

SKILL BASED ELECTIVE
USZOD420-POULTRY KEEPING

Year	SEM	Course code	Title of the Course	Course Type	Course Category	H/W	Credits	Marks
II	IV	USZOD420	Poultry Keeping	Theory	Skill based Elective	2	2	100

Objectives:

- To learn the types of breeds and housing methods for successful poultry keeping.
- To guide and motivate self-employment.

Course Outcomes:

On completion of the course the student will be able to...

CO1: Acquire Knowledge on different types of breeds of Fowls

CO2: Describe the essentials and maintenance of a good house

CO3: Compare the different types of rearing methods

CO4: Discuss the feeding requirements and its management

CO5: Explain the nutritive value and products of poultry. Identify Poultry diseases and vaccination Schedule.

CO/PSO	PSO					
	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	H	H	H	H
CO2	H	H	H	H	H	H
CO3	H	H	M	H	H	H
CO4	H	H	H	H	H	H
CO5	H	H	H	H	M	H

CO/PO	PO					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	H	H	H	H	H
CO2	H	H	H	H	H	H
CO3	H	H	H	H	H	H
CO4	H	H	H	H	H	H
CO5	H	H	H	H	H	H

Unit 1:

Hours)

1.1: Introduction to Poultry Keeping- Importance. (K1, K2, K3)

1.2: Breeds of fowls- Desi Breeds. (K1, K2, K3)

1.3: Exotic Breeds- American Class. (K1, K2, K3)

1.4: Asiatic Class. (K1, K2, K3)

1.5: English Class. (K1, K2, K3)

1.6: Mediterranean Class. (K1, K2, K3)

(6

Unit 2:

Hours)

2.1: Essentials of a good house. (K1, K2, K3)

2.2: Maintenance-Summer and Winter. (K1, K2, K3)

2.3: Management of Free –Range System, Semi-Intensive System. (K1, K2, K3, K4)

2.4: Intensive System- Deep Litter System. (K1, K2, K3, K4)

2.5: Battery System, Folding Unit System. (K1, K2, K3, K4)

(6

2.6: Equipments- Types of Feeder and Water troughs. (K1, K2, K3)

Unit 3: (6
Hours)

3.1: Reproduction in Fowl- Male and Female Reproductive system. (K1, K2, K3)

3.2: How is egg formed? Types of Abnormal Eggs, Grading of Egg. (K1, K2, K3)

3.3: Breeding in Fowls- Cross Breeding- Selection of Best Layer. (K1, K2, K3)

3.4: Selection of Eggs, Fertility and quality of eggs. (K1, K2, K3)

3.5: Hatchery Equipment- Incubator, Egg tray, Tray Cart and Racks, Egg Candler, Chick boxes. (K1, K2, K3)

3.6: Natural and Artificial methods of Incubation and Hatching. (K1, K2, K3)

Unit 4: (6
Hours)

4.1: Poultry Feeding –Food Ration. (K1, K2, K3)

4.2: Poultry feed ingredient – Energy rich feed stuffs, Protein-rich feed stuffs, Mineral and Vitamin Sources, Feed additives. (K1, K2, K3)

4.3: Nutrient requirement of Poultry, Feed formulation for different age groups.(K1, K2, K3, K4)

4.4: Feeding systems of Poultry, Feeding Management. (K1, K2, K3, K4)

4.5: Nutritive value of Egg, Preservation of Egg, Products of Egg- Albumen flakes, Frozen Yolk, Egg Powder. (K1, K2, K3, K4)

4.6: By products of Poultry, Processing of Meat. (K1, K2, K3)

Unit 5: (6 hrs)

5.1: Care and Management of Poultry- Layer, Grower, Broiler, Pullet. (K1, K2, K3)

5.2: Symptoms, Transmission, Treatment and Control of Ranikhet, Fowl Pox, Coryza, Coccidiosis, Polyneuritis. (K1, K2, K3, K4)

5.3: Egg Drop Syndrome, Avian Influenza, Fowl Cholera. (K1, K2, K3)

5.4: Chronic Respiratory Disease. (K1, K2, K3)

5.5: Endoparasitic and Ectoparasitic diseases. (K1, K2, K3)

5.5: Vaccination Schedule. (K1, K2, K3)

Book for study and Reference:

Textbooks:

1) Jayasurya, Arumugam N. – Economic Zoology- Saras Publication, Nagercoil, 2013.

