

**STEM CELL ENGINEERING/ MOLECULAR MODELING AND DRUG  
DESIGNING  
PBT6J001 STEM CELL ENGG**

**Module-1**

Stem cell basics: Unique properties of stem cells, embryonic stem cells, adult stem cells, umbilical cord stem cells, similarities and differences between embryonic and adult stem cells. Properties of stem cells, pluripotency, totipotency. Embryonic stemcell: In vitro fertilization, culturing of embryos-isolation of human embryonic stem cells, blastocyst, inner cell mass, growing ES cells in lab, laboratory tests to identify ES cells, stimulation ES cells for differentiation, properties of ES cells.

**Module-II**

Adult stem cells: Somatic stem cells, test for identification of adult stem cells, adult stem cell differentiation, trans differentiation, plasticity, different types of adult stem cells. Stem cell in drug discovery and tissue engineering: Target identification, Manipulating differentiation pathways, stem cell therapy Vs cell protection, stem cell in cellular assays for screening stem cell techniques: fluorescence activated cell sorting (FACS), time lapse video, green fluorescent protein tagging, stem cell based drug discovery, drug screening and toxicology.

**Module-III**

Genetic engineering and therapeutic application of stem cells: Gene therapy, genetically engineered stem cells, stem cells and Animal cloning, transgenic animals and stem cells, Therapeutic applications Parkinson disease, Neurological disorder, limb amputation, heart disease, spinal cord injuries, diabetes, burns, HLA typing, Alzheimer's disease, tissue engineering application – production of complete organ, kidney, eyes, heart, brain. Stem cell regulations, debate, social and ethical concerns

**Books**

1. Embryonic Stem cells by Kursad and Turksen. 2002.Humana Press.
2. Stem cell and future of regenerative medicine. By committee on the Biological and Biomedical applications of Stem cell Research.2002.National Academic press
3. Hematopoietic Stem Cell Transplantation by Treleaven, J., first edition 2009
4. Essentials of Stem Cell Biology by Lanza, R., second Edition, 2009 Academic Press
5. Molecular Cell Biology by Lodish et al., sixth Ed., W.H. Freeman & Co. 2008
6. Stem Cells: From Bench to Bedside by Bongso and Ariff BTBT903 Nanobi