



# St. Xavier's College – Autonomous Mumbai

## Syllabus For IV Semester Courses in Zoology (November 2019 onwards)

### **Contents:**

Theory Syllabus for Courses:

SZOO0401- Developmental Biology and Information Flow

SZOO0402- Cell Biology

SZOO0403– Biochemistry and Applied Zoology

Practical Syllabus for Course: SZOO4PR

## S.Y.B.Sc. Zoology

SZOO0401

### DEVELOPMENTAL BIOLOGY AND INFORMATION FLOW

#### Learning Objectives:

- This course aims at laying strong foundation for developmental biology with regard to the principles and the study of model organisms.
- This course lays the basic framework for transcription and translation

#### UNIT 1

#### DEVELOPMENTAL BIOLOGY 1

(15 lectures)

##### Introduction to developmental biology

- Early theories of Developmental biology
- Concept of model organisms

##### Model Organisms: A closer look

- Amphibians: *Xenopus laevis*
- Birds: Chicken
- Mammals: Mouse
- Invertebrate: *Drosophila melanogaster*
- Invertebrate: *Caenorhabditis elegans*

##### Regeneration: Remembering previous existence

- Limb regeneration: Salamander
- Regeneration in Hydra

#### UNIT 2

#### DEVELOPMENTAL BIOLOGY 2

(15 lectures)

##### Body Plan: Setting up the vertebrate body axes

- Animal vegetal axis : Amphibians
- Dorsal ventral axis: Amphibians
- Antero-posterior axis: Chick

##### Fertilization: The Genesis

- Concept of fertilization
- Fertilizin, Resact, ZP3
- Slow and fast block to polyspermy

##### Morphogenesis

- Cleavage: Holoblastic and Meroblastic
- Blastulation: *Drosophila*, Frog, Chick
- Gastrulation: *Drosophila*, Frog, Chick

### **UNIT 3**

#### **INFORMATION FLOW**

(15 lectures)

##### **DNA transcription:**

- RNA polymerase and Transcription Cycle
- Prokaryotic and Eukaryotic transcription
- Post-transcriptional modifications
- Regulation

##### **Translation:**

- Genetic Code
- Main players in translation
- Prokaryotic and Eukaryotic translation
- Regulation

#### **Recommended References:**

1. Principles of developmental Biology: Lewis Wolpert. 3<sup>rd</sup> ed. Oxford University Press
2. Developmental Biology: Scott Gilbert. 10<sup>th</sup> ed. Sinauer associates
3. Molecular Biology of the Gene: Watson et al. Pearson International Ed.
4. Molecular Biology: Robert Weaver.
5. Mark's Basic Medical Biochemistry: A clinical Approach: Leiberman and Marks. 4<sup>th</sup> ed. Lippincott, Williams and Wilkins

#### **CIA modalities:**

**CIA I** – Short answers for 5 marks each with options

**CIA II** – Multiple choice questions /Presentations/Assignments

#### **Practical Course:**

1. Chick embryo permanent slides (18, 24, 36, 48, 72 hours)
2. Blastula of Frog, Gastrula of Frog
3. Egg of Frog, Bird, reptile, Fish
4. Temporary preparation of Chick embryo
5. Temporary preparation of Drosophila embryo
6. Regeneration in hydra
7. Understanding Transcription and Translation using presence and absence of antibiotic markers

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**S.Y.B.Sc. Zoology**

**SZOO0402**

## **CELL BIOLOGY**

### **Learning Objectives:**

- To learn fundamental biochemical and physiological concepts that governs cell function and its application to understand health and disease.

### **UNIT 1**

#### **INTRODUCTION MEMBRANES AND ENDOMEMBRANE SYSTEMS (15 lectures)**

- Introduction to basic cell structure
- Membrane structure ,Transport through membranes Diffusion and Facilitated Diffusion
- Osmosis, Active transport, Bulk transport.
- Endo membrane systems-Endoplasmic reticulum Types of Endoplasmic reticulum and Functions
- Golgi-complex and cell secretion
- Lysosomes – types of lysosome and function

### **UNIT 2**

#### **CELL ENERGETICS AND REGULATION (15 lectures)**

- Mitochondria: Structure and ATP Synthesis
- Nuclear structure-Nuclear envelope, Nuclear Pore complex, Nucleolus
- Chromatin structure and compaction
- Giant chromosomes - Polytene chromosomes and Lampbrush chromosomes

### **UNIT 3**

#### **CELL CYCLE AND CANCER BIOLOGY (15 lectures)**

- Cell cycle – regulation of cell cycle
- Cell division- Mitosis and Meiosis
- Cell culture - Primary cell culture, organ culture , cell lines, cell viability
- Cancer Biology: Cancer and Types of Cancer, Characteristics of Cancer Cells
- Carcinogens: Physical, Chemical and Biological
- Genes and Cancer: Oncogenes and Tumor Suppressor Genes

