

**National Institute of Technology
Tiruchirappalli**



FLEXIBLE CURRICULA

B. Tech. Programmes

(Students Admitted in 2019-20 onwards)





**FLEXIBLE CURRICULA
UNDER GRADUATE PROGRAMMES
(B. Tech.)**

Students Admitted in 2019 – 20 Onwards



**ACADEMIC OFFICE
NATIONAL INSTITUTE OF TECHNOLOGY
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VISION

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

MISSION

- 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.



FRAME WORK / FLEXIBLE CURRICULUM

MINIMUM CREDIT REQUIREMENT FOR THE VARIOUS COURSE CATEGORIES

The structure of B. Tech. programmes shall have General Institute Requirements (GIR), Programme Core (PC), Elective Courses (PE, OE and MI) and Essential Programme Laboratory Requirements (ELR) as follows:

Course Category	Courses	No. of Credits	Weightage (%)
GIR (General Institute Requirement Courses)	22	50	31.25
PC (Programme Core)	15	49 – 55**	32.50
Programme Electives (PE) / Open Electives (OE)	14 [§]	42	26.25
Essential Laboratory Requirements (ELR)	Maximum 2 per session up to 6 th semester	16	10
Total		160 ±3	100
Minor (Optional)	Courses for 15 credits	15 Additional credits	-
Honours (Optional)	Courses for 15 credits	15 Additional credits	-

Note:

- **Minimum of 4 programme core courses shall be 4 credits each.
- [§]Out of 14 elective courses (PE/OE), the students should study **at least eight programme elective courses (PE)**.
- MI – Minor Degree: **15 credits over and above** the minimum credit as specified by the departments. The details of MINOR will be mentioned only in the transcript not in the Degree certificate.
- HO – Honours Degree:
 - Registered at least for 12 theory courses and 2 ELRs in the second year.
 - Consistently obtained a minimum CGPA of 8.5 in the first four sessions.
 - Consistently maintain a minimum CGPA of 8.5 in all sessions excluding honours courses.
 - Additional courses for **15 credits** shall be successfully completed by a student in order to earn the Honours degree. Maintaining an aggregate of at least B grade in Honours courses is mandatory.
 - The Honours courses shall be distinct, a level above the PC and PE courses, preferably M. Tech. courses.
 - Honours courses shall not be treated as programme elective under any circumstances.
 - Grades obtained in honours shall never be considered for CGPA calculations.
 - Project work is compulsory for B. Tech. (Honours) degree.
- OE- Open elective courses: OE10 to OE50 refers to institute open elective courses and OE51 to OE99 refers to online open elective courses.

**GIR (General Institute Requirement Courses)**

Sl. No.	Name of the course	Number of courses	Max. Credits
1.	Mathematics	3	10
2.	Physics	1	3
	Physics Lab	1	2
3.	Chemistry	1	3
	Chemistry Lab	1	2
4.	Industrial Economics and Foreign Trade	1	3
5.	English for Communication	2	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.	Internship / Industrial Training / Academic Attachment [#]	1	2
14.	Project work [§]	--	--
15.	Comprehensive viva [@]	1	1
16.	Industrial Lecture [*]	1	1
17.	NSS/NCC/NSO	1	Compulsory participation
Total		22	50

The student should undergo industrial training/internship for a minimum period of two months during the summer vacation of 3rd year. Attachment with an academic institution within the country (IISc/IITs/NITs/IIITs and CFTIs) or university abroad is also permitted instead of industrial training. To be evaluated at the beginning of VII semester by assessing the report and seminar presentations.

§ Project work is an optional course. A student can opt for either Project Work or two electives courses equivalent to 6 credits. But, the project work is compulsory for B. Tech. (Honours) degree.

@ The comprehensive examination in the final year of study shall have two objective test of 25 marks each. The final examination shall have 50 marks each. The examination will be of objective type similar to GATE examination.

* A course based on industrial lectures shall be offered for 1 credit. A minimum of five lectures of two hours duration by industry experts will be arranged by the Department. The evaluation methodology, will in general, be based on quizzes at the end of each lecture.

CREDIT DISTRIBUTION (B.Tech.)

Sl. No.	Department	I	II	III	IV	V	VI	VII	VIII	Total
1.	Chemical Engineering	19	20	24	22	24	24	14	10	157
2.	Civil Engineering	21	19	23	24	22	24	14	10	157
3.	Computer Science and Engineering	19	21	24	23	24	24	14	10	159
4.	Electrical and Electronics Engineering	19	21	25	25	25	24	14	10	163
5.	Electronics and Communication Engineering	19	21	26	22	23	23	14	10	158
6.	Instrumentation and Control Engineering	19	21	24	23	23	23	14	10	157
7.	Mechanical Engineering	19	20	24	24	23	24	14	10	158
8.	Metallurgical and Materials Engineering	19	21	24	25	23	24	14	10	160
9.	Production Engineering	19	21	25	24	24	24	14	10	161

**CHEMICAL ENGINEERING**

The total minimum credits for completing the B.Tech. programme in Chemical Engineering is 157.

(I) GENERAL INSTITUTE REQUIREMENTS**1. MATHEMATICS**

Sl. No.	Course Code	Course Title	Credits
1.	MAIR11	Matrices and Calculus	3
2.	MAIR21	Complex Analysis and Differential Equations	3
3.	MAIR41	Mathematics III	4
Total			10

2. PHYSICS

Sl. No.	Course Code	Course Title	Credits
1.	PHIR11	Physics	3
2.	PHIR12	Physics Lab	2
Total			5

3. CHEMISTRY

Sl. No.	Course Code	Course Title	Credits
1.	CHIR11	Chemistry	3
2.	CHIR12	Chemistry Lab	2
Total			5

4. HUMANITIES

Sl. No.	Course Code	Course Title	Credits
1.	HSIR13	Industrial Economics & Foreign Trade	3
Total			3

5. COMMUNICATION

Sl. No.	Course Code	Course Title	Credits
1.	HSIR11	English for Communication (Theory & Lab)	4
Total			4

6. ENERGY AND ENVIRONMENTAL ENGINEERING



Sl. No.	Course Code	Course Title	Credits
1.	ENIR11	Energy and Environmental Engineering	2
Total			2

7. PROFESSIONAL ETHICS

Sl. No.	Course Code	Course Title	Credits
1.	HSIR14	Professional Ethics	3
Total			3

8. ENGINEERING GRAPHICS

Sl. No.	Course Code	Course Title	Credits
1.	MEIR12	Engineering Graphics	3
Total			3

9. ENGINEERING PRACTICE

Sl. No.	Course Code	Course Title	Credits
1.	PRIR11	Engineering Practice	2
Total			2

10. BASIC ENGINEERING

Sl. No.	Course Code	Course Title	Credits
1.	CEIR11	Basics of Civil Engineering	2
2.	EEIR11	Basics of Electrical and Electronics Engineering	2
Total			4

11. INTRODUCTION TO COMPUTER PROGRAMMING

Sl. No.	Course Code	Course Title	Credits
1.	CSIR12	Introduction to Computer Programming	3
Total			3

12. BRANCH SPECIFIC COURSE

Sl. No.	Course Code	Course Title	Credits
1.	CLIR15	Introduction to Chemical Engineering	2
Total			2

**13. SUMMER INTERNSHIP**

Sl. No.	Course Code	Course Title	Credits
1.	CLIR17	Internship / Industrial Training / Academic Attachment (2 to 3 months duration during summer vacation)	2
Total			2

14. PROJECT WORK

Sl. No.	Course Code	Course Title	Credits
1.	CLIR19	Project Work (Optional)	6
Total			6

15. COMPREHENSIVE VIVA

Sl. No.	Course Code	Course Title	Credits
1.	CLIR18	Comprehensive Viva-Voce	1
Total			1

16. INDUSTRIAL LECTURE

Sl. No.	Course Code	Course Title	Credits
1.	CLIR16	Industrial Lectures	1
Total			1

17. NSS/NCC/NSO

Sl. No.	Course Code	Course Title	Credits
1.	SWIR11	NSS/NCC/NSO	0
Total			0

(II) PROGRAMME CORE (PC)

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	CLPC11	Chemistry-III	-	3
2.	CLPC12	Process Calculations	-	3
3.	CLPC13	Momentum Transfer	-	3
4.	CLPC14	Chemical Engineering Thermodynamics	CLPC11	4
5.	CLPC15	Chemical Technology	-	3
6.	CLPC16	Heat Transfer	CLPC13	3



7.	CLPC17	Particulate Science and Technology	-	3
8.	CLPC18	Mass Transfer - I	CLPC11, CLPC14	3
9.	CLPC19	Transport Phenomena	CLPC13,CLPC16, CLPC18	3
10.	CLPC20	Mass Transfer - II	CLPC18	4
11.	CLPC21	Chemical Reaction Engineering	CLPC14,CLPC16	3
12.	CLPC22	Chemical Process Equipment Design	CLPC13, CLPC16 CLPC18,CLPC20	4
13.	CLPC23	Process Modeling and Simulation	CLPC13, CLPC16 CLPC18,CLPC20	3
14.	CLPC24	Process Dynamics and Control	MAIR21	4
15.	CLPC25	Project Engineering and Economics	CLPC17	3
Total				49

(III) ELECTIVES**a. PROGRAMME ELECTIVES (PE)**

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	CLPE11	Petroleum and Petrochemical Engineering	-	3
2.	CLPE12	Computer Applications in Chemical Engineering	-	3
3.	CLPE13	Polymer Science and Technology	-	3
4.	CLPE14	Modern Separation Processes	CLPC18, CLPC20	3
5.	CLPE15	Safety in Chemical Process Industries	CLPC17	3
6.	CLPE16	Material Science & Technology	-	3
7.	CLPE17	Industrial Process Biotechnology	-	3
8.	CLPE18	Fluidization Engineering	CLPC13, CLPC17	3
9.	CLPE19	Pharmaceutical Technology	-	3
10.	CLPE20	Process Intensification	CLPC16, CLPC18, CLPC21	3
11.	CLPE21	Electro-chemical Reaction Engineering	-	3
12.	CLPE22	Food Processing Technology	-	3
13.	CLPE23	Bio refinery Engineering	-	3
14.	CLPE24	Water Treatment Technology	-	3
15.	CLPE25	Biochemical Engineering	-	3
16.	CLPE26	Air Pollution Control Engineering	-	3
17.	CLPE27	Industrial Wastewater Treatment	-	3
18.	CLPE28	Fuel Cells and Batteries	-	3
19.	CLPE29	Heterogeneous Chemical Reaction Engineering	CLPC21	3

**(b) OPEN ELECTIVES (OE)**

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	CLOE11	Environmental Engineering	-	3
2.	CLOE12	Optimization Techniques	-	3
3.	CLOE13	Energy Engineering	-	3
4.	CLOE14	Process Instrumentation	-	3
5.	CLOE15	Nano Technology	-	3
6.	CLOE16	Bioenergy	-	3
7.	CLOE17	Design and Analysis of Experiments	-	3
8.	CLOE18	Introduction to Data Analysis	-	3
9.	CLOE19	Soft Computing Techniques	-	3

(IV) ESSENTIAL PROGRAMME LABORATORY REQUIREMENTS (ELR)

Sl. No.	Course Code	Course Title	Co requisites	Credits
1.	CLLR11	Momentum Transfer Lab	CLPC13	2
2.	CLLR12	Instrumental Analysis and Thermodynamics Lab	CLPC14	2
3.	CLLR13	Particulate Science & Technology Lab	CLPC17	2
4.	CLLR14	Heat Transfer Lab	CLPC16	2
5.	CLLR15	Mass Transfer Lab	CLPC18, CLPC20	2
6.	CLLR16	Chemical Reaction Engineering Lab	CLPC21	2
7.	CLLR17	Process Dynamics and Control Lab	CLPC24	2
8.	CLLR18	Process Modeling Simulation Lab	CLPC23	2
Total				16

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

(V) MINORS (MI)

Students who have registered for B.Tech. Minor in Chemical Engineering [**Note: Number of Minor courses: 5 courses (Minimum)**]

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	CLMI11	Chemical Process Calculations	-	3
2.	CLMI12	Transfer Operations – I	-	3
3.	CLMI13	Transfer Operations – II	CLMI12	3
4.	CLMI14	Chemical Reaction Engineering	CLMI11, CLMI13	3
5.	CLMI15	Chemical Technology	-	3
Total				15

**(VI) HONOURS**

Sl. No.	Course Code	Course Title	Co requisites	Credits
1.	CLHO11	Advanced Process control	CLPC24	3
2.	CLHO12	Pinch Analysis and Heat Exchange Network Design	CLPC14, CLPC16	3
3.	CLHO13	Applied Mathematics in Chemical Engineering	CLPC16, CLPC18, CLPC21	3
4.	CLHO14	Advances in Heat Transfer	CLPC16	3
5.	CLHO15	Computational Fluid Dynamics	CLPC13	3
6.	CLHO16	Process Safety Management	-	3

(VII) ONLINE COURSES

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1	CLOE51	Bio Informatics: Algorithms and Applications	-	3
2	CLOE52	Introduction to Machine Learning	-	3
3	CLOE53	System Identification	-	3
4	CLOE53	Computer Aided Drug Design	-	3

Courses offered by NPTEL/SWAYAM/MOOC

* The students should register online courses after obtaining prior approval from the competent authorities. The BoS recommended absolute grading policy for online courses.



