FLEXIBLE CURRICULA
B. Tech. PROGRAMMES
(2024– 25)

NATIONAL INSTITUTE OF TECHNOLOGY
TIRUCHIRAPPALLI - 620 015
TAMIL NADU, INDIA

CONTENTS

VISION OF THE INSTITUTE

- To be a university globally trusted for technical excellence where learning and research integrate to sustain society and industry.

MISSION OF THE INSTITUTE

- To offer undergraduate, postgraduate, doctoral and modular programmes in multi-disciplinary / inter-disciplinary and emerging areas.
- To create a converging learning environment to serve a dynamically evolving society.
- To promote innovation for sustainable solutions by forging global collaborations with academia and industry in cutting-edge research.
- To be an intellectual ecosystem where human capabilities can develop holistically.

CURRICULUM FRAMEWORK AND CREDIT SYSTEM FOR THE FOUR-YEAR B.Tech. and 3 Year B.Sc. (Engineering) PROGRAMME

COURSE STRUCTURE

Course Category	Courses	No. of Credits	Weightage (%)
GIR (General Institute Requirements)	22	56	34.7
PC (Programme Core)	15	52 – 55**	33.1
Programme Elective (PE) / Open Elective (OE)	12	36	22.3
Essential Laboratory Requirements (ELR)	8 Maximum 2 per session up to 6th semester	16	9.9
Total	**57**	**160+3**	**100**
Minor (Optional)	Courses for 15 credits	15 Additional credits	-
Honors (Optional)	Courses for 15 credits	15 Additional credits	-

1. **A minimum of seven Programme Core, each carrying 4 credits (II, III, IV, V, VI Semester).**
2. **Out of the 12 elective courses (PE / OE), students must complete at least eight Programme Electives (PE).**
3. **For a Minor Degree (MI), students must earn 15 credits in addition to the credit specified by the departments (160 credits), with the details of the Minor only mentioned on the transcript, not the degree certificate.**
4. **To qualify for an Honors Degree (HO), students must: (a) register for at least 12 theory courses and 2 ELRs in their second year, (b) consistently maintain a minimum CGPA of 8.5 during the first four sessions, (c) maintain a minimum CGPA of 8.5 in all sessions excluding Honors courses, (d) successfully complete additional courses totaling 15 credits (3 numbers of 4 credit course and 1 number of 3 credit course), and (e) achieve at least a B grade in Honors courses, which must be distinct and at a higher level than PC and PE courses, preferably M. Tech. courses. Honors courses cannot be treated as Programme Electives and grades from these courses do not factor into CGPA calculations.**
5. **Project Work is compulsory for B. Tech. programme. However, those students wish to carry out the intern outside the institute (8th semester) can opt for two electives courses equivalent to 6 credits. But the project work is compulsory for B. Tech. (Honors) degree**

CURRICULUM FRAME WORK / FLEXIBLE CURRICULUM / NEP 2020 / NCrF / B.Tech.

Semester	GIR		PC		ELR		PE/OE		Total Credits	Credit Distribution
	Course	Credit	Course	Credit	Course	Credit	Course	Credit		
I	7	19	-	-	-	-	-	-	**19**	**40**
II	8	17	1	4	-	-	-	-	**21**	
III	-	-	4	14	2	4	2	6	**24**	**48**
IV	1	4	3	10	2	4	2	6	**24**	
V	1	3	4	14	2	4	1	3	**24**	**48**
VI	2	4	3	10	2	4	2	6	**24**	
VII	2	3	-	-	-	-	4	12	**15**	**24**
VIII	1	6	-	-	-	-	1	3	**9**	
Total	**22**	**56**	**15**	**52**	**8**	**16**	**12**	**36**	**160**	**160**

CURRICULUM FRAME WORK / FLEXIBLE CURRICULUM / NEP 2020 / NCrF / B.Sc. (Engineering)

	Sem	GIR		PC		ELR		PE/OE		Total Credits	Credit Distri-bution
		Course	Credit	Course	Credit	Course	Credit	Course	Credit		
Same as B.Tech.	I	7	19	-	-	-	-	-	-	**19**	**40**
	II	8	17	1	4	-	-	-	-	**21**	
	III	-	-	4	14	2	4	2	6	**24**	**48**
	IV	1	4	3	10	2	4	2	6	**24**	
B.Sc. Exit	V	1	3	2	8	2	4	2	6	**21**	**37**
	VI	4[@]	12	-	-	2	4	-	-	**16***	
After B.Sc. exit and join back for B. Tech.	VII	-	-	3	10	-	-	3	9	**19**	**35**
	VIII	1	1	2	6	-	-	3	9	**16**	
	Total	**22**	**56**	**15**	**52**	**8**	**16**	**12**	**36**	**160**	**160**

[@](Summer internship (2), Project Work (6) and Industrial Lecture (1))

CURRICULUM FRAME WORK / FLEXIBLE CURRICULUM / NEP 2020 / NCrF / B.Tech.

Semester	GIR		PC		ELR		PE/OE		Total Credits	Credit Distribution
	Course	Credit	Course	Credit	Course	Credit	Course	Credit		
I	7	19	-	-	-	-	-	-	**19**	**40**
II	8	17	1	4	-	-	-	-	**21**	
III	1	4	4	14	2	4	1	3	**25**	**50**
IV	-	-	3	12	2	4	3	9	**25**	
V	1	3	4	15	2	4	1	3	**25**	**49**
VI	2	4	3	10	2	4	2	6	**24**	
VII	2	3	-	-	-	-	4	12	**15**	**24**
VIII	1	6	-	-	-	-	1	3	**9**	
Total	**22**	**56**	**15**	**55**	**8**	**16**	**12**	**36**	**163**	**163**

CURRICULUM FRAME WORK / FLEXIBLE CURRICULUM / NEP 2020 / NCrF / B.Sc. (Engineering)

	Sem	GIR		PC		ELR		PE/OE		Total Credits	Credit Distri-bution
		Course	Credit	Course	Credit	Course	Credit	Course	Credit		
Same as B.Tech.	**I**	7	19	-	-	-	-	-	-	**19**	**40**
	II	8	17	1	4	-	-	-	-	**21**	
	III	1	4	4	14	2	4	1	3	**25**	**50**
	IV	-	-	3	12	2	4	3	9	**25**	
B.Sc. Exit	**V**	1	3	2	8	2	4	1	3	**18**	**34**
	VI	4[#]	12	-	-	2	4	-	-	**16***	
After B.Sc. exit and join back for B. Tech.	**VII**	-	-	3	10	-	-	4	12	**22**	**39**
	VIII	1	1	2	7	-	-	3	9	**17**	
	Total	**22**	**56**	**15**	**55**	**8**	**16**	**12**	**36**	**163**	**163**

[#](Summer internship (2), Project Work (6), Professional Ethics (3), and Industrial Lecture (1))

GENERAL INSTITUTE REQUIREMENTS (GIR) COURSES

Sl. No.	Course	Number of Courses	Max. Credits
1.	Mathematics	3	10
2.	Physics	1	3
	Physics Laboratory	1	2
3.	Chemistry	1	3
	Chemistry Laboratory	1	2
4.	Industrial Economics *	1	3
5.	English for Communication	1	4
6.	Energy and Environmental Engineering	1	2
7.	Professional Ethics *	1	3
8.	Engineering Graphics	1	3
9.	Engineering Practice	1	2
10.	Basic Engineering	2	4
11.	Introduction to computer Programming	1	3
12.	Branch Specific Course (Introduction to the Branch of study)	1	2
13.	Summer Internship	1	2
14.	Project Work	1	6
15.	Comprehensive viva	1	1
16.	Industrial Lecture	1	1
17.	NSS / NCC / NSO	1	Pass / Fail
Total		**22**	**56**

**Refer to the Curriculum and Syllabus of the respective Department.*

CREDIT DISTRIBUTION FOR B.Tech.

Sl. No.	Department	I	II	III	IV	V	VI	VII	VIII	Total
1.	Chemical Engineering	19	21	24	25	24	23	15	9	160
2.	Civil Engineering	21	19	24	24	24	24	15	9	160
3.	Computer Science and Engineering	19	21	24	23	24	25	15	9	160
4.	Electrical and Electronics Engineering	19	21	25	25	25	24	15	9	163
5.	Electronics and Communication Engineering	19	21	26	23	24	23	15	9	160
6.	Instrumentation and Control Engineering	19	21	25	22	25	24	15	9	160
7.	Mechanical Engineering	19	21	25	25	25	24	15	9	163
8.	Metallurgical and Materials Engineering	19	21	25	25	25	24	15	9	163
9.	Production Engineering	19	21	25	24	24	24	15	9	161

CREDIT DISTRIBUTION FOR B.Sc. (Engineering)

Sl. No.	Department	I	II	III	IV	V	VI	Total
1.	Chemical Engineering	19	21	24	25	21	13	123
2.	Civil Engineering	21	19	24	24	21	16	125
3.	Computer Science and Engineering	19	21	24	23	16	17	120
4.	Electrical and Electronics Engineering	19	21	25	25	18	16	124
5.	Electronics and Communication Engineering	19	21	26	23	18	16	123
6.	Instrumentation and Control Engineering	19	21	25	22	19	16	122
7.	Mechanical Engineering	19	21	25	25	21	16	127
8.	Metallurgical and Materials Engineering	19	21	25	25	18	16	124
9.	Production Engineering	19	21	25	24	20	16	125

CHEMICAL ENGINEERING

The total minimum credits for completing the B.Tech. programme in Chemical Engineering is 160.

CURRICULUM FRAME WORK / FLEXIBLE CURRICULUM / NEP 2020 / NCrF / B.Tech.

Semester	GIR		PC		ELR		PE/OE		Total Credits	Credit Distribution
	Course	Credit	Course	Credit	Course	Credit	Course	Credit		
I	7	19	-	-	-	-	-	-	**19**	**40**
II	8	17	1	4	-	-	-	-	**21**	
III	1	3	4	14	2	4	1	3	**24**	**49**
IV	1	4	3	11	2	4	2	6	**25**	
V	1	3	4	14	2	4	1	3	**24**	**47**
VI	1	1	3	9	2	4	3	9	**23**	
VII	2	3	-	-	-	-	4	12	**15**	**24**
VIII	1	6	-	-	-	-	1	3	**9**	
Total	**22**	**56**	**15**	**52**	**8**	**16**	**12**	**36**	**160**	**160**

CURRICULUM FRAME WORK / FLEXIBLE CURRICULUM / NEP 2020 / NCrF / B.Sc. (Engineering)

	Sem	GIR		PC		ELR		PE/OE		Total Credits	Credit Distri-bution
		Course	Credit	Course	Credit	Course	Credit	Course	Credit		
Same as B.Tech.	I	7	19	-	-	-	-	-	-	**19**	**40**
	II	8	17	1	4	-	-	-	-	**21**	
	III	1	3	4	14	2	4	1	3	**24**	**49**
	IV	1	4	3	11	2	4	2	6	**25**	
B.Sc. Exit	V	1	3	2	8	2	4	2	6	**21**	**34**
	VI	3[@]	9	-	-	2	4	-	-	**13**	
After B.Sc. exit and join back for B. Tech.	VII	-	-	2	6	-	-	5	15	**21**	**37**
	VIII	1	1	3	9	-	-	2	6	**16**	
	Total	**22**	**56**	**15**	**52**	**8**	**16**	**12**	**36**	**160**	**160**

[@](Summer internship (2), Project Work (6) and Industrial Lecture (1))

Curriculum Framework and Credit System / CL / 160

Semester I (July Session)

Sl. No.	Course Code	Course Title	Credits	Category
1.	HSIR11	English for Communication (Theory and Laboratory)	4	GIR
2.	MAIR11	Matrices and Calculus	3	GIR
3.	CHIR11	Chemistry	3	GIR
4.	CLIR15	Introduction to Chemical Engineering (*Branch Specific Course*)	2	GIR
5.	EEIR11	Basics of Electrical and Electronics Engineering	2	GIR
6.	MEIR12	Engineering Graphics	3	GIR
7.	CHIR12	Chemistry Laboratory	2	GIR
		Total	**19**	

Semester II (January Session)

Sl. No.	Course Code	Course Title	Credits	Category
1.	MAIR21	Complex Analysis and Differential Equations	3	GIR
2.	PHIR11	Physics	3	GIR
3.	CSIR12	Introduction to Computer Programming (Theory and Laboratory)	3	GIR
4.	CEIR11	Basics of Civil Engineering	2	GIR
5.	ENIR11	Energy and Environmental Engineering	2	GIR
6.	PRIR11	Engineering Practice	2	GIR
7.	CLPC11	Programme Core – 1 / Process Calculations	4	PC
8.	PHIR12	Physics Laboratory	2	GIR
9.	SWIR11	NSS / NCC / NSO	0	GIR
		Total	**21**	

Semester III (July Session)

Sl. No.	Course Code	Course Title	Credits	Category
1.	HSIR13	Industrial Economics	3	GIR
2.	CLPC12	Programme Core – 2 / Heat Transfer	3	PC
3.	CLPC13	Programme Core – 3 / Momentum transfer	4	PC
4.	CLPC14	Programme Core – 4 / Chemical Engineering Thermodynamics	4	PC
5.	CLPC15	Programme Core – 5 / Chemical Technology	3	PC
6.		Programme Elective – 1	3	PE
7.	CLLR11	ELR – 1 / Momentum Transfer Laboratory	2	ELR
8.	CLLR12	ELR – 2 / Heat Transfer Laboratory	2	ELR
		Total	**24**	

Note: Department(s) to offer Minor (MI) Course and ONLINE Course (OC) to those willing students in addition to 24 credits.

Semester IV (January Session)

Sl. No.	Course Code	Course Title	Credits	Category
1.	MAIR41	Fourier Series and Numerical Methods	4	GIR
2.	CLPC16	Programme Core – 6 / Particulate Science and Technology	3	PC
3.	CLPC17	Programme Core – 7 / Chemical Reaction Engineering	4	PC
4.	CLPC18	Programme Core – 8 / Mass Transfer - I	4	PC
5.		Programme Elective – 2	3	PE
6.		Programme Elective – 3 / Open Elective – 1	3	PE/OE
7.	CLLR13	ELR – 3 / Particulate Science and Technology Laboratory	2	ELR
8.	CLLR14	ELR – 4 / Chemical Reaction Engineering Laboratory	2	ELR
		Total	**25**	

Semester V (July Session)

Sl. No.	Course Code	Course Title	Credits	Category
1.	CLPC19	Programme Core – 9 / Transport Phenomena	3	PC
2.	CLPC20	Programme Core – 10 / Mass Transfer - II	4	PC
3.	CLPC21	Programme Core – 11 / Chemical Process Equipment Design	4	PC
4.	CLPC22	Programme Core – 12 / Safety in Chemical Process Industries	3	PC
5.	CLIR14	Professional Ethics	3	GIR
6.		Programme Elective – 4 / Open Elective - 2	3	PE/OE
7.	CLLR15	ELR – 5 / Mass Transfer Laboratory	2	ELR
8.	CLLR16	ELR – 6 / Technical Analysis and Thermodynamics Laboratory	2	ELR
		Total	**24**	

Semester V (July Session) / B.Sc. (Engineering) Exit

Sl. No.	Course Code	Course Title	Credits	Category
1.	CLIR14	Professional Ethics	3	GIR
2.	CLPC21	Programme Core – 9 / Chemical Process Equipment Design	4	PC
3.	CLPC20	Programme Core – 10 / Mass Transfer - II	4	PC
4.		Programme Elective – 4	3	PE
5.		Programme Elective – 5 / Open Elective – 2	3	PE/OE
6.	CLLR15	ELR– 5 / Mass Transfer Laboratory	2	ELR
7.	CLLR16	ELR – 6 / Technical Analysis and Thermodynamics Laboratory	2	ELR
		Total	**21**	

Semester VI (January Session)

Sl. No.	Course Code	Course Title	Credits	Category
1.	CLPC23	Programme Core – 13 / Process Modelling and Simulation	3	PC
2.	CLPC24	Programme Core – 14 / Process Dynamics and Control	3	PC
3.	CLPC25	Programme Core – 15 / Project Engineering and Economics	3	PC
4.		Programme Elective – 5	3	PE
5.		Programme Elective - 6	3	PE
6.		Programme Elective - 7 / Open Elective - 3	3	PE/OE
7.	CLIR19	Industrial Lecture	1	GIR
8.	CLLR17	ELR – 7 / Process Dynamics and Control Laboratory	2	ELR
9.	CLLR18	ELR – 8 / Process Modelling and Simulation Laboratory	2	ELR
		Total	**23**	

Semester VI (January Session) / B.Sc. (Engineering) Exit

Sl. No.	Course Code	Course Title	Credits	Category
1.	CLIR17	Project Work	6	GIR
2.	CLIR16	Winter Internship	2	GIR
3.	CLIR19	Industrial Lecture	1	GIR
4.	CLLR17	ELR –7 / Process Dynamics and Control Laboratory	2	ELR
5.	CLLR18	ELR – 8 / Process Modelling and Simulation Laboratory	2	ELR
		Total	**13**	

Semester VII (July Session)

Sl. No.	Course Code	Course Title	Credits	Category
1.		Programme Elective – 8 / Open Elective - 4	3	PE/OE
2.		Programme Elective – 9 / Open Elective - 5	3	PE/OE
3.		Programme Elective – 10	3	PE
4.		Programme Elective – 11	3	PE
5.	CLIR16	Summer Internship / Industrial Training / Academic Attachment	2	GIR
6.	CLIR18	Comprehensive Viva Voce	1	GIR
		Total	**15**	

Semester VII (July Session) / Rejoins B.Tech. after B.Sc. (Engineering) exit

Sl. No.	Course Code	Course Title	Credits	Category
1.	CLPC19	Programme Core – 11 / Transport Phenomena	3	PC
2.	CLPC22	Programme Core – 12 / Safety in Chemical Process Industries	3	PC
3.		Programme Elective – 6	3	PE
4.		Programme Elective – 7	3	PE
5.		Programme Elective – 8	3	PE
6.		Programme Elective – 9	3	PE
7.		Programme Elective – 10 / Open Elective – 3	3	PE/OE
		Total	**21**	

Semester VIII (January Session)

Sl. No.	Course Code	Course Title	Credits	Category
1.		Programme Elective – 12	3	PE
2.	CLIR17	Project Work	6	GIR
		Total	**9**	

Semester VIII (January Session) / Rejoins B.Tech. after B.Sc. (Engineering) exit

Sl. No.	Course Code	Course Title	Credits	Category
1.	CLPC23	Programme Core – 13 / Process Modelling and Simulation	3	PC
2.	CLPC24	Programme Core – 14 / Process Dynamics and Control	3	PC
3.	CLPC25	Programme Core – 15 / Project Engineering and Economics	3	PC
4.		Programme Elective – 11	3	PE
5.		Programme Elective – 12 / Open Elective – 4	3	PE/OE
6.	CLIR18	Comprehensive Viva Voce	1	GIR
		Total	**16**	

Credits:

Semester	I	II	III	IV	V	VI	VII	VIII	Total
B.Tech.	19	21	24	25	24	23	15	9	**160**
B.Sc.	19	21	24	25	21	13	21	16	**160**

Note:

1. Curriculum should have 7 Programme Core courses shall be of 4 credits each.
2. Out of 12 elective courses (PE/OE), the students should study at least eight Programme Elective courses (PE).
3. Minor (MI): 15 credits over and above the minimum credit as specified by the departments (160). The details of MINOR will be mentioned in the transcript.
4. Honors (HO): 15 credits over and above the minimum credit as specified by the departments (160).

Electives Choices

Option 1 / Regular B.Tech.

To get a B.Tech. degree in Chemical Engineering, possible choices of electives in Programme Electives and Open Electives are,

Programme Electives	Open Electives	Total
8	4	12
9	3	12
10	2	12
11	1	12
12	0	12

Option 2 / B.Sc. (Engineering) Exit (at end of 3rd year)

Programme Electives	Open Electives	Total
3	2	5
4	1	5
5	0	5

Option 3 / B.Tech. with Minor

To get a B.Tech. degree in Chemical Engineering, and Minor in other programmes, possible choices of electives in Programme Electives, Open Electives and Minor Electives are,

Programme Electives	Open Electives	Minor Electives	Total
8	4	5	12 + 5
9	3	5	12 + 5
10	2	5	12 + 5
11	1	5	12 + 5
12	0	5	12 + 5

Option 4 / B.Tech. with Honors

To get a B.Tech. Honors degree in Chemical Engineering, possible choices of electives in Programme Electives, Open Electives, and Honor Electives are,

Programme Electives	Open Electives	Honor Electives	Total
8	4	4	12 + 4
9	3	4	12 + 4
10	2	4	12 + 4
11	1	4	12 + 4
12	0	4	12 + 4

Option 5 / B.Tech. with Honors and Minor

To get a B.Tech. Honors degree in Chemical Engineering, and Minor in other programmespossible choices of electives in Programme Electives, Open Electives, and Honor Electives are,

Programme Electives	Open Electives	Honor Electives	Minor Electives	Total
8	4	4	5	12 + 4 + 5
9	3	4	5	12 + 4 + 5
10	2	4	5	12 + 4 + 5
11	1	4	5	12 + 4 + 5
12	0	4	5	12 + 4 + 5

Note: No Minor or Honors will be awarded for B.Sc. But student can credit Minors and Honors during the 6 semesters, and redeem it to obtain a Minor or Honors after rejoining and completing B.Tech. Also, B.Sc. students shall do Programme Electives in place of their project work in 6th semester.

List of Courses

I. Programme Core (PC)

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	CLPC11	Process Calculations	None	4
2.	CLPC12	Heat Transfer	None	3
3.	CLPC13	Momentum Transfer	None	4
4.	CLPC14	Chemical Engineering Thermodynamics	CLPC11	4
5.	CLPC15	Chemical Technology	None	3
6.	CLPC16	Particulate Science and Technology	None	3
7.	CLPC17	Chemical Reaction Engineering	CLPC14, CLPC12	4
8.	CLPC18	Mass Transfer - I	CLPC11, CLPC14	4
9.	CLPC19	Transport Phenomena	CLPC18, CLPC12, CLPC13	3
10.	CLPC20	Mass Transfer - II	CLPC18	4
11.	CLPC21	Chemical Process Equipment Design	CLPC12, CLPC18, CLPC17, CLPC20	4
12.	CLPC22	Safety in Chemical Process Industries	CLPC15	3
13.	CLPC23	Process Modelling and Simulation	CLPC12, CLPC18, CLPC17, CLPC20	3
14.	CLPC24	Process Dynamics and Control	MAIR21	3
15.	CLPC25	Project Engineering and Economics	CLPC15	3
		Total		**52**

II. Essential Laboratory Requirements (ELR)

Sl. No.	Course Code	Course Title	Co requisites	Credits
1.	CLLR11	Momentum Transfer Laboratory	CLPC13	2
2.	CLLR12	Heat Transfer Laboratory	CLPC12	2
3.	CLLR13	Particulate Science and Technology Laboratory	CLPC16	2
4.	CLLR14	Chemical Reaction Engineering Laboratory	CLPC17	2
5.	CLLR15	Mass Transfer Laboratory	CLPC18, CLPC20	2
6.	CLLR16	Technical analysis and Thermodynamics Laboratory	CLPC14	2
7.	CLLR17	Process Dynamics and Control Laboratory	CLPC24	2
8.	CLLR18	Process Modelling and Simulation Laboratory	CLPC23	2
Total				**16**

NOTE: Students can register for 2 laboratory courses during one session along with regular courses (PC / PE / OE /MI).

III. Elective Courses

a. Programme Electives (PE)

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	CLPE11	Chemistry - III	None	3
2.	CLPE12	Petroleum Refining and Petrochemicals	None	3
3.	CLPE13	Computer Applications in Chemical Engineering	None	3
4.	CLPE14	Polymer science and Technology	None	3
5.	CLPE15	Material Science and Technology	None	3
6.	CLPE16	Water Treatment Technology	None	3
7.	CLPE17	Industrial wastewater treatment	None	3
8.	CLPE18	Solid Waste Management	None	3
9.	CLPE19	Air Pollution and Control Engineering	None	3
10.	CLPE20	Modern Separation Processes	None	3
11.	CLPE21	Electrochemical Reaction Engineering	None	3
12.	CLPE22	Fuel cells and batteries	None	3
13.	CLPE23	Heterogeneous Chemical Reaction Engineering	None	3
14.	CLPE24	Biochemical Engineering	None	3
15.	CLPE25	Biorefinery Engineering	None	3
16.	CLPE26	Industrial Process Biotechnology	None	3
17.	CLPE27	Process Intensification	None	3
18.	CLPE28	Food Processing Technology	None	3
19.	CLPE29	Pharmaceutical Technology	None	3
20.	CLPE30	Fluidization Engineering	None	3

b. Open Electives (OE): Offered by Department

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	CLOE11	Environmental Engineering	None	3
2.	CLOE12	Energy Engineering	None	3
3.	CLOE13	Process Instrumentation	None	3
4.	CLOE14	Introduction to Data Analysis	None	3
5.	CLOE15	Process Optimization	None	3
6.	CLOE16	Design and Analysis of Experiments	None	3
7.	CLOE17	Soft Computing Techniques	None	3
8.	CLOE18	Nonlinear Controller Techniques	None	3
9.	CLOE19	Nano Technology	None	3
10.	CLOE20	Bioenergy	None	3
11.	CLOE21	Solar Energy	None	3
12.	CLOE22	Interfacial Engineering	None	3

c. Online Courses (OC)

Sl. No.	Course Code	Course Title	Prerequisites	Credits
		Course list shall be updated regularly at the start of each Academic Year or Semester by the department NPTEL Coordinator. The students shall be able to select an online course from then available list.		

IV. Minor (MI) (offered for the students of other departments)

Students who have registered for B.Tech. Minor in Chemical Engineering can opt to study the courses listed below.

