

BTech Biological Engineering curriculum (2023 onward)

Semester 1

S.No	Course No	Course Name	L	T	E	P	O	C	Cat
1	BT1000	Introduction to Biological Sciences and Engineering	3	0	0	0	6	9	S
2	CY1001	Chemistry I	3	1	0	0	6	10	S
3	CS1100	Introduction to Programming	3	0	0	3	6	12	E
4	MA1101	Functions of Several Variables	3	1	0	0	6	10	S
5	PH1010	Physics 1	3	1	0	0	6	10	S
6	PH1030	Physics Lab	0	0	0	3	1	4	S
7	GN1101	Life Skills	0	0	0	0	2	0	
8	ID1200	Ecology and Environment	0	0	0	0	2	0	
9		NCC (NC1010)/ NSS (NS1020)/ NSO (NS1030)	0	0	0	0	2	0	
		Total Credits:						55	

Winter

S.No	Course No	Course Name	L	T	E	P	O	C	Cat
1	WS1010	Workshop I	0	0	0	3	0	3	E
		Total Credits:						3	

Semester 2

S.No	Course No	Course Name	L	T	E	P	O	C	Cat
1	MA1102	Series and Matrices	3	1	0	0	6	10	S
2	PH1020	Physics 2	3	1	0	0	6	10	S
3	CY1051	Chemistry 2	3	0	0	0	6	9	S
4	EE1101	Signals and Systems	3	1	0	0	6	10	E
5	BT1020	Material and Energy Balances	2	1	0	0	6	9	P
6	CY1002	Chemistry Lab	0	0	0	3	0	3	S
7	GN1102	Life Skills	0	0	0	0	1	0	
8		NCC (NC1010)/ NSS (NS1020)/ NSO (NS1030)	0	0	0	0	2	0	
		Total Credits:						51	

Summer

S.No	Course No	Course Name	L	T	E	P	O	C	Cat
1	WS1020	Workshop II	0	0	0	3	0	3	E
		Total Credits:						3	

Semester 3

S.No	Course No	Course Name	L	T	E	P	O	C	Cat
1	MAE1	Mathematics Elective [^]	3	0	0	0	6	9	S
2	HSE1	Humanities 1	3	0	0	0	6	9	H
3	AM1100	Engineering Mechanics	3	1	0	0	6	10	E
4	BT2011	Microbiology and Biochemistry	3	0	0	0	6	9	P
5	BT3051	Data Structures and Algorithms for Biology	2	1	0	2	6	11	P
		Total Credits:						48	

^Restricted elective: Students choose between MA2020 Differential Equations, MA2040 Probability, Statistics and Stochastic Process, MA2130 Basic Graph Theory, MA2031 Linear Algebra for Engineers

Semester 4

S.No	Course No	Course Name	L	T	E	P	O	C	Cat
1	HSE2	Humanities 2	3	0	0	0	6	9	H
2	BT2020	Numerical Methods for Biology	2	1	0	0	6	9	P
3	BT2041	Bioreaction Engineering	3	0	0	0	6	9	P
4	BT2061	Biochemical Thermodynamics	3	1	0	0	6	10	P
5	ME1120	Engineering Drawing	0	1	0	3	3	7	E
		Total Credits:						44	

Semester 5

S.No	Course No	Course Name	L	T	E	P	O	C	Cat
1	BT3011	Molecular Biology and Genetic Engineering	3	0	0	0	6	9	P
2	BT5061	Cellular Engineering	3	0	0	0	6	9	P
3	BT5051	Transport Phenomena in Biological Systems	3	1	0	0	6	10	P
4	BT3111	Biological Engineering Lab 1	0	0	0	6	2	8	P
		Total Credits:						36	

Semester 6

S.No	Course No	Course Name	L	T	E	P	O	C	Cat
1	BT3040	Bioinformatics	2	0	0	3	6	11	P
2	BT5240	Computational Systems Biology	3	0	0	1	8	12	
3	BT3121	Biological Engineering Lab 2	0	0	0	6	2	8	P
		Total Credits:						31	

Summer

S.No	Course No	Course Name	L	T	E	P	O	C	Cat
1	BT3900	Summer Internship	0	0	0	0	20	0	P
		Total Credits:						0	

Semester 7

S.No	Course No	Course Name	L	T	E	P	O	C	Cat
1	HSE3	Humanities 3	3	0	0	0	6	9	H
2	BT3041	Analysis and Interpretation of Biological Data	3	0	0	0	6	9	P
3	BT5011	Biomaterials Engineering	3	0	0	0	6	9	P
		Total Credits:						27	

Semester 8

S.No	Course No	Course Name	L	T	E	P	O	C	Cat
1	HS3050	Professional Ethics	2	0	0	0	0	0	H
		Total Credits:						0	

Semester-wise distribution of credits and time commitment

Semester	I	II	III	IV	V	VI	Sum	VII	VIII	Total
Credits	55	51+6	48*	44*	36*	31*	0	27*	0*	433

*Indicated credits are only for the core program. In addition, students are required to earn 135 elective credits during semester III-VIII, with at least 63 of those credits in Biotechnology. The remaining 72 credits can be from any department, including Biotechnology.

