

# DEPARTMENT OF ZOOLOGY

SYLLABUS FOR FOUR YEAR UNDERGRADUATE PROGRAMME

FIRST AND SECOND SEMESTER

(APPROVED BY ACADEMIC COUNCIL VIDE RESOLUTION NO. 3, DATED: 04 – 07 – 23)



**ARYA VIDYAPEETH COLLEGE (AUTONOMOUS)**

**ARYA NAGAR, GUWAHATI – 16**

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### Structure of Four Year Undergraduate Course

Semester	Type	Core	Minor	SEC	IDC	AEC	VAC/FC	IN
	Credit	4	4	3	3	2	4(2 + 2)	2
I		CE-1114	MN-1114	SE-1113	ID-1113	AE-1112	VL-1112 (Two Courses)	-
II		CE-2114	MN-2114	SE-2113	ID-2113	AE-2112	VL-2112 (Two Courses)	-
III		CE-3214	MN-3214	SE-3213	ID-3213	AE-3212	-	-
		CE-3224						
IV		CE-4214	MN-4214	-	-	AE-4212	-	IN-4212
		CE-4224						
		CE-4234						
V		CE-5314	MN-5214	-	-	-	-	-
		CE-5324						
		CE-5334						
		CE-5344						
VI		CE-6314	MN-6214	-	-	-	-	-
		CE-6324						
		CE-6334						
		CE-6344						
VII		CE-7414	MN-7314	-	-	-	-	-
		CE-7424						
		CE-7434						
		CE-7444						
VIII		CE-8414	MN-8314	-	-	-	-	-
		CE-8424**						
		CE-8434**						
		CE-8444**						

\*\*Students who secure more than 7.5 CGPA at the end of third year (6<sup>th</sup> semester) may opt for a research dissertation of 12 credits instead of the three core papers.

Course code: First two letters is the abbreviation of course component

First digit implies semester number

Second digit implies course level

Third digit implies course number

Fourth digit implies credit points per course.

Digit	Course Level
1	100 - 199
2	200 - 299
3	300 - 399
4	400 - 499

## Semester Wise Credit Distribution

Semester	CREDIT DISTRIBUTION							
	CORE	MINOR	SEC	AEC	IDC	VAC/FC	IN	TOTAL
FIRST	1 x 4	1 x 4	1 x 3	1 x 2	1 x 3	2x 2	--	20
SECOND	1 x 4	1 x 4	1 x 3	1 x 2	1 x 3	2x 2	--	20
THIRD	2 x 4	1 x 4	1 x 3	1 x 2	1 x 3	--	--	20
FOURTH	3 x 4	1 x 4	--	1 x 2	--	--	1 x 2	20
FIFTH	4 x 4	1 x 4	--	--	--	--	--	20
SIXTH	4 x 4	1 x 4	--	--	--	--	--	20
SEVENTH	4 x 4	1 x 4	--	--	--	--	--	20
EIGHT	4 x 4	1 x 4	--	--	--	--	--	20

**SEC: SKILL ENHANCEMENT COURSE**

**AEC: ABILITY ENHANCEMENT COURSE**

**IDC: INTERDISCIPLINARY COURSE**

**VAC/FC: VALUE ADDED COURSE**

**IN: INTERNSHIP**

**Abbreviation of Course Components:**

**CE (Core), MN (Minor), SE(Skill Enhancement Course), AE (Ability Enhancement Course), VL (Value added Course), ID (Interdisciplinary Course), IN (Internship)**

**LIST OF PAPERS:**

**CORE:**

1. Non-Chordates (ZL – CE – 1114 )
2. Chordates (ZL – CE – 2114 )

**MINOR:**

1. Non-Chordates (ZL – MN – 1114 )
2. Chordates (ZL – MN – 2114 )

**MULTIDISCIPLINARY/INTERDISCIPLINARY COURSE:**

1. Outlines of Zoology (ZL – ID – 1113 )
2. Human Health and Diseases (ZL – ID – 2113 )

**SKILL ENHANCEMENT COURSE:**

1. Apiculture (ZL – SE – 1113 )
2. Ornamental Fish and Fisheries (ZL – SE – 2113 )

# FIRST SEMESTER

**PAPER NAME: Non-Chordates**

**PAPER CODE: ZL – CE – 1114**

**Total Credits: 4 (Theory: 3 + Practical/Tutorial: 1)**

**THEORY: 3 CREDITS**

**Total Lectures: 45**

**COURSE OBJECTIVE:**

*The aim of this course is to understand animal diversity from a phylogenetic perspective as well as from a developmental and functional morphology point of view, and to be able to understand the evolution and divergence of these features in the context of animal evolution.*