2) Nilotpal Ghosh- Poultry Science and Practice- A Textbook- CBS Publishers and Distributors Pvt. Ltd. 2015.

Reference Book:

3) Gnanamani M.R. – Modern Aspects of Commercial Poultry Keeping – Ezhil offset printers, Madurai- 2010

4) Tomar B.S. and Neera Singh- Economic Zoology- Emkay publications, Delhi- 2004.

5) Shukla G.S. and Upadhyay V.B. –Economic Zoology- Rastogi Publications, Meerut- 1997.

E-Resources:

<https://thepoultrysite.com>

<https://www.poultryworld.net>

<http://www.agritech.tnau.ac.in>

SKILL-BASED ELECTIVE
USZOC320– SERICULTURE

Year	SEM	Course code	Title of the Course	Course Type	Course Category	H/W	Credits	Marks
II	III	USZOC320	Sericulture	Theory	Skill Based Elective	2	2	100

Objectives:

- To help the non-science students to understand the life cycle and culture technique of silkworm
- To motivate the students for self-employment

Course Outcomes:

On completion of the course the student will be able to...

CO1: Enlist different variety of silkworms and their economic status

CO2: Explain about mulberry cultivation

CO3: Expand knowledge on utilizing silkworm rearing appliances.

CO4: Elucidate an indulgent of silkworm mounting, silkworm rearing, and silkworm reeling operations.

CO5: Indicate and identify diseases in silkworms and recognize their enemies to take necessary control measures.

CO/PSO	PSO					
	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	H	M	M	H
CO2	H	H	H	M	M	H
CO3	H	H	H	L	M	H
CO4	H	H	H	L	M	H
CO5	H	H	H	M	M	H

CO/PO	PO					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	H	H	M	M	H
CO2	H	H	H	M	M	H
CO3	H	H	H	L	M	H
CO4	H	H	H	L	M	H
CO5	H	H	H	M	M	H

Unit 1: (6 Hours)

- 1.1: Scope of sericulture in India and in global market. (K1, K2, K3)
- 1.2: Economics; Central Silk Board (CSB). (K1, K2, K3)
- 1.3: Training Facilities in Sericulture. (K1, K2, K3)
- 1.4: Types of silk worm Mulberry, Tasar, Eri, Muga. (K1, K2, K3)
- 1.5: Life cycle of *Bombyx mori*. (K1, K2, K3)
- 1.6: Silk. (K1, K2, K3)

Unit 2:(6 Hours)

- 2.1: Varieties of Mulberry. (K1, K2, K3)
- 2.2: Mulberry Cultivation. (K1, K2, K3)
- 2.3: Propagation, Plantation. (K1, K2, K3)

- 2.4: Manuring, Pruning. (K1, K2, K3)
- 2.5: Harvesting, Storing. (K1, K2, K3)
- 2.6: Transporting. (K1, K2, K3)

Unit 3: (6 Hours)

- 3.1: Silkworm Rearing-Rearing House. (K1, K2, K3, K4)
- 3.2: Appliances used for Rearing, Feeding. (K1, K2, K3, K4)
- 3.3: Cleaning and Spinning. (K1, K2, K3)
- 3.4: Factors for rearing. (K1, K2, K3, K4)
- 3.5: Temperature. (K1, K2, K3)
- 3.6: Humidity. (K1, K2, K3)

Unit 4: (6 Hours)

- 4.1: Rearing operations – Disinfection. (K1, K2, K3)
- 4.2: Brushing, Feeding. (K1, K2, K3)
- 4.3: Bed Cleaning, Spacing. (K1, K2, K3)
- 4.4: Care during Moulting, Mounting. (K1, K2, K3)
- 4.5: Harvesting of cocoons. (K1, K2, K3)
- 4.6: Storing. (K1, K2, K3)

