B.Sc. Science: Curriculum and Credit Framework for Undergraduate Program with Zoology as Major and one more Science course as Major subject (both subjects with practicals)

Semester – V							
Category	**Course code**		**Marks**			**Credit**	**Duration of exam (Hours)**
			IA	**SA**	**Total**		
DSC	A	ZOOC9-T	40	60	100	4	
	A	ZOOC10-P	25	25	50	2	
	A	ZOOC11-T	40	60	100	4	
	A	ZOOC12-P	25	25	50	2	
	B	Any Science Subject -T	40	60	100	4	
	B	Any Science Subject -P	25	25	50	2	
	B	Any Science Subject -T	40	60	100	4	
	B	Any Science Subject -P	25	25	50	2	
		SEC				3	
Total Credits :						**27**	

Semester – VI							
Category		**Course code**	**Marks**			**Credit**	**Duration of exam (Hours)**
			IA	**SAE**	**Total**		
DSC	A	ZOOC15-T	40	60	100	4	
	A	ZOOC16-P	25	25	50	2	
	A	ZOOC17-T	40	60	100	4	
	A	ZOOC18-P	25	25	50	2	
	B	Any Science Subject -T	40	60	100	4	
	B	Any Science Subject -P	25	25	50	2	
	B	Any Science Subject -T	40	60	100	4	
	B	Any Science Subject -P	25	25	50	2	
		Internship				2	
Total Credits :						**26**	

Dr. RAMALINGAPPA
Professor and Dean,
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DAVANGERE - 577 007

Registrar
Davangere University
Shivagangotri, Davangere,

B.Sc. Science: Curriculum and Credit Framework for Undergraduate Program with Zoology as Major and one more Science course as Major subject (both subjects with practicals)

Sem.	Discipline Core (DSC) (Credits) (L+T+P)	Discipline Elective(DSE) / OpenElective (OE) (Credits) (L+T+P)	Ability Enhancement Compulsory Courses (AECC),Languages (Credits) (L+T+P)		Skill Enhancement Courses (SEC)			Total Credits
					Skill based (Credits) (L+T+P)	Value based (Credits) (L+T+P)		
I	Zoology C1(4+2) Botany C1(4+2)	OE-1 (3)	L1-1(3), L2-1(3) (4 hrs. each)		SEC-1: Digital Fluency (2) (1+0+2)	Yoga (1) (0+0+2)	Health & Wellness(1) (0+0+2)	25
II	Zoology C2(4+2) Botany C2(4+2)	OE-2 (3)	L1-2(3), L2-2(3) (4 hrs. each)	Environmental Studies (2		Sports (1) (0+0+2)	NCC/NSS/ R&R(S&G) / Cultural (1)(0+0+2)	25
I and II semester Total Credit: 50								
III	Zoology C3(4+2) Botany C3(4+2)	OE-3 (3)	L1-3(3), L2-3(3) (4 hrs. each)		SEC-2: AI or some other SEC (2) (1+0+2)	Sports (1) (0+0+2)	NCC/NSS/ R&R(S&G) / Cultural (1) (0+0+2)	25
IV	Zoology C4(4+2) Botany C4(4+2)	OE-4 (3)	L1-4(3), L2-4(3) (4 hrs. each)	Constitution of India (2)		Sports (1) (0+0+2)	NCC/NSS/ R&R(S&G) / Cultural (1) (0+0+2)	25
III and IV semester Total Credit: 50								
V	Zoology C5(4+2) Zoology C6(4+2) Botany C5(4+2)	Vocational-1 (3)			SEC-3: Cyber Security or some other SEC (2) (1+0+2)	Sports (1) (0+0+2)	NCC/NSS/ R&R(S&G) / Cultural (1) (0+0+2)	24/25
VI	Zoology C7(4+2) Zoology C8(4+2) Botany C6(4+2)	Vocational-2 (3) Internship (2)			SEC-4: Professional Communication (2) (1+0+2)	Sports (1) (0+0+2)	NCC/NSS/ R&R(S&G) / Cultural (1) (0+0+2)	24/25
V and VI semester Total Credit: 48/50								

Dr. RAMALINGAPPA
Professor and Dean,
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DAVANGERE - 577 007

GOVERNMENT OF KARNATAKA

Curriculum Framework for Four-Year Undergraduate Multidisciplinary Programme (Honours) & Master Program in Colleges and Universities of Karnataka State.

