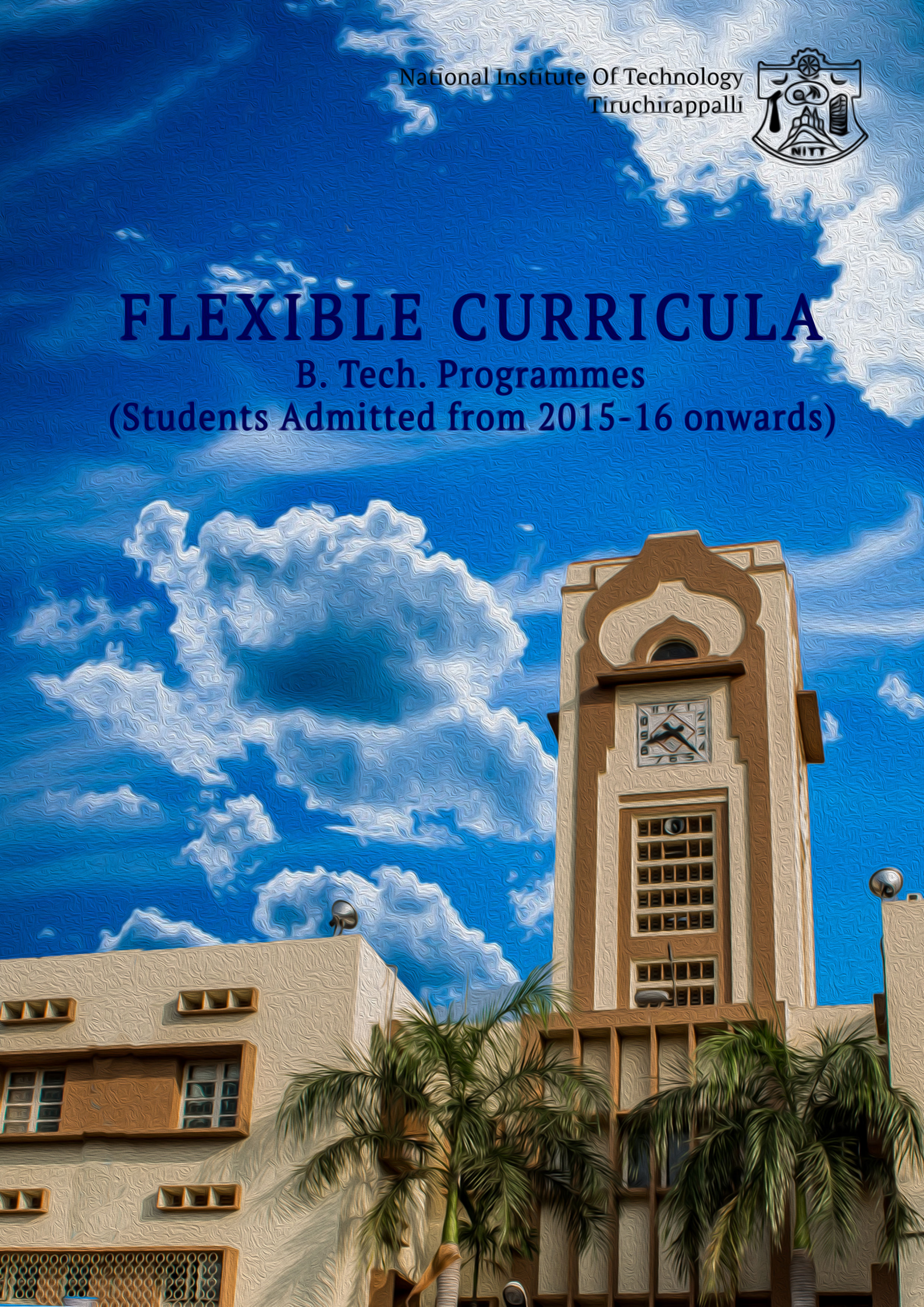
National Institute Of Technology
Tiruchirappalli

FLEXIBLE CURRICULA

B. Tech. Programmes
(Students Admitted from 2015-16 onwards)



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VISION

- To provide valuable resources for industry and society through excellence in technical education and research.

MISSION

- To offer state-of-the-art undergraduate, postgraduate and doctoral programmes.
- To generate new knowledge by engaging in cutting-edge research.
- To undertake collaborative projects with academia and industries.
- To develop the human intellectual capability to its fullest potential.