**COURSE OUTCOME:**

- *Students will be knowing the major phyla of the kingdom Animalia.*
- *Students will develop an understanding of the diversity of animal life and an appreciation of the significance of various taxa.*
- *Demonstrate theoretical and technical knowledge of the diversity of invertebrate animals, their taxonomy, evolution and phylogeny;*
- *Compare and contrast the morphology, ecology and physiology of the different invertebrate groups;*
- *A successful student in this course should be able to :Understand the diversity and evolutionary relationships among animals, Explain the basic structure and function of different groups of invertebrates and vertebrates and Identify common organisms to broad groups (e.g. Phyla)*

**Unit- I: Protista, Parazoa and Metazoa (Lectures: 6)**

General characteristics and outline Classification upto classes Locomotion and Reproduction in Protista Evolution of symmetry and segmentation of Metazoa

**Unit 2: Porifera (Lectures: 4)**

General characteristics and outline Classification upto classes Canal system and spicules in sponges

**Unit 3: Cnidaria (Lectures: 4)**

General characteristics and outline Classification upto classes Polymorphism in Cnidaria Coral sand coral reefs

**Unit 4 : Platyhelminthes (Lectures: 4)**

General characteristics and outline Classification upto classes Life cycle and pathogenicity of *Fasciola hepatica*

**Unit 5 : Nemathelminthes (Lectures: 5)**

General characteristics and Classification upto classes Life cycle and pathogenicity of *Ascaris lumbricoides* Parasitic adaptations in helminthes

**Unit 6 : Introduction to Coelomates (Lectures: 2)**

Evolution of coelom and metamerism

**Unit 7 : Annelida (Lectures: 3)**

General characteristics and outline Classification upto classes Urinogenital system in Annelida

**Unit 8 : Arthropoda (Lectures: 5)**

General characteristics and outline Classification upto classes Vision in Arthropoda Social life in bees and termites

**Unit 9 : Onychophora (Lectures: 2)**

General characteristics and Evolutionary significance

**Unit 10 : Mollusca (Lectures: 5)**

General characteristics and outline Classification upto classes Torsion and detorsion in Gastropoda Pearl formation in bivalves

**Unit 11 : Echinodermata (Lectures: 5)**

General characteristics and outline Classification upto classes, Affinities with chordates Water-vascular system in Asteroidea Larval forms in Echinodermata

**PRACTICAL:****CREDITS:1 (LECTURES: 30)**

1. Study of whole mount of *Euglena* , *Amoeba* , *Paramecium*
2. Study of *Sycon*(L.S.),*Hyalonema*,and*Spongilla*
3. Study of *Physalia*,*Tubipora*,*Gorgonia*,*Metridium*,*Pennatula*,*Madrepora*
4. Study of following specimens: Platyhelminthes - *Taenia*, Nemathelminthes-*Ascaris* Annelids-*Aphrodite*, *Nereis*, *Pheretima*, *Hirudinaria* Arthropods *Limulus*, *Palaemon*, *Balanus*, *Cancer*, *Scolopendra*, *Julus*, *Bombyx*, *Periplaneta*, Onychophora-*Peripatus*, Molluscs-*Chiton*, *Dentalium*, *Pila*, *Pinctada*, *Sepia*, *Octopus*, Echinodermata-*Asterias*, *Ophiura*, *Echinus*, *Cucumaria* and *Antedon*
5. Project work on life cycle of any helminthes



## **RECOMMENDED BOOKS:**

1. Ruppert and Barnes, R.D.(2006). *Invertebrate Zoology*,VIII Edition. Holt Saunders International Edition.
2. Barnes, R.S.K.,Calow, P.,Olive, P.J.W., Golding, D.W.and Spicer, J.I. (2002). *The Invertebrates: A New Synthesis*, III Edition, Blackwell Science
3. Barrington, E.J.W.(1979). *Invertebrate Structure and Functions*. II Edition, E.L.B.S. and Nelson
4. A Manual of Practical Zoology: Invertebrates by Verma P.S
5. Grzimek's Animal Life Encyclopedia by Gale Research Staff; Michael Hutchins Call Number: E-BOOKISBN: 0787653624
6. Practical Zoology Invertebrate Dr. S.S. Lal