Unit 5:(6 Hours)

- 5.1: Silkworm Diseases and Control- Pebrine. (K1, K2, K3, K4)
- 5.2: Flacherie. (K1, K2, K3, K4)
- 5.3: Muscardine, Grasserie. (K1, K2, K3, K4).
- 5.4: Natural Enemies. (K1, K2, K3)
- 5.5: Cocoon Marketing. (K1, K2, K3)
- 5.6: Loans to start sericulture. (K1, K2, K3)

Books for Study and Reference:

Textbooks:

1. Sukla G.S. and Upadhyay V.B. – Economic Zoology – ISBN Rastogi Publications, Meerut, India, 1992.
2. Ganga G. and Sulochana Chetty J. An Introduction to Sericulture Oxford Publication, New Delhi, India, 1997.

Reference Books:

3. Ganga G. Comprehensive Sericulture Vol. II: Silkworm Rearing and Silk Reeling – ISBN Oxford Publication, New Delhi, India, 2003.
4. Ganga G. Comprehensive sericulture Vol. I: Moriculture – Oxford Publication, New Delhi, India, 2003.

E-resources:

<http://csb.gov.in>

<http://www.csrtimys.res.in>

<https://tnsericulture.gov.in>

**SEMESTER V
SKILL-BASED ELECTIVE**

USZOE520 -ORNAMENTAL FISH KEEPING

Year	SEM	Course code	Title of the Course	Course Type	Course Category	H/W	Credits	Marks
III	V	USZOE520	Ornamental Fish Keeping	Theory	Core Elective	2	2	100

Objectives:

- To learn about the rearing techniques in fish keeping
- To motivate for self-employment

Course Outcomes:

On completion of the course the student will be able to...

CO1: Discuss the importance, design and maintenance of an aquarium.

CO2: Explain the aquarium plants and usage of various accessories required for an aquarium.

CO3: Discuss the feed requirement, formulation and various live bearing fishes.

CO4: Differentiate the Egg laying fishes, marine fishes and other organisms in an aquarium.

CO5: Attain understanding on loan availability and export potential.

CO/PSO	PSO					
	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	H	H	M	H
CO2	H	H	M	H	M	M
CO3	H	M	H	H	H	H
CO4	H	H	H	H	H	M
CO5	M	H	M	M	H	M

CO/PO	PO					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	H	H	M	M	H
CO2	H	H	H	M	M	H
CO3	H	H	H	M	M	H
CO4	H	H	H	M	M	H
CO5	H	H	H	M	M	H

Unit 1:(6 Hours)

1.1: Construction of home aquarium: Materials used- wooden and metal frames. (K1, K2, K3)

1.2: Frameless tanks- Sealants and gums. (K1, K2, K3)

1.3: Design and construction of aquarium tank. (K1, K2, K3)

1.4: Accessories used in aquarium tanks- aerators, filters. (K1, K2, K3)

1.5: Heaters, thermostat, hand nets. (K1, K2, K3)

1.6: Gravel/pebble - objects. (K1, K2, K3)

Unit 2:(6 Hours)

2.1: Aquarium plants. (K1, K2, K3)

2.2: Nutritional requirements. (K1, K2, K3)

2.3: Kinds of feed - live feeds - artificial feed. (K1, K2, K3)

- 2.4: Feed formulation - balanced diet. (K1, K2, K3, K4)
- 2.5: Culture of live food organisms - Chironomous, mosquito larva, tubifex. (K1, K2, K3)
- 2.6: Problems of over feeding. (K1, K2, K3)

Unit 3:(6 Hours)

- 3.1: Popular ornamental fish - live bearers - Red sword tail. (K1, K2, K3)
- 3.2: Guppy, Molly. (K1, K2, K3)
- 3.3: Egg layers - Gold fish, Siamese fighting fish, Gowrami. (K1, K2, K3)
- 3.4: Angel fish, Oscar. (K1, K2, K3)
- 3.5: Neon tetra, Discus. (K1, K2, K3)
- 3.6: Fish handling. (K1, K2, K3)