CIVIL ENGINEERING

The total minimum credits for completing the B.Tech. programme in Civil Engineering is 157.

(I) GENERAL INSTITUTE REQUIREMENTS

1. MATHEMATICS

Sl. No.	Course Code	Course Title	Credits
1.	MAIR11	Matrices and Calculus	3
2.	MAIR21	Complex Analysis and Differential Equations	3
3.	MAIR42	Mathematics III	4
Total			10

2. PHYSICS

Sl. No.	Course Code	Course Title	Credits
1.	PHIR11	Physics	3
2.	PHIR12	Physics Lab	2
Total			5

3. CHEMISTRY

Sl. No.	Course Code	Course Title	Credits
1.	CHIR11	Chemistry	3
2.	CHIR12	Chemistry Lab	2
Total			5

4. HUMANITIES

Sl. No.	Course Code	Course Title	Credits
1.	HSIR13	Industrial Economics & Foreign Trade	3
Total			3

5. COMMUNICATION

Sl. No.	Course Code	Course Title	Credits
1.	HSIR11	English for Communication (Theory & Lab)	4
Total			4

**6. ENERGY AND ENVIRONMENTAL ENGINEERING**

Sl. No.	Course Code	Course Title	Credits
1.	ENIR11	Energy and Environmental Engineering	2
Total			2

7. PROFESSIONAL ETHICS

Sl. No.	Course Code	Course Title	Credits
1.	HSIR14	Professional Ethics	3
Total			3

8. ENGINEERING GRAPHICS

Sl. No.	Course Code	Course Title	Credits
1.	MEIR12	Engineering Graphics	3
Total			3

9. ENGINEERING PRACTICE

Sl. No.	Course Code	Course Title	Credits
1.	PRIR11	Engineering Practice	2
Total			2

10. BASIC ENGINEERING

Sl. No.	Course Code	Course Title	Credits
1.	MEIR11	Basics of Mechanical Engineering	2
2.	EEIR11	Basics of Electrical and Electronics Engineering	2
Total			4

11. INTRODUCTION TO COMPUTER PROGRAMMING

Sl. No.	Course Code	Course Title	Credits
1.	CSIR12	Introduction to Computer Programming	3
Total			3

12. BRANCH SPECIFIC COURSE

Sl. No.	Course Code	Course Title	Credits
1.	CEIR15	Introduction to Civil Engineering	2
Total			2

**13. SUMMER INTERNSHIP**

Sl. No.	Course Code	Course Title	Credits
1.	CEIR17	Internship / Industrial Training / Academic Attachment (2 to 3 months duration during summer vacation)	2
Total			2

14. PROJECT WORK

Sl. No.	Course Code	Course Title	Credits
1.	CEIR19	Project Work (Optional)	6
Total			6

15. COMPREHENSIVE VIVA

Sl. No.	Course Code	Course Title	Credits
1.	CEIR18	Comprehensive Viva-Voce	1
Total			1

16. INDUSTRIAL LECTURE

Sl. No.	Course Code	Course Title	Credits
1.	CEIR16	Industrial Lectures	1
Total			1

17. NSS/NCC/NSO

Sl. No.	Course Code	Course Title	Credits
1.	SWIR11	NSS/NCC/NSO	-
Total			-

(II) PROGRAMME CORE COURSES

Sl. No.	Course Code	Course Title	Pre requisites	Credits
1.	CEPC10	Engineering Mechanics	-	4
2.	CEPC11	Mechanics of Solids	CEPC10	4
3.	CEPC12	Hydraulics and Fluid Machinery	-	3
4.	CEPC13	Surveying	-	3
5.	CEPC14	Concrete Technology	-	3



6.	CEPC15	Analysis of Indeterminate Structures	CEPC11	4
7.	CEPC16	Geotechnical Engineering - I	-	3
8.	CEPC17	Environmental Engineering - I	-	3
9.	CEPC18	Environmental Engineering - II	CEPC17	3
10.	CEPC19	Geotechnical Engineering - II	CEPC16	3
11.	CEPC20	Highway and Pavement Engineering	-	3
12.	CEPC21	Basic Reinforced Concrete Design	-	3
13.	CEPC22	Hydrology and Irrigation Engineering	CEPC12	4
14.	CEPC23	Railway, Airport and Harbour Engineering	-	3
15.	CEPC24	Basic Steel Structural Elements	-	3
		Total		49

(III) ELECTIVE COURSES

(a) PROGRAMME ELECTIVE COURSES (PE)

Sl. No.	Course Code	Course Title	Pre requisites	Credits
1.	CEPE10	Construction Techniques and Equipments	-	3
2.	CEPE11	Elementary Structural Dynamics	CEPC10	3
3.	CEPE12	Maintenance and Rehabilitation of Structures	CEPC13	3
4.	CEPE13	Construction Management	-	3
5.	CEPE14	Structural System Analysis	CEPC15	3
6.	CEPE15	Prestressed Concrete Structures	CEPC21	3
7.	CEPE16	Advanced Reinforced Concrete Design	CEPC21	3
8.	CEPE17	Advanced Steel Structural Elements	CEPC24	3
9.	CEPE18	Advanced Structural Analysis	CEPC15	3
10.	CEPE19	Traffic Engineering and Safety	CEPC18	3
11.	CEPE20	Pavement Analysis and Design	CEPC18	3
12.	CEPE21	Transportation Planning	CEPC18	3
13.	CEPE22	Air Pollution Management	CEPC20	3
14.	CEPE23	Industrial Wastewater Treatment	CEPC20	3
15.	CEPE24	Environmental Management and Impact Assessment	CEPC20	3
16.	CEPE25	Solid Waste Management Techniques	CEPC20	3
17.	CEPE26	Models for Air and Water Quality	CEPC20	3
18.	CEPE27	Advanced Foundation Engineering	CEPC19	3
19.	CEPE28	Geotechnical Earthquake Engineering	CEPC19	3



20.	CEPE29	Reinforced Earth and Geotextiles	CEPC19	3
21.	CEPE30	Earth and Earth Retaining Structures	CEPC19	3
22.	CEPE31	Marine Foundation Engineering	CEPC19	3
23.	CEPE32	Geodetic Surveying	CEPC14	3
24.	CEPE33	Advanced Surveying Techniques	CEPC14	3
25.	CEPE34	Groundwater Hydrology	CEPC12	3
26.	CEPE35	Applied Hydraulics Engineering	CEPC12	3
27.	CEPE36	Design of Hydraulic Structures	CEPC22	3
28.	CEPE37	Simulation Modelling for Water Resources Engineering	CEPC22	3
29.	CEPE38	Design of Offshore and Coastal Structures	CEPC19 CEPC24	3
30.	CEPE39	Coastal Engineering	CEPC12	3
31.	CEPE40	Disaster Modelling and Management	CEPC12 CEPC22	3
32.	CEPE41	Prefabricated Structures	-	3
33.	CEPE42	Heritage Structures	CEPC13	3
34.	CEPE43	Earthquake Resistant Structures	CEPC11 CEPC15	3
35.	CEPE44	Steel Concrete Composite Structures	CEPC21 CEPC24	3
36.	CEPE45	Steel Structural Systems	CEPC24	3
37.	CEPE46	Basic Bridge Engineering	CEPC10 CEPC21 CEPC24	3

(b) OPEN ELECTIVE COURSES (OE)

Sl. No.	Course Code	Course Title	Pre requisites	Credits
1.	CEOE10	Remote Sensing and GIS	-	3
2.	CEOE11	Ocean Energy	-	3
3.	CEOE12	Earthquake Engineering	-	3
4.	CEOE13	Urban and Regional Planning	-	3
5.	CEOE14	Experimental Stress Analysis	-	3
6.	CEOE15	Health Monitoring of Structures	-	3
7.	CEOE16	Forensic Engineering	-	3
8.	CEOE17	Sustainable Infrastructure	-	3

**(IV) ESSENTIAL PROGRAMME LABORATORY REQUIREMENTS (ELR)**

Sl. No.	Course Code	Course Title	Pre-/Co-requisites	Credits
1.	CELR11	Strength of Materials and Concrete Laboratory	-	2
2.	CELR12	Survey Laboratory	-	2
3.	CELR13	Fluid Mechanics Laboratory	-	2
4.	CELR14	Building Planning & Drawing	-	2
5.	CELR15	Geotechnical Engineering Laboratory	-	2
6.	CELR16	Environmental Engineering Laboratory	-	2
7.	CELR17	Transportation Engineering Laboratory	-	2
8.	CELR18	Computational Laboratory	-	2
Total				16

(V) MINOR COURSES (MI)

Sl. No.	Course Code	Course Title	Pre requisites	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

**(VI) HONOURS**

Sl. No.	Course Code	Course Title	Pre requisites	Credits
1.	CEHO10	Basic Structural Dynamics	CEPC15	3
2.	CEHO11	Basics of Finite Element Methods	CEPC15	3
3.	CEHO12	Elementary Theory of Elasticity and Introduction to Plasticity	CEPC11	3
4.	CEHO13	Nonlinear Analysis of Structures	CEPC15	3
5.	CEHO14	Theory of Plates and Introduction to Shells	CEPC11	3
6.	CEHO15	Theory of Traffic Flow	CEPC18	3
7.	CEHO16	Pavement Construction and Management	CEPC18	3
8.	CEHO17	Soil Dynamics and Machine Foundations	CEPC19	3
9.	CEHO18	Numerical Modelling in Geotechnical Engineering	CEPC19	3
10.	CEHO19	Physicochemical Methods for Water and Wastewater Treatment	CEPC20	3
11.	CEHO20	Biological Treatment of Wastewater	CEPC20	3
12.	CEHO21	Free Surface Flow	CEPC22	3
13.	CEHO22	Computational Fluid Dynamics	CEPC22	3
14.	CEHO23	Wave Hydrodynamics	CEPC22	3
15.	CEHO24	Advanced Remote Sensing Techniques	CEPC14	3

**COMPUTER SCIENCE AND ENGINEERING**

The total minimum credits for completing the B.Tech. programme in Computer Science Engineering is **159**.