Suggested elective credits: 9 each in Semesters III and IV, 18 in Semester V, 27 each in Semesters VI and VII, and 45 in Semester VIII.

Project: An optional BTech project can be taken in any department in lieu of 27 elective credits. These 27 credits can be counted against 27 professional elective credits mentioned above only if the project is done in the Department of Biotechnology.

Category-wise credit requirements for BTech

Category	Engineering (E)	Professional (P) Core+Elective	Humanities (H)	Sciences (S) Core+Elective	Unallocated credits	Total
Credits	45	142+63	27	75+9	72	433

BTech (Honors): (Total credit requirement: $433 + 27 = 460$)

- **Eligibility:** minimum CGPA of 8.5 at the end of 5th sem without U or W grade in any course. They need to maintain these conditions until graduation.
- **Extra credit requirement:**
 - BTech project (27 credits) must be completed in the Department of Biotechnology.
 - Additional 27 credits must be earned from 5000 level or above courses from Biotechnology.

Category-wise credit requirements for the BTech (Honors)

Category	Engineering (E)	Professional (P) Core+Elective+Project	Humanities (H)	Sciences (S) Core+Elective	Unallocated credits	Total
Credits	45	142+63*+27	27	75+9	72	460

*27 out of these 63 credits must be earned from 5000 level or higher courses from Biotechnology.

BTech+MTech Biological Engineering curriculum (2023 onward)

Semester 1

S.No	Course No	Course Name	L	T	E	P	O	C	Cat
1	BT1000	Introduction to Biological Sciences and Engineering	3	0	0	0	6	9	S
2	CY1001	Chemistry I	3	1	0	0	6	10	S
3	CS1100	Introduction to Programming	3	0	0	3	6	12	E
4	MA1101	Functions of Several Variables	3	1	0	0	6	10	S
5	PH1010	Physics 1	3	1	0	0	6	10	S
6	PH1030	Physics Lab	0	0	0	3	1	4	S
7	GN1101	Life Skills	0	0	0	0	2	0	
8	ID1200	Ecology and Environment	0	0	0	0	2	0	
9		NCC (NC1010)/ NSS (NS1020)/ NSO (NS1030)	0	0	0	0	2	0	
		Total Credits:						55	

Winter

S.No	Course No	Course Name	L	T	E	P	O	C	Cat
1	WS1010	Workshop I	0	0	0	3	0	3	E
		Total Credits:						3	

Semester 2

S.No	Course No	Course Name	L	T	E	P	O	C	Cat
1	MA1102	Series and Matrices	3	1	0	0	6	10	S
2	PH1020	Physics 2	3	1	0	0	6	10	S
3	CY1051	Chemistry 2	3	0	0	0	6	9	S
4	EE1101	Signals and Systems	3	1	0	0	6	10	E
5	BT1020	Material and Energy Balances	2	1	0	0	6	9	P
6	CY1002	Chemistry Lab	0	0	0	3	0	3	S
7	GN1102	Life Skills	0	0	0	0	1	0	
8		NCC (NC1010)/ NSS (NS1020)/ NSO (NS1030)	0	0	0	0	2	0	
		Total Credits:						51	

Summer

S.No	Course No	Course Name	L	T	E	P	O	C	Cat
1	WS1020	Workshop II	0	0	0	3	0	3	E
		Total Credits:						3	

Semester 3

S.No	Course No	Course Name	L	T	E	P	O	C	Cat
1	MAE1	Mathematics Elective [^]	3	0	0	0	6	9	S
2	HSE1	Humanities 1	3	0	0	0	6	9	H
3	AM1100	Engineering Mechanics	3	1	0	0	6	10	E
4	BT2011	Microbiology and Biochemistry	3	0	0	0	6	9	P
5	BT3051	Data Structures and Algorithms for Biology	2	1	0	2	6	11	P
		Total Credits:						48	

^Restricted elective: Students choose between MA2020 Differential Equations, MA2040 Probability, Statistics and Stochastic Process, MA2130 Basic Graph Theory, MA2031 Linear Algebra for Engineers

Semester 4

S.No	Course No	Course Name	L	T	E	P	O	C	Cat
1	HSE2	Humanities 2	3	0	0	0	6	9	H
2	BT2020	Numerical Methods for Biology	2	1	0	0	6	9	P
3	BT2041	Bioreaction Engineering	3	0	0	0	6	9	P
4	BT2061	Biochemical Thermodynamics	3	1	0	0	6	10	P
5	ME1120	Engineering Drawing	0	1	0	3	3	7	E
		Total Credits:						44	

