UNIVERSITY OF MADRAS

B.Sc. DEGREE PROGRAMME IN ADVANCED ZOOLOGY AND BIOTECHNOLOGY

SYLLABUS WITH EFFECT FROM 2023-2024

SEMESTER – III

Course Code	Course Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
221C3A	**CELL AND MOLECULAR BIOLOGY**	Core	Y	-	-	-	5	5	25	75	100

Learning Objectives	
CO1	To understand the various techniques used to study the structures and purposes of basic components of prokaryotic and eukaryotic cells, especially macromolecules, membranes and organelles.
CO2	To understand how these cellular components are used to generate and utilize energy in cells.
CO3	To understand the cellular components.
CO4	To apply the knowledge of cell biology and its significance to cell function.
CO5	To understand different types of cell division.

UNIT	**Details**	**No. of Hours**	**Course Objectives**
I	History of cell biology- Cell theory- Prokaryotic and eukaryotic cells- Cell fractionation- Homogenisation and centrifugation- Microtechniques –Fixation and Staining - Principle and working mechanism of Light, Phase contrast and Electron Microscope (SEM &TEM)- Ultrastructure of animal cell	15	CO1, CO2
II	Plasma membrane organisation-structure, composition, models and functions-Junctional complexes, membrane receptor modifications-microvilli, desmosomes and plasmodesmata-Cytoplasm-composition and functions	15	CO1, CO2, CO4, CO5
III	Cell organelles- Endoplasmic reticulum- types, structure and functions-Peroxisomes, Glyoxysomes and centrioles- Golgi complex- structure and functions- Ribosomes– structure and functions – Lysosomes - Centioles – Mitochondria - structure and functions	15	CO1, CO2, CO3, CO4, CO5

IV	Nucleus and Nucleolus - Structure and functions - Chromosomes –Structure -Heterochromatin and Euchromatin-Giant chromosomes (polytene and lampbrush) Cell cycle and stages- Cell divisions and their significance- Amitosis, Mitosis and Meosis- Ageing of Cells- Programmed cell death (Apoptosis)- Cancer cells-Characteristics- Stem cells	15	CO1, CO2, CO4, CO5
V	Central dogma of molecular biology-Molecular structure of DNA and RNA-Ribosomal RNA (rRNA),Transfer RNA (tRNA),Messenger RNA (mRNA)- Basic mechanism of Transcription and translation in prokaryotes	15	CO1, CO2, CO4, CO5
	Total	**75**	
Course Outcomes			
Course Outcomes	On completion of this course, students will;		
CO1	Integrate and assess the biochemical, cytological and histological tools to infer cellular basis of organization. Understand and recall the basic structure, origin and development of cell organelles.	PO1	
CO2	Understand and recall the basic structure, origin and development of cell organelles.	PO1, PO3	
CO3	Analyze and differentiate cellular components based on structure, composition and inter and intra cellular interactions.	PO3, PO4, PO5	
CO4	Explain the role of cells and cell organelles in various biological processes.	PO1, PO3, PO5, PO6, PO8	
CO5	Understand the structure and complexity of cells and cell organelles.	PO3, PO4, PO5, PO6, PO7, PO8	
Text Books (Latest Editions)			
1.	Ambrose, E.J. and Dorothy, M. Easty, 1970. Cell Biology, Thomas Nelson & Sons Ltd., 500 pp.		
2.	Kumar P. and Mina U. (2018) Life Sciences: Fundamentals and Practice, Part-I, 6th Edn., Pathfinder Publication. p.608.		
3.	VeerBala Rastogi, Introductory cytology. Kedar Nath Ram Nath. Meerut 250 001.		
4.	Verma, P.S. and V. K.Agarwal, 1995. Cell and Molecular Biology, 8th Edition, S.Chand & co., New Delhi - 110 055, 567 pp.		