(I) GENERAL INSTITUTE REQUIREMENTS**1. MATHEMATICS**

Sl. No.	Course Code	Course Title	Credits
1.	MAIR12	Linear Algebra and Calculus	3
2.	MAIR22	Complex Analysis and Differential Equations	3
3.	MAIR31	Mathematics III - Probability and Random Processes	4
Total			10

2. PHYSICS

Sl. No.	Course Code	Course Title	Credits
1.	PHIR11	Physics	3
2.	PHIR12	Physics Lab	2
Total			5

3. CHEMISTRY

Sl. No.	Course Code	Course Title	Credits
1.	CHIR11	Chemistry	3
2.	CHIR12	Chemistry Lab	2
Total			5

4. HUMANITIES

Sl. No.	Course Code	Course Title	Credits
1.	HSIR13	Industrial Economics and Foreign Trade	3
Total			3

6. COMMUNICATION

Sl. No.	Course Code	Course Title	Credits
1.	HSIR11	English for Communication (Theory& Lab)	4
Total			4

**6. ENERGY AND ENVIRONMENTAL ENGINEERING**

Sl. No.	Course Code	Course Title	Credits
1.	ENIR11	Energy and Environmental Engineering	2
Total			2

7. PROFESSIONAL ETHICS

Sl. No.	Course Code	Course Title	Credits
1.	HSIR14	Professional Ethics	3
Total			3

8. ENGINEERING GRAPHICS

Sl. No.	Course Code	Course Title	Credits
1.	MEIR12	Engineering Graphics	3
Total			3

9. ENGINEERING PRACTICE

Sl. No.	Course Code	Course Title	Credits
1.	PRIR11	Engineering Practice	2
Total			2

10. BASIC ENGINEERING

Sl. No.	Course Code	Course Title	Credits
1.	CEIR11	Basics of Civil Engineering	2
2.	MEIR11	Basics of Mechanical Engineering	2
Total			4

11. INTRODUCTION TO COMPUTER PROGRAMMING

Sl. No.	Course Code	Course Title	Credits
1.	CSIR11	Introduction to Computer Programming (Theory & Lab)	3
Total			3

**12. BRANCH SPECIFIC COURSE**

Sl. No.	Course Code	Course Title	Credits
1.	CSIR21	Branch Specific Course - Essentials of Computer Science	2
Total			2

13. SUMMER INTERNSHIP

Sl. No.	Course Code	Course Title	Credits
1.	CSIR71	Internship / Industrial Training / Academic Attachment (2 to 3 months duration during summer)	2
Total			2

14. PROJECTWORK (OPTIONAL COURSE)

Sl. No.	Course Code	Course Title	Credits
1.	CSIR82	Project Work (Optional)	6
Total			6

15. COMPREHENSIVE VIVA

Sl. No.	Course Code	Course Title	Credits
1.	CSIR81	Comprehensive viva voce	1
Total			1

16. INDUSTRIAL LECTURE

Sl. No.	Course Code	Course Title	Credits
1.	CSIR61	Industrial Lecture	1
Total			1

17. NSS /NCC/ NSO

Sl. No.	Course Code	Course Title	Credits
1.	SWIR11	NSS/NCC/NSO	0
Total			0

(II) PROGRAMME CORE COURSES

Sl. No.	Course Code	Course Title	Pre requisites	Credits
1.	CSPC11	Programme Core – 1 / Discrete Structures	-	4
2.	CSPC31	Programme Core – II / Principles of Programming languages	-	4
3.	CSPC32	Programme Core – III / Data Structures	-	3
4.	CSPC33	Programme Core – IV / Digital systems design	-	3
5.	CSPC34	Programme Core – V / Computer Organization	-	3
6.	CSPC41	Programme Core – VI / Formal languages and automata theory	CSPC11	4
7.	CSPC42	Programme Core – VII / Design and analysis of algorithms	CSPC32	3
8.	CSPC43	Programme Core – VIII / Operating systems	-	3
9.	CSPC51	Programme Core – IX / Computer Architecture	CSPC34	4
10.	CSPC52	Programme Core – X / Database Management Systems	-	3
11.	CSPC53	Programme Core – XI / Computer Networks	-	3
12.	CSPC54	Programme Core – XII / Introduction to Artificial Intelligence and Machine Learning	CSPC11	4
13.	CSPC61	Programme Core – XIII / Embedded Systems Architectures	CSPC34	3
14.	CSPC62	Programme Core – XIV / Compiler Design	CSPC41	4
15.	CSPC63	Programme Core – XV / Principles of Cryptography	-	3
Total				51

(III) ELECTIVE COURSES**(a) PROGRAMME ELECTIVE COURSES (PE)**

Sl. No.	Course Code	Course Title	Pre requisites	Credits
1.	CSPE31	Linear Algebra and applications	-	3
2.	CSPE32	Combinatorics and Graph theory	CSPC11	3
3.	CSPE41	Software Engineering	-	3
4.	CSPE42	Design Thinking	-	3
5.	CSPE43	Advanced Data structures and algorithms	CSPC31	3



6.	CSPE44	Computer Graphics	-	3
7.	CSPE45	Multimedia Systems	-	3
8.	CSPE51	Augmented and Virtual Reality	-	3
9.	CSPE52	Digital Signal Processing	-	3
10.	CSPE53	Game Theory	-	3
11.	CSPE54	Real Time Systems	CSPC43	3
12.	CSPE55	Software Testing and Automation	-	3
13.	CSPE56	Cloud Computing	CSPC43	3
14.	CSPE57	Agile Software Development	-	3
15.	CSPE61	Web Technology and its Applications	CSPC42	3
16.	CSPE62	Advanced Database Management Systems	CSPC52	3
17.	CSPE63	Artificial Intelligence and its Applications	CSPC54	3
18.	CSPE64	Data Analytics	CSPC52	3
19.	CSPE65	Machine Learning Techniques and Practices	CSPC54	3
20.	CSPE66	Mobile Computing	CSPC53	3
21.	CSPE67	Internetworking Protocols	CSPC53	3
22.	CSPE68	Design and Analysis of Parallel Algorithms	CSPC42	3
23.	CSPE71	Advanced Cryptography	CSPC63	3
24.	CSPE72	Deep Learning Techniques	CSPC54	3
25.	CSPE73	Natural Language Processing	CSPC62	3
26.	CSPE74	Image Processing and Applications	-	3
27.	CSPE75	Network Security	CSPC63	3
28.	CSPE76	Wireless Network Systems	CSPC53	3
29.	CSPE77	Parallel Architectures and Programming	CSPC51	3
30.	CSPE78	Information Security	-	3
31.	CSPE79	Human Computer Interaction	-	3
32.	CSPE70	Undergraduate Research 1		3
33.	CSPE81	Data Science	-	3
34.	CSPE82	GPU Computing	CSPC51	3
35.	CSPE83	Internet of Things - Principles and Practices	-	3
36.	CSPE84	Social Network Analysis	-	3
37.	CSPE85	Speech Processing Techniques	-	3
38.	CSPE86	Undergraduate Research 2		3

**(b) OPEN ELECTIVE COURSES**

Sl. No.	Course Code	Course Title	Pre requisites	Credits
1.	CSOE11	Big Data Analytics	-	3
2.	CSOE12	Cloud & 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 & Practices	-	3
13.	CSOE23	Web Technology	-	3

(IV) ESSENTIAL PROGRAMME LABORATORY REQUIREMENTS (ELR)

Sl. No.	Course Code	Course Title	Pre-/Co-requisites	Credits
1.	CSLR31	Laboratory – I / Data structures laboratory	CSPC31	2
2.	CSLR32	Laboratory – II / Digital laboratory	CSPC32	2
3.	CSLR41	Laboratory – III / Algorithms laboratory	CSPC42	2
4.	CSLR42	Laboratory – IV / Operating systems lab	CSPC43	2
5.	CSLR51	Laboratory – V / Database Management Systems Laboratory	CSPC52	2
6.	CSLR52	Laboratory – VI / Networks laboratory	CSPC53	2
7.	CSLR61	Laboratory – VII / Embedded Systems Laboratory	CSPC61	2
8.	CSLR62	Laboratory – VIII / App Development laboratory	CSPC31	2
Total				16

**(V) MINOR COURSES (MI)**

Sl. No.	Course Code	Course Title	Pre requisites	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

(VI) HONOURS

Sl. No.	Course Code	Course Title	Pre requisites	Credits
1.	CSHO11	Software Defined Networking	-	3
2.	CSHO12	Distributed Systems	CSPC41	4
3.	CSHO13	Multi-core Programming	CSPC51	4
4.	CSHO14	Pervasive and Ubiquitous Computing	CSPC43	3
5.	CSHO15	Middleware Technologies	-	3
6.	CSHO16	Randomized Algorithms	CSPC42	4
7.	CSHO17	Big Data Mining	-	4
8.	CSHO18	Modelling and Simulation	-	4
9.	CSHO19	Quantum Computing	-	4

**ELECTRICAL AND ELECTRONICS ENGINEERING**

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

I. GENERAL INSTITUTE REQUIREMENT (GIR)**1. MATHEMATICS**

Sl. No.	Course Code	Course Title	Credits
1	MAIR12	Linear Algebra and Calculus	3
2	MAIR22	Complex Analysis and Differential Equations	3
3	MAIR32	Fourier Transforms and Numerical Techniques	4
Total			10

2. PHYSICS

Sl. No.	Course Code	Course Title	Credits
1.	PHIR11	Physics	3
2.	PHIR12	Physics Lab	2
Total			5

3. CHEMISTRY

Sl. No.	Course Code	Course Title	Credits
1.	CHIR11	Chemistry	3
2.	CHIR12	Chemistry Lab	2
Total			5

4. HUMANITIES

Sl. No.	Course Code	Course Title	Credits
1.	HSIR13	Industrial Economics and Foreign Trade	3
Total			3

5. COMMUNICATION

Sl. No.	Course Code	Course Title	Credits
1.	HSIR11	English for Communication (Theory & Lab)	4
Total			4

**6. ENERGY AND ENVIRONMENTAL ENGINEERING**

Sl. No.	Course Code	Course Title	Credits
1.	ENIR11	Energy and Environmental Engineering	2
Total			2

7. PROFESSIONAL ETHICS

Sl. No.	Course Code	Course Title	Credits
1.	HSIR14	Professional Ethics	3
Total			3

8. ENGINEERING GRAPHICS

Sl. No.	Course Code	Course Title	Credits
1.	MEIR12	Engineering Graphics	3
Total			3

9. ENGINEERING PRACTICE

Sl. No.	Course Code	Course Title	Credits
1.	PRIR11	Engineering Practice	2
Total			2

10. BASIC ENGINEERING

Sl. No.	Course Code	Course Title	Credits
1.	CEIR11	Basics of Civil Engineering	2
2.	MEIR11	Basics of Mechanical Engineering	2
Total			4

11. INTRODUCTION TO COMPUTER PROGRAMMING

Sl. No.	Course Code	Course Title	Credits
1.	CSIR11	Introduction to Computer Programming (Theory and Labs)	3
Total			3

12. BRANCH SPECIFIC COURSE

Sl. No.	Course Code	Course Title	Credits
1.	EEIR15	Introduction to Electrical and Electronics Engineering	2
Total			2

**13. SUMMER INTERNSHIP**

Sl. No.	Course Code	Course Title	Credits
1.	EEIR16	Internship / Industrial Training / Academic Attachment (2 to 3 months duration during summer vacation)	2
Total			2

14. PROJECT WORK

Sl. No.	Course Code	Course Title	Credits
1.	EEIR17	Project Work (Optional)	6
Total			6

15. COMPREHENSIVE VIVA

Sl. No.	Course Code	Course Title	Credits
1.	EEIR18	Comprehensive Viva-Voce Examination	1
Total			1

Note: Students can appear for Comprehensive Viva-Voce Examination only after completing all Programme Core (PC) courses.

16. INDUSTRIAL LECTURES

Sl. No.	Course Code	Course Title	Credits
1.	EEIR19	Industrial Lectures	1
Total			1

17. NSS/NCC/NSO

Sl. No.	Course Code	Course Title	Credits
1.	SWIR11	NSS/NCC/NSO	0
Total			0

II. PROGRAMME CORE (PC)

Sl. No.	Course Code	Course Title	Pre requisites	Credits
1.	EEPC10	Circuit Theory	MAIR21	4
2.	EEPC11	Networks and Linear 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 EEPC11	4
10.	EEPC19	Power Electronics	MAIR32 EEPC10 EEPC13	4
11.	EEPC20	Control Systems	EEPC10	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
TOTAL				55

III. **ELECTIVE COURSES**

a) **PROGRAMME ELECTIVES (PE)**

Sl. No.	Course Code	Course Title	Pre requisites	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	EEPE18	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

- * 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 ELECTIVES (OE)

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

Sl. No.	Course Code	Course Title	Pre requisites	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

**(IV) ESSENTIAL PROGRAMME LABORATORY REQUIREMENT (ELR)**

Sl. No.	Course Code	Course Title	Co- Pre requisites *	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	EEPC21	2
6.	EELR15	Power Electronics Laboratory	EEPC19	2
7.	EELR16	Micro-controller Laboratory	EEPC22	2
8.	EELR17	Power Systems Laboratory	EEPC18	2
TOTAL				16

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

(V) MINOR (MI)

Students who have registered for B.Tech. (Minor) in Electrical and Electronics Engineering can opt to study any 5 of the courses listed below. Students from non-circuit branches alone can opt for this Minor Programme.

