SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Department of Biotechnology	LP: Sub Code: BT22048 Rev. No: 00 Date: 12/06/2026
~~B.E/~~B.Tech~~/M.E/M.Tech~~ : **Biotechnology** Regulation: **2022** PG Specialisation : NA Sub. Code / Sub. Name : **BT22048 STEM CELL TECHNOLOGY** Unit : I	

Unit Syllabus: **Stem Cells-Characteristics and Types** **(9)**

Stem cells: Definition, Classification, Sources and Properties –Types of stem cells: methods of isolation, study of stem cells and their viability IPSC, embryonic stem cells, cancer stem cells. Preservations of Stem cell. Embryonic stem cell: Isolation, Culturing, Differentiation, Properties – Adult stem cell: Isolation, Culturing, Differentiation, Trans-differentiation, Plasticity, and Properties

Objective: Understand stem cell characteristics, classification, and types.

Session No *	Topics to be covered	Ref	Teaching Aids
1	Introduction to the concept of stem cell and their classifications	TB3 01-07	Video Lecture/GCR/ LCD/BB
2	Types, sources and properties of stem cells	TB3 15-23	Video Lecture/GCR
3	Methods of isolation	TB2 11-17	Video Lecture/GCR
4	Study of stem cells and their viability IPSC	TB2 23-28	Video Lecture/GCR
5	Embryonic stem cells and cancer stem cells	TB2 43-54	Video Lecture/GCR/ LCD/BB
6	Preservations of Stem cell	TB2 11-14	Video Lecture/GCR
7	Embryonic stem cell: Isolation, Culturing, Differentiation, Properties	TB2 81-86	Video Lecture/GCR
8	Adult stem cell: Isolation, Culturing, Differentiation, Trans-differentiation	TB2 23-28	Video Lecture/GCR
9	Adult stem cell: Plasticity, and Properties	TB2 23-28	Video Lecture/GCR/ LCD/BB
Content beyond syllabus covered (if any):			

* Session duration: 50 minutes

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Sub. Code / Sub. Name: BT22048 STEM CELL TECHNOLOGY

Unit : II

Unit Syllabus : **Embryonic Stem Cells- Isolation and Cloning** **(9)**

ESCs –IVF, Primate and Mouse ES cells, Markers - Nuclear transfer technology in ES cells - Human ESCs - Isolation and culturing of hESC"s - Differentiation of stem cells - Primed Cells - Naïve Cells - Epiblast Stem Cells - ESC markers- Therapeutic cloning using ESCs - Reproductive cloning using ESCs

Objective: Learn about embryonic stem cell isolation, culturing, differentiation techniques, and therapeutic/reproductive cloning

Session No *	Topics to be covered	Ref	Teaching Aids
10	ESCs –IVF, Primate and Mouse ES cells, Markers	TB1 57-64	Video Lecture/GCR/ LCD/BB
11	Nuclear transfer technology in ES cells	RF1 42-49	Video Lecture/GCR
12	Human ESCs Isolation and culturing	RF2 71-92	Video Lecture/GCR
13	Differentiation of stem cells	TB2 81-86	Video Lecture/GCR
14	Primed Cells and Naïve Cells	RF2 38-42	Video Lecture/GCR/ LCD/BB
15	Epiblast Stem Cells	TB1 79-85	Video Lecture/GCR
16	ESC markers	RF 71-95	Video Lecture/GCR
17	Therapeutic cloning using ESCs	RF2 237-250	Video Lecture/GCR
18	Reproductive cloning using ESCs	RF2 237-250	Video Lecture/GCR/ LCD/BB
Content beyond syllabus covered (if any):			

* Session duration: 50 mins

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Sub. Code / Sub. Name: BT22048 STEM CELL TECHNOLOGY

Unit : III

Unit Syllabus : **Stem Cells Differentiation** **(9)**

Factors influencing proliferation, physical, chemical and molecular methods for differentiation of stem cells – hormonal role in differentiation.

Objective: Explore factors influencing stem cell differentiation and hormonal roles in the process.

Session No *	Topics to be covered	Ref	Teaching Aids
19	Importance of stem cell differentiation in regenerative medicine	TB3 47-49	Video Lecture/GCR/ LCD/BB
20	Factors influencing proliferation	TB3 41-62	Video Lecture/GCR
21	Physical factors influencing stem cell proliferation	TB3 133-140	Video Lecture/GCR
22	Chemical factors influencing stem cell proliferation	TB3 141-157	Video Lecture/GCR
23	molecular methods for differentiation of stem cells - cytometry	RF1 1-24	Video Lecture/GCR/ LCD/BB
24	Differentiation of stem cells using genetic labelling and gene expression analysis	RF1 59-79	Video Lecture/GCR
25	Hormonal role in differentiation	TB3 15-22	Video Lecture/GCR
26	Clinical Significance of hormonal differentiation	TB1 423-445	Video Lecture/GCR
27	Regenerative Medicine	TB1 447-462	Video Lecture/GCR/ LCD/BB