5th Semester

Model Syllabusfor

BSc. in Zoology

Submitted to

VICE CHAIRMAN

Karnataka State Higher Education Council
30, Prasanna Kumar Block,
Bengaluru City University Campus,
Bengaluru, Karnataka _ 560009

COMPOSITION OF SUBJECT EXPERT COMMITTEE MEMBERS

SN	Name and Organization	Designation
1	Prof. K. Vijaykumar, Department of Zoology, Gulbarga University, Kalaburagi. 9480060508, katepaga63@gmail.com	Chairman
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12	Dr. Asiya Nuzhath F.B, Associate Professor, Dept. of Zoology, Tumkur University, Tumakuru. 9844029441	Member
13	Dr. Akshatha, Special Officer, KSHEC, Bengaluru. 9535487108	Member Convener

Davangere University
Shivagangotri
DAVANGERE – 577 007

Curriculum of B.Sc. Honours
In
Zoology

5th Semester
(With effect from 2023-2024)

Board of Studies in Zoology
DAVANGERE UNIVERSITY

Sl. No.	Name & Professional details	Designation
1	**Prof. Vijaykumar K** Professor of Zoology Postgraduate Department of Studies in Zoology Gulbarga University KALBURGI Contact No. 8472263300	Chairman
2	**Smt. Lolakshi K.V.** Associate Professor Department of Studies in Zoology Government First Grade College MCC B Block DAVANGERE Contact No. 9448824624	Member
3	**Dr. Muhammed Zafar Iqbal. A. Navalgund** Associate Professor Department of Studies in Zoology Government Science College CHITRADURGA Contact No. 9481927388	Member
4	**Dr. Renuka. C. Khaple** Assistant Professor Postgraduate Department of Studies in Zoology Davangere University DAVANGERE Contact No. 9342047484	Member
5	**Dr. Sathishagouda. S.** Assistant Professor Department of Studies in Zoology Government Science College CHITRADURGA Contact No. 9448833029	Member

Government of Karnataka

Curriculum Summary

Program Name	**B.Sc.**	V Semester	
Course Title	**Non-Chordates and Economic Zoology (Theory)**		
Course Code:	**ZOOC9-T**	No. of Credits	**4**
Contact hours	**60 Hours**	Duration of SEA/Exam	**2 hours**
Formative Assessment Marks	**40**	Summative Assessment Marks	**60**

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs) /(POs)	ZOO C9T	ZOO C10P	ZOO C11T	ZOO C12P	ZOO C13T	ZOO C14P	ZOO C15T	ZOO C16P	ZOO C17T	ZOO C18P
I Core competency	X									
II Critical thinking	X									
III Analytical reasoning	X									
IV Research skills	X									
V Team work	X									

Course Articulation Matrix relates course outcomes of course with the corresponding program outcomes whose attainment is attempted in this course. Mark _X' in the intersection cell if a course outcome addresses a particular program outcome.

Course Pre-requisite(s):

Course Outcomes (COs): After the successful completion of the course, the student will be able to: CO1. Group animals on the basis of their morphological characteristics/ structures.

CO2. Demonstrate comprehensive identification abilities of Non-Chordate diversity CO3. Explain structural and functional diversity of Non-Chordates

CO4. Develop understanding on the diversity of life with regard to protists, nonchordates and chordates.

CO 5. Examine the diversity and evolutionary history of a taxon through the construction of a basic phylogenetic/ cladistics tree.

Contents	60 Hrs
Unit-I	**15 Hrs.**
1. Protozoa to Coelenterate **General characters and classification up to classes with suitable examples** • Protozoa-*Paramecium* (Locomotion and Reproduction) • Porifera-*Sycon* (Type of canal system in Porifera & reproduction in Sycon) • Coelenterates – *Obelia* (Morphology and Reproduction)	
1. Ctenophora to Nematheiminthes **General characters and classification up to classes with suitable examples** • Ctenophora • Platyhelminthes- *Taenia* (Tape worm) (Type of body cavity, Morphology and Reproduction) • Nemathelminthes-*Ascarislumbricoides* (Type of body cavity, Morphology and Reproduction)	
Unit-II	**15 Hrs.**
3. Annelida **General characters and classification upto classes with suitable examples** • Orgin of coelom • Annelida – *Hirudinaria* (Leech) (Morphology and Reproduction)	
4. Arthropoda **General characters and classification upto classes with suitable examples** • Arthropoda – *Palaemon* (Prawn) Morphology, Appendages, Nervous System and Reproduction) • Larval forms in Arthropoda	
Unit-III	**15 Hrs.**
6. Mollusca to Hemichordata **General characters and classification upto classes with suitable examples** Mollusca – *Pila* (Morphology, Shell, Respiration, Nervous System and Reproduction • Echinodermata – *Pentoceros* (Morphology and Water Vascular System) • Auricularia larvae and its evolutionary significance • Hemichordata: *Balanoglossus* – (Habit and Habitat, Morphology and Tornaria larvae and its evolutionary significance) • Affinities and systematic position of Hemichordata	
Unit-IV	**15 Hrs.**
7. Economic Zoology: Vectors and Pests • Life cycle and their control of following pests: Gundhi, Bug, Sugarcane leafhopper. Termites and Mosquitoes and their bio-control	
8. Economic Zoology: Lac-culture, Vermiculture and Poultry (Breeds of fowls, diseases & control measures)	

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs 1-15)

Course Outcomes (COs) / Program Outcomes (POs)	Program Outcomes (POs)														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
					X										
					X										
					X										
					X										
					X										

Pedagogy: .....