Sl. No.	Course Code	Course Title	Pre requisites	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

(VI) HONOURS

Sl. No.	Course Code	Course Title	Pre requisites	Credits
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1.	EEHO10	Distribution System Automation	EEPC11	3
2.	EEHO11	EHV AC and DC Transmission	EEPC11	3
3.	EEHO12	Non-linear Control Systems	EEPC20	3
4.	EEHO13	Power Switching Converters	EEPC19	3
5.	EEHO14	Vehicular Electric Power Systems	EEPC15, EEPC19	3
6.	EEHO15	Power System Dynamics	EEPC18	3
7.	EEHO16	Modern Optimization Techniques for Electric Power Systems	EEPC18	3
8.	EEHO17	Computer Relaying and Phasor Measurement Unit	EEPE18	3
9.	EEHO18	Power System Restructuring	EEPE29	3
10.	EEHO19	Design with PIC Microcontrollers	EEPC14	3

(VII) ONLINE COURSES

The online courses to be offered in Department of EEE are listed below. A student can earn maximum of 12 credits from these courses.

Sl. No.	Course Name	Duration In Weeks	URL
1	Engineering Econometrics	12	https://swayam.gov.in/nd1_noc20_mq21/preview
2	Data Analytics using Python	12	https://nptel.ac.in/courses/106/107/106107220/
3	Introduction to internet of things	12	https://nptel.ac.in/courses/106/105/106105166/
4	Computational Number Theory and Algebra	12	https://swayam.gov.in/nd1_noc20_ma42/preview
5	Statistical Inference	8	https://swayam.gov.in/nd1_noc20_ma19/preview
6	Introduction to Block chain Technology and Applications	8	https://swayam.gov.in/nd1_noc20_cs01/preview
7	Introduction to robotics	12	https://swayam.gov.in/nd1_noc20_de11/preview
9	Fundamentals of Automotive Systems	12	https://swayam.gov.in/nd1_noc20_de06/preview
10	Biomedical Signal Processing	12	https://swayam.gov.in/nd1_noc20_ee41/preview
11	Analog IC Design	12	https://swayam.gov.in/nd1_noc20_ee26/preview
12	Embedded System Design with ARM	8	https://nptel.ac.in/courses/106/105/106105193/
13	Statistical Signal Processing	12	https://swayam.gov.in/nd1_noc20_ee53/preview



14	Cyber Security	15	https://swayam.gov.in/nd2_cec20_cs15/preview
15	Cloud Computing and Distributed Systems	8	https://swayam.gov.in/nd1_noc20_cs48/preview
16	Robotics and Control: Theory and Practice	8	https://nptel.ac.in/courses/112/107/112107289/
17	Applied Electromagnetics for Engineers	12	https://swayam.gov.in/nd1_noc20_ee93/preview
18	Innovation, Business Models and Entrepreneurship	8	https://nptel.ac.in/courses/110/107/110107094/
19	DC Microgrid and Control System	8	https://swayam.gov.in/nd1_noc20_ee84/preview
20	Arduino	8	https://swayam.gov.in/nd2_aic20_sp04/preview

Note: In case any of the above listed courses are not offered in Swayam, the department will notify alternative courses offered in Swayam



ELECTRONICS AND COMMUNICATION ENGINEERING

The total minimum credits for completing the B.Tech. programme in Electronics and Communication Engineering is **158**.

I. GENERAL INSTITUTE REQUIREMENTS

1. MATHEMATICS

Sl. No.	Course Code	Course Title	Credits
1	MAIR12	Linear Algebra and Calculus	3
2	MAIR22	Complex Analysis and Differential Equations	3
3	MAIR33	Real Analysis and Probability Theory	4
Total			10

2. PHYSICS

Sl. No.	Course Code	Course Title	Credits
1	PHIR11	Physics	3
2	PHIR12	Physics Lab	2
Total			5

3. CHEMISTRY

Sl. No.	Course Code	Course Title	Credits
1	CHIR11	Chemistry	3
2	CHIR12	Chemistry Lab	2
Total			5

4. HUMANITIES

Sl. No.	Course Code	Course Title	Credits
1	HSIR13	Industrial Economics and Foreign Trade	3
Total			3

5. COMMUNICATION

Sl. No.	Course Code	Course Title	Credits
1	HSIR11	English for Communication (Theory & Lab)	4
Total			4

**6. ENERGY AND ENVIRONMENTAL ENGINEERING**

Sl. No.	Course Code	Course Title	Credits
1	ENIR11	Energy and Environmental Engineering	2
Total			2

7. PROFESSIONAL ETHICS

Sl. No.	Course Code	Course Title	Credits
1	HSIR14	Professional Ethics	3
Total			3

8. ENGINEERING GRAPHICS

Sl. No.	Course Code	Course Title	Credits
1	MEIR12	Engineering Graphics	3
Total			3

9. ENGINEERING PRACTICE

Sl. No.	Course Code	Course Title	Credits
1	PRIR11	Engineering Practice	2
Total			2

10. BASIC ENGINEERING

Sl. No.	Course Code	Course Title	Credits
1	CEIR11	Basics of Civil Engineering	2
2	MEIR11	Basics of Mechanical Engineering	2
Total			4

11. INTRODUCTION TO COMPUTER PROGRAMMING

Sl. No.	Course Code	Course Title	Credits
1	CSIR11	Introduction to Computer Programming	3
Total			3

**12. BRANCH SPECIFIC COURSE**

Sl. No.	Course Code	Course Title	Credits
1	ECIR15	Branch Specific Course - Introduction to Electronics and communication Engineering	2
Total			2

13. SUMMER INTERNSHIP

Sl. No.	Course Code	Course Title	Credits
1	ECIR16	Internship / Industrial Training / Academic Attachment (2 To 3 Months Duration During Summer Vacation)	2
Total			2

14. PROJECT WORK

Sl. No.	Course Code	Course Title	Credits
1	ECIR17	Project work/equivalent no of electives	6
Total			6

15. COMPREHENSIVE VIVA

Sl. No.	Course Code	Course Title	Credits
1	ECIR18	Comprehensive Viva	1
Total			1

16. INDUSTRIAL LECTURE

Sl. No.	Course Code	Course Title	Credits
1	ECIR19	Industrial Lecture	1
Total			1

17. NSS / NCC / NSO

Sl. No.	Course Code	Course Title	Credits
1	SWIR11	NSS / NCC / NSO	0
Total			0

**II. PROGRAMME CORE (PC)**

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	ECPC10	Signals and Systems	-	4
2.	ECPC11	Network Analysis and Synthesis	-	4
3.	ECPC12	Electrodynamics and Electromagnetic Waves	-	4
4.	ECPC13	Semiconductor Physics and Devices	-	4
5.	ECPC14	Digital Circuits and Systems	-	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	3
11.	ECPC20	Antennas and Propagation	ECPC12	3
12.	ECPC21	Analog Integrated Circuits	ECPC17	3
13.	ECPC22	Wireless Communication	ECPC19	3
14.	ECPC23	VLSI Systems	ECPC21	3
15.	ECPC24	Microwave Electronics	ECPC16	3
Total				50

III. 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	-	3
2.	ECPE11	Wireless Local Area Network	ECPE10	3
3.	ECPE12	Microprocessors and Microcontrollers	-	3
3.	ECPE13	Computer Architecture and Organization	-	3
5.	ECPE14	Embedded Systems	-	3



6.	ECPE15	Operating Systems	-	3
7.	ECPE16	Arm System Architecture	-	3
8.	ECPE17	Statistical Theory of Communication	-	3
9.	ECPE18	Digital Signal Processors and Applications	ECPC15	3
10.	ECPE19	High Speed System Design	-	3
11.	ECPE20	Digital Speech Processing	ECPC15	3
12.	ECPE21	Digital Image Processing	-	3
13.	ECPE22	Pattern Recognition	-	3
14.	ECPE23	Display Systems	ECPC13	3
15.	ECPE24	Internet of Things	CSIR11, ECPE12, C/C++ and Python Programming skills	3
16.	ECPE25	Advanced Digital Signal Processing	ECPC15	3
17.	ECPE26	Cognitive Radio	ECPC15	3
18.	ECPE27	Multimedia Communication Technology	ECPC15	3
19.	ECPE28	Communication Switching Systems	ECPC18	3
20.	ECPE29	Broadband Access Technologies	ECPC18 & ECPC19	3
21.	ECPE30	Microwave Components and Circuits	ECPC16	3
22.	ECPE31	Fiber Optic Communication	ECPC12 & ECPC18	3
23.	ECPE32	Digital Signal Processing For Wireless Communication	ECPC15	3
24.	ECPE33	Microwave Integrated Circuit Design	ECPC16 & ECPC24	3
25.	ECPE34	RF MEMS Circuit Design	ECPC16 & ECPC24	3
26.	ECPE35	Satellite Communication	ECPC18	3
27.	ECPE36	Principles of Radar	ECPC20	3
28.	ECPE37	Low Power VLSI Circuits	ECPC23	3
29.	ECPE38	ADHOC Wireless Networks	ECPE10	3
30.	ECPE39	Wireless Sensor Networks	ECPE10	3
31.	ECPE40	Nano Electronics	-	3
Total				93

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	-	3
2.	ECOE11	RF Mems Circuit	-	3
3.	ECOE12	High Speed System Design	-	3
4.	ECOE13	Digital Speech Processing	ECPC15	3
5.	ECOE14	Digital Image Processing	-	3
6.	ECOE15	Pattern Recognition	-	3
7.	ECOE16	Computer Architecture and Organization	-	3



8.	ECOE17	Operating Systems	-	3
9.	ECOE18	Wireless Sensor Networks	ECPE10	3
10.	ECOE19	Arm System Architecture	-	3
11.	ECOE20	Low Power VLSI Circuits	ECPC23	3
12.	ECOE21	Computer Vision and Machine Learning	-	3
13.	ECOE22	Text Data Mining	-	3
14.	ECOE23	Internet of Things	CSIR11, C/C++, Python Programming skills	3
Total				42

(IV) 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	ECPE12	2
5.	ECLR14	Analog VLSI & Embedded System Design Laboratory	ECPC21 & ECPC23	2
6.	ECLR15	Digital Signal Processing Laboratory	ECPC15 & ECPE18	2
7.	ECLR16	Communication Engineering Laboratory	ECPC18 & ECPC19	2
8.	ECLR17	Microwave & Fiber Optic Laboratory	ECPC24, ECPE30 & ECPE31	2
Total				16

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

(V) MINOR

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	-	3
2.	ECMI11	Network Analysis and Synthesis	-	3
3.	ECMI12	Electrodynamics and Electromagnetic Waves	-	3



4.	ECMI13	Semiconductor Physics and Devices	-	3
5.	ECMI14	Digital Circuits and Systems	-	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 Communication	ECMI23	3
18.	ECMI27	Fiber Optic Communication	ECMI12 &ECMI20	3
19.	ECMI28	Microwave Electronics	ECMI24	3
Total				57

(VI) HONOURS

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	ECHO11	Spectral Analysis of Signals	ECPC15	3
2.	ECHO12	Detection and Estimation	MAIR 33	3
3.	ECHO13	Wavelet Signal Processing	ECPC15	3
4.	ECHO14	RF Circuits	-	3
5.	ECHO15	Numerical Techniques for MIC	ECPE30	3
6.	ECHO16	Applied Photonics	-	3
7.	ECHO17	Advanced Radiation Systems	ECPE17	3
8.	ECHO18	Bio MEMS	-	3
9.	ECHO19	Analog IC Design	ECPE18	3
10.	ECHO20	VLSI System Testing	ECPC23	3
11.	ECHO21	Electronic Design Automation Tools	-	3
12.	ECHO22	Design of Asics	-	3
13.	ECHO23	Digital System Design	ECPC14	3



14.	ECHO24	Optimizations of Digital Signal Processing Structures For VLSI	ECPC23 & ECPE18	3
15.	ECHO25	Low Power VLSI Circuits	ECPC23	3
16.	ECHO26	VLSI Digital Signal Processing Systems	ECPC15 & ECPC23	3
17.	ECHO27	Asynchronous System Design	ECPC14	3
18.	ECHO28	Physical Design Automation	-	3
19.	ECHO29	Mixed - Signal Circuit Design	-	3
20.	ECHO30	Digital Signal Processing for Medical Imaging	ECPC15	3
21.	ECHO31	Advanced Techniques for Wireless Reception	-	3
22.	ECHO32	Error Control Coding	-	3
23.	ECHO33	Digital Communication Receivers	-	3
Total				69

