animal_Tissues.pdf)

Mapping of COs and POs

Course Outcomes	Programme Outcomes					
	1	2	3	4	5	6
Differentiate Simple and Compound microscope			X			
Different parts of microscope and their function.			X			
Describe location & function of tissues.		X		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			
Different phases of cell cycle			X			
Define: Cell cycle, Interphase, Mitosis and Meiosis	X	X				
Importance of cell cycle and check points	X					
Differentiate between Mitosis and Meiosis			X			
Sketch different phase of cell cycle			X			



Unit	Remembering (1)	Understanding (2)	Applying (3)	Analyzing (4)	Evaluating (5)	Creating (6)	Total
I	10%	40%	30%	20%	-	-	100%
II	15%	60%	25%		-	-	100%

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

Course Name: Microscopy, Tissue System and Cell Cycle [CC VI]

Course Code: ZOOMJ-S3PR6-2CR25

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">• Review the principles of light microscopy and identify the major parts of the microscope.• Learn how to use the microscope to view slides of several different cell types• Preparation of temporary slides of Mitosis and Meiosis	
Practical Module – I (ZOOMJ-S3PR5-2CR25) [10L]	
The following practical are to be taught / studied only with the help of charts, models, videos, photographs, permanent slides, working models etc.	
1	<ol style="list-style-type: none">1. To study parts of microscope and their function. (simple and compound microscope)2. Determination of blood group.3. To prepare blood smear and study blood corpuscles.4. Enumeration of white blood cells using haemocytometer.5. Estimation of haemoglobin using Sahli's haemoglobinometer.6. To study different types of muscles (Slide/ photograph)7. To study different types of neurons (Slide/ photograph)8. To study bones and cartilages. (Slide/ photograph)9. To study different types of epithelial tissues. (Slide/ photograph)10. To study mitosis & meiosis through permanent slides. (Slide/ photograph)11. Preparation of mitosis and meiosis by squash method from preserved testis of grasshopper.



Mapping of CLOs and PSOs

Course Learning Outcomes	Programme Outcomes					
	1	2	3	4	5	6
Review the principles of light microscopy and identify the major parts of the microscope.			X			
Learn the microscope to view slides of several different cell types.		X	X			
Preparation of temporary slides of mitosis and meiosis.				X		

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

Course Name: Cell Biology and Genetics - I [CC VII]

Course Code: ZOOMJ-S3P7-4CR25

Theory [Credits - 04]

Course learning outcome		
<p>After successfully completing this course, students will be able to:</p> <ul style="list-style-type: none"> • Define cell biology • Understand the scope of cell biology. • Illustrate the cell theory. • Sketch animal cell and describe its function. • Explain the structure and function of nucleus. • Understand the types of chromatins. • Sketch the cytoskeletal elements and describe them in details. • Define and explain the scope and importance of genetics. • Explain the concept of gene. • Understand and explain allele, wild type and mutant alleles, locus • Explain dominant and recessive traits, homozygous and heterozygous, genotype and phenotype. • Describe Mendelian inheritance. 		
Module 1	Introduction to cell biology	[07L]
<p>Learning Objective</p> <ul style="list-style-type: none"> • Understand the scope of cell biology. • Illustrate the cell theory 		
<p>Learning Outcomes:</p> <ul style="list-style-type: none"> • Define cell biology • Understand the scope of cell biology. • Illustrate the cell theory. • Sketch animal cell and describe its function. 		



1.1	Definition and scope of cell biology.	
1.2	Concept of cell theory	
1.3	Generalized Eukaryotic (animal) cell – Structure and function.	
Module 2	Cell organelles	[15L]
Learning Objective		
Cell organelles importance		
Learning Outcomes:		
<ul style="list-style-type: none"> • Explain the structure and function of nucleus • Illustrate internal structure of nucleus 		
2.1	Nucleus: Size, shape, number and position, Structure and functions of interphase nucleus, nucleolus	
2.2	Chromatin: euchromatin, heterochromatin.	
2.3	Cytoskeletal elements: microtubules, microfilaments – structure and function.	
Module 3	Mendelian Inheritance	[15L]
Learning Objectives:		
This module is intended to		
<ul style="list-style-type: none"> • Understand Mendelian inheritance. • Learn genetic and metabolic syndromes. 		
Learning Outcome:		
After the successful completion of the module, the learner will be able to		
<ul style="list-style-type: none"> • Explain dominant and recessive traits, homozygous and heterozygous, genotype and phenotype. • Describe Mendelian inheritance. 		
3.1	Mendel's laws: Law of segregation of alleles, Law of Independent Assortment	
3.2	Monohybrid, dihybrid and trihybrid ratios: test cross and self-cross, Punnet square	
3.3	Mendelian traits in human.	
Module 4	Concept of genetics	[15L]
Learning Objectives:		
This module is intended to		
<ul style="list-style-type: none"> • Define and explain the scope and importance of genetics 		



Learning Outcome:

After the successful completion of the module, the learner will be able to

- Define and explain the scope and importance of genetics.
- Explain the classical and modern concept of gene.
- Understand and explain allele, wild type and mutant alleles, locus

4.1	Definition, scope and importance of genetics.	
4.2	Gene concept	
4.3	Allele, wild type and mutant alleles, locus	
4.4	Dominant and recessive traits, homozygous and heterozygous, genotype and phenotype.	