Formative Assessment for Theory	
Assessment Occasion/ type	**Marks**
House Examination/Test	15
Written Assessment/Presentation/Project/Term Papers/Seminars	15
Class room Performance/Participation	10
Total	**40 Marks**
Formative Assessment as per NEP guideline are compulsory	

Course Title	**Non-Chordates and Economic Zoology (Practical)**	Practical Credits	**2**
Course Code	**ZOO C10-P**	Contact Hours	
Formative Assessment	**25 Marks**	Summative Assessment	**25 Marks**
Course Pre-requisite(s):			

Course Outcomes (COs):

At the end of the course the student should be able to:

1. Understand basics of classification of non-chordates.
2. Learn the diversity of habit and habitat of these species.
3. Develop the skills to identify different classes and species of animals.
4. Know uniqueness of a particular animal and its importance 5. Enhancement of basic laboratory skill like keen observation and drawing.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs) /(POs)	**ZOO C9T**	**ZOO C10P**	**ZOO C11T**	**ZOO C12 P**	**ZOO C13T**	**ZOO C14P**	**ZOO C15T**	**ZOO C16P**	**ZOO C17T**	**ZOO C18P**
I Core competency		X								
II Critical thinking		X								
III Analytical		X								
reasoning IV Research skills		X								
V Team work		X								

Course Articulation Matrix relates course outcomes of course with the corresponding program outcomes whose attainment is attempted in this course. Mark _X' in the intersection cell if a course outcome addresses a particular program outcome.

Practical Content	
1. Preparation and observation of protozoan (Amoeba, Euglina, Paramecium) 2. **Protozoa**: Systematics of *Amoeba*, *Euglena*, *Noctiluca*, *Paramecium* and *Vorticella* (Permanent slides).	

3. **Porifera:** Systematics of *Sycon, Euplectella, Hyalonema, Spongilla* and *Euspongia* (Specimens). Study of permanent slides of T.S of *Sycon*, spicules and gemmules.
4. **Cnidaria:** Systematics of *Aurelia* and *Metridium* (Specimens). Slides of *Hydra*, *Obelia*-polyp and medusa, and *Ephyra* larva, T.S. of *Metridium* passing through mesenteries.
5. **Study of Corals-***Astraea, Fungia, Meandrina, Corallium, Gorgonia, Millepora* and *Pennatula.*
6. **Helminthes:** Systematics of *Planaria*, *Fasciola hepatica* and *Taenia solium*, Ascaris- Male and female (Specimens). Slides of T.S. of *Planaria*,T.S of male and female Ascaris.
7. **Annelida:** Systematics of *Nereis, Heteronereis, Sabella, Aphrodite* (Specimens). Slide of T.S. of Earth worm through typhlosole.
8. **Arthropoda**: Systematics of *Panaeus, Palaemon, Astracus,* Scorpion, Spider, *Limulus, Peripatus, Millipede, Centipede,* Praying mantis, Termite Queen, Moth, Butterfly, Dung beetle/Rhinocerous beetle (Any six specimens).Slide of Larvae- Nauplius, Zoea, Mysis.
9. **Mollusca:** Systematics of *Chiton, Mytilus, Aplysia, Pila, Octopus, Sepia* (Specimens) and Glochidium larva (Slide).
10. **Shell Pattern-***Unio, Ostrea, Cypria, Murex, Nautilus, Patella, Dentalium,* Cuttle bone.
11. **Echinodermata**: Systematics of Sea star, Brittle star, Sea Urchin, Sea cucumber, Sea lilly (Specimens).Slides of Bipinnaria larva, Echinopluteus larva and Pedicellaria.
12. **Harmful Nonchordates:** Soil Nematodes. Agricultural, veterinary and human pests of Arachnida and Arthropoda.
13. **Beneficial Nonchordates:**

- **Sericulture:** Life cycle of *Bombyx mori*, Uzi fly, Cocoon, Raw silk.
- **Apiculture**: Any 2 Species of honey bee and bee wax.
- **Pearl Culture**: Pearl Oyster and Natural Pearls.

14. **Virtual Dissection/Cultured specimens:** Earthworm – Nervous system, Leech- Digestive System
15. **Virtual Dissection/Cultured specimens:** Prawn - Nervous system. Cockroach- Salivary Apparatus and Digestive system.
16. **Hemichordata:** *Balanglossus* and T.S. through proboscis.

Pedagogy: Lectures, Presentations, Videos, Assignments and Weekly Formative Assessment Tests

Formative Assessment for Practical	
Assessment Occasion/ type	**Marks**
House Examination/Test	10
Written Assessment/Presentation/Project/Term Papers/Seminars	10

Class room Performance/Participation	5
Total	**25 Marks**

Formative Assessment as per NEP guidelines are compulsory

References	
1	Barnes, R.S.K.; Calow,P.; Olive,P.J.W.; Golding,D.W.; Spicer, J.I.(2002) The Invertebrates: Synthesis, Blackwell Publishing.
2	Hickman,C.; Roberts,L.S.; Keen,S.L.; Larson, A. and Eisenhour, D. (2018) Animal Diversity, McGraw-Hill.
3	Holland, P.(2011) The Animal Kingdom: A Very Short Introduction, Oxford University Press.
4	Kardong, K.V.(2006) Vertebrates: Comparative Anatomy, Function, Evolution (4thedition), McGraw-Hill.
5	Barrington, E.J.W. (1979) Invertebrate Structure and Functions. II Edition. E.L.B.S. and Nelson.
6	Boradale, L.A. and Potts, E.A. (1961) Invertebrates: A Manual for the use of Students. Asia Publishing Home.
7	Bushbaum, R.(1964) Animals without Backbones. University of Chicago Press.