Content beyond syllabus covered (if any):

* Session duration: 50 mins

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Sub. Code / Sub. Name: BT22048 STEM CELL TECHNOLOGY

Unit : IV

Unit Syllabus : **Regeneration And Experimental Methods** **(9)**

Germ cells, hematopoietic organs, and kidney, cord blood transplantation, donor selection, HLA matching, patient selection, peripheral blood and bone marrow transplantation, - Stem cell Techniques: fluorescence activated cell sorting (FACS), time lapse video, green fluorescent protein tagging

Objective: Understand regeneration techniques, experimental methods and stem cell applications in various organs.

Session No *	Topics to be covered	Ref	Teaching Aids
28	Regenerative biology - Germ cells	TB1 283-313	Video Lecture/GCR/ LCD/BB
29	Hematopoietic organs, and kidney	TB1 401-422	Video Lecture/GCR
30	Cord blood transplantation and donor selection	RF1 53-58	Video Lecture/GCR
31	HLA matching and patient selection	RF2 253-259	Video Lecture/GCR
32	Peripheral blood and bone marrow transplantation	RF2 293-311	Video Lecture/GCR/ LCD/BB
33	Stem cell Techniques: fluorescence activated cell sorting (FACS)	RF1 1-24	Video Lecture/GCR
34	Advanced stem cell analysis using time lapse video	RF1 59-79	Video Lecture/GCR
35	Green Fluorescent Protein (GFP) tagging technique	RF3 73-99	Video Lecture/GCR
36	Experimental Methods developed for stem cell analysis	RF1 215-232	Video Lecture/GCR/ LCD/BB
Content beyond syllabus covered (if any):			

* Session duration: 50 mins

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Sub. Code / Sub. Name: BT22048 STEM CELL TECHNOLOGY

Unit : V

Unit Syllabus : **Application of Stem Cells and Ethics in Stem Cell Research** **(9)**

Stem cell Therapy for neurodegenerative diseases, spinal cord injury, heart disease, diabetes, burns, skin ulcers, muscular dystrophy and orthopedic applications. Stem cell policy and ethics, stem cell research: Hype, hope and controversy.

Objective: Examine stem cell therapy applications in treating diseases and ethical considerations in stem cell research and policy.

Session No *	Topics to be covered	Ref	Teaching Aids
37	Application of Stem Cells	TB3 185-197	Video Lecture/GCR/ LCD/BB
38	Stem cell Therapy for neurodegenerative diseases	TB2 149, 157-160	Video Lecture/GCR
39	Spinal cord injury and heart disease	TB2 217-220, 395	Video Lecture/GCR
40	Diabetes, burns, skin ulcers	TB2 169-176, 253	Video Lecture/GCR
41	Muscular dystrophy and orthopedic applications	TB2 211-216	Video Lecture/GCR/ LCD/BB
42	Stem cell policy and ethics	TB2 479-488	Video Lecture/GCR
43	Ethical and potential aspect of stem cell research	TB2 489-494	Video Lecture/GCR
44	Stem cell research: Hype, hope and controversy	TB3 473-82	Video Lecture/GCR
45	Case study on evolution of advanced regenerative technology using stem cells	TB2 503-520	Video Lecture/GCR/ LCD/BB
Content beyond syllabus covered (if any):			

* Session duration: 50 mins

Sub Code / Sub Name: BT22048 STEM CELL TECHNOLOGY

REFERENCES:

TEXTBOOKS:

1. Potten C.S., "Stem Cells", 1st Edition, Elsevier, 2006.
2. Lanza R., "Essentials of Stem Cell Biology", 4th Edition, Elsevier, 2014.
3. Quesenberry P., "Stem Cell Biology and Gene Therapy", 1st Edition, WileyLiss, 1998.

REFERENCE BOOKS:

1. Turksen K., "Embryonic Stem Cells – Protocols", 2nd Edition, Humana Press, 2002.
2. Bongso A., Lee E.H., "Stem Cells: From Bench to Bedside", 1st Edition, World Scientific Publishing Company, 2005.
3. Gholamrezanezhad A., "Stem Cells in Clinic and Research", 1st Edition, Intech, 2013.

You Tube Channel:

https://www.youtube.com/playlist?list=PLvDocy_6Jwl90M-IRu6F_Rwj_Hf8zLqpw

	Prepared by	Approved by
Signature		15/6/26
Name	Dr M Nareshkumar	Dr E Nakkeeran
Designation	Assistant Professor	Professor & Head
Date	12/06/2026	12/06/2026
Remarks *: NIL		
Remarks *: NIL		

15/6/26

* If the same lesson plan is followed in the subsequent semester/year it should be mentioned and signed by the Faculty and the HOD