

Subject Code: 2SC2010302	Subject Title: Animal Biotechnology
COURSE TYPE: CORE COURSE	

Course Objective: The objective of this course is to make students to understand and aware of animal cell culture of high standard required in scientific laboratories, good cell culture practice to for in vitro technique, principles of greater standard laboratory practices.

Teaching scheme(hours) per week		Credit			Theory Marks		Practical Marks		Total
Theory	Practical	Theory	Practical	Total	Uni. Assessment	Cont. Assessment	Uni. Assessment	Cont. Assessment	
4	-	4	-	4	60	40	-	-	100

Unit	Content	Lectures	Weightage
1	Cell culture - Nutrient requirement for cell of animal origin, media for culturing animal cells: types, composition, Role of CO₂, Serum, growth supplements, growth factors (EGF, PDGF, NGF, Gap-43) - Development and applications of cell and organ culture: primary culture, secondary culture and establishment of cell lines - Different methods of monolayer scale-up - propagators; disks, Roller culture; perfusions; Microencapsulation - Characterization of cultured cell: karyotyping, Cellular Interactions, Growth : Detection of contaminants in cell cultures and various parameters of growth, Cell viability and cytotoxicity assays,	20	30%
2	Various Methods of Transgenesis and animals developed - blastocyst injection, , nuclear transfers and artificial chromosome for gene transfer, Transferring genes into animal oocytes, eggs, embryonic and specific animal tissue - Mouse model for various human diseases, - Zebra fish for human cardiovascular disease - Pig for meat and organ development - Goat and sheep for milk and meat - Cow for high yield milk and therapeutics recombinants proteins production, - Insect for understanding gene expression and developmental biology - Transgenic Animals –Bird	10	25%
3	Stem Cell Technology - Introduction to stem cell: Definition, Types of stem cells, Isolation, Properties, proliferation and culturing of stem cell, Medical application - Isolation of human Embryonic stem cells, generation of human induced pluripotent stem cells. History of human pluripotent stem cell development - Methodologies for pluripotent stem cell culture, characterization of pluripotency and differentiation into different lineages - Cell Replacement Therapy : Principles of cell replacement therapy, Methods to engineer pluripotent stem cells for treatment of genetically impaired conditions/diseases. - Application of pluripotent stem cells: in treatment of autoimmune complications, cancer management and treatment, ocular and	20	25%

	cardiovascular diseases management and treatment, neuronal disease management and treatment. Ethical and regulatory issues affective pluripotent stem cell-based cell replacement therapies. Technological challenges towards development of pluripotent stem cell-based cell replacement therapies.		
4	Application of Animal Biotechnology Improvement of biomass: Artificial insemination, in vitro fertilization (IVF-technology for live stock and humans), Embryo transfer technology - Diagnosis of various infection diseases (e.g. FMD, Coccidiosis, Trypanosomiasis, Theileriosis) - Vaccines and its types. - Genetic modification in Medicine - gene therapy, types of gene therapy, vectors in gene therapy, molecular engineering, human genetic engineering, problems & ethics	10	20%

Learning Outcome: After studying this course students should know techniques, issues related to animal cell, cell culture, tissue, organ or whole animal usage for various pharmaceutical and medicinal purposes.

Reference Books:

- Jan Freshney. R .Culture of Animal Cells: A Manual of Basic Technique and Specialized Applications (6th Ed.)Wiley & Sons. 2010
- Glick, B.R. and Pasternak J.J. Molecular Biotechnology.ASM Press, Washington DC.2003.
- John Davis., Animal Cell Culture: Essential Methods (1st Ed.) Wiley-Blackwell and Sons publisher. 2011
- Ballin C.A., Philips J.P and Moo Young M.Animal Biotechnology. Pergamon press, New York. 1989. Animal Cell Culture –Practical ApproachJ. R. W. Masters (Eds)
- Animal Cell Culture Techniques: M. Clynes (Ed)
- Stem Cell Biology and Gene Therapy. Quesenberry PJ, Stein GS, eds. (£65.00.) Wiley, 1998.
- Stem Cells Handbook: Stewart Sell, Humana Press; Totowa NJ, USA; Oct. 2003.
- Frontiers in Pluripotent Stem Cells Research and Therapeutic Potentials Bench-To-Bedside, 2018, by Kuldip S. Sidhu.
- Patient-Specific Induced Pluripotent Stem Cell Models: Generation and Characterization (Methods in Molecular Biology) 1st ed. by Andras Nagy (Editor) and Kursad Turksen (Editor)
- Human Pluripotent Stem Cells: Methods and Protocols (Methods in Molecular Biology) 2011th Edition by Philip H. Schwartz (Editor), Robin L. Wesselschmidt.
- Atlas of Human Pluripotent Stem Cells: Derivation and Culturing (Stem Cell Biology and Regenerative Medicine) 2011 by Michal Amit and Joseph Itskovitz-Eldor
- Stem Cell Biology, Daniel Marshak, Richard L. Gardener and David Gottlieb, Cold Spring Harbour Laboratory Press
- Stem cell biology and gene therapy, Booth C., Cell Biology International, Academic Press