COURSE CODE	COURSE TITLE	L	T	P	C
1152BT121	STEM CELL TECHNOLOGY	3	0	0	3

Course Category:

Program Elective

a. Preamble: To study the unique properties of stem cell with its classification and to understand its application in the treatment of diseases.

b. Prerequisite Courses:

Biology for Engineers

c. Related Courses:

None

d. Course Outcomes:

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

CO Nos.	Course Outcomes	Knowledge Level (Based on revised Bloom's Taxonomy)
CO1	To understand the basic properties of stem cell	K2
CO2	To comprehend the source and characterization of human embryonic stem cell.	K2
CO3	To isolate and identify the different types of adult stem cell.	K2
CO4	To explain the role of stem cell in tissue engineering.	K2
CO5	To demonstrate the various medical applications of stem cell.	K2

e. Course Content:

UNIT I INTRODUCTION TO STEM CELLS

Scope of Stem Cells -Unique properties of stem cells – differentiation , maturation , proliferation , pluripotency, self – maintainance and self – renewal –classification- problems in measuring stem cells – preservation protocols.

UNIT II HUMAN EMBRYONIC STEM CELL

Stem cells and their developmental potential. In vitro fertilization-culturing of embryos-blastocyst-inner cell mass-isolation and growing ES cells in lab Identification and characterization of human ES cells-Cloning and controlled differentiation of human embryonic stem cells. Applications of Embryonic stem cells. Ethical issues and regulations.

UNIT III HUMAN ADULT STEM CELL

Somatic stem cells-test for identification of adult stem cells- adult stem cell differentiation-trans differentiation-plasticity-different types of adult stem cells-liver stem cells-skeletal muscle stem cells-bone marrow derived stem cells.

UNIT IV STEM CELLS IN TISSUE ENGINEERING

Haematopoietic Stem Cells-Growth factors and the regulation of haematopoietic stem cells-clinical applications of haematopoietic stem cells. Mesenchymal stem cells and their role in bone tissue engineering-bone repair. Stem cell based gene therapy and benefits to human.

UNIT V APPLICATIONS OF STEM CELL

Therapeutic applications-Parkinsons disease, Cancer stem cell – Neural stem cell for central nervous system repair – Spinal cord injury – use of ESC to treat heart disease – Burns and skin ulcers – Orthopaedic applications of stem cell - Insulin-producing Cells Derived from Stem Cells: A Potential Treatment for Diabetes.

TEXTBOOKS

1. Potten.C S, “Stem Cells,” Elsevier, 1996.

2. Robert Lanza, “Essentials of Stem Cell Biology,” Academic Press, 2009.

REFERENCES

1. Ariff Bongso, Eng Hin Lee, “Stem Cells: From Bench to Bedside,” World Scientific, 2011.

2. Daniel R. Marshak, “Stem cell biology,” Cold Spring Harbor Laboratory Press, 2001.

3. Peter Quesenberry, “Stem cell biology and Gene Therapy,” Wiley-Liss, 1998.