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	CLMI11	Chemical Process Calculations	NONE	3
2.	CLMI12	Transfer Operations – I	NONE	3
3.	CLMI13	Transfer Operations – II	CLMI12	3
4.	CLMI14	Chemical Reaction Engineering	NONE	3
5.	CLMI15	Chemical Technology	NONE	3

V. Advanced Level Courses for B.Tech. (Honors)

- Consistently obtained a minimum CGPA of 8.5 in the first four sessions.
- Consistently maintaining a minimum CGPA of 8.5 in all sessions excluding Honors courses.
- Completed additional theory courses for 15 credits from the basket of Honors courses listed (3 Nos. of 4 credits courses and 1 No. of 3 credit course)
- Honors courses shall not be treated as PE under any circumstances.

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	CLHO11	Advanced Process control	CLPC24	4
2.	CLHO12	Pinch Analysis and Heat Exchange Network Design	CLPC12, CLPC14	4
3.	CLHO13	Applied Mathematics in Chemical Engineering	CLPC12, CLPC18, CLPC17	4
4.	CLHO14	Advances in Heat Transfer	CLPC12	4
5.	CLHO15	Computational Fluid Dynamics	CLPC13, CLPC16	3
6.	CLHO16	Process Safety Management	NONE	3
7.	CLHO17	Statistical Mechanics and Thermodynamics	CLPC 14	3

VI. Microcredits (MC)

(Students can opt 3 courses of 1 credit (4 weeks) each as microcredits instead of 1 OE/OC)

Note: Course list shall be updated regularly at the start of each Academic Year or Semester by the department NPTEL Coordinator. The students shall be able to select an online course from then available list.

CIVIL ENGINERING

The total minimum credits for completing the B.Tech. programme in Civil Engineering is **160.**

CURRICULUM FRAME WORK / FLEXIBLE CURRICULUM / NEP 2020 / NCrF / B.Tech.

Semester	GIR		PC		ELR		PE/OE		Total Credits	Credit Distribution
	No. of Courses	Credits	No. of Courses	Credits	No. of Courses	Credits	No. of Courses	Credits		
I	8	21	-	-	-	-	-	-	**21**	**40**
II	7	15	1	4	-	-	-	-	**19**	
III	-	-	4	14	2	4	2	6	**24**	**48**
IV	1	4	3	10	2	4	2	6	**24**	
V	1	3	4	14	2	4	1	3	**24**	**48**
VI	2	4	3	10	2	4	2	6	**24**	
VII	2	3	-	-	-	-	4	12	**15**	**24**
VIII	1	6	-	-	-	-	1	3	**9**	
Total	**22**	**56**	**15**	**52**	**8**	**16**	**12**	**36**	**160**	**160**

CURRICULUM FRAME WORK / FLEXIBLE CURRICULUM / NEP 2020 / NCrF / B.Sc. (Engineering)

	Sem	GIR		PC		ELR		PE/OE		Total Credits	Credit Distribution
		No. of Courses	Credits	No. of Courses	Credits	No. of Courses	Credits	No. of Courses	Credits		
Same as B.Tech.	**I**	8	21	-	-	-	-	-	-	**21**	**40**
	II	7	15	1	4	-	-	-	-	**19**	
	III	-	-	4	14	2	4	2	6	**24**	**48**
	IV	1	4	3	10	2	4	2	6	**24**	
B.Sc. Exit	**V**	1	3	2	8	2	4	2	6	**21**	**37**
	VI	4[@]	12	-	-	2	4	-	-	**16**	
After B.Sc. exit and join back for B. Tech.	**VII**	-	-	3	10	-	-	3	9	**19**	**35**
	VIII	1	1	2	6	-	-	3	9	**16**	
	Total	**22**	**56**	**15**	**52**	**8**	**16**	**12**	**36**	**160**	**160**

[@](Internship (2), Project Work (6), Industrial Economics course (3), and Industrial Lecture (1))

CURRICULUM FRAMEWORK AND CREDIT SYSTEM / 160

Semester I (July Session)

Sl. No.	Course Code	Course Title	Credits	Category
1.	HSIR11	English for Communication (Theory and Laboratory)	4	GIR
2.	MAIR11	Matrices and Calculus	3	GIR
3.	CHIR11	Chemistry	3	GIR
4.	CEIR15	Introduction to Civil Engineering (*Branch Specific Course*)	2	GIR
5.	EEIR11	Basics of Electrical and Electronics Engineering	2	GIR
6.	MEIR11	Basics of Mechanical Engineering	2	GIR
7.	MEIR12	Engineering Graphics	3	GIR
8.	CHIR12	Chemistry Laboratory	2	GIR
Total			**21**	

Semester II (January Session)

Sl. No.	Course Code	Course Title	Credits	Category
1.	MAIR21	Complex Analysis and Differential Equations	3	GIR
2.	PHIR11	Physics	3	GIR
3.	CSIR12	Introduction to Computer Programming (Theory and Laboratory)	3	GIR
4.	ENIR11	Energy and Environmental Engineering	2	GIR
5.	PRIR11	Engineering Practice	2	GIR
6.	PHIR12	Physics Laboratory	2	GIR
7.	SWIR11	NSS / NCC / NSO	0	GIR
8.	CEPC10	Programme Core – 1 / Engineering Mechanics	4	PC
Total			**19**	

Semester III (July Session)

Sl. No.	Course Code	Course Title	Credits	Category
1.	CEPC11	Programme Core – 2 / Concrete Technology and Construction Management	4	PC
2.	CEPC12	Programme Core – 3 / Hydraulics and Fluid Machinery	4	PC
3.	CEPC13	Programme Core – 4 / Surveying	3	PC
4.	CEPC14	Programme Core – 5 / Mechanics of Solids	3	PC
5.		Programme Elective – 1	3	PE
6.		Programme Elective – 2	3	PE
7.	CELR10	ELR – 1 / Building Planning and Drawing	2	ELR
8.	CELR11	ELR – 2 / Survey Laboratory	2	ELR
Total			**24**	

Note: Department(s) to offer Minor (MI) Course and Online Course (OC) to those willing students in addition to 24 credits.

Semester IV (January Session)

Sl. No.	Course Code	Course Title	Credits	Category
1.	MAIR42	Probability and Numerical Techniques	4	GIR
2.	CEPC15	Programme Core – 6 / Analysis of Indeterminate Structures	4	PC
3.	CEPC16	Programme Core – 7 / Soil Mechanics	3	PC
4.	CEPC17	Programme Core – 8 / Water Supply Engineering	3	PC
5.		Programme Elective – 3	3	PE
6.		Programme Elective – 4 / Open Elective – 1	3	PE/OE
7.	CELR12	ELR – 3 / Fluid Mechanics Laboratory	2	ELR
8.	CELR13	ELR – 4 / Strength of materials and concrete Laboratory	2	ELR
Total			**24**	

Semester V (July Session) / Continuing B.Tech.

Sl. No.	Course Code	Course Title	Credits	Category
1.	CEIR14	Professional Ethics	3	GIR
2.	CEPC18	Programme Core – 9 / Design of Reinforced Concrete Structural Elements	4	PC
3.	CEPC19	Programme Core – 10 / Highway and Pavement Engineering	4	PC
4.	CEPC20	Programme Core – 11 / Foundation Engineering	3	PC
5.	CEPC21	Programme Core – 12 / Environmental Pollution and Control Engineering	3	PC
6.		Programme Elective – 5 / Open Elective – 2	3	PE/OE
7.	CELR14	ELR – 5 / Geotechnical Engineering Laboratory	2	ELR
8.	CELR15	ELR – 6 / Environmental Engineering Laboratory	2	ELR
Total			**24**	

Semester V (July Session) / B.Sc. (Engineering) Exit

Sl. No.	Course Code	Course Title	Credits	Category
1.	CEIR14	Professional Ethics	3	GIR
2.	CEPC18	Programme Core – 9 / Design of Reinforced Concrete Structural Elements	4	PC
3.	CEPC19	Programme Core – 10 / Highway and Pavement Engineering	4	PC
4.		Programme Elective – 5	3	PE
5.		Programme Elective - 6 / Open Elective – 2	3	PE/OE
6.	CELR14	ELR – 5 / Geotechnical Engineering Laboratory	2	ELR
7.	CELR15	ELR – 6 / Environmental Engineering Laboratory	2	ELR
Total			**21**	

Semester VI (January Session)

Sl. No.	Course Code	Course Title	Credits	Category
1.	CEIR19	Industrial Lecture	1	GIR
2.	HSIR13	Industrial Economics	3	GIR
3.	CEPC22	Programme Core – 13 / Irrigation Engineering and Hydraulic Structures	4	PC
4.	CEPC23	Programme Core – 14 / Railway, Airport and Harbour Engineering	3	PC
5.	CEPC24	Programme Core – 15 / Design of Steel Structural Elements	3	PC
6.		Programme Elective – 6	3	PE
7.		Programme Elective – 7 / Open Elective – 3	3	PE/OE
8.	CELR16	ELR – 7 / Transportation Engineering Laboratory	2	ELR
9.	CELR17	ELR – 8 / Computational Laboratory	2	ELR
Total			**24**	

Semester VI (January Session) / B.Sc. (Engineering) Exit

Sl. No.	Course Code	Course Title	Credits	Category
1.	CEIR17	Project Work	6	GIR
2.	CEIR16	Winter Internship	2	GIR
3.	CEIR19	Industrial Lecture	1	GIR
4.	HSIR13	Industrial Economics	3	GIR
5.	CELR16	ELR – 7 / Transportation Engineering Laboratory	2	ELR
6.	CELR17	ELR – 8 / Computational Laboratory	2	ELR
Total			**16**	

Semester VII (July Session)

Sl. No.	Course Code	Course Title	Credits	Category
1.	CEIR16	Summer Internship / Industrial Training / Academic Attachment*	2	GIR
2.	CEIR18	Comprehensive Viva Voce	1	GIR
3.		Programme Elective – 8	3	PE
4.		Programme Elective – 9	3	PE
5.		Programme Elective – 10 / Open Elective – 4	3	PE/OE
6.		Programme Elective – 11 / Open Elective – 5	3	PE/OE
Total			**15**	

*** Evaluation for Summer Internship**

Semester VII (July Session) / Rejoins B.Tech. After B.Sc. (Engineering) Exit

Sl. No.	Course Code	Course Title	Credits	Category
1.	CEPC20	Programme Core – 11 / Foundation Engineering	3	PC
2.	CEPC21	Programme Core – 12 / Environmental Pollution and Control Engineering	3	PC
3.	CEPC22	Programme Core – 13 / Irrigation Engineering and Hydraulic Structures	4	PC
4.		Programme Elective – 7	3	PE
5.		Programme Elective – 8	3	PE
6.		Programme Elective – 9 / Open Elective – 3	3	PE/OE
Total			**19**	

Semester VIII (January Session)

Sl. No.	Course Code	Course Title	Credits	Category
1.		Programme Elective – 12 / Open Elective – 4	3	PE/OE
2.	CEIR17	Project Work	**6**	GIR
Total			**9**	

Semester VIII (January Session) / Rejoins B.Tech. After B.Sc. (Engineering) Exit

Sl. No.	Course Code	Course Title	Credits	Category
1.	CEIR18	Comprehensive Viva Voce	1	GIR
2.	CEPC23	Programme Core – 14 / Railway, Airport and Harbour Engineering	3	PC
3.	CEPC24	Programme Core – 15 / Basic Steel Structural Elements	3	PC
4.		Programme Elective – 10	3	PE
5.		Programme Elective – 11	3	PE
6.		Programme Elective – 12 / Open Elective – 4	3	PE/OE
Total			**16**	

Credits:

Semester	I	II	III	IV	V	VI	VII	VIII	Total
B.Tech.	19	21	24	24	24	24	15	9	**160**
B.Sc.	19	21	24	24	21	16	19	16	**160**

Note:

- Curriculum should have 7 Programme Core courses shall be of 4 credits each.
- Out of 12 elective courses (PE/OE), the students should study at least eight Programme Elective courses (PE).

- Minor (MI): 15 credits over and above the minimum credit as specified by the departments (160). The details of MINOR will be mentioned in the transcript.
- Honors (HO): 15 credits over and above the minimum credit as specified by the departments (160).

ELECTIVES CHOICES

Option 1 / Regular B.Tech.

To get a B.Tech. degree in Civil Engineering, possible choices of electives in Programme Electives and Open Electives are,

Programme Electives	Open Electives	Total
8	4	12
9	3	12
10	2	12
11	1	12
12	0	12

Option 2 / B.Sc. (Engineering) Exit (At End of 3rd Year)

Programme Electives	Open Electives	Total
3	2	5
4	1	5
5	0	5

Option 3 / B.Tech. With Minor

To get a B.Tech. degree in Civil Engineering, and Minor in other programmes, possible choices of electives in Programme Electives, Open Electives and Minor Electives are,

Programme Electives	Open Electives	Minor Electives	Total
8	4	5	12 + 5
9	3	5	12 + 5
10	2	5	12 + 5
11	1	5	12 + 5
12	0	5	12 + 5

Option 4 / B.Tech. With Honors

To get a B.Tech. Honors degree in Civil Engineering, possible choices of electives in Programme Electives, Open Electives, and Honor Electives are,

Programme Electives	Open Electives	Honor Electives	Total
8	4	4	12 + 4
9	3	4	12 + 4
10	2	4	12 + 4
11	1	4	12 + 4
12	0	4	12 + 4

Option 5 / B.Tech. With Honors And Minor

To get a B.Tech. Honors degree in Civil Engineering, and Minor in other programmes possible choices of electives in Programme Electives, Open Electives, and Honor Electives are,

Programme Electives	Open Electives	Honor Electives	Minor Electives	Total
8	4	4	5	12 + 4 + 5
9	3	4	5	12 + 4 + 5
10	2	4	5	12 + 4 + 5
11	1	4	5	12 + 4 + 5
12	0	4	5	12 + 4 + 5

Note: No Minor or Honors will be awarded for B.Sc. But student can credit Minors and Honors during the 6 semesters, and redeem it to obtain a Minor or Honors after rejoining and completing B.Tech. Also, B.Sc. students shall do Programme Electives in place of their project work in 6th semester.

List of Courses

I. Programme Core (PC)

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	CEPC10	Engineering Mechanics	-	4
2.	CEPC11	Concrete Technology and Construction Management	-	4
3.	CEPC12	Hydraulics and Fluid Machinery	-	4
4.	CEPC13	Surveying	-	3
5.	CEPC14	Mechanics of Solids	CEPC10	3
6.	CEPC15	Analysis of Indeterminate Structures	CEPC14	4
7.	CEPC16	Soil Mechanics	-	3
8.	CEPC17	Water Supply Engineering	-	3
9.	CEPC18	Design of Reinforced Concrete Structural Elements	CEPC15	4
10.	CEPC19	Highway and Pavement Engineering	-	4
11.	CEPC20	Foundation Engineering	CEPC16	3
12.	CEPC21	Environmental Pollution and Control Engineering	-	3
13.	CEPC22	Irrigation Engineering and Hydraulic Structures	CEPC12	4
14.	CEPC23	Railway, Airport and Harbour Engineering	-	3
15.	CEPC24	Design of Steel Structural Elements	CEPC15	3

II. Elective Courses

a. Programme Electives (PE)

Stream I (Construction Technology and Management)

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	CEPE10	Construction Techniques and Equipment	-	3
2.	CEPE11	Construction Management	-	3
3.	CEPE12	Project Planning, Scheduling and Control	-	3
4.	CEPE13	Quality and Safety Management in Construction Projects	-	3
5.	CEPE14	Estimation and Costing in Civil Engineering	-	3
6.	CEPE15	Lean Concepts and Tools in Construction Projects	-	3
7.	CEPE16	Project Risk Management	-	3
8.	CEPE17	Project and Business Strategy Management in Construction	-	3
9.	CEPE18	Infrastructure Project Delivery and Management	-	3
10.	CEPE19	Sustainable Practices in Construction	-	3

Stream II (Environmental Engineering)

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	CEPE20	Air Pollution Management	CEPC17	3
2.	CEPE21	Industrial Wastewater Treatment	CEPC17	3
3.	CEPE22	Environmental Management and Impact Assessment	CEPC17	3
4.	CEPE23	Solid Waste Management Techniques	CEPC17	3
5.	CEPE24	Models for Air and Water Quality	CEPC17	3
6.	CEPE25	Hazardous Waste Management	CEPC17	3
7.	CEPE26	Indoor Air Quality	CEPC17	3
8.	CEPE27	Health Safety and Environment	CEPC17	3

Stream III (Geotechnical Engineering)

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	CEPE30	Advanced Foundation Engineering	CEPC20	3
2.	CEPE31	Geotechnical Earthquake Engineering	CEPC20	3
3.	CEPE32	Reinforced Earth and Geotextiles	CEPC20	3
4.	CEPE33	Earth and Earth Retaining Structures	CEPC20	3
5.	CEPE34	Marine Foundation Engineering	CEPC20	3
6.	CEPE35	Ground Improvement Techniques	CEPC20	3
7.	CEPE36	Rock Mechanics	-	3

8.	CEPE37	Geoenvironmental Engineering	CEPC20	3
9.	CEPE38	Fundamentals of Geosynthetic Engineering	-	3
10.	CEPE39	Engineering Geology	-	3

Stream IV (Geospatial Techniques)

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	CEPE40	Geodetic Surveying	CEPC13	3
2.	CEPE41	Advanced Surveying Techniques	CEPC13	3
3.	CEPE42	Geodesy	CEPC13	3
4.	CEPE43	Disaster Modelling and Management	CEPC13	3
5.	CEPE44	AI/ML and DL for Remote Sensing and GIS	CEPC13	3
6.	CEPE45	Geomatics in Water Resources Engineering	CEPC13	3
7.	CEPE46	Advanced Geospatial Techniques	CEPC13	3
8.	CEPE47	Thermal and Hyperspectral Remote Sensing	CEPC13	3

Stream V (Transportation Engineering)

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	CEPE50	Traffic Engineering and Safety	CEPC19	3
2.	CEPE51	Pavement Analysis and Design	CEPC19	3
3.	CEPE52	Transportation Planning	-	3
4.	CEPE53	Urban Transportation Systems	-	3
5.	CEPE54	Intelligent Transportation Systems	-	3
6.	CEPE55	Pavement Management System	CEPC19	3
7.	CEPE56	Pavement Material Characterisation	-	3
8.	CEPE57	Sustainable Transportation	-	3

Stream VI (Structural Engineering)

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	CEPE60	Elementary Structural Dynamics	CEPC10	3
2.	CEPE61	Maintenance and Rehabilitation of Structures	CEPC11	3
3.	CEPE62	Conceptual Design of Structures	CEPC10	3
4.	CEPE63	Prestressed Concrete Structures	CEPC18	3
5.	CEPE64	Advanced Reinforced Concrete Design	CEPC18	3
6.	CEPE65	Advanced Steel Structural Elements	CEPC24	3
7.	CEPE66	Advanced Structural Analysis	CEPC15	3
8.	CEPE67	Design of Offshore and Coastal Structures	CEPC18 CEPC24	3
9.	CEPE68	Prefabricated Structures	CEPC18 CEPC24	3

10.	CEPE69	Heritage Structures	CEPC14	3
11.	CEPE70	Earthquake Resistant Structures	CEPC18 CEPC24	3
12.	CEPE71	Steel Concrete Composite Structures	CEPC18 CEPC24	3
13.	CEPE72	Metallurgy for Civil Engineers	CEPC24	3
14.	CEPE73	Basic Bridge Engineering	CEPC18 CEPC24	3
15.	CEPE74	Advanced Mechanics of Solids	CEPC10 CEPC11	3
16.	CEPE75	Optimisation Techniques in Civil Engineering	-	3
17.	CEPE76	Introduction to Finite Element Methods	CEPC10 CEPC15	3
18.	CEPE77	Structural Health Monitoring	CELR13	3
19.	CEPE78	Introduction to Matrix Method of Structural Analysis	CEPC15	3

Stream VII (Water Resources Engineering)

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	CEPE80	Groundwater Hydrology	CEPC12	3
2.	CEPE81	Applied Hydraulics Engineering	CEPC12	3
3.	CEPE82	Simulation Modelling for Water Resources Engineering	CEPC12	3
4.	CEPE83	Coastal Engineering	CEPC12	3
5.	CEPE84	Surface water hydrology	CEPC12	3
6.	CEPE85	AI /ML for water Resources Engineering	CEPC12	3
7.	CEPE86	Hydroclimatology	CEPC12	3
8.	CEPE87	River Engineering	CEPC12	3
9.	CEPE88	Watershed Management	CEPC12	3
10.	CEPE89	Water Resources Systems Planning	CEPC12	3

b. Open Elective (OE)

The courses listed below are offered by the Department of Civil Engineering for students of all Departments.

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	CEOE10	Remote Sensing and GIS	-	3
2.	CEOE11	Ocean Energy	-	3
3.	CEOE12	Urban and Regional Planning	-	3
4.	CEOE13	Experimental Stress Analysis	-	3
5.	CEOE14	Sustainable Infrastructure	-	3
6.	CEOE15	Disaster Modelling and Management	-	3
7.	CEOE16	Standardization and Conformity Assessment	-	3
8.	CEOE17	Computational Fluid dynamics	-	3
9.	CEOE18	Hydroinformatics	-	3
10.	CEOE19	Reliability methods	-	3
11.	CEOE20	Uncertainty Modelling, Analysis and Quantification	-	3
12.	CEOE21	Application of Remote Sensing and GIS in Agriculture and Forestry	-	3

c. Minor (MI) (Offered for the Students of Other Departments)

Students of other departments who desire B.Tech. Minor in Civil Engineering can opt to study any 5 of the courses listed below.

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	CEMI10	Construction Technology	-	3
2.	CEMI11	Surveying Practices	-	3
3.	CEMI12	Structural Analysis and Design	-	3
4.	CEMI13	Soils and Foundations	-	3
5.	CEMI14	Transportation Systems	-	3
6.	CEMI15	Water and Air Pollution Management	-	3
7.	CEMI16	Irrigation Engineering and Management	-	3
8.	CEMI17	Quantity Estimation and Valuation	-	3

III. Essential Laboratory Requirement (ELR)

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	CELR10	Building Planning and Drawing	-	2
2.	CELR11	Survey Laboratory	-	2
3.	CELR12	Fluid Mechanics Laboratory	-	2
4.	CELR13	Strength of Materials and Concrete Laboratory	-	2
5.	CELR14	Geotechnical Engineering Laboratory	-	2
6.	CELR15	Environmental Engineering Laboratory	-	2
7.	CELR16	Transportation Engineering Laboratory	-	2
8.	CELR17	Computational Laboratory	-	2

IV. Online Courses (OC)

Sl. No.	Course Code	Course Title	Prerequisites	Credits
		Course list shall be updated regularly at the start of each Academic Year or Semester by the department NPTEL Coordinator. The students shall be able to select an online course from then available list.		

V. ADVANCED LEVEL COURSES FOR B.Tech. (HONORS)

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	CEHO10	Dynamics of Structures	CEPC10 CEPE66	4
2.	CEHO11	Finite Element Analysis	CEPE66	4
3.	CEHO12	Theory of Elasticity and Introduction to Plasticity	CEPC10	4
4.	CEHO13	Nonlinear Analysis of Structures	CEPC15	3
5.	CEHO14	Theory of Traffic Flow	CEPC19	3
6.	CEHO15	Pavement Construction and Management	CEPC19	4
7.	CEHO16	Dynamics of Soils and Foundations	CEPC20	4
8.	CEHO17	Soil Exploration and Field Testing	CEPC20	3
9.	CEHO18	Physicochemical Methods for Water and Wastewater Treatment	CEPC21	4

10.	CEHO19	Biological Treatment of Wastewater	CEPC21	4
11.	CEHO20	Free Surface Flow	CEPC12	3
12.	CEHO21	Wave Hydrodynamics	CEPC12	3
13.	CEHO22	Advanced Remote Sensing Techniques	CEPC13	4
14.	CEHO23	River Hydraulics and Sediment Transport	CEPC22	4
15.	CEHO24	Advanced Soil Mechanics	CEPE16	3
16.	CEHO25	Soft Computing Techniques in Civil Engineering	-	3
17.	CEHO26	Quantitative Methods in Construction Management	-	3

VI. MICROCREDITS (MC)

(Students can opt 3 courses of 1 credit (4 weeks) each as microcredits instead of 1 OE/OC)

Note: Course list shall be updated regularly at the start of each Academic Year or Semester by the department NPTEL Coordinator. The students shall be able to select an online course from then available list.

COMPUTER SCIENCE AND ENGINEERING

The total minimum credits for completing the B.Tech. programme in Computer Science and Engineering is **160.**

CURRICULUM FRAME WORK / FLEXIBLE CURRICULUM / NEP 2020 / NCrF / B.Tech.

