GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Bachelor of Science

Level: Under Graduate

Branch Name: Honors/ Honors With Research (Biotechnology)

Course / Subject Code: BS02001041

Course / Subject Name: Developmental Biology

w. e. f. Academic Year:	2024-25
Semester:	2
Category of the Course:	Minor Elective Subject

Prerequisite:	Students in previous classes must studied about the different kinds of nucleic acid. They have basic knowledge about the fundamentals of biochemistry and genetics
Rationale:	Molecular biology is the branch science that deals with the molecular basis of living cells. This will allow students to understand the molecules present in living cells and their role in the functioning of life

Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
				Theory		Tutorial / Practical		
L	T	PR	C	ESE (E)	PA / CA (M)	PA/CA (I)	ESE (V)	
3	0	2	4	70	70	30	30	200

Course Content:

Sr. No.	Course Content	No. of Hours	% of Weightage
1	**Plant development:** Morphology of an Angiosperm plant with the understanding of evolution, compound and simple leaf, apetalae, thegamopetalae and polypetalae, fibrous and tap root system,parallel venation and reticulate venation, herbs, shrubs andtrees, annuals and perennials, monocots vrs dicots, AquaticPlants, epiphytes and terrestrial.Development of seeding, shoot apex organization, vegetativeand floral apex, root, shoot and flower development. Life cycleof an angiosperm plant showing alternation of generation	**10**	**22**
2	**Experimental and Applied Embryology:** Artificial pollination and sexual incompatibility, methods to overcome incompatibility.	**9**	**21**

3	**Plant embryology:** Structure and development of microsporangium and male gametophyte, Structure and development of megasporangium and female gametophyte, Endosperm with types, Embryogeny in Monocot and Dicot, Polyembryony, Apomixis, Parthenocarpy Applications of Embryology in Crop improvement: Haploid production, Nucellus, Ovule, Ovary, Seed culture, Genetic transformation	**9**	**21**
4	**Animal development** Definition, scope and history of embryology, branches ofembryology, phases in ontogenic development, gametogenesis,spermatogenesis, oogenesis, Types of eggs, Egg membranesFertilization: Encounter of spermatozoa and ova, Capacitationand contact, Acrosome reaction and penetration, Activation of ovum, Migration of pronuclei and amphimixis. Parthenogenesis	**10**	**22**
5	**Cleavage** Patterns and Types of cleavage, Brief account on Holoblastic and Meroblastic cleavages Morulation and Blastulation Fate Maps – Construction of fate maps by natural marking Gastrulation (Epiboly and Emboly) Growth and Differentiation Medical implications of Animal Development Biology: Genetic errors of Human development, Infertility, Teratogenesis.	**7**	**14**
	Total	**45**	

Reference Books:

1. Molecular Biology of the Gene 6th ed., Watson, J.D., Baker, T.A., Bell, S.P.2008.
2. Lehninger: Principles of Biochemistry 6th ed., Nelson, D.L. and Cox, M.M., W.H. Freeman & Company (New York), 2013.
3. Genetics.P. K. Gupta, Rastogi Publications. ISBN: 81-7133-779-1. Shivaji Road Meerut, India

Course Outcome:

After Completion of the Course, Student will able to:

Sr. No	Course Outcomes	RBT Level
1	Understand the transcription of different types of RNA in both prokaryotes and eukaryotes	RM,UN
2	Students will learn Post transcriptional and post translation modification.	RM,UN

3	Biosynthesis of protein by translation mechanism	RM,UN
4	Regulation of gene expression, RNA Interference (SiRNAs and miRNAs)	RM,UN

*RM: Remember, UN: Understand, AP: Apply, AN: Analyze, EL: Evaluate, CR: Create

List of Experiments: (Minimum 6 experiments need to be performed)

- **Morphological Study of Angiosperm Plants** – Classifying plants based on morphological features like leaves, roots, and flowers.
- **Seed Development and Life Cycle of Angiosperm** – Observing the stages of seed development and the alternation of generations in plants.
- **Artificial Pollination and Overcoming Sexual Incompatibility** – Demonstrating artificial pollination techniques and overcoming incompatibility.
- **Animal Gametogenesis (Spermatogenesis and Oogenesis)** – Studying the processes of spermatogenesis and oogenesis in animals.
- **Fertilization and Early Embryonic Development** – Observing fertilization and early embryonic stages including cleavage, morulation, and blastulation.
- **Gastrulation and Embryonic Development** – Studying the process of gastrulation and its role in forming germ layers during embryonic development.

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