Course Code: ZOO 332 **Course Title: Stem Cell Biology**
Number of Credits: 3
Effective from AY: 2020 -21

Prerequisite for the Course:	Basic understanding of cytology, histology and cellular types of embryo and adult.	
Objectives:	1. Broad awareness of current issues and approaches in stem cell biology, 2. Appreciation of the many ways in which stem cell science is utilized in therapeutic contexts. 3. A thorough understanding of stem cell science and the molecular nature of pleuripotency and differentiation. 4. Hands-on experience in several stem cell-related technologies and laboratory practices, including the theory and practice of stem cell propagation and differentiation,	
Content:	**Module 1:** Basic Biology of stem cells: Introduction to stem cells and basis of stemness; Embryonic stem cells, embryonal carcinoma cells, embryonic germ cells, adult stem cells, hematopoietic stem cells, mesenchymal stem cells, cancer stem cells, induced pluripotent stem cells. Cellular Mechanisms of Stem Cells: Molecular basis of pluripotency, stem cell niche, cell cycle regulators in stem cells, mechanisms of stem cell self-renewal. **Module 2:** Stem cells isolation and culture: Isolation, characterization and maintenance of embryonic stem cell isolated from: Mouse and Human. Serum and feeder free culture of human embryonic stem cells, evolution of Xeno-free culture systems. **Module 3:** Applications of stem cells: Neurodegenerative diseases, spinal cord injury, heart disease, diabetes, burns and skin ulcers, muscular dystrophy, orthopedic applications, eye diseases, stem cells and gene therapy. Ethical and regulatory issues in the use of stem cells.	4 hrs 8 hrs 12 hrs 12 hrs
Pedagogy:	Lectures/Tutorials/ PBL/Videos/Assignments/Group Activities/Self-study.	
Learning Outcome:	After successful completion of this course, students will be able to: 1. Describe the characteristics of stem cells and the different types of stem cells. 2. Understand the isolation process and cultivation of embryonic stem cells.	

	3. Understand basic biology/mechanisms of pluripotency, self-renewal of stem cells, stem cell niche in regulating stem cell fate, role cell cycle regulators in stem cells. 4. Describe the applications of stem cells in diseases, injury and gene therapy. 5. Appreciate the ethical and regulatory issues associated with use of stem cells.
References /Reading:	1. Atala A & Lanza R, (2012). Handbook of Stem Cells, 2nd Edition, Academic Press, 2012. 2. Lanza R, et al, (2013). Essential of Stem Cell Biology, Elsevier Academic Press. 3. Mao JJ, et al, (2007). Translational Approaches in Tissue Engineering & Regenerative Medicine, Artech House. 4. Habib NA, Levièar NY, Gordon M, Jiao L & Fisk N, (2007).Stem Cell Repair and Regeneration, Volume-2, Imperial College Press, 2007.