**PAPER NAME: Non-Chordates**

**PAPER CODE: ZL – MN – 1114**

**Total Credits: 4 (Theory: 3 + Practical/Tutorial: 1)**

**THEORY: 3 CREDITS**

**Total Lectures: 45**

**COURSE OBJECTIVE:**

*The aim of this course is to understand animal diversity from a phylogenetic perspective as well as from a developmental and functional morphology point of view, and to be able to understand the evolution and divergence of these features in the context of animal evolution.*

**COURSE OUTCOME:**

- *Students will be knowing the major phyla of the kingdom Animalia.*
- *Students will develop an understanding of the diversity of animal life and an appreciation of the significance of various taxa.*
- *Demonstrate theoretical and technical knowledge of the diversity of invertebrate animals, their taxonomy, evolution and phylogeny;*
- *Compare and contrast the morphology, ecology and physiology of the different invertebrate groups;*
- *A successful student in this course should be able to :Understand the diversity and evolutionary relationships among animals, Explain the basic structure and function of different groups of invertebrates and vertebrates and Identify common organisms to broad groups (e.g. Phyla)*

**Unit- I: Protista, Parazoa and Metazoa (Lectures: 6)**

General characteristics and outline Classification upto classes Locomotion and Reproduction in Protista Evolution of symmetry and segmentation of Metazoa

**Unit 2: Porifera (Lectures: 4)**

General characteristics and outline Classification upto classes Canal system and spicules in sponges

**Unit 3: Cnidaria (Lectures: 4)**

General characteristics and outline Classification upto classes Polymorphism in Cnidaria  
Coral sand coral reefs

**Unit 4 : Platyhelminthes (Lectures: 4)**

General characteristics and outline Classification upto classes Life cycle and pathogenicity of *Fasciola hepatica*

### **Unit 5 : Nemathelminthes (Lectures: 5)**

General characteristics and Classification upto classes Life cycle and pathogenicity of *Ascaris lumbricoides* Parasitic adaptations in helminthes

### **Unit 6 : Introduction to Coelomates (Lectures: 2)**

Evolution of coelom and metamerism

### **Unit 7 : Annelida (Lectures: 3)**

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### **Unit 10 : Mollusca (Lectures: 5)**

General characteristics and outline Classification upto classes Torsion and detorsion in Gastropoda Pearl formation in bivalves

### **Unit 11 : Echinodermata (Lectures: 5)**

General characteristics and outline Classification upto classes, Affinities with chordates Water-vascular system in Asteroidea Larval forms in Echinodermata

### **PRACTICAL:**

### **CREDITS:1 (LECTURES: 30)**

1. Study of whole mount of *Euglena* , *Amoeba* , *Paramecium*
2. Study of *Sycon*(L.S.),*Hyalonema*,and*Spongilla*
3. Study of *Physalia*,*Tubipora*,*Gorgonia*,*Metridium*,*Pennatula*,*Madrepora*
4. Study of following specimens: Platyhelminthes - *Taenia*, Nemathelminthes-*Ascaris* Annelids-*Aphrodite*, *Nereis*, *Pheretima*, *Hirudinaria* Arthropods *Limulus*, *Palaemon*, *Balanus*, *Cancer*, *Scolopendra*, *Julus*, *Bombyx*, *Periplaneta*, Onychophora-*Peripatus*, Molluscs-*Chiton*, *Dentalium*, *Pila*, *Pinctada*, *Sepia*, *Octopus*, Echinodermata-*Asterias*, *Ophiura*, *Echinus*, *Cucumaria* and *Antedon*
5. Project work on life cycle of any helminthes

## **RECOMMENDED BOOKS:**

1. Ruppert and Barnes, R.D.(2006). *Invertebrate Zoology*,VIII Edition. Holt Saunders International Edition.
2. Barnes, R.S.K.,Calow, P.,Olive, P.J.W., Golding, D.W.and Spicer, J.I. (2002). *The Invertebrates: A New Synthesis*, III Edition, Blackwell Science
3. Barrington, E.J.W.(1979). *Invertebrate Structure and Functions*. II Edition, E.L.B.S. and Nelson
4. A Manual of Practical Zoology: Invertebrates by Verma P.S
5. Grzimek's Animal Life Encyclopedia by Gale Research Staff; Michael Hutchins Call Number: E-BOOKISBN: 0787653624
6. Practical Zoology Invertebrate Dr. S.S. Lal

