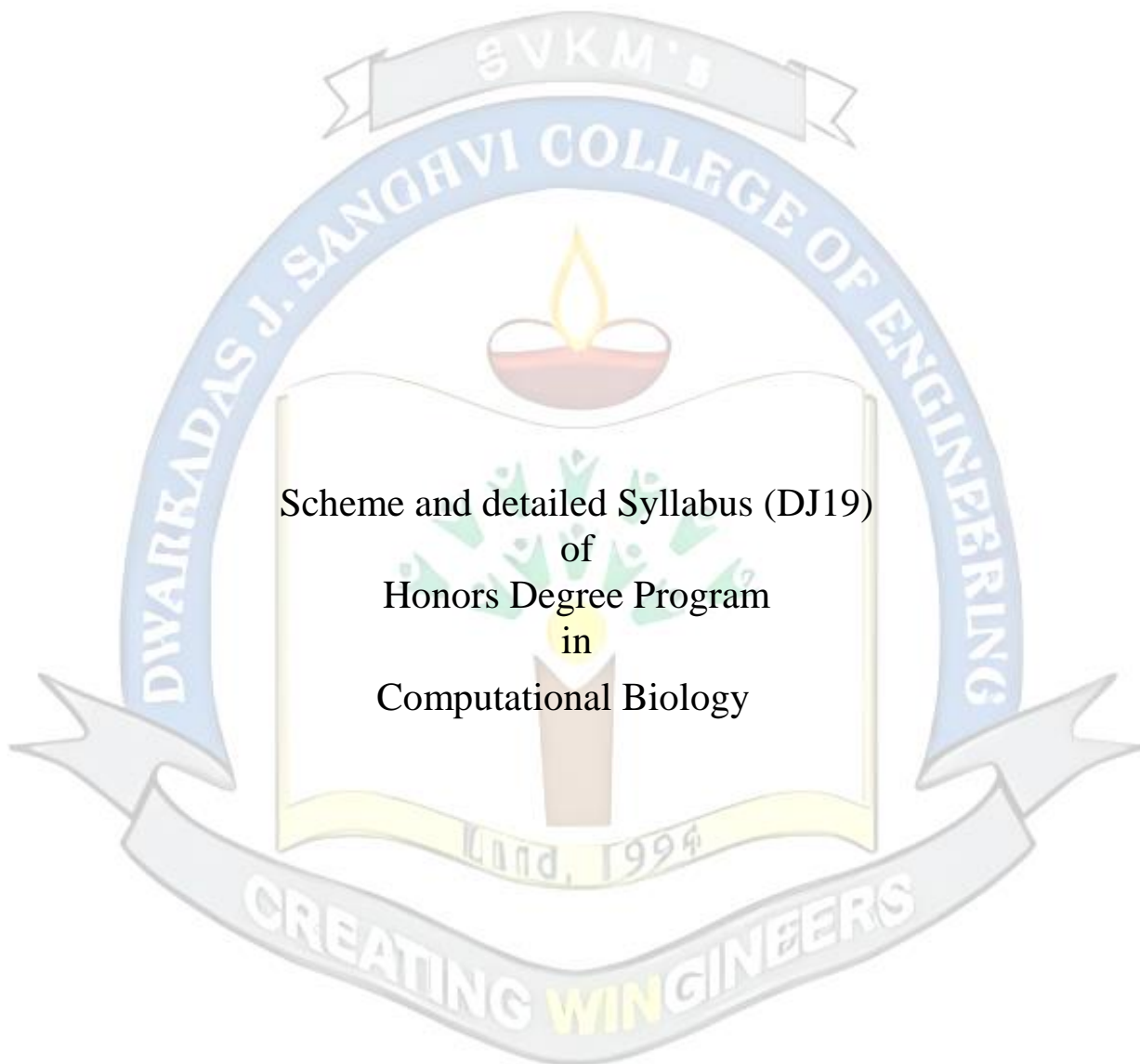




Shri Vile Parle Kelavani Mandal's  
**Dwarkadas J. Sanghvi College of Engineering**

*(Autonomous College Affiliated to the University of Mumbai)*





**Proposed Scheme for Honors in Computational Biology: Department Of Artificial Intelligence and Data Science**  
 (Academic Year 2023-2024)

Sr	Course Code	Course	Teaching Scheme(hrs)				Continuous Assessment (A) (marks)			Semester End Assessment (B) (marks)					Aggregate (A+B)	Total Credits
			Th	P	T	Credits	Th	T/W	Total CA (A)	Th	O	P	O &P	Total SEA (B)		
<b>SEM V</b>																
1	DJ19ADHN1C1	Introduction To Biological Science	4	--	--	4	25	--	25	75	--	--	--	75	100	4
<b>SEMVI</b>																
2	DJ19ADHN1C2	Algorithms For Computational Biology	4	--	--	4	25	--	25	75	--	--	--	75	100	4
3	DJ19ADHN1L2	Algorithms For Computational Biology Laboratory	--	2	--	1	--	25	25	--	--	--	--	25	25	1
<b>SEM VII</b>																
4	DJ19ADHN1C3	Bioinformatics	4	--	--	4	25	--	25	75	--	--	--	75	100	4
5	DJ19ADHN1L3	Bioinformatics Laboratory	--	2	--	1	--	25	25	--	--	--	--	25	25	1
<b>SEM VIII</b>																
7	DJ19ADHN1C4	Gneomic data science	4	--	--	4	25	--	25	75	--	--	--	75	100	4
<b>Total</b>			16	4	0	18	100	50	150	300	0	0	0	350	450	18