Semester	GIR		PC		ELR		PE/OE		Total Credits	Credit Distribution
	Course	Credit	Course	Credit	Course	Credit	Course	Credit		
I	8	19	-	-	-	-	-	-	**19**	**40**
II	7	17	1	4	-	-	-	-	**21**	
III	1	4	4	13	2	4	1	3	**24**	**47**
IV	1	3	3	10	2	4	2	6	**23**	
V	1	3	4	14	2	4	1	3	**24**	**49**
VI	1	1	3	11	2	4	3	9	**25**	
VII	2	3	-	-	-	-	4	12	**15**	**24**
VIII	1	6	-	-	-	-	1	3	**9**	
Total	**22**	**56**	**15**	**52**	**8**	**16**	**12**	**36**	**160**	**160**

CURRICULUM FRAME WORK / FLEXIBLE CURRICULUM / NEP 2020 / NCrF / B.Sc. (Engineering)

	Sem	GIR		PC		ELR		PE/OE		Total Credits	Credit Distri-bution
		Course	Credit	Course	Credit	Course	Credit	Course	Credit		
Same as B.Tech.	**I**	8	19	-	-	-	-	-	-	**19**	**40**
	II	8	17	1	4	-	-	-	-	**21**	
	III	1	4	4	13	2	4	1	3	**24**	**47**
	IV	1	3	3	10	2	4	2	6	**23**	
B.Sc. Exit	**V**	1	3	2	6	2	4	1	3	**16**	**33**
	VI	4[@]	12	-	-	1	2	1	3	**17***	
After B.Sc. exit and join back for B. Tech.	**VII**	-	-	2	8	-	-	4	12	**20**	**40**
	VIII	1	1	2	8	1	2	3	9	**20**	
	Total	**24**	**59**	**14**	**49**	**8**	**16**	**12**	**36**	**160**	**160**

[@](Summer internship (2), Project Work (6) and Industrial Lecture (1))

Curriculum Framework and Credit System (CSE) / 160

Semester I (July Session)

Sl. No.	Course Code	Course Title	Credits	Category
1.	MAIR12	Linear Algebra and Calculus	3	GIR
2.	PHIR11	Physics	3	GIR
3.	ENIR11	Energy and Environmental Engineering	2	GIR
4.	CSIR11	Introduction to Computer Programming (Theory and Laboratory)	3	GIR
5.	CEIR11	Basics of Civil Engineering	2	GIR
6.	MEIR11	Basics of Mechanical Engineering	2	GIR
7.	PRIR11	Engineering Practice	2	GIR
8.	PHIR12	Physics Laboratory	2	GIR
		Total	**19**	

Semester II (January Session)

Sl. No.	Course Code	Course Title	Credits	Category
1.	HSIR11	English for Communication (Theory and Laboratory)	4	GIR
2.	MAIR21	Complex Analysis and Differential Equations	3	GIR
3.	CHIR11	Chemistry	3	GIR
4.	CSIR21	*Branch Specific Course*	2	GIR
5.	MEIR12	Engineering Graphics	3	GIR
6.	CHIR12	Chemistry Laboratory	2	GIR
7.	SWIR11	NSS / NCC / NSO	0	GIR
8.	CSPC11	Programme Core – 1 / Discrete Structures	4	PC
		Total	**21**	

Semester III (July Session)

Sl. No.	Course Code	Course Title	Credits	Category
1.	MAIR31	Probability and Operations Research	4	GIR
2.	CSPC31	Programme Core - 2 / Principles of Programming Languages	4	PC
3.	CSPC32	Programme Core – 3 / Data Structures	3	PC
4.	CSPC33	Programme Core – 4 / Digital Systems Design	3	PC
5.	CSPC34	Programme Core – 5 / Computer Organization	3	PC
6.		Programme Elective – 1	3	PE
7.	CSLR31	ELR – 1 / Data structures Laboratory	2	ELR
8.	CSLR32	ELR – 2 / Digital Laboratory	2	ELR
		Total	**24**	

Note: Department(s) to offer Minor (MI) Course and Online Course (OC) to those willing students in addition to 24 credits.

Semester IV (January Session)

Sl. No.	Course Code	Course Title	Credits	Category
1.	CSIR14	Professional Ethics	3	GIR
2.	CSPC41	Programme Core – 6 / Formal Languages and Automata Theory	4	PC
3.	CSPC42	Programme Core – 7 / Design and Analysis of Algorithms	3	PC
4.	CSPC43	Programme Core – 8 / Operating Systems	3	PC
5.		Programme Elective – 2	3	PE
6.		Programme Elective – 3 / Open Elective – 1	3	PE/OE
7.	CSLR41	ELR – 3 / Algorithms Laboratory	2	ELR
8.	CSLR42	ELR – 4 / Operating Systems Laboratory	2	ELR
		Total	**23**	

Semester V (July Session) / Continuing B.Tech.

Sl. No.	Course Code	Course Title	Credits	Category
1.	HSIR13	Industrial Economics	3	GIR
2.	CSPC51	Programme Core - 9 / Computer Architecture	4	PC
3.	CSPC52	Programme Core - 10 / Database Management Systems	4	PC
4.	CSPC53	Programme Core – 11 / Computer Networks	3	PC
5.	CSPC54	Programme Core – 12 / Introduction to Artificial Intelligence and Machine Learning	3	PC
6.		Programme Elective – 4 / Open Elective – 2	3	PE
7.	CSLR51	ELR – 5 / Database Management Systems Laboratory	2	ELR
8.	CSLR52	ELR – 6 / Networks Laboratory	2	ELR
		Total	**24**	

Semester VI (January Session)

Sl. No.	Course Code	Course Title	Credits	Category
1.	CSIR19	Industrial Lecture	1	GIR
2.	CSPC61	Programme Core - 13 / Embedded Systems Architectures	4	PC
3.	CSPC62	Programme Core - 14 / Compiler Design	4	PC
4.	CSPC63	Programme Core – 15 / Principles of Cryptography	3	PC
5.		Programme Elective – 5	3	PE
6.		Programme Elective – 6	3	PE
7.		Programme Elective – 7 / Open Elective – 3	3	PE/OE
8.	CSLR61	ELR – 7 / Embedded Systems Laboratory	2	ELR
9.	CSLR62	ELR – 8 / App Development Laboratory	2	ELR
		Total	**25**	

Semester VII (July Session)

Sl. No.	Course Code	Course Title	Credits	Category
1.	CSIR16	Summer Internship / Industrial Training / Academic Attachment	2	GIR
2.	CSIR18	Comprehensive Viva Voce	1	GIR
3.		Programme Elective – 8	3	PE
4.		Programme Elective – 9	3	PE
5.		Programme Elective – 10 / Open Elective – 4	3	PE/OE
6.		Programme Elective – 11 / Open Elective – 5	3	PE/OE
		Total	**15**	

Semester VIII (January Session)

Sl. No.	Course Code	Course Title	Credits	Category
1.		Programme Elective – 12 / Open Elective – 6	3	PE/OE
2.	CSIR17	Project Work	6	GIR
		Total	**9**	

Semester V (July Session) / B.Sc. (Engineering) Exit

Sl. No.	Course Code	Course Title	Credits	Category
1.	HSIR13	Industrial Lecture	3	GIR
2.	CSPC51	Programme Core – 9 / Database Management Systems	3	PC
3.	CSPC52	Programme Core – 10 / Computer Networks	3	PC
4.		Programme Elective – 4 / Open Elective – 2	3	PE/OE
5.	CSLR51	ELR – 5 / Database Management Systems Laboratory	2	ELR
6.	CSLR52	ELR – 6 / Networks Laboratory	2	ELR
		Total	**16**	

Semester VI (January Session) / B.Sc. (Engineering) Exit

Sl. No.	Course Code	Course Title	Credits	Category
1.	CSIR17	Project Work	6	GIR
2.	CSIR16	Winter Internship	2	GIR
3.	CSIR19	Industrial Lecture	1	GIR
4.		Programme Core – 11 / Embedded Systems Architectures	3	PC
5.		Programme Elective – 5	3	PE
6.	CSLR61	ELR – 7 / Embedded Systems Laboratory	2	ELR
		Total	**17**	

Semester VII (July Session) / Rejoins B.Tech. after B.Sc. (Engineering) exit

Sl. No.	Course Code	Course Title	Credits	Category
1.	CSPC54	Programme Core – 12 / Introduction to Artificial Intelligence and Machine Learning	4	PC
2.	CSPC51	Programme Core – 13 / Computer Architecture	4	PC

3.		Programme Elective – 6	3	PE
4.		Programme Elective – 7	3	PE
5.		Programme Elective – 8	3	PE
6.		Programme Elective – 9 / Open Elective – 3	3	PE/OE
		Total	**20**	

Semester VIII (January Session) / Rejoins B.Tech. after B.Sc. (Engineering) exit

Sl. No.	Course Code	Course Title	Credits	Category
1.	CSPC62	Programme Core – 14 / Compiler Design	4	PC
2.	CSPC63	Programme Core – 15 / Principles of Cryptography	4	PC
3.		Programme Elective – 10	3	PE
4.		Programme Elective – 11 / Open Elective – 4	3	PE
5.		Programme Elective – 12 / Open Elective – 5	3	PE/OE
6.		ELR – 8	2	ELR
7.	CSR18	Comprehensive Viva Voce	1	GIR
		Total	**20**	

Credits:

Semester	I	II	III	IV	V	VI	VII	VIII	Total
B.Tech.	19	21	24	23	24	25	15	9	160
B.Sc.	19	21	24	23	16	17	20	20	160

Note:

1. Curriculum should have 7 Programme Core courses shall be of 4 credits each.
2. Out of 12 elective courses (PE/OE), the students should study at least eight Programme Elective courses (PE).
3. Minor (MI): 15 credits over and above the minimum credit as specified by the departments (160). The details of MINOR will be mentioned in the transcript.
4. Honors (HO): 15 credits over and above the minimum credit as specified by the departments (160).

Electives Choices

Option 1 / Regular B.Tech.

To get a B.Tech. degree in Computer Science and Engineering, possible choices of electives in ProgrammeElectives and Open Electives are,

Programme Electives	Open Electives	Total
8	4	12
9	3	12
10	2	12
11	1	12
12	0	12

Option 2 / B.Sc. (Engineering) Exit (at end of 3rd year)

Programme Electives	Open Electives	Total
3	2	5
4	1	5
5	0	5

Option 3 / B.Tech. with Minor

To get a B.Tech. degree in Computer Science and Engineering, and Minor in other programmes, possible choices of electives in Programme Electives, Open Electives and Minor Electives are,

Programme Electives	Open Electives	Minor Electives	Total
8	4	5	12 + 5
9	3	5	12 + 5
10	2	5	12 + 5
11	1	5	12 + 5
12	0	5	12 + 5

Option 4 / B.Tech. with Honors

To get a B.Tech. Honors degree in Computer Science and Engineering, possible choices of electives inProgramme Electives, Open Electives, and Honor Electives are,

Programme Electives	Open Electives	Honor Electives	Total
8	4	4	12 + 4
9	3	4	12 + 4
10	2	4	12 + 4
11	1	4	12 + 4
12	0	4	12 + 4

Option 5 / B.Tech. with Honors and Minor

To get a B.Tech. Honors degree in Computer Science and Engineering, and Minor in other programmes possible choices of electives in Programme Electives, Open Electives, and Honor Electives are,

Programme Electives	Open Electives	Honor Electives	Minor Electives	Total
8	4	4	5	12 + 4 + 5
9	3	4	5	12 + 4 + 5
10	2	4	5	12 + 4 + 5
11	1	4	5	12 + 4 + 5
12	0	4	5	12 + 4 + 5

Note: No Minor or Honors will be awarded for B.Sc. But student can credit Minors and Honors during the 6 semesters, and redeem it to obtain a Minor or Honors after rejoining and completing B.Tech. Also, B.Sc. students shall do Programme Electives in place of their project work in 6th semester.

List of Courses

I. General Institute Requirements (GIR) Courses

Sl. No.	Course Code	Course Title	Credits
1.	MAIR12	Linear Algebra and Calculus	3
2.	PHIR11	Physics	3
3.	PHIR12	Physics Laboratory	2
4.	ENIR11	Energy and Environmental Engineering	2
5.	CSIR11	Introduction to Computer Programming (Theory and Laboratory)	3
6.	CEIR11	Basics of Civil Engineering	2
7.	MEIR11	Basics of Mechanical Engineering	2
8.	PRIR11	Engineering Practice	2
9.	HSIR11	English for Communication (Theory and Laboratory)	4
10.	MAIR21	Complex Analysis and Differential Equations	3
11.	CHIR11	Chemistry	3
12.	CHIR12	Chemistry Laboratory	2
13.	CSIR21	*Branch Specific Course*	2
14.	MEIR12	Engineering Graphics	3
15.	SWIR11	NSS / NCC / NSO	0
16.	MAIR31	Probability and Operations Research	4
17.	CSIR14	Professional Ethics	3
18.	HSIR13	Industrial Economics	3
19.	CSIR19	Industrial Lecture	1
20.	CSIR16	Summer Internship / Industrial Training / Academic Attachment	2
21.	CSIR18	Comprehensive Viva Voce	1
22.	CSIR17	Project Work	6
		Total	**56**

II. Programme Core (PC)

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	CSPC11	Programme Core - 1 / Discrete Structures	-	4
2.	CSPC31	Programme Core - 2 / Principles of Programming Languages	-	4
3.	CSPC32	Programme Core - 3 / Data Structures	-	3
4.	CSPC33	Programme Core - 4 / Digital Systems Design	-	3
5.	CSPC34	Programme Core - 5 / Computer Organization	-	3
6.	CSPC41	Programme Core - 6 / Formal Languages and Automata Theory	CSPC11	4
7.	CSPC42	Programme Core - 7 / Design and Analysis of Algorithms	CSPC32	3
8.	CSPC43	Programme Core - 8 / Operating Systems	-	3
9.	CSPC51	Programme Core – 9 / Computer Architecture	CSPC34	4
10.	CSPC52	Programme Core – 10 / Database Management Systems	-	3
11.	CSPC53	Programme Core – 11 / Computer Networks	-	3
12.	CSPC54	Programme Core - 12 / Introduction to Artificial Intelligence and Machine Learning	CSPC11	4

13.	CSPC61	Programme Core – 13 / Embedded Systems Architectures	CSPC51	3
14.	CSPC62	Programme Core – 14 / Compiler Design	CSPC41	4
15.	CSPC63	Programme Core - 15 / Principles of Cryptography	-	4
Total				**52**

III. Elective Courses

a. Programme Electives

II year Electives (Programme Elective – I, II, III)

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	CSPE01	Combinatorics and Graph Theory	CSPC11	3
2.	CSPE02	Software Engineering	-	3
3.	CSPE03	Design Thinking	-	3
4.	CSPE04	Advanced Data Structures and Algorithms	CSPC32	3
5.	CSPE05	Multimedia Systems	-	3
6.	CSPE06	Computing algorithms based on Indian Knowledge Systems	-	3

Stream I: Modern Computing Paradigms

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	CSPE11	Real Time Systems	CSPC43	3
2.	CSPE12	Cloud Computing	CSPC43	3
3.	CSPE13	Design and Analysis of Parallel Algorithms	CSPC42	3
4.	CSPE14	Parallel Architectures and Programming	CSPC51	3
5.	CSPE15	GPU Computing	CSPC51	3
6.	CSPE16	Internet of Things - Principles and Practices	-	3
7.	CSPE17	Quantum Computing	-	3

Stream II: Network and Security

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	CSPE21	Cyber Physical Systems	-	3
2.	CSPE22	Internetworking Protocols	-	3
3.	CSPE23	Network Security	CSPC63	3
4.	CSPE24	Wireless Network Systems	CSPC53	3
5.	CSPE25	Advanced Cryptography	CSPC63	3
6.	CSPE26	Information Security	-	3
7.	CSPE27	Metaverse and Blockchain	-	3

Stream III: Artificial Intelligence and Applications

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	CSPE31	Image Processing and Applications	-	3
2.	CSPE32	Machine Learning Techniques and Practices	CSPC54	3
3.	CSPE33	Deep Learning Techniques	CSPC54	3
4.	CSPE34	Natural Language Processing	CSPC62	3
5.	CSPE35	Deep Learning Paradigms for Computer Vision	CSPC54	3

6.	CSPE36	Responsible and Ethical AI	-	3
7.	CSPE37	Generative AI	-	3
8.	CSPE38	Cognitive Science	-	3
9.	CSPE39	Drone Technologies	-	3

Stream IV: Software Engineering for Web Applications

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	CSPE41	Augmented and Virtual Reality	-	3
2.	CSPE42	Game Theory	-	3
3.	CSPE43	Software Testing and Automation	-	3
4.	CSPE44	Agile Software Development	-	3
5.	CSPE45	Web Technology and its Applications	-	3
6.	CSPE46	Brain Computer Interface and its Applications	-	3
7.	CSPE47	Full Stack development	CSPC52	3
8.	CSPE48	DevOps	CSPC62	3

Stream V: Data Engineering

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	CSPE51	Data Interpretation and Analysis	-	3
2.	CSPE52	Advanced Database Management Systems	CSPC52	3
3.	CSPE53	Data Analytics	-	3
4.	CSPE54	Data Science	-	3
5.	CSPE55	Social Network Analysis	-	3
6.	CSPE56	Human Computer Interaction	-	3
7.	CSPE57	Text, Speech and Video Analytics	-	3

Note:

1. Programme Electives (PE1, PE2, PE3) have to be chosen from the Second year elective group.
2. Programme Electives for 5^{th} to 8^{th} semester can be chosen from the streams.
3. If a student chooses at least 6 Programme Electives from a particular stream then the stream will be mentioned as the specification in their transcript.

b. Open Elective (OE)

The courses listed below are offered by the Department of Computer Science and Engineering for students of all Departments.

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	CSOE11	Big Data Analytics	-	3
2.	CSOE12	Cloud and Grid Computing	-	3
3.	CSOE13	Computer Graphics and Multimedia Systems	-	3
4.	CSOE14	Distributed Architecture	-	3
5.	CSOE15	Human Computer Interaction	-	3
6.	CSOE16	Image Processing	-	3
7.	CSOE17	Internet of Things	-	3
8.	CSOE18	Machine Learning for Engineering Applications	-	3

9.	CSOE19	Security Principles	-	3
10.	CSOE20	Soft Computing	-	3
11.	CSOE21	Software Project Management	-	3
12.	CSOE22	Software Testing and Practices	-	3
13.	CSOE23	Web Technology	-	3

c. Minor (MI) (offered for the students of other departments)

Students of other departments who desire B.Tech. Minor in Computer Science and Engineering can opt to study any 5of the courses listed below.

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	CSMI11	Data Structures and Algorithms	-	3
2.	CSMI12	Computer Organization	-	3
3.	CSMI13	Operating Systems	-	3
4.	CSMI14	Database Management Systems	-	3
5.	CSMI15	Software Engineering	-	3
6.	CSMI16	Computer Networks	-	3
7.	CSMI17	Artificial Intelligence	-	3
8.	CSMI18	Internetworking Principles	-	3
9.	CSMI19	Web Application Development	-	3

IV. Essential Programme Laboratory Requirement (ELR)

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	CSLR31	ELR – 1 / Data structures Laboratory	-	2
2.	CSLR32	ELR – 2 / Digital Laboratory	-	2
3.	CSLR41	ELR – 3 / Algorithms Laboratory	-	2
4.	CSLR42	ELR – 4 / Operating Systems Lab	-	2
5.	CSLR51	ELR – 5 / Database Management Systems Laboratory	-	2
6.	CSLR52	ELR – 6 / Networks Laboratory	-	2
7.	CSLR61	ELR – 7 / Embedded Systems Laboratory	-	2
8.	CSLR62	ELR – 8 / App Development Laboratory	-	2

V. Online Courses (OC)

Sl. No.	Course Code	Course Title	Prerequisites	Credits
		Course list shall be updated regularly at the start of each Academic Year or Semester by the department NPTEL Coordinator. The students shall be able to select an online course from then available list.		

VI. Advanced Level Courses for B.Tech. (Honors)

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	CSHO11	Software Defined Networking	-	3

2.	CSHO12	Multi-Core Programming	CSPC51	4
3.	CSHO13	Pervasive and Ubiquitous Computing	CSPC43	3
4.	CSHO14	Virtualization Techniques	-	3
5.	CSHO15	Randomized Algorithms	CSPC42	4
6.	CSHO16	Compiler Optimization Techniques	CSPC41	4
7.	CSHO17	Fog and Edge Computing	-	4
8.	CSHO18	Quantum Safe Cryptography	CSPC63	4

VII. Microcredits (MC) (Students can opt 3 courses of 1 credit (4 weeks) each as microcredits instead of 1 OE/OC)

Sl. No.	Course Code	Course Title	Credit
1.	CSMCXX	*Offered based on the industry expert availability and recent trends*	1

ELECTRICAL AND ELECTRONICS ENGINEERING

The total credits required for completing the B.Tech. Programme in Electrical and Electronics Engineering is **163**.

CURRICULUM FRAMEWORK / FLEXIBLE CURRICULUM / NEP 2020 / NCrF / B.Tech.

Semester	GIR		PC		ELR		PE/OE		Total Credits	Credit Distribution
	Course	Credit	Course	Credit	Course	Credit	Course	Credit		
I	8	19	-	-	-	-	-	-	**19**	**40**
II	7	17	1	4	-	-	-	-	**21**	
III	1	4	4	14	2	4	1	3	**25**	**50**
IV	-	-	3	12	2	4	3	9	**25**	
V	1	3	4	15	2	4	1	3	**25**	**49**
VI	2	4	3	10	2	4	2	6	**24**	
VII	2	3	-	-	-	-	4	12	**15**	**24**
VIII	1	6	-	-	-	-	1	3	**9**	
Total	**22**	**56**	**15**	**55**	**8**	**16**	**12**	**36**	**163**	**163**

CURRICULUM FRAMEWORK / FLEXIBLE CURRICULUM / NEP 2020 / NCrF / B.Sc. (Engineering)

	Sem	GIR		PC		ELR		PE/OE		Total Credits	Credit Distri-bution
		Course	Credit	Course	Credit	Course	Credit	Course	Credit		
Same as B.Tech.	**I**	8	19	-	-	-	-	-	-	**19**	**40**
	II	7	17	1	4	-	-	-	-	**21**	
	III	1	4	4	14	2	4	1	3	**25**	**50**
	IV	-	-	3	12	2	4	3	9	**25**	
B.Sc. Exit	**V**	1	3	2	8	2	4	1	3	**18**	**34**
	VI	4[#]	12	-	-	2	4	-	-	**16***	
After B.Sc. exit and join back for B. Tech.	**VII**	-	-	3	10	-	-	4	12	**22**	**39**
	VIII	1	1	2	7	-	-	3	9	**17**	
	Total	**22**	**56**	**15**	**55**	**8**	**16**	**12**	**36**	**163**	**163**

[#](Summer internship (2), Project Work (6), Professional Ethics (3), and Industrial Lecture (1))

Curriculum Framework and Credit System (EE) / 163

Semester I (July Session)

Sl. No.	Course Code	Course Title	Credits	Category
1.	MAIR12	Linear Algebra and Calculus	3	GIR
2.	PHIR11	Physics	3	GIR
3.	ENIR11	Energy and Environmental Engineering	2	GIR
4.	CSIR11	Introduction to Computer Programming (Theory and Laboratory)	3	GIR
5.	CEIR11	Basics of Civil Engineering	2	GIR
6.	MEIR11	Basics of Mechanical Engineering	2	GIR
7.	PRIR11	Engineering Practice	2	GIR
8.	PHIR12	Physics Laboratory	2	GIR
		Total	**19**	

Semester II (January Session)

Sl. No.	Course Code	Course Title	Credits	Category
1.	HSIR11	English for Communication (Theory and Laboratory)	4	GIR
2.	MAIR21	Complex Analysis and Differential Equations	3	GIR
3.	CHIR11	Chemistry	3	GIR
4.	EEIR15	Introduction to Electrical and Electronics Engineering (*Branch Specific Course*)	2	GIR
5.	MEIR12	Engineering Graphics	3	GIR
6.	CHIR12	Chemistry Laboratory	2	GIR
7.	SWIR11	NSS / NCC / NSO	0	GIR
8.	EEPC10	Programme Core – 1 / Circuit Theory	4	PC
		Total	**21**	

Semester III (July Session)

Sl. No.	Course Code	Course Title	Credits	Category
1.	MAIR32	Fourier Analysis and Numerical Techniques	4	GIR
2.	EEPC11	Programme Core – 2 / Signals and Systems	4	PC
3.	EEPC12	Programme Core – 3 / DC Machines and Transformers	4	PC
4.	EEPC13	Programme Core – 4 / Electron Devices	3	PC
5.	EEPC14	Programme Core – 5 / Digital Electronics	3	PC
6.		Programme Elective – 1	3	PE
7.	EELR10	ELR – 1 / Circuits and Digital Laboratory	2	ELR
8.	EELR11	ELR – 2 / DC Machines and Transformers Laboratory	2	ELR
		Total	**25**	

Note: Department(s) to offer Minor (MI) Course and Online Course (OC) to those willing students in addition to 25 credits.

Semester IV (January Session)

Sl. No.	Course Code	Course Title	Credits	Category
1.	EEPC15	Programme Core – 6 / AC Machines	4	PC
2.	EEPC16	Programme Core – 7 / Analog Electronic Circuits	4	PC
3.	EEPC17	Programme Core – 8 / Transmission and Distribution of Electrical Energy	4	PC
4.		Programme Elective – 2	3	PE
5.		Programme Elective – 3	3	PE
6.		Programme Elective – 4 / Open Elective – 1	3	PE/OE
7.	EELR12	ELR – 3 / Electronics Circuits Laboratory	2	ELR
8.	EELR13	ELR – 4 / Synchronous and Induction Machines Laboratory	2	ELR
		Total	**25**	

Semester V (July Session) / Continuing B.Tech.

Sl. No.	Course Code	Course Title	Credits	Category
1.	HSIR13	Industrial Economics	3	GIR
2.	EEPC18	Programme Core – 9 / Power System Analysis	4	PC
3.	EEPC19	Programme Core – 10 / Power Electronics	4	PC
4.	EEPC20	Programme Core – 11 / Control Systems	4	PC
5.	EEPC21	Programme Core – 12 / Linear Integrated Circuits	3	PC
6.		Programme Elective – 5 / Open Elective – 2	3	PE/OE
7.	EELR14	ELR – 5 / Integrated Circuits Laboratory	2	ELR
8.	EELR15	ELR – 6 / Power Electronics Laboratory	2	ELR
		Total	**25**	

Semester V (July Session) / B.Sc. (Engineering) Exit

Sl. No.	Course Code	Course Title	Credits	Category
1.	HSIR13	Industrial Economics	3	GIR
2.	EEPC18	Programme Core – 9 / Power System Analysis	4	PC
3.	EEPC19	Programme Core – 10 / Power Electronics	4	PC
4.		Programme Elective – 5 / Open Elective – 2	3	PC
5.	EELR14	ELR – 5 / Integrated Circuits Laboratory	2	ELR
6.	EELR15	ELR – 6 / Power Electronics Laboratory	2	ELR
		Total	**18**	

Semester VI (January Session) / Continuing B.Tech.