(VII) ONLINE COURSES

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	ECO51	NPTEL - Semiconductor Optical Communication Components And Devices	-	3
2.				
3.	ECO52	NPTEL - Fundamentals Of MIMO Wireless Communication	ECPC22	3
4.	ECO53	NPTEL - Modern Digital Communication Techniques	ECPC19	3
5.	ECO54	NPTEL - VLSI Design Verification And Test	ECPC23	3
6.	ECO55	NPTEL - Digital Vlsi Testing	ECPC23	3
7.	ECO56	NPTEL - Analog Circuits And Systems Through SPICE Simulation	ECPC17	3
8.	ECO57	NPTEL - Linux Programming And Scripting	-	3
9.	ECO58	NPTEL - Digital System Design With PLDS and FPGAS	ECPC14	3
10.	ECO59	NPTEL - MEMS And Microsystems	-	3
11.	ECO60	NPTEL - Neural Networks And Applications	-	3
12.	ECO61	Nptel - Biomedical Signal Processing	-	3
13.	ECO62	NPTEL - Evolution Of Air Interface Towards 5G	-	3
14.	ECO63	NPTEL - Introduction To Machine Learning	-	3
15.	ECO64	NPTEL - A Brief Introduction Of Micro – Sensors	-	3
16.	ECO65	NPTEL - An Introduction To Coding Theory	-	3
17.	ECO66	Nptel - Deep Learning	-	3
18.	ECO67	NPTEL - Python For Everybody	-	3



19.	ECO68	NPTEL - Cryptography And Network Security	-	3
20.	ECO69	NPTEL - Blockchain Architecture Design And Use Cases	-	3
21.	ECO70	NPTEL - Optical Sensors	-	3
22.	ECO71	NPTEL - Non -Linear Adaptive Control	-	3
23.	ECO72	NPTEL - Modelling & Simulation Of Dynamic Systems	-	3
24.	ECO73	NPTEL - Bio Informatics: Algorithm & Applications	-	3



INSTRUMENTATION AND CONTROL ENGINEERING

The total minimum credits required for completing the B.Tech. programme in Instrumentation and Control Engineering is **163**.

I. GENERAL INSTITUTE REQUIREMENT (GIR)

1. MATHEMATICS

Sl. No.	Course Code	Course Title	Credits
1	MAIR12	Linear Algebra and Calculus	3
2	MAIR22	Complex Analysis and Differential Equations	3
3	MAIR34	Probability and Distribution Theory	4
Total			10

2. PHYSICS

Sl. No.	Course Code	Course Title	Credits
1.	PHIR11	Physics	3
2.	PHIR12	Physics Lab	2
Total			5

3. CHEMISTRY

Sl. No.	Course Code	Course Title	Credits
1.	CHIR11	Chemistry	3
2.	CHIR12	Chemistry Lab	2
Total			5

4. HUMANITIES

Sl. No.	Course Code	Course Title	Credits
1.	HSIR13	Industrial Economics and Foreign Trade	3
Total			3

5. COMMUNICATION

Sl. No.	Course Code	Course Title	Credits
1.	HSIR11	English for Communication (Theory & Lab)	4
Total			4

6. ENERGY AND ENVIRONMENTAL ENGINEERING

Sl. No.	Course Code	Course Title	Credits
1.	ENIR11	Energy and Environmental Engineering	2
Total			2

**7. PROFESSIONAL ETHICS**

Sl. No.	Course Code	Course Title	Credits
1.	HSIR14	Professional Ethics	3
Total			3

8. ENGINEERING GRAPHICS

Sl. No.	Course Code	Course Title	Credits
1.	MEIR12	Engineering Graphics	3
Total			3

9. ENGINEERING PRACTICE

Sl. No.	Course Code	Course Title	Credits
1.	PRIR11	Engineering Practice	2
Total			2

10. BASIC ENGINEERING

Sl. No.	Course Code	Course Title	Credits
1.	MEIR11	Basics of Mechanical Engineering	2
2.	CEIR11	Basics of Civil Engineering	2
Total			4

11. INTRODUCTION TO COMPUTER PROGRAMMING

Sl. No.	Course Code	Course Title	Credits
1.	CSIR11	Introduction to Computer Programming (Theory and Lab)	3
Total			3

12. BRANCH SPECIFIC COURSE

Sl. No.	Course Code	Course Title	Credits
1.	ICIR11	Introduction to Instrumentation and Control Systems Engineering	2
Total			2

13. SUMMER INTERNSHIP

Sl. No.	Course Code	Course Title	Credits
1.	ICIR16	Internship / Industrial Training / Academic Attachment (2 To 3 Months Duration During Summer Vacation)	2
Total			2

**14. PROJECT WORK**

Sl. No.	Course Code	Course Title	Credits
1.	ICIR17	Project Work (Optional)	6
Total			6

15. COMPREHENSIVE VIVA

Sl. No.	Course Code	Course Title	Credits
1.	ICIR18	Comprehensive Viva-Voce Examination	1
Total			1

16. INDUSTRIAL LECTURES

Sl. No.	Course Code	Course Title	Credits
1.	ICIR19	Industrial Lectures	1
Total			1

17. NSS/NCC/NSO

Sl. No.	Course Code	Course Title	Credits
1.	SWIR11	NSS/NCC/NSO	0
Total			0

II. PROGRAMME CORE (PC)

Sl. No.	Course Code	Course Title	Pre-Req	Credits
16.	ICPC11	Thermodynamics and Fluid Mechanics	---	4
17.	ICPC12	Circuit Theory	---	4
18.	ICPC13	Sensors and Transducers	---	3
19.	ICPC14	Digital Electronics	---	3
20.	ICPC15	Signals and Systems	---	3
21.	ICPC16	Control Systems	---	4
22.	ICPC17	Analog Signal Processing	---	3
23.	ICPC18	Microprocessors and Microcontrollers	ICPC14	3
24.	ICPC19	Product Design and Development (Theory and Practice)	-	4
25.	ICPC20	Industrial Instrumentation	---	3
26.	ICPC21	Electrical and Electronic Measurements	---	3
27.	ICPC22	Process Control	ICPC16	3
28.	ICPC23	Biomedical Instrumentation	-	3
29.	ICPC24	Analytical Instrumentation	-	3
30.	ICPC25	Logic and Distributed Control Systems	-	3
TOTAL				49



III. ELECTIVE COURSES

a. PROGRAMME ELECTIVES (PE)

Students pursuing B. Tech.in Instrumentation and Control Engineering should complete at least eight courses from the Programme Electives listed below.

Sl. No.	Course Code	Course Title	Pre-Req.	Credits
1	ICPE10	Instrumentation Practices in Industries	ICPC20	3
2	ICPE11	Optical Instrumentation	-	3
3	ICPE12	Measurement Data Analysis	-	3
4	ICPE13	Micro Electro Mechanical Systems	-	3
5	ICPE14	Automotive Instrumentation	-	3
6	ICPE15	Instrumentation and Control for Power Plant	-	3
7	ICPE16	Instrumentation and Control for Petrochemical Industries	-	3
8	ICPE17	Instrumentation and Control for Paper Industries	-	3
9	ICPE18	Instrumentation for Agricultural and Food Processing Industries	-	3
10	ICPE19	Piping and Instrumentation Diagrams	ICPC20	3
11	ICPE20	Assistive devices	-	3
12	ICPE21	Medical Diagnostic and Therapeutic Instrumentation	-	3
13	ICPE22	Advanced Control Systems	-	3
14	ICPE23	Digital Control Systems	-	3
15	ICPE24	Building Automation	-	3
16	ICPE25	Non-Linear Control	ICPE22	3
17	ICPE26	System Identification	-	3
18	ICPE27	Fault Detection and Diagnosis	ICPC16	3
19	ICPE28	Computational Techniques in Control Engineering	ICPE22	3
20	ICPE29	Process Modeling and Optimization	-	3
21	ICPE30	Control System Components	-	3
22	ICPE31	Network Control Systems	-	3
23	ICPE32	Robotics	-	3
24	ICPE33	Power Electronics	-	3
25	ICPE34	Digital Signal Processing	ICPC15	3
26	ICPE35	Industrial Electric Drives	ICPE33	3
27	ICPE36	Real-Time Embedded Systems	ICPC18	3
28	ICPE37	Smart and Wireless Instrumentation	-	3
29	ICPE38	Principles of Communication Systems	-	3
30	ICPE39	Multi Sensor Data Fusion	ICPE22	3
31	ICPE40	Digital Image Processing	-	3
32	ICPE41	Biomedical Signal Processing	-	3
33	ICPE42	Medical Imaging Systems	-	3



34	ICPE43	Energy Harvesting Techniques	-	3
35	ICPE44	Smart Materials and Systems	-	3
36	ICPE45	Hydraulics and Pneumatics	-	3
37	ICPE46	Engineering Mechanics	-	3
38	ICPE47	Internet of Things System Design	-	3
39	ICPE48	Software Design Tools for Sensing and Control	-	3
40	ICPE49	Neural Networks and Fuzzy Logic	-	3
41	ICPE50	Industrial Data Communication	ICPE38	3
42	ICPE51	Numerical Methods	-	3
43	ICPE52	Electron Devices and Circuits	-	3
44	ICPE53	Data Structures and Algorithms	-	3

b. OPEN ELECTIVES (OE)

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

Sl. No.	Course Code	Course Title	Pre-Req	Credits
1.	ICOE10	Biomedical Instrumentation	-	3
2.	ICOE11	Biomedical Signal Processing	-	3
3.	ICOE12	Micro Electro Mechanical Systems	-	3
4.	ICOE13	Measurement and Control	-	3
5.	ICOE14	Industrial Measurements	-	3
6.	ICOE15	Virtual Instrument Design	-	3
7.	ICOE16	Neural Networks and Fuzzy Logic	-	3
8.	ICOE17	Network Control Systems	-	3
9.	ICOE18	Control Systems	-	4
10.	ICOE19	Energy Harvesting Techniques	-	3
11.	ICOE20	Internet of Things	-	3
12.	ICOE21	Intellectual Property Rights	-	3
13.	ICOE22	Smart Materials and Systems	-	3
14.	ICOE23	Product Design and Development (Theory and Practice)	-	4
15.	ICOE24	Medical Imaging Systems	-	3
16.	ICOE25	Building Automation	-	3

IV. ESSENTIAL PROGRAMME LABORATORY REQUIREMENT (ELR)

Sl. No.	Course Code	Course Title	Pre-Req	Credits
1.	ICLR10	Thermodynamics and Fluid Mechanics Laboratory	-	2
2.	ICLR11	Circuits and Digital Laboratory	-	2
3.	ICLR12	Sensors and Transducers Laboratory	-	2
4.	ICLR13	Analog Signal Processing Laboratory	-	2
5.	ICLR14	Control Engineering Laboratory	-	2



6.	ICLR15	Microprocessors and Microcontrollers Laboratory	-	2
7.	ICLR16	Instrumentation Laboratory	-	2
8.	ICLR17	Industrial Automation and Process Control Laboratory	-	2
TOTAL				16

Note: Students can register for 2 laboratory courses during one session along with the regular courses.

(V) MINOR (MI)

Students can register for the following minor courses offered by the department of Instrumentation and Control Engineering over and above the courses prescribed in their B.Tech curriculum.

Sl. No.	Course Code	Course Title	Pre-Req	Credits
1.	ICMI10	Transducer Engineering	-	3
2.	ICMI11	Test and Measuring Instruments	-	3
3.	ICMI12	Industrial Measurements	-	3
4.	ICMI13	Essentials of Control Engineering	-	3
5.	ICMI14	Industrial Automation and Control	-	3
6.	ICMI15	Microprocessor and Microcontroller	-	3
7.	ICMI16	Medical Instrumentation	-	3
8.	ICMI17	Micro Electro Mechanical Systems	-	3

(VI) HONOURS

Sl. No.	Course Code	Course Title	Pre-Req.	Credits
1.	ICHO10	Design of Sensors and Transducers	ICPC13	3
2.	ICHO11	Instrumentation System Design	ICPC20	3
3.	ICHO12	Micro System Design	ICPE13	3
4.	ICHO13	Control System Design	ICPC16, ICPE22	3
5.	ICHO14	Advanced Process Control	ICPC16, ICPC22	3
6.	ICHO15	Optimal and Robust Control	ICPC16, ICPE22	3
7.	ICHO16	Electronics for Sensor Design	ICPC17	3

**VII. ONLINE COURSES**

The online courses to be offered are listed below, a student can earn maximum of 12 credits from these courses.

