Sri Sai Raghavendra (SSR) Degree College (Autonomous)

CURRICULUM FOR OPTIONAL - ZOOLOGY
INUNDER-GRADUATEDEGREEPROGRAMME
CBCSSYLLABUS- SCHEMA

Year	Semester	COURSE		Title of the COURSE	No. of Credits	Exam Hrs.	Max. Marks		
							I.A	End Exam	Total
I	I	COURSE-I	DSC-I Theory	Animal Diversity –Invertebrates& Vertebrates	4	3	40	60	100
			DSC-I Practical*	Animal Diversity –Invertebrates& Vertebrates	1	2	-	50	50
	II	COURSE– II	DSC-II Theory	Comparative Anatomy of Vertebrates And Developmental Biology	4	3	40	60	100
			DSC-II Practical*	Comparative Anatomy of Vertebrates And Developmental Biology	1	2	-	50	50
II	III	COURSE– III	DSC-III Theory	Animal Physiology and Animal Behaviour	4	3	40	60	100
			DSC-III Practical*	Animal Physiology and Animal Behaviour	1	2	-	50	50
	IV	COURSE- IV	DSC-IV Theory	Cell and Molecular Biology & Genetics	4	3	40	60	100
			DSC-IV Practical*	Cell and Molecular Biology & Genetics	1	2	-	50	50
III	V	COURSE- V	DSC-V Theory	Immunology and Animal Biotechnology	4	3	40	60	100
			DSC-V Practical*	Immunology and Animal Biotechnology	1	2	-	50	50
			MDC Theory	Preventive Medicine / Integrated Pest Management / Biomaterials from Animal Sources/Aquarium Fish Keeping	4	3	40	60	100
	VI	COURSE- VI	DSE-I Theory	Physiological Chemistry & Endocrinology/Laboratory Animals Maintenance and Applications /Fisheries and Limnology/ Ecology, Zoogeography and Evolution	4	3	40	60	100
			DSE-I Practical*	Physiological Chemistry & Endocrinology/Laboratory Animals Maintenance and Applications /Fisheries and Limnology/ Ecology, Zoogeography and Evolution	1	2	-	50	50
			SEC-I	Sericulture / Ecotourism / Public Health and Hygiene / Apiculture / Medical Diagnostics/Environmental Impact Analysis /Poultry and Animal Husbandry / Aquaculture / Vector Biology	2	2	10	40	50
			PRO	Project/Internship	4	3	-	100	100
					40		**290**	**1010**	**1300**

DSC– Discipline Specific Core; **DSE–**Discipline Specific Elective; **SEC–**Skill Enhancement Course; MDC Multi disciplinary Course (Open Stream); **SEM** – Seminar; **PRO** – Project; *Practical one credit equal to 2 hours of instruction

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Sri Sai Raghavendra (SSR) Degree College (Autonomous)

B.Sc. ZOOLOGY I YEAR

SEMESTER-I

DISCIPLINE SPECIFIC CORE COURSE – I

ANIMAL DIVERSITY – INVERTEBRATES & VERTEBRATES

UNIT I: INVERTEBRATES - PROTOZOA TO PLATYHELMINTHES (15 Periods)

1.1 Concepts of: Multicellularity; Diploblastic and triploblastic organization; Symmetries; Body cavities.

1.2 Protozoa: General characteristics and classification up to classes; Locomotory organelles and locomotion in Protozoa.

1.3 Porifera: General characteristics and classification up to classes; Canal system in sponges and spicules; Evolutionary significance of sponges as early metazoans.

1.4 Cnidaria: General characteristics and classification up to classes; Polymorphism in Hydrozoa and Siphonophora; Coral reef formation and ecological significance.

1.5 Helminthes: General characteristics and classification up to classes of Platyhelminthes and Nemathelminths; Parasitic adaptations in helminths; Regeneration in Turbellarians

UNIT II: INVERTEBRATES – ANNELIDA TO HEMICHORDATA (15 Periods)

2.1 Annelida: General characteristics and classification up to classes; Metamerism and its evolutionary significance; Coelom and coelomocytes.

2.2 Arthropoda: General characteristics and classification up to classes; Vision in arthropods and metamorphosis in insects; Economic importance of insects.

