



SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

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Department of Biotechnology		LP: BT 22309
B.E/B. Tech/M.E/M.Tech : Biotechnology	Regulation: 2022	Rev. No: 00
PG Specialisation : N.A		Date: 10.06.2026
Sub. Code / Sub. Name : BT 22309/ Cell Biology: Theory and Practices		
Unit : I		

Unit Syllabus: CELL STRUCTURE & FUNCTION**6+6**

Sub-cellular structures, chromatin organization, and organelles functions. Cytoskeletal proteins. Cell - Cell junctions.

Visualization of prokaryotic and eukaryotic cells;

Staining and Visualization of Mitochondria;

Preparation of blood smear and differential staining of blood cells.

OBJECTIVE: To understand the structures and purposes of basic components of prokaryotic and eukaryotic cells.

Session No *	Topics to be covered	Ref	Teaching Aids
1.	Sub-cellular structures - nucleus, endoplasmic reticulum, ribosome	T4 (355-375)	BB & LCD
2.	Sub-cellular structures - golgi apparatus, and mitochondria	T4 (425-437)	BB & LCD
3.	Chromatin organization – DNA binding proteins	T4 (369-375), R1 (151-159)	BB & LCD
4.	Organelle's functions	T5 (263-265)	BB & LCD
5.	Cytoskeletal proteins	T4 (453-479)	BB & LCD
6.	Cell - Cell junctions	T4 (553-565), R5 (236-235)	Blended learning / Video lecture
7.	Visualization of prokaryotic and eukaryotic cells	Lab manual	Demo / Experimentation
8.			
9.	Staining and visualization of mitochondria	Lab manual	Demo / Experimentation
10.			
11.	Preparation of blood smear and differential staining of blood cells	Lab manual	Demo / Experimentation
12.			
Content beyond syllabus covered (if any): Extra Cellular Matrix			

* Session duration: 50 minutes

* Session duration: 50 minutes

10/6/26



Sub. Code / Sub. Name : BT 22309/ Cell Biology: Theory and Practices
Unit : II

Unit Syllabus: CELL DIVISION**6+6**

Mitosis, Meiosis, Cell cycle - regulation - checkpoints - mitosis promoting factors – cyclins and cyclin-dependent kinases

Identifying the various divisional stages in Mitosis

Observation of growth and differentiation in single cells

OBJECTIVE: To become familiar with the role of cellular components in cell division

Session No *	Topics to be covered	Ref	Teaching Aids
13.	Cell cycle - stages	T2 (604-607)	BB & LCD
14.	Cell cycle - regulation and checkpoints	T2 (607-613), R1 (146-150)	Blended learning / Video lecture
15.	Mitosis promoting factors	T1 (882-887)	BB & LCD
16.	Mitosis cell division	T2 (621-629)	BB & LCD
17.	Meiosis cell division	T1 (911-917)	BB & LCD
18.	Cyclins and cyclin-dependent kinases	T1 (882-887)	BB & LCD
19.	Identifying the various divisional stages in mitosis	Lab manual	Demo / Experimentation
20.			
21.	Observation of growth in single cells	Lab manual	Demo / Experimentation
22.			
23.	Observation of differentiation in single cells	Lab manual	Demo / Experimentation
24.			
Content beyond syllabus covered (if any): ---			

* Session duration: 50 mins



Sub. Code / Sub. Name : BT 22309/ Cell Biology: Theory and Practices
Unit : III

Unit Syllabus: CELL MEMBRANE TRANSPORT**6+6**

Membrane Structure and organization. - pumps - channels transporters and receptors; types of membrane Transport, Osmosis and Ion channels, ATP pumps. Na^+ / K^+ / Ca^{2+} pumps; Osmosis and Tonicity;

Cell Viability - Trypan Blue Assay. Cell Proliferation Assay - MTT assay.

OBJECTIVE: To possess broad knowledge of the molecular interaction between cells.

Session No *	Topics to be covered	Ref	Teaching Aids
25.	Membrane structure and organization	T3 (1592-1594)	BB & LCD
26.	Pumps - channels transporters and receptors	T3 (1595-1597)	BB & LCD
27.	Types of membrane transport, osmosis and ion channels	T3 (1600-1603)	BB & LCD
28.	ATP pumps. Na ⁺ / K ⁺ pumps	T3 (1606-1608)	BB & LCD
29.	ATP pumps. Ca ²⁺ pumps	T3 (1609-1610)	BB & LCD
30.	Osmosis and Tonicity	T1 (477-481)	BB & LCD
31.	Cell viability - Trypan blue assay	Lab manual	Demo / Experimentation
32.			
33.	Cell Viability - Trypan blue assay	Lab manual	Demo / Experimentation
34.			
35.	Cell proliferation assay - MTT assay	Lab manual	Demo / Experimentation
36.			
Content beyond syllabus covered (if any): Endocytosis and exocytosis			

* Session duration: 50 mins



Sub. Code / Sub. Name : BT 22309/ Cell Biology: Theory and Practices
Unit : IV

Unit Syllabus: CELL COMMUNICATION**6+6**

Signal transduction; Extracellular signaling: autocrine/paracrine/endocrine models. Receptors – Cell surface / cytosolic receptors and examples, GPCR - RTKs and ion channel. Secondary messengers – adenylate cyclase - calcium flux - phospholipases - protein kinases molecules.