**PAPER NAME: Outlines of Zoology**

**PAPER CODE: ZL – ID – 1113**

**Total Credits: 3 (Theory)**

**THEORY**

**Total Lectures: 45**

**COURSE OBJECTIVE:**

*The course will an introduction to zoology, with particular emphasis on the basics of morphology both vertebrates and invertebrates. In addition, the students should acquire basic knowledge of the animal kingdom. He/She will be able to*

- *recognize common local species*
- *identify common and unknown species*
- *have an understanding of the ecological relationships of the local species*
- *be competent in the use of microscopes for identification*

**COURSE OUTCOME:**

- *Students will be knowing the major phyla of the kingdom Animalia.*
- *Students will develop an understanding of the diversity of animal life and an appreciation of the significance of various taxa.*
- *A successful student in this course should be able to :Understand the diversity and evolutionary relationships among animals, Explain the basic structure and function of different groups of invertebrates and vertebrates and Identify common organisms to broad groups (e.g. Phyla)*

**Unit 1: (Lectures: 15)**

What are animals? Amazing Invertebrates, Animal architecture and body plans, Concept of species and Binomial Nomenclature. Identifying characteristics of all invertebrate Phyla.

**Unit 2: (Lectures: 15)**

Type study: Paramecium. Type study: Sycon., Type study – Taenia solium, Type study – Ascaris lumbricoides, Type study: Muga .

**Unit 3: (Lectures: 15)**

Basic concept of evolution, Darwinism and Lamarckism, Archaeopteryx as a connecting link

**RECOMMENDED BOOKS:**

1. Jordan, E.L and P.S. Verma. 1995, Invertebrate Zoology and elements of animal physiology, S. Chand and Co. Ltd. New Delhi.

2. Ayyar, E.K and T. Ananthakrishnan, 1992. Manual of Zoology Vol.1 Invertebrates Part I and II, S. Viswanathan Printers and Publishers Pvt. Ltd. Madras.
3. Kotpal, R.L. 1992. (All Series). Rastogi Publications, Meerut.
4. Nair, N.C., N. Arumugam, N. Soundarapandian, T. Murugan and S. Leelavathy. 2010. A textbook of Invertebrates. Saras Publication, Nagercoil.
5. Modern Text Book Of Zoology Vertebrates by R.I Kotpal Paperback
6. Organic Evolution (Evolutionary Biology) by Veer Bala Rastogi Paperback

**PAPER NAME: Apiculture**  
**PAPER CODE: ZL – SE – 1113**  
**Total Credits: 3 (Theory: 2 + Practical/Tutorial: 1)**

**THEORY:**

**Total Lectures: 30**

**COURSE OBJECTIVE:**

*The course will be an introduction to bee culture, with particular emphasis on the basics of morphology of the species commonly reared. In addition, the students should acquire basic knowledge the procedure, perils and economics of bee keeping. The course content will enable the student to,*

- *Recognize the common bee species.*
- *Know the ways of economic rearing of bee keeping*
- *Acquire knowledge of the optimum environmental for bee keeping.*

**COURSE OUTCOME:**

*Student successfully completing the course should be able to : Understand the diversity and Overall development of scientific beekeeping in India, Decide on the species economically viable in the available environment, Use ways and means for economic bee keeping with the optimum environmental required and be potentially competent for bee keeping and revenue generation.*

**Unit 1: Biology of bees (Lectures: 8)**

History, classification and Biology of Honey bee; Social organization of Bee colony; Pollen basket- structure and function.

**Unit 2 Rearing of Bees (Lectures: 10 )**

Artificial rearing (Apiary), Beehives – Newton and Langstroth, Bee pasturage, Selection of Bee species for Apiculture, Bee keeping equipment, Method of extraction of honey (indigenous and modern)

**Unit 3: Diseases and Enemies (Lectures: 4 )**

Bee diseases and enemies, Control and preventive measures

**Unit 4: Bee Economy (Lectures: 3 )**

Products of Apiculture Industry and its uses (Honey, Bees wax, Propolis), pollen, etc.

**Unit 5: Entrepreneurship in Apiculture (Lectures: 5 )**

Bee keeping industry – Recent efforts; Present status of bee industry in India.