2.3 Mollusca: General characteristics and classification up to classes; Torsion and detorsion in gastropods; Pearl formation and economic importance of molluscs.

2.4 Echinodermata: General characteristics and classification up to classes; Water vascular system in starfish; Larval forms of echinoderms.

2.5 Hemichordata: General characteristics and affinities of Hemichordata.

UNIT III: VERTEBRATES - PROTOCHORDATES TO AMPHIBIANS (15 Periods)

3.1 General characteristics of Urochordata and Cephalochordata; Retrogressive metamorphosis in Urochordata.

3.2 Cyclostomata: General characteristics and classification; Evolutionary status and affinities of cyclostomes.

3.3 Pisces: General characteristics and classification up to classes and major orders; Migration and osmoregulation in migratory fishes; Parental care in fishes.

3.4 Amphibia: General characteristics and classification up to orders; Parental care, neoteny, and paedogenesis in amphibians.

3.5 Evolutionary Trends in Early Vertebrates: Transition from water to land; Adaptive features in early tetrapod.

UNIT IV: VERTEBRATES - REPTILIA TO MAMMALIA (15 Periods)

4.1 Reptilia: General characteristics and classification up to orders; Biting mechanism in snakes and temporal fossae in reptiles; Adaptive radiations in Mesozoic reptiles.

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4.2 Aves: General characteristics and classification up to orders; Flight adaptations and migration in birds; Evolutionary significance of birds as theropod ancestors.
4.3 Mammalia: General characteristics and classification up to orders; Origin of mammals: Monotremes, marsupials, and placentals; Dentition and aquatic adaptations in mammals.
4.4 Evolutionary Trends in Vertebrates: Origin of amniotes and evolutionary significance of amniotic egg; Primate evolution and human ancestry.
4.5 Conservation of Vertebrate Diversity: Threats to vertebrate diversity; Conservation strategies for endangered species.

Suggested Readings:

1. Ruppert, E.E., Fox, R.S., Barnes, R.D. (2004). Invertebrate Zoology: A Functional Evolutionary Approach. VII Edition, Cengage Learning, India
2. Barrington, E.J.W. (2012). Invertebrate Structure and Functions, II Edition, ELBS and Nelson.
3. Pechenik, J. A. (2015). Biology of the Invertebrates. VII Edition, McGraw-Hill Education
4. Hickman, C., Keen, S., Larson, A., Eisenhour, D. (2018). Animal Diversity, 9th Edition, McGraw-Hill.
5. Young, J.Z. (2004). The Life of Vertebrates, III Edition, Oxford University Press.
6. Kardong, K.V. (2009). Vertebrates: Comparative Anatomy, Function, Evolution, 4th Edition, McGraw-Hill.
7. Pough F.H., Janis, C.M., Heiser, J.B., Heiser, C.B. (2009). Vertebrate Life, VIII Edition, Benjamin Cummings.
8. L.H. Hyman 'The Invertebrates' Vol I, II and V. – M.C. Graw Hill Company Ltd.
9. Kotpal, R.L. Protozoa, Porifera, Coelenterata, Helminthes, Arthropoda, Mollusca, Echinodermata. Rastogi Publications, Meerut.
10. E.L. Jordan and P.S. Verma 'Invertebrate Zoology' S. Chand and Company.
11. R.D. Barnes 'Invertebrate Zoology' by: W.B. Saunders CO., 1986.
12. P.S. Dhami and J.K. Dhami. Invertebrate Zoology. S. Chand and Co. New Delhi.
13. Parker, T.J. and Haswell 'A text book of Zoology' by, W.A., Mac Millan Co. London.
14. Mohan P.Arora. 'Chordata – I, Himalaya Publishing House Pvt.Ltd.
15. Marshal, Parker and Haswell 'Text book of Vertebrates'. ELBS and McMillan, England.
16. J.W. Young, The Life of Vertebrates, 3rd ed, Oxford University press.
17. Harvey Pough F, Christine M. Janis, B. Heiser, Vertebrate Life, Pearson, 6th ed, Pearson Education Inc.2002.

