Department of ZOOLOGY
Chaudhary Devi Lal University
Sirsa–125 055

As per Ph.D. ordinance, the research scholar has to clear minimum 12 credits

Sr. No.	Course ID	Nomenclature	Credit	Contact Hours per week	Internal Assessment	External Exam	Max. marks	Exam Duration (Hrs)
1	PhD/ZOO/1/701	Recent Advances in Techniques in Animal Sciences	4	4	30***	70	100	3
2	PhD/ZOO/1/702	A. Toxicology and Aquaculture B. Reproductive Physiology	4	4	30***	70	100	3
3	PhD/ZOO/1/703	Research Methodology/ MOOC*	4	4	30***	70	100	3
4	PhD/ZOO/1/704	Research and Publication Ethics/MOOC*	2	2	20**	30	50	3

Grand Total=350 Marks

*Research Methodology (PhD/ZOO/1/703) and Research and Publication Ethics (PhD/ZOO/1/704) courses offered on Swayam Portal will be cleared by research scholar as per Ph.D. ordinance and MOOC guidelines. Internal assessment marks will not be awarded for these two above courses.
**IA=20 Marks (10–Midterm examination; 5–Assignment hand written; 5–Attendance)
***IA = 30 Marks (20–Midterm examination; 5–Assignment hand written; 5–Attendance)

Note:
1. Students are allowed to use single memory, non-programmable scientific calculator during exam, however, sharing of calculator is not allowed.

28/5/24 28/5/24

Ph.D. (Zoology)

PhD/ZOO/1/702B-Reproductive Physiology

Credits: 4 **Total marks: 100**

Time: 3 Hrs. **Theory: 70**

IA: 30

Course objective: This course offers students to understanding the physiology and functioning of reproductive organs. It will also provide information about roll of mitochondria in gametogenesis. Students will also learn about Reactive Oxygen Species (ROS) and their impacts on reproductive organs. The main focus is on research and innovations in the field of Reproductive Physiology.

Course outcomes:	
CO1	To enable the students understands the basics of Reproductive Physiology.
CO2	To understand the structure and functions of reproductive organs along with Reactive Oxygen Species (ROS).
CO3	This core elective paper will generate knowledge about Molecular biology of apoptosis.
CO4	To enable the students with *In-vitro* culturing of cells and tissues, Cloning techniques and applications.

Note for the paper setter: The question paper will consist of nine questions in all. The first question will be compulsory and will consist of five short questions of 2 marks each covering the whole syllabus. In addition, eight more questions will be set unit-wise comprising of two questions from each of the four units. The candidates are required to attempt four more questions selecting at least one question from each unit.

UNIT I

In-vitro culturing of cells and tissues: Basic requirements, Culturing medias, types, procedures and precautions. Short term and long term cell culture.

Physiology, biochemistry and molecular biology of follicular growth. Reactive Oxygen Species (ROS) and ovarian function: Reactive oxygen species; ROS in the follicle, oocyte and corpus luteum.

UNIT II

Mitochondria and Ageing Ovary: mitochondrial DNA; mitochondria and oogenesis; mitochondria and reproductive ageing.

Testicular Physiology: Morphology, differentiation, function and regulation. Morphometric, biochemical and viability assay in semen.

UNIT III

Molecular biology of apoptosis in testicular and ovarian tissue.

Oocyte maturation: Nuclear maturation, meiotic competence, cytoplasmic maturation, coordination of nuclear and cytoplasmic maturation, *in-vitro* fertilization and transgenesis.

28/5/24 28/5/24

UNIT IV

Follicular atresia; causes, regulation and significance.

Cloning techniques and applications; Stem cells, stem cell markers, techniques and applications.

Text/Reference Books:

1. Guraya S.S. (1998). Cellular and Molecular Biology of General development and Maturation in mammals Narosa Publishing House, New Delhi.
2. Hafez E.S.E.(1994). "Reproduction in farm animals". Lea Febighiese.
3. Gurays S.S. (2000). Comparative Cellular and Molecular Biology of Ovary in mammals. I.B.H., New Delhi.
4. The Physiology of Reproduction, second edition, Vol 1 and 2, edited by Ernst Knobil and Jimmy D. Neil. Raven Press, 2014.
5. Male Reproductive Function, edited by Christina Wang. Kluwer Academic Publishers, 1999.
6. The ovary, edited by Solly Zuckerman Baron Zuckerman, Barbara J. Weir, T. G. Baker. Academic Press.
7. The ovary, edited by Peter C.K. Leung and Eli Y. Adashi, Elsevier (Academic Press), 2004.
8. Cell and Molecular Biology of Testis, edited by Claude Desjardins and Larry L. Ewing. Oxford University Press US.
9. Reproductive Endocrinology: Physiology, Pathophysiology, and Clinical Management, edited by Samuel S. C. Yen, Robert B. Jaffe, Robert L. Barbieri. Saunders publisher.
10. Regulation of Implantation and Establishment of Pregnancy in Mammals, Editors: Rodney D Geisert, Fuller W. Bazer, ISBN 978-3-319-15856-3, Springer International Publishing, 2015.
11. Implantation and early development, Editors: Hilary Critchley, Ian Cameron and Stephan Smith, ISBN 9781107784680, Cambridge University press, 2014.
12. Implantation, Biological and Clinical Aspects, Editors: Michael G. Chapman, J. Gedis Grudzinskas, Tim Chard, ISBN 978-1-4471-3531-9, Springer-Verlag, 1988.

CO-PO-PSO mapping matrix for PhD/ZOO/1/702B-Reproductive Physiology

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO1	2.5	2.5	2.5	2	3	3	2	2.5	3	2	2	2.5
CO2	2.5	2	2.5	2	3	3	2.5	2.5	3	2	2	2.5
CO3	2.5	2.5	2.5	2	3	3	2.5	2.5	3	2	2	2.5
CO4	2.5	2	2.5	2	3	3	2	2.5	3	2	2	2.5
Avg	2.5	2.25	2.5	2	3	3	2.25	2.5	3	2	2	2.5

28/05/24 28/5/24