Unit 4:(6 Hours)

- 4.1: Aquarium maintenance - water quality-pH. (K1, K2, K3, K4)
- 4.2: O₂, CO₂ hardness. (K1, K2, K3)
- 4.3: Ammonia, Nitrite and Nitrate. (K1, K2, K3)
- 4.4: Common diseases - diagnosis – treatment. (K1, K2, K3)
- 4.5: Common marine fish - Anemone fish, Butterfly fish. (K1, K2, K3)
- 4.6: Other marine organism. (K1, K2, K3)

Unit 5:(6 Hours)

- 5.1: Budget for commercial scale. (K1, K2, K3)
- 5.2: Loan availability. (K1, K2, K3)
- 5.3: Credit policies. (K(K1, K2, K3)1, K2, K3)
- 5.4: Export potentials. (K1, K2, K3)
- 5.5: Value addition in ornamental fish culture. (K1, K2, K3)
- 5.6: Transportation. (K1, K2, K3)

Books for Study and Reference:

Textbooks:

1. K.V. Jayashree, C.B. Thara Devi, N. Arumugam, Home Aquarium and Ornamental Fish Culture, Saras Publication,2015.
2. Dick Mills- Tropical aquarium fishes, Salamander Books Ltd, London, 1982.
3. J.D.Jameson and R.Santhanam- Manual of ornamental fishes and farming technologies- Fisheries College and Research Institute TANVASU, Tuticorin, 1996.

Reference Books:

4. R. Santhanakumar *et al.*, - Manual of fresh water ornamental fish culture, Dept. of Fisheries extension, Fisheries College and research institute TANVASU, Tuticorin, 2004.
5. V.K.Venkataraman *et al.*, - Biodiversity and stock assessment of marine ornamental fishes. Dept. of Fisheries biology and capture fisheries, Fisheries College and Research Institute TANVASU, Tuticorin, 2004.

E-Resources:

- <http://www.cifa.nic.in>
- <http://agritech.tnau.ac.in>
- <http://aquaculturetraining.com.au>
- <http://www.oftri.org>

SEMESTER I & II

UCZOC20 – CORE PRACTICAL – I: INVERTEBRATA AND CHORDATA

Year	SEM	Course code	Title of the Course	Course Type	Course Category	H/W	Credits	Marks
I	I & II	UCZOC20	Core Practical-I	Practical	Core	3	4	100

Objectives:

- To obtain practical skills in dissection and display of the systems.
- To learn about adaptation, biological significance of animals.
- To understand the evolutionary significance and skeletal structures of animals.

Course Outcomes:

On completion of the course the student will be able to...

CO1: Acquire knowledge about the digestive, circulatory and nervous system of arthropods and vertebrates.

CO2: Prepare mounting of the mouth parts of insects.

CO3: Analyze the biological significance of invertebrates and vertebrates.

CO4: Distinguish structure and function of invertebrates and vertebrates.

CO5: Justify the importance of evolutionary significance of animals, osteology and dentition in mammals.

CO/PSO	PSO					
	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	H	H	H	M
CO2	H	H	H	H	H	H
CO3	H	H	H	H	H	M
CO4	H	H	H	H	H	M
CO5	H	H	H	H	H	H

CO/PO	PO					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	H	H	H	H	M
CO2	H	H	H	H	H	M
CO3	H	H	H	H	H	H
CO4	H	H	H	H	H	H
CO5	H	H	H	H	H	H

INVERTEBRATA

1. Dissections:
 - a) Major: Cockroach – Digestive and Nervous system.
 - b) Prawn: Digestive and Nervous system.
2. Minor: Mouth parts - Mosquito, House fly.
 Prawn - Cephalic Appendages.
 Thoracic Appendages.
 Abdominal Appendages.
3. Study of museum specimen/ slides relevant to the types studied in theory:
 - a) Biological significance
 - b) Descriptive notes
 - c) Structure and function
 - d) Evolutionary significance