Government of Karnataka

Model Curriculum

Program Name	**B.Sc.**	Semester	**V**
Course Title	**Chordates and Comparative Anatomy** (Theory)		
Course Code:	**ZOOC11-T**	No. of Credits	**4**
Contact hours	**60 Hours**	Duration of SEA/Exam	**2 hours**
Formative Assessment Marks	**40**	Summative Assessment Marks	**60**

Course Pre-requisite(s):

Course Outcomes (COs): After the successful completion of the course, the student will be able to:

CO1. To demonstrate comprehensive identification abilities of chordate diversity

CO2. Able to explain structural and functional diversity of chordate diversity

CO3. To understand evolutionary relationship amongst chordates

CO4. To take up research in biological sciences.

CO5. To realize that very similar physiological mechanisms are used in very diverse organisms.

CO6. To Get a flavor of research by working on project besides improving their writing skills. It will further enable the students to think and interpret individually.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs) /(POs)	ZOO C9T	ZOO C10P	ZOO C11T	ZOO C12 P	ZOO C13T	ZOO C14P	ZOO C15T	ZOO C16P	ZOO C17T	ZOO C18P

I Core competency			X							
II Critical thinking			X							
III Analytical reasoning			X							
IV Research skills			X							
V Team work			X							

Course Articulation Matrix relates course outcomes of course with the corresponding program outcomes whose attainment is attempted in this course. Mark _X' in the intersection cell if a course outcome addresses a particular program outcome.

Contents	**60 Hrs**
Unit-I	**12 hrs**
Chapter 1: Chordates: Landmark evolutionary developments Origin of Chordates, origin of jaw and appearance of amniotic egg **Chapter 2:** Basic characters of chordates and classification upto classes. **Chapter 3:Urochordata :** General characters and classification upto orders with suitable examples. Type Study of *Herdmania*-Habit and Habitat, Morphology, Ascidian tadpole- structure and its retrogressive metamorphosis. **Chapter 4: Cephalochordata :** General characters and classification upto orders with suitable. Type Study of *Branchiostoma* (*Amphioxus*)-Habit and Habitat, Morphology, Digestive system, Feeding mechanism, excretory and circulatory system. **Chapter 5: Agnatha** General characters of Agnatha and classification upto classes. Salient features of Cyclostomata Petromyzon and Ostracodermi with orders and examples. Ammocoetes larva and its significance.	
Unit-II	18
Chapter 6: Vertebrates: General characters and Classification of different classes of vertebrates (Placoderms, Chondrichthyes and Osteichthyes, Amphibia, Reptilia, Aves, Mammalia) up to the order with five characters for each order citing examples. Interesting features and evolutionary significance of Dipnoi. Interesting features of *Sphenodon*, crocodile and *Archaeopteryx*. Salient features of Ratitae and Carinatae with examples.Interesting features of mammalian orders (Insectivora, Carnivora, Chiroptera, Cetacea, Proboscidia, Ungulata – Perissodactyla and Artiodactyla, and Primates –Platyrhini and Catarhini) with examples.	
Unit-III	15

Chapter 7. General account of Chordates: Types of caudal fins, scales and swim bladder in fishes. Origin of Amphibia. Neoteny and Paedogenesis. Adaptive radiation in reptiles with suitable examples. Temporal fossae in reptiles. Venom apparatus in snakes, Precautions to be taken after snake bite and antidote. Parental care: Hippocampus, Arius, Rhacophorus, Icthyophis Flight adaptations in birds. Dentition in mammals. Migration in Pisces, Birds.	
Unit-IV	15
Comparative Anatomy of Vertebrates: **Chapter 8. Integumentary System:** Integuments and their derivatives. **Chapter 9. Skeletal System** • Comparative account of Axial Skeletal system in vertebrates; Skull- Amphibian (Frog), Reptiles (Lizard), Aves (Pigeon) and Mammals (Man). **Chapter-10. Appendicular system** • Comparative account of Appendicular skeletal system in vertebratesPectoral and Pelvic girdles of Amphibian (Frog), Reptiles (Lizard), Aves (Pigeon) and Mammals (Man). **Chapter-11 Circulatory System** • Comparative account of heart and aortic arches in vertebrates: Pisces (Scoliodon), Amphibian (Frog), Reptiles (Lizard), Aves (Pigeon) and Mammals (Man). **Chapter-12 Excretory System** • Urino-genetial system in fish, frog, lizard, pigeon and rat. **Chapter-13 Nervous system** • Comparative account of brain in vertebrates: Pisces (Scoliodon), Amphibian (Frog), Reptiles (Lizard), Aves (Pigeon) and Mammals (Man).	

