

SEMESTER I

CODE	COURSE TITLE
18ZOUC101	INVERTEBRATA- I

Category	CIA	ESE	L	T	P	Credit
Core	25	75	42	3	-	4

Preamble

An introduction to the basic aspects of classification, structural and functional details of Invertebrates and to understand the diversity, evolution and relationship between the major groups of Invertebrates.

Course Outcomes

On the successful completion of the course, students will be able to understand and analyze the structural and functional organization of Invertebrate animals.

CO Number	CO Statement	Knowledge Level
CO1	To learn and recollect the organizational, anatomical and functional aspects of Invertebrates.	K1
CO2	To understand the physiological processes those are significant to each phylum.	K2
CO3	To analyze anatomical and functional modifications that exists in different forms of Invertebrates.	K2
CO4	To compare and evaluate the Invertebrate organization with reference to their life history and development.	K2, K3
CO5	To discuss and interpret the economic importance of Invertebrate animals based on their habit and habitats.	K3

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	M	M
CO2	S	S	M	M	S
CO3	S	S	M	S	S
CO4	S	S	S	S	S
CO5	M	S	S	M	S

S- Strong; M-Medium

Syllabus

UNIT I

9Hrs.

Phylum Protozoa : Classification upto orders and their distinguishing characters with suitable examples.

Type study : **Paramecium caudatum** - External features - Nutrition Locomotion - Reproduction Asexual - Binary fission, Sexual reproduction - Conjugation, Autogamy, Endomixis, Hemimixis and Cytogamy.

General topic : Protozoan human diseases.

UNIT II

8 Hrs.

Phylum Porifera : Classification upto orders and their distinguishing characters with suitable examples.

Type study : **Leucosolenia botryoides** (Ascon sponge) - External features- Body wall - Spicules - Canal system - Nutrition - Reproduction

General topic : Canal system in sponges.

UNIT III

9 Hrs.

Phylum Coelenterata: Classification upto orders and their distinguishing characters with suitable examples.

Type study : **Obelia geniculata** - External features- Histology of the colony- Cnidoblast and its functions- Nutrition- Reproduction - Life history.

General topic : Polymorphism in Coelenterates.

UNIT IV

9 Hrs.

Phylum Helminthes : Classification upto orders and their distinguishing characters with suitable examples.

Type study : **Taenia solium** (Tape worm) - External features - Body wall - Feeding - Respiratory system - Excretory system - Nervous system - Reproductive system- Life cycle.

General topic : Parasitic adaptation in Helminthes.

UNIT V

10 Hrs.

Phylum Annelida : Classification upto order level. Salient features - examples.

Type study : **Megascolex mauritii** (Earth worm) - External features - Body wall - Coelom - Locomotion - Digestive system - Circulatory system - Excretory system - Nervous system - Reproductive system.

General topic : A brief account on Vermiculture.

Text Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Ekambaranath Ayyar and Anantha Krishnan T.N	A Manual of Zoology Vol I Part I & II	Viswanathan Publication	2003 Reprint & 2 nd Edn
2.	Jordon E.L. and Verma P.S	Invertebrate Zoology	S.Chand & Co., New Delhi	2005 Reprint & 1 st Edn

Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Kotpal. R.L	Modern text book of zoology:Invertebrates : animal diversity- I.	Rastogi Publication	2014 & 11 th Edn
2.	Dhami and Dhami	Invertebrate Zoology	Chand & Co	2015 & 5 th Edn
3.	Majpuria T.C	Invertebrata Zoology	Pradeep Publication	2001 & 8 th Edn

Web Resources

- <http://users.rcn.com/jkimball.ma.ultranet/BiologyPages/I/Invertebrates.html>
- <https://www.britannica.com/animal/invertebrate>
- <https://study.com/academy/lesson/chordates-features-groups-characteristics.html>

Pedagogy

- Lecture, PPT, Chart, Models, Specimen

CODE	COURSE TITLE					
18ZOUC102	INVERTEBRATA- II					
Category	CIA	ESE	L	T	P	Credit
Core	25	75	42	3	-	4

Preamble

An introduction to the basic aspects of classification, structural and functional details of Invertebrates and to understand the diversity, evolution and relationship between the major groups of Invertebrates.

Course Outcomes

On the successful completion of the course, students will be able to understand and analyze the structural and functional organization of Invertebrate animals.