Sl. No.	Course Name	Duration In Weeks	UG / PG	NOC URL	NPTEL URL
1	Laser: Fundamentals and Applications	8	UG / PG	https://nptel.ac.in/noc/courses/noc19/SEM1/noc19-cy13	https://nptel.ac.in/courses/104/104/104104085/
2	Data Analytics using Python	12	UG / PG	https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-cs46/	https://nptel.ac.in/courses/106/107/106107220/
3	Deep Learning	12	UG / PG	https://nptel.ac.in/noc/courses/noc19/SEM2/noc19-cs54	https://nptel.ac.in/courses/106/105/106105215/
4	Introduction to internet of things	12	UG	https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-cs22	https://nptel.ac.in/courses/106/105/106105166/
5	Programming, Data Structures And Algorithms Using Python	8	UG	https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-cs26	https://nptel.ac.in/courses/106/106/106106145/
6	Introduction to Machine Learning	12	UG / PG	https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-cs29	https://nptel.ac.in/courses/106/106/106106139/
7	Innovation by Design	4	UG	https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-de02	https://nptel.ac.in/courses/107/101/107101086/
8	Introduction to robotics	12	UG / PG		
9	Design, Technology and Innovation	8	UG	https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-de03/	https://nptel.ac.in/courses/107/101/107101088/
10	Fabrication Techniques for MEMs-based sensors : clinical perspective	12	UG	https://nptel.ac.in/noc/courses/noc18/SEM2/noc18-ee36	https://nptel.ac.in/courses/108/108/108108113/
11	Electronics equipment integration and Prototype building	8	UG / PG	https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-ee01/	https://nptel.ac.in/courses/108/108/108108157/
12	Embedded System Design with ARM	8	UG	https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-cs15/	https://nptel.ac.in/courses/106/105/106105193/
13	Fiber Optics	8	UG / PG	https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-ph07/	https://nptel.ac.in/courses/115/107/115107095/
14	Industrial Automation And	12	UG / PG	https://nptel.ac.in/noc/courses/noc20/	https://nptel.ac.in/courses/108/105/108105105/



	Control			SEM1/noc20-me39/	08105088/
15	Process Control - Design Analysis and Assessment	12	UG	https://nptel.ac.in/oc/courses/noc20/SEM1/noc20-ch11/	https://nptel.ac.in/courses/103/106/103106148/
16	Robotics and Control: Theory and Practice	8	UG / PG	https://nptel.ac.in/oc/courses/noc20/SEM1/noc20-me03/	https://nptel.ac.in/courses/112/107/112107289/
17	Introductory Neuroscience & Neuro-Instrumentation	12	UG / PG		
18	Innovation, Business Models and Entrepreneurship	8	UG / PG	https://nptel.ac.in/oc/courses/noc19/SEM2/noc19-mg55	https://nptel.ac.in/courses/110/107/110107094/
19	Robotics	8	UG / PG	https://nptel.ac.in/oc/courses/noc19/SEM2/noc19-me74	https://nptel.ac.in/courses/112/105/112105249/
20	Automation in Manufacturing	12	UG / PG		
21	BioMEMS And Microfluidics	8	UG / PG	https://nptel.ac.in/oc/courses/noc19/SEM1/noc19-me38	https://nptel.ac.in/courses/112/104/112104181/
22	Fundamentals of electronic device fabrication	4 Weeks	U0G / PG	https://nptel.ac.in/oc/courses/noc19/SEM2/noc19-mm23	https://nptel.ac.in/courses/113/106/113106094/

Note: In case any of the above listed courses are not offered in Swayam in that semester, the department will notify alternative courses offered in Swayam



MECHANICAL ENGINEERING

The total minimum credits for completing B.Tech. Programme in Mechanical Engineering is **158**.

I. GENERAL INSTITUTE REQUIREMENTS

1. MATHEMATICS

Sl. No.	Course Code	Course Title	Credits
1.	MAIR11	Matrices and Calculus	3
2.	MAIR21	Complex Analysis and Differential Equations	3
3.	MAIR43	Mathematics III	4
Total			10

2. PHYSICS

Sl. No.	Course Code	Course Title	Credits
1.	PHIR11	Physics	3
2.	PHIR12	Physics Lab	2
Total			5

3. CHEMISTRY

Sl. No.	Course Code	Course Title	Credits
1.	CHIR11	Chemistry	3
2.	CHIR12	Chemistry Lab	2
Total			5

4. HUMANITIES

Sl. No.	Course Code	Course Title	Credits
1.	HSIR13	Industrial Economics & Foreign Trade	3
Total			3

5. COMMUNICATION

Sl. No.	Course Code	Course Title	Credits
1.	HSIR11	English for Communication (Theory & Lab)	4
Total			4

**6. ENERGY AND ENVIRONMENTAL ENGINEERING**

Sl. No.	Course Code	Course Title	Credits
1.	ENIR11	Energy and Environmental Engineering	2
Total			

7. PROFESSIONAL ETHICS

Sl. No.	Course Code	Course Title	Credits
1.	HSIR14	Professional Ethics	3
Total			3

8. ENGINEERING GRAPHICS

Sl. No.	Course Code	Course Title	Credits
1.	MEIR12	Engineering Graphics	3
Total			3

9. ENGINEERING PRACTICE

Sl. No.	Course Code	Course Title	Credits
1.	PRIR11	Engineering Practice	2
Total			2

10. BASIC ENGINEERING

Sl. No.	Course Code	Course Title	Credits
1.	CEIR11	Basics of Civil Engineering	2
2.	EEIR11	Basics of Electrical and Electronics Engineering	2
Total			4

11. INTRODUCTION TO COMPUTER PROGRAMMING

Sl. No.	Course Code	Course Title	Credits
1.	CSIR12	Introduction to Computer Programming	3
Total			3

12. BRANCH SPECIFIC COURSE

Sl. No.	Course Code	Course Title	Credits
1.	MEIR15	Introduction to Mechanical Engineering	2
Total			2

**13. SUMMER INTERNSHIP**

Sl. No.	Course Code	Course Title	Credits
1.	MEIR16	Summer Internship	2
Total			2

14. PROJECT WORK

Sl. No.	Course Code	Course Title	Credits
1.	MEIR17	Project Work (Optional)	6
Total			6

15. COMPREHENSIVE VIVA

Sl. No.	Course Code	Course Title	Credits
1.	MEIR18	Comprehensive Viva	1
Total			1

16. INDUSTRIAL LECTURE

Sl. No.	Course Code	Course Title	Credits
1.	MEIR19	Industrial Lecture	1
Total			1

17. NSS/NCC/NSO

Sl. No.	Course Code	Course Title	Credits
1.	SWIR11	NSS/NCC/NSO	0
Total			

(II) PROGRAMME CORE (PC) COURSES

Sl. No.	Course Code	Course Title	Pre-requisites	Credits
1.	MEPC10	Engineering Mechanics	-	3
2.	MEPC11	Engineering Thermodynamics	-	3
3.	MEPC12	Strength of Materials	-	3
4.	MEPC13	Applied Electrical and Electronics Engineering	EEIR11	4
5.	MEPC14	Fluid Mechanics and Machines	-	4



6.	MEPC15	Mechanics of Machines – I	MEPC10	3
7.	MEPC16	Manufacturing Technology	-	3
8.	MEPC17	Thermal Engineering	MEPC11	4
9.	MEPC18	Engineering Materials	-	4
10.	MEPC19	Heat and Mass Transfer	MEPC11	3
11.	MEPC20	Mechanics of Machines – II	MEPC15	3
12.	MEPC21	Metrology and Measurements	-	3
13.	MEPC22	Automobile Engineering	-	3
14.	MEPC23	Energy Conversion systems	MEPC17	3
15.	MEPC24	Design of Machine Elements	MEPC12 MEPC15	4

(III) ELECTIVE COURSES

a. PROGRAMME ELECTIVES (PE)

Out of the 14 elective courses offered in the curriculum, a Student should opt for a minimum eight Program Elective courses.

Sl. No	Course Code	Course Title	Pre- requisites	Credits
1.	MEPE10	Compressible Flow and Jet Propulsion	MEPC14	3
2.	MEPE11	Computational Fluid Dynamics	MEPC14	3
3.	MEPE12	Advanced IC Engines	MEPC17	3
4.	MEPE13	Combustion Engineering	MEPC17	3
5.	MEPE14	Biofuels	-	3
6.	MEPE15	Refrigeration and Air Conditioning	MEPC17	3
7.	MEPE16	Fundamentals of HVAC Systems	MEPC17	3
8.	MEPE17	Cryogenic Engineering	MEPC17	3
9.	MEPE18	Nano Technology	MEPC18	3
10.	MEPE19	Vehicle Dynamics	MEPC22	3
11.	MEPE21	Dynamics of Machinery	MEPC20	3
12.	MEPE22	MEMS Devices – Design and Fabrication	MEPC13	3
13.	MEPE24	Oil Hydraulics and Pneumatics	MEPC14	3
14.	MEPE25	Industrial Robotics	MEPC13	3



15.	MEPE26	Mechatronics	MEPC13	3
16.	MEPE27	Industrial Tribology	MEPC18	3
17.	MEPE29	Renewable Energy Sources	MEPC17	3
19.	MEPE30	Continuum Mechanics	MEPC12	3
20.	MEPE31	Mathematical Methods for Mechanical Engineers	MAIR43	3
21.	MEPE32	Two phase flow and heat transfer	MEPC19	3
22.	MEPE33	Theory of sprays	MEPC14	3
23.	MEPE34	Additive Manufacturing	MEPC16	3
24.	MEPE35	Computer Aided design and drafting	MEIR12	3
25.	MEPE36	Power Plant Engineering	MEPC17	3
26.	MEPE37	Radiative Heat Transfer	MEPC19	3
27.	MEPE38	Quality Control	-	3
28.	MEPE39	Industrial Safety engineering	-	3
29.	MEPE40	Operations Research	-	3
30.	MEPE41	Mechanical Vibrations	MEPC20	3
31.	MEPE42	Introduction to Fracture Mechanics	MEPC12	3
32.	MEPE43	Theory of Elasticity	MEPC12	3
33.	MEPE44	Industrial Noise and Vibration Control	MEPC14, MEPC17	3

b. OPEN ELECTIVES(OE)

Sl. No	Course Code	Course Title	Pre- requisites	Credits
1.	MEOE11	Finite Element Method	-	3
2.	MEOE12	Composite Materials	-	3
3.	MEOE15	Optimization in Engineering Design	-	3
4.	MEOE17	Energy Conservation and Management	-	3
5.	MEOE18	Energy Storage Technology	-	3
6.	MEOE20	Low Temperature Technology	-	3
7.	MEOE21	Waste to Energy Conversion Techniques	-	3
8.	MEOE22	Non-Destructive Testing	-	3
9.	MEOE23	Pollution and Control	-	3
10.	MEOE24	Welding Technology	-	3

**(IV) ESSENTIAL LABORATORY REQUIREMENT (ELR) COURSES**

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

(V) MINOR COURSES

Sl. No	Course Code	Course Title	Pre-requisites	Credits
1.	MEMI10	Basic Thermodynamics	-	3
2.	MEMI11	Fundamentals of Thermal Engineering	-	3
3.	MEMI12	Fluid Mechanics and Machinery	-	3
4.	MEMI13	Fundamentals of Heat and Mass Transfer	-	3
.	MEMI15	Fundamentals of Automotive Technology	-	3
6.	MEMI17	Fundamentals of Refrigeration and Air Conditioning	-	3
7.	MEMI18	Principles of Turbomachinery	-	3
8.	MEMI19	Fundamentals of Internal Combustion Engines	-	3
9.	MEMI20	Engine Pollution and Control	-	3
10.	MEMI22	Dynamics	-	3
11.	MEMI23	Fundamental of Mechanical design	-	3

(VI) HONOURS

Sl. No	Course Code	Course Title	Pre-requisites	Credits
1.	MEHO10	Advanced Heat Transfer	MEPC19	3
2.	MEHO11	Advanced Fluid Mechanics	MEPC14	3
3.	MEHO12	Simulation of IC Engines	MEPC17	3



4.	MEHO13	Design and Analysis of Turbo Machines	MEPC14	3
5.	MEHO14	Advanced Engineering Materials	MEPC18	3
6.	MEHO15	Design of Heat Exchangers	MEPC19	3
7.	MEHO16	Design and Optimization of Thermal Energy Systems	MEPC17	3
8.	MEHO17	Heat Transfer Equipment Design	MEPC19	3
9.	MEHO18	Analysis and Design of Pressure Vessels	MEPC12	3
10.	MEHO19	Analysis of Thermal Power Cycles	MEPC17	3
11.	MEHO20	Fuels Combustion and Emission Control	MEPC17	3
12.	MEHO21	Finite Element Method in Heat Transfer Analysis	MEPC19	3

**METALLURGICAL AND MATERIALS ENGINEERING**

The total minimum credits for completing B.Tech. Programme in Metallurgical and Materials Engineering is **160**.

