

## Dual Degree Programme : Bachelor of Technology and Master of Technology in Biochemical Engineering and Biotechnology

Department of Biochemical Engineering and Biotechnology

### The overall Credit Structure

Course Category	Credits
<b>B.Tech Part</b>	
<b>Institute Core Courses</b>	
Basic Sciences (BS)	22
Engineering Arts and Science (EAS)	18
Humanities and Social Sciences (HuSS)	15
<b>Programme-linked Courses</b>	11
<b>Departmental Courses</b>	
Departmental Core	66*
Departmental Electives	6
<b>Open Category Courses</b>	4
<b>Total B.Tech Credit Requirement</b>	<b>142*</b>
<b>Non Graded Units</b>	<b>15</b>
<b>M.Tech Part</b>	
Programme Core Courses	32
Programme Elective Courses	16
<b>Total M.Tech Credit Requirement</b>	<b>48</b>
<b>Grand Total Credit Requirement</b>	<b>190</b>

\*Those students who join the dual degree program from JEE or those who choose to pursue a M.Tech degree along with their B.Tech program, will not be required to do the 3-credit B.Tech Project as part of the Departmental core requirement.

#### Institute Core: Basic Sciences

CML100	General Chemistry	3	0	0	3
CMP100	Chemistry Laboratory	0	0	4	2
MTL100	Calculus	3	1	0	4
MTL101	Linear Algebra and Differential Equations	3	1	0	4
PYL100	Electromagnetic Waves and Quantum Mechanics	3	0	0	3
PYP100	Physics Laboratory	0	0	4	2
SBL100	Introductory Biology for Engineers	3	0	2	4
<b>Total Credits</b>		<b>22</b>			

#### Institute Core: Engineering Arts and Sciences

APL100	Engineering Mechanics	3	1	0	4
COL100	Introduction to Computer Science	3	0	2	4
CVL100	Environmental Science	2	0	0	2
ELL100	Introduction to Electrical Engineering	3	0	2	4
MCP100	Engineering Visualization	0	0	4	2
MCP101	Product Realization through Manufacturing	0	0	4	2
<b>Total Credits</b>		<b>18</b>			

#### Programme-Linked Basic/Engineering Arts/Sciences Core

APL102	Introduction to Materials Science and Engineering	3	0	2	4
CLL110	Transport Phenomena	3	1	0	4
MTL102	Differential Equations	3	0	0	3
<b>Total Credits</b>		<b>11</b>			

#### Humanities and Social Sciences

Courses from Humanities, Social Sciences and Management offered under this category **15**

#### Departmental Core

BBL131	Principles of Biochemistry	3	0	3	4.5
BBL132	General Microbiology	3	0	3	4.5
BBL133	Mass and Energy Balances in Biochemical Engineering	3	0	0	3
BBL231	Molecular Biology and Genetics	3	0	3	4.5
BBL331	Bioprocess Engineering	3	0	0	3

BBP332	Bioprocess Engineering Laboratory	0	0	3	1.5
BBL431	Bioprocess Technology	2	0	0	2
BBL432	Fluid Solid Systems	2	0	0	2
BBL433	Enzyme Science and Engineering	3	0	2	4
BBL434	Bioinformatics	2	0	2	3
BBL731	Bioseparation Engineering	3	0	3	4.5
BBL732	Bioprocess Plant Design	3	0	2	4
BBL733	Recombinant DNA Technology	2	0	3	3.5
CLL122	Chemical Reaction Engineering-I	3	1	0	4
CLL231	Fluid Mechanics for Chemical Engineers	3	1	0	4
CLL251	Heat Transfer for Chemical Engineers	3	1	0	4
CLL252	Mass Transfer-I	3	0	0	3
CLL261	Process Dynamics and Control	3	1	0	4
CLP301	Chemical Engineering Laboratory-I	0	0	3	1.5
CLP302	Chemical Engineering Laboratory-II	0	0	3	1.5
<b>Total Credits</b>		<b>66</b>			