Sl. No.	Course Code	Course Title	Credits	Category
1.	EEIR19	Industrial Lecture	1	GIR
2.	EEIR14	Professional Ethics	3	GIR
3.	EEPC24	Programme Core – 13 / Power System Protection and Switchgear	4	PC
4.	EEPC22	Programme Core – 14 / Microprocessors and Microcontrollers	3	PC
5.	EEPC23	Programme Core – 15 / Measurements and Instrumentation	3	PC
6.		Programme Elective – 6	3	PE
7.		Programme Elective – 7 / Open Elective – 3	3	PE/OE
8.	EELR16	Microcomputing Laboratory	2	ELR
9.	EELR17	ELR – 8 / Power Systems Laboratory	2	ELR
		Total	**24**	

Semester VI (January Session) / B.Sc. (Engineering) Exit

Sl. No.	Course Code	Course Title	Credits	Category
1.	EEIR19	Industrial Lecture	1	GIR
2.	EEIR14	Professional Ethics	3	GIR
3.	EEIR16	Winter Internship	2	GIR
4.	EEIR17	Project Work	6	GIR
5.	EELR16	ELR – 7 / Microcomputing Laboratory	2	ELR
6.	EELR17	ELR – 8 / Power Systems Laboratory	2	ELR
		Total	**16**	

Semester VII (July Session) / Continuing B.Tech.

Sl. No.	Course Code	Course Title	Credits	Category
1.	EEIR16	Summer Internship / Industrial Training / Academic Attachment	2	GIR
2.	EEIR18	Comprehensive Viva Voce	1	GIR
3.		Programme Elective – 8	3	PE
4.		Programme Elective – 9	3	PE
5.		Programme Elective – 10 / Open Elective – 4	3	PE/OE
6.		Programme Elective – 11 / Open Elective – 5	3	PE/OE
		Total	**15**	

Semester VII (July Session) / Rejoins B.Tech. after B.Sc. (Engineering) exit

Sl. No.	Course Code	Course Title	Credits	Category
1.	EEPC20	Programme Core – 11 / Control Systems	4	PC
2.	EEPC21	Programme Core – 12 / Linear Integrated Circuits	3	PC
3.	EEPC23	Programme Core – 15 / Measurements and Instrumentation	3	PC
4.		Programme Elective – 6	3	PE
5.		Programme Elective – 7	3	PE
6.		Programme Elective – 8	3	PE
7.		Programme Elective – 9 / Open Elective – 3	3	PE/OE
		Total	**22**	

Semester VIII (January Session) / Continuing B.Tech.

Sl. No.	Course Code	Course Title	Credits	Category
1.		Programme Elective – 12 / Open Elective – 6	3	PE/OE
2.	EEIR17	Project Work	6	GIR
		Total	**9**	

Semester VIII (January Session) / Rejoins B.Tech. after B.Sc. (Engineering) exit

Sl. No.	Course Code	Course Title	Credits	Category
1.	EEPC24	Programme Core – 14 / Power System Protection and Switchgear	4	PC
2.	EEPC22	Programme Core – 15 / Microprocessors and Microcontrollers	3	PC
3.		Programme Elective – 10	3	PE
4.		Programme Elective – 11	3	PE
5.		Programme Elective – 12 / Open Elective – 4	3	PE/OE
6.	EEIR18	Comprehensive Viva Voce	1	GIR
		Total	**17**	

Credits:

Semester	I	II	III	IV	V	VI	VII	VIII	Total
B.Tech.	19	21	25	25	25	24	15	9	163
B.Sc.	19	21	25	25	18	16	22	17	163

Note:

1. Out of 12 elective courses (PE/OE), the students should study at least eight Programme Elective courses (PE).
2. Minor (MI): 15 credits over and above the minimum credit as specified by the department (163). The details of MINOR will be mentioned in the transcript.
3. Honors (HO): 15 credits over and above the minimum credit as specified by the department (163).

Electives Choices

Option 1 / Regular B.Tech.

To get a B.Tech. degree in Electrical and Electronics Engineering, possible choices of electives in Programme Electives and Open Electives are,

Programme Electives	Open Electives	Total
8	4	12
9	3	12
10	2	12
11	1	12
12	0	12

Option 2 / B.Sc. (Engineering) Exit (at end of 3rd year)

Programme Electives	Open Electives	Total
3	2	5
4	1	5
5	0	5

Option 3 / B.Tech. with Minor

To get a B.Tech. degree in Electrical and Electronics Engineering, and Minor in other programmes, choices of electives in Programme Electives, Open Electives and Minor Electives are,

Programme Electives	Open Electives	Minor Electives	Total
8	4	5	12 + 5
9	3	5	12 + 5
10	2	5	12 + 5
11	1	5	12 + 5
12	0	5	12 + 5

Option 4 / B.Tech. with Honors

To get a B.Tech. Honors degree in Electrical and Electronics Engineering, choices of electives in Programme Electives, Open Electives, and Honor Electives are,

Programme Electives	Open Electives	Honor Electives	Total
8	4	4	12 + 4
9	3	4	12 + 4
10	2	4	12 + 4
11	1	4	12 + 4
12	0	4	12 + 4

Option 5 / B.Tech. with Honors and Minor

To get a B.Tech. Honors degree in Electrical and Electronics Engineering, and Minor in other programmes possible choices of electives in Programme Electives, Open Electives, and Honor Electives are,

Programme Electives	Open Electives	Honor Electives	Minor Electives	Total
8	4	4	5	12 + 4 + 5
9	3	4	5	12 + 4 + 5
10	2	4	5	12 + 4 + 5
11	1	4	5	12 + 4 + 5
12	0	4	5	12 + 4 + 5

Note: No Minor or Honors will be awarded for B.Sc. But student can credit Minors and Honors during the 6 semesters, and redeem it to obtain a Minor or Honors after rejoining and completing B.Tech. Also, B.Sc. students shall do Programme Electives in place of their project work in 6th semester.

List of Courses

I. Programme Core (PC)

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	EEPC10	Circuit Theory	MAIR12	4
2.	EEPC11	Signals and Systems	EEPC10	4
3.	EEPC12	DC Machines and Transformers	EEPC10	4
4.	EEPC13	Electron Devices	-	3
5.	EEPC14	Digital Electronics	-	3
6.	EEPC15	AC Machines	EEPC12	4
7.	EEPC16	Analog Electronic Circuits	EEPC13	4
8.	EEPC17	Transmission and Distribution of Electrical Energy	EEPC10	4
9.	EEPC18	Power System Analysis	MAIR32, EEPC10	4
10.	EEPC19	Power Electronics	MAIR32 EEPC10, EEPC13	4
11.	EEPC20	Control Systems	MAIR32	4
12.	EEPC21	Linear Integrated Circuits	EEPC10	3
13.	EEPC22	Microprocessors and Microcontrollers	EEPC14	3
14.	EEPC23	Measurements and Instrumentation	EEPC21	3
15.	EEPC24	Power System Protection and Switchgear	EEPC18	4

II. Electives

a. Programme Electives

Sl. No.	Course Code	Course Title	Pre-Req.	Credits
1.	EEPE10	Power Generation Systems	-	3
2.	EEPE11	Electrical Safety	-	3
3.	EEPE12#	Thermodynamics and Mechanics of Fluids	-	3
4.	EEPE13	Fuzzy Systems and Genetic Algorithms	-	3
5.	EEPE14	Industrial Automation	-	3
6.	EEPE15	High Voltage Engineering	EEPC10	3
7.	EEPE16	Computer Organization and Architecture	EEPC14	3
8.	EEPE17	Digital System Design and HDLS	EEPC14	3
9.	EEPE18	Digital Signal Processing	MAIR32, EEPC14	3
10.	EEPE19	Artificial Neural Networks	MAIR32	3
11.	EEPE20	Design of Electrical Apparatus	EEPC15	3
12.	EEPE21	Utilization of Electrical Energy	EEPC15	3
13.	EEPE22	Computer Networks	-	3
14.	EEPE23	Modern Control Systems	EEPC20	3
15.	EEPE24	Fundamentals of FACTS	EEPC11, EEPC19	3
16.	EEPE25	Special Electrical Machines	EEPC15, EEPC19	3
17.	EEPE26	Wind and Solar Electrical Systems	EEPC15, EEPC19	3
18.	EEPE27	Solid State Drives	EEPC15, EEPC19.	3
19.	EEPE28	Embedded System Design	EEPC22	3
20.	EEPE29	Power System Economics and Control Techniques	EEPC20, EEPC18	3
21.	EEPE30	Digital Control Systems	EEPC20	3
22.	EEPE31*	Operations Research	MAIR32	3
23.	EEPE32	Electric Vehicle Technology	-	3
24.	EEPE33	Design Thinking	-	3
25.	EEPE34	Machine Learning and Deep Learning	MAIR32	3
26.	EEPE35	Nano Electronics	EEPC13	3
27.	EEPE36##	Communication Systems	EEPC14, EEPC17	3
28.	EEPE37	Data Structures and Algorithms	-	3
29.	EEPE38	Electric Power Quality	EEPC17, EEPC18	3
30.	EEPE39	VLSI Design	EEPC14, EEPC21	3
31.	EEPE40	Power System Restructuring	EEPC18	3
32.	EEPE41	Economic Evaluation of Power Projects	EEPC17	3
33.	EEPE42	Introduction to Switched Mode Power Supplies	EEPC19	3
34.	EEPE43	Optimal and Robust Control	EEPC20	3
35.	EEPE44	Robotics	-	3
36.	EEPE45	Battery Management Systems	-	3
37.	EEPE46	Power System Reliability	EEPC17	3
38.	EEPE47	Electronic System Design	-	3

**Will be offered by the Department of Mathematics.*
 # Will be offered by Department of Mechanical Engineering
Will be offered by the Department of Electronics and Communication Engineering

b. Open Elective (OE)

The courses listed below are offered by the Department of Electrical and Electronics Engineering for the students of all Departments / *only other departments.

Sl. No.	Course Code	Course Title	Pre-Req	Credits
1.	EEOE10	Electrical Safety	-	3
2.	EEOE11	Fuzzy Systems and Genetic Algorithms	-	3
3.	EEOE12	Artificial Neural Networks	-	3
4.	EEOE13	Modern Control Systems	-	3
5.	EEOE14	Digital Control Systems	-	3
6.	EEOE15	Electric Vehicle Technology	-	3
7.	EEOE16	Basics of Electrical Circuits*	-	3
8.	EEOE17	Electrical Machines*	-	3
9.	EEOE18	Control Systems Engineering*	-	3
10.	EEOE19	Analog and Digital Electronics*	-	3
11.	EEOE20	Power Electronic Systems*	-	3
12.	EEOE21	Power Systems Engineering*	-	3
13.	EEOE22	Electric Power Utilization*	-	3
14.	EEOE23	Renewable Power Generation Systems*	-	3
15.	EEOE24	Design Thinking	-	3
16.	EEOE25	Optimal and Robust Control	EEPC20	3
17.	EEOE26	Robotics	-	3
18.	EEOE27	Battery Management Systems	-	3
19.	EEOE28	Electronic System Design	-	3

c. Minor (MI) (offered for the students of other departments)

Students of other departments who desire B.Tech. Minor in Electrical and Electronics Engineering can opt to study any5 of the courses listed below.

Sl. No.	Course Code	Course Title	Pre-Req	Credits
1.	EEMI10	Basics of Electrical Circuits	-	3
2.	EEMI11	Electrical Machines	-	3
3.	EEMI12	Control Systems Engineering	-	3
4.	EEMI13	Analog and Digital Electronics	EEMI10	3
5.	EEMI14	Power Electronic Systems	EEMI11	3
6.	EEMI15	Power Systems Engineering	EEMI11	3
7.	EEMI16	Electric Power Utilization	EEMI11	3
8.	EEMI17	Introduction to Microcontrollers	EEMI13	3
9.	EEMI18	Renewable Power Generation Systems	EEMI14	3

III. Essential Programme Laboratory Requirement (ELR)

Sl. No.	Course Code	Course Title	Prerequisites/ Corequisites	Credits
1.	EELR10	Circuits and Digital Laboratory	EEPC10	2
2.	EELR11	DC Machines and Transformers Laboratory	EEPC12	2
3.	EELR12	Electronic Circuits Laboratory	EEPC13	2
4.	EELR13	Synchronous and Induction Machines Laboratory	EEPC15	2
5.	EELR14	Integrated Circuits Laboratory	-	2
6.	EELR15	Power Electronics Laboratory	EEPC19	2
7.	EELR16	Microcomputing Laboratory	-	2
8.	EELR17	Power Systems Laboratory	EEPC18	2

IV. Online Courses (OC)

Sl. No.	Course Code	Course Title	Prerequisites	Credits
		Course list shall be updated regularly at the start of each Academic Year or Semester by the department NPTEL Coordinator. The students shall be able to select an online course from then available list.		

V. Advanced Level Courses for B.Tech. (Honors)

Sl. No.	Course Code	Course Title	Pre-Req.	Credits
1.	EEHO10	Distribution System Automation	EEPC11	3
2.	EEHO11	EHV AC and DC Transmission	EEPC11	3
3.	EEHO12	Non-linear Control Systems	EEPC20	4
4.	EEHO13	Power Switching Converters	EEPC19	4
5.	EEHO14	Vehicular Electric Power Systems	EEPC15, EEPC19	4
6.	EEHO15	Power System Dynamics	EEPC18	4
7.	EEHO16	Modern Optimization Techniques for Electric Power Systems	EEPC18	4
8.	EEHO17	Computer Relaying and Phasor Measurement Unit	EEPC24	3
9.	EEHO18	Electricity Markets	EEPC18	4
10.	EEHO19	Design with PIC Microcontrollers	EEPC14	4
11.	EEHO20	Aircraft Electronic Systems	EEPC22	3

VI. Microcredits (MC) (Students can opt 3 courses of 1 credit (4 weeks) each as microcredits instead of 1 OE/OC)

Students are advised to take 4-week courses from NPTEL/SWAYAM platform

ELECTRONICS AND COMMUNICATION ENGINEERING

The total minimum credits for completing the B.Tech. programme in Electronics andCommunication Engineering is **160.**

CURRICULUM FRAMEWORK / FLEXIBLE CURRICULUM / NEP 2020 / NCrF / B.Tech.

Semester	GIR		PC		ELR		PE/OE		Total Credits	Credit Distribution
	Course	Credit	Course	Credit	Course	Credit	Course	Credit		
I	8	19	-	-	-	-	-	-	**19**	**40**
II	7	17	1	4	-	-	-	-	**21**	
III	1	4	4	15	2	4	1	3	**26**	**49**
IV	1	3	3	10	2	4	2	6	**23**	
V	-	-	4	14	2	4	2	6	**24**	**47**
VI	2	4	3	9	2	4	2	6	**23**	
VII	2	3	-	-	-	-	4	12	**15**	**24**
VIII	1	6	-	-	-	-	1	3	**9**	
Total	**22**	**56**	**15**	**52**	**8**	**16**	**12**	**36**	**160**	**160**

Curriculum Framework / Flexible Curriculum / NEP 2020 / NCrF/ B.Sc. (Engineering)

	Sem	GIR		PC		ELR		PE/OE		Total Credits	Credit Distri-bution
		Course	Credit	Course	Credit	Course	Credit	Course	Credit		
Same as B.Tech.	I	8	19	-	-	-	-	-	-	**19**	**40**
	II	7	17	1	4	-	-	-	-	**21**	
	III	1	4	4	15	2	4	1	3	**26**	**49**
	IV	1	3	3	10	2	4	2	6	**23**	
B.Sc. Exit	V	-	-	2	8	2	4	2	6	**18**	**34**
	VI	4[@]	12	-	-	2	4	-	-	**16***	
After B.Sc. exit and join back for B. Tech.	VII	-	-	2	6	-	-	4	12	**18**	**37**
	VIII	1	1	3	9	-	-	3	9	**19**	
	Total	**22**	**56**	**15**	**52**	**8**	**16**	**12**	**36**	**160**	**160**

[@](Summer internship (2), Project Work (6) and Industrial Lecture (1))

Curriculum Framework and Credit System (ECE) / 160

Semester I (July Session)

Sl. No.	Course Code	Course Title	Credits	Category
1.	ENIR11	Energy and Environmental Engineering	2	GIR
2.	MAIR12	Linear Algebra and Calculus	3	GIR
3.	PHIR11	Physics (Circuit)	3	GIR
4.	PHIR12	Physics Laboratory (Circuit)	2	GIR
5.	CSIR11	Introduction to Computer Programming (Theory and Laboratory)	3	GIR
6.	MEIR11	Basics of Mechanical Engineering (For CE, EE, EC, IC and CS)	2	GIR
7.	PRIR11	Engineering Practice	2	GIR
8.	CEIR11	Basics of Civil Engineering (For EE, EC, IC and CS)	2	GIR
		Total	**19**	

Semester II (January Session)

Sl. No.	Course Code	Course Title	Credits	Category
1.	HSIR11	English for Communication (Theory and Laboratory)	4	GIR
2.	MAIR21	Complex Analysis and Differential Equations	3	GIR
3.	CHIR11	Chemistry (Circuit)	3	GIR
4.	CHIR12	Chemistry Laboratory (Circuit)	2	GIR
5.	ECIR15	Introduction to Electronics and communication Engineering	2	GIR
6.	MEIR12	Engineering Graphics	3	GIR
7.	ECPC11	Network Analysis and Synthesis	4	PC
8.	SWIR11	NSS / NCC / NSO	0	GIR
		Total	**21**	

Semester III (July Session)

Sl. No.	Course Code	Course Title	Credits	Category
1.	MAIR33	Real Analysis and Probability Theory	4	GIR
2.	ECPC10	Signals and Systems	4	PC
3.	ECPC13	Semiconductor Physics and Devices	4	PC
4.	ECPC12	Electrodynamics and Electromagnetic Waves	4	PC
5.	ECPC14	Digital Circuits and Systems	3	PC
6.	ECLR10	Devices and Networks Laboratory	2	ELR
7.	ECLR11	Digital Electronics Laboratory	2	ELR
8.		Programme Elective – 1	3	PE
		Total	**26**	

Note: Department to offer Minor (MI) Course, and ONLINE Course (OC) to those willing students in addition to 26 credits.

Semester IV (January Session)

Sl. No.	Course Code	Course Title	Credits	Category
1.	HSIR13	Industrial Economics	3	GIR
2.	ECPC15	Digital Signal Processing	4	PC
3.	ECPC16	Transmission Lines and Waveguides	3	PC
4.	ECPC17	Electronic Circuits	3	PC
5.	ECLR12	Electronic Circuits Laboratory	2	ELR
6.	ECLR13	Microprocessor and Microcontroller Laboratory	2	ELR
7.		Programme Elective – 2	3	PE
8.		Programme Elective – 3	3	PE
		Total	**23**	

Semester V (July Session)

Sl. No.	Course Code	Course Title	Credits	Category
1.	ECPC18	Analog Communication	3	PC
2.	ECPC19	Digital Communication	4	PC
3.	ECPC20	Antennas and Propagation	3	PC
4.	ECPC21	Analog Integrated Circuits	4	PC
5.	ECLR14	Analog VLSI and Embedded System Design Laboratory	2	ELR
6.	ECLR15	Digital Signal Processing Laboratory	2	ELR
7.		Programme Elective – 4	3	PE/OE
8.		Programme Elective – 5	3	PE/OE
		Total	**24**	

Semester V (July Session) / B.Sc. (Engineering) Exit

Sl. No.	Course Code	Course Title	Credits	Category
1.	ECPC19	Digital Communication	4	PC
2.	ECPC21	Analog Integrated Circuits	4	PC
3.	ECLR14	Analog VLSI and Embedded System Design Laboratory	2	ELR
4.	ECLR15	Digital Signal Processing Laboratory	2	ELR
5.		Programme Elective – 4	3	PE/OE
6.		Programme Elective – 5	3	PE/OE
		Total	**18**	

Semester VI (January Session)

Sl. No.	Course Code	Course Title	Credits	Category
1.	ECIR19	Industrial Lecture	1	GIR
2.	ECPC22	Wireless Communication	3	PC
3.	ECPC23	VLSI Systems	3	PC

4.	ECPC24	RF and Microwave Engineering	3	PC
5.	ECLR16	Communication Engineering Laboratory	2	ELR
6.	ECLR17	Microwave and Fiber Optic Laboratory	2	ELR
7.	ECIR14	Professional Ethics (Circuit)	3	GIR
8.		Programme Elective – 6	3	PE
9.		Programme Elective – 7	3	PE/OE
		Total	**23**	

Semester VI (January Session) / B.Sc. (Engineering) Exit

Sl. No.	Course Code	Course Title	Credits	Category
1.	ECIR17	Project Work	6	GIR
2.	ECIR16	Winter Internship*	2	GIR
3.	ECIR19	Industrial Lecture	1	GIR
4.	ECLR16	Communication Engineering Laboratory	2	ELR
5.	ECLR17	Microwave and Fiber Optic Laboratory	2	ELR
6.	ECIR14	Professional Ethics (Circuit)	3	GIR
		Total	**16**	

*Evaluation for winter internship

Semester VII (July Session)

Sl. No.	Course Code	Course Title	Credits	Category
1.	ECIR16	Summer Internship / Industrial Training / Academic Attachment *	2	GIR
2.	ECIR18	Comprehensive Viva Voce	1	GIR
3.		Programme Elective – 8	3	PE
4.		Programme Elective – 9	3	PE
5.		Programme Elective – 10	3	PE
6.		Programme Elective – 11	3	PE/OE
		Total	**15**	

Semester VII (July Session) / Rejoins B.Tech. after B.Sc. (Engineering) exit

Sl. No.	Course Code	Course Title	Credits	Category
1.	ECPC18	Analog Communication	3	PC
2.	ECPC20	Antennas and Propagation	3	PC
3.		Programme Elective – 6	3	PE/OE
4.		Programme Elective – 7	3	PE
5.		Programme Elective – 8	3	PE
6.		Programme Elective – 9	3	PE/OE
		Total	**18**	

Semester VIII (January Session)

Sl. No.	Course Code	Course Title	Credits		Category
1.		Programme Elective – 12	3		PE
2.	ECIR17	Project Work[$]/ Equivalent no. of Electives	6	0	GIR/Optional
3.		Programme Elective – 13	0	3	PE/Optional
4.		Programme Elective – 14	0	3	PE/Optional
		Total	**9**		

Semester VIII (January Session) / Rejoins B.Tech. after B.Sc. (Engineering) exit

Sl. No.	Course Code	Course Title	Credits	Category
1.	ECIR18	Comprehensive Viva Voce	1	GIR
2.	ECPC22	Wireless Communication	3	PC
3.	ECPC23	VLSI Systems	3	PC
4.	ECPC24	RF and Microwave Engineering	3	PC
5.		Programme Elective – 10	3	PE
6.		Programme Elective – 11	3	PE
7.		Programme Elective – 12	3	PE
		Total	**19**	

Credit Distribution

Semester	I	II	III	IV	V	VI	VII	VIII	Total
B.Tech.	**19**	**21**	**26**	**23**	**24**	**23**	**15**	**9**	**160**
B.Sc.	**19**	**21**	**26**	**23**	**18**	**16**	**18**	**19**	**160**

List of Courses

I. Programme Core (PC)

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	ECPC10	Signals and systems	NONE	4
2.	ECPC11	Network Analysis and Synthesis	NONE	4
3.	ECPC12	Electrodynamics And Electromagnetic Waves	NONE	4
4.	ECPC13	Semiconductor Physics and Devices	NONE	4
5.	ECPC14	Digital Circuits and Systems	NONE	3
6.	ECPC15	Digital Signal Processing	ECPC10	4
7.	ECPC16	Transmission Lines and Waveguides	ECPC12	3
8.	ECPC17	Electronic Circuits	ECPC13	3
9.	ECPC18	Analog Communication	ECPC10	3
10.	ECPC19	Digital Communication	ECPC10	4

11.	ECPC20	Antennas And Propagation	ECPC12	3
12.	ECPC21	Analog Integrated Circuits	ECPC17	4
13.	ECPC22	Wireless Communication	ECPC19	3
14.	ECPC23	VLSI Systems	ECPC21	3
15.	ECPC24	Rf And Microwave Engineering	ECPC16	3
		Total		**52**

II. Electives

a. Programme Elective (PE)

Students who are pursuing B.Tech. in Electronics and Communication Engineering should complete at least three courses from the Programme Electives listed below.

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	ECPE10	Networks And Protocols	NONE	3
2.	ECPE11	Wireless Local Area Network	ECPE10	3
3.	ECPE12	Microprocessors and Microcontrollers	ECPC14	3
4.	ECPE13	Computer Architecture and Organization	NONE	3
5.	ECPE14	Embedded Systems	NONE	3
6.	ECPE15	Operating Systems	NONE	3
7.	ECPE16	Arm System Architecture	NONE	3
8.	ECPE17	Statistical Theory of Communication	NONE	3
9.	ECPE18	Digital Signal Processors and Applications	ECPC15	3
10.	ECPE19	High Speed System Design	NONE	3
11.	ECPE20	Digital Speech Processing	ECPC15	3
12.	ECPE21	Digital Image Processing	NONE	3
13.	ECPE22	Pattern Recognition	NONE	3
14.	ECPE23	Display Systems	ECPC13	3
15.	ECPE24	Internet of Things	CSIR11, ECPE12,	3
16.	ECPE26	Cognitive Radio	ECPC15	3
17.	ECPE27	Multimedia Communication Technology	ECPC15	3
18.	ECPE28	Communication Switching Systems	ECPC18	3
19.	ECPE29	Broadband Access Technologies	ECPC18 & ECPC19	3

20.	ECPE31	Fiber Optic Communication	ECPC12 & ECPC18	3
21.	ECPE32	Digital Signal Processing for Wireless Communication	ECPC15	3
22.	ECPE33	Microwave Integrated Circuit Design	ECPC16 & ECPC24	3
23.	ECPE34	RF Mems Circuit Design	ECPC16 & ECPC24	3
24.	ECPE35	Satellite Communication	ECPC18	3
25.	ECPE36	Principles Of Radar	ECPC20	3
26.	ECPE37	Low Power VLSI Circuits	ECPC23	3
27.	ECPE38	Adhoc Wireless Networks	ECPE10	3
28.	ECPE39	Wireless Sensor Networks	ECPE10	3
29.	ECPE40	Nano Electronics	NONE	3
30.	ECPE41	Electronic Design Automation Tools	NONE	3
31.	ECPE42	Electromagnetic Interference and Compatibility	NONE	3
32.	ECPE43	Computer Vision	NONE	3
33.	ECPE44	Natural Language Processing	NONE	3
34.	ECPE45	Optimization Methods in Machine Learning	NONE	3
35.	ECPE46	Hardware For Deep Learning	NONE	3
36.	ECPE47	Image And Video Processing	NONE	3
37.	ECPE48	Automated Test Engineering for Electronics	NONE	3
38.	ECPE49	Foundations of Artificial Intelligence	NONE	3
39.	ECPE50	Photonic Integrated Circuits	NONE	3
40.	ECPE51	Microwave Circuits	NONE	3
41.	ECPE52	Introduction to Machine Learning	NONE	3
42.	ECPE53	Deep Learning	NONE	3
43.	ECPE54	Control Systems	NONE	3
44.	ECPE55	Advanced Topics in 5G/B5G Wireless Communication	NONE	3
45.	ECPE56	Analog Power Integrated Circuits	ECPC11, ECPC17, ECPC21	3
		Total		**135**

Specializations (Streams) in B.Tech. Degree:

After the successful completion of IV year, and earning 160 credits, the student is eligible for the degree B.Tech. in Electronics and Communication Engineering. The specialization in the degree is given if the student completes any five program electives listed in the following table against each specialization.

