Course Code: ZOO 340 **Course Title: Animal Genetics**
Number of Credits: 3
Effective from AY: 2020 -21

Prerequisite for the Course:	Basic knowledge of classical genetics and fundamental aspects of genetics.	
Objectives:	1. To develop concepts in classical animal genetics and their application. It leads to a better understanding of human genetic profile and the related diseases. 2. To relate the genetic concepts and the basic principles to produce better breeds of animals which can benefit economically. This course also aids in gaining better knowledge of novel aspects of Genetics and Bioinformatics.	
Content:	**Module 1:** Chromosomal Genetics: Chromosomal basis of inheritance and Cytological basis of crossing over- Sterns experiments in Drosophila, Inheritance of linked genes -Coupling and Repulsion phase, differential chromosomal staining techniques. Mapping genomes: a) Genetic mapping – DNA markers - RFLPs, SSLPs, SNPs b) Physical mapping - Restriction mapping, Fluorescent in situ hybridization, Radiation hybrid mapping and Sequence tagged site mapping, gene mapping in Drosophila using two point and three point test crosses with an emphasis on interference and coefficient of coincidence. Genetic models: Mouse as a model mammal for genetic studies, other animal models for human diseases. **Module 2:** Review of Pedigree analysis: Autosomal recessive disorders, Autosomal dominant disorders, X-linked recessive disorders, X-linked dominant disorders, Y-linked disorders (two examples each). Bioinformatics: tools and application in genetic studies. Cancer Genetics: Introduction and cellular aspects; Proto-oncogenes; Oncogenes; Viruses and Cancer; Oncoproteins; Tumor suppressor genes; Inherited Cancer genes (Familial Cancers). **Module 3:** Genetic applications in Fishes, Livestock and Wildlife**:** Evaluation and characterization of various indigenous breeds of fishes, livestock and poultry. *Ex-situ* and *In-situ* conservation of animal and poultry genetic resources.	4 hrs 6 hrs 2 hrs 6 hrs 6 hrs 6 hrs 3 hrs

	Role of artificial insemination / frozen semen / embryo transfer / ONBS / MOET technology in animal breeding. Gene editing in livestock: Promise, prospects and policy. Knock-out animals, Conditional knock outs using cre-loxP recombination; tissue specific promoters.	3 hrs
Pedagogy:	Lectures/Tutorials/Videos/Assignments/Group Activities/Self-study.	
Learning Outcome:	1. Understand Classical genetics and learn about microbial genetics and the related use of the concept in laboratories. 2. Learn about Drosophila genetics to study genetic principles using the model of Drosophila 3. Study the lesser known field of epigenetics 4. Knowledge on cancer and inherited genetics. 5. Distinguish between structural, functional and comparative genomics and how they differ from proteomics. 6. Evaluation of the various techniques used in advanced genetic analysis. 7. Learn about the novel field of Bioinformatics.	
References /Reading:	1. Klug WS, Cummings MR, Spencer C and Palladino MA (2008): Concepts of Genetics, 9th edition Publisher-Benjamin Cummings. 2. Snustad and Simmons (2005): Principles of Genetics, 4th Ed., John Wiley & Sons, USA. 3. Russell J (2009): Genetics, Benjamin-Cummings Publishing Company, San Francisco, California, USA 4. Alberts B, Johnson A, Lewis J, Raff M, Roberts K, and Walter P (2002): Molecular Biology of the Cell, 4th edition, Taylor & Francis Group, New York, USA. 5. Griffiths AJF., Gelbart WM, Lewontin RC and Miller JH (1999): Modern Genetic Analysis: Integrating Genes & Genomes, WH Freeman & Co. New York. 6. Hartl DL and Jones EW (2004): Genetics: Analysis of Genes and Genomes, 6th edition Jones & Bartlett Publishers, Boston, USA. 7. Benjamin L (2008): Genes IX, 9th edition, Publisher - Jones and Barlett Publishers Inc. 8. Primrose SB and Twyman RM (2001): Principle of Genome Analysis and Genomics, Blackwell Publishing Co. Malden, USA. 9. Watson JD, Baker TA, Bell SP, Gann A, Levine M, Losick R (2013): Molecular Biology of the Gene, 7th edition, Pearson Education, Delhi, India.	