

**B. TECH. (BIOSCIENCE & BIOENGINEERING)
COMPONENT WISE DISTRIBUTION**

Main Curriculum Components	Sub Components	Approved Credits for B. Tech.	Approved Credits Range	Proposed Credits for B. Tech. by Department	Proposed Credits Range
Institute Core Course	HSSC	5	52-58	5	53
	HSSEC	6		6	
	MC	3		3	
	BSC	12-20		16	
	ESC	8-20		12	
	DSC	4		4	
	ESSC	3		3	
	TM	4		4	
Program Core Course	CCCC	40-48	87-91	45	91
	AI/ML	2		2	
	Engg. Analysis and design (design thinking based project)/Industry Oriented Problem Solving/ Lab based Project/ Practical Problem/ Case study	4		4	
	Technical Communication	2		2	
	BTP/Entrepreneurship/ Project-based internship/PEC	6-10		8	
	PEC	22-26		24	
	TEB	6-8		6	
	OEK	9-12		9-12	
	CORE	2	2	2	2
	Total	150-160		155-158	
	MSC/DHC	18/20		18/20	
	Grand Total			173-178	

**DEPARTMENT OF BIOSCIENCE & BIOENGINEERING
INDIAN INSTITUTE OF TECHNOLOGY ROORKEE**

Program Code : 125 **B. Tech. (Bioscience & Bioengineering)**
Department : BE **Bioscience & Bioengineering**

Teaching Scheme

Year	Credits in Autumn Semester	Credits in Spring Semester	Credits (Year – wise)
1	23	24	47
2	23/24	24/25	47/49
3	23/24	18	41/42
4	16	4	20
Grand Total			155-158
Total with MSC/DHC	With addition 18-20 credits		173-178

Non-Credit Elements (NCE)	Components	Maximum Units	Minimum Units	Comments
	Discipline (DIS)	16	8	To be evaluated by DoSW
	NCC/NSS/NSO	8	4	To be evaluated by DoSW
	Internship (INT)	24	8	1-week internship= 1 unit (to be coordinated by the deptt. /Centres/School)
	Participation in professional development programs by Industry experts/ field experts (PPD-1 & PPD-2)	8	4	To be coordinated by the departments/Centres/school (2 nd & 3 rd Years)
Minimum non-credit units to be earned: 24				

List of Program Elective Courses

Teaching Scheme					Contact Hours/Week			Exam Duration		Relative Weight (%)				
S. No.	Subject Code	Course Title	Subject Area	Credit	L	T	P	Th.	Pr.	CWS	PRS	MTE	ETE	PRE
1.	BEL-401	Gene Regulation	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
2.	BEL-402	Food Biotechnology	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3.	BEL-403	Virology	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
4.	BEL-404	Nano- Bioengineering	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
5.	BEL-405	Separation and Analysis of Biomolecules	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
6.	BEL-406	Drug Discovery	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
7.	BEL-407	Principles of Synthetic Biology	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
8.	BEL-408	Stem Cell Technology	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
9.	BEL-409	Industrial Bioprocessing	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
10.	BEL-410	High Throughput Sequencing	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
11.	BEL-411	Chemical Genetics	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
12.	BEL-412	Genetically Modified Organisms	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
13.	BEL-413	Vaccine Biotechnology	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
14.	BEL-414	Tissue Engineering	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
15.	BEL-415	Biomaterials and Devices	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
16.	BEL-416	Molecular Diagnostics	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
17.	BEL-417	Fundamentals of Neuroscience	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
18.	BEL-418	Biotherapeutics	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-

