B.Sc. ZOOLOGY DEGREE COURSE

(With effect from 2023 - 2024)

S. No.	Part	Study Components Course Title		Ins. Hrs / week	Credit	Title of the Paper	Maximum Marks		
		SEMESTER II					**CIA**	**Uni. Exam**	**Total**
6	I	Language	Paper-2	6	3		25	75	100
7	II	English	Paper-2	6	3		25	75	100
8	III	Core Theory	Paper-III	4	5	Chordata	25	75	100
9	III	Core lab course	Practical -II	3	3	chordata Lab course	25	75	100
10	III	Elective Courses(EC2)	Paper-II	4	3	Chemistry-II Botany-II (To choose any one)	25	75	100
11	III	Elective Courses(EC2): Practical	Practical -I	3	3	Chemistry - II practical Botany - II Practical (To choose any one)	25	75	100
12	IV	Skill Enhancement Course-II	SEC II	2	2	1.Ornamental fish farming and management. 2.Biocomposting for enterpreneurship 3.Aquarium keeping 4.Medical laboratory techniques (To choose any one)	25	75	100
	IV	Skill enhancement course- III	SEC -III	2	2	1.Biophysics and biostatistics 2.Basic course in ornithology 3.Basics of marine biology 4. Economic zoology 5..Bioinstrumentation (To choose any one)	25	75	100
		Sem. Total		**30**	**24**		**200**	**600**	**800**

SEMESTER - II

Course Code CC3	Course Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
	CHORDATA	Core	Y	-	-	-	5	4	25	75	100

Learning Objectives	
CO1	To understand the structures and distinct features of Phylum Chordata.
CO2	To understand and able to distinguish the characteristic features of each subphylum and class.
CO3	To understand the economic importance of vertebrates
CO4	To know about the adaptations of vertebrates
CO5	To understand the evolutionary position of different groups of vertebrates

UNIT	Details	No. of Hours	Course Objectives
I	**General Characters and Classification of Phylum Chordata**: Origin of Chordata, Differences between non-chordates and chordates, General characters, Affinities and Systematic position of Prochordates. Hemichordata (*Balanoglossus*), Urochordata (*Ascidia*), Cephalochordata (*Amphioxus*).	12	CO1, CO2
II	**Subphylum vertebrata.** Classification of Vertebrata up to Class level, Agnatha (*Petromyzon*), Gnathostomata. –Class: Pisces (*Scoliodon sorrakowah*) General characters and classification, Origin of fishes, Affinities of Dipnoi - Types of scales and fins - Accessory respiratory organs - Air bladder - Parental care - Migration - Economic importance.	12	CO1, CO2, CO4, CO5
III	**Class: Amphibia** : General characters and classification - Origin of Amphibia - Type study - *Rana hexadactyla* - Adaptive features of Anura, Urodela and Apoda - Neoteny in Urodela - Parental care in Amphibia.	12	CO1, CO2, CO3, CO4, CO5
IV	**Class: Reptilia** : General characters and classification - Type study – (*Calotes versicolor (endoskeleton of Varanus*) - Origin of reptiles and effects of terrestrialisation, Extinct reptiles. Snakes of India. Poison apparatus and biting mechanism of poisonous snakes - Skull in reptiles as basis of classification	12	CO1, CO2, CO4, CO5
V	**Class: Aves and Mammalia :** Aves: General characters and classification – Type study - *Columba livia* - Origin of birds, Archaeopteryx. Flightless birds- Ratitae, Flight adaptations, Migration. A Mammalia: General characters and classification - Type study - Rabbit - Adaptive radiation in mammals - Egg laying mammals,	12	CO1, CO2, CO4, CO5

	Marsupials, Flying mammals, Aquatic mammals, Dentition in mammals.		
	Total	**60**	

Course Outcomes

Course Outcomes	On completion of this course, students will;	
CO1	Classify, Identify and recall the name and distinct features of different subphylum belonging to phylum Chordata.	PO1
CO2	Explain, and relate the origin, structural organization and evolutionary aspects of vertebrates.	PO1, PO2
CO3	Analyze, compare and distinguish the developmental stages and describe the important biological process.	PO3, PO4, PO5
CO4	Correlate the different modes of life and parental care among different vertebrates.	PO3, PO5, PO6
CO5	Summarise the morphology and ecological adaptations in vertebrates and list out the economic importance.	PO2, PO3, PO5, PO8