References:

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. Buttler
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
13. Janin vidya (Gujarati), Dr. B. S. Vaidya
14. <https://microbenotes.com/category/cell-biology/>

Mapping of COs and POs

Course Outcomes	Programme Outcomes					
	1	2	3	4	5	6
Define cell biology	X					
Understand the scope of cell biology.	X					
Illustrate the cell theory.		X				
Sketch animal cell and describe its function.		X				
Explain the structure and function of nucleus.		X				
Understand the types of chromatin.	X					
Sketch the cytoskeletal elements and describe them in details.		X				



Define and explain the scope and importance of genetics.						
Explain the concept of gene.	X					
Understand and explain allele, wild type and mutant alleles, locus	X					
Explain dominant and recessive traits, homozygous and heterozygous, genotype and phenotype.		X				
Describe Mendelian inheritance		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	50%	50%	-	-	-	-	100%

S. Y. B. Sc. (Zoology) SEMESTER III
Course Name: Nutrition, Health and Hygiene [MDC]
Course Code: ZOOMDC-S3P3-4CR25
Theory [Credits - 04]

Course learning outcome		
After successfully completing this course, students will be able to:		
<ul style="list-style-type: none"> • Define nutrition, health and hygiene • Understand importance of nutrients • Understand balance diet • Explain factors that affect human health • Understand mental and physical health • Understand importance of personal hygiene in daily life • Describe hygiene practices • Define vaccines • Understand types of vaccine and its application 		
Module 1	Nutrition	[07L]
Learning Objective		



<ul style="list-style-type: none"> Understand importance of nutrients 	
Learning Outcomes:	
<ul style="list-style-type: none"> Define nutrition, health, hygiene and nutrients Understand importance of nutrients Understand balanced diet 	
1.1	Introduction of nutrition
1.2	Importance of nutrition and causes of malnutrition
1.3	Basics of balanced diet and meal planning
1.4	Macronutrients (Carbohydrates, proteins, fats), Micronutrient (Vitamins, Minerals), their functions and deficiencies
Module 2 Health	
[8L]	
Learning Objective	
Learn human health and different organizations working in field of human health.	
Learning Outcomes:	
<ul style="list-style-type: none"> Explain factors affecting human health Understand mental and physical health 	
2.1	Introduction to human health
2.2	Dimensions of human health (Physical and Mental)
2.3	Importance and factors affecting human health
2.4	Health Organizations (e.g. WHO, UNICEF)
Module 3 Hygiene	
[8L]	
Learning Objectives:	
This module is intended to	
<ul style="list-style-type: none"> Understand genetic and metabolic syndromes. 	
Learning Outcome:	
After the successful completion of the module, the learner will be able to	
<ul style="list-style-type: none"> Understand importance of personal hygiene in daily life Describe hygiene practices 	
3.1	Definition of hygiene and its role in disease prevention
3.2	Importance of personal hygiene
3.3	Hygiene in specific settings (e.g. educational place, hospitals and other public places)
Module 4 Vaccines and its applications	
[7L]	



Learning Objectives:	
This module is intended to	
<ul style="list-style-type: none"> • Different types of vaccine and basic of applications 	
Learning Outcome:	
After the successful completion of the module, the learner will be able to	
<ul style="list-style-type: none"> • Define vaccine • Understand types of vaccine and its application 	
4.1	Introduction to vaccines
4.2	Types of vaccines
4.3	Application of vaccines
4.4	Covid-19
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 6. https://www.niehs.nih.gov/health/topics/nutrition 	

Mapping of COs and POs

Course Outcomes	Programme Outcomes					
	1	2	3	4	5	6
Define Nutrition, Health, Hygiene, Nutrients	X					
Understand importance of nutrients	X					
Understand balance diet	X					
Explain factors that affect human health		X				
Differentiate mental and physical health		X				
Understand mental and physical health	X					
Understand importance of personal hygiene in daily life	X					
Describe hygiene practices		X				
Define vaccine	X					
Understand types of vaccine and its application	X					



Unit	Remembering (1)	Understanding (2)	Applying (3)	Analyzing (4)	Evaluating (5)	Creating (6)	Total
I	45%	55%	-	-	-	-	100%
II	30%	70%	-	-	-	-	100%
III	35%	65%	-	-	-	-	100%
IV	50%	50%	-	-	-	-	100%

S. Y. B. Sc. (Zoology) SEMESTER III
Course Name: Vermiculture [SEC]
Course Code: ZOOSEC-S3P3-2CR25
Practical [Credits - 02]

Course learning outcome

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

- Understand the basics of vermiculture
- Identify suitable earthworm species
- Analyse vermicomposting processes
- Evaluate soil and compost quality
- Apply vermiculture in agriculture and waste management
- Understand entrepreneurial skills in vermiculture

Module 1

Practical

[10L]

Learning Objective

Introduction, Construction and Management of Vermiculture.