S. No.	B.Tech. in ECE and Specialization in	List of Programme Electives (to complete any five)
1.	Wireless Networks	a) ECPE10 - Networks and Protocols b) ECPE11 - Wireless Local Area Network c) ECPE29 - Broadband Access Technologies d) ECPE38 - Adhoc Wireless Networks e) ECPE39 - Wireless Sensor Networks f) ECPE55 - Advanced Topics in 5G/B5G Wireless Communication
2.	Signal Processing	a) ECPE17 - Statistical Theory of Communication b) ECPE18 - Digital Signal Processors and Applications c) ECPE20 - Digital Speech Processing d) ECPE21 - Digital Image Processing e) ECPE22 - Pattern Recognition f) ECPE32 - Digital Signal Processing for Wireless Communication
3.	Artificial Intelligence	a) ECPE49 - Foundations of Artificial Intelligence b) ECPE43 - Computer Vision c) ECPE44 - Natural Language Processing d) ECPE45 - Optimization Methods in Machine Learning e) ECPE46 - Hardware for Deep Learning f) ECPE47 - Image and Video Processing
4.	VLSI and Embedded Systems	a) ECPE13 - Computer Architecture and Organization b) ECPE14 - Embedded Systems c) ECPE16 - ARM System Architecture d) ECPE19 - High Speed System Design e) ECPE37 - Low Power VLSI Circuits f) ECPE41 - Electronic Design Automation Tools g) ECPE12 - Microprocessors and Micro Controllers
5.	Microwave and Fiber Optic Communication	a) ECPE31 - Fiber Optic Communication b) ECPE33 - Microwave Integrated Circuit Design c) ECPE34 - RF MEMS Circuit Design d) ECPE36 - Principles of Radar e) ECPE42 - Electromagnetic Interference and Compatibility f) ECPE50 - Photonic Integrated Circuits g) ECPE51 - Microwave Circuits
6.	Semiconductor Technology	a) ECPE41 - Electronic Design Automation Tools b) ECPE42- Electromagnetic Interference and Compatibility c) ECPE48 - Automated Test Engineering for Electronics d) ECPE50 - Photonic Integrated Circuits e) ECPE51 - Microwave Circuits f) ECPE56 - Analog Power Integrated Circuits

b. Open Elective (OE)

The courses listed below are offered by the Department of Electronics and Communication Engineering for students of other Departments.

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	ECOE10	Microwave Integrated Circuits	None	3
2.	ECOE11	RF MEMS Circuit	None	3
3.	ECOE12	High Speed System Design	None	3
4.	ECOE13	Digital Speech Processing	ECPC15	3
5.	ECOE14	Digital Image Processing	None	3
6.	ECOE15	Pattern Recognition	None	3
7.	ECOE16	Computer Architecture and Organization	None	3
8.	ECOE17	Operating Systems	None	3
9.	ECOE18	Wireless Sensor Networks	ECPE10	3
10.	ECOE19	Arm System Architecture	NONE	3
11.	ECOE20	Low Power VLSI Circuits	ECPC23	3
12.	ECOE21	Computer Vision and Machine Learning	NONE	3
13.	ECOE22	Text Data Mining	NONE	3
14.	ECOE23	Internet of Things	CSIR11	3
Total				42

c. Minor (MI)

Students who have registered for B.Tech. Minor in ELECTRONICS AND COMMUNICATION ENGINEERING can opt to study any 5 of the courses listed below.

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	ECMI10	Signals and Systems	None	3
2.	ECMI11	Network Analysis and Synthesis	None	3

3.	ECMI12	Electrodynamics and Electromagnetic Waves	None	3
4.	ECMI13	Semiconductor Physics and Devices	None	3
5.	ECMI14	Digital Circuits and Systems	None	3
6.	ECMI15	Digital Signal Processing	ECMI10	3
7.	ECMI16	Transmission Lines and Waveguides	ECMI12	3
8.	ECMI17	Electronic Circuits	ECMI13	3
9.	ECMI18	Microprocessors and Micro Controllers	ECMI14	3
10.	ECMI19	Digital Signal Processors and Applications	ECMI15	3
11.	ECMI20	Analog Communication	ECMI10	3
12.	ECMI21	Antennas and Propagation	ECMI12	3
13.	ECMI22	Analog Integrated Circuits	ECMI17	3
14.	ECMI23	Digital Communication	ECMI20	3
15.	ECMI24	Microwave Components and Circuits	ECMI16	3
16.	ECMI25	VLSI Systems	ECMI14	3
17.	ECMI26	Wireless Communicaiton	ECMI23	3
18.	ECMI27	Fiber Optic Communication	ECMI12 &ECMI20	3
19.	ECMI28	Microwave Electronics	ECMI24	3
Total				**57**

Note: Student should be allowed a minimum of 50% of the total electives of a programme from Open electives and Minor, if so desired by the student.

III. Essential Programme Laboratory Requirement (ELR)

Sl. No.	Course Code	Course Title	Co-requisites	Credits
1.	ECLR10	Devices and Networks Laboratory	ECPC13	2
2.	ECLR11	Digital Electronics Laboratory	ECPC14	2

3.	ECLR12	Electronic Circuits Laboratory	ECPC17	2
4.	ECLR13	Microprocessor and Microcontroller Laboratory	ECPC14	2
5.	ECLR14	Analog VLSI and Embedded System Design Laboratory	ECPC21 & ECPC23	2
6.	ECLR15	Digital Signal Processing Laboratory	ECPC15	2
7.	ECLR16	Communication Engineering Laboratory	ECPC18 & ECPC19	2
8.	ECLR17	Microwave and Fiber Optic Laboratory	ECPC24	2
Total				**16**

NOTE: Students can register for 2 laboratory courses during one session along with regular courses (PC / PE / OE / MI).

IV. Online Courses (OC)

Sl. No.	Course Code	Course Title	Prerequisites	Credits
		Course list shall be updated regularly at the start of each Academic Year or Semester by the department NPTEL Coordinator. The students shall be able to select an online course from then available list.		

V. Advanced Level Courses for B.Tech. (Honors)

To qualify for an Honors Degree (HO), students must: (a) register for at least 12 theory courses and 2 ELRs in their second year, (b) consistently maintain a minimum CGPA of 8.5 during the first four sessions, (c) maintain a minimum CGPA of 8.5 in all sessions excluding Honors courses, (d) successfully completed additional courses totalling 15 credits (3 numbers of 4 credit course and 1 number of 3 credit course), and (e) achieve at least a B grade in Honors courses, which must be distinct and at a higher level than PC and PE courses, preferably M. Tech. courses. Honors courses cannot be treated as Programme Electives and grades from these courses do not factor into CGPA calculations. (f) Completed all the courses registered, in the first attempt and in four years of study, and (g) Project Work is compulsory for Honors.

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	ECHO11	Spectral Analysis of Signals	ECPC15	3
2.	ECHO12	Detection and Estimation	MAIR45	3
3.	ECHO13	Wavelet Signal Processing	ECPC15	4
4.	ECHO14	RF Circuits	NONE	3
5.	ECHO15	Numerical Techniques for MIC	ECPC16	3
6.	ECHO16	Applied Photonics	NONE	3
7.	ECHO17	Advanced Radiation Systems	ECPC20	3

8.	ECHO18	Bio MEMS	NONE	3
9.	ECHO19	Analog IC Design	ECPC21	3
10.	ECHO20	VLSI System Testing	ECPC23	3
11.	ECHO22	Design of ASICs	NONE	4
12.	ECHO23	Digital System Design	ECPC14	3
13.	ECHO24	Optimizations of Digital Signal Processing Structures for VLSI	ECPC23, ECPE18, ECPC15	4
14.	ECHO26	VLSI Digital Signal Processing Systems	ECPC15 &ECPC23	3
15.	ECHO27	Asynchronous System Design	ECPC14	3
16.	ECHO28	Physical Design Automation	NONE	3
17.	ECHO29	Mixed - Signal Circuit Design	NONE	3
18.	ECHO30	Digital Signal Processing for Medical Imaging	ECPC15	3
19.	ECHO31	Advanced Techniques for Wireless Reception	-	4
20.	ECHO32	Error Control Coding	-	3
21.	ECHO33	Digital Communication Receivers	-	3
22.	ECHO34	Advanced Digital Signal Processing	ECPC15	3
Total				**70**

VI. Microcredits (MC) (Students can opt 3 courses of 1 credit (4 weeks) each as microcredits instead of 1 OE/OC)

Students are advised to take 4-week courses from NPTEL/SWAYAM platform

INSTRUMENTATION AND CONTROL ENGINEERING

The total minimum credits required for completing the B.Tech. programme inInstrumentation and Control Engineering is **160.**

CURRICULUM FRAME WORK / FLEXIBLE CURRICULUM / NEP 2020 / NCrF / B.Tech. Instrumentation and Control Engineering

Semester	GIR		PC		ELR		PE/OE		Total Credits	Credit Distribution
	Course	Credit	Course	Credit	Course	Credit	Course	Credit		
I	8	19	-	-	-	-	-	-	**19**	**40**
II	7	17	1	4	-	-	-	-	**21**	
III	1	4	4	14	2	4	1	3	**25**	**47**
IV	-	-	3	12	2	4	2	6	**22**	
V	1	3	4	12	2	4	2	6	**25**	**49**
VI	2	4	3	10	2	4	2	6	**24**	
VII	2	3	-	-	-	-	4	12	**15**	**24**
VIII	1	6	-	-	-	-	1	3	**9**	
Total	**22**	**56**	**15**	**52**	**8**	**16**	**12**	**36**	**160**	**160**

CURRICULUM FRAME WORK / FLEXIBLE CURRICULUM / NEP 2020 / NCrF / B.Sc. (Engineering) Instrumentation and Control Engineering

	Sem	GIR		PC		ELR		PE/OE		Total Credits	Credit Distribution
		Course	Credit	Course	Credit	Course	Credit	Course	Credit		
Same as B.Tech.	**I**	8	19	-	-	-	-	-	-	**19**	**40**
	II	7	17	1	4	-	-	-	-	**21**	
	III	1	4	4	14	2	4	1	3	**25**	**47**
	IV	-	-	3	12	2	4	2	6	**22**	
B.Sc. (Engg.) Exit	**V**	1	3	3	9	2	4	1	3	**19**	**35**
	VI	4[#]	12	-	-	2	4	-	-	**16**	
After B.Sc. (Engg.) exit and join back for B. Tech.	**VII**	-	-	1	3	-	-	6	18	**21**	**38**
	VIII	1	1	3	10	-	-	2	6	**17**	
	Total	**22**	**56**	**15**	**52**	**8**	**16**	**12**	**36**	**160**	**160**

[#](Winter internship (2), Project Work (6), Professional Ethics (3), and Industrial Lecture (1))

Curriculum Framework and Credit System / ICE / 160

B.Tech. Instrumentation and Control Engineering

Semester I (July Session)

Sl. No.	Course Code	Course Title	Credits	Category
1.	MAIR12	Linear Algebra and Calculus	3	GIR
2.	PHIR11	Physics	3	GIR
3.	ENIR11	Energy and Environmental Engineering	2	GIR
4.	CSIR11	Introduction to Computer Programming (Theory and Laboratory)	3	GIR
5.	CEIR11	Basics of Civil Engineering	2	GIR
6.	MEIR11	Basics of Mechanical Engineering	2	GIR
7.	PRIR11	Engineering Practice	2	GIR
8.	PHIR12	Physics Laboratory	2	GIR
		Total	**19**	

Semester II (January Session)

Sl. No.	Course Code	Course Title	Credits	Category
1.	HSIR11	English for Communication (Theory and Laboratory)	4	GIR
2.	MAIR21	Complex Analysis and Differential Equations	3	GIR
3.	CHIR11	Chemistry	3	GIR
4.	ICIR15	Introduction to Instrumentation and Control Systems Engineering	2	GIR
5.	MEIR12	Engineering Graphics	3	GIR
6.	CHIR12	Chemistry Laboratory	2	GIR
7.	SWIR11	NSS / NCC / NSO	0	GIR
8.	ICPC11	Programme Core – 1 / Circuit Theory	4	PC
		Total	**21**	

Semester III (July Session)

Sl. No.	Course Code	Course Title	Credits	Category
1.	MAIR34	Probability and Distribution Theory	4	GIR
2.	ICPC12	Programme Core – 2 / Electronic Circuits	4	PC
3.	ICPC13	Programme Core – 3 / Signals and Systems	4	PC
4.	ICPC14	Programme Core – 4 / Sensors and Transducers	3	PC
5.	ICPC15	Programme Core – 5 / Digital Electronics	3	PC
6.	ICPEXX	Programme Elective – 1	3	PE
7.	ICLR11	ELR – 1 / Electric Circuits Laboratory	2	ELR
8.	ICLR12	ELR – 2 / Electronic Circuits Laboratory	2	ELR
		Total	**25**	

Semester IV (January Session)

Sl. No.	Course Code	Course Title	Credits	Category
1.	ICPC16	Programme Core – 6 / Microprocessors and Microcontrollers	3	PC
2.	ICPC17	Programme Core – 7 / Industrial Instrumentation	3	PC
3.	ICPC18	Programme Core – 8 / Control Systems - I	4	PC
4.	ICPC19-A	Programme Core – 9 Part A / Product Design and Development – 1 (Theory)	2	PC
5.	ICPEXX	Programme Elective – 2	3	PE
6.	ICPEXX	Programme Elective - 3 / Open Elective – 1	3	PE/OE
7.	ICLR13	ELR – 3 / Sensors and Transducers Laboratory	2	ELR
8.	ICLR14	ELR – 4 / Microprocessors and Microcontrollers Laboratory	2	ELR
		Total	**22**	

Semester V (July Session)

Sl. No.	Course Code	Course Title	Credits	Category
1.	HSIR13	Industrial Economics	3	GIR
2.	ICPC20	Programme Core – 10 / Analog Signal Processing	4	PC
3.	ICPC21	Programme Core – 11 / Process Control	3	PC
4.	ICPC22	Programme Core – 12 / Control Systems - II	3	PC
5.	ICPC19-B	Programme Core – 9 Part B / Product Design and Development – 2 (Practice)	2	PC
6.	ICPEXX	Programme Elective – 5	3	PE
7.	ICPEXX	Programme Elective – 6 / Open Elective – 2	3	PE/OE
8.	ICLR15	ELR – 5 / Control Engineering Laboratory	2	ELR
9.	ICLR16	ELR – 6 / Analog Signal Processing Laboratory	2	ELR
		Total	**25**	

Semester VI (January Session)

Sl. No.	Course Code	Course Title	Credits	Category
1.	ICIR19	Industrial Lecture	1	GIR
2.	ICIR14	Professional Ethics	3	GIR
3.	ICPC23	Programme Core – 13 / Electrical and Electronic Measurements	3	PC
4.	ICPC24	Programme Core – 14 / Digital Signal Processing	3	PC
5.	ICPC25	Programme Core – 15 / Logic and Distributed Control Systems	4	PC
6.	ICPCXX	Programme Elective – 6	3	PE
7.	ICPCXX	Programme Elective – 7 / Open Elective – 3	3	PE/OE
8.	ICLR17	ELR – 7 / Instrumentation Laboratory	2	ELR
9.	ICLR18	ELR – 8 / Industrial Automation and Process Control Laboratory	2	ELR
		Total	**24**	

Semester VII (July Session)

Sl. No.	Course Code	Course Title	Credits	Category
1.	ICIR16	Summer Internship / Industrial Training / Academic Attachment	2	GIR
2.	ICIR18	Comprehensive Viva Voce	1	GIR
3.	ICPEXX	Programme Elective – 8	3	PE
4.	ICPEXX	Programme Elective – 9	3	PE
5.	ICPEXX	Programme Elective – 10 / Open Elective – 4	3	PE/OE
6.	ICPEXX	Programme Elective – 11 / Open Elective – 5	3	PE/OE
		Total	**15**	

Semester VIII (January Session)

Sl. No.	Course Code	Course Title	Credits	Category
1.	ICIR17	Project Work	6	GIR
2.	ICPEXX	Programme Elective – 12 / Open Elective – 6	3	PE/OE
		Total	**9**	

Minimum Credits and Contact hours requirement for graduation with the B. Tech. degree

Semester	Credits to be earned	Number of Contact Hours
I	19	266
II	21	294
III	25	350
IV	22	308
V	25	350
VI	24	336
VII	15	210
VIII	9	126
Total	**160**	**2,240**

Note:

1. Among the 15 Programme Core courses, 7 are of 4 credits.
2. In order to fulfill 36 credits from the elective (PE/OE) courses, the students should complete at least eight Programme Elective (PE) courses.
3. Minor (MI): 15 credits over and above the minimum total credits as specified by the B.Tech. curriculum (160).
   The details of MINOR will be mentioned in the Transcript but not in the Degree Certificate.
4. Honors (HO): 15 credits over and above the minimum total credits as specified by the B.Tech. curriculum (160).

B. Sc. (Engineering) in Instrumentation and Control Engineering

The curriculum structure for the 3 year B. Sc. (Engineering) degree in Instrumentation and Control Engineering remains the same as that of 4 year B.Tech. Instrumentation and Control Engineering for the first 4 sessions.

Semester V (July Session) / B.Sc. (Engineering) Exit

Sl. No.	Course Code	Course Title	Credits	Category
1.	HSIR13	Industrial Economics	3	GIR
2.	ICPC20	Programme Core – 10 /Analog Signal Processing	4	PC
3.	ICPC21	Programme Core – 11 / Process Control	3	PC
4.	ICPC19-B	Programme Core – 9 Part B / Product Design and Development – 2 (Practice)	2	PC
5.	ICPEXX	Programme Elective – 5 / Open Elective – 2	3	PE/OE
6.	ICLR15	ELR – 5 / Control Engineering Laboratory	2	ELR
7.	ICLR16	ELR – 6 / Analog Signal Processing Laboratory	2	ELR
		Total	**19**	

Semester VI (January Session) / B.Sc. (Engineering) Exit

Sl. No.	Course Code	Course	Credits	Category
1.	ICIR19	Industrial Lecture	1	GIR
2.	ICIR14	Professional Ethics	3	GIR
3.	ICIR16	Internship (Winter)	2	GIR
4.	ICIR17	Project Work*	6	GIR
5.	ICLR17	ELR – 7 / Instrumentation Laboratory	2	ELR
6.	ICLR18	ELR – 8 / Industrial Automation and Process Control Laboratory	2	ELR
		Total	**16**	

*Project Work is mandatory in the 6th Semester for B.Sc. (Engineering) (ICE) students. However, the students who wish to carry out / undergo the semester exchange programme / industry attachment (preplacement offer / internship) outside the institute during the 6th semester can opt for completing two additional Programme Elective (PE) courses equivalent to 6 credits, preferably during the previous semesters, in place of the Project Work in the 6th Semester (if, they cannot do a project work in this tenure).

Note: No Minor or Honors will be awarded for B.Sc. (Engineering). But the student can credit Minors and Honors courses during the 6 semesters, and redeem the credits to obtain a Minor or Honors degree after rejoining and completing B.Tech.

The students of B. Tech. who have exited earlier with the 3 year B. Sc. (Engineering) (ICE) degree have the option of rejoining later to pursue the 4th year of B. Tech. (ICE) During the final year, they would earn more credits by completing the Programme Core (PC) courses and Programme Elective (PE) courses of B.Tech. that were not completed due to their B. Sc. (Engineering) exit.

Semester VII (July Session) / Rejoins B.Tech. after B.Sc. (Engineering) exit

Sl. No.	Course Code	Course Title	Credits	Category
1.	ICPC22	Programme Core – 12 / Control Systems - II	3	PC
2.	ICPEXX	Programme Elective – 6	3	PE
3.	ICPEXX	Programme Elective – 7	3	PE
4.	ICPEXX	Programme Elective – 8	3	PE
5.	ICPEXX	Programme Elective – 9 / Open Elective – 3	3	PE/OE
6.	ICPEXX	Programme Elective – 10 / Open Elective – 4	3	PE/OE
7.	ICPEXX	Programme Elective – 11 / Open Elective - 5	3	PE/OE
		Total	**21**	

Semester VIII (January Session) / Rejoins B.Tech. after B.Sc. (Engineering) exit

Sl. No.	Course Code	Course Title	Credits	Category
1.	ICIR18	Comprehensive Viva Voce	1	GIR
2.	ICPC23	Programme Core – 13 / Electrical and Electronic Measurements	3	PC
3.	ICPC24	Programme Core – 14 / Digital Signal Processing	3	PC
4.	ICPC25	Programme Core – 15 / Logic and Distributed Control Systems	4	PC
5.	ICPEXX	Programme Elective – 11	3	PE
6.	ICPEXX	Programme Elective – 12 / Open Elective – 6	3	PE/OE
		Total	**17**	

Minimum Credits and Contact hours requirement for graduation with the B. Sc. (Engineering) degree

Semester	Credits to be earned	Number of Contact Hours
B. Sc. (Engineering) Exit		
I	19	266
II	21	294
III	25	350
IV	22	308
V	19	266
VI	16	224
Total	**122**	**1,708**
After B.Sc. (Engineering) exit and join back for B. Tech.		
VII	21	294
VIII	17	238
Total	**160**	**2,240**

Credits:

Semester	I	II	III	IV	V	VI	VII	VIII	Total
B.Tech.	19	21	25	22	25	24	15	9	160
B.Sc.	19	21	25	22	19	16	21	17	160

Elective Choices

Option 1 / Regular B.Tech. (ICE)

To get a B.Tech. degree in Instrumentation and Control Engineering, possible choices of electives in Programme Electives and Open Electives are,

Programme Electives	Open Electives	Total
8	4	12
9	3	12
10	2	12
11	1	12
12	0	12

Option 2 / B.Sc. (Engineering) (ICE) Exit (at end of 3rd year)

Programme Electives	Open Electives	Total
3	2	5
4	1	5
5	0	5

Option 3 / B.Tech. (ICE) with Minor

To get a B.Tech. degree in Instrumentation and Control Engineering, and Minor in other programmes, possible choices of electives in Programme Electives, Open Electives and Minor Electives are,

Programme Electives	Open Electives	Minor Electives	Total
8	4	5	12 + 5
9	3	5	12 + 5
10	2	5	12 + 5
11	1	5	12 + 5
12	0	5	12 + 5

Option 4 / B.Tech. (ICE) with Honors

To get a B.Tech. Honors degree in Instrumentation and Control Engineering, possible choices of electives in Programme Electives, Open Electives, and Honor Electives are,

Programme Electives	Open Electives	Honor Electives	Total
8	4	4	12 + 4
9	3	4	12 + 4
10	2	4	12 + 4
11	1	4	12 + 4
12	0	4	12 + 4

Option 5 / B.Tech. (ICE) with Honors and Minor

To get a B.Tech. Honors degree in Instrumentation and Control Engineering, and Minor in other programmes possible choices of electives in Programme Electives, Open Electives, and Honor Electives are,

Programme Electives	Open Electives	Honor Electives	Minor Electives	Total
8	4	4	5	12 + 4 + 5
9	3	4	5	12 + 4 + 5
10	2	4	5	12 + 4 + 5
11	1	4	5	12 + 4 + 5
12	0	4	5	12 + 4 + 5

List of Courses

I. Programme Core (PC)

Sl. No.	Course Code	Course Title	Semester (B.Tech.)	Pre-requisites	Credits
1.	ICPC11	Programme Core – 1 / Circuit Theory	2nd		4
2.	ICPC12	Programme Core – 2 / Electronic Circuits	3rd	ICPC11	4
3.	ICPC13	Programme Core – 3 / Signals and Systems	3rd		4
4.	ICPC14	Programme Core – 4 / Sensors and Transducers	3rd		3
5.	ICPC15	Programme Core – 5 / Digital Electronics	3rd		3
6.	ICPC16	Programme Core – 6 / Microprocessors and Microcontrollers	4th	ICPC15	3
7.	ICPC17	Programme Core – 7 / Industrial Instrumentation	4th	ICPC14	3
8.	ICPC18	Programme Core – 8 / Control Systems - I	4th	ICPC13	4
9.	ICPC19-A	Programme Core – 9 Part A / Product Design and Development – 1 (Theory)	4th		2
	ICPC19-B	Programme Core – 9 Part B / Product Design and Development – 2 (Practice)	5th		2
10.	ICPC20	Programme Core – 10 / Analog Signal Processing	5th	ICPC12, ICPC13	4
11.	ICPC21	Programme Core – 11 / Process Control	5th	ICPC18	3
12.	ICPC22	Programme Core – 12 / Control Systems - II	5th	ICPC11, ICPC12	3
13.	ICPC23	Programme Core – 13 / Electrical and Electronic Measurements	6th	ICPC16	3
14.	ICPC24	Programme Core – 14 / Digital Signal Processing	6th	ICPC13	3
15.	ICPC25	Programme Core – 15 / Logic and Distributed Syste	6th	ICPC18, ICPC16	4

II. Electives

a. Programme Electives

Sl. No.	Course Code	Course Title	Pre-requisites	Credits
1.	ICPE11	Biomedical Instrumentation	ICPC14	3

