

Deccan Education Society's  
**FERGUSSON COLLEGE (AUTONOMOUS)**  
**PUNE**

**SYLLABUS**  
**SECOND YEAR B.Sc. ZOOLOGY**

**Academic Year 2017-2018**

**SEMESTER –III**

**PAPER CODE: ZOO2301****PAPER –I: LIFE AND DIVERSITY OF ANIMALS – III****[Credit -3: No. of Lectures 45]**

	<b>Title and Contents</b>	<b>No. of Lectures</b>
<b>Unit –I</b>	Salient features and classification up to order of the following: (any one example from each order) : Class <i>Insecta</i> (special emphasis on the evolutionary aspect) Class <i>Gastropoda</i> Class <i>Asteroidea</i>	<b>15</b>
<b>Unit –II</b>	<b>General topics:</b> Mouthparts in Insects Metamorphosis in Insects Mimicry in Insects Bioluminescence in Fireflies Larval forms of Class <i>Crustacea</i> Shell and foot modification in <i>Molluscs</i> Types of <i>Pedicellariae</i> Larval forms of <i>Asteroidea</i>	<b>15</b>
<b>Unit –III</b>	<b>Study of Sea Star:</b> Systematic Position, Habit and Habitat External Characters Digestive System Water Vascular System Reproductive System Autotomy and Regeneration (Latest Development and examples from other groups)	<b>02</b> <b>02</b> <b>03</b> <b>03</b> <b>02</b> <b>02</b> <b>01</b>

**References:**

1. Text Books of Zoology. Vol.11, Invertebrates, A. J. Marshall And W. D. Williams, ELSB And Macmillan, Hongkong.
2. Invertebrates Zoology, E.L. Jordan and P.S. Verma; S. Chand and Co. Ltd., New Delhi. 14th fully Revised Edition
3. Invertebrate Zoology, Ruppert and Barnes, 6<sup>th</sup> Edition.
4. An Introduction to Mollusca. H. S. Bhamrah, Kavita Juneja. Anmol Publications Pvt.Ltd. New Dehli- 110002 (India).
5. Life of Invertebrates, S. N. Prasad, Vikas Publishing Co. Sahldabad.
6. The Invertebrates, Echinodermata Vol- IV, L.H. Hyman, International books and periodicals supply services Dehli.
7. An Introduction of Echinodermata. . H. S. Bhamrah, Kavita Juneja. Anmol Publications Pvt. Ltd. New Dehli- 110002 (India).
8. Invertebrate Zoology R. D. Barnes, Saunders College, Philadelphia.
9. Text Books of Zoology, Invertebrates Vol- II, T.J.Parker and W.A. Haswel, Edited by Marshall and Williams, CBS publications and distribution, New Dehli.
10. Invertebrate Zoology, Paul, A. Meglitch and Fedricks R. Schram, Oxford University Press, New York.
11. Modern Text Book of Zoology. Invertebrates. 6th Edition, R. L. Kotpal, Rastogi Publication, Meerut.

<b>PAPER CODE:ZOO2302</b>		
<b>PAPER –II: ECONOMIC ZOOLOGY- I</b>		
<b>(FISHERIES, EMBRYOLOGY AND BIOINSTRUMENTATION)</b>		
<b>[Credit -3: No. of Lectures 45]</b>		
	<b>Title and Contents</b>	<b>No. of Lectures</b>
	<b>FISHERIES</b>	
<b>Unit-I</b>	An introduction to fisheries and its types (in brief: Freshwater fisheries, Marine fisheries, Brackish water fisheries.	<b>02</b>
<b>Unit -II</b>	Study of different ponds in a fish farm : Breeding , Hatching, Nursery, Rearing and Stocking	<b>03</b>
<b>Unit –III</b>	Habit, habitat and culture methods of following freshwater forms : Rohu ( <i>Labeo rohita</i> ), Catla ( <i>Catla catla</i> ) and Mrigal ( <i>Cirrhinus mrigala</i> )	<b>07</b>
<b>Unit –IV</b>	Harvesting methods of following marine / brackish water forms : Bombay Duck, <i>Mackerel</i> , Crab and Pearl Oyster	<b>05</b>
<b>Unit –V</b>	Crafts and Gears in Indian Fishery : Crafts – Catamaran, Machwa, Dugout canoe, Gears – Gill net, Dol net, Purse net, Rampani net, Cast net.	<b>02</b>
<b>Unit –VI</b>	Fishery by products :Fish meal, Fish flour, Liver oil, Ising glass, Fish glue, Fish manure and Fish fin soup	<b>02</b>
<b>Unit –VII</b>	Fish Preservation Technique : Sun Drying, Salting, Freezing, Chilling And Canning	<b>02</b>
	<b>EMBRYOLOGY AND BIOINSTRUMENTATION</b>	
<b>Unit-I</b>	Introduction and Theories of Developmental Biology (Epigenesis, pangenesis and Germ Plasm) Types of Eggs: On the basis on amount & distribution of Yolk Gametogenesis in animals in brief and gross structure of gametes. Concept and Significance of Fertilization: Process and Significance Cleavage and Blastulation: Definition, Pattern, Structure of Blastula and its Types. Gastrulation and Morphogenetic Movements in Early Development (Invagination, Epiboly, Emboly, Involution, Ingression and Delamination) In Vitro fertilization; Definition and Types of ART Gamete Intrafallopian Transfer (GIFT); Zygote Intrafallopian Transfer (ZIFT) Intracytoplasmic Sperm Injection; Process of IVF; Risk factors in IVF; Success rate of IVF (Current status and future) Introduction to Surrogacy (Definition, scope, History, Social relevance)	<b>12</b>
	<b>BIOINSTRUMENTATION</b>	
<b>Unit-II</b>	Hot Air Oven; Incubator; Laminar Air Flow; pH Meter; Colorimeter Chromatography : Principle and Types (Paper and Thin Layer Chromatography)	<b>07</b>