CO Number	CO Statement	Knowledge Level
CO1	To learn and recollect the organizational, anatomical and functional aspects of Invertebrates.	K1
CO2	To understand the physiological processes those are significant to each phyla.	K2
CO3	To analyze anatomical and functional modifications that exists in different forms of Invertebrates.	K2
CO4	To compare and evaluate the Invertebrate organization with reference to their life history and development.	K2,K3
CO5	To discuss and interpret the economic importance of Invertebrate animals based on their habit and habitats.	K3

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	M	M
CO2	S	S	S	M	S
CO3	S	S	M	S	M
CO4	S	S	S	S	S
CO5	M	S	S	M	S

S- Strong; M-Medium

Syllabus

UNIT I

10 hrs

- Phylum Arthropoda** : Classification up to orders and their distinguishing characters with suitable examples.
- Type study** : **Penaeus indicus** (Marine Prawn) - External features- Appendages – Body wall - Body cavity - Digestive system - Circulatory system - Respiratory system - Excretory system - Nervous system - Reproductive system - Life history.

UNIT II

8 hrs

- Type study** : **Periplaneta americana** (Cockroach) - External features – Body wall- Body cavity - Mouth parts - Digestive system - Blood vascular system - Respiratory system - Excretory system - Nervous system - Reproductive system
- General topic** : Beneficial insects.

UNIT III

9 hrs

- Phylum Mollusca** : Classification up to orders and their distinguishing characters with suitable examples.
- Type study** : **Pila globosa** (Apple snail) - Shell - Body organization- Digestive system - Respiratory system - Circulatory system - Excretory system - Nervous system - Sense organs - Reproductive system.

UNIT IV

8 hrs

- Type of study** : **Sepia** (Cuttle fish) - External features - Colour change - Locomotion- Digestive system - Ink gland - Respiratory system - Circulatory system- Nervous system - Excretory system - Reproductive system.
- General topic** : Economic importance of Mollusca.

UNIT V

10 hrs

- Phylum Echinodermata** : Classification up to orders and their distinguishing characters with suitable examples.
- Type study** : **Asterias rubens** (Star fish) - External features- Pedicellaria structure and function - Digestive system - Respiratory system - Water vascular system - Circulatory system- Excretory system - Reproductive system- Life cycle.
- General topic** : Larval forms of echinoderms and their evolutionary Significance.

Text Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Ekambaranath Ayyar and Anantha Krishnan T.N	A Manual of Zoology Vol I Part I & II	Viswanathan Publication	2003 Reprint & 2 nd Edn

2.	Jordon E.L. and Verma P.S	Invertebrate Zoology	S.Chand & Co., New Delhi	2005 Reprint & 1 st Edn
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Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Kotpal. R.L	A Modern text book of Zoology	Rastogi Publication	2009 & 11 th Edn
2.	Dhami and Dhami	Invertebrate Zoology	Chand & Co	2015 & 5 th Edn
3.	Majupuria T.C	Introduction of Invertebrates	S.Nagin & Co., Delhi	2001 & 8 th Edn

Web Resources

- <http://users.rcn.com/jkimball.ma.ultranet/BiologyPages/I/Invertebrates.html>
- <https://www.britannica.com/animal/invertebrate>

Pedagogy

- Lecture, PPT, Chart, Specimen

SEMESTER I & II

CODE	COURSE TITLE
18ZOUCP01	CORE PRACTICAL I

Category	CIA	ESE	L	T	P	Credit
Core	40	60	-	-	90	4

Preamble

To study the morphological as well as anatomical features of Invertebrates and Chordates. To impart practical skills in mounting and dissecting invertebrate animals. To collect and study insects belonging to different orders.

Course Outcomes

On the successful completion of the course, the students will have practical skills in culturing, observing and distinguishing taxonomic features of Invertebrate and Chordate animals.