Semester 5

S.No	Course No	Course Name	L	T	E	P	O	C	Cat
1	BT3011	Molecular Biology and Genetic Engineering	3	0	0	0	6	9	P
2	BT5061	Cellular Engineering	3	0	0	0	6	9	P
3	BT5051	Transport Phenomena in Biological Systems	3	1	0	0	6	10	P
4	BT3111	Biological Engineering Lab 1	0	0	0	6	2	8	P
		Total Credits:						36	

Semester 6

S.No	Course No	Course Name	L	T	E	P	O	C	Cat
1	BT3040	Bioinformatics	2	0	0	3	6	11	P
2	BT5240	Computational Systems Biology	3	0	0	1	8	12	
3	BT3121	Biological Engineering Lab 2	0	0	0	6	2	8	P
		Total Credits:						31	

Summer

S.No	Course No	Course Name	L	T	E	P	O	C	Cat
1		Summer Internship	0	0	0	0	20	0	P
		Total Credits:						0	

Semester 7

S.No	Course No	Course Name	L	T	E	P	O	C	Cat
1	HSE3	Humanities 3	3	0	0	0	6	9	H
2	BT3041	Analysis and Interpretation of Biological Data	3	0	0	0	6	9	P
3	BT5011	Biomaterials Engineering	3	0	0	0	6	9	P
		Total Credits:						27	

Semester 8

S.No	Course No	Course Name	L	T	E	P	O	C	Cat
1	HS3050	Professional Ethics	2	0	0	0	0	0	H
		Total Credits:						0	

Summer

S.No	Course No	Course Name	L	T	E	P	O	C	Cat
1	BT5701**	DD Project	0	0	0	0	25	25	P
		Total Credits:						25	

Semester 9

S.No	Course No	Course Name	L	T	E	P	O	C	Cat
1	BT5702**	DD Project	0	0	0	0	20	20	P
		Total Credits:						20	

Semester 10

S.No	Course No	Course Name	L	T	E	P	O	C	Cat
1	BT5703	DD Project	0	0	0	0	40	40	H
		Total Credits:						40	

**Grades for BT5701 and BT5702 will be awarded together at the end of Semester 9. At the end of the 9th Semester, if the student is underperforming (grade lesser than 'B'), they must drop the project in the 10th Semester. The remaining credit requirements must be earned through professional electives.

Semester-wise distribution of credits and time commitment

Semester	I	II	III	IV	V	VI	Sum	VII	VIII	Sum	IX	X	Total
Credits	55	51+6	48*	44*	36*	31*	0	27**	0*	25	20*	40*	554

*Indicated credits are only for the core program. In addition, students are required to earn 180 elective credits during semester III-X. 99 of the elective credits (including at least 36 from 5000 level or above courses) must be earned from the Department of Biotechnology. The remaining 72 credits can be from any department, including Biotechnology.

Suggested elective credits: 9 each in Semesters III and IV, 18 in Semester V, 27 in Semester VI and VII, 45 in Semester VIII, 27 in Semester IX, and 9 in Semester X.

Category-wise credit requirements for BTech+MTech

Category	Engineering (E)	Professional (P) Core+Elective+Project	Humanities (H)	Sciences (S) Core+Elective	Unallocated credits	Total
Credits	45	142+99+85	27	75+9	72	554

BTech (Honors)+MTech: (Total credit requirement: 554 + 27 = **581**)

- **Eligibility:** minimum CGPA of 8.5 at the end of 5th sem without U or W grade in any course. They need to maintain these conditions until graduation.
- **Extra credit requirement:** Additional 27 credits must be earned from 5000 level or above courses from Biotechnology.

Category-wise credit requirements for the BTech (Honors)+MTech

Category	Engineering (E)	Professional (P) Core+Elective+Project	Humanities (H)	Sciences (S) Core+Elective	Unallocated credits	Total
Credits	45	142+126*+85	27	75+9	72	581

*63 out of these 126 credits must be earned from 5000 level or higher courses from Biotechnology.

Criteria for stream change at the DD level

Students who opt for stream change at the DD level, i.e., BTech (Biol. Engg.) + MS (Biol. Sci.) must fulfil the following additional criteria to complete the requirements of the DD program.

- Must complete at least 4 Professional courses from a basket of stream-specific courses listed in the table below.
- These credits can be earned in lieu of the prescribed Professional elective credits.
- Credits are to be earned by the end of the 7th semester.
- All other rules for DD upgrade options apply.

Course basket for upgradation from BTech (Biol. Engg.) to BTech (Biol. Engg.) + MS (Biol. Sci.)

S. No.	Course No.	Course Name
1	BT2010 or BT2030	Microbiology or Biochemistry
2	BT2082	Cell Biology
3	BT2012	Genetics
4	BT3020	Structural Biology
5	BT3072	Immunology
6	BT3022	Genomics and Proteomics
7	BT5330	Human Physiology