M. C. E. Society's

Abeda Inamdar Senior College

Of Arts, Science and Commerce, Camp, Pune-1

(Autonomous) Affiliated to Savitribai Phule Pune University

NAAC accredited 'A' Grade

S.Y.B.Sc Zoology

(CBCS – Autonomy 21 Pattern)

Course/ Paper Title	Vertebrate Diversity- I
Course Code	21SBZO231
Semester	III
No. of Credits	2 (36 lectures of 50 minutes)

Aims & Objectives of the Course

Sr. No.	Objectives
1.	To understand the chordate diversity around us.
2.	To understand the underlying principles and terminology needed in classification of chordates.
3.	To able to understand the possible group of vertebrates observes in nature and classify them based on general characters.
4.	To understand parental care in Amphibia.
5.	To understand the anatomy and physiology of organs systems of vertebrate.

Expected Course Specific Learning Outcome

Sr. No.	Learning Outcome
1.	The students will be able to understand, classify and identify the diversity of Chordates.
2.	The students will able to understand the complexity and difference of Chordates.
3.	The students will be able to understand different life functions of vertebrates.
4.	The students will be able to understand the linkage among different groups of vertebrates.
5.	The students will be able to identify types of scales and fin in fishes.
6.	The student will be able to explain habit, habitat, anatomy and physiology of *Scoliodon.*

Syllabus

Unit No	Title with Contents	No. of Lectures
Unit I	**Introduction to Phylum Chordata –**	**07**
	1. Dipleurula concept and the Echinoderm theory of origin of chordates 2. Salient features of Phylum Chordata and outline of classification 3. Classification of Phylum Chordata upto class – Pisces, Amphibia, Reptilia, Aves, Mammalia. 4. Comparison of characters of chordates with non-chordates 5. Salient features of Hemichordata with examples- *Balanoglossus*	
Unit II	**Introduction to Group – Protochordata.**	**03**
	1. Salient features of following subphyla with two examples each i. Urochordata – *Herdmania* and *Salpa*, ii. Cephalochordata – *Amphioxus* and *Asymmetron* 2. Retrogressive metamorphosis in Urochordata	
Unit III	**Introduction to subphylum vertebrata**	**05**
	1. Salient features of vertebrata. 2. Introduction and general characters and classification upto class with two examples. i. Agnatha–*Petromyzon* and *Myxine* ii. Gnathostomata with examples	
Unit IV	**Introduction to Class – Pisces**	**08**
	1. Salient features of class Pisces. 2. Introduction and salient features of following sections with examples i. Chondrichthyes – *Scoliodon* and *Chimaera* ii. Osteichthyes – *Labeo* and *Catla* 3. Types of scales in fishes. 4. Types of fins in fishes. 5. Aerial respiration in fishes. 6. Migration, osmoregulation and swim bladder in fishes	
Unit V	**Introduction to class – Amphibia**	**07**
	1. Salient features of class Amphibia. 2. Introduction to order - Apoda–*Ichthyophis*, Urodela–*Salamandra*,	

	Annura - *Rana* 3. Parental care in Amphibia. 4. Pademorphosis in Amphibia	
Unit VI	**Study of *Scoliodon***	**06**
	1. Systematic position, geographical distribution, habit, habitat and external characters 2. Digestive system, food and feeding mechanism. 3. Respiratory system – Structure of holobranch only. 4. External morphology, internal structure and working of heart of *Scoliodon*. 5. Nervous System (Brain). 6. Male urinogenital system & Female reproductive System. 7. Yolk sac placenta.	

References:

1. T.J. Parker and W.A. Haswel, Edited by Marshall and Williams, (1992), Text Books of Zoology, Invertebrates Vol- II, CBS publications and distribution, New Delhi.

2. Hickman CP, Roberts LS & Larson A., Integrated Principles of Zoology, Eleventh Edition International Edition, The McGraw-Hill Companies, Inc.,

3. R. L. Kotpal, 3rd edn. Modern Text Book of Zoology, Vertebrates Rastogi Publications, Meerut.

4. P. S. Dhami and J.K.Dhami, (1982), Chordate Zoology, R. Chand and Co., New Delhi.

5. Campbell and Reece. 7th Edn. Biology, Pearson Education in South Asia, Delhi.

6. Young, J. Z. (2004). The Life of Vertebrates. III Edition. Oxford university press.

7. Pough H., (2018), Vertebrate life, X Edition, Pearson International.

8. Hickman C. P., Roberts L. S.& Larson A. Integrated Principles of Zoology, Eleventh Edition, International Edition, The McGraw-Hill Companies, Inc.,