2.	ICPE12	Biomedical Signal Processing	ICPC13, ICPC24	3
3.	ICPE13	Digital Image Processing	ICPC13, ICPC24	3
4.	ICPE14	Medical Imaging Systems	ICPC13, ICPC24	3
5.	ICPE15	Medical Diagnostic and Therapeutic Instrumentation	ICPE11	3
6.	ICPE16	Assistive devices	ICPE11	3
7.	ICPE17	Instrumentation Practices in Industries	ICPC17	3
8.	ICPE18	Digital Control Systems	ICPC18	3
9.	ICPE19	Neural Networks and Fuzzy Logic	-	3
10.	ICPE20	Computational Techniques in Control Engineering	ICPC18	3
11.	ICPE21	Network Control Systems	ICPC18	3
12.	ICPE22	Industrial Data Communication	ICPC25	3
13.	ICPE23	Internet of Things System Design	-	3
14.	ICPE24	Robotics	-	3
15.	ICPE25	Cyber security for industrial automation	ICPC25	3
16.	ICPE26	Real-Time Embedded Systems	ICPC15, ICPC16	3
17.	ICPE27	Optical Instrumentation	ICPC14	3
18.	ICPE28	Measurement Data Analysis	-	3
19.	ICPE29	Micro Electro Mechanical Systems	ICPC14	3
20.	ICPE30	Automotive Instrumentation and Control	ICPC14	3
21.	ICPE31	Instrumentation and Control for Power Plant	ICPC17, ICPC18	3
22.	ICPE32	Instrumentation and Control for Petrochemical Industries	ICPC17, ICPC18	3
23.	ICPE33	Instrumentation and Control for Paper Industries	ICPC17, ICPC18	3
24.	ICPE34	Instrumentation for Agricultural and Food Processing Industries	ICPC17	3
25.	ICPE35	Piping and Instrumentation Diagrams	ICPC18, ICPC21	3
26.	ICPE36	Communication and Networking in Industrial Automation	ICPC25	3
27.	ICPE37	Building Automation	ICPC25	3
28.	ICPE38	Nonlinear Control	MAIR courses, ICPC18	3
29.	ICPE39	System Identification	ICPC13	3
30.	ICPE40	Fault Detection and Diagnosis	ICPC21	3
31.	ICPE41	Process Modeling and Optimization	ICPC18, ICPC21	3
32.	ICPE42	Control System Components	ICPC11, ICPC12	3
33.	ICPE43	Power Electronics	ICPC11, ICPC12	3
34.	ICPE44	Industrial Electric Drives	ICPC11, ICPC12	3
35.	ICPE45	Smart and Wireless Instrumentation	ICPC14	3
36.	ICPE46	Principles of Communication Systems	ICPC13	3
37.	ICPE47	Multi Sensor Data Fusion	-	3
38.	ICPE48	Energy Harvesting Techniques	ICPC14	3
39.	ICPE49	Smart Materials and Systems	ICPC14	3
40.	ICPE50	Hydraulics and Pneumatics	ICPC14	3
41.	ICPE51	Engineering Mechanics	-	3
42.	ICPE52	Software Design Tools for Sensing and Control	ICPC18	3
43.	ICPE53	Numerical Methods	-	3
44.	ICPE54	Analytical Instrumentation	ICPC14, ICPC17	3
45.	ICPE55	Data structures and algorithms	-	3
46.	ICPE56	Nuclear Instrumentation	ICPC14, ICPC17	3

47.	ICPE57	Condition monitoring	ICPC14, ICPC17	3
48.	ICPE58	Safety Instrumented system	ICPC17	3
49.	ICPE59	Modern Optimization Techniques and Algorithms	MAIR courses	3
50.	ICPE60	Robot Dynamics and Control	ICPC18, ICPC21	3
51.	ICPE61	CMOS Analog IC Design	ICPC12, ICPC20	3
52.	ICPE62	Sensor Interface Design	ICPC11, ICPC12, ICPC17	3
53.	ICPE63	Artificial Intelligence in Instrumentation and Measurement	-	3
54.	ICPE81	Design of Sensors and Transducers	ICPC14	3
55.	ICPE82	Instrumentation System Design	ICPC17, ICPC20	3
56.	ICPE83	Micro System Design	ICPC14	3
57.	ICPE84	Control System Design	ICPC18, ICPC21	3
58.	ICPE85	Advanced Process Control	ICPC18, ICPC21	3
59.	ICPE86	Optimal and Robust Control	ICPC18, ICPC22	3
60.	ICPE87	Sensors Systems Design	ICPC17	3

The Programme Elective courses are distributed into two specialization streams: Stream 1 (Biomedical Instrumentation), Stream 2 (Automation) in addition to other electives which do not fall under the two streams.

Stream I (Biomedical Instrumentation)

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	ICPE11	Biomedical Instrumentation	ICPC14	3
2.	ICPE12	Biomedical Signal Processing	ICPC13, ICPC24	3
3.	ICPE13	Digital Image Processing	ICPC13, ICPC24	3
4.	ICPE14	Medical Imaging Systems	ICPC13, ICPC24	3
5.	ICPE15	Medical Diagnostic and Therapeutic Instrumentation	ICPE11	3
6.	ICPE16	Assistive devices	ICPE11	3

Stream II (Automation)

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	ICPE17	Instrumentation Practices in Industries	ICPC17	3
2.	ICPE18	Digital Control Systems	ICPC18	3
3.	ICPE19	Neural Networks and Fuzzy Logic	-	3
4.	ICPE20	Computational Techniques in Control Engineering	ICPC18	3
5.	ICPE21	Network Control Systems	ICPC18	3
6.	ICPE22	Industrial Data Communication	ICPC25	3
7.	ICPE23	Internet of Things System Design		3
8.	ICPE24	Robotics	-	3
9.	ICPE25	Cyber security for industrial automation	ICPC25	3
10.	ICPE26	Real-Time Embedded Systems	ICPC15, ICPC16	3
11.	ICPE17	Instrumentation Practices in Industries	ICPC17	3
12.	ICPE36	Communication and Networking in Industrial Automation	ICPC23	3
13.	ICPE37	Building Automation	ICPC23	3

14.	ICPE38	Nonlinear Control	MAIR courses, ICPC18	3
15.	ICPE39	System Identification	ICPC13	3
16.	ICPE40	Fault Detection and Diagnosis	ICPC21	3
17.	ICPE41	Process Modeling and Optimization	ICPC18, ICPC21	3
18.	ICPE42	Control System Components	ICPC11, ICPC12	3
19.	ICPE43	Power Electronics	ICPC11, ICPC12	3
20.	ICPE44	Industrial Electric Drives	ICPC11	3
21.	ICPE55	Data structures and algorithms	-	3
22.	ICPE57	Condition monitoring	ICPC14, ICPC17	3
23.	ICPE58	Safety Instrumented system	ICPC17	3
24.	ICPE59	Modern Optimization Techniques and Algorithms	MAIR courses	3
25.	ICPE60	Robot Dynamics and Control	ICPC18, ICPC21	3
26.	ICPE84	Control System Design	ICPC18, ICPC21	3
27.	ICPE85	Advanced Process Control	ICPC18, ICPC21	3
28.	ICPE86	Optimal and Robust Control	ICPC18, ICPC22	3

Stream III (Non-Specialization Electives)

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	ICPE27	Optical Instrumentation	ICPC14	3
2.	ICPE28	Measurement Data Analysis	-	3
3.	ICPE29	Micro Electro Mechanical Systems	ICPC14	3
4.	ICPE30	Automotive Instrumentation and Control	ICPC14	3
5.	ICPE31	Instrumentation and Control for Power Plant	ICPC17, ICPC18	3
6.	ICPE32	Instrumentation and Control for Petrochemical Industries	ICPC17, ICPC18	3
7.	ICPE33	Instrumentation and Control for Paper Industries	ICPC17, ICPC18	3
8.	ICPE34	Instrumentation for Agricultural and Food Processing Industries	ICPC17	3
9.	ICPE35	Piping and Instrumentation Diagrams	ICPC18, ICPC21	3
10.	ICPE45	Smart and Wireless Instrumentation	ICPC14	3
11.	ICPE46	Principles of Communication Systems	ICPC13	3
12.	ICPE47	Multi Sensor Data Fusion	-	3
13.	ICPE48	Energy Harvesting Techniques	ICPC14	3
14.	ICPE49	Smart Materials and Systems	ICPC14	3
15.	ICPE50	Hydraulics and Pneumatics	ICPC14	3
16.	ICPE51	Engineering Mechanics	-	3
17.	ICPE52	Software Design Tools for Sensing and Control	ICPC18	3
18.	ICPE53	Numerical Methods	-	3
19.	ICPE54	Analytical Instrumentation	ICPC14, ICPC17	3
20.	ICPE56	Nuclear Instrumentation	ICPC14, ICPC17	3
21.	ICPE61	CMOS Analog IC Design	ICPC12, ICPC20	3
22.	ICPE62	Sensor Interface Design	ICPC11, ICPC12, ICPC17	3
23.	ICPE63	Artificial Intelligence in Instrumentation and Measurement	-	3
24.	ICPE81	Design of Sensors and Transducers	ICPC14	3
25.	ICPE82	Instrumentation System Design	ICPC17, ICPC20	3
26.	ICPE83	Micro System Design	ICPC14	3
27.	ICPE87	Sensors Systems Design	ICPC17	3

b. Open Electives (OE)

The courses listed below are offered by the Department of Instrumentation and Control Engineering for students of other branches.

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	ICOE11	Biomedical signal processing	-	3
2.	ICOE12	Micro Electro Mechanical Systems	-	3
3.	ICOE13	Measurement and Control	-	3
4.	ICOE14	Industrial Measurements	-	3
5.	ICOE15	Virtual Instrument Design	-	3
6.	ICOE16	Neural Networks and Fuzzy Logic	-	3
7.	ICOE17	Network Control Systems	-	3
8.	ICOE18	Control Systems	-	3
9.	ICOE19	Energy Harvesting Techniques	-	3
10.	ICOE20	Smart Materials and Systems	-	3
11.	ICOE21	Product Design and Development (Theory and Practice)	-	3
12.	ICOE22	Medical Imaging Systems	-	3
13.	ICOE23	Building Automation	-	3

c. Minor (MI) (offered for the students of other departments)

Students of other departments who desire B.Tech. Minor in Instrumentation and Control Engineering can opt to study (from 4th to 8th semester) any 5 of the courses listed below.

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	ICMI11	Transducer Engineering	-	3
2.	ICMI12	Test and Measuring Instruments	-	3
3.	ICMI13	Measurements in Process Industries	-	3
4.	ICMI14	Essentials of Control Engineering	-	3
5.	ICMI15	Industrial Automation and Control	-	3
6.	ICMI16	Digital Electronics	-	3
7.	ICMI17	Microprocessor and Microcontroller	-	3
8.	ICMI18	Micro Electro Mechanical Systems	-	3
9.	ICMI19	Medical Instrumentation	-	3

III. Essential Laboratory Requirement (ELR)

Sl. No.	Course Code	Course Title	Semester (B.Tech.)	Prerequisites	Credits
1.	ICLR11	ELR – 1 / Electric Circuits Laboratory	3rd	ICPC11	2
2.	ICLR12	ELR – 2 / Electronic Circuits Laboratory	3rd		2
3.	ICLR13	ELR – 3 / Sensors and Transducers Laboratory	4th	ICPC14	2
4.	ICLR14	ELR – 4 / Microprocessors and Microcontrollers Laboratory	4th		2
5.	ICLR15	ELR – 5 / Control Engineering Laboratory	5th	ICPC18	2
6.	ICLR16	ELR – 6 / Analog Signal Processing Laboratory	5th		2
7.	ICLR17	ELR – 7 / Instrumentation Laboratory	6th	ICPC17	2
8.	ICLR18	ELR – 8 / Industrial Automation and Process Control Laboratory	6th	ICPC21	2

IV. ONLINE COURSES (OC)

A committee headed by the head of the department with two faculty members can decide the online courses to be offered to the students through the NPTEL/Swayam portal (https://swayam.gov.in/). A student can earn a maximum of 12 credits from these online courses, in place of Open Electives (OE).

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	ICOE51	Laser: Fundamentals and Applications	-	3
2.	ICOE52	Data Analytics using Python	-	3
3.	ICOE53	Deep Learning	-	3
4.	ICOE54	Introduction to Internet of Things	-	3
5.	ICOE55	Programming, Data Structures and Algorithms Using Python	-	3
6.	ICOE56	Introduction to Machine Learning	-	3
7.	ICOE57	Introduction to Robotics	-	3
8.	ICOE58	Design, Technology and Innovation	-	3
9.	ICOE59	Fabrication Techniques for MEMS-based sensors: clinical perspective	-	3
10.	ICOE60	Electronics Equipment Integration and Prototype building	-	3
11.	ICOE61	Embedded System Design with ARM	-	3
12.	ICOE62	Fiber Optics	-	3
13.	ICOE63	Industrial Automation andControl	-	3
14.	ICOE64	Process Control - Design Analysis and Assessment	-	3
15.	ICOE65	Robotics and Control: Theory and Practice	-	3
16.	ICOE66	Introductory Neuroscience and Neuro-Instrumentation	-	3
17.	ICOE67	Innovation, Business Models and Entrepreneurship	-	3
18.	ICOE68	Robotics	-	3
19.	ICOE69	Automation inManufacturing	-	3
20.	ICOE70	BioMEMS and Microfluidics	-	3
21.	ICOE71	Applied Linear Algebra for SignalProcessing, Data Analytics and Machine Learning	-	3
22.	ICOE72	Reinforcement Learning	-	3
23.	ICOE73	Op-Amp Practical Applications: Design, Simulation, and Implementation	-	3
24.	ICOE74	Introduction to Fuzzy Set Theory, Arithmetic and Logic	-	3
25.	ICOE75	Robotics: Basics and *Selected* Advanced Concepts	-	3
26.	ICOE76	Sensors and Actuators	-	3
27.	ICOE77	Model Predictive Control: Theory and Applications	-	3

Note: *In case any of the above listed courses are not offered in Swayam portal in a particular semester, the department will notify alternative courses offered in Swayam during the same period.*

Qualification in some online/offline co-curricular certification courses conducted by professional organizations such as Microsoft, IBM, CISCO, National Instruments, International Society of Automation (ISA), IEEE, SAE, Bureauof Indian Standards (BIS), International Society for Measurement and Control, etc. can be considered for the award of upto a maximum of 3 credits in place of one Open

Elective (OE), as decided by the department. The duration of the instructional course leading to the certification should be commensurate with the credits earned, with each credit typically requiring 12-14 hours of the student's attendance.

V. Advanced Level Courses for B.Tech. (Honors)

Students who desire to obtain B.Tech. (Honors) degree in Instrumentation and Control Engineering can opt to study additional advanced level courses (from 5th to 8th semester) from the list below.

Sl. No.	Course Code	Course Title	Pre-requisites	Credits
1.	ICHO11	Design of Sensors and Transducers	ICPC14	4
2.	ICHO12	Instrumentation System Design	ICPC17, ICPC20	4
3.	ICHO13	Micro System Design	ICPC14	4
4.	ICHO14	Control System Design	ICPC18, ICPC21	4
5.	ICHO15	Advanced Process Control	ICPC18, ICPC21	4
6.	ICHO16	Optimal and Robust Control	ICPC18, ICPC22	4
7.	ICHO17	Sensors Systems Design	ICPC17	4
8.	ICHO18	Project-based Learning	-	4

VI. Microcredits (MC)

(Students can opt 3 courses of 1 credit (12-14 hours) each as microcredits instead of one 3 credit OE/OC)

Students are also advised to take 4-week courses from NPTEL/SWAYAM platform

Sl. No.	Course Code	Course Title	Credit
1.	ICMC11	Essentials of Entrepreneurship for Engineers	1
2.	ICMC12	Intellectual Property Rights and Patents	1
3.	ICMC13	Medical Embedded Systems	1
4.	ICMC14	Wearable Robotics	1
5.	ICMC15	Augmented Reality (AR) and Virtual Reality (VR) in Industrial Automation	1
6.	ICMC16	Additive Manufacturing	1
7.	ICMC17	Smart Manufacturing	1
8.	ICMC18	Communication Networks in Practice	1
9.	ICMC19	Building and Infrastructure systems Automation	1
10.	ICMC20	Embedded System Design	1
11.	ICMC21	IT/OT Cyber Security	1
12.	ICMC22	Data Analytics/ Big Data	1
13.	ICMC23	Python Programming for AI/ML	1
14.	ICMC24	Advanced Driver Assistance System – An Introduction	1
15.	ICMC25	Vehicle Data Capture, Analytics and Dynamic vehicle performance Alteration	1

MECHANICAL ENGINEERING

The total minimum credits for completing B.Tech. Programme in Mechanical Engineeringis **163.**

CURRICULUM FRAMEWORK / FLEXIBLE CURRICULUM / NEP 2020 / NCrF / B.Tech.

Semester	GIR		PC		ELR		PE/OE		Total Credits	Credit Distribution
	Course	Credit	Course	Credit	Course	Credit	Course	Credit		
I	7	19	-	-	-	-	-	-	**19**	**40**
II	8	17	1	4	-	-	-	-	**21**	
III	-	-	4	15	2	4	2	6	**25**	**50**
IV	1	4	3	11	2	4	2	6	**25**	
V	1	3	4	15	2	4	1	3	**25**	**49**
VI	2	4	3	10	2	4	2	6	**24**	
VII	2	3	-	-	-	-	4	12	**15**	**24**
VIII	1	6	-	-	-	-	1	3	**9**	
Total	**22**	**56**	**15**	**55**	**8**	**16**	**12**	**36**	**163**	**163**

CURRICULUM FRAMEWORK / FLEXIBLE CURRICULUM / NEP 2020 /NCrF / B.Sc. (Engineering)

	Sem	GIR		PC		ELR		PE/OE		Total Credits	Credit Distri-bution
		Course	Credit	Course	Credit	Course	Credit	Course	Credit		
Same as B.Tech.	**I**	7	19	-	-	-	-	-	-	**19**	**40**
	II	8	17	1	4	-	-	-	-	**21**	
	III	-	-	4	15	2	4	2	6	**25**	**50**
	IV	1	4	3	11	2	4	2	6	**25**	
B.Sc. Exit	**V**	1	3	2	8	2	4	2	6	**21**	**37**
	VI	4[#]	12	-	-	2	4	-	-	**16**	
After B.Sc. exit and join back for B. Tech.	**VII**	-	-	3	11	-	-	3	9	**20**	**36**
	VIII	1	1	2	6	-	-	3	9	**16**	
	Total	**22**	**56**	**15**	**56**	**8**	**16**	**12**	**36**	**163**	**163**

[#](Summer internship (2), Project Work (6), Professional Ethics (3), and Industrial Lecture (1))

Curriculum Framework and Credit System (ME) / 163

Semester I (July Session)

Sl. No.	Course Code	Course Title	Credits	Category
1.	HSIR11	English for Communication (Theory and Laboratory)	4	GIR
2.	MAIR11	Matrices and Calculus	3	GIR
3.	CHIR11	Chemistry	3	GIR
4.	MEIR15	Introduction to Mechanical Engineering (*Branch Specific Course*)	2	GIR
5.	EEIR11	Basics of Electrical and Electronics Engineering	2	GIR
6.	MEIR12	Engineering Graphics	3	GIR
7.	CHIR12	Chemistry Laboratory	2	GIR
		Total	**19**	

Semester II (January Session)

Sl. No.	Course Code	Course Title	Credits	Category
1.	MAIR21	Complex Analysis and Differential Equations	3	GIR
2.	PHIR11	Physics	3	GIR
3.	CSIR12	Introduction to Computer Programming (Theory and Laboratory)	3	GIR
4.	CEIR11	Basics of Civil Engineering	2	GIR
5.	ENIR11	Energy and Environmental Engineering	2	GIR
6.	PRIR11	Engineering Practice	2	GIR
7.	PHIR12	Physics Laboratory	2	GIR
8.	SWIR11	NSS / NCC / NSO	0	GIR
9.	MEPC10	Engineering Mechanics	4	PC
		Total	**21**	

Semester III (July Session)

Sl. No.	Course Code	Course Title	Credits	Category
1.	MEPC11	Engineering Thermodynamics	4	PC
2.	MEPC12	Applied Electrical and Electronics Engineering	4	PC
3.	MEPC13	Manufacturing Technology	4	PC
4.	MEPC14	Mechanics of Solids	3	PC
5.		Programme Elective - 1	3	PE
6.		Programme Elective – 2	3	PE
7.	MELR11	Manufacturing Technology Laboratory	2	ELR
8.	MELR12	Computer Aided Machine Drawing	2	ELR
		Total	**25**	

Note: Department(s) to offer Minor (MI) Course and Online Course(OC) to those willing students in addition to 25 credits.

Semester IV (January Session)

Sl. No.	Course Code	Course Title	Credits	Category
1.	MAIR43	Fourier Transforms and Numerical techniques	4	GIR
2.	MEPC15	Fluids Mechanics and Machinery	4	PC
3.	MEPC16	Thermal Engineering	4	PC
4.	MEPC17	Mechanics of Machines – I	3	PC
5.		Programme Elective – 3	3	PE
6.		Programme Elective - 4 / Open Elective – 1	3	PE/OE
7.	MELR13	Thermal Engineering Laboratory	2	ELR
8.	MELR14	Strength of Materials and Fluid Mechanics Laboratory	2	ELR
		Total	**25**	

Semester V (July Session) / Continuing B.Tech.

Sl. No.	Course Code	Course Title	Credits	Category
1.	MEIR14	Professional Ethics	3	GIR
2.	MEPC18	Engineering Materials	4	PC
3.	MEPC19	Heat and Mass Transfer	4	PC
4.	MEPC20	Mechanics of Machines – II	4	PC
5.	MEPC21	Metrology and Measurements	3	PC
6.		Programme Elective – 5 / Open Elective – 2	3	PE/OE
7.	MELR15	Heat transfer and Refrigeration and Air-Conditioning Laboratory	2	ELR
8.	MELR16	Metrology and Measurements Laboratory	2	ELR
		Total	**25**	

Semester V (July Session) / B.Sc. (Engineering) Exit

Sl. No.	Course Code	Course Title	Credits	Category
1.	MEIR14	Professional Ethics	3	GIR
2.	MEPC18	Engineering Materials	4	PC
3.	MEPC19	Heat and Mass Transfer	4	PC
4.		Programme Elective – 5	3	PE
5.		Programme Elective - 6 / Open Elective - 2	3	PE/OE
6.	MELR15	Heat transfer and Refrigeration and Air-Conditioning Laboratory	2	ELR
7.	MELR16	Metrology and Measurements Laboratory	2	ELR
		Total	**21**	

Semester VI (January Session)

Sl. No.	Course Code	Course Title	Credits	Category
1.	MEIR19	Industrial Lecture	1	GIR
2.	HSIR13	Industrial Economics	3	GIR
3.	MEPC22	Design of Machine Elements	4	PC
4.	MEPC23	Automobile Engineering	3	PC
5.	MEPC24	Energy Conversion systems	3	PC
6.		Programme Elective - 6	3	PE
7.		Programme Elective - 7 / Open Elective – 3	3	PE/OE

8.	MELR17	Dynamics Laboratory	2	ELR
9.	MELR18	Automobile Engineering Laboratory	2	ELR
		Total	**24**	

Semester VI (January Session) / B.Sc. (Engineering) Exit

Sl. No.	Course Code	Course Title	Credits	Category
1.	MEIR17	Project Work	6	GIR
2.	MEIR16	Winter Internship	2	GIR
3.	MEIR19	Industrial Lecture	1	GIR
4.	HSIR13	Industrial Economics	3	GIR
5.	MELR17	Dynamics Laboratory	2	ELR
6.	MELR18	Automobile Engineering Laboratory	2	ELR
		Total	**16**	

Semester VII (July Session)

Sl. No.	Course Code	Course Title	Credits	Category
1.	MEIR16	Summer Internship / Industrial Training / Academic Attachment*	2	GIR
2.	MEIR18	Comprehensive Viva Voce	1	GIR
3.		Programme Elective – 8	3	PE
4.		Programme Elective – 9	3	PE
5.		Programme Elective – 10 / Open Elective - 4	3	PE/OE
6.		Programme Elective - 11 / Open Elective – 5	3	PE/OE
		Total	**15**	

** Evaluation for Summer Internship*

Semester VII (July Session) / Rejoins B.Tech. after B.Sc. (Engineering) exit

Sl. No.	Course Code	Course Title	Credits	Category
1.	MEPC20	Mechanics of Machines – II	4	PC
2.	MEPC21	Metrology and Measurements	3	PC
3.	MEPC22	Design of Machine Elements	4	PC
4.		Programme Elective – 7	3	PE
5.		Programme Elective – 8	3	PE
6.		Programme Elective - 9 / Open Elective – 3	3	PE/OE
		Total	**20**	

Semester VIII (January Session)

Sl. No.	Course Code	Course Title	Credits	Category
1.		Programme Elective - 12 / Open Elective – 4	3	PE/OE
2.	MEIR17	Project Work	**6**	GIR
		Total	**9**	

Semester VIII (January Session) / Rejoins B.Tech. after B.Sc. (Engineering) exit

Sl. No.	Course Code	Course Title	Credits	Category
1.	MEIR18	Comprehensive Viva Voce	1	GIR
2.	MEPC23	Automobile Engineering	3	PC
3.	MEPC24	Energy Conversion systems	3	PC
4.		Programme Elective – 10	3	PE
5.		Programme Elective – 11	3	PE
6.		Programme Elective – 12 / Open Elective – 4	3	PE/OE
		Total	**16**	

Credits:

Semester	I	II	III	IV	V	VI	VII	VIII	Total
B.Tech.	19	21	25	25	25	24	15	9	**163**
B.Sc.	19	21	25	25	21	16	20	16	**163**

Note:

1. The curriculum should have 7 Programme Core courses shall be of 4 credits each.
2. Out of 12 elective courses (PE/OE), the students should study at least eight Programme Elective courses (PE).
3. Minor (MI): 15 credits over and above the minimum credit as specified by the departments (163). The details of MINOR will be mentioned in the transcript.
4. Honors (HO): 15 credits over and above the minimum credit as specified by the departments (163).