19.	BEL-419	Molecular Genetics	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
20.	BEL-420	Immunotechnology and Therapeutics	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
Basket-2 (Biological Engineering)														
21.	BEL-451	Bioprocess Control	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
22.	BEL-452	Bioprocess Modelling and Simulation	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
23.	BEL-453	Bioreactor Design and Analysis	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
24.	BEL-454	Bioprocess Optimization	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
25.	BEL-455	Bioseparation Engineering	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
26.	BEL-456	Bioelectronic Medical Devices	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
27.	BEL-457	Plant Design and Economics	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
Basket-3 (Structural and Computational Biology)														
28.	BEL-471	Machine Learning and Deep Learning	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
29.	BEL-472	Protein Engineering	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
30.	BEL-473	Biophotonics	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
31.	BEL-474	Biomolecular NMR	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
32.	BEL-475	Biomolecular Modelling	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
33.	BEL-476	Systems Biology	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
34.	BEL-477	Molecular Biophysics	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
35.	BEL-478	Biomolecular Interactions	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
36.	BEL-479	X-Ray Crystallography	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
37.	BEL-480	Fundamentals of Cryo-EM	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
38.	BEL-481	Structural Bioinformatics	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
39.	BEL-482	DNA Computing	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-

List of Talent Enhancement Basket Courses

Teaching Scheme					Contact Hours/Week			Exam Duration		Relative Weight (%)				
S. No.	Course Code	Course Title	Area	Cr.	L	T	P	Th.	Pr.	CWS	PRS	MTE	ETE	PRE
TEB-A														
1	BET-101	Emerging Techniques in Cell and Molecular Biology-I	TEB	3	0	0	6	-	-	-	50	-	-	50
2	BET-102	Emerging Techniques in Cell and Molecular Biology-II	TEB	3	0	0	6	-	-	-	50	-	-	50
TEB-B														
1	BET-103	3D Structural Characterization	TEB	3	0	0	6	-	-	-	50	-	-	50
2	BET-104	Computational Characterization of Biomolecules	TEB	3	0	0	6	-	-	-	50	-	-	50
TEB-C														
1	BET-105	Bioprocess Engineering-I	TEB	3	0	0	6	-	-	-	50	-	-	50
2	BET-106	Bioprocess Engineering-II	TEB	3	0	0	6	-	-	-	50	-	-	50

**List of Minor Specialization Courses
Minor in Computational Biology and Bioinformatics**

Teaching Scheme					Contact Hours/Week			Exam Duration		Relative Weight (%)				
S. No.	Course Code	Course Title	Area	Cr.	L	T	P	Th.	Pr.	CWS	PRS	MTE	ETE	PRE
1	BE-XXX	Biosciences for engineers	MSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
2	BEC-108	Bioinformatics	MSC	2	2	0	0	3	0	20-35	-	20-30	40-50	-
3	BEC-303	Computational Biology	MSC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
4	BE-XXX	Programming for Computational Biology	MSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
5	BEL-471	Machine Learning and Deep Learning	MSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
6	BEL-481	Structural Bioinformatics	MSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-

Minor in Cell and Molecular Biology

Teaching Scheme					Contact Hours/Week			Exam Duration		Relative Weight (%)				
S. No.	Course Code	Course Title	Area	Cr.	L	T	P	Th.	Pr.	CWS	PRS	MTE	ETE	PRE
1	BE-XXX	Fundamentals of Biotechnology	MSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
2	BEL-473	Biophotonics	MSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3	BEL-417	Fundamentals of Neuroscience	MSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
4	BE-XXX	IPR and Bioethics	MSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
5	BE-XXX	Bionanotechnology	MSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
6	BE-XXX	Recombinant DNA technology	MSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-

List of Department Honours Specialization Courses:

Teaching Scheme					Contact Hours/Week			Exam Duration		Relative Weight (%)				
S. No.	Course Code	Course Title	Area	Cr.	L	T	P	Th.	Pr.	CWS	PRS	MTE	ETE	PRE
1	BEL-XXX	Drug Discovery and Development	DHC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
2	BEL -XXX	Advanced Virology	DHC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3	BEL -XXX	Microbial Genetics	DHC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
4	BEL -XXX	Protein Crystallography	DHC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
5	BEL -XXX	Advances in Food Biotechnology	DHC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
6	BEL -XXX	Biomedical Optics and Biophotonics	DHC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
7	BEL -XXX	Protein NMR	DHC	4	3	1	0	3	0	20-35	-	20-30	40-50	-