Buffer & Culture media preparation and sterilization; Culturing of plant and animal cells;
Cryopreservation of cell culture;

OBJECTIVE: To demonstrate a clear understanding between secondary messenger and signal transduction mechanism

Session No *	Topics to be covered	Ref	Teaching Aids
37.	Signal transduction; Extracellular signaling: autocrine/paracrine/endocrine models	T1 (675-680)	BB & LCD
38.	Receptors – Cell surface / cytosolic receptors and examples	T1 (681-684), R2 (200-206)	BB & LCD
39.	GPCR - RTKs and ion channel	T1 (686-691),	BB & LCD
40.	Secondary messengers – adenylate cyclase	T1 (699-706),	Video Lecture & LCD
41.	Calcium flux - phospholipases	T1 (708-709)	BB & LCD
42.	Protein kinases molecules	R4 (427-428)	BB & LCD
43.	Buffer & culture media preparation and sterilization	Lab manual	Demo / Experimentation
44.			
45.	Culturing of plant and animal cells	Lab manual	Demo / Experimentation
46.			
47.	Cryopreservation of cell culture	Lab manual	Demo / Experimentation
48.			
Content beyond syllabus covered (if any): ---			

* Session duration: 50 mins



Sub. Code / Sub. Name : BT 22309/ Cell Biology: Theory and Practices

Unit : V

Unit Syllabus: CELL CULTURE TECHNIQUES

6+6

Flow cytometry, FACS, SEM, TEM, Confocal Microscopy and Fluorescence Microscopy.

Measurement of Onion epidermal cell using Trinocular Microscope, Separation of Peripheral Blood Mononuclear Cells from blood.

OBJECTIVE: To develop skills in the working principles of microscopy and identification of cell based on morphology.

Session No *	Topics to be covered	Ref	Teaching Aids
49.	Flow cytometry	T3 (2514)	BB & LCD
50.	FACS – Fluorescence-activated cell sorting	T1 (132-135)	BB & LCD
51.	SEM – Scanning electron microscopy	T3 (1422-1424)	BB & LCD
52.	TEM – Transmission electron Microscope	T1 (157-161)	BB & LCD
53.	Confocal microscopy	T1(139-155)	BB & LCD
54.	Fluorescence microscopy	R3(352-355)	BB & LCD
55.	Measurement of onion epidermal cell using trinocular microscope	Lab manual	Demo / Experimentation
56.			
57.	Measurement of onion epidermal cell using trinocular microscope	Lab manual	Demo / Experimentation
58.			
59.	Separation of peripheral blood mononuclear cells from blood	Lab manual	Demo / Experimentation
60.			
Content beyond syllabus covered (if any): Cell lines and its types			

* Session duration: 50 mins

TEXT BOOKS:



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1.	Bretscher, A., Kaiser, C. A., Amon, A., Berk, A., Ploegh, H., Lodish, H., Martin, K. C., Krieger, M. (2016). Molecular Cell Biology. United Kingdom: W. H. Freeman.
2.	Alberts, B., Hopkin, K., Johnson, A. D. (2019). Essential Cell Biology. United Kingdom: W.W. Norton.
3.	Alberts, B. (2017). Molecular Biology of the Cell. United States: W.W. Norton.
4.	Cooper, G. M., Cooper, G. (o. B. (2019). The Cell: A Molecular Approach. United Kingdom: Oxford University Press, Incorporated.
5.	Dickey, J., Simon, E. (2019). Campbell Essential Biology, Global Edition. United Kingdom: Pearson.
REFERENCES:	
1.	Watson, J. D., Losick, R., Baker, T. A., Bell, S. P., Gann, A., Levine, M. (2014). Molecular Biology of the Gene. United Kingdom: Pearson.
2.	Jones, P., Owen, J. A., Stranford, S., Punt, J. (2018). Kuby Immunology. United Kingdom: Macmillan Learning.
3.	Singh, B. R., Kumar, R. (2022). Practical Techniques in Molecular Biotechnology. India: Cambridge University Press.
4.	Wilson and Walker's Principles and Techniques of Biochemistry and Molecular Biology. (2018). United Kingdom: Cambridge University Press.
5.	Shephard, E. A., Townsend-Nicholson, A., Hyams, J. S., Patel, S., FitzHarris, G., Bolsover, S. R. (2022). Cell Biology: A Short Course. United Kingdom: Wiley.
VIDEO LECTURE:	
https://drive.google.com/drive/u/2/folders/1QQB6Ec2mb5RO8Db_Gl1qMCbioKo3XvLk	

	Prepared by	Approved by
Signature		
Name	Mr. Vimal Arasan. A	Dr. Nakkeeran. E
Designation	Assistant Professor	HOD
Date	10.06.2026	10.06.2026
Remarks *: The Same lesson plan will be followed in the subsequent year		

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