18CHFA0	BIOLOGY FOR ENGINEERS	Category	L	T	P	Credit
		FE	3	0	0	3

Preamble

The objective of this course is to make the students to understand the basic concept of cells and cellular process; to explain the basic structural and functional aspects of biomolecules and applications of stem cells. It is also impart the knowledge on enzymes and their applications and understanding the basics of bio mimetic, biosensors and interpreting biological concepts and its applications.

Prerequisite

Nil

Course Outcomes

On the successful completion of the course students will be able to

COs	Course Outcome Statement	Weightage in %
CO1	Explain the structure and types of cell	15
CO2	Recognize the cell cycle, aging and oncogenesis of cell	10
CO3	Summarize the structure, function and metabolism of biomolecules	20
CO4	Demonstrate the applications of Stem cells and Tissue Engineering	5
CO5	Identify the industrial applications of enzymes	25
CO6	Apply the bio mimicry techniques in the field of Engineering	15
CO7	Illustrate the principle and applications of Biosensors	10

CO Mapping with CDIO Curriculum Framework

CO #	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	
CO1	TPS 2	Understand	Respond	--	1.1.4,2.3.1,
CO2	TPS 2	Understand	Respond	--	1.1.4,2.3.1,
CO3	TPS 2	Understand	Respond	--	1.1.4,2.3.1
CO4	TPS 4	Apply	Value	--	1.1.4,2.3.1,
CO5	TPS 4	Apply	Value	--	1.1.4,2.3.1,2.4.1,2.4.3,2.5.4,
CO6	TPS 4	Apply	Value	--	1.1.4,2.3.1,2.4.1,2.4.3,2.5.4,
CO7	TPS 4	Apply	Value	--	1.1.4,2.3.1,2.4.1,2.4.3,2.5.4,

Mapping with Programme Outcomes and Programme Specific Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	L	-	-	-	-	-	-	-	-	-	-
CO2	M	L	-	-	-	-	-	-	-	-	-	-
CO3	M	M	-	-	-	-	-	-	-	-	-	-
CO4	S	M	L	-	-	-	-	-	-	-	-	-
CO5	S	M	L	-	-	-	-	-	-	-	-	-
CO6	S	M	L	-	-	-	-	-	-	-	-	-
CO7	S	M	L	-	-	-	-	-	-	-	-	-

S- Strong; M-Medium; L-Low

Assessment Pattern: Cognitive Domain

Cognitive Levels	Continuous Assessment Tests			Assignment			Terminal Examination
	1	2	3	1	2	3	
Remember	50	20	20	-	-	-	20

Understand	50	40	40	10	-		40
Apply	0	40	40		10	10	40
Analyse	0	0	0				0
Evaluate	0	0	0				0
Create	0	0	0				0

Sample Questions for Course Outcome Assessment

Course Outcome 1(CO1):
1. Define structure of cell.
2. Differentiate cellular assemblies in single cell to multi cellular organism.
3. Recall cell senescence.

Course Outcome 2(CO2):
1. Interpret the mechanism of cell growth in oncogenesis.
2. Illustrate Mitosis and Meiosis cell division.
3. Mention the defects of cell cycle breakdown

Course Outcome 3(CO3):
1. Outline the role buffers in biomolecules structures.
2. Describe the metabolism of carbohydrates.
3. Compare the functions of m-RNA, t RNA and rRNA

Course Outcome 4 (CO4):
1. Identify the types of stem cell.
2. Demonstrate the applications of stem cells in therapeutic process.
3. List out the applications of tissue engineering in the medicine field.

Course Outcome 5 (CO5):
1. Demonstrate the bio mimicking application of Photosynthesis.
2. Illustrate the mechanism of catalytic reaction of enzyme protease.
3. List out the industrial applications of restriction enzymes.

Course Outcome 6 (CO6):
1. Analyze the bio mimetic model in Velcro tapes
2. Demonstrate the application of bio mimicry in the fabrication of display units.
3. List the contribution of bio imitation in the field of construction.

Course Outcome 7(CO7):
1. Describe biosensors and its types
2. Inspect the possible enzyme present in the glucose sensor for monitoring glucose level in blood.
3. Identify the applications of sensors in the field of Environment, medicine and Military.

