



SARVAJANIK  
UNIVERSITY

INCLUSIVE | INTEGRATED | INNOVATIVE

SARVAJANIK UNIVERSITY  
Sarvajani College of Engineering and Technology  
Surat



Bachelor of Technology (B.Tech.)

B. Tech. Semester III

Subject Name: Introduction to biological science and Bioengineering Subject Code: BTCH14302

Type of course: Professional Elective

Prerequisite: X<sup>th</sup> Standard Biology course, Physical Chemistry

Rationale: The course offers fundamental principles of biochemistry, genetics, molecular biology, and cell biology. This course offers important contribution to understand chemical reactions present in living organisms. Many complex chemical reactions and complex transport processes occur due to biomaterials.

Teaching and Examination Scheme:

TEACHING SCHEME				Theory Marks			Practical Marks		Total
L	T	P	C	TEE	CA1	CA2	TEP	CA3	
3	0	0	3	60	25	15	00	00	100

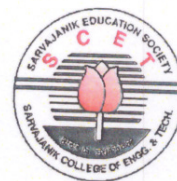
CA1: Continuous Assessment (assignments/projects/open book tests/closed book tests CA2: Sincerity in attending classes/class tests/ timely submissions of assignments/self-learning attitude/solving advanced problems TEE: Term End Examination TEP: Term End Practical Exam (Performance and viva on practical skills learned in course) CA3: Regular submission of Lab work/Quality of work submitted/Active participation in lab sessions/viva on practical skills learned in course

Content:

Sr. No.	Topics	Teaching Hrs.	Module Weightage
1.	Introduction to cells: Eukaryotes and prokaryotes, Microscopy and cell structure and mechanism.	8	18%
2.	Chemical Components of the cell: Chemical bonds and groups, chemical properties of water, types of sugar, fatty acids and lipids, amino acids, proteins and nucleotides.	8	18%
3.	Energy, Catalysis, and Biosynthesis, Free energy and biological reactions, Bioreactor design.	4	9%
4.	Protein Structure and Function, A few examples of some general proteins, different ways of depicting a small protein, making and using antibodies, cell breakage and initial fractionation of cell extracts, Protein separation by chromatography & electrophoresis	8	18%
5.	DNA and Chromosomes, DNA replication, repair and recombinations, Intracellular compartment and transport, cell communication, cytoskeleton, cell division	6	13%
6.	Membrane Structure, Membrane Transport in Biocell	3	7%
7.	How Cell Obtain energy from food, Glycolysis, complete citric acid cycle	8	18%
8.	Energy Generation in cell, Bioengineering, tissues, stem cells and cancer	8	18%

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Suggested Specification table with Marks (Theory/Practical):

% Distribution of Marks					
R Level	U Level	A Level	N Level	E Level	C Level
30	30	20	15	05	00

**Legends:** R: Remembrance, U: Understanding; A: Application, N: Analyze, E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

**Note:** This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Text Books:

Sr. No.	Title of book /article	Author(s)	Publisher and details like ISBN	Year of publication	Publication Edition
1	Essential cell biology	Bruce Alberts	Garland Science, Taylor & Francis Group, ISBN 978-0-8153-4129-1	2015	4 <sup>th</sup> Edition
2	Lehninger Principles of Biochemistry	David L. Nelson, Albert L. Lehninger, Michael. M. Cox	W. H. Freeman, ISBN 071677108X, 9780716771081	2013	6 <sup>th</sup> edition
3	Applied Biochemistry and Bioengineering	Lemuel Wingard	© Academic Press 1979, eBook ISBN: 9780323156011	1979	1st Edition
4	Biochemical Engineering: A Textbook for Engineers, Chemists and Biologists	Horiuchi, Jun-ichi, Katoh, Shigeo, Fumitake Yoshida	Wiley-VCH	2015	2nd edition

Course Outcome:

Sr. No.	CO Statement	Marks % weightage
	After learning this subject, students will be able to	
CO-1	Identify the general structure and function of carbohydrates, phospholipids, proteins, enzymes and nucleic acids.	25
CO-2	Outline the general processes used by the cell to generate cellular energy from sugar and to generate the energy and reducing agent needed for the citric acid cycle.	25
CO-3	Predict the results of genetic crosses involving two or more traits when the genes involved are linked or unlinked.	20
CO-4	Describe how cell divides and mutation takes place in Bio-organism.	15
CO-5	Describe different microorganism and their reproduction cycles.	15

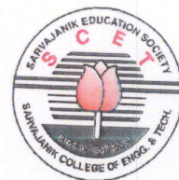




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**Mapping with POs:**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO-1	2	2	2	2	2	2	2	3	3	2	3	3	3	2	3
CO-2	2	3	2	2	3	2	2	3	3	2	3	3	3	2	3
CO-3	3	3	2	2	2	3	3	3	3	2	3	3	3	3	3
CO-4	3	3	1	2	2	3	3	3	3	2	3	3	3	3	3
CO-5	3	3	2	1	2	3	3	3	3	2	3	3	3	3	2
<b>Rationale*</b>	<b>13</b>	<b>14</b>	<b>9</b>	<b>9</b>	<b>11</b>	<b>13</b>	<b>13</b>	<b>15</b>	<b>15</b>	<b>10</b>	<b>15</b>	<b>15</b>	<b>15</b>	<b>13</b>	<b>14</b>

**Rationale\*:** Engineering students should learn the principles of biochemistry, genetics, molecular biology, and cell biology. Many complex chemical reactions and complex transport processes occur due to biomaterials can be studied by the students.

**LIST OF PRACTICALS:** NIL

**Major Equipment:** NIL

**List of Open Source/learning website:**

- <https://www.sciencedirect.com/book/9781907568978/open-source-software-in-life-science-research#book-info>
- <https://ocw.mit.edu/courses/biological-engineering/>
- <https://www.edx.org/course/subject/biology-life-sciences>

**List of Open Source Software:**

- <https://www.sciencedirect.com/book/9781907568978/open-source-software-in-life-science-research#book-info>
- <https://www.nature.com/articles/431491b>



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