**Recommended References:**

1. Molecular cell Biology Harvey Lodish David Baltimore Arnold Berk et al Scientific American books
2. Cell Biology, Genetics and Evolution By Verma and Aggarwal S.Chand Publication
3. Cell Biology by Pollard
4. The World of Cell Wayne M. Becker, Lewis J. Kliensmith Jeff Hardin Pearson Publication
5. Principles of Anatomy and Physiology Gerald J Tortora and Sandra Reynolds Grabowski Harper and Row Publisher
6. Biology of Disease Jonathan Phillips and Paul Murray Published by Blackwell science Ltd

**CIA modalities:**

CIA I – Short answers for 5 marks each with options

CIA II – Multiple choice questions /Presentations/Assignments

**Practical Course:**

1. Study of Osmosis using Erythrocytes
2. Electron micrographs of ER, Golgi Complex, Lysosomes and Mitochondria
3. Vital staining of Mitochondrion
4. Study of Mitosis using Onion Root Tip
5. Study of polytene chromosomes from Chironomous larvae
6. Shell less embryo culture
7. Characteristics of Cancer Cells – Slides / Electron Micrographs
8. Primary Cell Culture / Cell Line Culture
9. Identification of the stages of Mitosis and Prophase I of Meiosis

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**S.Y.B.Sc. Zoology**

**SZOO0403**

**BIOCHEMISTRY AND APPLIED ZOOLOGY**

**Learning Objectives:**

- To emphasize the commercial aspect of the pure science of zoology
- To learn the various commercial applications of zoology
- To learn concepts used in biochemistry and their applications

**UNIT 1**

**BIOCHEMISTRY**

**(15 lectures)**

- Molecular structure of water: tetrahedral geometry, Hydrogen bond and flickering→ clusters, macromolecular association
- Physical and chemical properties of water: Density, specific heat, heat of vaporization,→ heat of fusion, surface tension. Hydrogen bonds with solutes. Interaction with non-polar compounds. Water as a reactant.
- Ionization of water, Kw ion product of water, pH scale.
- Dissociation of weak acids and weak bases, pKa,
- Henderson – Hasselbach equation.
- Titration curves of weak acids
- Buffers in biological system including Histidine buffer.

**UNIT 2**

**METABOLISM**

**(15 lectures)**

- Physiologic regulation
- Carbohydrate metabolism
- Lipid metabolism
- Nitrogen and Amino Acid Metabolism
- Metabolic Integration, Adaptation and Disease

**UNIT 3**

**APPLIED ZOOLOGY**

**(15 lectures)**

- Introduction to fisheries – Types of fisheries and recent techniques- SONAR, GPS, Remote Sensing
- Fish uses and fish processing industries
- Dairy Science – including cattle diseases
- Aquaculture – Prawn culture, Pearl culture, Fish culture (including fish diseases) and fish vaccines

**Recommended References:**

1. Biochemistry - Lehninger
2. Biochemistry – Harper
3. Biochemistry 4th ed – Satyanarayana and Chakrapani. Elsevier pulication
4. A text book of Animal Husbandry – G.C. Banerjee. Oxford Publishers.
5. Infectious Diseases of Cattle – Deb, Chakraborty, Singh, Kumar, Sharma. Satish Serial Publication House
6. General and Applied Ichthyology: Fish and Fisheries – SK Gupta & PC Gupta. S. Chand Publishers
7. Economic Zoology – Sagarika Chaudhari. NCBA Publishers
8. Biochemical Calculations 2<sup>nd</sup> ed.– Irwin Segel. Wiley India Pvt Ltd
9. Fish Processing Technology & Product Development – A.S. Ninawe & K. Rathnakumar. Narendra Publishing House
10. Advancement in Fish, Fisheries and Technology – K P Biswas. Narendra Publishing House
11. Textbook of Fish Diseases – Erwin Amlacher. Narendra Publishing House

**CIA modalities:**

**CIA I** – Short answers for 5 marks each with options

**CIA II** – Multiple choice questions /Presentations/Assignments

**Practical Course:**

1. Identification of: Crafts and gears.
2. Identification of: Fish, Crustaceans and Molluscs.
3. Estimation of reducing sugars from the given milk sample.
4. Estimation of calcium content in milk.
5. Study of cattle breeds.
6. pH metry
7. Study of Colorimeter
8. Preparation of Buffers and pKa
9. Biometric study in Fish
10. Preparation of solutions

**Field Trip:** Visit to KKV Dapoli and nearby Fish landing sites

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