CC - 10: DEVELOPMENTAL BIOLOGY **(Credit: 3)**

Course Code:

Learning Objectives: Students will gain a detailed understanding of the events that regulate the development of specialized cells, tissues and organs during embryonic development. In particular, the pathways that regulate embryonic induction, tissue interactions and pattern formation, and expression of regulatory genes. A particular focus is the experimental strategies and techniques that are used to identify molecular and cellular mechanisms of development.

Learning Outcome: On the completion of the course the student will be able to describe the morphological processes that transform a fertilized egg into a multicellular organism and explain the molecular, biochemical and cellular events that regulate the development of specialized cells, tissues and organs during embryonic development.

UNIT-I

Introduction: Historical perspective and basic concepts: Phases of development, Cell-Cell interactions, Pattern formation, Differentiation and growth, Differential gene expression, Cytoplasmic determinants and asymmetric cell division.

UNIT-II

Early Embryonic Development: Gametogenesis, Spermatogenesis, Oogenesis; Types of eggs, egg membrane; Fertilization (External and Internal): Changes in gametes, Planes and Patterns of cleavage; Types of Blastula; Fate maps; Early development of chick up tyo gastrulation; Embryonic induction and organizers.

UNIT-III

Late Embryonic Development: Fate of Germ Layers; Extra-embryonic membranes in birds; Implantation of embryo in humans, Types of Placenta.

UNIT - IV

Post Embryonic Development: Metamorphosis: Changes, hormonal regulations in amphibians and insects; Regeneration: Concept, epimorphosis, morphollaxis and compensatory regeneration (with one example each).

UNIT-V

Implications of Development Biology: Teratogenesis: teratogenic agents and their effects on embryonic development; in vitro fertilization, Stem cell (ESC), Amniocentesis.

REFERENCES:

1. Gilbert, S. F. (2010). Developmental Biology, IX Edition, Sinauer Associates, Inc.,Publishers, Sunderland, Massachusetts, USA
2. Balinsky B. I. and Fabian B. C. (1981). An Introduction to Embryology, V Edition, International Thompson Computer Press
3. Carlson, R. F. Patten's Foundations of Embryology
4. Kalthoff (2008). Analysis of Biological Development, II Edition, McGraw-HillPublishers
5. Lewis Wolpert (2002). Principles of Development. II Edition, Oxford University Press

Practical CC-10: DEVELOPMENTAL BIOLOGY LAB (Credit – 1)

1. Study of whole mounts and sections of developmental stages of frog through permanent slides:
2. Cleavage stages, blastula, gastrula, neurula, tail-bud stage, tadpole (external and internal gill stages)
3. Study of whole mounts of developmental stages of chick through permanent slides: Primitive streak (13 and 18 hours), 21, 24, 28, 33, 36, 48, 72, and 96 hours of incubation (Hamilton and Hamburger stages).
4. Study of the developmental stages and life cycle of Drosophila from stock culture
5. Study of different sections of placenta (photomicrograph/ slides)
6. Project report on Drosophila culture/chick embryo develop