BSE512 STEM CELL BIOLOGY AND REGENERATIVE MEDICINE

39hrs

Course Outcomes:

After successful completion of the course, students will be able to:

CO 1. Gain in-depth knowledge in the field of stem cell biology and regenerative medicine
CO 2. Understand the different types of stem cell and their applications.
CO 3. Learn about state-of-the-art technologies, applications and ethics in research of stem cell biology.
CO 4. Understand the legal and ethical aspects of stem cell research and applications.
CO 5. Know the principles and applications of tissue engineering and nanotechnology.

Unit 1 (13 hours)

Basics of stem cell biology, origin, development, types and properties of stem cells, embryonic stem cells and induced pluripotent stem cells (iPSCs), foetal (amniotic, umbilical cord blood and stem cells from other embryonic tissues), adult stem cells- Hematopoieticstem cells, mesenchymal stem/stromal cells, neural stem cells, hepatic stem cells and skeletal muscle stem cells, cancer stem cells, state-of-the-art technologies, applications and ethics in research of stem cell biology anddifferentiation

Unit II (13 hours)

Introduction and principles of regenerative medicine, cell based therapies, pluripotency and regenerative medicine, Cell-cell interactions in tissue regeneration, Isolation and culture of stem cells, Viral and non viral vectors in stem cell research, Genome editing and use of genetically engineered stem cells. Applications of stem cell based therapies in bone, blood, cardiovascular regeneration, musculoskeletal repair, hepatocyte and neuronal transplantation, legal and ethical aspects of stem cell research and applications

Unit III (13 hours)

Nanotechnology: Definition, nanomaterials and their applications; Regenerative medicine, biomaterials and scaffolds in regenerative medicine, principles and applications of tissue engineering, modes of cell and tissue delivery, *in situ* tissue engineering and bioartificial organs, GMP and regenerative medicine

References:

1. Appasani K., Appasani, R.K.(2013) Stem cells and regenerative medicine, Humana Press, 2013
2. Lanza R., Atala, A. (2014) Essentials of stem cell biology, 3rd Ed., Academic Press