SPOTTERS LIST: INVERTEBRATA

1. ENTAMOEBA
2. VOLVOX
3. PLASMODIUM
4. TRYPANOSOMA
5. VORTICELLA
6. SYCON
7. SPONGE GEMMULE
8. EUPLECTELLA
9. HYALONEMA
10. OBELIA COLONY
11. OBELIA MEDUSA
12. ADAMSIA
13. ZOANTHUS
14. PHYSALIA
15. VELLELA
16. TAENIA SOLIUM
17. SCOLEX OF TAENIA SOLIUM
18. BLADDERWORM
19. ASCARIS MALE AND FEMALE
20. SCHISTOSOMA
21. WUCHERERIA
22. NEREIS ENTIRE
23. NEREIS PARAPODIUM
24. CHAETOPTERUS
25. ARENICOLA
26. TROCHOPHORE LARVA
27. PRAWN ENTIRE
28. PRAWN – DIGESTIVE SYSTEM
29. PRAWN – NERVOUS SYSTEM
30. PRAWN- APPENDAGES
31. NAUPLIUS LARVA
32. ZOEAL LARVA
33. MEGALOPA LARVA
34. PERIPATUS
35. LIMULUS
36. COCKROACH- DIGESTIVE SYSTEM
37. COCKROACH- NERVOUS SYSTEM
38. HOUSEFLY MOUTH PARTS
39. MOSQUITO MOUTH PARTS
40. UNIO ENTIRE
41. GLOCHIDIUM LARVA
42. RADULA OF PILA
43. CHITON
44. MYTILUS
45. OCTOPUS
46. SEA STAR ENTIRE
47. PEDICELLARIA OF SEA STAR
48. BIPINNARIA LARVA
49. HOLOTHURIA
50. SEA LILY

CHORDATA:

1. Dissections:
 - a) Major: Frog (Model) - Digestive, Arterial and Venous system.
 - b) Minor: Shark -Placoid scales.

2. Study of museum specimen/ slides relevant to the types studied in theory:
 - a) Biological significance.
 - b) Descriptive notes.
 - c) Structure and function.
 - d) Skeletal structure / Dentition.

SPOTTERS LIST: CHORDATA

1. AMPHIOXUS ENTIRE
2. ASCIDIA ENTIRE
3. ASCIDIAN TADPOLE
4. BALANOGLOSSUS ENTIRE
5. TORNARIA LARVA
6. PETROMYZON ENTIRE
7. AMMOCETES LARVA
8. BUCCAL FUNNEL OF PETROMYZON
9. SALPA
10. SHARK ENTIRE
11. SCALES- PLACOID, CTENOID
12. NARCINE
13. SACCOBRANCHUS
14. EXOCOETUS
15. ECHENEIS
16. HIPPOCAMPUS
17. FROG ENTIRE
18. FROG-DIGESTIVE SYSTEM
19. FROG-VENOUS SYSTEM
20. FROG- ARTERIAL SYSTEM
21. FROG-BRAIN
22. FROG-HYOID
23. FROG-PECTORAL AND PELVIC GIRDLE
24. ICHTHYOPHIS
25. SALAMANDER
26. AXOLOTYL LARVA
27. NECTURUS
28. ALYTES
29. RHACOPHORUS
30. CALOTES ENTIRE
31. CALOTES- HYOID
32. CALOTES-PECTORAL AND PELVIC GIRDLE
33. DRACO
34. CHAMAELEON
35. PYTHON
36. KRAIT
37. COBRA
38. COBRA-POISON APPARATUS
39. PIGEON ENTIRE

40. PECTEN OF BIRD
41. PIGEON FORE AND HIND LIMBS
42. SYNSACRUM OF BIRD
43. OSTRICH
44. PROTOTHERIA- PLATYPUS
45. METATHERIA - OPOSSUM
46. EUTHERIA – BAT
47. RABBIT ENTIRE
48. RABBIT – PECTORAL AND PELVIC GIRDLE
49. SKULL OF RABBIT
50. SKULL OF DOG