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B.Sc. ZOOLOGY I YEAR

PRACTICAL SYLLABUS

DISCIPLINE SPECIFIC CORE COURSE – I

ANIMAL DIVERSITY – INVERTEBRATES & VERTEBRATES

Instructions: 2hr per week

No. of credits: 1

1. Study of Museum Specimens/Slides/Models (with Classification of animals)
    1. Protozoa: *Amoeba, Paramecium, Plasmodium vivax*
    2. Porifera: *Sycon, Spongilla*
    3. Cnidaria: *Obelia, Aurelia*
    4. Platyhelminthes: *Fasciola, Taeniasolium*
    5. Nemathelminths: *Ascaris, Wuchereria*
    6. Annelida: *Nereis, Hirudinaria*
    7. Arthropoda: Prawn, *Periplaneta*
    8. Mollusca: *Pila, Sepia*
    9. Echinodermata: *Asterias, Echinus*
    10. Protochordates: *Balanoglossus, Amphioxus*
    11. Cyclostomata: *Petromyzon, Myxine*
    12. Pisces: *Scoliodon, Labeo*
    13. Amphibia: *Hoplobatrachus, Bufo*
    14. Reptilia: *Calotes, Naja*
    15. Aves: *Columba, Passer*
    16. Mammalia: *Pteropus, Oryctolagus, Funambulus*

2. Dissections
    Prawn: Appendages, digestive system, nervous system, mounting of statocyst.
    Insect: Mouthparts of Anopheles, Culex, housefly, and butterfly.
    Virtual dissection of Labeo/Tilapia: Digestive system, brain, and cranial nerves (demonstration only).
3. Key for identification of venomous and non-venomous snakes
4. First aid for snake bite mitigation
5. Animal Album: Mandatory submission of an "Animal album" containing photographs, cut-outs, and write-ups about the studied taxa.
6. Visit to Zoological Park or Natural History Museum
7. Computer-Aided Techniques : Use of virtual dissections and animations for better understanding of anatomical structures.

Suggested manuals:

1. Lal, S.S. Practical Zoology – Invertebrates, Rastogi Publications.
2. Verma, P.S. Practical Zoology – Invertebrates, S. Chand Publications.
3. Verma, P.S. A Manual of Practical Zoology – Chordata, S. Chand Publications.
4. S.S.Lal, Practical Zoology – Vertebrata
5. Freeman & Bracegirdle, An atlas of embryology

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B.Sc. ZOOLOGY I YEAR

SEMESTER-II

DISCIPLINE SPECIFIC CORE COURSE – II

COMPARATIVE ANATOMY OF VERTEBRATES AND DEVELOPMENTAL BIOLOGY

Instructions: 4 hours per week

No. of period: 60

No. of credits: 4

UNIT – I: Integumentary, Skeletal, and Muscular Systems (15 Periods)

1.1 Comparative study of structure and function of integument and its derivatives (glands, scales, feathers, and hair) from fishes to mammals.

1.2 Comparative study of axial skeleton in fishes to mammals (skull and vertebrae).

1.3 Comparative study of appendicular skeleton in fishes to mammals (pectoral and pelvic girdles; limbs).

1.4 Comparative anatomy of axial, appendicular, branchiomeric, and integumentary muscles.

1.5 Comparative study of adaptive modifications in vertebrate locomotion (swimming, walking, and flying).

UNIT – II: Digestive, Respiratory, Circulatory, and Excretory Systems (15 Periods)

2.1 Evolution of the Digestive System – Structural and functional modifications of the alimentary canal an digestive glands from fishes to mammals.

2.2 Respiratory System Adaptations – Comparative study of respiratory structures (gills, swim bladders, lungs, and air sacs) and their evolutionary significance.

2.3 Circulatory System Variations – Morphological and functional diversity of the heart, aortic arches, and major blood vessels in vertebrates.

2.4 Excretory System and Osmoregulation – Evolution of kidneys, urinary bladders, and their ducts in different vertebrate groups with adaptations to aquatic and terrestrial environments.

2.5 Nephron and Kidney Evolution – Comparative anatomy of nephron structure, types of kidneys (pronephros, mesonephros, metanephros), and their evolutionary succession.

UNIT – III: Reproductive, Nervous, and Sensory Systems (15 Periods)

3.1 Evolution of Reproductive Organs – Structural and functional modifications in male and female reproductive organs from fishes to mammals.

