UNIVERSITY OF MADRAS

B.Sc. DEGREE PROGRAMME IN ADVANCED ZOOLOGY AND BIOTECHNOLOGY

SYLLABUS WITH EFFECT FROM 2023-2024

SEMESTER -V

Course Code	Course Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
321C5B	**DEVELOPMENTAL BIOLOGY**	Core	Y	-	-	-	5	4	25	75	100

Learning Objectives	
CO1	To create an awareness to the students about the theories, concepts and basics of Developmental Biology and explain and contrast the processes of spermatogenesis, oogenesis and fertilization.
CO2	To provide students about the idea of sex cells, fertilization, cleavage, Understand various cleavage patterns in animals,differentiation and development of organs.
CO3	To make an awareness of the induction, organizers and development of organs and to gain knowledge of the sequential changes from cellular grade of organization to organ grade of organization
CO4	To provide adequate explanation to students about the late embryonic developments and post embryonic development, about teratogenesis and ageing
CO5	To give an idea about invitro fertilization, stem cells, IVF and amniocentesis to the students

UNIT	Details	No. of Hours	Course Objectives
I	Origin of germ cells -Gametogenesis -Spermatogenesis – Oogenesis- Structure of Sperm and Egg Fertilization: Pre and Post fertilization events - Mechanism and Physiology of Fertilization and significance.	12	CO1
II	**Blastulation & Gastrulation** Cleavage - Planes and Patterns, Factors controlling cleavage - Fate map and its construction. Blastulation – types of blastula. Gastrulation and Morphogenetic movements - Gastrulation of frog & chick.	12	CO2
III	**Organogenesis** -Derivatives of primary germ layers. Development of Brain, Eye and heart in Frog. Induction-Organizer concept. Extra embryonic membranes. Placenta in Mammals.	12	CO3

IV	**Applied Embryology** Parthenogenesis, Nuclear transplantation in Acetabularia - teratogenesis – Regeneration: types - events and factors. Embryonic stem cells & significance. Methods to culture embryo, IUI, IVF.	12	CO4
V	**Human embryology** Puberty , Menstrual cycles, – Menopause – Pregnancy and related problems – Parturition – Lactation. Sexual dysfunctions, sexually transmitted diseases; Cancers of the reproductive system; Adenomyosis: gland-like growth into myometrium; Birth Control; endometriosis, fibroids, Endometritis: chronic infection of uterus, congenital uterine anomalies; Ovarian cysts, pelvic varicosities.	12	CO5
		60	

Course Outcomes	On completion of this course, students will	
CO1	Describe and illustrate the significance of cellular processes in embryonic development.	PO1
CO2	Be able to relate the factors that contribute to the developmental process, construct fate maps and illustrate the steps in morphogenesis and organogenesis.	PO1, PO4
CO3	To correlate the involvement of specific cell types in the formation of specific organs and explain the importance of morphogens.	PO4, PO6
CO4	To distinguish between the different types of developmental mechanisms in various organisms and appraise the species-based differences in development.	PO4, PO5, PO6
CO5	To justify and validate the role of environment and genetics in influencing embryonic development	PO3, PO8

Text Books
(Latest Editions)

1. Lewis Wolpert 2007. Principles of development, 3rd edition, Oxford University Press, New Delhi, India
2. Subramoniam, T. 2003. Developmental Biology, Narosa Publishing House, New Delhi, India.
3. Verma, P.S., Agarwal, V. K.2010.Chordate Embryology: Developmental Biology, S. Chand & Company, New Delhi., India.

References Books
(Latest editions, and the style as given below must be strictly adhered to)

1. Gilbert S.F. 2010. Developmental Biology, Sinauer Associates, Massachusetts, USA.

2.	Balinsky, B.I. 1970. Introduction to Embryology, Philadelphia & London, UK.
3.	Berril, N.J.1971. Developmental Biology, McGraw Hill, New York, USA.
4.	Russ Hodge 2010. Developmental Biology, Facts on File, Inc., New York, USA.
5.	Carlson, Bruce, M. 2009. Human embryology and Developmental Biology, Elsevier, Philadelphia, USA

Web Resources

1.	https://www.ncbi.nlm.nih.gov/books/NBK10052/
2.	https://www.cdc.gov/ncbddd/developmentaldisabilities/facts.html
3.	https://anatomypubs.onlinelibrary.wiley.com/doi/full/10.1002/dvdy.20468
4.	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5293490/

Methods of Evaluation

Internal Evaluation	Continuous Internal Assessment Test	25 Marks
	Assignments	
	Seminars	
	Attendance and Class Participation	
External Evaluation	End Semester Examination	75 Marks
	Total	100 Marks

Methods of Assessment

Recall (K1)	Simple definitions, MCQ, Recall steps, Concept definitions
Understand/ Comprehend (K2)	MCQ, True/False, Short essays, Concept explanations, Short summary or overview
Application (K3)	Suggest idea/concept with examples, Suggest formulae, Solve problems, Observe, Explain
Analyze (K4)	Problem-solving questions, Finish a procedure in many steps, Differentiate between various ideas, Map knowledge
Evaluate (K5)	Longer essay/ Evaluation essay, Critique or justify with pros and cons
Create (K6)	Check knowledge in specific or offbeat situations, Discussion, Debating or Presentations

Mapping with Programme Outcomes:

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**
CO 1	S							
CO 2	M			M				
CO 3				S		S		
CO 4				S	S	M		
CO 5			S					S

S-Strong(3) M-Medium (2) L-Low (1) B N