GENERIC ELECTIVE COURSE -17

Principles of Developmental Biology

Zoo-GE -17

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course	Department offering the course
		Lectures	Tutorial	Practical/ Practice			
Principles of Developmental Biology **Zoo-GE-17**	**4**	**2**	**0**	**2**	**As per the program eligibility**	**Nil**	**Zoology**

Learning Objectives

The learning objectives of this course are to:

- Identify the basic principles of developmental biology
- Understand the mechanisms associated with the development of organ system of the human body
- Acquaint the students with the fascinating transformation of a single cell (fertilised egg) into a fully developed, complex organism.
- Explain the basic principles and concepts underlying morphogenesis.
- Be able to investigate the effects of environmental factors on embryonic development.

Learning Outcomes

By studying this course, students will be able to:

- Understand the process and significance of formation of haploid germ cells
- Interpret the events that lead to formation of a multicellular organism from a single fertilized egg, the zygote.
- Understand the general patterns and sequential developmental stages during embryogenesis; and understand how the developmental processes lead to establishment of the body plan of multicellular organisms.
- Gain knowledge of the general mechanisms involved in morphogenesis and to explain how different cells and tissues interact in a coordinated way to form various tissues and organs.
- Become aware of the effects of pollutants/chemicals on abnormal embryonic development.

SYLLABUS

THEORY **30 Hrs**

UNIT- 1: Introduction and Historical perspectives **2 hrs**

Definition and scope of developmental biology; Importance of embryology in medicine and biology.

UNIT- 2: Gametogenesis, Fertilisation and Morphogenetic movements **18 hrs**

Spermatogenesis and oogenesis; Types of eggs, Egg membranes; Fertilization (External and Internal), Blocks to polyspermy; Planes and patterns of cleavage; Types of Blastula. Gastrulation: Process of Gastrulation in frog and chick. Fate of the three germ layers: ectoderm, mesoderm, and endoderm.

UNIT- 3: Metamorphosis **2 hrs**

Metamorphosis of Amphibian larvae to Adult.

UNIT- 4: Placentation and Teratology **8 hrs**

Types of placenta (shape and structure), Functions of Placenta, Amniocentesis. Teratology: Teratogenesis, Teratogenic agents and their effects on embryonic development.

PRACTICALS **60 hrs**

(Laboratory periods: 15 classes of 4 hours each)

1. Study of whole mounts and sections of developmental stages of frog through permanent slides: Cleavage stages, blastula, gastrula, neurula (Neural plate, Neural fold and Neural tube stages), tail-bud stage, tadpole (external and internal gill stages)
2. Study of whole mounts of developmental stages of chick through permanent slides (Hamburger and Hamilton Stages): primitive streak stage, head process stage, head fold stage, 4-somite stage, 13-somite stage, 16-somite stage, 37-somite stage
3. Types of placenta with the help of photomicrographs/ slides.

PROJECT WORK

Project report on *Drosophila* or any insect culture/Visit to Poultry Farm/IVF Centre.

Essential/recommended readings

1. **1.**Slack, J.M.W. (2013) Essential Developmental Biology. III Edition, Wiley-Blackwell.
2. 2.Gilbert, S. F. (2010). Developmental Biology. IX Edition, Sinauer Associates, Inc. Publishers, Sunderland, Massachusetts, USA
3. 3.Balinsky, B. I. and Fabian B. C. (2006). An Introduction to Embryology. VIII Edition, International Thompson Computer Press.
4. Wolpert, L. (2002). Principles of Development. II Edition, Oxford University Press.

Suggested readings

1. Baweja, V. and Misra, M. (2021). *E-book on Practical Manual of Developmental Biology*.
2. Arora, R. and Grover, A. (2018). *Developmental Biology: Principles and Concepts*. 1st Edition, R. Chand & Company.
3. Carlson, B.M. (2007.) Foundations of Embryology. VI Edition, Tata McGraw-Hill Publishers.

NOTE: Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.