Birla Institute of Technology & Science, Pilani
Hyderabad Campus

FIRST SEMESTER 2020-2021
COURSE HANDOUT (PART-II)

Dated: 28/10/2020

In addition to Part I (general handout for all courses appended to the timetable) this portion gives further specific details regarding the course.

Course No : **BIO G524**
Course Title : **Animal Cell Culture Technology**
Instructor-In charge : PIYUSH KHANDELIA
Instructors : **R. Karthiya, Kotwal Shifa Bushra**

1. Course Description: Animal cell and tissue culture from various organisms, types of cell lines, development and maintenance of cell lines, manipulation and applications of cell culture technology for biotechnological research and therapeutics implication**.**

2. Scope and objective of the course: This course will enable students to increase their knowledge in recent advances in animal cell and tissue culture technology both theoretically and practically. The knowledge of this area is important to understand the modern *in vitro* research related to the biology of the cell. In addition, cell genetic manipulations and their implications in human life. The major biotechnological advances include *in vitro* maintenance of cell microenvironment, proliferation and large scale propagation, cryopreservation, cell transformation, 3D culture, cytotoxicity, stable transfection and production of therapeutic agents and bioengineering etc.

3. Text Books:

1. Freshney, R.I. Culture of Animal Cells: A Manual of Basic Technique and Specialized Applications, Willey-Blackwell Press (6th Ed), 2010 (*BITS library catalog number 591.87 F885 2010*).

4. Reference books:

1. Asok Mukhopadhyay. Animal Cell Technology. I. K. International Publishing House Pvt. Ltd. 2009 (*BITS library catalog number 591.87 M953 2009*).

5. Course plan:

Lec. No.	Learning objectives	Contents	References (Chapters)
1-2	Introduction	Types of culture, advantages and limitations of tissue culture.	1 (TB), Class notes
3-6	Biology of cultured cells	General characteristics of cells in culture microenvironment.	2 (TB)
7-9	Bio safety and lab ethics	Basic lab exercises, laboratory safety and ethics.	6 (TB) 6 (RB)
9-11	Laboratory design and equipments	Designing of animal tissue culture laboratory, common and specialized equipments, consumable items.	3, 4, 7 (TB) 6 (RB)
12-13	Sterilization	Aseptic techniques, sterilization.	5, 10 (TB) 6 (RB)
14-16	Culture media	Defined media and supplements, serum-free medium.	8, 9 (TB) 5 (RB)

17-18	Primary culture	Types of primary cell cultures, isolation of tissue, primary culture. Environmental factors and cell culture process.	11 (TB) 3, 7 (RB)
19-21	Subculture and cloning	Subculture, cloning, isolation of clones.	12, 13 (TB)
22-25	Cell characterization and transformation	Characterizing cells in the culture, transformation, immortalization, tumorigenicity.	15, 17 (TB)
26-27	Contamination	Source of contamination, monitoring and eradication of contamination.	18 (TB)
28-29	Cytotoxicity	Markers for cell viability and apoptosis. Viability and cytotoxicity assays.	21 (TB) 2, 9 (RB)
30-33	Cell culture of specialized cells and 3D culture	Culture conditions for specific (Differentiated, non differentiated and tumor) cells. Organ, histotypic and organotypic cultures.	22, 23, 24, 25 (TB) 13 (RB)
34-35	Cryopreservation	Rational and principles for cell cryopreservation, Thawing and recovery of frozen cells.	19 (TB) 4 (RB)
36-39	Specialized techniques and implications of cell culture	Viable cell separation and quantitation, differentiation, Confocal microscopy, *in situ* hybridization, somatic cell fusion, monoclonals, microcarriers, scale up and automation.	14, 16, 20, 26, 27 (TB) 2, 7, 8, 9 12, 14 (RB) Class notes
40-41	Therapeutics implications of cell culture and Bioengineering	Stable gene expression in mammalian cells and methods of DNA transfer. Bioreactors, Tissue engineering	10, 11, 14, 15 (RB) Class notes

6. Laboratory plan:

Expt. No.	Contents
1	Introduction to Animal Cell Culture Laboratory
2	Introduction to FaDu and HeLa cells
3	Preparation of Cell Culture Media
4	Reviving FaDu/HeLa cells
5	Sub-Culturing or Passaging of FaDu/HeLa cells
6	Trypan Blue Staining and Counting of Viable Cells Using a Hemocytometer
7	Freezing of Cells or Cryopreservation
8	Reviving cryopreserved cells to check viability
9	Seeding cells
10	MTT assay to measure cytotoxicity

7. Evaluation scheme:

Component	Duration	Weightage %	Marks	Date and time	Remarks
Midsem	90 mins	35	70	29/12/2020, 9.00-10.30 AM	OB
Laboratory Evaluation	-	15	30	Continuous Evaluation	OB
Assignment/Seminars	-	20	40	Continuous Evaluation	OB
Comprehensive	120 mins	30	60	19/02/2021, FN	OB

8. Chamber consultation hour: To be announced in the class.

9. Notices: All notices will be displayed on the Course Management System (CMS).

10. Grading policy: Students missing one or more component of evaluation completely will be given an NC.

11. Make-up policy: As per the clause 4.07 in the Academic regulations booklet. Make-up will be granted only in case of hospitalization and genuine medical emergency.

12. Academic Honesty and Integrity Policy: Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

Instructor-in-Charge
BIO G524