9. Arora M.P. Chordates I. Himalaya Publications.

10. R.S. Lull. Organic Evolution. Light & Life Publishers.

11. Jordan E. L.& Verma P. S. (2003), Chordates Zoology. S. Chand & Company Ltd. New Delhi.

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NAAC accredited 'A' Grade

S.Y.B.Sc Zoology

(CBCS – Autonomy 21 Pattern)

Course/ Paper Title	Applied Zoology – I
Course Code	21SBZO232
Semester	III
No. of Credits	2 (36 lectures of 50 minutes)

Aims & Objectives of the Course

Sr. No.	Objectives
1.	To understand the basic information about fishery, cultural and harvesting methods of fishes
2.	To understand fish preservation techniques
3.	To study types of agricultural pests and Major insect pests of agricultural importance
4.	To study Pest control practices

Expected Course Specific Learning Outcome

Sr. No.	Learning Outcome
1.	The learner understands the basic information about fishery, cultural and harvesting methods of fishes and fish preservation techniques.
2.	The learner understands the types of agricultural pests, Major insect pests of agricultural importance and Pest control practices
3.	The learner will be able to link the intricacies of fishery, cultural and harvesting methods of fishes and fish preservation and use it for developing his/her own business
4.	The learner will be able to apply the knowledge about agricultural pest and its management in their own farms in their locality

Syllabus

Unit No.	Title with Content	No. of Lectures
	Fisheries	
Unit I	**A brief introduction to fisheries and its types**	**03**
	1. Freshwater fisheries- Riverine fishery and Pond fishery **2. Marine fisheries-** Coastal fishery**,** Offshore fishery and Deep sea fishery **3. Brackish water fisheries-** Estuarine lakes and Embanked fishery	
Unit II	**Types of ponds used in fishery and its management in brief**	**02**
	1. Nursery Pond 2. Rearing Pond 3. Stocking Pond	
Unit III	**Habit, habitat and culture methods of some freshwater forms**	**03**
	1. Rohu (*Labeo rohita*) 2. Catla (*Catla catla*) 3. Mrigal (*Cirrhinus mrigala*) 4. Giant prawn (*Macrobrachium rosenbergi*)	
Unit IV	**Harvesting methods of following marine forms**	**02**
	1. Harpadon 2. Mackerel 3. Lobster 4. Pearl oyster	
Unit V	**Crafts and gears in Indian Fishery**	**03**
	1**. Crafts/ Boats-** Catamaran, Machwa, Dinghy, Dugout canoe and Built – up boat **2. Gears/ Nets-** Gill net, Dol net**,** Purse net**,** Rampani net and Cast net	
Unit VI	**Fishery byproducts**	**02**
	1. Fish meal 2. Fish flour 3. Fish liver oil	

	4. Fish manure 5. Fish fin soup	
Unit VII	**Fish preservation technique**	**02**
	1. Chilling 2. Freezing 3. Salting 4. Drying 5. Canning	
Unit VIII	**Technologies in Fishery development**	**03**
	1. Recirculation technology 2. Geographic Information System (GIS) technology 3. Use of Information and Communication Technology (ICT) in fishes	
	Agricultural Pests and their control	
Unit I	**Pest**	**01**
	1. Introduction, history and origin 2. Definition and types of pests i. Agricultural, household ii. Stored grain iii. Structural iv. Veterinary v. Forestry vi. Nursery	
Unit II	**Study of important agricultural pests (marks of identification, life cycle, nature of damage and control measures)**	**06**
	1. Jowar stem borer 2. Red cotton bug 3. Brinjal fruit borer 4. Mango stem borer 5. Pulse beetle 6. Rice weevil	
Unit III	**Study of following non insect pests with respect to nature of damage and control measures**	**01**

	1. Rats 2. Crabs 3. Snails and Slugs 4. Squirrels	
Unit IV	**Pest control practices in brief**	**05**
	1. Cultural control 2. Physical control 3. Mechanical control 4. Chemical control 5. Biological control 6. Pheromonal control 7. Autocidal control 8. Concept of IPM in brief	
Unit V	**Important plant protection appliances**	**02**
	1. Rotary duster 2. Knapsack sprayer 3. Cynogas Pump.	
Unit VI	**Hazards of pesticides on human and antidotes**	**01**

References:

1. Fishes. Mary Chandy. N.B.T. India, 2005.
2. Economic Zoology, Shukla Upadhyay, Rastogi Publication, Meerut, India, 1998.
3. Fisheries Developments, K.K. Trivedi, Oxford and IBH Pub. Co.
4. Marine Fishes in India, 1990, D.V.Bal & K. Virabhdra, tata McGraw Hill Publication.
5. Fishery Management, 1990, S.C.Agarwal, Avinash Publication House, New Dehli.
6. Entomology & Pest Management. Pedigo L.P. Prentice Hall, India 1996.
7. General & Applied Entomology, Nayar K.K. & T.N. Ananthkrishnan & B.V.Davis, Tata McGraw Hill Publication, New Dehli.
8. Insects. M.S. Mani, NBT, India, 2006.
9. Agricultural Pests: Biology & Control Measures, B.M.Deoray and T.B.Nikam, Nirali Publication, Pune, 1990.
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Publication, 1988.
12. Agricultural Insect Pests of India and their Control, Dennis S.Hill, Cambridge University Press.
13. Applied Entomology. Vol. I & II. K.P. Srivastava. Kalyani Publication, Ludhiyana, New Dehli.
14. Principles of Insect Pest Management. G.S. Dhaliwal and Ramesh Arora, Kalyani Publications, Ludhiyana.
15. Pest Management and Pesticides: Indian Scenario. Editor- B. Vasantaraj David, Namrutha Publications, Madras (Chennai).
16. Concepts of Insect Control. Ghosh M.R. Wiley Eastern Ltd. New Dehli.
17. Recirculating Aquaculture Systems: A Guide to Farm Design and Operations. Andy Davison Independently Published, 2019

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S.Y.B.Sc Zoology

(CBCS – Autonomy 21 Pattern)

Course/ Paper Title	Practical based on 21SBZO231 and 21SBZO232
Course Code	21SBZO233
Semester	III
No. of Credits	2 (14 practicals 60 hours)

Aims & Objectives of the Course

Sr. No.	Objectives
1.	To understand the underlying principles and terminology needed in classification of chordates.
2.	To able to understand the possible group of vertebrates observes in nature and classify them based on general characters.
3.	To understand the anatomy and physiology of organs systems of vertebrate.
4.	To understand the basic information about fishery, cultural and harvesting methods of fishes
5.	To study types of agricultural pests and Major insect pests of agricultural importance
6.	To study Pest control practices

Expected Course Specific Learning Outcome

Sr. No.	Learning Outcome
1.	The student will be able to identify and classify animals based on their characters of Hemichordata, Protochordata, Pisces and Amphibia.
2.	The student will be able to understand anatomy of organ system of vertebrates with reference fish.
3.	The learner understands the basic information about fishery, cultural and harvesting methods of fishes and fish preservation techniques.
4.	The learner will be able to link the intricacies of fishery, cultural and harvesting methods of fishes and fish preservation and use it for developing

	his/her own business
5.	The learner understands the types of agricultural pests, Major insect pests of agricultural importance and Pest control practices
6.	The learner will be able to apply the knowledge about agricultural pest and its management in their own farms in their locality

Syllabus

Sr. no.	**Unit- I Vertebrate Diversity – I**
1.	Museum study of Hemichordata- *Balanoglossus*, Group Protochordata: *Herdmania*, *Amphioxus*.
2.	Museum study of Class Pisces: *Labeo*, *Scoliodon*, *Hippocampus*.
3.	Museum study of Class Amphibia: *Salamandra*, *Rana*, *Ichthyophis*.
4.	Study of types of scales in fishes: Placoid scale, Cycloid scale, Ctenoid scale & Ganoid scale.
5.	Study of types of tail fins in fishes: Homocercal, Heterocercal & Diphycercal.
6.	Study of external characters & digestive system of locally available fish. (E) - Compulsory
7.	Study of brain of locally available fish.
8.	Temporary preparation of scales & its identification from locally available fish. - (E) Compulsory
9.	Compulsory field visit to study pond ecosystem with reference to pisces and amphibians, report writing and submission OR Power point presentation on study of any two animals from two different classes by students.
Sr. no.	**Unit- II Fisheries**
1.	Identification, Classification and study of habit, habitat and economic importance of a) Rohu (*Labeo rohita*), b) Catla (*Catla catla*), c) Mrigal (*Cirrhinus mrigala*). (D)
2.	Identification, Classification and study of habit, habitat and economic importance of