Concept Map
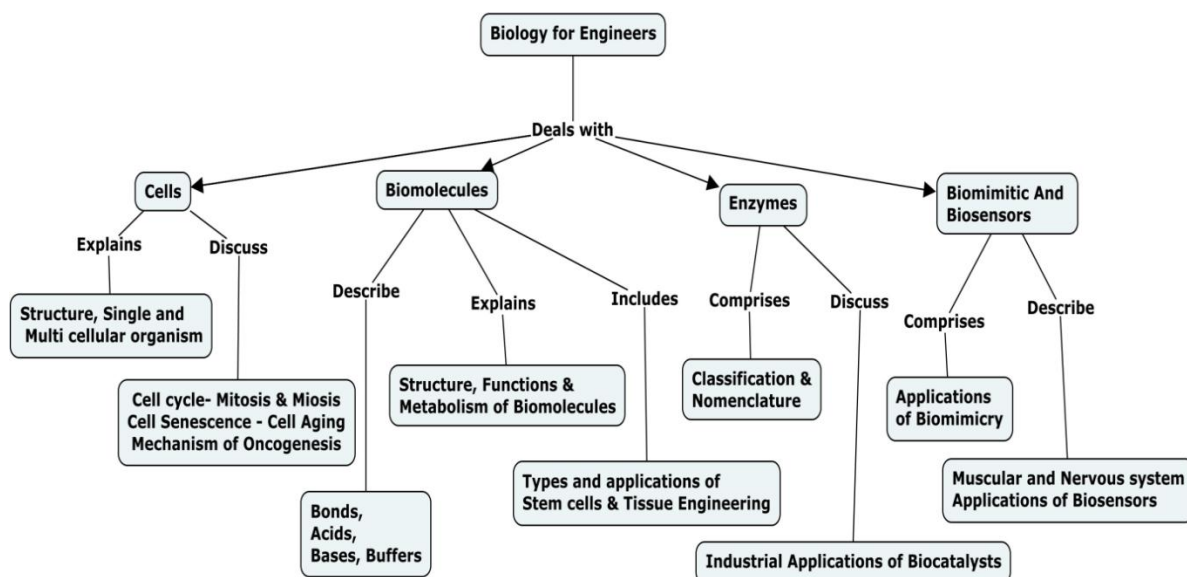
Syllabus

Origin of life and evolution-Cell: Structure - single cell to multi-cellular organisms-cell cycle – Mitosis & Meiosis; Cell Senescence- Cell ageing; Cancer- Mechanism of oncogenesis. **Chemistry of Biomolecules**-Bonds, Inter molecular forces, Acids, Bases, Buffers-Biomolecules - Structure Function and Metabolism of Carbohydrates, Lipids, Proteins; Nucleic acids - DNA & RNA - Stem cells and Tissue Engineering– Types and applications. **Enzymes in industrial applications**- Enzymes: Classification and Nomenclature- Co-Factors- Biological catalysts, Proteases, Carbonic anhydrase-Photosynthesis. **Bioinspired devices and Biosensor** -- Bio inspired design – bio mimicry - materials like gecko-inspired adhesives, artificial muscles - Fabrication, display technology - Biosensors - Types and Applications.

Learning Resources

1. Wiley Editorial ,Biology for Engineers: As per Latest AICTE Curriculum, Wiley,2018
2. Arthur T. Johnson, Biology for Engineers, Second Edition, CRC press,2018
3. G K Suraishkumar, Biology for Engineers, First Edition, Oxford University press, 2019
4. https://nptel.ac.in/courses/121106008/ -NPTEL course – Biology for Engineers and Non-biologist
5. https://swayam.gov.in/nd1_noc19_ge31 - Swayam course - Biology for Engineers and Non-biologist
6. https://www.aminotes.com/2017/02/biology-for-engineers-module-1-cocepts.html

Course Contents and Lecture Schedule

Module No.	Topic	No. of Hours	CO
1.0	**Origin of life and evolution**		
1.1	Cell: Structure	2	1
1.2	single cell to multi-cellular organisms	1	1
1.3	cell cycle – Mitosis & Meiosis	2	1
1.4	Cell Senescence- Cell ageing	2	2
1.5	Cancer- Mechanism of oncogenesis	1	2
2.0	**Chemistry of Biomolecules**		
2.1	Bonds, Inter molecular forces, Acids, Bases, Buffers	1	3
2.2	Biomolecules - Structure Function and Metabolism of Carbohydrates	2	3
2.3	Lipids, Proteins	2	3
2.4	Nucleic acids - DNA& RNA	2	3

2.5	Stem cells and Tissue Engineering– Types and applications.	2	4
3.0	**Enzymes in industrial applications**		
3.1	Enzymes: Classification and Nomenclature of Enzymes- Co-Factors	2	5
3.2	Biological catalysts, Transaminase,	2	5
3.3	Proteases	1	5
3.4	Carbonic anhydrase,	1	5
3.5	Amylase, Lipase, cellulase	2	5
3.6	Photosynthesis	2	5
4.0	**Bioinspired design and Biosensors**		
4.1	Biomimicry design - Gecko inspired adhesives,	1	6
4.2	Artificial muscles, biological inspiration in medicines	1	6
4.3	Bio inspired building materials, self healing concrete	2	6
4.4	Display technology	1	6
4.5	Muscular system, Nervous system	2	7
4.6	Biosensors Types - Applications in Medicine, Environmental and Agriculture	2	7
	Total	36	

Course Designers:

1. Dr.S.Rajkumar   rajkumarsubramanium@tce.edu
2. Dr.M.Velayudham   mvchem@tce.edu
3. Dr. V. Velkannan   velkannan@tce.edu