SEMESTER III & IV- CORE PRACTICAL II

UCZOF20 - CELL BIOLOGY , BIOINSTRUMENTATION AND GENETICS

Year	SEM	Course code	Title of the Course	Course Type	Course Category	H/W	Credits	Marks
II	III & IV	UCZOF20	Core Practical-II	Practical	Core	3	4	100

Objectives:

- To obtain practical skills in preparation of slides and basic hematological techniques.
- To learn about cell organelles and nucleic acid.
- To understand the principles in genetics and bioinstrumentation.

Course Outcomes:

On completion of the course the student will be able to...

CO1:Observe the structure of different types of tissue and the stages of cell division.

CO2:Demonstrate preparation of buccal smear and squash preparation of onion root tip.

CO3:Demonstrate the skill of focusing, calibrating a microscope and learn the principle, working of laboratory instruments.

CO4:Enumerate the Differential count of WBC, total count of WBC and RBC. Identify the blood group, simple Mendelian traits and syndromes.

CO5:Observe and study the life cycle of drosophila, polytene giant chromosome and the common mutants.

CO/PSO	PSO					
	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	H	M	M	M
CO2	H	H	H	L	M	M
CO3	H	H	H	M	M	M
CO4	H	H	H	M	M	M
CO5	H	H	H	L	M	M

CO/PO	PO					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	H	H	L	H	M
CO2	H	H	H	L	H	M
CO3	H	H	H	L	H	H
CO4	H	H	H	L	H	H
CO5	H	H	H	L	H	M

CELL BIOLOGY

1. Spotters: Tissue slides – T. S. of bone, striated, non – striated and cardiac muscles, Neuron, ciliated epithelium, columnar epithelium, germinal epithelium-Human sperm and ovum.
2. Mitosis: Squash preparation of Onion root tip.
3. Meiosis: Slides
4. Buccal epithelium - smear preparation.
5. Micrometry.
6. Camera Lucida.

7. Total Count of RBC.
8. Total Count of WBC.
9. Differential Count of WBC.
10. Structure of DNA – Model.
11. Structure of rRna, mRNA, tRNA- Charts.
12. Structure and function of cell organells- 80s Ribosome, Golgi Body, Centriole, Mitochondria- Chart.
13. Bioinstrumentation – Homogenizer, Centrifuge, Gel Electrophoresis, Light Microscope, TEM, SEM.

GENETICS

14. ABO blood grouping and Rh typing.
15. Study of Simple Mendelian traits in Human – Any 2 traits.
16. Karyotypic study of Syndromes: Klinefeiter’s syndrome, Turners syndrome and Down syndrome- Chart.
17. Giant chromosome of Chironomous larva- Permanent Slide.
18. Drosophila mutants - vestigial wing, white eye, yellow body.
19. Drosophila medium preparation and observation of life cycle.
20. Drosophila male and female.

SEMESTER VI – CORE PRACTICAL III
UCZOL20 – PHYSIOLOGY, DEVELOPMENTAL BIOLOGY, AND ECONOMIC ZOOLOGY.

Year	SEM	Course code	Title of the Course	Course Type	Course Category	H/W	Credits	Marks
III	V & VI	UCZOL20	Core Practical-III	Practical	Core	3	5	100

Objectives:

- To obtain practical skills physiology.
- To learn about development of animals.
- To understand the economic importance of animals.

Course Outcomes:

On completion of the course the student will be able to...

CO1:Demonstrate experiments in Physiology.

CO2:Demonstrate expertise in handling instruments.

CO3:Identify developmental stages, placenta and histology in development biology.

CO4:Apply equipments used in rearing techniques.

CO5:Discuss the economic importance of animals.

