BME 6324 Stem Cell Engineering

Credits: 3 credits

Textbook, Title, Author, and Year: Mirjana Pavlovic and Bela Balint: Stem Cells and Tissue Engineering (Springer Briefs in Electrical and Computer Engineering), NY, Heidelberg, 2013, ISSN: 2191-8120 (electronic), ISBN: 978-1-4614-5505-9 (eBook)

Reference Materials: Will be given at class, dependent on student's interest

Specific Course Information

Catalog Description: This course will focus on the stem cells research and application in its endeavor to understand the nature of these cells; their sources, categories; engineering of these cells in their role as novel cellular therapeutical approaches, reprogramming of their function, through an exciting combination of readings, penetrating discussions, and animation of new techniques and tools (little movies). This course enhances students' understanding of human ordinary stem cells and cancer stem cells, clarifies what is stemness, elevates student's experience through the search and study of literature resources and the use of modern technologies and tools, piques their intellectual curiosity in the complex science of stem cells, and helps to guide them in matching their interests to their academic pursuits.

Prerequisites: N/A

Specific Goals for the Course:

- Better understand scientific, engineering, therapeutical views of stem cell phenomenology, including recent theories of complexity in their nature and ethical obstacles in human society.
- Articulate theories, challenges, and prospects for stem cell entities and cellular therapies in scientific community.
- Understand models of dynamics, evolution, reprograming of stem cells.
- Compare similarities and differences between stem cell renewal and differentiation
- Consider and reflect upon the ethical and social consequences of the various models used in cellular treatments.
- Consider and reflect upon the implications of the mobilization, harvesting, stem cell transplant and engraftment in this system.
- Name principles and practice of stem cell cryopreservation
- Know the basics of cancer stem cell concepts
- Improve individual work and oral and writing capabilities

Brief List of Topics to be covered:

1. Introduction
2. Stem Cell Concept
3. Embryonic Stem Cells
4. Adult (Tissue's) Stem cells
5. Cord blood Stem cells
6. Hematopoietic Stem cells
7. Ethical aspects of stem cell research
8. Stem Cell Renewal and Differentiation
9. Stem Cell Sources, Harvesting and Clinical Use
10. HLA Typization : Choice of Donors
11. Peritransplant blood component therapy
12. Engraftment: homing and use of genetic markers
13. Principles and practice of stem cell cryopreservation
14. Cord Blood cryopreservation
15. Current status and perspectives in Stem cell research : the concept of Cancer stem cell
16. Stem cell therapy: optimization, regeneration, reprograming ,TE
17. Cellular therapy/engineering: Heart stem cell therapy
18. Neurological diseases and stem cell therapy