(I) GENERAL INSTITUTE REQUIREMENTS**1. MATHEMATICS**

Sl. No.	Course Code	Course Title	Credits
1.	MAIR11	Matrices and Calculus	3
2.	MAIR21	Complex Analysis and Differential Equations	3
3.	MAIR44	Mathematics III	4
Total			10

2. PHYSICS

Sl. No.	Course Code	Course Title	Credits
1.	PHIR11	Physics	3
2.	PHIR12	Physics Lab	2
Total			5

3. CHEMISTRY

Sl. No.	Course Code	Course Title	Credits
1.	CHIR11	Chemistry	3
2.	CHIR12	Chemistry Lab	2
Total			5

4. HUMANITIES

Sl. No.	Course Code	Course Title	Credits
1.	HSIR13	Industrial Economics and Foreign Trade	3
Total			3

5. COMMUNICATION

Sl. No.	Course Code	Course Title	Credits
1.	HSIR11	English for Communication (Theory & Lab)	4
Total			4

**6. ENERGY AND ENVIRONMENTAL ENGINEERING**

Sl. No.	Course Code	Course Title	Credits
1.	ENIR11	Energy and Environmental Engineering	2
Total			2

7. PROFESSIONAL ETHICS

Sl. No.	Course Code	Course Title	Credits
1.	HSIR14	Professional Ethics	3
Total			3

8. ENGINEERING GRAPHICS

Sl. No.	Course Code	Course Title	Credits
1.	MEIR12	Engineering Graphics	3
Total			3

9. ENGINEERING PRACTICE

Sl. No.	Course Code	Course Title	Credits
1.	PRIR11	Engineering Practice	2
Total			2

10. BASIC ENGINEERING

Sl. No.	Course Code	Course Title	Credits
1.	CEIR11	Basics of Civil Engineering	2
2.	EEIR11	Basics of Electrical and Electronics Engineering	2
Total			4

**11. INTRODUCTION TO COMPUTER PROGRAMMING**

Sl. No.	Course Code	Course Title	Credits
1.	CSIR12	Introduction to Computer Programming (Theory and Lab)	3
Total			3

12. BRANCH SPECIFIC COURSE

Sl. No.	Course Code	Course Title	Credits
1.	MTIR15	Branch Specific Course–Introduction to MME	2
Total			2

13. SUMMER INTERNSHIP

Sl. No.	Course Code	Course Title	Credits
1.	MTIR16	Internship / Industrial Training /Academic Attachment	2
Total			2

14.PROJECT WORK (OPTIONAL COURSE)

Sl. No.	Course Code	Course Title	Credits
1.	MTIR19	Project Work (Optional)	6
Total			6

15. COMPREHENSIVE VIVA

Sl. No.	Course Code	Course Title	Credits
1.	MTIR18	Comprehensive viva	1
Total			1

16. INDUSTRIAL LECTURE

Sl. No.	Course Code	Course Title	Credits
1.	MTIR17	Industrial Lecture	1
Total			1

**17.NSS /NCC/ NSO**

Sl. No.	Course Code	Course Title	Credits
1.	SWIR11	NSS/NCC/NSO	0
Total			0

II. PROGRAMME CORE COURSES

Sl. No.	Course Code	Course Title	Pre requisites	Credits
1.	MTPC10	Engineering Mechanics and Strength of Materials	-	4
2.	MTPC11	Metallurgical Thermodynamics and kinetics	-	4
3.	MTPC12	Physical Metallurgy	-	4
4.	MTPC13	Electrical, Electronic and Magnetic Materials	-	3
5.	MTPC14	Polymers, Composites and Ceramics	-	3
6.	MTPC15	Phase Transformation and Heat Treatment	MTPC12	4
7.	MTPC16	Transport Phenomena	-	3
8.	MTPC17	Mechanical Behaviour and Testing of Materials	MTPC12	4
9.	MTPC18	Iron Making and Steel Making	MTPC11, MTPC16	4
10.	MTPC19	Metal Casting Technology	-	3
11.	MTPC20	Materials Joining Technology	-	3
12.	MTPC21	Metal Forming Technology	MTPC17	3
13.	MTPC22	Non-Ferrous Metallurgy	MTPC12	4
14.	MTPC23	Material Characterization	-	3
15.	MTPC24	Corrosion Engineering	-	3
Total				52

(III) ELECTIVE COURSES**(a) PROGRAMME ELECTIVE**

Sl. No.	Course Code	Course Title	Pre requisites	Credits
1.	MTPE01	Mineral Processing and Metallurgical analysis	-	3
2.	MTPE02	Instrumentation and Control Engineering	-	3
3.	MTPE03	Fatigue, Creep and Fracture Mechanics	MTPC17	3
4.	MTPE04	Special Steels and Cast Irons	MTPC15	3



5.	MTPE05	Special Casting Techniques	MTPC19	3
6.	MTPE06	Special Topics in Metal Forming	MTPC21	3
7.	MTPE07	Economics of Metal Production Processes	MTPC18	3
8.	MTPE08	Particulate Technology	-	3
9.	MTPE09	Additive Manufacturing	-	3
10.	MTPE10	Computational Materials Science	-	3
11.	MTPE11	Materials for New and Renewable Energy	-	3
12.	MTPE12	Non-Ferrous Extraction	-	3
13.	MTPE13	Metallurgical Waste Management	-	3
14.	MTPE14	Non-destructive Testing	-	3
15.	MTPE15	Welding Metallurgy	MTPC20	3
16.	MTPE16	Materials for extreme environments	-	3
17.	MTPE17	Thermodynamics of Solidification	MTPC11, MTPC19	3
18.	MTPE18	Design aspects of Welding and Casting	MTPC19, MTPC20	3
19.	MTPE19	Alloy Development	-	3
20.	MTPE20	Ceramic Materials	-	3
21.	MTPE21	Ceramic Processing	MTPC14	3
22.	MTPE22	High Temperature Materials	MTPC12	3
23.	MTPE23	Emerging Materials	-	3
24.	MTPE24	Automotive Materials	MTPC12	3
25.	MTPE25	Metallurgical Failure Analysis	-	3
26.	MTPE26	Biomaterials	-	3

(b) OPEN ELECTIVE COURSES

Sl. No	Course Code	Course Title	Pre requisites	Credits
1.	MTOE10	Nanomaterials and Applications	-	3
2.	MTOE11	Mathematical Techniques in Materials Research	-	3
3.	MTOE12	Design and Selection of Materials	-	3
4.	MTOE13	New Product Development	-	3
5.	MTOE14	Introduction to Quality Management	-	3
6.	MTOE15	Surface Engineering	-	3



7.	MTOE16	Process Modelling and Applications	-	3
8.	MTOE17	Intellectual Property Rights	-	3
9.	MTOE18	Business and Entrepreneurship for Engineers	-	3

(III) ESSENTIAL PROGRAMME LABORATORY REQUIREMENTS (ELR)

Sl. No	Course Code	Course Title	Pre-/Co-requisites	Credits
1.	MTLR30	Process Metallurgy Laboratory	-	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
Total				16

(IV) MINOR COURSES (MI)

Sl. No.	Course Code	Course Title	Pre requisites	Credits
1.	MTMI10	Materials Technology	-	3
2.	MTMI11	Fundamentals of Metallurgy	-	3
3.	MTMI12	Physical Metallurgy and Heat Treatment	-	3
4.	MTMI13	Deformation Processing	-	3
5.	MTMI14	Manufacturing Methods	-	3
6.	MTMI15	Testing and Evaluation of Materials	-	3
7.	MTMI16	Non-Metallic Materials	-	3

**(V) HONOURS**

Sl. No.	Course Code	Course Title	Pre requisites	Credits
1.	MTHO10	Advanced Thermodynamics of Materials	MTPC11	3
2.	MTHO11	Crystallography	MTPC12	3
3.	MTHO12	Aerospace Materials	-	3
4.	MTHO13	Ladle Metallurgy and Continuous Casting of steels	MTPC18	3
5.	MTHO14	Recent Trends in Nano materials	-	3
6.	MTHO15	Advanced Solidification Processing	MTPC19	3
7.	MTHO16	Recent Developments in Welding Processes	MTPC20	3
8.	MTHO17	Recent Developments in Forming Processes	MTPC21	3

**PRODUCTION ENGINEERING**

The total minimum credits for completing B.Tech. Programme in Production Engineering is **161**.

(I) GENERAL INSTITUTE REQUIREMENTS**1. MATHEMATICS**

Sl. No.	Course Code	Course Title	Credits
1.	MAIR11	Matrices and Calculus	3
2.	MAIR21	Complex Analysis and Differential Equations	3
3.	MAIR45	Mathematics III	4
Total			10

2. PHYSICS

Sl. No.	Course Code	Course Title	Credits
1.	PHIR11	Physics	3
2.	PHIR12	Physics Lab	2
Total			5

3. CHEMISTRY

Sl. No.	Course Code	Course Title	Credits
1.	CHIR11	Chemistry	3
2.	CHIR12	Chemistry Lab	2
Total			5

4. HUMANITIES

Sl. No.	Course Code	Course Title	Credits
1.	HSIR13	Industrial Economics and Foreign Trade	3
Total			3

5. COMMUNICATION

Sl. No.	Course Code	Course Title	Credits
1.	HSIR11	English for Communication (Theory & Lab)	4
Total			4

**6. ENERGY AND ENVIRONMENTAL ENGINEERING**

Sl. No.	Course Code	Course Title	Credits
1.	ENIR11	Energy and Environmental Engineering	2
Total			2

7. PROFESSIONAL ETHICS

Sl. No.	Course Code	Course Title	Credits
1.	HSIR14	Professional Ethics	3
Total			3

8. ENGINEERING GRAPHICS

Sl. No.	Course Code	Course Title	Credits
1.	MEIR12	Engineering Graphics	3
Total			3

9. ENGINEERING PRACTICE

Sl. No.	Course Code	Course Title	Credits
1.	PRIR11	Engineering Practice	2
Total			2

10. BASIC ENGINEERING

Sl. No.	Course Code	Course Title	Credits
1.	CEIR11	Basics of Civil Engineering	2
2.	EEIR11	Basics of Electrical and Electronics Engineering	2
Total			4

11. INTRODUCTION TO COMPUTER PROGRAMMING

Sl. No.	Course Code	Course Title	Credits
1.	CSIR12	Introduction to Computer Programming (Theory and Lab)	3
Total			3

12. BRANCH SPECIFIC COURSE

Sl. No.	Course Code	Course Title	Credits
1.	PRIR15	Branch Specific Course–Introduction to MME	2
Total			2

**13. SUMMER INTERNSHIP#**

Sl. No.	Course Code	Course Title	Credits
1.	PRIR16	Internship / Industrial Training /Academic Attachment	2
Total			2

14. INDUSTRIAL LECTURE

Sl. No.	Course Code	Course Title	Credits
1.	PRIR17	Industrial Lecture	1
Total			1

15. COMPREHENSIVE VIVA

Sl. No.	Course Code	Course Title	Credits
1.	PRIR18	Comprehensive viva	1
Total			1