CO Number	CO Statement	Knowledge Level
CO1	To understand and analyze the different systems of Invertebrates and Chordates through live and virtual dissections.	K2
CO2	To design methodology for culturing organisms. To compare and contrast the systematic position, biological significance, structure and function of organisms.	K2
CO3	To access and analyze the beak and feet modifications in birds. To sequence the stages of lifecycle of selected animals. To categorize and identify the insects based on their salient features, habit and habitats. To analyze and distinguish morphometrics of different species of fishes.	K3

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	S	S	S	S	S
CO3	S	S	S	S	S

S- Strong

Syllabus

LABORATORY EXERCISES:

1. **COCKROACH** - Digestive system, Nervous system, Male and Female Reproductive system (Live Dissection- Demonstration)
2. **FROG** - Digestive system, Arterial system, Venous system, Male and Female Urino genital system (Virtual Dissection)

MOUNTINGS:

3. **COCKROACH** - Mouth parts
4. **EARTHWORM** - Body setae

EXPERIMENTS:

5. Culturing and identification of Paramecium.
6. Observation – Butterfly Life cycle.
7. Identification and determination of morphometric characters of fresh water fishes. (Any three)
8. Study of metamorphosis in Frog
9. Observation of beak modification in birds.
10. Observation of feet modification in birds.
11. Identification of different types of feathers in a bird.

- FIELD STUDY** - Observation and identification of any 15 insects.
Report must be submitted along with record note book.

SPOTTERS:

A. CLASSIFY GIVING REASONS:

Paramecium, Obelia, Taenia solium, Earthworm, Prawn, Starfish, Shark, Frog, Pigeon, Rabbit.

B. DRAW LABELLED SKETCH :

Obelia medusa, T.S of Earthworm, T.S. of Taenia solium, Frog- Skull (Dorsal view and ventral view), Pectoral and Pelvic girdle.

C. COMMENT ON BIOLOGICAL SIGNIFICANCE:

Sponge gemmule, Physalia, Peripatus, Axolotyl larva, Limulus, Chaemeleon.

D. RELATE STRUCTURE AND FUNCTION:

Spicules of Sponges, Scolex of Taenia, Parapodium of Nereis, Body setae of Earthworm, Mandible of Cockroach, Radula of Pila, Placoid scale, Quill feather.

E. WRITE DESCRIPTIVE NOTES:

Sea anemone, Lepas, Mysis larva, Bipinnaria Larva, Octopus, Hippocampus, Exocoetus, Rhacophorus, Cobra, Bat.

Pedagogy

- Demonstration, Field Study, Video Tutorials

SEMESTER I

CODE	COURSE TITLE
18ZOUA101	INVERTEBRATA AND CHORDATA

Category	CIA	ESE	L	T	P	Credit
Allied	20	55	56	4	-	4

Preamble

The course imparts knowledge on basic concepts and distinctive features of taxonomic classes in Zoology through the study of the major heritage of Invertebrate and Vertebrate animals, with special emphasis on the structure, organization and functional details.

Course Outcomes

On successful completion of the course, students will be able to understand the structural-functional relationships of living organisms and place the subject in the larger context and experience on a global scale.

CO Number	CO Statement	Knowledge Level
CO1	To learn and recollect the fundamentals such as systematic position, morphology, structural modification in various groups of Invertebrates & Chordates.	K1
CO2	To understand the structural and physiological processes occurring in various organisms and are distinctive to each Phylum and Class.	K2
CO3	To analyze the physiology of the organisms from Invertebrates to Chordates with special emphasis on their life history and development.	K2
CO4	To analyze and correlate the affinities and adaptations of animals to different modes of life.	K2, K3
CO5	To develop a general familiarity with all major groups of animals and to discuss the diversity of both Invertebrate and Vertebrate animal life and their fascinating adaptations in all conceivable ecological niches.	K3

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	M	M	M	S
CO2	S	S	M	M	S
CO3	S	S	M	S	M
CO4	S	M	M	S	S
CO5	S	S	M	M	S

S- Strong; M-Medium

Syllabus**UNIT I****8 hrs**

General Characteristics of Phylum Protozoa, Porifera and Coelenterata.

Type Study : **Paramecium caudatum** - External features - Nutrition - Locomotion – Reproduction - Asexual – Binary fission, Sexual reproduction - Conjugation, Autogamy, Endomixis, Hemimixis and Cytogamy.

UNIT II**12 hrs**

General Characteristics of Phylum Platyhelminthes, Aschelminthes, Annelida and Arthropoda.

Type Study : **Periplaneta americana** (Cockroach) - External features - Body wall - Body cavity - Mouth parts - Digestive system - Blood vascular system - Respiratory system - Excretory system - Nervous system - Reproductive system.

