Programme: M. Sc. (Zoology)
Course Code: ZOC-201 **Title of the Course:** Animal Genetics
Number of Credits: 3
Effective from AY: 2018-19

Prerequisites for the course:	Basic working knowledge of classical genetics.	
Objective:	This course develops concepts in classical animal genetics and their application. Use of various animals for understanding the basic principles and the working of genetic principles in producing better breeds of animals with better vigour.	
Content:	**Module 1**: Drosophila Genetics: Biology and life cycle of Drosophila; Drosophila as "Cinderella of genetics"; Chromosome constitution; Polytene chromosomes; puffs as regions of gene transcription; Lozenge in Drosophila. Epigenetics and Epigenomes : Definition, brief history; Epigenetic patterns; Genomic imprinting; Histone Code; DNA Methylation (DM); Mutations and Epimutations; Cellular transformation; chromosome imprinting; Epigenetic defects and ageing.	12 hours
	Module 2: Cancer Genetics: Introduction; Origin of Oncogenes; Identification of an Oncogene; Viral Oncogene; Transfection Assay for Oncogene; Activation of Proto- oncogenes; retroviruses contain Oncogenes; Proto- oncogenes; A model of Carcinogenesis; Evidences supporting Pall's model; Tumor suppressor genes or Anti-oncogenes; Inherited Cancer genes (Familial Cancers); Cellular function of Oncoproteins.	12 hours
	Module 3: Genomics and Proteomics: Introduction, tools to study functional genomics; assigning function to a gene; cDNA: synthesis, cloning, construction of cDNA libraries and sequencing; Application of functional genomics; Gene transfer methods and transgenic organisms; Genome research; Proteomics: tools, application and research; Bioinformatics: tools and application in genetic studies; Databases: nucleic acid and protein; Phylogenetic analysis; Expressed sequence tags; Genetic algorithm; Gene prediction.	12 hours
Pedagogy:	Lectures/ Tutorials/Assignments/Self-study.	
References/Readings	1. Alberts B, Johnson A, Lewis J, et al., Molecular Biology of the Cell, Taylor & Francis Group, New York, USA. 2. David AC and Jenuwein T, Epigenetics, Cold Spring Harbor Laboratory Press, New York, USA. 3. Griffiths AJF, Gelbart WM, Lewontin RC and Miller JH, Modern Genetic Analysis: Integrating Genes & Genomes, WH Freeman & Co. New York.	

	4. Hartl DL and Jones EW, Genetics: Analysis of Genes and Genomes, Jones & Bartlett Publishers, Boston. 5. Lewin B, Genes IX, Oxford University Press, Oxford, New York. 6. Lodish H, Berk A, Lawrence S, et al.,Molecular Cell Biology, Freeman WH & Co. New York. 7. Primrose SB and Twyman RM, Principle of Genome Analysis and Genomics, Blackwell Publishing Co. Malden, USA. 8. Watson JD, Beyker, Bell JD, et al., Molecular Biology of the Gene, Pearson Education, Delhi.	
Learning Outcomes	1. Understand genetic analysis at the gene, genome and population levels. 2. Understanding of the latest developments in Drosophila genetics. 3. Evaluation of the various techniques used in advanced genetic analysis 4. Distinguish between structural, functional and comparative genomics and how they differ from proteomics. 5. Designing and development of experiments using Drosophila and their evaluation through genetic analysis using genetic techniques and interpretations. 6. Knowledge on cancer genetics.	