

Name of the Programme: M. Sc. Zoology

Course Code: ZOO-615

Title of the Course: Stem Cell Biology

Number of Credits: 02

Effective from AY: 2023-24

Pre-requisites for the Course:	Basic understanding of anatomy, cytology and types of cells	
Course Objectives:	1. To provide theoretical knowledge on stem cell science and the molecular nature of pluripotency and differentiation 2. To estimate competency in the technique of isolation, maintenance, and characterization 3. To review the current issues and approaches in the stem cell biology 4. To develop ways in which stem cell science can be utilized in the therapeutic context	
Content:	Module 1 Basic Biology of stem cells: Introduction to stem cells and basis of stemness; Embryonic stem cells, embryonal carcinoma 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, mechanisms of stem cell self-renewal.	15 hours
	Module 2 Stem cells isolation and culture: Isolation, characterization and maintenance of embryonic stem cells isolated from: Mouse and Human. 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.	15 hours
Pedagogy:	Lectures/tutorials/self-study/videos/presentations/mini projects/Group	

	activities
References/ Readings:	1. A. Atala and R. Lanza, Handbook of Stem Cells, 2nd Edition, Academic Press, 2012. 2. A. Atala, J. J. Mao, A. Mikos, G and Vunjak-Novakovic, Translational Approaches in Tissue Engineering & Regenerative Medicine, Artech House, 2007 3. R. Lanza and A. Atala, Essential of Stem Cell Biology, Elsevier Academic Press, 2013. 4. N.A. Habib, N. Y.Levièar, M. Gordon, L Jiao and N Fisk, Stem Cell Repair and Regeneration, Volume-2, Imperial College Press, 2007.
Course Outcomes:	The learner will 1. Analyze molecular mechanisms involved in pluripotency and differentiation 2. Select techniques of isolation, maintenance and characterization best suited for any particular type of cell 3. Assess the ongoing current issues and approaches involved in stem cell science 4. Generate ways of using stem cells in therapeutics 5. Predict the ethical and regulatory issues associated with the use of stem cells