Model Curriculum

Course Title	**Chordates and Comparative Anatomy Zoology (Practical)**	Practical Credits	**2**
Course Code	**ZOO C12-P**	Contact Hours	
Formative Assessment	**25 Marks**	Summative Assessment	**25 Marks**

Course Pre-requisite(s):

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs) /(POs)	**ZOO C9T**	**ZOO C10P**	**ZOO C11T**	**ZOO C12 P**	**ZOO C13T**	**ZOO C14P**	**ZOO C15T**	**ZOO C16P**	**ZOO C17T**	**ZOO C18P**
I Core competency				X						
II Critical thinking				X						
III Analytical				X						
reasoning IV Research skills				X						
V Team work				X						

Course Articulation Matrix relates course outcomes of course with the corresponding program outcomes whose attainment is attempted in this course. Mark _X' in the intersection cell if a course outcome addresses a particular program outcome.

Practical Content	

1. **Protochordata**: Ascidian/ *Herdmania* and *Amphioxus,* T.S. of *Amphioxus* through pharynx and intestine. 2. **Cyclostomata:** -*Petromyzon*, Ammocoete larva and *Myxine.* 3. **Pisces**: 4. Cartilaginous Fishes – *Narcine, Trygon, Pristis, Myolobaties* 5. Bony Fishes –Zebra fish, Hippocampus, Muraena, Ostracion, Tetradon, Pleuronectus, Diodon, Echeneis. (Any six). 6. **Ornamental fishes:** -Siamese, Koi, Oscar, Betta Sp., Neon tetra, Guppies, Gold fish, Angle fish, Rainbow fish, Mollies (Any four). 7. **Accessory respiratory organs** – *Saccobranchus, Clarias* and *Anabas.* 8. **Amphibia**:	**15 units**
-*Rana, Bufo, Ambystoma, Axolotl larva, Necturus and Ichthyophis.* 9. **Reptilia**: -Turtle, Tortoise, *Mabuya, Calotes,* Chameleon, *Varanus.* snakes –Dryophis, Rat snake, Brahmini, Cobra, Krait, Russell's viper and Hydrophis (Any four) 10. **Aves:** Beak and feet modifications in the following examples: Duck, Crow, Sparrow, Parrot, Kingfisher, Eagle or Hawk. 11. **Mammalia**: Mongoose, Squirrel, Pangolin, Hedge Hog, Rat and Loris. 12. **Virtual Dissection/Cultured specimens:** Shark/Bony fish: Afferent and efferent branchial systems, glossopharyngeal and vagus nerves. 13. **Virtual Dissection/Cultured specimens:** Rat: Dissection (only demonstration) – Circulatory system (arterial and venous), urinogenital system. 14. **Skeletal System in man:** Skull, vertebrae, girdles and limb bones (Except hands and feet) 15. **Comparative account** of skin in shark, frog, calotis, pigeon and Man. 16. **Comparative account** of heart in shark, frog, calotis, pigeon and Man. 17. **Comparative account** of brain in frog, calotis, pigeon and Man.	

Pedagogy: .....

Formative Assessment for Practical	
Assessment Occasion/ type	**Marks**
House Examination/Test	10
Written Assessment/Presentation/Project/Term Papers/Seminars	10

Class room Performance/Participation	5
Total	**25 Marks**
Formative Assessment as per NEP guidelines are compulsory	

References	
1	Colbert *et al*: Colbert's Evolution of the Vertebrates: A history of the backboned animals through time.
	(5th ed 2002, Wiley – Liss).
2	Hildebrand: Analysis of vertebrate Structure (4th ed 1995, John Wiley)
3	Kenneth V. Kardong (20015) vertebrates: Comparative Anatomy, Function,
	Evolution McGraw Hill
4	McFarland *et al.,*: Vertebrate Life (1979, Macmillan publishing)
5	Parker and Haswell: Text Book of Zoology, Vol. II (1978, ELBS)
6	Romer and Parsons: The Vertebrate Body (6th ed 1986, CBS Publishing Japan)
7	Young: The Life of vertebrates (3rd ed 2006, ELBS/Oxford)
8	Weichert C.K. and William Presch (1970). Elements of Chordate Anatomy, Tata McGraw Hills

CBCS Question Paper Pattern for UG Semester DSC

Paper Code:	**Paper Title:**		
Duration of Exam	**2 Hours**	Max Marks	**60**
Instruction:	**Answer all the sections**		

Section-A

……..	**15 Marks**
I. Answer any Five of the following questions (5x3=15) 1. 2. 3. 4. 5. 6. 7.	

Section-B

……	**25 Marks**
II. Answer any **FIVE** of the following questions (5X5=25) 8. 9. 10. 11. 12. 13. 14.	

Section-C

……	**20 Marks**
III. Answer any TWO of the following questions (2X10=20)	
15. **16.** **17. 18.**	

Government of Karnataka

Curriculum Framework for Four-Year Undergraduate Multidisciplinary Programme (Honours) & Master Programme inColleges and Universities of Karnataka State.

