SEMESTER S7

CELL CULTURE TECHNIQUES

Course Code	**PEBBT753**	**CIE Marks**	40
Teaching Hours/Week (L: T:P: R)	3:0:0:0	**ESE Marks**	60
Credits	3	**Exam Hours**	2 Hrs. 30 Min.
Prerequisites (if any)	Foundation in Micro Biology and Cell Biology	**Course Type**	Theory

Course Objectives:

1. This course will be a short primer for the students to understand how animal cell culture technologies have strengthened the bio-medical research from basic research to the modern drug discovery.

SYLLABUS

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Module No.	Syllabus Description	Contact Hours
1	**Cell Culture Laboratory Design And Equipment:** Planning, construction and services; Layout; Sterile handling area; Incubation; Hot room; Air circulation; Service bench; Laminar flow; Sterilizer; Incubators; CO2 incubator; Culture Racks, Colony Counters, Refrigerators and freezers; Centrifuge; Inverted stage microscope; Magnetic stirrer; Liquid nitrogen freezers; Slow cooling system for cell freezing; Water bath; Autoclaves and hot air oven; Pipette washers; Water purification system; Fluid handling systems and other equipments; Washing, packing and sterilization of different materials used in plants, animals and microbial cell cultures; Aseptic concepts; Maintenance of sterility; Cell culture vessels	9
2	**Media And Reagents:** Types of cell culture media for plants, animals and microbial cells; Ingredients of media; Physiochemical properties; Buffers; Oxygen; Osmolarity; Temperature; Balance salt solutions; Antibiotics, growth supplements; Conditioned media; Other cell culture reagents; Preparation	9

	and sterilization of cell culture media and other reagents.	
3	**Animal Cell Cultures Techniques:** History of animal cell culture; Different tissue culture techniques; Cell separation, disaggregation of the explants, mechanical and enzymatic disaggregation; Continuous cell lines; Organ culture, techniques, advantages, disadvantages, applications; Cell cultures, substrate culture and suspension culture; Primary cell culture; Secondary cell culture (cell lines); Development, characterization and maintenance of cell lines, Cryopreservation; Commercial scale production of animal cells; stem cells-fate mapping, application; Application of animal cell culture for in vitro testing of drugs;	**7**
4	**Plant Cell Culture Techniques:** Cellular Totipotency, And its Applications. Organogenesis, factors affecting organogenesis. Cytodifferentiation. Somatic Embryogenesis, Synthetic Seeds, Techniques for production of haploids, diploidization, production of double haploids and their Applications. Triploids production - Endosperm culture and Applications. Secondary metabolite production, selection of high yielding lines, elicitation, immobilization of cultures, hairy root culture and biotransformation. Factors affecting secondary metabolites, industrial application of secondary metabolites. Molecular farming. **Microbial Cell Culture Techniques:** Auxotroph isolation - replica plating technique, Screening Preservation of microbial products. Production of antibiotics. Enumeration and screening of novel microbial secondary metabolites, strain improvement, Use of microbes in industrial waste treatment. Microbial leaching.	**11**

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Course Assessment Method
(CIE: 40 marks, ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Assignment/ Microproject	Internal Examination-1 (Written)	Internal Examination- 2 (Written)	Total
5	15	10	10	40

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
• 2 Questions from each module. • Total of 8 Questions, each carrying 3 marks **(8x3 =24marks)**	• Each question carries 9 marks. • Two questions will be given from each module, out of which 1 question should be answered. • Each question can have a maximum of 3 sub divisions. **(4x9 = 36 marks)**	**60**

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Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Understand the various sources of cells to be used in cell culture techniques	**K2**
CO2	Correlate between different biological samples and understand the importance of different media in tissue culture	**K2**
CO3	Comprehend the applications of plant, animal and microbial cell culture in industry, healthcare and environment	**K2**

Note*: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create*

CO-PO Mapping Table:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2										2
CO2	3	3										2
CO3	2	3										2

Text Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Plant Cell Culture: A Practical Approach	R.A. Dixon & Gonzales	IRL Press 1994	1994
2	Culture of animal cells-A manual of basic technique and specialized applications	R. Ian Freshney	Wiley Blackwell publishers 1983	1983
3	Microbial Biotechnology	Alexander N Glazer, Hiroshi Nikaido W H	Freeman & Company 1995	1995

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Reference Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Living resources for Biotechnology, Animal cells	Doyle, R. Hay and B.E. Kirsop	Cambridge University Press 1990	1990
2	Plant Tissue Culture	Sathyanarayana B N,	IK Intl. Publishers 2007	2007

Video Links (NPTEL, SWAYAM…)	
Module No.	**Link ID**
1	https://archive.nptel.ac.in/noc/courses/noc21/SEM2/noc21-bt47/
2	
3	
4	