3.2 Modifications in Vertebrate Genital Structures – Evolutionary adaptations in gonads, accessory reproductive structures, and reproductive strategies across vertebrates.

3.3 Comparative Anatomy of the Nervous System – Structural variations in the vertebrate brain and cranial nerves from fishes to mammals.

3.4 Spinal Cord and Peripheral Nervous System – Comparative study of the spinal cord and spinal nerves, their structural and functional modifications in vertebrates.

3.5 Sensory Organs and Receptor Systems – Comparative study of sensory organs (vision, hearing, taste, smell, and touch) and sensory receptors (special somatic and special visceral receptors)from fishes to mammals.

UNIT – IV: Developmental Biology (15 Periods)

4.1 Early Embryonic Development: Gametogenesis (spermatogenesis and oogenesis) in mammals; vitellogenesis in birds; Fertilization mechanisms, and blocks to polyspermy.

4.2 Cleavage and Gastrulation: Structure of the fertilized chick egg; Patterns of cleavage, presumptive areas, fate maps.

4.3 Late Embryonic Development: Implantation of the rabbit embryo; Extraembryonic membranes; Placenta and types.

4.4 Organogenesis: Morphogenetic movements; Neurulation and notogenesis in frogs.

4.5 Basic principles of Evolutionary Developmental Biology Hox genes, and their role in vertebrate development and evolution.

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SUGGESTED READINGS:

1. E.L.Jordan and P.S. Verma 'Chordate Zoology' -. S. Chand Publications.
2. Mohan P. Arora. 'Chordata – I, Himalaya Publishing House Pvt.Ltd.
3. Marshal, Parker and Haswell 'Text Book of Vertebrates'. ELBS and McMillan, England.
4. Alfred Sherwood Romer. Thomas S. Pearson 'The Vertebrate Body, Sixth edition, CBS College Publishing, Saunders College Publishing.
5. George C. Kent, Robert K. Carr. Comparative Anatomy of the Vertebrates, 9th ed. McGraw Hill.
6. Kenneth Kardong Vertebrates: Comparative Anatomy, Function and Evolution, 4th ed, McGraw Hill.
7. J.W. Young, The Life of Vertebrates, 3rd ed, Oxford University Press.
8. Harvey Pough F, Christine M. Janis, B. Heiser, Vertebrate Life, Pearson, 6th ed, Pearson
9. Education Inc.2002.
10. Gilbert, S. F. (2010). Developmental Biology, IX Edition, Sinauer Associates, Inc.,
11. Publishers, Sunderland, Massachusetts, USA.
12. Balinsky B. I. and Fabian B. C. (1981). An Introduction to Embryology, V Edition, International Thompson Computer Press.
13. Carlson, R. F: Patten's Foundations of Embryology
14. Kalthoff (2008). Analysis of Biological Development, II Edition, McGraw-Hill Publishers.
15. Berril. N.J. and Karp: Developmental Biology. McGraw Hill, New York.

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B.Sc. ZOOLOGY I YEAR

PRACTICAL SYLLABUS

DISCIPLINE SPECIFIC CORE COURSE - II

COMPARATIVE ANATOMY OF VERTEBRATES AND DEVELOPMENTAL BIOLOGY

Instructions: 2hr per week

No. of credits: 1

1. Comparative Study of Vertebrate Skeletons: Observation and identification of skeletal structures from different vertebrate groups (fishes, amphibians, reptiles, birds, mammals).
2. Histological Examination of Tissues: Microscopic study of integumentary, muscular, and glandular tissues in different vertebrates.
3. Virtual Dissection and Organ System Comparison: Dissection of representative vertebrates to study the digestive, respiratory, circulatory, nervous and urogenital systems.
4. Comparison of the anatomy of locomotory appendages in different groups of vertebrates .
5. Developmental Biology Experiments: Study of frog/chick embryology through prepared slides, observation of cleavage, gastrulation, and neurulation stages.

Suggested Manuals

1. Freeman & Bracegirdle, An atlas of embryology
2. George C. Kent, Robert K. Carr. Comparative Anatomy of the Vertebrates, 9th ed. McGraw Hill.
3. Kenneth Kardong Vertebrates: Comparative Anatomy, Function and Evolution, 4th ed, McGraw Hill.

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