	National Institute of Technology Meghalaya An Institute of National Importance	CURRICULUM

Programme	Bachelor of Technology (All branches)	Year of Regulation	2024-2025
Department	Chemical and Biological Sciences	Semester	I

Course Code	Course Name	Credit Structure				Marks Distribution			
		L	T	P	C	INT	MID	END	Total
CB 103	**Biology for Engineers**	**2**	**0**	**0**	**2**	**50**	**50**	**100**	**200**

Course Objectives	
	To provide the basic knowledge of various biomolecules, which are essential for life, their structures, and functions.
	To supply the knowledge of cell structure and function and further information sharing on different cellular process and biological signal transduction.
	To provide the knowledge of heredity, how genes work, concept of central dogma of life, following the discussion of genetic engineering and genomics.
	To provide the fundamental information of diverse concepts of engineering tools in disease biology, stem cell engineering, 3D printing of organs, Bioconcrete, heavy metal removal etc.

Course Outcomes	COs	Statement	Bloom's Taxonomy
	CY103.1	**Comprehend the significance of biomolecules for sustaining life including the knowledge of structure of the cell and difference between unicellular to multi-cellular organisms, roles in biological signal transduction**	**Understand**
	CY103.2	**Interpret the heredity, variation and central dogma of life followed by gene expression and their applications.**	**Understand**
	CY103.3	**Implement the concepts of engineering tools to solve the issues related disease aspects, diagnosis, etc.**	**Apply**
	CY103.4	**Employ the concepts of processing of biomaterials and their applications in modern aspects of research.**	**Apply**

No.	COs	Mapping with Program Outcomes (POs)												Mapping with PSOs		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	CY103.1	**2**	**3**	**3**	-	-	-	-	-	-	-	-	-	-	-	-
2	CY103.2	**2**	**3**	**3**	-	-	-	-	-	-	-	-	-	-	-	-
3	CY103.3	**2**	**3**	**3**	-	-	-	-	-	-	-	-	-	-	-	-
4	CY103.4	**2**	**3**	**3**	-	-	-	-	-	-	-	-	-	-	-	-

SYLLABUS

No.	Content	Hours	COs
I	**Molecules of Life**: chemical basis of life, protein structure and function, nucleic acids and the RNA world, carbohydrates, lipids, membranes, and cells, cell–cell Interactions, cell cycle, biological signal transduction.	**06**	CY103.1
II	**Gene structure and expression**: Mitosis, Meiosis, Mendel and the gene, DNA and the gene: synthesis and repair, how genes work, central dogma of life, transcription, RNA processing, and translation, control of gene expression, analyzing and engineering genes, genomics.	**06**	CY103.2
III	**Trends in bioengineering**: Genetic engineering, disease biology and biopharmaceuticals, stem cell engineering, metabolic engineering, biosafety and bioethics. Bioprinting techniques and materials, 3D printing of ear, bone and skin. Bioimaging and Artificial Intelligence for disease diagnosis.	**08**	CY103.3
IV	**Biomaterials Processing**: Classification, Concept of Biocompatibility, Quantification of structure-property correlation - Bioglass/ Glass-ceramics, Biodegradable polymers, Biocomposites, Bioplastics, Macroporous scaffolds. Self-healing Bioconcrete (based on bacillus spores, calcium lactate nutrients and biomineralization processes) and Bioremediation via microbial surface adsorption (removal of heavy metals like Lead, Cadmium, Mercury, Arsenic).	**08**	CY103.4
	Total Hours	**28**	

Essential Readings

1. E. Engner, R. Ross, D. Bailey, "*Concepts in Biology*", 14th Edition, McGraw Hill Education, New York, 2011.
2. R. Renneberg, V. Berkling and V. Loroch, "Biotechnology for Beginners", 2nd Edition, Academic Press, 2016.

Supplementary Readings

1. G.K. Suraishkumar, "Biology for Engineers", 1st Edition, Oxford University Press, New Delhi, 2019.
2. G. Karp, "Cell and Molecular Biology: Concepts and Experiments", 7th edition, Wiley, New York, 2013.
3. D. Floreano and C. Mattiussi, "Bio-Inspired Artificial Intelligence: Theories, Methods and Technologies", 1st Edition, MIT Press, 2008.