	a) Prawn, b) Crab, c) Lobster, d) Pearl Oyster. (D)
3.	Study and maintenance of Aquarium. (D) - Compulsory
4.	Study of crafts: a) Catamaran, b) Machwa, c) Dinghi (Photographs/models/line drawings). (D)
5.	Study of gears in fishing: a) Gill net, b) Dol net, c) Rampani net, d) Cast net. (Photographs/models/line drawings). (D)
6.	Study of nutritional value of fish: Biochemical estimation of fish muscle proteins by using Biuret method. (E) - Compulsory
7.	Compulsory visit to Fish market and report writing (three photographs of freshwater and marine water fishes each). (E) (2 P).
8.	Compulsory study tour/field visit to Fish farm/ RAS plant/Aquarium. (E) (2 P).
	Unit- III Agricultural Pests and their control
9.	1. Study of following insect pests with respect to marks of identification, nature of damage, economic importance and control measures. (D) a) Jowar stem borer b) Red cotton bug c) Brinjal fruit borer
10.	Study of following pests with respect to marks of identification, nature of damage, economic importance and control measures. (D) a) Mango stem borer b) Rice weevil c) Pulse beetle
11.	Study of any two non-insect pests corresponding to theory course. (D)
12.	Compulsory submission of at least five Insect Pests/ Photographs/ Sketches. (E)
13.	Study of pest control appliances (as per theory course). (D)
14.	Compulsory field visit to Agricultural farm, report writing and submission. (2 P).

S.Y.B.Sc Zoology

(CBCS – Autonomy 21 Pattern)

Course/ Paper Title	Vertebrate Diversity –II
Course Code	21SBZO241
Semester	IV
No. of Credits	2 (36 lectures of 50 minutes)

Aims & Objectives of the Course

Sr. No.	Objectives
1.	To understand the higher vertebrate diversity around us.
2.	To understand the underlying principles and terminology needed in classification of higher vertebrates.
3.	To able to understand the possible group of vertebrates observed in nature and classify them based on general characters.
4.	To understand morphological and physiological adaptations in Desert animals
5.	To understand difference between venomous and non-venomous snakes
6.	To understand the anatomy and physiology of organs systems of mammals.

Expected Course Specific Learning Outcome

Sr. No.	Learning Outcome
1.	The students will be able to understand, classify and identify the diversity of higher vertebrates.
2.	The students will able to understand the complexity and difference of higher vertebrates.
3.	The students will be able to understand different life functions of higher vertebrates.
4.	The students will be able to understand the anatomical and physiological adaptation in vertebrates.
5.	The student will be able to explain anatomy and physiology of organs systems of rat.

Syllabus

Unit No	Title with Contents	No. of Lectures
Unit I	**Introduction to class – Reptilia**	**08**
	1. Salient features of class Reptilia with two examples (name only) – *Chelone*, *Calotes*. 2. Venomous and Non-venomous snakes – Cobra, Russell's viper, Rat snake, Grass snake. 3. Poison apparatus and biting mechanism 4. Snake venom- Nature and effects. 5. First aid treatment of snakebite. 6. Desert adaptations in reptiles in brief. 7. Status of *Sphenodon* and crocodiles.	
Unit II	**Introduction to class –Aves**	**08**
	1. Salient features of class Aves with two examples (names only) –Sparrow, Parrot. 2. *Archaeopteryx*- a connecting link; 3. Flight adaptations in birds. 4. Types of Beaks and feet in birds. 5. Migration in birds – Altitudinal, Latitudinal, Diuranal and Nocturnal	
Unit III	**Introduction to class - Mammalia**	**10**
	1. Salient features of class Mammalia with two examples (names only) – Rat, Rabbit. 2. Egg laying mammals. 3. Aquatic adaptations in mammals. 4. Flying adaptations in mammals. 5. Cursorial and fossorial adaptation in mammals. 6. Dentition in mammals 7. Marsupials and primates in brief with examples 8. Adaptive radiation with reference to locomotory appendages in mammals	
Unit IV	**Study of Rat**	**10**

	1. Systematic position, habit, habitat and external characters. 2. Digestive system, food, feeding and physiology of digestion. 3. Respiratory system. 4. Blood vascular system – Structure of heart. 5. Nervous system – Central nervous system only. 6. Sense organs i. Structure and functions of eye ii. Structure and functions of ear 7. Reproductive system.	