UNIT III**10 hrs**

General Characteristics of Phylum Mollusca and Echinodermata

Type Study : **Asterias rubens** (Starfish) - External features - Pedicellaria structure and function - Digestive system - Respiratory system - Water vascular system - structure and function- Circulatory system - Excretory system - Reproductive system – Life cycle.

UNIT IV**15 hrs**

General Characteristics of Class Pisces, Amphibia and Reptilia

Type Study : **Scoliodon sorrakowah** (Shark) (Excluding Endoskeleton)- External features- Digestive system - Respiratory system - Circulatory system - Nervous system - Urinogenital system.

UNIT V**15 hrs**

General Characteristics of Class Aves and Mammals

Type Study : **Rana hexadactyla** (Frog) (Excluding endoskeleton) - External features – Sexual dimorphism - Locomotion- Digestive system- Respiratory system- Circulatory system- Nervous system- Urinogenital system - Life cycle.

Text Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Ekambaranath Ayyar and Anantha Krishnan T.N	A Manual of Zoology Vol I Part I & II	Viswanathan Publication	2003 Reprint & Revised Edn
2.	Jordan. E.L and Verma.P.S.	Chordate Zoology	S. Chand & Co, New Delhi	2014 & 2 th Edn

Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Kotpal. R.L	A Modern text book of Zoology	Rastogi Publication	2009 & 4 th Edn
2.	Dhami and Dhami	Invertebrate Zoology	Chand & Co	2015 & 5 th Edn

Web Resources

- <http://users.rcn.com/jkimball.ma.ultranet/BiologyPages/I/Invertebrates.html>
- <https://www.britannica.com/animal/chordate>
- <https://study.com/academy/lesson/chordates-features-groups-characteristics.html>

Pedagogy

- Lecture, Seminar, Quiz, Group discussion, Power point presentation, Charts, Models

SEMESTER I & II

CODE	COURSE TITLE
18ZOUAP01	ALLIED ZOOLOGY PRACTICAL

Category	CIA	ESE	L	T	P	Credit
Allied	20	30	-	-	90	2

Preamble

A practical oriented approach in zoology which solidifies student knowledge on morphology, function, and interconnections between organs and systems. To distinguish and apply skills in Haematological study and to enhance their knowledge in Applied Zoology.

Course Outcomes

On the successful completion of the course, students will able to learn anatomy and physiology of organisms and acquire technical skills in Haematology and culturing skills in Applied Zoology.

CO Number	CO Statement	Knowledge Level
CO1	To identify and recognize the different systems of Invertebrate and Chordates through live virtual dissection.	K2
CO2	To analyze and interpret the clinical significance of haematological experiments. To classify, compare and distinguish the importance of specimens, models and equipments.	K2
CO3	To execute the practical skills in culturing economically important organisms.	K3

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	S	S	S	S	S
CO3	S	S	S	S	S

S- Strong

Syllabus**Laboratory Exercises:**

- COCKROACH** - Mouth parts, Salivary glands, Digestive system, Nervous system, Male and Female Reproductive system (live Dissection- Demonstation)

2. **FROG** - Digestive system, Arterial system, Venous system, Male and Female Urinogenital system (Virtual Dissection)

Mountings:

3. **COCKROACH** – Mouth Parts
4. **EARTHWORM** - Body setae

Experiments:

5. Blood grouping- ABO and Rh system.
6. Determination of bleeding time.
7. Determination of clotting time.
8. Haemoglobin estimation by Sahli's method.

Spotters:

Identify and comment on:

Paramecium, Earthworm, Cockroach, Starfish, Shark, Placoid Scale, Frog, Earthworm - Body setae, Penial setae, Vermicompost, Haemoglobinometer, Antisera A,B and D, Chandrika, Silk gland, Silkworm cocoon, *Catla catla*, *Tilapia mossambicus*, *Penaeus indicus*, Honey bee – Queen, Drones, Workers, Honey, Bee hive.

Pedagogy

- Demonstration, Field Study, Video Tutorials

SEMESTER II

CODE	COURSE TITLE
18ZOUC203	CHORDATA

Category	CIA	ESE	L	T	P	Credit
Core	25	75	85	5	-	4

Preamble

An introduction to the basic concepts in Zoology with special emphasis on the systematic position, structure and physiological functions in Chordate animals.

Course Outcomes

On the successful completion of the course, students will be able to understand and analyze the diversity, organization and taxonomic status of Chordates.

