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**	
	OEC	9-12	9-12	**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 (2nd& 3rd Years)
Minimum non-credit units to be earned: 24				

Program Code : 125 B. Tech. (Bioscience & Bioengineering)
Department : BE Department of Bioscience & Bioengineering
Year : I

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weights(%)				
S. No.	**Subject Code**	**Course Title**	**Subject Area**	**Credits**	**L**	**T**	**P**	**Theory**	**Practical**	**CWS**	**PRS**	**MTE**	**ETE**	**PRE**
(Autumn)														
1	HSI-101	Soft Skills	HSSC	3	2	0	2	2	0	10-25	25	15-25	30-40	-
2	MAI-101	Mathematics-I	BSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3	PHI-101	Physics-I	BSC	4	3	1	2/2	3	0	15-30	20	15-25	30-40	-
4	BEC-101	Computer Programming	PCC	4	3	0	2	3	0	10-25	25	15-25	30-40	-
5	TMI-102	Tinkering and Mentoring*	TMI	2	-	-	-	-	-	60	40	-	-	-
6	TMI-103	Basics of IP and Entrepreneurship*	TMI	2	2	0	0	2	-	50	-	-	50	-
7	ECE-101	Fundamentals of Electronics	ESC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
		Total		**23**										
(Spring)														
1	IKS-102	Indian Knowledge System	HSSC	2	2	0	0	2	0	20-35	-	20-30	40-50	-
2	MAI-102	Mathematics-II	BSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3	ESS-103	Environmental Science and Sustainability	ESSC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
4	MTE-102	Material Characterization	ESC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
5	BEC-102	Microbiology	PCC	3	2	0	2	3	0	10-25	25	15-25	30-40	-
6	BEC-104	Biochemistry and Biophysics	PCC	4	3	0	2	3	0	10-25	25	15-25	30-40	-
7	BEC-191	Technical Communication	PCC	2	0	2	0	-	-	100				
8	BEC-108	Bioinformatics	PCC	2	2	0	0	3	0	20-35	-	20-30	40-50	-
		Total		**24**										

*** These two courses were taught as single course (TMI-101: Tinkering & Mentoring – 4 Credits) for 2023-24 admitted students**

DEPARTMENT OF BIOSCIENCE & BIOENGINEERING

Program Code : 125 B. Tech. (Bioscience & Bioengineering)
Department : BE Department of Bioscience & Bioengineering
Year : II

Teaching Scheme					Contact Hours/Week			ExamDuration (Hrs.)		Relative Weights (%)				
S. No.	**Subject Code**	**Course Title**	**Subject Area**	**Credits**	**L**	**T**	**P**	**Theory**	**Practical**	**CWS**	**PRS**	**MTE**	**ETE**	**PRE**
(Autumn)														
1	MSI-101	Fundamentals of Management	MC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
2	HSSEC-I	HSS Elective Course	HSSEC	3										
3	OEC-I	Open Elective Course-I	OEC	3/4										
4	CSE-101	Data Structures and Algorithms	ESC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
5	CYB-101	Fundamentals of Organic Chemistry	BSC	4	3	0	2	3	0	10-25	25	15-25	30-40	-
6	BEC-201	Transport Phenomenon in Biological System	PCC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
7	BEC-203	Cell Biology and Genetics	PCC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
		Total		**23/24**										
(Spring)														
1	OEC-II	Open Elective Course-II	OEC	3/4										
2	DAI-101	Data Science	DSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3	BEC-202	Physiology of Animals and Plants	PCC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
4	BEC-204	Molecular Biology and Genetic Engineering	PCC	4	3	0	2	3	0	10-25	25	15-25	30-40	-
5	BEC-206	Structural Biology	PCC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
6	BEC-208	Bioprocess Calculations	PCC	2	2	0	0	3	0	20-35	-	20-30	40-50	-
7	BEC-210	Immunology	PCC	2	2	0	0	3	0	20-35	-	20-30	40-50	-
8	BET-I	Talent Enhancement Course-I	TEB	3	0	0	6	-	-	-	50	-	-	50
		Total		**24/25**										

DEPARTMENT OF BIOSCIENCE & BIOENGINEERING

Program Code : 125 B. Tech. (Bioscience & Bioengineering)
Department : BE Department of Bioscience & Bioengineering
Year : III

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weights (%)				
S. No.	**Subject Code**	**Course Title**	**Subject Area**	**Credits**	**L**	**T**	**P**	**Theory**	**Practical**	**CWS**	**PRS**	**MTE**	**ETE**	**PRE**
(Autumn)														
1	HSSEC-II	HSS Elective Course-II	HSSEC	3										
2	OEC-III	Open Elective Course-III	OEC	3/4										
3	BEC-351	Fundamentals of AI/ML	PCC	2	2	0	0	3	0	20-35	-	20-30	40-50	-
4	BEC-301	Bioprocess Engineering	PCC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
5	BEC-303	Computational Biology	PCC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
6	BEC-305	Animal and Plant Tissue Culture	PCC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
7	BEC-399	Community Outreach	CORE	2						100				
8	BEL-I	Program Elective Course-I	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
		Total		**23/24**										
(Spring)														
1	BEC-300	Lab Based Project/ Industrial Oriented Problem Solving/ Case Study, etc.	PCC	4	0	0	8	-	-	-	-	-	100	-
2	BEC-302	Genomics, Proteomics and Metabolomics	PCC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
3	BEL-II	Program Elective Course-II	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
4	BEL-III	Program Elective Course-III	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
5	BET-II	Talent Enhancement Course-II	TEB	3	0	0	6	-	-	-	50	-	-	50
6	MSC/DHC - I	Minor Specialization Course - I / Departmental Honours Course - I	MSC/ DHC	3/4										
		Total		**18 /21-22**										

DEPARTMENT OF BIOSCIENCE & BIOENGINEERING

Program Code : 125 B. Tech. (Bioscience & Bioengineering)
Department : BE Department of Bioscience & Bioengineering
Year : IV

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weights (%)				
S. No.	**Subject Code**	**Course Title**	**Subject Area**	**Credits**	**L**	**T**	**P**	**Theory**	**Practical**	**CWS**	**PRS**	**MTE**	**ETE**	**PRE**
(Autumn)														
1	BEP-400A/ BEL	BTP/Project/Internship/Entrepreneurship/ PEC*	PCC/PEC*	4	0	0	8	-	-	-	-	-	100	-
2	BEL-IV	Program Elective Course -IV	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3	BEL-V	Program Elective Course -V	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
4	BEL-VI	Program Elective Course -VI	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
5	MSC/DHC-II	Minor Specialization Course -II /Departmental Honours Course - II	MSC/ DHC	3/4										
6	MSC/DHC-III	Minor Specialization Course -III /Departmental Honours Course - III	MSC/ DHC	3/4										
		Total		**16/22-24**										
(Spring)														
1	BEP-400B/ BEL	BTP/Project/Internship/Entrepreneurship/ PEC*	PCC/PEC*	4	0	0	8	-	-	-	-	-	100	-
2	MSC/DHC-IV	Minor Specialization Course -IV /Departmental Honours Course – IV	MSC/ DHC	3/4										
3	MSC/DHC-V	Minor Specialization Course - IV/Departmental Honours Course - IV	MSC/ DHC	3/4										
		Total		**04/10-12**										

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
Basket-1 (Cell and Molecular Biology)														
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.	C W S	PRS	M T E	E T E	PRE
1	BEB-102	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.	C W S	PRS	M T E	E T E	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.	C W S	PRS	M T E	E T E	P R E
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	-