<b>Unit-III</b>	<b>Ethics in Animal Research</b> The ethical and sensitive care and use of animals in research, teaching and testing, Approval from Institutional animal ethics Committee  <b>Ethics In Clinical Research</b> Approval from Clinical Research Ethical Committee, Informed Consent.	<b>03</b>
-----------------	--	-----------

**References:**

1. Fishes. Mary Chandy. N.B.T. India.
2. Economic Zoology, Shukla Upadhyay, Rastogi Publication, Meerut, India.
3. Fisheries Developments, K.K. Trivedi, Oxford and IBH Pub. Co.
4. Marine Fishes in India, D. V. Bal & K. Virbhadra, Tata McGraw Hill Publication.
5. Fishery Management, , S. C. Agarwal, Avinash Publication House, New Delhi.
6. Embryology, Mohan P. Arora.
7. Chordate Embryology- Dalela, Verma and Tyagi.
8. Developmental Biology, Scott Gilbert.
9. Embryology, Balinsky.
10. Practical I Biochemistry, David Plummer.
11. Biochemistry Laboratory (Modern Theory and Techniques), Rodney Boyer.
12. Indian Council of Medical Research (ICMR) guidelines.

	<b>PAPER CODE: ZOO2303</b> <b>PAPER –III: PRACTICALS</b> <b>[Credit -2: No. of Practicals 10]</b> <b>*D=Demonstration, E=Experiment.</b>
	<b>Title of Experiment/ Practical</b>
1	Study and classification with reasons of the following animals: Phylum Arthropoda:- Scorpion, Crab, Cockroach, Head louse, Centipede and <i>Peripatus</i> (D)
2	Study and classification with reasons of the following animals: Phylum Mollusca:- <i>Chiton</i> , Snail, Bivalve, <i>Dentalium</i> and <i>Octopus</i> (D)
3	Study and classification with reasons of the following animals: Phylum Echinodermata:- Sea Star, Brittle star, <i>Holothuria</i> , Sea Urchin and <i>Echinus</i> (D)
4	Study of permanent slides of mouthparts of the following insects : Cockroach, Mosquito, Plant bug/Bed bug, Butterfly, Honey Bee and Housefly (D)
5	Study of Shell: <i>Chiton</i> , <i>Pila</i> , <i>Sepia</i> , <i>Pecten</i> , <i>Dentalium</i> , Study of Foot: <i>Chiton</i> , <i>Patella</i> , <i>Aplysia</i> , <i>Sepia</i> , <i>Octopus</i> and <i>Dentalium</i> (D)
6	Identification, Classification and study of habit, habitat and economic importance of the following:(D) a) Rohu, Catla, <i>Mrigal</i> , <i>Pomphret</i> . b) Prawn, Crab and Oyster.
7	Study of Permanent slides of Eggs of : <i>Amphioxus</i> , Insect, Frog and Hen (D)
8	Study of Blastulae and Gastrulae (Permanent Slides): <i>Amphioxus</i> , Frog and Chick (D)
9	Study of external characters ,digestive and water vascular system of Sea Star (D)
10	Study of Principle of Chromatography and Separation of amino acid mixture by ascending paper chromatography (E)

