5. Topic Clouds

5.1 Master Topic Cloud - Course Overview



5.3 Sub-Cloud - 2 - Omics



5.4 Sub-Cloud - 3 - Biosensors



5.5 Sub-cloud - 4 - Systems Biology



5.6 Sub-Cloud - 5 - Biomaterial Engineering



5.7 Sub-Cloud - 6- Bioenergy & Environment technologies



6. M. Tech. Bioscience and Bioengineering Proposed Course structure

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Cat	Course Title	L-T-P	Credits	Cat	Course Title	L-T-P	Credits			
I Semester					II Semester					
с	BBL7XX0: Introduction to OMICS Technologies	2-0-0	2	с	BBL7XX0: Systems Biology	3-0-2	4			
с	BBL7XX1; Bioimaging Instrumentation and Acquisition	2-0-2	3	с	BBL7XX1: Types of Blosensors & their Characterization EE7XX2: Microfabrication Technologies, Interfacing and Read Out Electronics	2-0-0	2			
с	BBL7XX0: Biomaterials Engineering	3-D-0	3	с	CS7XX2: Biolmage Computing	1-0-0	1			
с	MAL7XX0: Statistics for Data Science	2-0-0	2	c	BBP7XX2: Statistics and Data Analysis Lab MAL7XX1: Regression	0-0-2	1			
PE	Program Elective-1	3-0-0	3			1	1			
NG	Technical Communication	1-0-0	1	PE	Program Elective-3	3-0-0	3			
PE	Program elective-2	1-0-0	1	PE	Program Elective-4	3-0-0	3			
				NG	Innovation and IP Management	1-0-0	1			
Total	Total (Graded + Non-graded) 15			Tota	Total (Graded + Non-graded) 16					
III Semester			·		IV Semester					
OE	Open Elective-1	3-0-0	3	OE	Open Elective+2	3-0-0	3			
PE	Program Elective-5	3-0-0	3	тн	Project-2	0-0-20	10			
PE	Program Elective-6	3-0-0	3	NG	Professional Ethics	1-0-0	1			

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PE	Program Elective-7	1~0-0	1			-24			
TH	Project-1	0-0-12	6						
NG	Systems Engineering and Project Management	1-0-0	1						
Total	(Graded + Non-graded)	<u>ha</u>	17	 	Total	(Grade	ed + Non-graded)	1	14

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6.1 Credit Distribution

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Course Type	Credits
Program Core (C)	19
Program Elective (17
Open Elective (OE)	6
Project	16
Non-Graded	4
Total (Graded + Non-Graded)	62 (58 + 4)

6.2 M. Tech. Program in Bioscience & Bioengineering - Elective Sets

Students must complete a minimum of 9 credits from one Program Elective Set. Six credits may be completed from other PE Set. A student can opt for any two of the given elective sets. Students may opt for Open Electives from anywhere in the institute.

Program	Elective	Set 1 -	Bioimaging	&Health	Informatics

BBL7XX0 Fundamentals of Neuroscience [3-0-0]

BBL7XX0 Principles of Drug Development [3-0-0]

BBL7XX0 Introduction to Chemical Biology [3-0-0]

CSL7XX0 Digital Image Analysis [3-0-0]

CSL7XX0 Machine Learning-1 [3-0-0]

CSLEEL7XX0 Image Sensor Design and Applications [3-0-0]

PH7XX0 Introduction to Medical Physics fractal 1 & 3 [2-0-0]

Program Elective Set 2- Multi-omics

BBL7XX1 Omics Databases [1-0-0]

MAL7XX0 Introduction to Data Science [1-0-0]

CSL7XX2 Data Management [1-0-0]

BBL7XX0 Proteomics Data Analysis [2-0-0]

BBL7XX0 Microbial Genomes & Microbiomes [3-0-0]

BBL7XX0 RNA Sequencing Data Analysis [3-0-0]

BBL7XX0 Microarray Data Analysis [2-0-0]

BBL7XX0 Metabolomics [3-0-0]

BBL7XX0 Algorithms in Biology [3-0-0]

Program Elective Set 3- Biological systems & Biosensors

BBL7XX0 Disease Processes diagnostics & therapeutics [3-0-0]

BBL7XX0 Quantitative Physiology: systems and controls of the human machine [3-0-0]

BBP7XX0 Quantitative Physiology lab [0-0-2]

BBL7XX0 Cell and Molecular Biology [3-0-0]

BBL7XX0 Sensory-neural systems [3-0-0]

BBL7XX3 Visual perception [1-0-0]

BBL7XX2 Auditory perception: from cell to signal [1-0-0]

BBL7XX1 Synaptic communication: function and dysfunction [1-0-0]

BBL7XX0 Immunodiagnostics and therapeutics [2-0-2]

BBL7XX0 Cardiovascular Physiology: Signals, systems and controls

BBL7XX1 Microbes as sensors [1-0-0]

MEL7XXO Microfluidics technologies [3-0-0]

CSL7XX0 Measurement in remote healthcare [1-0-0]

CSL7XX0 Analog & Interfacing Circuits [3-0-0]

CYL6XX0 Biophysical Techniques: Theory and applications [3-0-0]

MEL7XX0 Fluid Flow in Biological Processes [2-0-0]

Program Elective Set 4 – Systems Biology

BBL7XX0 Synthetic Biology [3-0-0]

BBL7XX0 Systems Biology in Personalized Genomics [3-0-0]

BBL7XX0 RNA Sequencing Data Analysis [2-0-0]

BBL7XX0 Flux Balance Analysis [3-0-0]

BBL7XX0 Immunotechnology [3-0-0]

CYL6XX1 Thermodynamics [1-0-0]

CYL6XX3 Chemical Kinetics [1-0-0]

MAL6XX0 Ordinary Differential Equations [3-0-0]

MAL7XX0 Numerical Methods for PDE [1-0-0]

Program Elective Set 5 – Biomaterials Engineering

BBL7XX0 Biophysics [2-0-0]

BBL7XX0 Biomechanics [2-0-0]

BBL7XX0 Tissue Engineering & Medical devices and Implants [3-0-0]

BBL7XX0 Selected topics in Biomaterials Engineering [1-0-0]

MT7LXX0 Principles of Engineering Material Selection 3-0-0 [3]

MTL7XX0 Computational material Engineering [3-0-0]

Program Elective Set 6 – Bioenergy & Environmental Technologies

BBL7XX0 Environmental Microbiology [2-0-0]

BBL7XX0 Environmental Biotechnology and Bioremediation [3-0-0]

BB7XX0 Bioenergy Systems [3-0-0]

BB7XX0 Bio-electrochemical Systems [2-0-0]

MEL7XX0 Water Energy nexus [3-0-0]

MEL7XX0 Soil and Water Conservation engineering [3-0-0]

MT7XX0 Industrial waste: control & utilization [3-0-0]

6.3 List of Laboratory courses

6.3.1. Core Labs:

Bioimaging lab

Systems Biology lab

Statistics and Data Analysis lab

6.3.2. Elective Labs:

Quantitative Physiology lab Artificial Intelligence in bioengineering lab Immunodiagnostics and therapeutics [2-0-2]