Model Syllabus for B.Sc

6th Semester ZOOLOGY

Submitted to Vice-Chairman

Karnataka State Higher Educational Council

30, Prasanna Kumar, Bangalore City University Campus,

Bangalore, Karnataka- 560009

Government of Karnataka

Composition of Subject Expert Committee Members

SN	Name & Organization	Designation
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2	Prof. P M Basha, Department of Zoology, Bangalore University, Bengaluru. 9448701652, pmbashabub@rediffmail.com	Member
3	Prof. Vijaykumar B Malashetty, Department of Zoology, VSK University, Ballari. 9343011567, vijaymalashetty@gmail.com	Member
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5	Prof. Nagaraj, Department of Zoology, Kuvempu University, Shivamogga. 9620485338 REPEATED	Member
6	Prof. B.Vasanthkumar, Department of Zoology, Sir M V Govt College, Bhadravathi, Shimoga	Member
7	Prof. B. K. Meera, Associate Professor, Maharani Cluster University, Bengaluru (9886409382)	Member
8	Smt. Kareemunnisa Syed, Associate professor, Dept. of Zoology, Nrupathunga University, Bengaluru (9964300991) REPEATED	Member
9	Dr. GangadharaRao, Associate Professor, Govt. Women's College, Kolar. 9448984956	Member
10	Prof. Shankarappa S. Hatti, Govt. College, Dept. of Zoology, Sedam Road, Kalaburgi. 9980391964	Member

11	Dr. Zeba Parveen Dept. of Zoology, BiBiRaza Women's Degree College, Kalaburagi. 9448092786	Member
12	Dr. AsiyaNuzhath F.B, Associate Professor, Dept. of Zoology, Tumkurn Unversity, Tumakuru. 9844029441	Member
13	Dr. Akshatha, Special Officer, KSHEC, Bengaluru. 9535487108	Member Convener

Davangere University
Shivagangotri
DAVANGERE – 577 007

Curriculum of B.Sc. Honours
In
Zoology

6th Semester
(With effect from 2023-2024)

Board of Studies in Zoology

DAVANGERE UNIVERSITY

Sl. No.	Name & Professional details	Designation
1	**Prof. Vijaykumar K** Professor of Zoology Postgraduate Department of Studies in Zoology Gulbarga University KALBURGI Contact No. 8472263300	Chairman
2	**Smt. Lolakshi K.V.** Associate Professor Department of Studies in Zoology Government First Grade College MCC B Block DAVANGERE Contact No. 9448824624	Member
3	**Dr. Muhammed Zafar Iqbal. A. Navalgund** Associate Professor Department of Studies in Zoology Government Science College CHITRADURGA Contact No. 9481927388	Member
4	**Dr. Renuka. C. Khaple** Assistant Professor Postgraduate Department of Studies in Zoology Davangere University DAVANGERE Contact No. 9342047484	Member
5	**Dr. Sathishagouda. S.** Assistant Professor Department of Studies in Zoology Government Science College CHITRADURGA Contact No. 9448833029	Member

Government of Karnataka

Curriculum Summary

Program Name	**B.Sc.**	Semester	**VI**
Course Title	**Evolutionary & Developmental Biology** (Theory)		
Course Code:	**ZOOC15-T**	No. of Credits	**4**
Contact hours	**60 Hours**	Duration of SEA/Exam	**2 hours**
Formative Assessment Marks	**40**	Summative Assessment Marks	**60**

Course Pre-requisite(s):

Course Outcomes (COs): After the successful completion of the course, the student will be able to:

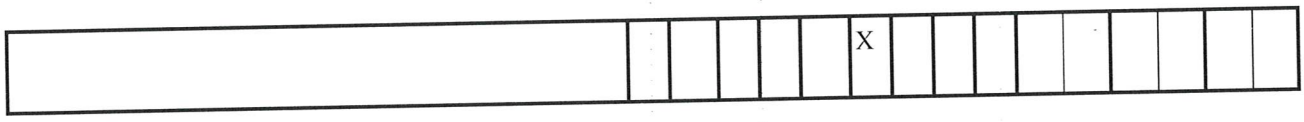
- Understand that by biological evolution we mean that many of the organisms that inhabit the earth today are different from those that inhabited it in the past.
- Understand that natural selection is one of several processes that can bring about evolution, although it can also promote stability rather than change.
- Understand how the single cell formed at fertilization forms an embryo and then a full adult organism.
- Integrate genetics, molecular biology, biochemistry, cell biology, anatomy and physiology during embryonic development.
- Understand a variety of interacting processes, which generate an organism's heterogeneous shapes, size, and structural features.
- Understand how a cell behaves in response to an autonomous determinant or an external signal, and the scientific reasoning exhibited in experimental life science.

Contents	**60 Hrs**
Unit-I	**15 Hrs**
1. **Theories of Evolution:** Origin of Life, Historical review of evolutionary concept: Lamarckism, Darwinism (Natural, Sexual and Artificial selection), Modern synthetic theory of evolution, Adaptive radiations: Patterns of evolution (Divergence, Convergence, Parallel, Co-evolution).	