Deccan Education Society's  
**FERGUSSON COLLEGE (AUTONOMOUS)**  
**PUNE**

**SYLLABUS**  
**SECOND YEAR B.Sc. ZOOLOGY**

**Academic Year 2017-2018**

**SEMESTER –IV**

<b>PAPER CODE: ZOO2401</b>		
<b>PAPER –I: LIFE AND DIVERSITY OF ANIMALS -IV</b>		
<b>[Credit -3: No. of Lectures 45]</b>		
	<b>Title and Contents</b>	<b>No. of Lectures</b>
<b>Unit –I</b>	Salient features of following classes and its subclasses with two examples of each: Reptilia , Aves and Mammalia	<b>12</b>
<b>Unit –II</b>	<b>General topics:</b> Poisonous and non-poisonous snakes (Two examples each) Management of snake bites Migration in Birds Aquatic mammals Ethology: Definition and Scope; Innate and Learned Behaviour in Animals; Types of Learning in Animals: Habituation, Imprinting, Classical Conditioning, Instrumental learning and Insight Learning	<b>15</b>
<b>Unit –III</b>	<b>Study of <i>Scoliodon</i></b> Systematic position, Habit and habitat, External characters, Digestive system, food, feeding and physiology of digestion, Respiratory system, Blood vascular system, Nervous system and sense organs, Male Urinogenital system and Female Urinogenital system	<b>18</b>

#### **References:**

1. Biology of Animals By Ganguly, BB., Sinha, A.K., Adhikari, S., New Central Book Agency, Kolkata
2. Introduction to Amphibia By Bhamrah, MS., Juneja, K., Anmol Publication, Delhi
3. Life of Vertebrates By Young, JZ., III Edition, Clarendon Press, London
4. General Zoology By Goodnight and others IBH Publishing Co.
5. Life of Vertebrates By Young, JZ., III Edition, Clarendon Press, London
6. General Zoology By Goodnight and others IBH Publishing Co.
7. Textbook of Vertebrate Zoology, By Kotpal, RL., Rastogi and Co. Meerut
8. Animal Diversity By Kershaw, DR., Redwood Burn Ltd., Trowbridge
9. Textbook of Zoology By Parkar J. and Haswell, W., ELBS Edition
10. Textbook of Zoology By Vidyarthi, Agrasia Publishers, Agra Animal Behaviour- David Mc Farland
11. Animal Behaviour- Mohan Arora
12. Animal Behaviour – Reena Mathur
13. An Introduction to Animal Behaviour- Dawkins
14. Animal Behaviour- Tinbergen

<b>PAPER CODE:ZOO2402</b>		
<b>PAPER –II: ECONOMIC ZOOLOGY II (APICULTURE AND SERICULTURE)</b>		
<b>[Credit -3: No. of Lectures 45]</b>		
	<b>Title and Contents</b>	<b>No. of Lectures</b>
<b>APICULTURE</b>		
<b>Unit –I</b>	An introduction to Apiculture, Study of habit, habitat and nesting behavior of <i>Apis dorsata</i> , <i>Apis indica</i> , <i>Apis florea</i> and <i>Apis mellifera</i>	<b>03</b>
<b>Unit –II</b>	Life cycle, Colony organization and division of labour, Polymorphism	<b>05</b>
<b>Unit –III</b>	Bee behaviour and bee communication.	<b>03</b>
<b>Unit –IV</b>	Bee keeping equipments : <b>a)</b> Bee box (Langstroth type) <b>b)</b> Honey extractor <b>c)</b> Smoker <b>d)</b> Bee-veil <b>e)</b> Gloves <b>f)</b> Hive tool <b>g)</b> Bee Brush and <b>h)</b> Queen excluder	<b>02</b>
<b>Unit –V</b>	Bee products (collection methods, composition and uses: <b>a)</b> Honey <b>b)</b> Wax <b>c)</b> Bee Venom <b>d)</b> Propolis <b>e)</b> Royal jelly and <b>f)</b> Pollen grains	<b>05</b>
<b>Unit –VI</b>	Diseases and enemies of Bees: <b>a)</b> Bee diseases – Protozoan, Bacterial, Viral, Fungal – with two examples. <b>b)</b> Bee pests – Wax moth (Greater and Lesser), Wax beetle. <b>c)</b> Bee Enemies – Bee eater, King crow, Wasp, Lizard, Bear, Man	<b>04</b>
<b>Unit –VII</b>	Bee pollination	<b>01</b>
<b>SERICULTURE</b>		
<b>Unit –I</b>	An introduction to sericulture, Study of different types of silk moths and the varieties of silk produced by Mulberry, Tassar, Eri and Muga silkworms in India.	<b>04</b>
<b>Unit –II</b>	External morphology and life cycle of <i>Bombyx mori</i> .	<b>03</b>
<b>Unit –III</b>	Moriculture: Cultivation of mulberry, Varieties for cultivation, Rainfed and irrigated mulberry cultivation – Fertilizer schedule, Pruning methods and leaf yield, Harvesting of mulberry: Leaf plucking, Branch cutting and Whole shoot cutting	<b>02</b>
	Quality of silk, factors influencing the quality of silk, market value, commercial aspects	<b>04</b>
<b>Unit –IV</b>	<b>Silk worm rearing</b> Types of rearing, Rearing house and Rearing techniques	<b>05</b>
<b>Unit –V</b>	<b>Post harvest processing of cocoons</b> Harvesting and Preparation of cocoons for marketing Stiffling, Sorting, Storage, Deflossing and Riddling Cocoon cooking, Reeling Equipment and Rereeling, Washing and Polishing.	<b>02</b>
<b>Unit –VI</b>	Important diseases (Bacterial, viral and fungal)	<b>02</b>



