LS428A	Developmental Biology	3 Credits
Name of the Faculty: Prof. AK Sarkar*, Dr. BC Mondal		

	Sr.No.	Topic	Faculty Name/ Contact Hours
Animal Developmental Biology	1.	Principles of Developmental Biology: (a) Questions and approaches in Plant Developmental Biology, (b) Questions and approaches in Animal Developmental Biology. Evolution of developmental patterns, Principles of experimental embryology, Genomic equivalence	AKS/1, BCM/1
	2.	Signaling cascades involved in the control of the developmental program, with specific examples	BCM/2
	3.	Early embryonic development: Cleavage – Types and mechanism, Gastrulation – movements involved, Cell specification w.r.t. amphibian, chick	BCM/3
	4.	Phenomenon of the Organizer w.r.t. amphibians: Progressive determination, regional specificity of induction	BCM/2
	5.	Pattern formation: French flag model, Polar coordinate model	BCM/1
	6.	*Dictyostelium discoideum* as a model organism: Life cycle, Pattern formation, cAMP signaling during development	BCM/1
	7.	*C. elegans* as a model system: Vulval development, sex determination	BCM/2
	8.	*Drosophila* as a model system: Anterior/posterior, dorsal/ventral polarity development	BCM/2
	9.	Tetrapod limb development: Axes formation, Coordination of the three axes	BCM/3
	10.	Regeneration: Epimorphic, e.g., salamander limbs; Morphallactic e.g., Hydra; Stem cell-mediated e.g., Planaria; Compensatory e.g., mammalian liver	BCM/3
	11.	Applications of Developmental Biology	BCM/2
	12.	Program cell death: apoptosis, autophagy, and necrosis	BCM/2
Plant Developmental Biology	13.	**Basic plant architecture:** Cell and tissue structures; epidermal, ground, vascular, and meristem tissues; cell division plane and pattern; tissue, cell and organ polarity.	AKS/4
	14.	**Embryonic pattern formation and polarity development**: Development of embryo from zygote, cell division pattern, initiation of shoot apical meristem (SAM), root apical meristem (RAM); development of embryonic polarity, hormonal regulation of polarity development.	AKS/3
	15.	**Shoot Apical Meristem (SAM) and organ size control**: Initiation and organization of SAM, roles and interaction of CUC, NAM, STM, WUS, auxin and cytokinin in SAM initiation and size control.	AKS/3
	16.	**Root apical meristem (RAM) and radial patterning**: Initiation and organization of RAM, role of SHR, SCR, ethylene and auxin organization of radial patterning, root-branching, differentiation of root epidermal layer.	AKS/3

	17.	**Leaf development- shape and dorsoventral patterning:** Leaf initiation and expansion, phyllotaxy, positioning of leaf on SAM; dorsoventral patterning, signal from SAM on dorso-ventral patterning, coordination of cell division and expansion,	AKS/3
		leaf asymmetry development, stomata density and distribution control, trichome development.	
	18.	**Flower development and organ patterning:** Organization of floral organs, ABC model, modification of floral organs, boundary genes; homeotic genes of plants, MADS box, evolutionary conservation between eudicot and cereal crop plants.	AKS/3
	19.	**Transition**: Transition from vegetative and reproductive stage, photoperiodic, vernalization, Gibberlic acid and autonomous pathways.	AKS/2
	20.	Development of reproductive organs: Development of gamotophytes and gametes, meiosis, developmental control, pollination, fertilization.	AKS/2

Suggested readings:

1. Developmental Biology: Scott F Gilbert
2. Essentials of Developmental Biology: JMW Slack
3. Principles of Developmental Biology (2nd, edition): Louis Wolpert
4. Ecological developmental Biology integrating epigenetic, medicine and evolution: Scott F Gilbert and Epel
5. The Arabidopsis Book, ASPB publication (available freely at www.aspb.org)
6. Biochemistry and Molecular Biology of plants Ed. Buchanan, Gruissem, and Jones, ASPB publication.
7. Plant Physiology by Taiz and Zeiger, Sinauer Associate Inc. Publishers.
8. Molecular Life of Plants, Ed. Jones, Ougham, Thomas, and Waaland. Wiley- Blackwell/ASPB publication.