ELECTIVES CHOICES

Option 1 / Regular B.Tech.

To get a B.Tech. degree in **Mechanical Engineering**, possible choices of electives in Programme Electives and Open Electives are,

Programme Electives	Open Electives	Total
8	4	12
9	3	12
10	2	12
11	1	12
12	0	12

Option 2 / B.Sc. (Engineering) Exit (at end of 3rd year)

Programme Electives	Open Electives	Total
3	2	5
4	1	5
5	0	5

Option 3 / B.Tech. with Minor

To get a B.Tech. degree in **Mechanical Engineering** and Minor in other programmes, possible choices of electives in Programme Electives, Open Electives and Minor Electives are,

Programme Electives	Open Electives	Minor Electives	Total
8	4	5	12 + 5
9	3	5	12 + 5
10	2	5	12 + 5
11	1	5	12 + 5
12	0	5	12 + 5

Option 4 / B.Tech. with Honors

To get a B.Tech. Honors degree in **Mechanical Engineering**, possible choices of electives in Programme Electives, Open Electives, and Honor Electives are,

Programme Electives	Open Electives	Honor Electives	Total
8	4	4	12 + 4
9	3	4	12 + 4
10	2	4	12 + 4
11	1	4	12 + 4
12	0	4	12 + 4

Option 5 / B.Tech. with Honors and Minor

To get a B.Tech. Honors degree in **Mechanical Engineering** and Minor in other programmes possible choices of electives in Programme Electives, Open Electives, and Honor Electives are,

Programme Electives	Open Electives	Honor Electives	Minor Electives	Total
8	4	4	5	12 + 4 + 5
9	3	4	5	12 + 4 + 5
10	2	4	5	12 + 4 + 5
11	1	4	5	12 + 4 + 5
12	0	4	5	12 + 4 + 5

Note: No Minor or Honors will be awarded for B.Sc. But students can credit Minors and Honors during the 6 semesters and redeem it to obtain a Minor or Honors after rejoining and completing B.Tech. Also, B.Sc. students shall do Programme Electives in place of their project work in 6th semester.

List of Courses

I. Programme Core (PC)

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	MEPC10	Engineering Mechanics	NIL	4
2.	MEPC11	Engineering Thermodynamics	NIL	4
3.	MEPC12	Applied Electrical and Electronics Engineering	EEIR11	4
4.	MEPC13	Manufacturing Technology	NIL	4
5.	MEPC14	Mechanics of Solids	NIL	3

6.	MEPC15	Fluid Mechanics and Machinery	MEPC10	4
7.	MEPC16	Thermal Engineering	MEPC11	4
8.	MEPC17	Mechanics of Machines – I	MEPC10	3
9.	MEPC18	Engineering Materials	NIL	4
10.	MEPC19	Heat and Mass Transfer	MAIR32 MEPC11 MEPC15	4
11.	MEPC20	Mechanics of Machines – II	MEPC17	4
12.	MEPC21	Metrology and Measurements	NIL	3
13.	MEPC22	Design of Machine Elements	MEPC14 MEPC17	4
14.	MEPC23	Automobile Engineering	NIL	3
15.	MEPC24	Energy Conversion systems	MEPC16	3

II. Electives

a. Programme Electives

Stream I (Thermal Engineering)

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	MEPE33	Biofuels	NIL	3
2.	MEPE34	Renewable Energy Sources	NIL	3
3.	MEPE43	Advanced IC Engines	MEPC16	3
4.	MEPE52	Compressible Flow and Jet Propulsion	MEPC16	3
5.	MEPE61	Refrigeration and Air Conditioning	MEPC16	3
6.	MEPE62	Computational Fluid Dynamics	MEPC15	3
7.	MEPE65	Convective Heat Transfer	MEPC11	3
8.	MEPE72	Power Plant Engineering	MEPC16	3
9.	MEPE74	Cryogenic Engineering	MEPC16	3
10.	MEPE84	Fundamentals of HVAC Systems	MEPC16	3
11.	MEPE85	Alternative Refrigerants	MEPC16	3

Stream II (Design Engineering)

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	MEPE31	Computer Aided Design and Drafting	NIL	3
2.	MEPE42	Continuum Mechanics	MEPC14	3
3.	MEPE51	Advanced Mechanics of Solids	MEPC14	3
4.	MEPE63	MEMS Devices – Design and Fabrication	MEPC14	3
5.	MEPE64	Mechanical Vibration and Acoustics	MEPC20	3
6.	MEPE71	Finite Element Method	MEPC14	3
7.	MEPE75	Vehicle Dynamics	MEPC20	3
8.	MEPE76	Fundamentals of Biomechanics	MEPC10	3
9.	MEPE77	Mechanics of Composite Materials	MEPC14	3
10.	MEPE82	Introduction to Fracture Mechanics	MEPC14	3
11.	MEPE83	Dynamics of Machinery	MEPC20	3

Stream III (Industrial and Manufacturing Engineering)

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	MEPE32	Industrial Safety Engineering	NIL	3
2.	MEPE41	Mechatronics	NIL	3
3.	MEPE44	Additive Manufacturing	MEPC13	3
4.	MEPE45	Industrial Tribology	MEPC18	3
5.	MEPE53	Operations Research	NIL	3
6.	MEPE73	Fundamentals of Robotics	MEPC17	3
7.	MEPE78	Advanced Automotive Technology	MEPC23	3
8.	MEPE81	Quality Control	NIL	3

b. Open Elective (OE)

The courses listed below are offered by the Department of Mechanical Engineering for students of all Departments.

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	MEOE10	Smart Materials and Structures	NIL	3
2.	MEOE11	Optimization in Engineering Design	NIL	3
3.	MEOE12	Energy Conservation and Management	NIL	3
4.	MEOE13	Energy Storage Technology	NIL	3
5.	MEOE14	Low Temperature Technology	NIL	3
6.	MEOE15	Waste to Energy Conversion Techniques	NIL	3
7.	MEOE16	Non-Destructive Testing	NIL	3
8.	MEOE17	Pollution and Control	NIL	3
9.	MEOE18	Welding Technology	NIL	3
10.	MEOE19	Finite Element Method for Engineers	NIL	3
11.	MEOE20	Computational Methods in Engineering	NIL	3
12.	MEOE21	Elementary Continuum Mechanics	NIL	3
13.	MEOE22	Modern Automotive Technology	NIL	3
14.	MEOE23	Hydrogen – Production Handling and Storage	NIL	3

c. Minor (MI) (offered for the students of other departments)

Students of other departments who desire B.Tech. Minor in **Mechanical Engineering** can opt to study any 5 of the courses listed below.

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	MEMI10	Basic Thermodynamics	NIL	3
2.	MEMI11	Fundamentals of Thermal Engineering	NIL	3
3.	MEMI12	Fluid Mechanics and Machinery	NIL	3
4.	MEMI13	Fundamentals of Heat and Mass Transfer	NIL	3
5.	MEMI14	Fundamentals of Automotive Technology	NIL	3
6.	MEMI15	Fundamentals of Refrigeration and Air Conditioning	NIL	3
7.	MEMI16	Principles of Turbomachinery	NIL	3
8.	MEMI17	Fundamentals of Internal Combustion Engines	NIL	3
9.	MEMI18	Engine Pollution and Control	NIL	3
10.	MEMI19	Fundamentals of Dynamics	NIL	3
11.	MEMI20	Fundamentals of Mechanical Design	NIL	3

III. Essential Programme Laboratory Requirement (ELR)

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	MELR11	Manufacturing Technology Laboratory	NIL	2
2.	MELR12	Computer Aided Machine Drawing	NIL	2
3.	MELR13	Thermal Engineering Laboratory	NIL	2
4.	MELR14	Strength of Materials and Fluid Mechanics Laboratory	NIL	2
5.	MELR15	Heat Transfer and RAC Laboratory	NIL	2
6.	MELR16	Metrology and Measurements Laboratory	NIL	2
7.	MELR17	Dynamics Laboratory	NIL	2
8.	MELR18	Automobile Engineering Laboratory	NIL	2

IV. Online Courses (OC)

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	MEOC51	Automation Engineering	NIL	3
2.	MEOC52	Functional and Conceptual Design	NIL	3
3.	MEOC53	Heat Exchangers: Fundamentals and Design Analysis	NIL	3
4.	MEOC54	Introduction to Aerospace Engineering	NIL	3
5.	MEOC55	Introduction to Airbreathing Propulsion	NIL	3
6.	MEOC56	Introduction to Mechanical Vibration	NIL	3
7.	MEOC57	Introduction to Robotics	NIL	3
8.	MEOC58	Lighter than Air Systems	NIL	3
9.	MEOC59	Rocket Propulsion	NIL	3
10.	MEOC60	Experimental Methods in Fluid Mechanics	NIL	3
11.	MEOC61	Fundamentals of Automotive Systems	NIL	3
12.	MEOC62	Solar Energy Engineering and Technology	NIL	3
13.	MEOC63	Computer Integrated Manufacturing	NIL	3
14.	MEOC64	Fundamentals of Compressible flow	NIL	3
15.	MEOC65	Wheeled Mobile Robots	NIL	3
16.	MEOC66	Leadership and Team effectiveness	NIL	3
17.	MEOC67	Deep Learning	NIL	3
18.	MEOC68	Entrepreneurship Essentials	NIL	3
19.	MEOC69	Six Sigma	NIL	3
20.	MEOC70	Deep Learning for Computer Vision	NIL	3
21.	MEOC71	Understanding Incubation and Entrepreneurship	NIL	3
22.	MEOC72	Automation in manufacturing	NIL	3
23.	MEOC73	Industrial Robotics: Theories For Implementation	NIL	3
24.	MEOC74	Manufacturing Systems Technology I and II	NIL	3
25.	MEOC75	Mathematical Modeling of Manufacturing Processes	NIL	3
26.	MEOC76	Entrepreneurship	NIL	3
27.	MEOC77	Aerodynamic Design of Axial Flow Compressors and Fans	NIL	3

28.	MEOC78	Machine Learning and Deep Learning - Fundamentals and Applications	NIL	3
29.	MEOC79	Applied Thermodynamics	NIL	3
30.	MEOC80	Introduction to Astrophysical Fluids	NIL	3
31.	MEOC81	Introduction to Laser	NIL	3
32.	MEOC82	Applied Optics	NIL	3
33.	MEOC83	Scientific Computing using python	NIL	3
34.	MEOC84	Introduction to Classical Mechanics	NIL	3
35.	MEOC85	Modern Engineering Materials	NIL	3
36.	MEOC86	Product Design and Manufacturing	NIL	3
37.	MEOC87	Fluid Dynamics for Astrophysics	NIL	3
38.	MEOC88	Thermal Physics	NIL	3
39.	MEOC89	Plasma Physics and Applications	NIL	3
40.	MEOC90	Fundamentals of Theoretical and Experimental Aerodynamics	NIL	3
41.	MEOC91	Viscous Fluid Flow	NIL	3
42.	MEOC92	Advanced Fluid Mechanics	NIL	3
43.	MEOC93	Computational Fluid Dynamics	NIL	3
44.	MEOC94	IC Engines and Gas Turbines	NIL	3
45.	MEOC95	Nonlinear Control Design	NIL	3
46.	MEOC96	Industrial Hydraulics and Automation	NIL	3
47.	MEOC97	Optimization from fundamentals	NIL	3
48.	MEOC98	Machinery Fault Diagnosis and Signal Processing	NIL	3

A committee headed by the head of the department with two faculty members can decide the online courses to be offered to the students through the NPTEL/Swayam portal.

Note: In case any of the above listed courses are not offered in Swayam portal in a particular semester, the department will notify alternative courses offered in Swayam during the same period.

V. Advanced Level Courses for B.Tech. (Honors)

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	MEHO10	Advanced Heat Transfer	MEPC19	4
2.	MEHO11	Advanced Fluid Mechanics	MEPC15	4
3.	MEHO12	Advanced Engineering Materials	MEPC18	4
4.	MEHO13	Design of Heat Exchangers	MEPC19	4
5.	MEHO14	Design and Optimization of Thermal Energy Systems	MEPC19	4
6.	MEHO15	Fuels Combustion and Emission Control	MEPC16	4
7.	MEHO16	Advanced Computational Methods in Engineering	NIL	4
8.	MEHO17	Computational Continuum Mechanics	MEPC14	4
9.	MEHO18	Heat Transfer Equipment Design	MEPC19	4

10.	MEHO19	Analysis and Design of Pressure Vessels	MEPC14	4
11.	MEHO20	Design and Analysis of Turbo Machines	MEPC15	3
12.	MEHO21	Analysis of Thermal Power Cycles	MEPC16	3
13.	MEHO22	Boiler Auxiliaries and Performance Evaluation	NIL	3
14.	MEHO23	Environmental Pollution Control	NIL	3

VI. Microcredits (MC) (Students can opt 3 courses of 1 credit (4 weeks) each as microcredits instead of 1 OE/OC)

Students are also advised to take 4-week courses from NPTEL/SWAYAM platform

Sl. No.	Course Code	Course Title	Credit
1.	MEMC10	Peridynamics for Fracture Simulation	1
2.	MEMC11	3D Printing and Design Integration	1
3.	MEMC12	CAD Fundamentals for Mechanical Design	1
4.	MEMC13	AI for Automotive Technology	1
5.	MEMC14	Mechanical Testing of Materials	1
6.	MEMC15	Granular Mechanics	1
7.	MEMC16	Introduction to Vehicle Noise and Vibration Control	1
8.	MEMC17	Melting and Solidification of Metals	1
9.	MEMC18	Future Fuels	1
10.	MEMC19	Introduction to Bioinspired Robotics	1

METALLURGICAL AND MATERIALS ENGINEERING

The total minimum credits for completing B.Tech. Programme in Metallurgical and Materials Engineering is **163.**

CURRICULUM FRAME WORK / FLEXIBLE CURRICULUM / NEP 2020 / NCrF / B.Tech.

Semester	GIR		PC		ELR		PE/OE		Total Credits	Credit Distribution
	Course	Credit	Course	Credit	Course	Credit	Course	Credit		
I	7	19	-	-	-	-	-	-	19	**40**
II	8	17	1	4	-	-	-	-	21	
III	1	4	4	14	2	4	1	3	25	**50**
IV	-	-	3	12	2	4	3	9	25	
V	1	3	4	15	2	4	1	3	25	**49**
VI	2	4	3	10	2	4	2	6	24	
VII	2	3	-	-	-	-	4	12	15	**24**
VIII	1	6	-	-	-	-	1	3	9	
Total	**22**	**56**	**15**	**55**	**8**	**16**	**12**	**36**	**163**	**163**

CURRICULUM FRAME WORK / FLEXIBLE CURRICULUM / NEP 2020 / NCrF / B.Sc. (Engineering)

	Sem	GIR		PC		ELR		PE/OE		Total Credits	Credit Distri-bution
		Course	Credit	Course	Credit	Course	Credit	Course	Credit		
Same as B.Tech.	**I**	7	19	-	-	-	-	-	-	**19**	**40**
	II	8	17	1	4	-	-	-	-	**21**	
	III	1	4	4	14	2	4	1	3	**25**	**50**
	IV	-	-	3	12	2	4	3	9	**25**	
B.Sc. Exit	**V**	1	3	2	8	2	4	1	3	**18**	**34**
	VI	4[@]	12	-	-	2	4	-	-	**16**	
After B.Sc. exit and join back for B. Tech.	**VII**	-	-	3	10	-	-	4	12	**22**	**39**
	VIII	1	1	2	7	-	-	3	9	**17**	
	Total	**22**	**56**	**15**	**55**	**8**	**16**	**12**	**36**	**163**	**163**

[@](Summer internship (2), Project Work (6) Professional Ethics (3), and Industrial Lecture (1))

Curriculum Framework and Credit System (ME) / 163

Semester I (July Session)

	Course Code	Course Title	Credits	Category
1.	HSIR11	English for Communication (Theory and Laboratory)	4	GIR
2.	MAIR11	Matrices and Calculus	3	GIR
3.	CHIR11	Chemistry	3	GIR
4.	MTIR15	Introduction to Metallurgical and Materials Engineering	2	GIR
5.	EEIR11	Basics of Electrical and Electronics Engineering	2	GIR
6.	MEIR12	Engineering Graphics	3	GIR
7.	CHIR12	Chemistry Laboratory	2	GIR
		Total	**19**	

Semester II (January Session)

Sl. No.	Course Code	Course Title	Credits	Category
1.	MAIR21	Complex Analysis and Differential Equations	3	GIR
2.	PHIR11	Physics (Non-circuit)	3	GIR
3.	CSIR12	Introduction to Computer Programming (Theory and Laboratory)	3	GIR
4.	CEIR11	Basics of Civil Engineering (**for CL, ME, MT, PR**)	2	GIR
5.	ENIR11	Energy and Environmental Engineering	2	GIR
6.	PRIR11	Engineering Practice	2	GIR
7.	PHIR12	Physics Laboratory (Non-circuit)	2	GIR
8.	SWIR11	NSS / NCC / NSO	0	GIR
9.	MTPC11	Programme Core – 1 / Metallurgical Thermodynamics and Kinetics	4	PC
		Total	**21**	

Semester III (July Session)

Sl. No.	Course Code	Course Title	Credits	Category
1.	MAIR41	Fourier Series and Numerical Methods	4	GIR
2.	MTPC12	Programme Core – 2 / Physical Metallurgy	4	PC
3.	MTPC14	Programme Core – 3 / Transport Phenomena	4	PC
4.	MTPC16	Programme Core – 4 / Polymers, Composites and Ceramics	3	PC
5.	MTPC13	Programme Core – 5 / Engg. Mechanics and Strength of Materials	3	PC
6.		Programme Elective – 1	3	PE
7.	MTLR30	Process Metallurgy Laboratory	2	ELR
8.	MTLR31	Polymers, Composites and Ceramics Laboratory	2	ELR
		Total	**25**	

Note: Department(s) to offer Minor (MI) Course and Online Course (OC) to those willing students in addition to 24 credits.

Semester IV (January Session)

Sl. No.	Course Code	Course Title	Credits	Category
1.	MTPC15	Programme Core – 8 / Mechanical Behavior and Testing of Materials	4	PC
2.	MTPC17	Programme Core – 6 / Iron Making and Steel Making	4	PC
3.	MTPC18	Programme Core – 7 / Phase Transformation and Heat Treatment	4	PC
4.		Programme Elective – 2	3	PE
5.		Programme Elective – 3	3	PE
6.		Programme Elective – 4 / Open Elective – 1	3	PE/OE
7.	MTLR32	Metallography and Heat Treatment Laboratory	2	ELR
8.	MTLR33	Materials Testing and Inspection Laboratory	2	ELR
		Total	**25**	

Semester V (July Session) / Continuing B.Tech.

Sl. No.	Course Code	Course Title	Credits	Category
1.	HSIR13	Industrial Economics	3	GIR
2.	MTPC19	Programme Core – 11 / Materials Characterization	4	PC
3.	MTPC20	Programme Core – 9 / Metal Casting Technology	4	PC
4.	MTPC22	Programme Core – 10 / Metal Forming Technology	4	PC
5.	MTPC21	Programme Core – 12 / Materials Joining Technology	3	PC
6.		Programme Elective – 5 / Open Elective – 2	3	PE/OE
7.	MTLR34	Foundry and Welding Laboratory	2	ELR
8.	MTLR35	Metal Forming and Particulate Processing Laboratory	2	ELR
		Total	**25**	

Semester V (July Session) / B.Sc. (Engineering) Exit

Sl. No.	Course Code	Course Title	Credits	Category
1.	HSIR13	Industrial Economics	3	GIR
2.	MTPC19	Programme Core – 9 / Materials Characterization	4	PC
3.	MTPC22	Programme Core – 10 / Metal Forming Technology	4	PC
4.		Programme Elective – 5 / Open Elective – 2	3	PE/OE
5.	MTLR34	Foundry and Welding Laboratory	2	ELR
6.	MTLR35	Metal Forming and Particulate Processing Laboratory	2	ELR
		Total	**18**	

Semester VI (January Session)

Sl. No.	Course Code	Course Title	Credits	Category
1.	MTIR19	Industrial Lecture	1	GIR
2.	MTIR14	Professional Ethics	3	GIR
3.	MTPC25	Programme Core – 13 / Corrosion and Surface Engineering	4	PC
4.	MTPC23	Programme Core – 14 / Non-ferrous Physical Metallurgy	3	PC
5.	MTPC24	Programme Core – 15 / Electrical, Electronic and Magnetic Materials	3	PC

6.		Programme Elective – 6	3	PE
7.		Programme Elective – 7 / Open Elective – 3	3	PE/OE
8.	MTLR36	Non-ferrous Metallography and Characterization Laboratory	2	ELR
9.	MTLR37	Corrosion and Surface Engineering Laboratory	2	ELR
		Total	**24**	

Semester VI (January Session) / B.Sc. (Engineering) Exit

Sl. No.	Course Code	Course Title	Credits	Category
1.	MTIR16	Summer Internship / Industrial Training / Academic Attachment*****	2	GIR
2.	MTIR17	**Project Work**	6	GIR
3.	MTIR14	Professional Ethics	3	GIR
4.	MTIR19	Industrial Lecture	1	GIR
5.	MTLR36	**Non-ferrous Metallography and Characterization Laboratory**	2	ELR
6.	MTLR37	Corrosion and Surface Engineering Laboratory	2	ELR
		Total	**16**	

Semester VII (July Session)

Sl. No.	Course Code	Course Title	Credits	Category
1.	MTIR16	Summer Internship / Industrial Training / Academic Attachment*	2	GIR
2.	MTIR18	Comprehensive Viva Voce	1	GIR
3.		Programme Elective – 8	3	PE
4.		Programme Elective – 9	3	PE
5.		Programme Elective – 10 / Open Elective – 4	3	PE/OE
6.		Programme Elective – 11 / Open Elective – 5	3	PE/OE
		Total	**15**	

** Evaluation for Summer Internship*

Semester VII (July Session) / Rejoins B.Tech. after B.Sc. (Engineering) exit

Sl. No.	Course Code	Course Title	Credits	Category
1.	MTPC20	**Programme Core – 11 / Metal Casting Technology**	4	PC
2.	MTPC21	**Programme Core – 12 / Materials Joining Technology**	3	PC
3.	MTPC23	**Programme Core – 13 / Non-ferrous Physical Metallurgy**	3	PC
4.		Programme Elective – 6	3	PE
5.		Programme Elective – 7	3	PE
6.		Programme Elective – 8 / Open Elective – 3	3	PE/OE
7.		Programme Elective – 9 / Open Elective – 4	3	PE/OE
		Total	**22**	

Semester VIII (January Session)

Sl. No.	Course Code	Course Title	Credits	Category
1.	MTIR17	Project Work / Equivalent no. of Electives	**6**	GIR
2.		Programme Elective – 12 / Open Elective – 4	3	PE/OE
		Total	**9**	

Semester VIII (January Session) / Rejoins B.Tech. after B.Sc. (Engineering) exit

Sl. No.	Course Code	Course Title	Credits	Category
1.	MTIR18	Comprehensive Viva Voce	1	GIR
2.	MTPC25	**Programme Core – 14 / Corrosion and Surface Engineering**	4	PC
3.	MTPC24	**Programme Core – 15 / Electrical, Electronic and Magnetic Materials**	3	PC
4.		Programme Elective – 10	3	PE
5.		Programme Elective – 11 / Open Elective – 5	3	PE/OE
6.		Programme Elective – XII / Open Elective – 6	3	PE/OE
		Total	**17**	

Credits:

Semester	I	II	III	IV	V	VI	VII	VIII	Total
B.Tech.	19	21	25	25	25	24	15	9	**163**
B.Sc. *	19	21	25	25	18	16	22	17	**163**

Note:

1. Curriculum should have 7 Programme Core courses shall be of 4 credits each.
2. Out of 12 elective courses (PE/OE), the students should study at least eight Programme Elective courses (PE).
3. Minor (MI): 15 credits over and above the minimum credit as specified by the departments (163). The details of MINOR will be mentioned in the transcript.
4. Honors (HO): 15 credits over and above the minimum credit as specified by the departments (163).

Electives Choices

Option 1 / Regular B.Tech.

To get a B.Tech. degree in Metallurgical and Materials Engineering, possible choices of electives in ProgrammeElectives and Open Electives are,

Programme Electives	Open Electives	Total
8	4	12
9	3	12
10	2	12
11	1	12
12	0	12

Option 2 / B.Sc. (Engineering) Exit (at end of 3rd year)

Programme Electives	Open Electives	Total
3	2	5
4	1	5
5	0	5

Option 3 / B.Tech. with Minor

To get a B.Tech. degree in Metallurgical and Materials Engineering, and Minor in other programmes, possiblechoices of electives in Programme Electives, Open Electives and Minor Electives are,

Programme Electives	Open Electives	Minor Electives	Total
8	4	5	12 + 5
9	3	5	12 + 5
10	2	5	12 + 5
11	1	5	12 + 5
12	0	5	12 + 5

Option 4 / B.Tech. with Honors

To get a B.Tech. Honors degree in Metallurgical and Materials Engineering, possible choices of electives inProgramme Electives, Open Electives, and Honor Electives are,

Programme Electives	Open Electives	Honor Electives	Total
8	4	4	12 + 4
9	3	4	12 + 4
10	2	4	12 + 4
11	1	4	12 + 4
12	0	4	12 + 4

Option 5 / B.Tech. with Honors and Minor

To get a B.Tech. Honors degree in Metallurgical and Materials Engineering, and Minor in other programmes possible choices of electives in Programme Electives, Open Electives, and Honor Electives are,

Programme Electives	Open Electives	Honor Electives	Minor Electives	Total
8	4	4	5	12 + 4 + 5
9	3	4	5	12 + 4 + 5
10	2	4	5	12 + 4 + 5
11	1	4	5	12 + 4 + 5
12	0	4	5	12 + 4 + 5

Note: No Minor or Honors will be awarded for B.Sc. But student can credit Minors and Honors during the 6 semesters, and redeem it to obtain a Minor or Honors after rejoining and completing B.Tech. Also, B.Sc. students shall do Programme Electives in place of their project work in 6th semester.