CO Number	CO Statement	Knowledge Level
CO1	To identify with the systematics of phylum Chordata and its classes up to order level with morphological, anatomical and functional modifications in Vertebrates.	K1
CO2	To assess the general and specific characteristics in different classes of Chordates.	K2
CO3	To analyze and compare the adaptive changes that have occurred in different groups of Vertebrates based on their habitat.	K2
CO4	To envision and analyze the modifications in analogy and homology that occurred in various classes of Chordates.	K3
CO5	To interpret the evolutionary concepts and relationship of animals in the biological history.	K3

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	M	M
CO2	S	S	M	M	S
CO3	S	S	M	S	S
CO4	S	S	S	S	S
CO5	M	S	S	S	S

S- Strong; M-Medium

Syllabus

UNIT I

18 Hrs.

- Chordata** : Classification and General characteristics
Prochordata : Classification and General characteristics
Type study : **Branchiostoma lanceolatum** (Amphioxus) - External features - Body wall – Atrium - Coelom - Notochord - Digestive system - Circulatory system - Excretory system - Nervous system - Reproductive system.
Class Pisces : Salient features-Classification up to orders with two suitable examples.
Type study : **Scoliodon sorrakowah** (Shark) - External features – Fins – Placoid scales - Digestive system - Respiratory system - Circulatory system - Nervous system- Sense organs - Urinogenital system.
General topic : Parental care in fishes.

UNIT II

18 Hrs.

- Class Amphibia** : Salient features- classification up to orders with two suitable Examples.
Type study : **Rana hexadactyla** (Frog) - External features - Sexual dimorphism - Skin - Chromatophores and Colour change - Coelom - Locomotion- Digestive system - Respiratory system - Circulatory system - Nervous system - Sense organs - Urinogenital system - Life cycle.
General topics : Neoteny.

UNIT III

18 Hrs.

- Class Reptilia** : Salient features- classification up to orders with two suitable Examples.
Type study : **Calotes versicolor** (Garden Lizard) - External features- Body cavity- Digestive system- Respiratory system- Circulatory system- Nervous system- Sense organs- Excretory system- Reproductive system.
General topic : Poisonous snakes of South India.

UNIT IV

18 Hrs.

- Class Aves** : Salient features - Classification up to orders with two suitable Examples.
Type study : **Columba livia** (Pigeon) External features - Exoskeleton - Digestive system - Circulatory system- Respiratory system - Flight muscles and Mechanism of flight - Nervous system - Sense organs- Excretory system - Reproductive system.
General topic : Migration in birds.

UNIT V**18 Hrs.**

- Class Mammalia** : Salient features- Classification up to orders with suitable two Examples.
- Type study** : **Oryctolagus cuniculus** (Rabbit) - External features - Integument - Coelom - Abdominal cavity - Digestive system - Circulatory system- Respiratory system- Nervous system- Sense organs- Urinogenital system.
- General topic** : Aquatic mammals.

Text Books

S. No.	Authors	Title of the Book	Publishers	Year and Edition
1.	Ekambaranath Ayyar and Anantha Krishnan T.N	A Manual of Zoology Vol II Part I & II	Viswanathan Publication	2003 & 4 th Edn

Reference Books

S. No.	Authors	Title of the Book	Publishers	Year and Edition
1.	Majupuria T.C	Introduction of Chordates	S.Nagin & Co., Delhi, 6 th Edition	2001 & 9 th Edn
2.	Kotpal R.L.	Modern Text Book of Zoology Vertebrates	Rastogi Publication	2009 & 4 th Edn
3.	Jordon E.L. and Verma P.S	Chordate Zoology	S.Chand & Co., New Delhi	2014 & 12 th Edn

Web Resources

- <https://www.britannica.com/animal/chordate>
- <https://study.com/academy/lesson/chordates-features-groups-characteristics.html>
- <https://a-z-animals.com/reference/animal-classification/>

Pedagogy

- Lecture, PPT, Chart, Specimen, Seminar, Models

SEMESTER II

CODE	COURSE TITLE
18ZOUA202	APPLIED ZOOLOGY

Category	CIA	ESE	L	T	P	Credit
Allied	20	55	56	4	-	4

Preamble

An introduction to application oriented fields in Zoology, with regard to their techniques used in traditional and modern methods. The study also makes the students to expertise in the area of applied subjects and to execute their learned skills practically.