Learning Outcomes:

- Understand the basics of vermiculture
- Identify suitable earthworm species
- Analyse vermicomposting processes
- Evaluate soil and compost quality

1. To study different species of earthworms used in vermiculture.
2. To study vermibed preparation.
3. To study maintenance of vermicompost unit.
4. To study collection of prepared vermicompost.



5. Field visit of vermicompost unit.

References:

1. Economic Zoology: G. S. Shukla & V. B. Upadhyay, Rastogi Publication, Meerut.
2. <https://www.fao.org/3/i3531e/i3531604.pdf>

Mapping of CLOs and PSOs

Course Learning Outcomes	Programme Outcomes					
	1	2	3	4	5	6
Understand the basics of vermiculture	X					
Identify suitable earthworm species		X				
Analyse vermicomposting processes			X			
evaluate soil and compost quality			X			
Apply vermiculture in agriculture and waste management		X				
Entrepreneurial skills in vermiculture			X			

**S. Y. B. Sc. (Zoology) SEMESTER IV
Course Code : ZOOIKS-S3P1-2CR25**

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

Course learning outcome

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

- Students will demonstrate comprehensive knowledge of traditional Indian wisdom about animal sciences
- (PraniVigyan) and understand its relevance in contemporary contexts.
- Students will analyze and interpret the holistic approach of Indian Knowledge Systems (IKS) to animal
- classification, conservation, and human- animal relationships.
- Students will evaluate the scientific basis behind traditional practices related to animal husbandry, particularly
- focusing on indigenous cattle breeds and their significance.
- Students will integrate traditional knowledge about animals with modern scientific understanding to develop
- sustainable ecological practices.
- Students will identify and appreciate the symbolism of animals in Indian culture, mythology, and spiritual
- traditions, understanding their deeper significance.
- Students will develop skills to document and preserve traditional knowledge about animals that is passed down through generations by various communities across India.



Module 1	Different Varga as per Vedas	[15L]
Learning Objective		
<ul style="list-style-type: none"> • Human- animal relationships. 		
Learning Outcomes:		
<ul style="list-style-type: none"> • classification, conservation, and human- animal relationships. • Students will evaluate the scientific basis behind traditional practices related to animal husbandry, particularly focusing on indigenous cattle breeds and their significance. • Students will integrate traditional knowledge about animals with modern scientific understanding to develop 		
1	1.1 JalaVarga: Aquatic animals and their significance 1.2 DugdhaVarga: Milk-producing animals and milk products 1.3 MadhuVarga: Honey bees and other insects producing beneficial substances 1.4 MamsaVarga: Classification of animals based on their flesh Characteristics 1.5 MutraVarga: Understanding of medicinal properties of animal urine	
Module 2	Importance of Cows in Agriculture	[15L]
Learning Objective		
<ul style="list-style-type: none"> • appreciate the symbolism of animals in Indian culture 		
Learning Outcomes:		
<ul style="list-style-type: none"> • Students will identify and appreciate the symbolism of animals in Indian culture, mythology, and spiritual traditions, understanding their deeper significance. • Students will develop skills to document and preserve traditional knowledge about animals that is passed down through generations by various communities across India 		
2.1	2.1 Traditional organic farming using cow-based inputs 2.2 Soil health and cow-based fertilizers 2.3 Pest management using cow products 2.4 Integration of cattle in sustainable agricultural system	[15L]
References:		
1. Cow Dung For Food Security And Survival of Race By SachdevaDasa Human 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
10. Ancient Indian Scientific Thought and Modern Theories - Sanjit Kumar SadhukhanDhirendranath Banerjee
11. Ancient Indian insights and modern science - KalpanaParanjape
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
Students will demonstrate comprehensive knowledge of traditional Indian wisdom about animal sciences	X					
(PraniVigyan) and understand its relevance in contemporary contexts.	X					
Students will analyze and interpret the holistic approach of Indian Knowledge Systems (IKS) to animal		X				
classification, conservation, and human- animal relationships.		X				
Students will evaluate the scientific basis behind traditional practices related to animal husbandry, particularly		X				

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