**PRACTICAL:****CREDITS:1 (LECTURES: 30)**

1. Study of various stages of life cycle of honey bee
2. Identification of various equipment of bee keeping
3. Structure of bee hive (Newton and Langstroth)
4. Preparation of temporary slide – Pollen basket
5. Testing of Purity of honey
6. Demonstration of extraction honey

**RECOMMENDED BOOKS:**

1. Prost, P.J. (1962) Apiculture, Oxford and IBH, New Delhi
2. Bisht, D.S., Apiculture, ICAR publication
3. Singh, S., Beekeeping in India, Indian council of Agriculture Research, New Delhi
4. Ahsan, J., A hand book on Economic Zoology
5. Mani, M.S. General Entomology, 1982, Publisher, Oxford & IBH Publishing Company
6. Tembhare, D.B., Modern Entomology, 2017 Himalaya Publication
7. Evans, Howard E. Insect Biology: A Textbook of Entomology, 1984 Addison Wesley Publishers.



# SECOND SEMESTER

**PAPER NAME: Chordates**

**PAPER CODE: ZL – CE – 2114**

**Total Credits: 4 (Theory: 3 + Practical/Tutorial: 1)**

**THEORY: 3 Credits**

**TOTAL LECTURES: 45**

**COURSE OBJECTIVE:**

- *To understand what the chordates are.*
- *To understand different categories of chordates.*
- *To understand the general characters of chordates.*
- *To understand the level of organization in chordate subphylum.*
- *To understand the origin and evolutionary relationship in different subphylum of chordates*

**COURSE OUTCOME:**

- *Student should be able to describe the unique characters of urochordates, cephalochordates and fishes.*
- *Student should be able to recognize life functions of urochordates to fishes.*
- *To understand the ecological role of different groups of chordates.*
- *To understand the diversity of chordates.*

**Unit 1: Introduction to Chordates (Lectures: 3)**

General characteristics and outline classification

**Unit 2: Protochordata (Lectures: 6)**

General characteristics of Hemichordata, Urochordata and Cephalochordata; Study of larval forms in protochordates; Retrogressive metamorphosis in Urochordata.

**Unit 3: Origin of Chordata (Lectures: 4)**

Dipleurula concept and the Echinoderm theory of origin of chordates. Advanced features of vertebrates over Protochordata

**Unit 4: Agnatha (Lectures: 3)**

General characteristics and classification of cyclostomes up to class, Ammocoete Larva

**Unit 5: Pisces (Lectures: 7)**

General characteristics of Chondrichthyes and Osteichthyes, classification upto order. Migration, Osmoregulation and Parental care in fishes

**Unit 6: Amphibia (Lectures: 5)**

Origin of Tetrapoda (Evolution of terrestrial ectotherms); General characteristics and classification upto order; Parental care in Amphibians, Neoteny

**Unit 7: Reptilia (Lectures: 4)**

General characteristics and classification up to order; Affinities of Sphenodon, Poison apparatus and Biting mechanism in snakes

**Unit 8: Aves (Lectures: 8)**

General characteristics and classification upto order Archaeopteryx -- a connecting link; Principles and aerodynamics of flight, Flight adaptations and Migration in birds

**Unit 9: Mammals (Lectures: 5)**

General characters and classification up to order; Affinities of Prototheria; Adaptive radiation with reference to locomotory appendages

**PRACTICAL:****CREDITS:1 (LECTURES: 30)**

1. Protochordata: Balanoglossus, Herdmania, Branchiostoma, Sections of Amphioxus through pharynx. Agnatha: Petromyzon, Myxine
2. Fishes; Scoliodon, Pristis, Torpedo, Hippocampus, Exocoetus, Flat fish, Heteropneustes, Labeo, Monopterus, Tetradon, Anabas,
3. Amphibia: Ichthyophis, Necturus, Bufo, Polypedates, Alytes, Salamandra
4. Reptilia: Chelone, Trionyx, Hemidactylus, Varanus, Chamaeleon, Draco, Bungarus, Vipera, Naja, Hydrophis, Xenochropis, Crocodylus
5. Aves: Study of three common birds from different orders. Mammalia: Bat, Funambulus, Loris