CO/PSO	PSO					
	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	M	H	L	L
CO2	H	H	H	H	L	H
CO3	H	H	H	H	L	H
CO4	H	H	H	H	M	H
CO5	H	H	H	H	M	H

CO/PO	PO					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	H	H	L	M	L
CO2	H	H	M	L	M	L
CO3	H	H	H	L	M	L
CO4	H	H	H	L	M	H
CO5	H	H	H	H	M	H

PHYSIOLOGY:

1. Detection of nitrogenous waste products in Fish Tank Water, Bird's Excreta and Cow's Urine.
2. Study of Human Salivary Amylase Activity in relation to pH.
3. Study of Human Salivary Amylase Activity in relation to Temperature.
4. Oxygen Consumption in Fish with reference to Body Weight.
5. Differential Count of WBC.
6. Estimation of Haemoglobin - Sahli's Method.
7. Kymograph, Respirometer.

DEVELOPMENTAL BIOLOGY:

1. Frog – 4 cell, 8 cell and 32 celled stages, Blastula, Gastrula.
2. Chick-18, 24, 48hr Embryos.
3. T.S of Testis and Ovary.

4. Human Ovum and Sperm.
5. Placenta - Sheep, Human, Yolk Sac Placenta of Shark.

ECONOMIC ZOOLOGY:

1. Spotters / Charts of equipments of sericulture and apiculture- Chandraki, Rearing tray, Rearing stand, Honey extractor, Smoker, Modern Hive.
2. Egg, Honey, Lac, Silk, Pearl, Hide and Leather
3. Edible fish: Tilapia, Anabas, Shark, Catla.
4. Field Visit Report.

SEMESTER VI- CORE PRACTICAL IV
UCZOM20 – ENVIRONMENTAL BIOLOGY, BIOTECHNOLOGY,
MICROBIOLOGY AND IMMUNOLOGY

Year	SEM	Course code	Title of the Course	Course Type	Course Category	H/W	Credits	Marks
III	VI	UCZOM20	Core Practical IV	Practical	Core	3	5	100

Objectives:

- To obtain practical skills Ecology, Immunology and Biotechnology.
- To learn about adaptation of animals to their ecosystem.
- To understand the basic interpretations in medical field.

Course Outcomes:

On completion of the course the student will be able to...

- CO1: Demonstrate procedures in Ecology and immunology.
 CO2: Identify the adaptation of animals in the ecosystem.
 CO3: Apply the principle, working and application of instruments used biotechnology.
 CO4: Discuss microbes and the disease caused by them.
 CO5: Describe Lymphoid organs and immunoglobulins.

CO/PSO	PSO					
	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	H	M	M	L
CO2	H	H	H	M	M	L
CO3	H	H	H	M	M	L
CO4	H	H	H	M	M	L
CO5	H	H	H	M	M	L

CO/PO	PO					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	H	H	H	M	L
CO2	H	H	H	H	M	L
CO3	H	H	H	H	M	L
CO4	H	H	H	H	M	L
CO5	H	H	H	H	M	L

ENVIRONMENTAL BIOLOGY:

1. Instruments - Rain gauge, Max-Min thermometer, Hygrometer, Luxmeter, Anemometer, Aneroid barometer.
2. Estimations - Oxygen, Carbon-dioxide, Salinity, Carbonate and Bicarbonate and pH in different water samples
3. Study of museum specimen based on Benthic, Sandy shore, Rocky shore and Flying adaptations.
4. Planktons: Fresh water and Marine Planktons five each(**Spotters**)

BIOTECHNOLOGY:

1. Plasmids pBR322
2. PCR
3. DNA sequencing- Sanger Method
4. Blotting techniques-Southern, Northern and Western

MICROBIOLOGY:

1. *Mycobacterium tuberculosis*,
2. *Salmonella typhi*,
3. *Clostridium tetani*,
4. *Vibrio cholerae*,
5. *Haemophilus influenzae*.

IMMUNOLOGY:

1. Blood grouping and Rh typing - Antigen and Antibody Reaction
2. Ig A, Ig G
3. Organs of immune system: TS of – Spleen, Thymus and Bone marrow