5.	Verma P.S. and Agarwal V.K. (2016) Cell Biology (Cytology, Biomolecules, Molecular Biology), Paperback, S. Chand and Company Ltd.
References Books (Latest editions, and the style as given below must be strictly adhered to)	
1.	Albert B., Hopkin K., Johnson A.D., Morgan D., Raff M., Roberts K. and Walter P. (2018) Essential Cell Biology 5th Edn.,(paperback) W.W. Norton & Company p.864.
2.	Burke, Jack. D., 1970. Cell Biology, Scientific Book Agency, Calcutta.
3.	Challoner J. (2015) The Cell: A visual tour of the building block of life, The University of Chicago Press and Ivy Press Ltd., p.193.
4.	Cohn, N. S., 1979, Elements of Cytology, Freeman Book Co., New Delhi – 110007, 495 pp
5.	Cooper G.M. (2019) The Cell – A Molecular Approach, 8th Edn., Sinauer Associates Inc., Oxford University Press p.813.
6.	DeRobertis, E.D.P. and E.M.F. De Robertis, 1988. Cell and Molecular Biology, 8th Edition, International Edition, Info med, Hong Kong, 734pp.
7.	Dowben, R., 1971. Cell Biology, Harper International Edition. Harper and Row Publisher, New York, 565 pp.
8.	Giese, A.C., 1979. Cell Physiology, Saunders Co., Philadelphia, London, Toronto, 609 pp.
9.	Hardin J. and Bertoni G. (2017) Becker's World of the Cell. 9th Edn (Global Edition). Pearson Education Ltd., p. 923
10.	Karp G., Iwasa J. and Masall W. (2015) Karp's Cell and Molecular Biology Concepts and Experiments. 8th Edn. John Wiley and Sons. p.832.
11.	Loewy, A.G. and P.Sickevitz, 1969. Cell Structure and Function, Amerind Publishing Co., NewDeihi - 110 020, 516 pp.
12.	Mason K.A., Losos J.B. and Singer S.R. (2011) Raven and Johnson's Biology. 9th Edn. Mc Graw Hill publications. p.1406.
13.	Powar, C.B., 1989. Essential of Cytology, Himalaya Publishing House, Bombay - 400 004, 368 pp.
14.	Swansen, C.P. and P.L.Webster, 1989. The Cell, Prentice Hall of India Pvt. Ltd., New Delhi - 110 001, 373 pp.
15.	Urry L.A. Cain M.L., Wasserman S.A., Minorsky P.V., Jackson R.B. and Reece J.B. (2014) Campbell Biology in Focus. Pearson Education. p.1080.

Web Resources		
1.	http://www.microscopemaster.com/organelles.html	
2.	https://bit.ly/3tXwDSB	
3.	https://bit.ly/3tWNpRX	
4.	https://bit.ly/3AuYR9M	
5.	https://rsscience.com/cell-organelles-and-their-functions/	
Methods of Evaluation		
Internal Evaluation	Continuous Internal Assessment Test	25 Marks
	Assignments	
	Seminars	
	Attendance and Class Participation	
External Evaluation	End Semester Examination	75 Marks
	Total	100 Marks
Methods of Assessment		
Recall (K1)	Simple definitions, MCQ, Recall steps, Concept definitions	
Understand/ Comprehend (K2)	MCQ, True/False, Short essays, Concept explanations, Short summary or overview	
Application (K3)	Suggest idea/concept with examples, Suggest formulae, Solve problems, Observe, Explain	
Analyze (K4)	Problem-solving questions, Finish a procedure in many steps, Differentiate between various ideas, Map knowledge	
Evaluate (K5)	Longer essay/ Evaluation essay, Critique or justify with pros and cons	
Create (K6)	Check knowledge in specific or offbeat situations, Discussion, Debating or Presentations	

Mapping with Programme Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
CO 1	S							
CO 2		M	S	S	S			S
CO 3			S	S	S	S		S
CO 4			M			M		
CO 5				S	S	S		S

S-Strong(3) M-Medium (2) L-Low (1)