List of Courses

I. Programme Core (PC)

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	MTPC11	Metallurgical Thermodynamics and Kinetics	Nil	4
2.	MTPC12	Physical Metallurgy	Nil	4
3.	MTPC13	Engineering Mechanics and Strength of Materials	Nil	3
4.	MTPC14	Transport Phenomena	Nil	4
5.	MTPC15	Mechanical Behavior and Testing of Materials	Nil	4
6.	MTPC16	Polymers, Composites and Ceramics	Nil	4
7.	MTPC17	Iron Making and Steel Making	MTPC11, MTPC14	4
8.	MTPC18	Phase Transformation and Heat Treatment	MTPC12	4
9.	MTPC19	Material Characterization	MTPC12	4
10.	MTPC20	Metal Casting Technology	Nil	3
11.	MTPC21	Materials Joining Technology	Nil	3
12.	MTPC22	Metal Forming Technology	MTPC15	4
13.	MTPC23	Non-Ferrous Physical Metallurgy	MTPC12	3
14.	MTPC24	Electrical, Electronic and Magnetic Materials	Nil	3
15.	MTPC25	Corrosion and Surface Engineering	Nil	4

II. Electives

a. Programme Electives

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	MTPE11	Mineral Processing and Metallurgical analysis	Nil	3
2.	MTPE12	Non-ferrous Extractive Metallurgy	Nil	3
3.	MTPE13	Manufacturing Processes	Nil	3
4.	MTPE14	Non-destructiveTesting	Nil	3
5.	MTPE15	Welding Metallurgy	MTPC21	3
6.	MTPE16	Materials for extreme environments	Nil	3
7.	MTPE17	Thermodynamics of Solidification	MTPC11, MTPC20	3
8.	MTPE18	Design aspects of Welding and Casting	MTPC20, MTPC21	3
9.	MTPE19	Alloy Development	Nil	3
10.	MTPE20	Ceramic Materials	Nil	3
11.	MTPE21	Ceramic Processing	MTPC16	3
12.	MTPE22	High Temperature Materials	MTPC12	3
13.	MTPE23	Emerging Materials	Nil	3
14.	MTPE24	Automotive Materials	Nil	3
15.	MTPE25	Metallurgical Failure Analysis	Nil	3
16.	MTPE26	Biomaterials	Nil	3
17.	MTPE27	Stainless steels and Advanced Ferrous Alloys	Nil	3
18.	MTPE28	Special Steels and Cast Irons	MTPC18	3
19.	MTPE29	Economics of Metal Production Processes	MTPC17	3
20.	MTPE30	Special Casting Techniques	MTPC20	3

21.	MTPE31	Particulate Technology	Nil	3
22.	MTPE32	Special Topics in Metal Forming	MTPC22	3
23.	MTPE33	Additive Manufacturing	Nil	3
24.	MTPE34	Computational Materials Science	Nil	3
25.	MTPE35	Materials for New and Renewable Energy	Nil	3
26.	MTPE36	Fatigue,Creep and Fracture Mechanics	MTPC15	3
27.	MTPE37	Metallurgical Waste Management	Nil	3
28.	MTPE38	Instrumentation and Control Engineering	Nil	3
29.	MTPE39	Sustainable Materials	Nil	3
30.	MTPE40	Integrated Computational Materials Engineering	Nil	3
31.	MTPE41	Green Manufacturing	Nil	3
32.	MTPE42	Principles of Extractive Metallurgy	MTPC11	3
33.	MTPE43	Modeling in Process Metallurgy	MTPE14	3
34.	MTPE44	Phase Equilibria in Materials	MTPC12	3
35.	MTPE45	Electrochemical Processing of Materials	Nil	3
36.	MTPE46	Design of Machine Elements	Nil	3

b. Open Elective (OE)

The courses listed below are offered by the Department of Metallurgical and Materials Engineering for students of all Departments.

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	MTOE11	Nanomaterials and Applications	Nil	3
2.	MTOE12	Mathematical Techniques in Materials Research	Nil	3
3.	MTOE13	Design and Selection of Materials	Nil	3
4.	MTOE14	New Product Development	Nil	3
5.	MTOE15	Introduction to Quality Management	Nil	3
6.	MTOE16	Surface Engineering	Nil	3
7.	MTOE17	Process Modelling and Applications	Nil	3
8.	MTOE18	Intellectual Property Rights	Nil	3
9.	MTOE19	Business and Entrepreneurship for Engineers	Nil	3
10.	MTOE20	History of Metals and Alloys	Nil	3
11.	MTOE21	Artificial Intelligence in Materials Engineering	Nil	3
12.	MTOE22	Materials in Indian Medicines	Nil	3
13.	MTOE23	Semiconductors Manufacturing	Nil	3

c. Minor (MI) (offered for the students of other departments)

Students of other departments who desire B.Tech. Minor in Metallurgical and Materials Engineering can opt to study any 5 of the courses listed below.

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	MTMI11	Materials Technology	Nil	3
2.	MTMI12	Fundamentals of Metallurgy	Nil	3
3.	MTMI13	Physical Metallurgy and Heat Treatment	Nil	3
4.	MTMI14	Deformation Processing	Nil	3

5.	MTMI15	Manufacturing Methods	Nil	3
6.	MTMI16	Testing and Evaluation of Materials	Nil	3
7.	MTMI17	Non-Metallic Materials	Nil	3

III. Essential Laboratory Requirement (ELR)

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	MTLR30	Process Metallurgy Laboratory	Nil	2
2.	MTLR31	Polymers, Composites and Ceramics Laboratory	MTPC14	2
3.	MTLR32	Metallography and Heat Treatment Laboratory	MTPC15	2
4.	MTLR33	Materials Testing and Inspection Laboratory	MTPC17	2
5.	MTLR34	Foundry and Welding Laboratory	MTPC19, MTPC20	2
6.	MTLR35	Metal Forming and Particulate Processing Laboratory	MTPC21	2
7.	MTLR36	Non-Ferrous Metallography and Characterization Laboratory	MTPC22, MTPC23	2
8.	MTLR37	Corrosion and Surface Engineering Laboratory	MTPC24	2

IV. ONLINE COURSES (OC)

Note: Course list shall be updated regularly at the start of each Academic Year or Semester by the department NPTEL Coordinator. The students shall be able to select an online course from then available list.

V. Advanced Level Courses For B.Tech. (Honors)

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	MTHO11	Advanced Thermodynamics of Materials	MTPC11	4
2.	MTHO12	Crystallography	MTPC12	3
3.	MTHO13	Aerospace Materials	Nil	4
4.	MTHO14	Ladle Metallurgy and Continuous Casting of steels	MTPC17	4
5.	MTHO15	Recent Trends in Nano materials	Nil	4
6.	MTHO16	Advanced Solidification Processing	MTPC20	3
7.	MTHO17	Recent Developments in Welding Processes	MTPC21	3
8.	MTHO18	Recent Developments in Forming Processes	MTPC22	4
9.	MTHO19	Atomic Scale Modeling of Materials	Nil	3
10.	MTHO20	Metallurgy of Intermetallic Materials	Nil	4
11.	MTHO21	Phasefield Modelling	Nil	4
12.	MTOH22	Advanced Microscopy Techniques		

VI. MICROCREDITS (MC) (Students can opt 3 courses of 1 credit (4 weeks) each as microcredits instead of 1 OE/OC)

Students are also advised to take 4-week courses from NPTEL/SWAYAM platform

Sl. No.	Course Code	Course Title	Credit
1.	MTMC11	Introduction to Fluid Mechanics	1
2.	MTMC12	Introduction to Mechanical Engineering	1
3.	MTMC13	Introduction to Intellectual Property Rights	1

PRODUCTION ENGINEERING

The total minimum credits for completing B.Tech. Programme in Production Engineering is **163.**

CURRICULUM FRAME WORK / FLEXIBLE CURRICULUM / NEP 2020 / NCrF / B.Tech.

Semester	GIR		PC		ELR		PE/OE		Total Credits	Credit Distribution
	Course	Credit	Course	Credit	Course	Credit	Course	Credit		
I	7	19	-	-	-	-	-	-	**19**	**40**
II	8	17	1	4	-	-	-	-	**21**	
III	-	-	4	15	2	4	2	6	**25**	**49**
IV	1	4	3	10	2	4	2	6	**24**	
V	1	3	4	14	2	4	1	3	**24**	**48**
VI	2	4	3	10	2	4	2	6	**24**	
VII	2	3	-	-	-	-	4	12	**15**	**24**
VIII	1	6	-	-	-	-	1	3	**9**	
Total	**22**	**56**	**15**	**53**	**8**	**16**	**12**	**36**	**160**	**161**

CURRICULUM FRAME WORK / FLEXIBLE CURRICULUM / NEP 2020 / NCrF / B.Sc. (Engineering)

	Sem	GIR		PC		ELR		PE/OE		Total Credits	Credit Distri-bution
		Course	Credit	Course	Credit	Course	Credit	Course	Credit		
Same as B.Tech.	**I**	7	19	-	-	-	-	-	-	**19**	**40**
	II	8	17	1	4	-	-	-	-	**21**	
	III	-	-	4	15	2	4	2	6	**25**	**49**
	IV	1	4	3	10	2	4	2	6	**24**	
B.Sc. Exit	**V**	1	3	2	7	2	4	2	6	**20**	**36**
	VI	4@	12	-	-	2	4	-	-	**16***	
After B.Sc. exit and join back for B. Tech.	**VII**	-	-	3	11	-	-	3	9	**20**	**36**
	VIII	1	1	2	6	-	-	3	9	**16**	
	Total	**22**	**56**	**15**	**53**	**8**	**16**	**12**	**36**	**160**	**161**

@(Summer internship (2), Project Work (6) and Industrial Lecture (1))

Curriculum Framework and Credit System / PROD / 161

Semester I (July Session)

Sl. No.	Course Code	Course Title	Credits	Category
1.	HSIR11	English for Communication (Theory and Laboratory)	4	GIR
2.	MAIR11	Matrices and Calculus	3	GIR
3.	CHIR11	Chemistry	3	GIR
4.	PRIR15	Introduction to Production Engineering	2	GIR
5.	EEIR11	Basics of Electrical and Electronics Engineering	2	GIR
6.	MEIR12	Engineering Graphics	3	GIR
7.	CHIR12	Chemistry Laboratory	2	GIR
		Total	**19**	

Semester II (January Session)

Sl. No.	Course Code	Course Title	Credits	Category
1.	MAIR21	Complex Analysis and Differential Equations	3	GIR
2.	PHIR11	Physics	3	GIR
3.	CSIR12	Introduction to Computer Programming (Theory and Laboratory)	3	GIR
4.	CEIR11	Basics of Civil Engineering	2	GIR
5.	ENIR11	Energy and Environmental Engineering	2	GIR
6.	PRIR11	Engineering Practice	2	GIR
7.	PHIR12	Physics Laboratory	2	GIR
8.	SWIR11	NSS / NCC / NSO	0	GIR
9.	PRPC10	Applied Mechanics	4	PC
		Total	**21**	

Semester III (July Session)

Sl. No.	Course Code	Course Title	Credits	Category
1.	PRPC11	Casting and Welding Technology	4	PC
2.	PRPC12	Metallurgy and Materials Engineering	3	PC
3.	PRPC13	Fluid Mechanics and Thermal Engineering	4	PC
4.	PRPC14	Forming and Machining Technology	4	PC
5.	PRPEXX	Programme Elective – 1	3	PE
6.	PRPEXX	Programme Elective – 2	3	PE
7.	PRLR10	Manufacturing Processes Laboratory	2	ELR
8.	PRLR11	Weldability, Foundry and Formability Laboratory	2	ELR
		Total	**25**	

Note: Department(s) to offer Minor (MI) Course and Online Course (OC) to those willing students in addition to 24 credits.

Semester IV (January Session)

Sl. No.	Course Code	Course Title	Credits	Category
1.	MAIR44	Probability and Statistics	4	GIR
2.	PRPC15	Kinematics and Dynamics of Machines	4	PC
3.	PRPC16	Metrology, Quality and Safety	3	PC
4.	PRPC17	Computer Numerical Control (CNC) Systems	3	PC
5.	PRPEXX	Programme Elective – 3	3	PE
6.	PRXXXX	Programme Elective – 4 / Open Elective – 1	3	PE/OE
7.	PRLR12	Metrology and Computer Numerical Control Machines	2	ELR
8.	PRLR13	Machine Drawing (CAD) and Cost Estimation	2	ELR
		Total	**24**	

Semester V (July Session) / Continuing B.Tech.

Sl. No.	Course Code	Course Title	Credits	Category
1.	PRIR14	Professional Ethics	3	GIR
2.	PRPC18	Industrial Automation and Mechatronics	3	PC
3.	PRPC19	Design of Machine Elements	4	PC
4.	PRPC20	Manufacturing System Simulation	3	PC
5.	PRPC21	Manufacturing Tooling and Automated Inspection	4	PC
6.	PRXXXX	Programme Elective – 5 / Open Elective – 2	3	PE/OE
7.	PRLR14	Manufacturing System Simulation Laboratory	2	ELR
8.	PRLR15	Industrial Automation and Mechatronics Laboratory	2	ELR
		Total	**24**	

Semester V (July Session) / B.Sc. (Engineering) Exit

Sl. No.	Course Code	Course Title	Credits	Category
1.	PRIR14	Professional Ethics	3	GIR
2.	PRPC18	Industrial Automation and Mechatronics	3	PC
3.	PRPC19	Design of Machine Elements	4	PC
4.	PRPEXX	Programme Elective – 5	3	PE
5.	PRXXXX	Programme Elective - 6 / Open Elective – 2	3	PE/OE
6.	PRLR14	Manufacturing System Simulation Laboratory	2	ELR
7.	PRLR15	Industrial Automation and Mechatronics Laboratory	2	ELR
		Total	**20**	

Semester VI (January Session)

Sl. No.	Course Code	Course Title	Credits	Category
1.	PRIR19	Industrial Lecture	1	GIR
2.	HSIR13	Industrial Economics	3	GIR
3.	PRPC22	Operations Research	4	PC
4.	PRPC23	Analysis of Production Systems	3	PC
5.	PRPC24	Computer Aided Design and Rapid Prototyping	3	PC
6.	PRPEXX	Programme Elective – 6	3	PE
7.	PRXXXX	Programme Elective – 7 / Open Elective – 3	3	PE/OE
8.	PRLR16	Advanced Manufacturing Laboratory	2	ELR
9.	PRLR17	Industrial Engineering Laboratory	2	ELR
		Total	**24**	

Semester VI (January Session) / B.Sc. (Engineering) Exit

Sl. No.	Course Code	Course Title	Credits	Category
1.	PRIR17	Project Work	6	GIR
2.	PRIR16	Winter Internship	2	GIR
3.	PRIR19	Industrial Lecture	1	GIR
4.	HSIR13	Industrial Economics	3	GIR
5.	PRLR16	Advanced Manufacturing Laboratory	2	ELR
6.	PRLR17	Industrial Engineering Laboratory	2	ELR
		Total	**16**	

Semester VII (July Session)

Sl. No.	Course Code	Course Title	Credits	Category
1.	PRIR16	Summer Internship / Industrial Training / Academic Attachment*	2	GIR
2.	PRIR18	Comprehensive Viva Voce	1	GIR
3.	PRPEXX	Programme Elective – 8	3	PE
4.	PRPEXX	Programme Elective – 9	3	PE
5.	PRXXXX	Programme Elective – 10 / Open Elective – 4	3	PE/OE
6.	PRXXXX	Programme Elective – 11 / Open Elective – 5	3	PE/OE
		Total	**15**	

** Evaluation for Summer Internship*

Semester VII (July Session) / Rejoins B.Tech. after B.Sc. (Engineering) exit

Sl. No.	Course Code	Course Title	Credits	Category
1.	PRPC20	Manufacturing System Simulation	3	PC
2.	PRPC21	Manufacturing Tooling and Automated Inspection	4	PC
3.	PRPC22	Operations Research	4	PC
4.	PRPEXX	Programme Elective – 7	3	PE
5.	PRPEXX	Programme Elective – 8	3	PE
6.	PRXXXX	Programme Elective – 9 / Open Elective – 3	3	PE/OE
		Total	**20**	

Semester VIII (January Session)

Sl. No.	Course Code	Course Title	Credits	Category
1.	PRXXXX	Programme Elective – 12 / Open Elective – 4	3	PE/OE
2.	PRIR17	Project Work	6	GIR
		Total	**9**	

Semester VIII (January Session) / Rejoins B.Tech. after B.Sc. (Engineering) exit

Sl. No.	Course Code	Course Title	Credits	Category
1.	PRIR18	Comprehensive Viva Voce	1	GIR
2.	PRPC23	Analysis of Production Systems	3	PC
3.	PRPC24	Computer Aided Design and Rapid Prototyping	3	PC
4.	PRPEXX	Programme Elective – 10	3	PE
5.	PRPEXX	Programme Elective – 11	3	PE
6.	PRXXXX	Programme Elective – 12 / Open Elective – 4	3	PE/OE
		Total	**16**	

Credits:

Semester	I	II	III	IV	V	VI	VII	VIII	Total
B.Tech.	19	21	25	24	24	24	15	9	**161**
B.Sc.	19	21	25	24	20	16	20	16	**161**

Note:

Curriculum should have 7 Programme Core courses shall be of 4 credits each.

1. Out of 12 elective courses (PE/OE), the students should study at least eight Programme Elective courses (PE).
2. Minor (MI): 15 credits over and above the minimum credit as specified by the departments (161). The details of MINOR will be mentioned in the transcript.
3. Honors (HO): 15 credits over and above the minimum credit as specified by the departments (161).

Electives Choices

Option 1 / Regular B.Tech.

To get a B.Tech. degree in Production Engineering, possible choices of electives in Programme Electives and Open Electives are,

Programme Electives	Open Electives	Total
8	4	12
9	3	12
10	2	12
11	1	12
12	0	12

Option 2 / B.Sc. (Engineering) Exit (at end of 3rd year)

Programme Electives	Open Electives	Total
3	2	5
4	1	5
5	0	5

Option 3 / B.Tech. with Minor

To get a B.Tech. degree in Production Engineering, and Minor in other programmes, possible choices of electives in Programme Electives, Open Electives and Minor Electives are,

Programme Electives	Open Electives	Minor Electives	Total
8	4	5	12 + 5
9	3	5	12 + 5
10	2	5	12 + 5
11	1	5	12 + 5
12	0	5	12 + 5

Option 4 / B.Tech. with Honors

To get a B.Tech. Honors degree in Production Engineering, possible choices of electives in Programme Electives, Open Electives, and Honor Electives are,

Programme Electives	Open Electives	Honor Electives	Total
8	4	4	12 + 4
9	3	4	12 + 4
10	2	4	12 + 4
11	1	4	12 + 4
12	0	4	12 + 4

Option 5 / B.Tech. with Honors and Minor

To get a B.Tech. Honors degree in Production Engineering, and Minor in other programmes possible choices of electives in Programme Electives, Open Electives, and Honor Electives are,

Programme Electives	Open Electives	Honor Electives	Minor Electives	Total
8	4	4	5	12 + 4 + 5
9	3	4	5	12 + 4 + 5
10	2	4	5	12 + 4 + 5
11	1	4	5	12 + 4 + 5
12	0	4	5	12 + 4 + 5

Note: No Minor or Honors will be awarded for B.Sc. But student can credit Minors and Honors during the 6 semesters, and redeem it to obtain a Minor or Honors after rejoining and completing B.Tech. Also, B.Sc. students shall do Programme Electives in place of their project work in 6th semester.

List of Courses

I. Programme Core (PC)

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	PRPC10	Applied Mechanics	---	4
2.	PRPC11	Casting and Welding Technology	---	4
3.	PRPC12	Metallurgy and Materials Engineering	CHIR11	3
4.	PRPC13	Fluid Mechanics and Thermal Engineering	---	4
5.	PRPC14	Forming and Machining Technology	PRPC12	4
6.	PRPC15	Kinematics and Dynamics of Machines	PRPC10	4
7.	PRPC16	Metrology, Quality and Safety	---	3
8.	PRPC17	Computer Numerical Control (CNC) Systems	PRPC14	3
9.	PRPC18	Industrial Automation and Mechatronics	EEIR11	3
10.	PRPC19	Design of Machine Elements	PRPC10	4
11.	PRPC20	Manufacturing System Simulation	---	3
12.	PRPC21	Manufacturing Tooling and Automated Inspection	PRPC14	4
13.	PRPC22	Operations Research	---	4
14.	PRPC23	Analysis of Production Systems	---	3
15.	PRPC24	Computer Aided Design and Rapid Prototyping	CSIR12	3

II. Electives

a. Programme Electives

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	PRPE10	Rapid Product Development	PRPC11, PRPC14	3
2.	PRPE11	Product Development Strategies	---	3
3.	PRPE12	Design for Manufacture and Assembly	PRPC19	3
4.	PRPE13	Finite Element Methods for Engineers	PRPC10	3
5.	PRPE14	Concepts of Engineering Design	PRPC19	3
6.	PRPE15	Engineering Optimization	---	3
7.	PRPE16	Computational Fluid Dynamics	PRPC13	3
8.	PRPE17	Experimental Stress Analysis	PRPC10	3
9.	PRPE18	Supply Chain Management	PRPC22	3
10.	PRPE19	Plant Engineering	---	3
11.	PRPE20	Design and Analysis of Experiments	---	3
12.	PRPE21	Lean Manufacturing	---	3
13.	PRPE22	Material Handling and Storage	---	3
14.	PRPE23	Sustainable Manufacturing	---	3
15.	PRPE24	Industry 4.0	---	3
16.	PRPE25	Integrated Materials Management	---	3
17.	PRPE26	Agile Manufacturing	---	3
18.	PRPE27	Industrial Robotics	---	3
19.	PRPE28	Unconventional Machining Processes	PRPC14	3
20.	PRPE29	Precision Engineering	PRPC14	3
21.	PRPE30	Manufacturing of Composite Materials	---	3
22.	PRPE31	Machine Tool Technology	PRPC14	3
23.	PRPE32	Non Destructive Testing	---	3
24.	PRPE33	Surface Engineering	---	3
25.	PRPE34	Processing of Polymeric Composites	---	3
26.	PRPE35	Introduction to Friction Composites	---	3
27.	PRPE36	Work Design and Facilities Planning	---	3
28.	PRPE37	Reliability and Maintenance Engineering	---	3
29.	PRPE38	Noise and Vibration Analysis	---	3
30.	PRPE39	Data Analytics for Production Engineering	---	3
31.	PRPE40	Numerical Methods for Engineers	---	3
32.	PRPE41	Product and Service Life Cycle Management	---	3
33.	PRPE42	Laser Micromachining	---	3
34.	PRPE43	Strategic Design for Additive Manufacturing	---	3
35.	PRPE44	Control Systems	---	3

b. Open Elective (OE)

The courses listed below are offered by the Department of Production Engineering for students of all Departments.

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	PROE10	Operations Management	---	3
2.	PROE11	Project Management	---	3
3.	PROE12	Value Engineering	---	3
4.	PROE13	Artificial Intelligence and Expert systems	---	3
5.	PROE14	Processing and Manufacturing of	---	3
6.	PROE15	Finite Element Methods for Engineers	---	3
7.	PROE16	Laser Materials processing	---	3
8.	PROE17	Digital Manufacturing for Industry 4.0	---	3
9.	PROE18	Micro and Nano Manufacturing Processes	---	3
10.	PROE19	Sustainability in Manufacturing Processes	---	3
11.	PROE20	Green Material Joining and Forming	---	3
12.	PROE21	Automobile component manufacturing	---	3

c. Minor (MI) (offered for the students of other departments)

Students of other departments who desire B.Tech. Minor in Production Engineering can opt to study any 5 of the courses listed below.

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	PRMI10	Product Design and Development	---	3
2.	PRMI11	Manufacturing Processes	---	3
3.	PRMI12	CAD, CAM and CAE	---	3
4.	PRMI13	Quality Engineering	---	3
5.	PRMI14	Industrial Engineering and Management	---	3

III. Essential Laboratory Requirement (ELR)

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	PRLR10	Manufacturing Processes Laboratory	PRPC11, PRPC14	2
2.	PRLR11	Weldability, Foundry and Formability Laboratory	PRPC11, PRPC14	2
3.	PRLR12	Metrology and Computer Numerical Control (CNC) Laboratory	PRPC16, PRPC17	2
4.	PRLR13	Machine Drawing (CAD) and Cost Estimation Laboratory	MEIR12	2
5.	PRLR14	Manufacturing System Simulation Laboratory	PRPC20	2
6.	PRLR15	Industrial Automation and Mechatronics Laboratory	PRPC18	2
7.	PRLR16	Advanced Manufacturing Laboratory	PRPC24	2
8.	PRLR17	Industrial Engineering Laboratory	PRPC22, PRPC23	2

IV. Online Courses (OC)

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.		*Course list shall be updated regularly at the start of each Academic Year or Semester by the department NPTEL Coordinator. The students shall be able to select an online course from then available list.*		

V. Advanced Level Courses for B.Tech. (Honors)

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	PRHO10	Tolerance Technology	---	4
2.	PRHO11	Robotics	---	4
3.	PRHO12	Intelligent Manufacturing Systems	---	4
4.	PRHO13	Total Quality Engineering	---	4
5.	PRHO14	Product Analysis and Cost Optimization	---	4
6.	PRHO15	Decision Support Systems	---	4
7.	PRHO16	Knowledge Management	---	3
8.	PRHO17	Product Life Cycle Management	---	3
9.	PRHO18	Technology Management	---	3
10.	PRHO19	Multi-Criteria Decision Making Techniques	---	3
11.	PRHO20	Advanced Optimization techniques	---	4
12.	PRHO21	Modeling of Manufacturing Processes	---	3
13.	PRHO22	Control of Manufacturing Processes	---	4
14.	PRHO23	Flexible Manufacturing Systems	---	3
15.	PRHO24	Lasers in Manufacturing	---	3

VI. MICROCREDITS (MC) (Students can opt 3 courses of 1 credit (4 weeks) each as microcredits instead of 1 OE/OC)

Students are also advised to take 4-week courses from NPTEL/SWAYAM platform