GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering
Subject Code: 3170415
Developmental Biology
7TH SEMESTER

Type of course: Professional Elective

Prerequisite: Basic Knowledge of Cell Biology and Molecular Biology

Rationale:.

1. To understand how : the body plan of a multicellular organism is patterned to give rise to specialized tissues and organs, the cells communicate in promoting the development of a multicellular organism & the external environment can influence the developmental process
2. to appreciate the conservation of the molecular and cellular principles across different species

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
4	0	0	4	70	30	0	0	100

Contents:

Sr. No.	Topics	Teaching Hrs.
1	**Basic concepts of development :** Potency, Commitment, Specification, Induction, Competence, Determination, Differentiation, Morphogenetic gradients, Cell fate and cell lineages, Stem cells, Genomic equivalence and the cytoplasmic determinants, Imprinting, Mutants, Transgenics in analysis of development	10
2	**Sex determination, Gametogenesis, fertilization and early development** Production of gametes, Cell surface molecules in sperm-egg recognition in animals, Embryo sac development, Double fertilization in plants, Zygote formation, Cleavage, Blastula formation, Embryonic fields, Gastrulation, Formation of germ layers in animals, Embryogenesis, Establishment of symmetry in plants, Seed formation, Germination	14
3	**Morphogenesis and organogenesis in animals:** Morphogenesis and organogenesis in animals : Cell aggregation and differentiation in Dictyostelium; axes and pattern formation in Drosophila, amphibia and chick;	14

	organogenesis – vulva formation in Caenorhabditis elegans, eye lens induction, limb development and regeneration in vertebrates; differentiation of neurons, post embryonic development- larval formation, metamorphosis; environmental regulation of normal development; sex determination.	
4	Morphogenesis and organogenesis in plants: Organization of shoot and root apical meristem; shoot and root development; leaf development and phyllotaxy; transition to flowering, floral meristems and floral development in Arabidopsis and Antirrhinum	10
5	Programmed cell death, aging and senescence	4

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
15	**15**	**5**	**5**	**10**	**0**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Reference Books:

1. Developmental Biology, Eighth Edition" by Scott F Gilbert.
2. Essential Developmental Biology by Jonathan Slack
3. Developmental Biology, Werner A Muller
4. Principles of Development - Lewis Wolpert (2019)
5. Developmental Biology A GUIDE FOR EXPERIMENTAL STUDY Mary S. Tyler

Course Outcome:

Sr. No.	**CO Statement**	**Marks % Weightage**
CO-1	Understand basic concepts of development	20
CO-2	Understand the Sex determination, Gametogenesis, fertilization and early development	27
CO-3	Describe and compare Morphogenesis and organogenesis in animals and plants	46
CO-4	Understand Programmed cell death, aging and senescence	08

List of Open Source Software/learning website:

1) NPTEL

2) MIT Open course lecture