SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Department of Biotechnology	LP: BT22065
B.E/B.Tech/M.E/M.Tech : **B. Tech Biotechnology** Regulation: **2022**	Rev. No:00
PG Specialisation : NA	Date:
Sub. Code / Sub. Name : **BT22065/Animal Cell Culture Technology**	20.01.2025
Unit **I**	

UNIT – I Introduction of animal cell culture **9**

Historical background – advantages of tissue culture – limitations of tissue culture – types of tissue culture – cell separation, cell density and isopycnic sedimentation – staining – cryopreservation – transporting cells – cell culture lab safety protocols.

Objective: To know the basics of animal cell culture.

Session No	Topics to be covered	Ref	Teaching Aids
1.	Historical background of animal cell culture- the origin and implementation.	T1(3-11) T3(1-14)	BB/LCD
2.	Advantages of tissue culture in various experimental application	T1(12-14)	BB/LCD
3.	Limitations of tissue culture in creating experimental conditions and cost.	T1(15-17)	BB/LCD
4.	Different Types of tissue culture in studying the basic cell biology, the interaction between cells and disease-causing agents, the effect of drugs and the process of aging.	T1(567-601) T3(15-29)	BB/LCD/ GCR
5.	cell separation, cell density and isopycnic sedimentation process in tissue culture	T1(491-496)	BB/LCD
6.	Various types of staining techniques involved in the tissue culture	T1(428-430)	BB/LCD
7.	Cryopreservation of cell lines, tissues and organs and the stability of the cells with respect to time.	T1(327-341)	BB/LCD
8.	Methods of transportation of various cell lines.	T1(347-348)	BB/LCD/ Blended Learning: Weblink 1
9.	Safety operation protocol in operating the cell culture lab with ethics	T1(111-117)	BB/LCD
Content beyond syllabus covered (if any): Equipment and Materials			

* Session duration: 50 minutes

Sub. Code / Sub. Name: **BT22065/Animal Cell Culture Technology**

Unit : II

UNIT – II Biology of cultured cells **9**

The culture environment – cell proliferation – cell differentiation – Cell signaling – evolution of cell culture – interaction with substrate – antigenic markers – stem cell plasticity – immortalization – phases of growth cycle.

Objective: To have an idea on molecular mechanisms of animal Cell.

Session No *	Topics to be covered	Ref	Teaching Aids
10.	The ability of cell culture in the physico-chemical and the physiological environment	T1(23-24)	BB/LCD
11.	The proliferation of cells in the medium.	T1(28-29)	BB/LCD /GCR
12.	The differentiation of cell in the external environment.	T1(30-32)	BB/LCD
13.	Cell – cell signaling for the growth and proliferation in the medium environment	T1(33-36)	BB/LCD
14.	Impact on biology and medicine evolution of cell culture	T1(39-47)	BB/LCD
15.	Cell-substrate interactions in the medium.	T1(157-170)	BB/LCD
16.	Antigenic markers in the cell culture medium that triggers an immune response.	T1(419-421)	BB/LCD
17.	Stem cell plasticity – ability of stem cells to cross lineage boundaries to adopt the morphologic, antigenic, and functional characteristics of a different lineage outside their destined repertoire of differentiation	T1(46-50)	BB/LCD
18.	Phases of growth cycle as sigmoid pattern of proliferation	T1(28-30) T2(206-223)	BB/LCD
Content beyond syllabus covered (if any): Nil			

* Session duration: 50 mins

Sub. Code / Sub. Name: **BT22065/Animal Cell Culture Technology**
Unit : III

UNIT – III Aseptic techniques, safety and bioethics **9**

Scale up of bioreactor - Elements of aseptic environment – risk assessment – safety regulations, chemical toxicity, ionizing radiation, human biopsy materials – bioethics, animal and human tissues – plating efficiency – culturing of specific cell lines.

Objective: Aseptic techniques, safety and bioethics

Session No *	Topics to be covered	Ref	Teaching Aids
19.	Scaling up from laboratory-scale bioreactors to industrial-scale production.	T1(675-684) R1(19-62)	BB/LCD
20.	Elements of aseptic environment - Tools and techniques: laminar flow hoods, sterilization, filtration.	T1(252-260)	BB/LCD
21.	Risk assessment – safety regulations - Safety protocols (e.g., Material Safety Data Sheets (MSDS), handling biohazards) and Importance of regulatory bodies (e.g., OSHA, WHO, and FDA).	T1(250-251)	BB/LCD
22.	Risk of chemical toxicity.	T1(118-120)	BB/LCD
23.	Risk of Ionizing radiation.	T1(482-483)	BB/LCD
24.	Handling the human biopsy materials and ensuring the good laboratory practices.	T1(280-281), T1(594-596)	BB/LCD/ Blended learning: Weblink 2
25.	Bioethics, animal and human tissues - Ethical considerations in biotechnology: informed consent, use of human biopsy materials, and animal testing.	T1(130-131, 600)	BB/LCD
26.	Factors affecting efficiency of plating efficiency.	T1(456-460)	BB/LCD
27.	Culturing of specific cell lines – Adherent, suspension cultures, medium selection, and sub-culturing.	T1(40–41, 604–606, 607)	BB/LCD
Content beyond syllabus covered (if any): Biohazard Risk Group			