#### Departmental Electives

BBL341	Environmental Biotechnology	3	0	0	3
BBL342	Physical and Chemical Properties of Biomolecules	2	1	0	3
BBL343	Carbohydrates and Lipids in Biotechnology	2	1	0	3
BBV350	Special Module in Biochemical Engineering and Biotechnology	1	0	0	1
BBD351	Mini Project (BB)	0	0	6	3
BBL441	Food Science and Engineering	3	0	0	3
BBL442	Immunology	3	0	2	4
BBL443	Modeling and Simulation of Bioprocesses	3	0	2	4
BBL444	Advanced Bioprocess Control	3	0	0	3
BBL445	Membrane Applications in Bioprocessing	3	0	0	3
BBL446	Biophysics	3	0	0	3
BBL447	Enzyme Catalyzed Organic Synthesis	2	0	2	3
BBL740	Plant Cell Technology	2	0	2	3
BBL741	Protein Science and Engineering	3	0	0	3
CLL728	Biomass Conversion and Utilization	3	0	0	3
CLL477	Materials of Construction	3	0	0	3

#### Program Core

BBL734	Metabolic Regulation and Engineering	3	0	0	3
BBL735	Genomics and Proteomics	2	0	2	3
BBL736	Dynamics of Microbial Systems	3	0	0	3
BBL737	Instrumentation and Analytical Methods in Bioengineering	2	0	2	3
BBD851*	Major Project Part-I (BB5)	0	0	12	6
BBD852*	Major Project Part-II (BB5)	0	0	28	14
BBD853	Major Project Part-I (BB5)	0	0	8	4
BBD854	Major Project Part-II (BB5)	0	0	32	16
<b>Total Credits</b>		<b>32</b>			
<b>*BBD851 and BBD852 together are alternatives to BBD853 and BBD854</b>					

#### Program Electives

BBL742	Biological Waste Treatment	3	0	2	4
BBL743	High Resolution Methods in Biotechnology	2	0	2	3
BBL744	Animal Cell Technology	3	0	2	4
BBL745	Combinatorial Biotechnology	3	0	0	3
BBL746	Current Topics in Biochemical Engineering and Biotechnology	3	0	0	3
BBL747	Bionanotechnology	3	0	0	3
BBL748	Data Analysis for DNA Microarrays	3	0	2	4
BBL749	Cancer Cell Biology	3	0	3	4.5
BBL750	Genome Engineering	2	0	2	3