**RECOMMENDED BOOKS:**

1. Grzimek's Animal Life Encyclopedia by Gale Research Staff; Michael Hutchins Call Number: E-BOOK ISBN: 0787653624
2. Young, J.Z.(2004). The Life of Vertebrates. III Edition. Oxford University Press.
3. Pough H. Vertebrate life, VIII Edition, Pearson International.
4. Zoology by Stephen Miller, Todd A. Tupper
5. Integrated Principles of Zoology by Cleveland Hickman, Susan Keen, David Eisenhour, Allan Larson
6. Text-Book of Vertebrate Zoology. By J. S. Kingsley, Professor of Zoology in Tufts College.
7. A Manual of Practical Zoology: Chordates by P.S. Verma
8. Practical Zoology: Vertebrates by Dr. S.S. Lal

**PAPER NAME: Chordates**

**PAPER CODE: ZL – MN – 2114**

**Total Credits: 4 (Theory: 3 + Practical/Tutorial: 1)**

**THEORY: 3 Credits**

**TOTAL LECTURES: 45**

**COURSE OBJECTIVE:**

- *To understand what the chordates are.*
- *To understand different categories of chordates.*
- *To understand the general characters of chordates.*
- *To understand the level of organization in chordate subphylum.*
- *To understand the origin and evolutionary relationship in different subphylum of chordates*

**COURSE OUTCOME:**

- *Student should be able to describe the unique characters of urochordates, cephalochordates and fishes.*
- *Student should be able to recognize life functions of urochordates to fishes.*
- *To understand the ecological role of different groups of chordates.*
- *To understand the diversity of chordates.*

**Unit 1: Introduction to Chordates (Lectures: 3)**

General characteristics and outline classification

**Unit 2: Protochordata (Lectures: 6)**

General characteristics of Hemichordata, Urochordata and Cephalochordata; Study of larval forms in protochordates; Retrogressive metamorphosis in Urochordata.

**Unit 3: Origin of Chordata (Lectures: 4)**

Dipleurula concept and the Echinoderm theory of origin of chordates. Advanced features of vertebrates over Protochordata

**Unit 4: Agnatha (Lectures: 3)**

General characteristics and classification of cyclostomes up to class, Ammocoete Larva

**Unit 5: Pisces (Lectures: 7)**

General characteristics of Chondrichthyes and Osteichthyes, classification upto order. Migration, Osmoregulation and Parental care in fishes

**Unit 6: Amphibia (Lectures: 5)**

Origin of Tetrapoda (Evolution of terrestrial ectotherms); General characteristics and classification upto order; Parental care in Amphibians, Neoteny

**Unit 7: Reptilia (Lectures: 4)**

General characteristics and classification up to order; Affinities of Sphenodon, Poison apparatus and Biting mechanism in snakes

**Unit 8: Aves (Lectures: 8)**

General characteristics and classification upto order Archaeopteryx -- a connecting link; Principles and aerodynamics of flight, Flight adaptations and Migration in birds

**Unit 9: Mammals (Lectures: 5)**

General characters and classification up to order; Affinities of Prototheria; Adaptive radiation with reference to locomotory appendages

**PRACTICAL:****CREDITS:1 (LECTURES: 30)**

1. Protochordata: Balanoglossus, Herdmania, Branchiostoma, Sections of Amphioxus through pharynx. Agnatha: Petromyzon, Myxine
2. Fishes; Scoliodon, Pristis, Torpedo, Hippocampus, Exocoetus, Flat fish, Heteropneustes, Labeo,, Monopterus, Tetrodon, Anabus,
3. Amphibia: Ichthyophis, Necturus, Bufo, Polypedates, Alytes, Salamandra
4. Reptilia: Chelone, Trionyx, Hemidactylus, Varanus, Chamaeleon, Draco, Bungarus, Vipera, Naja, Hydrophis, Xenochropis, Crocodylus
5. Aves: Study of three common birds from different orders. Mammalia: Bat, Funambulus, Loris

**RECOMMENDED BOOKS:**

1. Grzimek's Animal Life Encyclopedia by Gale Research Staff; Michael Hutchins Call Number: E-BOOKISBN: 0787653624
2. Young, J.Z.(2004).The Life of Vertebrates. III Edition. Oxford University Press.
3. Pough H. Vertebrate life, VIII Edition, Pearson International.
4. Zoology by Stephen Miller, Todd A. Tupper
5. Integrated Principles of Zoology by Cleveland Hickman, Susan Keen, David Eisenhour, Allan Larson
6. Text-Book of Vertebrate Zoology. By J. S. Kingsley, Professor of Zoology in Tufts College.
7. A Manual of Practical Zoology: Chordates by P.S. Verma
8. Practical Zoology: Vertebrates by Dr. S.S. Lal