* Session duration: 50 mins

Sub. Code / Sub. Name: **BT22065/Animal Cell Culture Technology**
Unit : IV

UNIT–IV Defined media and supplements **9**

Physiochemical properties – selection of medium and serum – other supplements – serum free media – buffer solutions - development of serum free media – conditions improve clonal growth – selective inhibitors – selective culture of tumor cells

Objective: To create awareness of media available.

Session No *	Topics to be covered	Ref	Teaching Aids
28.	Physiochemical properties of culture media required for maintaining proper cell health and growth.	T1(177-185)	BB/LCD
29.	Selection of medium and serum for the different medium components.	T1(177-185)	BB/LCD
30.	Supplements in media necessary for the growth of various cells.	T1(191-194)	BB/LCD
31.	Importance of Serum free media for various cell lines.	T1(199-214) R1(105-120)	BB/LCD /GCR
32.	Purpose of the buffer solutions in maintaining the media stability.	T1(199-214)	BB/LCD
33.	development of serum free media that supplements with recombinant growth factors and hormones.	T1(199-214)	BB/LCD
34.	Importance of improving clonal growth in genetic studies and monoclonal antibody production.	T1(193, 233, 244–246)	BB/LCD
35.	Selective inhibitors for maintaining a relevant tumor microenvironment.	T1(599–603)	BB/LCD
36.	Selective culture of targeting cancer cells.	T1(599–603)	BB/LCD

Content beyond syllabus covered (if any): Nil

* Session duration: 50 mins

Sub. Code / Sub. Name: **BT22065/Animal Cell Culture Technology**
Unit : V

UNIT – V Primary culture **9**

Types of primary culture, isolation of tissue, mouse and duck embryo – primary explant – enzymatic disaggregation – collagenase – subculture, criteria for subculture, growth cycle and split ratios – use of antibiotics – cell counting.

Objective: To enable students to know culturing of animal cells..

Session No *	Topics to be covered	Ref	Teaching Aids
37.	Overview of primary culture and tissue isolation	T1(269–274)	BB/LCD
38.	Different kinds of isolation procedures of tissue, mouse and duck embryo.	T1(275–280)	BB/LCD
39.	Primary explant tissue fragmentation and cellular fragmentation.	T1(281–282)	BB/LCD
40.	Enzymatic disaggregation in breaking down of extracellular matrix to release cells.	T1(283–287)	BB/LCD
41.	The role of collagenase in breaking down collagen in connective tissue.	T1(288)	BB/LCD
42.	The importance of subculture in maintaining the strength of cell lines.	T1(297–299)	BB/LCD
43.	The importance of maintaining cell density for healthy growth cycle and split ratios.	T1(312–319)	BB/LCD
44.	Role of Antibiotics in cell culture in preventing bacterial contamination.	T1(304–309)	BB/LCD
45.	cell counting for assessing the viability.	T1(312–319) T2 (205-221)	BB/LCD /GCR

Content beyond syllabus covered (if any): Nil

* Session duration: 50 mins

TEXTBOOKS:

1. Freshney, RI, "Culture of animal cells: a manual of basic techniques and specialized applications", 6th Edition, John Wiley & Sons, 2010
2. Portner, R, "Animal cell biotechnology: methods and protocols", 2nd Edition, Humana Press, 2007.
3. Michael Butler, "Animal Cell Culture And Technology" Taylor & Francis; 2nd Edition, 2003
4. Shalini Mani, Manisha Singh, Anil Kumar "Animal Cell culture: Principles and Practice" Springer International Publishing AG; 1st Edition 2023

REFERENCE BOOKS:

1. Masters, JRW, "Animal cell culture: practical approach", 1st Edition, Oxford University Press, 2000.

BLENDED LEARNING - WEBLINKS

1. https://drive.google.com/drive/folders/1bui0oPxqHkD10QMXSfCQMRnNjiZHnMV8?usp=drive_link
2. https://drive.google.com/drive/folders/16YlSPW2eWVTL7IXBr9pZh5pQglGLizat?usp=drive_link

	Prepared by	Approved by
Signature		20/1/25
Name	Dr. K. Ganesh Prasath	Prof. E. Nakkeeran
Designation	Assistant Professor, Biotechnology	HOD
Date	20-01-2025	20-01-2025
Remarks: Nil		
Remarks: Nil		

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