Indian Institute of Science

Department of Bioengineering

BE 222 (January)
3:0
Stem Cell Technology

Instructor: Dr. Ajay Tijore, ajaytijore@iisc.ac.in

Course Time: Monday, Wednesday, Friday, 12-1 pm
Course location: BE Annexe, Ground floor

Description and Syllabus

The course will introduce students to the fundamental principles of stem cell science, stem cell functioning, clinical applications and bioethical issues associated with using stem cells. Also, students will learn contemporary techniques to develop scaffolds and platforms to study stem cell differentiation in the context of regenerative medicines. The following topics will be covered: basic overview of stem cells; types of stem cells; stem cell microenvironment; stem cell isolation and characterization; stem cell differentiation and methods to regulate stem cell differentiation; induced pluripotent stem cells (iPSCs) and technique to develop iPSCs, methods to use stem cells to study diseases; stem cell-based therapies for regenerative medicines and the bioethics of stem cell research. In a nutshell, students will learn what has been accomplished, what challenges remain and what potential breakthrough may lie ahead in the field of stem cells.

References

1. Engineering Materials for stem cell regeneration, Faheem Sheikh, Springer Nature, 2021
2. The Science of Stem Cells, Slack Jonathan M. W, Wiley

Course material will include lecture presentations and reference books recommended by the lecturers.

Course Outcomes

Upon completion of the course, students will be able to:

1. Know the different types of stem cells and their unique properties
2. Describe 2D/3D methods to regulate stem cell differentiation
3. Discuss various stem cell-based models in the context of tissue engineering and regenerative medicines
4. Analyze the use of stem cells in current and future clinical applications
5. Know the bioethical issues associated with stem cells