References:

1. T.J. Parker and W.A. Haswel, Edited by Marshall and Williams, (1992), Text Books of Zoology, Invertebrates Vol- II, CBS publications and distribution, New Delhi.

2. Hickman CP, Roberts LS & Larson A., Integrated Principles of Zoology, Eleventh Edition International Edition, The McGraw-Hill Companies, Inc.,

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S.Y.B.Sc Zoology

(CBCS – Autonomy 21 Pattern)

Course/ Paper Title	Applied Zoology –II
Course Code	21SBZO242
Semester	IV
No. of Credits	2 (36 lectures) of 50 minutes

Aims & Objectives of the Course

Sr. No.	Objectives
1.	To understand the basic life cycle of the honeybees, beekeeping tools and equipments
2.	To learn for managing beehives for honey production and pollination
	To understand the biology, varieties of silkworms and the basic techniques of silk production and harvesting of cocoons
3.	To learn the different silkworm species and their host plants

Expected Course Specific Learning Outcome

Sr. No.	Learning Outcome
1.	The learner is able to distinguish different types of honey bees, their habit and habitat
2.	The learner understands the basics about beekeeping tools, equipment, and managing beehives.
3.	The learner understands the biology, varieties of silkworms and the basic techniques of silk production.
4.	The learner can apply the knowledge about apiculture and sericulture for further learning and starting small scale business

Syllabus

Unit No	Title with Contents	No. of Lectures
	Apiculture	
Unit I	**Biology of Bees: An introduction to Apiculture**	**06**
	1. History, Classification and Biology of following honey bees- *Apis dorsata, Apis indica, Apis florae* and *Apis mellifera* 2. Life cycle, social organization and division of labour, Polymorphism	
Unit II	**Bee behaviour and bee communication**	**02**
	1. Bee behaviour- Swarming and Absconding 2. Bee communication - Round dance, Tail wagging dance, Joy dance and Alarm dance	
Unit III	**Bee keeping equipments**	**02**
	1. Bee box (Langstroth type) 2. Honey extractor 3. Smoker 4. Bee-veil 5. Gloves 6. Hive tool 7. Bee Brush 8. Queen excluder	
Unit IV	**Management of bee colony**	**01**
	1. Bee keeping 2. Seasonal management- Summer, Winter, Rainy and Spring	
Unit V	**Bee products (collection methods, composition and uses)**	**02**
	Honey, Bees wax, Bee Venom, Propolis, Royal jelly and Pollen	
Unit VI	**Bee diseases and enemies; control and preventive**	**02**
	1. Diseases of bee i. Protozoan disease - Nosema ii. Bacterial -American foul brood disease iii. Viral -Sac brood disease iv. Fungal – Chalk brood disease	

	2. Bee enemies i. Pests – Wax moth (Greater and Lesser), Wax beetle. ii. Predators – Bee eater, King crow, Wasp, Lizard, Bear, Man	
Unit VII	**Bee pollination and bee economy**	**03**
	1. Introduction 2. Bees as efficient pollinators i. Social behaviour ii. The practice of feeding on flowers (Anthophagy) iii. Floral biology- Adaptation by bees 3. Crops pollinated by bees 4. Entrepreneurship in Apiculture i. Recent Efforts in bee keeping and marketing of bee products ii. Modern Methods in employing artificial Beehives for cross pollination in horticultural gardens	
	Sericulture	
Unit I	**An introduction to sericulture**	**03**
	1. Sericulture as important cottage industry 2. Taxonomic position and external morphology of silk moths 3. Distribution and varieties of silk produced by Mulberry, Tassar, Eri and Muga silk worms in India. 4. Life cycle of *Bombyx mori*	
Unit II	**5. Mulberry cultivation (moriculture):**	**03**
	1. Varieties for cultivation, 2. Rainfed and irrigated mulberry cultivation – Fertilize schedule, Prunning methods and leaf yield. 3. Harvesting of mulberry	
Unit III	**Silk worm rearing**	**01**
	1. Types of rearing 2. Varieties for rearing 3. Rearing house 4. Rearing techniques- Disinfection, Brushing, Feeding, Bed cleaning and Mounting	

	5. Important diseases- Protozoan disease (Pebrine), Bacterial disease (Flacherie), Viral disease (Grasserie), Fungal disease (Muscardine) 6. Pests- Uzi fly and Dermestid beetle	
Unit IV	**Post-harvest processing of cocoons**	**05**
	1. Harvesting and Preparation of cocoons for marketing 2. Stiffling, Sorting, Storage, Deflossing and Riddling 3. Cocoon cooking, Reeling Equipment and Rereeling, Washing and Polishing.	
Unit V	**Biotechnological and biomedical applications of silk.**	**01**