Text Books
(Latest Editions)

1.	Ayyar, E.K. and T.N. Ananthakrishnan, 1992. Manual of Zoology Vol. II (Chordata), S. Viswanathan (Printers and Publishers) Pvt Ltd., Madras, 891p.
2.	Jordan, E.K. and P.S. Verma, 1995. Chordate Zoology and Elements of Animal Physiology, 10th edition, S. Chand & Co Ltd., Ram Nagar, New Delhi, 1151 pp.
3.	Nigam, H.C., 1983. Zoology of Chordates, Vishal Publications, Jalandhar - 144008, 942.
4.	Ganguly, Sinha,. Bharati Goswami and Adhikari, 2004. Biology of animals Vol.II - New central book Agency (p) Ltd.
5.	Kotpal. R.L. A, Modern text book of Zoology Vertebrates- Rastogi publications. 2009

References Books
(Latest editions, and the style as given below must be strictly adhered to)

1.	Darlington P.J. The Geographical Distribution of Animals, R.E. Krieger Pub. Co.
2.	Hall B.K. and Hallgrimsson B. (2008). Strickberger's Evolution. IV Edition. Jones and Bartlett Publishers Inc.
3.	Hickman, C.P. Jr., F.M.Hickman and L.S. Roberts, 1984. Integrated Principles of Zoology, 7th Edition, Times Merror/Mosby College Publication. St. Louis. 1065 pp.
4.	Newman, H.H., 1981. The Phylum Chordata, Satish Book Enterprise, Agra – 282 003, 477 pp.
5.	Parker and Haswell, 1964. Text Book of Zoology, Vol II (Chordata), A.Z.T,B.S. Publishers and Distributors, New Delhi - 110 051, 952 pp.
6.	Pough H. Vertebrate life, VIII Edition, Pearson International.
7.	Waterman, Allyn J. et al., 1971. Chordate Structure and Function, Mac Millan

	&Co., New York, 587 pp.	
8.	Young, J. Z. (2004). The Life of Vertebrates. III Edition. Oxford university press.	
Web Resources		
1.	http://tolweb.org/Chordata/2499	
2.	https://www.nhm.ac.uk/	
3.	https://bit.ly/3Av1Ejg	
4.	https://bit.ly/3kqTfYz	
5.	https://biologyeducare.com/aves/	
6.	https://www.vedantu.com/biology/mammalia	
Methods of Evaluation		
Internal Evaluation	Continuous Internal Assessment Test	25 Marks
	Assignments	
	Seminars	
	Attendance and Class Participation	
External Evaluation	End Semester Examination	75 Marks
	Total	100 Marks
Methods of Assessment		
Recall (K1)	Simple definitions, MCQ, Recall steps, Concept definitions	
Understand/ Comprehend (K2)	MCQ, True/False, Short essays, Concept explanations, Short summary or overview	
Application (K3)	Suggest idea/concept with examples, Suggest formulae, Solve problems, Observe, Explain	
Analyze (K4)	Problem-solving questions, Finish a procedure in many steps, Differentiate between various ideas, Map knowledge	
Evaluate (K5)	Longer essay/ Evaluation essay, Critique or justify with pros and cons	
Create (K6)	Check knowledge in specific or offbeat situations, Discussion, Debating or Presentations	

Mapping with Programme Outcomes:

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**
CO 1	S							
CO 2	M	S						
CO 3		S	S	S	S	S		S
CO 4			S	S	S	M		
CO 5			S		S			S

S-Strong(3) M-Medium (2) L-Low (1)

SEMESTER - II

Course Code	Course Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
	CHORDATA LAB COURSE	Core	Y	-	-	-	3	3	25	75	100

Learning Objectives	
CO1	To understand the structures and distinct features of phylum chordata.
CO2	To understand and able to distinguish the characteristic features of each subphylum and class.
CO3	To understand and compare the structure of various internal organs in different classes of vertebrates.
CO4	To know about the classification, adaptations and affinities of chordate animals.