**PAPER NAME: Human Health and Diseases**

**PAPER CODE: ZL – ID – 2113**

**Total Credits: 3 (THEORY)**

**Total Lectures: 45**

**COURSE OBJECTIVE:**

*It will help students to improve access to primary health care services for all sections of society*

**COURSE OUTCOME:**

- *Students will know the human body maintains a healthy balance and how disturbances of this balance underlie diseases.*
- *Students will be familiar with modern biomedical scientific approaches to treating disease.*
- *Students will be able to make informed contributions to discussions of contemporary issues in health and disease with their peers.*
- *Students will be able to make rational decisions on personal, ethical and political issues in their health.*

**Unit 1: Nutrition and Health (Lectures: 10)**

Nutrition basics, Supplements/Fad diets, Diabetes

**Unit 2 Infectious Disease and Vaccines (Lectures: 12)**

STDs(HIV), Influenza/Common cold, Bacterial infection, Autism, ethics of vaccinating/not vaccinating

**Unit 3: Evolutionary Biology of Health and Infection (Lectures: 13)**

Two Infectious disease in man and animals, Third world disease/Global health, Bipolar disorder, Depression, Mental Health in both man and captive animals, Health insurance

**Unit 4: Drug Effects and Abuse (Lectures: 10)**

Prescription Drugs, Street Drugs, Alcohol, Tobacco and Cannabis

**RECOMMENDED BOOKS:**

1. One Health: People, Animals, and the Environment. ASM Press
2. Confronting Emerging Zoonoses: The One Health Paradigm. Yamada, et al. (Eds) Springer
3. Zoobiquity: The Astonishing Connection Between Human and Animal Health. Barbara Natterson- Horowitz, B, Bowers K. Vintage Press.
4. One Health: The Human-Animal-Environment Interfaces in Emerging Infectious Diseases. Mackenzie, J.S., et al (Eds.).Springer

**PAPER NAME: Ornamental Fish and Fisheries**  
**PAPER CODE: ZL – SE – 2113**  
**Total Credits: 3 (Theory: 2 + Practical/Tutorial: 1)**

**THEORY:**

**Total Lectures: 30**

**COURSE OBJECTIVE:**

*The course will introduce the students to an emerging field of fishery. As ornamental fish has become a global market. North east is the hub of ornamental fish biodiversity. Therefore the course gives an outline of the various aspects of ornamental fish keeping, so that a student can develop entrepreneurship through further training.*

**COURSE OUTCOME:**

*A student will be able to*

- *Identify the local ornamental fish fauna as well as aquatic ornamental flora*
- *Learn the basic concepts of aquarium keeping and management*
- *Importance of artificial feed in ornamental fish keeping*
- *Media preparation for infusoria culture and planktons*

**Unit 1: Ornamental Fish Diversity of North East India : (Lectures: 3)**

Classified and Non Classified OFS, Distribution in North Eastern Region of India, Ornamental fish groups, Global market of OFS

**Unit 2: Certain Aquarium plant species in Assam: (Lectures: 3)**

Emergent, Floating and Submerged plant species. Importance of aquarium plant species

**Unit 3: Home Aquarium: (Lectures: 7)**

Construction and management of Home Aquarium, Development of Biological filtration in Aquarium

**Unit 4: Ornamental Fish: (Lectures: 7)**

Natural feed of Ornamental Fish, Strategies for maintenance of natural colour of Ornamental Fish, Feed formulation of Ornamental Fish, Pure culture of planktons

### **Unit 5: Breeding of ornamental fish species: (Lectures: 10)**

Live Bearer, Egg layers, Nest builder, Sex determination, Brooder maintenance, Maintenance of Breeding tank, Rearing of fries

#### **PRACTICAL:**

#### **CREDITS:1 (LECTURES: 30)**

1. Identification of Ornamental Fish- five specimens of classified OFS and 5 specimens of Non Classified OFS
2. Culture of Indigenous ornamental fish in Aquarium
3. Estimation of Physico-chemical characteristics of Aquarium water-pH, DO, Dissolved CO<sub>2</sub>, alkalinity, total hardness
4. Biological filter for removal of Ammonia from Aquarium
5. Culture of Paramecium

#### **RECOMMENDED BOOKS:**

1. A. Sinha and P.K. Pandey 2021: Breeding and Culture of Freshwater Ornamental fish
2. S. Saha 2022: Concept of Aquarium Fish Keeping; Second edition