References:

1. Destructive and useful Insects, their habit and Control, 1973. C.L. Metcalf and W. p. Flint, Tata McGraw Hill Publications, New Delhi.
2. A Text Book of Entomology, 1974. V.K. Mathur and K.D. Upadhayay, Goel Printing Press, Barani.
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4. Biology of Insects, 1992. S.C. Saxena. Oxford and IBH Publishing Co., New Delhi. Bombay, Calcutta.
5. Bee and Bee Keeping, 1978, Roger A. Morse, Cornell University Press, London.
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11. FAQ Manual of Sericulture. Vol I Mulberry Cultivation, Vol II Silkworm Rearing. Central Silk Board, Bangalore.

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(CBCS – Autonomy 21 Pattern)

Course/ Paper Title	Practical based on 21SBZO241 and 21SBZO242
Course Code	21SBZO243
Semester	IV
No. of Credits	2 (14 practicals 60 hours)

Aims & Objectives of the Course

Sr. No.	Objectives
1.	To understand the underlying principles and terminology needed in classification of chordates.
2.	To able to understand the possible group of vertebrates observes in nature and classify them based on general characters.
3.	To understand the anatomy and physiology of organs systems of vertebrate.
4.	To understand the basic information about apiculture and bee products.
5.	To understand the basic information about sericulture practices.

Expected Course Specific Learning Outcome

Sr. No.	Learning Outcome
1.	The student will be able to identify and classify animals based on their characters of class- Reptilia, Aves and Mammals.
2.	The student will be able identify venomous and non-venomous snake
3.	The student will be able to understand the evolution of beak and feet in birds.
4.	The student will be able to understand anatomy of organ system of Rat.
5.	The learner is able to distinguish different types of honey bees, their habit and habitat
6.	The learner understands the basics about beekeeping tools, equipment, and managing beehives.
7.	The learner understands the biology, varieties of silkworms and the basic techniques of silk production.
8.	The learner can apply the knowledge about apiculture and sericulture for further learning and starting small scale business

Syllabus

Sr. no.	**Unit I- Animal Diversity - IV**
1.	Museum study of Class Reptilia: *Calotes*, *Chelone*, Crocodile, *Sphenodon*
2.	Identification of Venomous & Non-venomous snakes with the help of pictorial taxonomic keys. – (D) -Compulsory
3.	Museum study of Class Aves: Crow, Kingfisher & Duck
4.	Study of types of beaks & feets in birds – Any two each.
5.	Museum study of Class Mammalia: Human, Cat & Bat.
6.	Study of external characters & digestive system of Rat.
7.	Study of Heart of Rat. - (D) -Compulsory
8.	Study of brain of Rat.
9.	Study of reptilian/avian diversity in and around the campus (2 P) - (E) - Compulsory
10.	Compulsory visit to Zoo / Wildlife sanctuary / Bird sanctuary, report writing and submission. OR Power point presentation on study of any two animals from two different classes by students
Sr. no.	**Unit II- Apiculture**
1.	Study of external morphology, life cycle and polymorphism in Honey Bee. (D)
2.	Temporary mounting of mouth parts, legs, wings and sting apparatus of worker bee. (E)
3.	Study of Bee keeping Equipment: Bee box, Honey extractor, Smoker, Bee-veil, queen excluder. (D)- Compulsory
4.	Study of Bee products: Honey, Wax, Venom, Royal jelly, Pollen. (D)
5.	Determination of honey purity and quality. (D)- Compulsory
6.	Study of Bee enemies: Wax moth, Bee eater, ant. (D)
7.	Compulsory visit to Apiculture Institute/ Power point presentation of different types of bees found in India and their importance in increasing crop production (2P)

	Unit III- Sericulture
1.	Study of external morphology and life-cycle of *Bombyx mori*. (D)
2.	Study of five equipments in Sericulture. (E) - Compulsory
3.	Preparation of a map showing distribution of silk moth and rearing/ sericulture practices in India. (E)
4.	Compulsory submission of Photographs/ sketches of Mulberry, Tassar, Eri and Muga silk moths. (E)
5.	Visit to Sericulture Institute/Virtual visit/ Poster making of layout of sericulture farm and process of silkworm rearing (2P)
6.	Seminar on Biotechnological and biomedical applications of silk (2P)