16. PROJECTWORK

Sl. No.	Course Code	Course Title	Credits
1.	PRIR19	Project Work (Optional)	6
Total			6

17. NSS /NCC/ NSO

Sl. No.	Course Code	Course Title	Credits
1.	SWIR11	NSS/NCC/NSO	0
Total			0

(II) PROGRAMME CORE

Sl. No.	Course Code	Course Title	Pre requisites	Credits
1.	PRPC10	Applied Mechanics	---	4
2.	PRPC11	Casting and Welding Technology	PRIR15	4



3.	PRPC12	Metallurgy and Materials Engineering	CHIR11	3
4.	PRPC13	Fluids and Thermal Engineering	---	4
5.	PRPC14	Forming and Machining Technology	PRIR15, PRPC12	4
6.	PRPC15	Kinematics and Dynamics of Machines	PRPC10	4
7.	PRPC16	Metrology, Quality and Safety	PHIR11	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	MAIR45	3
12.	PRPC21	Manufacturing Tooling and Automated Inspection	PRPC19	4
13.	PRPC22	Operations Research	MAIR45	4
14.	PRPC23	Analysis of Production Systems	---	3
15.	PRPC24	Computer Aided Design and Rapid Prototyping	CSIR12	3
Total				54

(III) ELECTIVES**(a) PROGRAM ELECTIVE**

Sl. No.	Course Code	Course Title	Pre requisites	Credits
1.	PRPE10	Rapid Product Development	PRPC11, PRPC14, PRPC19	3
2.	PRPE11	Product Development Strategies	PRPC16	3
3.	PRPE12	Design for Manufacture and Assembly	PRPC16	3
4.	PRPE13	Finite Element Methods for Engineers	PRPC10	3
5.	PRPE14	Concepts of Engineering Design	PRPC19	3
6.	PRPE15	Engineering Optimization	PRPC16	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	PRPC16	3
11.	PRPE20	Design and Analysis of Experiments	MAIR45, PRPC16	3
12.	PRPE21	Lean Manufacturing	PRPC16	3



13.	PRPE22	Material Handling and Storage	PRPC16	3
14.	PRPE23	Sustainable Manufacturing	PRIR15	3
15.	PRPE24	Industry 4.0	---	3
16.	PRPE25	Integrated Materials Management	PRPE14	3
17.	PRPE26	Agile Manufacturing	PRPC16	3
18.	PRPE27	Industrial Robotics	PRPC18	3
19.	PRPE28	Unconventional Machining Processes	PRPC14	3
20.	PRPE29	Precision Engineering	PRPC14	3
21.	PRPE30	Manufacturing of Composite Materials	PRPC10	3
22.	PRPE31	Machine Tool Technology	PRPC14	3
23.	PRPE32	Non Destructive Testing	---	3
24.	PRPE33	Surface Engineering	PRPC10	3
25.	PRPE34	Processing of Polymeric Composites	PRPC10	3
26.	PRPE35	Introduction to Friction Composites	PRPC10	3
27.	PRPE36	Work Design and Facilities Planning	PRPC16	3
28.	PRPE37	Reliability and Maintenance Engineering	---	3
29.	PRPE38	Vibration and Noise Engineering	---	3
30.	PRPE39	Data Analytics	MAIR45	3
31.	PRPE40	Numerical Methods for Engineers	---	3
32.	PRPE41	Product and Service Life Cycle Management	---	3

(b) OPEN ELECTIVE COURSES

Sl. No.	Code	Course Title	Pre-/Co-requisites	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 Semiconductors	---	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	Introduction to Friction Composites	---	3
11.	PROE20	Green Material Joining and Forming	---	3
12.	PROE21	Automobile component manufacturing processes	---	3

(IV) ESSENTIAL PROGRAMME LABORATORY REQUIREMENTS (ELR)

Sl. No.	Course Code	Course Title	Pre-/Co-requisites	Credits
1.	PRLR10	Manufacturing Processes Lab.	PRPC11 PRPC14	2
2.	PRLR11	Weldability and Formability Lab.	PRPC11 PRPC14	2
3.	PRLR12	Metrology and Computer Numerical Control Machines Lab.	PRPC16 PRPC17	2
4.	PRLR13	Machine Drawing (CAD) and Cost Estimation	MEIR12	2
5.	PRLR14	Manufacturing System Simulation Lab.	PRPC20	2
6.	PRLR15	Mechatronics and Industrial Automation Lab.	PRPC18	2
7.	PRLR16	Advanced Manufacturing Lab.	PRPC24	2
8.	PRLR17	Industrial Engineering Lab.	PRPC22, PRPC23	2
Total				16

(V) MINOR

Sl. No.	Code	Course Title	Pre-/Co-requisites	Credits
1.	PRMI10	CAD, CAM and CAE	---	3
2.	PRMI11	Manufacturing Processes	---	3
3.	PRMI12	Unconventional Manufacturing Processes	---	3
4.	PRMI13	Quality Engineering	---	3
5.	PRMI14	Industrial Engineering and Management	---	3

(V) HONOURS

Sl. No.	Code	Course Title	Pre-/Co-requisites	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	---	3
14.	PRHO23	Flexible Manufacturing Systems	---	3
15.	PRHO24	Lasers in Manufacturing	---	3

**FLEXIBLE CURRICULUM (for Minor)****Department: Chemistry**

Students who have registered for Minor in Chemistry can opt to study any 5 of the courses listed below.

a. MINOR (MI)

Sl. No.	Course Code	Course Title	Credits
1.	CHMI10	Coordination Chemistry and Its Application	3
2.	CHMI11	Catalysis Science and Technology	3
3.	CHMI12	Applied Chemistry for Engineers	3
4.	CHMI13	Spectroscopy of Organic Compounds	3
5.	CHMI14	Advanced Physical Chemistry	3
6.	CHMI15	Principles of Computational Chemistry and Molecular Modeling	3
7.	CHMI16	Instrumental Methods of Analysis	3
8.	CHMI17	Techniques in Corrosion Science	3
9.	CHMI18	Environmental Chemistry	3
10.	CHMI19	Medicinal Chemistry	3
11.	CHMI20	Nano Science and Technology	3
12.	CHMI21	Nuclear Chemistry	3
13.	CHMI22	Natural Products Chemistry	3
14.	CHMI23	Polymer Chemistry	3
15.	CHMI24	Chemistry of Materials for Solar Applications	3

**Department: Computer Applications**

Students who have registered for Minor in Computer Applications can opt to study any 5 of the courses listed below.

a. MINOR (MI)

Sl. No.	Course Code	Course Title	Prerequisites (if any)	Credits
1.	CAMI10	Mathematical Foundations of Computer Science	-	3
2.	CAMI11	Operating Systems	-	3
3.	CAMI13	Data Base Management Systems	-	3
4.	CAMI14	Data Structures and Applications	-	3
5.	CAMI15	Data Mining Techniques	CAMI13	3
6.	CAMI16	Data Analytics		3
7.	CAMI17	Design and Analysis of Algorithms	CAMI14	3
8.	CAMI18	Unix and Shell Programming	CAMI11	3
9.	CAMI19	Information Security	CAMI10	3
10.	CAMI20	Big Data Analytics	CAMI16	

**Department: Energy and Environment**

Students who have registered for Minor in Energy and Environment can opt to study any 5 of the courses listed below.

a. MINOR (MI)

Sl. No.	Course Code	Course Title	Credits
1.	ENMI10	Energy Intensive Unit Operations	3
2.	ENMI11	Power Plant Engineering	3
3.	ENMI12	Energy Efficient Buildings	3
4.	ENMI13	Energy Audit and Management	3
5.	ENMI14	Solar Thermal Technology	3
6.	ENMI15	Solar Photo Voltaic Technology	3
7.	ENMI16	Bio - Energy Conversion	3
8.	ENMI17	Wind Energy - Fundamentals	3
9.	ENMI18	Energy Storage Materials	3
10.	ENMI19	Combined Heat and Power	3
11.	ENMI20	H ₂ and Fuel Cell Technology	3

Department: Humanities and Social Sciences**a. OPEN ELECTIVE (OE)**

Sl. No.	Course Code	Course Title	Credits	Department
1.	HSEO11	Creative Writing Through Literature	3	All Branches (July session)
2.	HSEO12	Executive Communication	3	All Branches (January session)
3.	HSEO13	Entrepreneurship Development	3	CL, CE, ME, MT, PR (July session) CS, EE, EC, IC (January session)
4.	HSEO14	Energy and Environmental Economics	3	CS, EE, EC, IC (January session) CL, CE, ME, MT, PR (July session)

b. MINOR(MI)

Students who have registered for Minor in Economics can opt to study any 5 of the courses listed below.

Sl. No.	Course Code	Course Title	Credits
1.	HSMI10	Basic Econometrics	3
2.	HSMI11	Applied Game Theory	3
3.	HSMI12	Principles of Economics	3
4.	HSMI13	Forecasting in Macro Economics and Finance	3
5.	HSMI14	Environment and Sustainable Development	3
6.	HSMI15	Economics of Technology and Innovation	3

Students who have registered for Minor in English can opt to study any 5 of the courses listed below.

Sl. No.	Course Code	Course Title	Credits
1.	HSMI20	The Professional Entrepreneur	3
2.	HSMI21	Critical Approaches to Thinking	3
3.	HSMI22	Discipline - Specific Reading and Higher Order Thinking Skills	3
4.	HSMI23	Cognitive Skills: Understanding Professional Challenges	3
5.	HSMI24	Technical Writing	3
6.	HSMI25	Introduction to Graphic Narratives and Comics Culture	3

Department: Management Studies**a. OPEN ELECTIVE(OE)**

Sl. No.	Course Code	Course Title	Credits
1.	MBOE11	Organization Behavior	3
2.	MBOE12	Project Systems Management	3
3.	MBOE13	Finance and Cost Accounting	3
4.	MBOE14	Financial Institutions and Services	3
5.	MBOE15	Technology Management	3
6.	MBOE16	Basic Introduction to Music Information Technology	

b. MINOR(MI)

Students who have registered for Minor in Management Studies can opt to study any 5 of the courses listed below.

Sl. No.	Course Code	Course Title	Credits
1.	MBMI11	Management Concepts and Practices	3
2.	MBMI12	Marketing Management	3
3.	MBMI13	Human Resources Management	3
4.	MBMI14	Production and Operations Management	3
5.	MBMI15	Financial Management	3

Department: Mathematics**a. OPEN ELECTIVE(OE)**

Sl. No.	Course Code	Course Title	Credits
1.	MAOE10	Special Functions and Probability Theory	3
2.	MAOE11	Calculus of Variations	3
3.	MAOE12	Theoretical Fluid Dynamics	3
4.	MAOE13	Probability and Statistics	3
5.	MAOE14	Operations Research	3
6.	MAOE15	Graph Theory	3
7.	MAOE16	Integral Equations and Integral Transforms	3
8.	MAOE17	Fuzzy Logic and Its Applications	3
9.	MAOE18	Markov Process And Markovian Queues	3

b. MINOR(MI)

Students who have registered for Minor in Mathematics can opt to study any 5 of the courses listed below.

Sl. No.	Course Code	Course Title	Credits
1.	MAMI10	Modern Algebra	3
2.	MAMI11	Linear Algebra	3
3.	MAMI12	Real Analysis	3
4.	MAMI13	Functional Analysis	3
5.	MAMI14	Complex Analysis	3

**Department: Physics****a. MINOR (MI)**

Students who have registered for Minor in Physics can opt to study any 5 of the courses (M.Sc. (Physics)) listed below.

Prerequisite: Students must clear PHIR11 and PHIR12/PHIR13

Sl. No.	Course Code	Course Title	Credits	Remarks
1.	PHMI11	Quantum Mechanics	4	Compulsory
2.	PHMI12	Electromagnetic Theory	4	Compulsory
3.	PHMI13	Solid State Physics	3	Compulsory
4.	PHMI14	Statistical Mechanics	4	Compulsory
5.	PHMI15	Magnetism and Superconducting Levitation	3	Any one
	PHMI16	Lasers and Applications	3	
	PHMI17	Sensors and Transducers	3	
	PHMI18	Nano science and Technology and Applications	3	
	PHMI19	Physics and Technology of Thin Films	3	