<b>Th</b>	Theory	T/W	Termwork
<b>P</b>	Practical	O	Oral
<b>T</b>	Tutorial		

Prepared by

Checked by

Head of the Department

Vice Principal

Principal Windows



<b>Honors in Computational Biology</b>					<b>Semester : V</b>					
<b>Program: Third Year B.Tech. in Artificial Intelligence &amp; Data Science</b>										
<b>Course : Introduction To Biological Science</b>					<b>Course Code: DJ19ADHN1C1</b>					
Teaching Scheme (Hours / week)				Evaluation Scheme						
				Semester End Examination Marks (A)			Continuous Assessment Marks (B)			Total marks (A+B)
Lectures	Practical	Tutorial	Total Credits	Theory			Term Test 1	Term Test 2	Total	
				75			25	25	25	
				Laboratory Examination			Term work		Total Term work	--
4	--	--	4	Oral	Practical	Oral & Practical	Laboratory Work	Tutorial / Mini project / presentation / Journal		
				--	--	--	--	--	--	

**Objectives:**

1. Analyze cell structure and its functions
2. Understand the concepts of cellular transportation systems and cell signaling
3. Familiarisation to Molecular Biology

**Outcomes:** On completion of the course, learner will be able to:

1. Define and recall the cell structure and functions
2. Classify the cell constituents and biomolecules
3. Elaborate the principles and regulations of replication, transcription and translation mechanism
4. Develop knowledge on genome-level cellular organisation

<b>Detailed Syllabus: Introduction to Biological Science (DJ19ADHN1C1)</b>		
<b>Unit</b>	<b>Description</b>	<b>Duration</b>
<b>1</b>	Cell Types, their Structure and Function, Cell - Unit of life, Cell morphology, Difference between bacterial, Plant and Animal cells, Structure and function of membranes, Membrane organization and composition, Structure and functions of cell organelles - Nucleus, Mitochondria, Ribosome, Golgi bodies, Lysosomes, Endoplasmic reticulum, Peroxisomes, Chloroplast and vacuoles.	<b>5</b>
<b>2</b>	Cytoskeleton and Cell Division, Cytoskeletal elements and architecture - Intermediate filaments, Microtubules, and Microfilaments, Micro trabecular system (lattice) of cytoplasm, shaping of the cells and mechanical support - Cell to cell integration, Extracellular matrix, Cell locomotion (amoeboid, flagella, ciliary movement), Types of cell division, Mitosis and Meiosis, Cell cycle and Molecules that control cell cycle.	<b>6</b>
<b>3</b>	Cellular Transport Systems Transport types - Passive and Active transport, Permeases, Na <sup>+</sup> /K <sup>+</sup> , Ca <sup>2+</sup> - ATPase pumps, ATP dependent proton pumps Cotransport, Symport, Antiport, Role of lysosomal and vacuolar membrane in cellular transport, Transport into prokaryotic cells, Endocytosis and Exocytosis, Entry of viruses and toxins into the cells.	<b>8</b>
<b>4</b>	Cell Signaling, Types - Autocrine, Paracrine, and Endocrine signaling molecules, Secondary signaling molecules G-protein coupled signal transduction pathways involving cAMP, cGMP, IP3, DAG and Ca <sup>2+</sup> as second messengers	<b>6</b>
<b>5</b>	<b>Genome Organization</b> Structure of DNA - Nucleotides, Nucleosides, Sugar, Bases, Bonds involved in double stranded DNA; Chargaff's rule; Genome organization in prokaryotes and eukaryotes; Chromosome structure – Different types of histones and chromosome packing; Central dogma of life; DNA, RNA, proteins as genetic material; Differences between DNA and RNA.	<b>6</b>
<b>6</b>	<b>DNA Replication</b> Classical experiments to understand mechanism of DNA replication; Proteins involved in replication, Replication in prokaryotes; End replication problem; Different models of DNA replication; Differences between prokaryotic and eukaryotic replication; Inhibitors of DNA replication <b>Techniques in Molecular Biology and Applications</b> Plasmid/Genomic DNA isolation, PCR, Restriction Enzyme digestion, SDS-PAGE, Electrophoretic mobility-shift assay, DNase footprinting assay. Transcription and Translation	<b>8</b>
	<b>Total Lecture Hours</b>	<b>39</b>

## **Books Recommended:**

### ***Text books:***

1. Lodish H, Berk A Kaiser CA Krieger M, Bretscher A, Ploegh H, Amon A, Martin KC (2012) Molecular Cell Biology, 7th edition, W.H. Freeman. USA.

### ***Reference Books:***

1. Cooper GM and Hausman RE (2013) The Cell: A Molecular Approach. 6th edition. Sinauer Associates, Inc. USA
2. Alberts B, Johnson A, Lewis J, Morgan D, Raff M, Roberts K, and Walter P (2014) Molecular Biology of the Cell. 6th edition. Garland Science, USA.

### ***Semester End Examination (A):***

#### ***Theory:***

1. Question paper based on the entire syllabus will comprise of 5 questions (All compulsory, but with internal choice as appropriate), each carrying 15 marks, total summing up to **75 marks**.
2. Total duration allotted for writing the paper is 3 hrs.

### ***Continuous Assessment (B):***

#### ***Theory:***

Two term tests of 25 marks each will be conducted during the semester out of which; one will be a compulsory term test (on minimum 02 Modules) and the other can either be a term test or an assignment on live problems. Total duration allotted for writing each of the paper is 1 hr. Average of the marks scored in both the two tests will be considered for final grading.

The final certification and acceptance of term work will be subject to satisfactory performance upon fulfilling minimum passing criteria in the term work / completion of audit course.

Prepared by

Checked by

Department Coordinator

Principal