2. **Population Genetics:** Microevolution and Macroevolution: allele frequencies, genotype frequencies, Hardy- Weinberg equilibrium and conditions for its maintenance, Forces of evolution: mutation, selection, genetic drift	
Unit-II	**15 Hrs**
3. **Direct Evidences of Evolution:** Types of fossils, Incompleteness of fossil record, Dating of fossils, Phylogeny of human.	
4. **Species Concept and Extinction**: Biological species concept (Advantages and Limitations); Modes of speciation (Allopatric, Sympatric), Mass extinction (Causes, Names of five major extinctions). Isolatory mechanism	
Unit-III	**15 Hrs**
5. **Gamete Fertilization and Early Development:** Gametogenesis, Fertilization mechanism, Cleavage pattern, blastulation, Gastrulation and neurulation in frog and chick. Fate maps in frog and Morphogenesis.	
6. **Developmental Genes:** General concepts of organogenesis, Introduction to genetic basis of embryonic development and Developmental control genes (Homeobox genes)	
Unit-IV	**15 Hrs**
7. **Early Vertebrate Development**: Early development of mammals including placentation, Metamorphosis, regeneration, Environmental regulation of development	
8. Late Developmental Processes, Development of eye, kidney, limb in amphibian, Mammalian female reproductive cycles estrous cycle and menstrual cycle.	

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs 1-15)

Course Outcomes (COs) / Program Outcomes (POs)	Program Outcomes (POs)														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
						X									
						X									
						X									
						X									



Pedagogy: .....

Formative Assessment for Theory	
Assessment Occasion/ type	**Marks**
House Examination/Test	15

Course Title	**Evolutionary & Developmental Biology (Practical)**	Practical Credits	**2**
Course Code	**ZOO C16-P**	Contact Hours	**4 Hours**
Formative Assessment	**25 Marks**	Summative Assessment	**25 Marks**

Practical Content
1.Study of fossils from models/pictures.
2.Study of homology and analogy from suitable specimens
3. Study and verification of Hardy-Weinberg Law by chi square analysis.
4. Types of eggs based on quantity and distribution of yolk: Sea urchin, insect, Chick. Study of blastula, gastrula and neurula of frog.
5. Study of development of chick embryo through incubation/permanent slides: chick eggs upto 96h.
6. Study of adaptive radiations in feet of birds and mouth parts of insects.

Written Assessment/Presentation/Project/Term Papers/Seminars	15
Class room Performance/Participation	10
Total	**40 Marks**
Formative Assessment as per NEP guidelines are compulsory	

Pedagogy: Lectures, Presentations, Videos, Assignments and Weekly Formative Assessment Tests

Formative Assessment for Practical

Assessment Occasion/ type	Marks
House Examination/Test	05
Written Assessment/Presentation/Project/Term Papers/Seminars	10
Class room Performance/Participation	10
Total	**25 Marks**
Formative Assessment as per NEP guidelines are compulsory	

References	
9	Developmental Biology: Michael J. F. Barresi, Scott F. Gilbert, Oxford University Press. (2019).
1	Ridley, M (2004) Evolution (3rd edition) Blackwell Publishing
2	Hall, B.K. and Hallgrimson, B (2008) Evolution (4th edition) Jones and Barlett Publishers
3	Barton, N. H., Briggs, D. E. G., Eisen, J. A., Goldstein, D. B. and Patel, N. H. (2007). Evolution. Cold Spring, Harbour Laboratory Press.
4	Campbell, N. A. and Reece J. B. (2011). Biology. IX Edition, Pearson, Benjamin, Cummings.
5	Douglas, J. Futuyma (1997). Evolutionary Biology. Sinauer Associates.
6	. Developmental Biology: T. Subramaniam, (Reprint), Narosa Publishing House Pvt. Ltd., New Delhi
7	. Developmental biology: Werner A. Müller, Springer Science & Business Media. (2012).
8	Human Embryology and Developmental Biology E-Book: Bruce M. Carlson, Elsevier Health Sciences.

Government of Karnataka

Curriculum

Program Name	**B.Sc.**	Semester	**VI**
Course Title	**Environmental Biology, Wildlife Management & Conservations (Theory)**		
Course Code:	**ZOO C17-T**	No. of Credits	**4**
Contact hours	**60 Hours**	Duration of SEA/Exam	**2 Hours**
Formative Assessment Marks	**40**	Summative Assessment Marks	**60**

Course Pre-requisite(s):

Course Outcomes (COs): After the successful completion of the course, the student will be able to:

CO1. Develop an understanding of how animals interact with each other and their natural environment.

CO2. Develop the ability to use the fundamental principles of wildlife ecology to solve local, regional and national conservation and management issues. CO3. Develop the ability to work collaborative team-based projects.

CO4. Gain an appreciation for the modern scope of scientific inquiry in the field of wildlife conservation management.

CO5. Develop an ability to analyze, present and interpret wildlife conservation management in formation.