UNIT	Details	No. of Hours	Course Objectives
I	**Dissections**: Frog - Digestive system, Urinogenital System – Male and Female (Demo Only). Fish: External features, Digestive system, Arterial system, Venous system.	12	CO1
II	**Mounting**: Fish: Placoid and Ctenoid scales, Frog: Hyoid apparatus and Brain (Demo Only).	12	CO2
III	**Spotters- Specimen and Slides** :**(i) Hemichordata:** Balanoglossus, Tornaria larva **(ii). Protochordata:** Amphioxus, Amphioxus T.S. through pharynx **(iii). Cyclostomata:** Petromyzon, Myxine, Ammocoetus larva.	12	CO3
IV	**(iv) Pisces:** Sphyrna Pristis, Torpedo, Channa, Pleuronectes, Hippocampus, Exocoetus, Echieneis, Labeo, Catla, Clarius, Auguilla, Protopterus, Scales: Placoid, Cycloid, Ctenoid **(v). Amphibia:** Ichthyophis, Amblystoma, Siren, Hyla, Rachophous,Bufo,Rana, Axolotal larva **(vi). Reptilia :** Draco, Chemaeleon, Gecko, Uromastix, Vipera russelli, Naja, Bungarus, Enhydrina, Typhlops, Testudo, Trionyx, Crocodilus, Ptyas. **(vii). Aves:** Archaeopteryx, Passer, Psittacula, Bubo, Alcedo, Columba, Corvus, Pavo; Collection and study of different types of feathers: Quill, Contour, Filoplume, Down **(viii). Mammalia:** Ornithorhynchus, Tachyglossus, Pteropus, Funambulus, Manis, Loris, Hedgehog	12	CO4

V	**Osteology**:Frog: Skull and lower jaw, Vertebral column, Pectoral girdle, Pelvic girdle, Forelimb, Hindlimb. Chelonia-Anapsid skull, Pigeon - skull and lower jaw, synsacrum.	12	CO5
	Total	**60**	
Course Outcomes			
Course Outcomes	On completion of this course, students will;		
CO1	Identify and recall the name and distinct external and internal features of animals belonging to phylum Chordata.	PO1	
CO2	Explain the structural organization of various organs and systems in different classes of vertebrates.	PO1, PO2	
CO3	Analyse, compare and distinguish the morphological features and developmental stages of chordates	PO4, PO6	
CO4	Dissect and explain various organs and internal systems in different vertebrates and correlate its function.	PO4, PO5, PO6	
CO5	Summarise the morphology and ecological adaptations in vertebrates and list out the economic importance.	PO3, PO8	
Text Books (Latest Editions)			
1.	Lal S S, 2009. Practical Zoology Vertebrate, Rajpal and Sons Publishing, 484pp.		
2.	VermaP.S,2000.AManual ofPracticalZoology:Chordates,S.ChandLimited, 627pp.		
References Books (Latest editions, and the style as given below must be strictly adhered to)			
1.	Robert William Hegner, 2015. Practical Zoology, BiblioLife, 522pp.		
2.	Young, J,Z., 1972. The life of vertebrates. OxfordUni. London.		
Web Resources			
1.	https://www.youtube.com/watch?v=b04hc_kOY10		
2.	https://bit.ly/3CzTEy8		
3.	http://tolweb.org/Chordata/2499		
4.	https://www.nhm.ac.uk/		
5.	https://bit.ly/3Av1Ejg		
Methods of Evaluation			
Internal Evaluation	Continuous Internal Assessment Test	25 Marks	
	Assignments		
	Seminars		
	Attendance and Class Participation		
External Evaluation	End Semester Examination	75 Marks	
	Total	100 Marks	
Methods of Assessment			
Recall (K1)	Simple definitions, MCQ, Recall steps, Concept definitions		

Understand/ Comprehend (K2)	MCQ, True/False, Short essays, Concept explanations, Short summary or overview
Application (K3)	Suggest idea/concept with examples, Suggest formulae, Solve problems, Observe, Explain
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Mapping with Programme Outcomes:

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**
CO 1	S							
CO 2	M	S						
CO 3				S		S		
CO 4				S	S	M		
CO 5			S					S

S-Strong(3) M-Medium (2) L-Low (1

Chordata lab course

MARKS DISTRIBUTION FOR PRACTICAL EXAM

Time: 3hrs Max.Marks: 75

Question no.	Experiment	Marks
I.	Major Practical -Dissection	25
II.	Minor Practical -Mounting	10
III.	Spotters	30 (6x5=30)
IV.	Record	10
	Total	75