**References:**

1. Biology of Insects, S.C. Saxena. Oxford and IBH Publishing Co., New Delhi. Bombay, Calcutta.
2. Bee and Bee Keeping, Roger A. Morse, Conell University Press, London.
3. The Behaviour & Social Life of Honey Bees, C.R. Ribbandas, Dover Publication inc.New York.
4. Principal of Sericulture. Hisao Arguo, Oxford & Co.
5. An Introduction of Sericulture, G.Ganga, J. Sulochana, Oxford & IBH Publication Co. Bombay.
6. FAQ Manual of Sericulture. Vol I Mulberry Cultivation, Vol II Silkworm Rearing. Central Silk Board, Bangalore.

<b>PAPER CODE: ZOO2403</b> <b>PAPER –III: PRACTICALS</b> <b>[Credit -2: No. of Practicals 10]</b>	
<b>Title of Experiment/ Practical</b>	
1	Study and classification with reasons of the following animals (D) Class Reptilia – <i>Cobra</i> , Garden lizard, Turtle, Rat snake, <i>Draco</i> .
2.	Study and classification with reasons of the following animals (D) Class Aves – Sparrow, Crow, Parrot, Woodpecker. Class Mammals – Rabbit, Mongoose, Kangaroo.
3	Identification of Poisonous and non- poisonous snakes with the help of identification key with two examples of each (D)
4	Study of external characters and digestive system of <i>Scoliodon</i> . (D)
5	Study of brain of <i>Scoliodon</i> (D)
6	a) Study of life cycle of Honey bee (D) b) Study of mouth parts, thoracic appendages (legs and wings) and sting apparatus of Honey bee.
7	Study of various bee keeping equipments (D) Study of: a) bee products, b) bee pests, d) bee enemies.
8	Study of life cycle of <i>Bombyx mori</i> .(D) b) Study of any five equipments in Sericulture.
9	Submission of short project report on Economics of Bee keeping (Activity based practical) (maximum 600 words, with necessary pictures).
10	Report on bird diversity in Fergusson College campus (Activity based practical).

#### References:

1. Invertebrates Practical Zoology. V. Banerjee. Bharati Bhavan, Patna,
2. Practical Zoology. Invertebrate / Vertebrate. S. S. Lal, Rastogi Publications. Meerut, India, Uttar Pradesh.
3. A Manual of Practical Zoology, Vol I Non-Chordata. P.K.G Nair and K. P Aehar. Himalaya Publishing House, Bombay, Delhi, Nagpur.
4. A Manual of Practical Zoology, Vol II Non-Chordata,. P.K.G Nair and K. P. Aehar. Himalaya Publishing House, Bombay, Delhi, Nagpur.
5. A Manual of Practical Zoology, Invertebrate,. P. Verma, S. Chand and Co., New Delhi..
6. Practical Invertebrate Zoology,V. S. Shrivastava. Central Book Depot, Allahabad.
7. A Manual of Practical Vertebrate Zoology and Physiology, V. B. Rastogi, Kedarnath, Ramnath, Meerut, Delhi.
8. Practical Bee keeping, Herbert Mace. Ward Lock Limited, London.
9. Handbook of Practical Sericulture, S. R. Uttal and M.N. Narsimhana, Central Silk Board, Bangalore.