Course Code: ZOC 203 **Course Title: Advanced Developmental Biology**
Number of Credits: 3
Effective from AY: 2020 -21

Prerequisite for the Course:	Elementary knowledge of embryology.	
Objectives:	To understand the overall chronology of the development and the role of various morphogens (protein/mRNA) in specification and determination of various organs and body axis formation.	
Content:	**Module 1** Mammalian Gametogenesis including the ultra structure of sperm and egg; Molecular events in mammalian fertilization (capacitation, prevention of polyspermy, genetic fusion , activation of egg metabolism). Cleavage in mammals, difference between somatic mitosis and cleavage, regulation of cleavage. Gastrulation (epiboly and emboly). Development of extra embryonic membrane. **Module 2** Mechanism of cell cellular differentiation; Stages of Commitment (differentiation, specification and determination; Cellular communication: Paracrine factors and signal transduction cascades (Jak-Stat pathway, smooth and patched protein pathway, wnt signaling pathway, smad pathway) . Developmental dynamics of cell speciation: Specification of body axes in sea urchin-, insect-, fish-, avian- and mammalian embryo. **Module 3** Induction and Competence; Cascade of induction during the formation of lens; epithelium-mesenchyme interaction during formation of feathers in bird.	**5 hours** **4 hours** **3 hours** **6 hours** **6 hours** **3 hours**

	The central nervous system and the epidermis: Primary and Secondary neurulation; Differentiation of the Neural Tube. Embryonic filed; Pattern formation in Vertebrate Limbs, Generation of the Proximal – Distal, Anterior – Posterior, Dorso - Ventral axis of the Limb. Regeneration ability of animals; Role of Interstitial cells in Regeneration in Hydra. Molecular mechanism of regeneration of limb in Salamander.	**3 hours** **3 hours** **3 hours**
Pedagogy:	Lectures/tutorials/online teaching mode/self-study.	
Learning Outcome:	1. Understanding the basic concept of the development 2. Understanding the cyto-differentiation and cellular communication during the process of development. 3. Boosting their concepts and knowledge regulation of gene expression and their interaction.	
References /Reading:	1. Barresi MJF and Gilbert SF (2019), Developmental Biology, 12th edition, Oxford University Press, UK. 2. Carlson BM (2003), Pattern's Foundation of Embryology, Mc Graw Hill Inc., USA. 3. Gilbert SF (2003), Developmental Biology, 5th edition, Sinauer 4.Gilbert SF (2006), Developmental Biology, 8th edition, Sinauer Associates Inc., Sunderland, USA. 5. Gilbert SF (2013), Developmental Biology, 10th edition, Sinauer Associates Inc., Sunderland, USA. 6. Moody SA (2015), Principles of Developmental Genetics, Academic Press., New York. 7. Slack JMW (2012), Essential Developmental Biology, Willey Publication, USA 8. Wolpert L, Tickle C and Arias AM (2019), Principles of Development, Oxford University Press.	