# Dual Degree Programme : B.Tech. and M.Tech. in Biochemical Engineering and Biotechnology BB5

Semester	Course-1		Course-2		Course-3		Course-4		Course-5		Course-6		Course-7		Course-8		Course-9		L	T	P	Credits	Non-Graded Units	Contact Hours			
	Code	Hours	Code	Hours	Code	Hours	Code	Hours	Code	Hours	Code	Hours	Code	Hours	Code	Hours	Code	Hours									
I	ELL100	3 0 2 4	MCP100	0.5 0 3 2	PYL100	3 0 0 3	MTL100	3 1 0 4	PYP100	0 0 4 2	MCP101	0 0 4 2	MN100	0 0 2 1	NE100	0 0 1 0.5	NLN100	0 0 2 1	9.5	1	13	17.0	3	28.5			
	APL100	3 1 0 4	COL100	3 0 2 4	CML100	3 0 0 3	MTL101	3 1 0 4	CMP100	0 0 4 2					NE100	0 0 1 0.5	NLN100	0 0 2 1									
II	Engineering Mechanics	3 1 0 4	Introduction to Computer Science	3 0 2 4	Introduction to Chemistry	3 0 0 3	Linear Algebra and Differential Equations	3 1 0 4	Chemistry Laboratory	0 0 4 2					Professional Ethics and Social Responsibility-2 (Non-graded)	0 0 1 0.5	Language and Writing Skills-2 (Non-Graded)	0 0 2 1									
		3 1 0 4		3 0 2 4		3 0 0 3		3 1 0 4		0 0 4 2					Professional Ethics and Social Responsibility-1 (Non-graded)	0 0 1 0.5	Language and Writing Skills-1 (Non-Graded)	0 0 2 1									
Note: Courses 1-6 above are attended in the given order by half of all first year students. The other half of First year students attend the Courses 1-6 of II semester first.																											
III	APL102	3 0 2 4	Transport Phenomena	3 1 0 4	SBL100	3 0 2 4	BBL131	3 0 3 4.5	BBL132	3 0 3 4.5	BBL133	3 0 0 3	BBN101	3 0 0 2													
	Introduction to Materials Science and Engineering	3 0 2 4		3 1 0 4	Introductory Biology for Engineers	3 0 2 4	Principles of Biochemistry	3 0 3 4.5	General Microbiology	3 0 3 4.5	Mass and Energy Balances in Biochemical Engg.	3 0 0 3	Introduction to Biochem. Engg. and Biotech. (Non-graded)	3 0 0 2													
IV	Heat Transfer for Chemical Engineers	3 1 0 4	Chemical Reaction Engineering I	3 1 0 4	Fluid Mechanics for Chemical Engineers	3 1 0 4	Environmental Science	3 0 3 4.5	Differential Equations	3 0 3 4.5	Humanities Elective-1	3 0 0 3															
		3 1 0 4		3 1 0 4		3 1 0 4		3 0 3 4.5		3 0 3 4.5																	
V	Molecular Biology and Genetics	3 0 3 4.5	Mass Transfer I	3 0 0 3	Process Dynamics and Control	3 1 0 4	Chemical Engineering Laboratory I	0 0 3 1.5	Bioprocess Engineering Laboratory	0 0 3 1.5	Bioprocess Engineering	3 0 0 3	Humanities Elective-2	3 1 0 4													
		3 0 3 4.5		3 0 0 3		3 1 0 4		0 0 3 1.5		0 0 3 1.5																	
VI	Chemical Engineering Laboratory II	0 0 3 1.5	Humanities Elective-3	3 1 0 4	Fluid Solid Systems	2 0 0 2	Bioinformatics	2 0 2 3	Enzyme Science and Engineering	3 0 2 4	Bioprocess Technology	2 0 0 2															
		0 0 3 1.5		3 1 0 4		2 0 0 2		2 0 2 3		3 0 2 4																	
VII	Humanities Elective-4	3 0 0 3	Bioseparation Engineering	3 0 3 4.5	Bioprocess Plant Design	3 0 2 4	Recombinant DNA Technology	2 0 3 3.5	Metabolic Regulation and Engineering	3 0 0 3																	
		3 0 0 3		3 0 3 4.5		3 0 2 4		2 0 3 3.5		3 0 0 3																	
VIII	DE2 (3)	3 0 0 3	OC1 (4)	3 0 3 4.5	PE 1 (4)	3 0 2 4	PE 2 (4)	2 0 3 3.5	PE 3 (4)	3 0 0 3	BBL736	3 0 0 3															
		3 0 0 3		3 0 3 4.5		3 0 2 4		2 0 3 3.5		3 0 0 3																	
Summer																											
IX	BBL735	3 0 0 3	BBL737	3 0 2 4	BED863	3 0 2 4	PE 4 (4)	3 0 2 4		3 0 2 4																	
		3 0 0 3		3 0 2 4		3 0 2 4		3 0 2 4		3 0 2 4																	
X	Genomics and Proteonomics	2 0 2 3	Instrumentation and Analytical Methods in Bioengineering	2 0 2 3	M.Tech. Project I	0 0 12 6		3 0 2 4																			
		2 0 2 3		2 0 2 3		0 0 12 6		3 0 2 4																			
	M.Tech. Project II	0 0 28 14																									
		0 0 28 14																									
																						<b>TOTAL=190.0</b>					