Course Outcomes

On the successful completion of the course, students will be able to manipulate and gain hands on experience in the Applied Zoology.

CO Number	CO Statement	Knowledge Level
CO1	To gain knowledge on the significance of Aquaculture, Sericulture, Vermiculture, Apiculture and Haematology	K1
CO2	To identify the important species and culture methods available for rearing Silkworm, Earthworm, Fishes and Honeybees. To acquire technical skills in Haematology	K2
CO3	To analyze and interpret the production of economically valuable products with interrelated species and to interpret the Hematological results	K3
CO4	To become skill-based experts in the applied and technical fields of Zoology	K3
CO5	To acquire the entrepreneurship skills and professionalism for the economic upliftment.	K3

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	M	S
CO2	S	M	S	M	S
CO3	S	S	S	S	S
CO4	S	S	M	S	S
CO5	S	S	M	M	S

S- Strong; M-Medium

Syllabus

UNIT I

12 Hrs.

AQUACULTURE

Definition - Scope - Types of Aquaculture - Freshwater Aquaculture - Pond, Dam & Lake, Brackish water Aquaculture - Marine aquaculture - Coastal & Off shore Aquaculture, Management of Fish farms. Culturable organism – Fin fishes. Feed organisms – Algae and Seaweeds. Integrated fish farming - Paddy cum fish culture. Preservation of Fishes - Methods of Preservation.

UNIT II

12 Hrs.

SERICULTURE

Definition – Scope – History of Sericulture – Types of Silkworm – Tasar, Muga, Eri. Life cycle of Mulberry Silkworm *Bombyx mori*. Rearing Appliances – Rearing stand, Rearing tray, Ant wells, Paraffin paper, Foam rubber strips, Chop sticks, feather. Feeding Appliances – Leaf basket, Leaf chamber, Chopping board, Chopping knife, Mats, Feeding stand. Mountage – Chandrika.

UNIT III

12 Hrs.

VERMITECHNOLOGY

Definition – Scope – Ecological Classification of Earthworm – Epigeic, Endogeic and Anecic. Life history of Composting Earthworm – *Eudrilus eugeniae*. Methods of Vermicomposting – Pit method and Heap method. Advantages of Vermitechnology – Vermiwash and its Applications.

UNIT IV

12 Hrs.

APICULTURE

Definition – Scope – Choice of Bee in Apiculture – Desirable traits, Good choice, Poor choice, Best Choice. Kinds of Honey Bee – *Apis dorsata*, *A. florea*, *A. indica*. Development of Honey Bee – Egg, Larva, Pupa and Adult. Bee keeping – Modern bee keeping – Newton Hive. Bee comb – Storage cells, Brood cells, Queen cells, Drone cells, Worker cells. Honey Extraction. Honey – Properties – Chemical composition – Nutritional value – Medicinal value – Honey as food – Bee venom – Bees wax.

UNIT V

12 Hrs.

HAEMATOLOGY

Blood - Components and functions – Collection of blood – Human blood groups – ABO grouping, Rh system, Determination of bleeding time – clotting time, Haemoglobin estimation by Sahli's method.

Text Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Shukla G.S and Upadhyay V.B	Economic Zoology	Rastogi Publications, Meerut, India	2010 & 4 th Edn
2.	Pradip V.Jabde	Text Book of Applied Zoology	Discovery Publishing House, New Delhi	2005 & 1 st Edn

Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Ganga.G & Sulochana Chetty. J.	An Introduction to Sericulture	Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi	2010 & 1 st Edn
2.	Ranganathan L.S.	Vermibiotechnology from soil health to human health	Agrobios, India.	2006 & 1 st Edn
3.	Ashok K Rathoure	Applied and Economic Zoology	Daya Publishing House New Delhi	2015 & 1 st Edn
4.	Banerjee.C	A text book of Animal Husbandry	Oxford and IBH publication, New Delhi	2018 reprint & Revised Edn

Web Resources

- <https://www.saraspublication.com/osc/catalog/applied-zoology-aquaculture-apiculture-sericulture-dairy-farming-p-37.html>
- <https://www.slideshare.net/atulthakur007/economic-zoology>
- <http://www.nios.ac.in/media/documents/dmlt/hbbt/Lesson-03.pdf>

Pedagogy

- Lecture, PPT, Quiz, Group Discussion, Seminar, Models, Specimens, Charts