Contents	**60 Hrs**
Unit-I	**15**
1 **Ecology:** Introduction to ecology, Definition, ecosystem, types of ecosystem, food chain and food web, trophic levels. **Environment:** Definition, types of environment, terrestrial, aquatic, desert, grassland and aerial environment. **Environmental Biology:** Adoptive features of animals to different environment. **Population Ecology:** Population density, Natality, Mortality	
Unit-II	**15**
2. **Pollution:** Definition, types of pollution, air, soil, water and thermal pollution, ozone layer depletion. Greenhouse effect and Acid rain. Effects of pollution on animals. Biomagnification, bioaccumulation and bioremediation.	
Unit-III	**15**
3. **Wildlife Conservation:** HIPPO, National parks, Wildlife sanctuaries, biosphere reserve. Project tiger. Project Elephant. Habitat preservation, breeding in captivity. Ex-situ and in-situ conservation. Wildlife Protection Act 1972. Biodiversity Act 2002.	

Unit-IV	15
4. **Wildlife Management and Conservation:** Inventorying and monitoring wildlife. Concept of home range and territory, animal census, tracing movement, remote sensing and GIS. Ramsar wetlands and their management.	

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs 1-15)

Course Outcomes (COs) / Program Outcomes (POs)	Program Outcomes (POs)														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
						X									
						X									
						X									
						X									
						X									

Pedagogy: .....

Formative Assessment for Theory	
Assessment Occasion/ type	**Marks**
House Examination/Test	15
Written Assessment/Presentation/Project/Term Papers/Seminars	15
Class room Performance/Participation	10
Total	**40 Marks**
Formative Assessment as per NEP guidelines are compulsory	

Course Title	**Environmental Biology, Wildlife Management & Conservation** (Practicals)	Practical Credits	2

Course Code	ZOO C-18-P	Contact Hours	4 Hours
Formative Assessment	25 Marks	Summative Assessment	25 Marks

Practical Content
1. **Water quality parameters assessment:** Collection of water sample, Dissolved Oxygen (O_2), Carbon dioxide (CO_2), Biological Oxygen Demand (BOD), total hardness, chloride and alkalinity, salinity estimation in water.
2. **Analysis of physico-chemical parameters of soil:** pH, soil moisture, soil temperature, organic matter in soil.
3. **Visit of pond and lakes:** Collection and identification of flora and fauna of selected ecosystems. Collection, preservation and estimation of zooplanktons.
4. **Demonstration of field equipments used in wildlife census:** Compass, Binoculars, Spotting scope, Range Finders, Global Positioning System, Various types of cameras and lenses.
5. **Identification wild animals:** Wild animal's pugmarks, hoof marks scats, pellet groups, nest, antlers. Demonstration of field techniques for wild flora and fauna.
6. **Field visit -** Visit to Wildlife sanctuary/ National park (Report to be submitted).

Pedagogy: Lectures, Presentations, Videos, Assignments and Weekly Formative Assessment Tests

Formative Assessment for Practical	
Assessment Occasion/ type	**Marks**
House Examination/Test	05
Written Assessment/Presentation/Project/Term Papers/Seminars	10
Class room Performance/Participation	10
Total	**25 Marks**
Formative Assessment as per NEP guidelines are compulsory	

References	
1	Colinvaux, P.A.(1993)Ecology(2nd edition) Wiley, John and Sons ,Inc.
2	Krebs, C.J. (2001) Ecology (6thedition) Benjamin Cummings.

3	Odum,E.P.,(2008) Fundamentals of Ecology. Indian Edition. Brooks/Cole.(3rd Edition) Blackwell Sci.
4	Kendeigh, F C. (1984) Ecology with Special Reference to Animal and Man. Prentice Hall Inc.
5	Caughley, G., and Sinclair, A.R.E. (1994) Wildlife Ecology and Management. Blackwell Science.
6	Woodroffe, R., Thirgood, S. and Rabinowitz, A. (2005) People and Wildlife, Conflict or Co-existence? Cambridge University.
7	Bookhout, T.A. (1996) Research and Management Techniques for Wildlife and Habitats (5thedition) The Wild life Society, Allen Press.
8	Sutherland, W.J. (2000) The Conservation Handbook: Research, Management and Policy. Blackwell Sciences
9	Hunter M.L.,Gibbs,J .B .and Sterling, E.J.(2008) Problem solving in Conservation Biology and Wildlife Management: Exercises for Class, Field, and Laboratory. Blackwell Publishing

CBCS Question Paper Pattern for UG Semester DSC

Paper Code:	**Paper Title:**		
Duration of Exam	**2 Hours**	Max Marks	**60**
Instruction:	**Answer all the sections**		

Section-A

.....	**15 Marks**

I. Answer any Five of the following questions (5x3=15)

1.
2.
3.
4.
5.
6.
7.

Section-B

.....	**25 Marks**

II. Answer any **FIVE** of the following questions	(5X5=25)
8. 9. 10. 11. 12. 13. 14.	

Section-C

.....	**20 Marks**
III. Answer any TWO of the following questions	**(2X10=20)**
15. **16.** **17. 18.**	