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:

Sl. No.	COURSE CATEGORY	Number of Courses	Number of Credits
1.	General Institute Requirement (GIR)	17	68
2.	Programme Core (PC)	16 - 20	56 - 65
3.	Essential Programme Laboratory Requirement (ELR)	Max. 2 per session	10 - 16
4.	Elective courses a. Programme Electives (PE)[+] b. Open Electives (OE) c. Minor (MI)[#] (A student should be allowed a minimum of 50% of the total electives of a programme from (b) and (c) if so desired by the student.)	10 - 15	30 - 50
TOTAL			**175 - 180**

[+] At least 3 courses

[#] 5 Courses

(I) GENERAL INSTITUTE REQUIREMENTS

Sl. No.	Name of the course	Number of Courses	Maximum Credits
1.	Mathematics	4	14
2.	**Physics***	**2**	**7**
3.	**Chemistry***	**2**	**7**
4.	Humanities	1	3
5.	Communication	2	6
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 Branch of Study)**	**1**	**2**
13.	***Summer Internship***	***1***	***2***
14.	***Project work***	***1***	***6***
15.	***Comprehensive Viva***	***1***	***3***
16.	Industrial lecture	-	1
17.	NSS / NCC / NSC	-	0
	TOTAL	**17 (Excluding Italics)**	**68**

***including Lab**

****Commence during Orientation Programme**

CREDIT DISTRIBUTION

Sl. No.	Department	GIR	PC	ELR	PE	Total
1.	Chemical Engineering	68	63	16	33	**180**
2.	Civil Engineering	68	65	16	30	**179**
3.	Computer Science and Engineering	68	58	16	36	**178**
4.	Electrical and Electronics Engineering	68	65	16	30	**179**
5.	Electronics and Communication Engineering	68	65	16	30	**179**
6.	Instrumentation and Control Engineering	68	62	16	30	**176**
7.	Mechanical Engineering	68	65	11	33	**177**
8.	Metallurgical and Materials Engineering	68	64	12	36	**180**
9.	Production Engineering	68	65	13	30	**176**

CHEMICAL ENGINEERING

The total minimum credits for completing the B.Tech. programme in Chemical Engineering is **180** (68 + 112).

I. GENERAL INSTITUTE REQUIREMENTS

1. MATHEMATICS

Sl. No.	Course Code	Course Title	Credits
1.	MAIR11	Mathematics - I	4
2.	MAIR21	Mathematics - II	4
3.	MAIR31	Transforms, Special Functions and Partial Differential Equations	3
4.	MAIR41	Numerical Techniques	3
		Total	**14**

2. PHYSICS

Sl. No.	Course Code	Course Title	Credits
1.	PHIR11	Physics – I	3
2.	PHIR12	Physics – II	4
		Total	**7**

3. CHEMISTRY

Sl. No.	Course Code	Course Title	Credits
1.	CHIR11	Chemistry – I	3
2.	CHIR14	Chemistry – II	4
		Total	**7**

4. COMMUNICATION

Sl. No.	Course Code	Course Title	Credits
1.	HSIR11	English for Communication	3
2.	HSIR12	Professional Communication	3
		Total	**6**

5. HUMANITIES

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

*The above course will be offered in January session

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**

[+]The above course will be offered in July session

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.	CSIR11	Basics of 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.	CLIR16[#]	INTERNSHIP / INDUSTRIAL TRAINING / ACADEMIC ATTACHMENT (2 to 3 months duration during summer vacation)	2
		Total	**2**

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.

14. PROJECT WORK

Sl. No.	Course Code	Course Title	Credits
1.	CLIR17	Project Work	6
		Total	**6**

15. COMPREHENSIVE VIVA

Sl. No.	Course Code	Course Title	Credits
1.	CLIR18	Comprehensive Viva	3
		Total	**3**

16. INDUSTRIAL LECTURE

Sl. No.	Course Code	Course Title	Credits
1.	CLIR19	Industrial Lecture	1
		Total	**1**

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.

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.	CLPC10	Strength of Materials	-	3
2.	CLPC11	Chemistry-III	-	3
3.	CLPC12	Electrical and Electronics Engineering	-	3
4.	CLPC13	Introduction to Mechanical Engineering	-	3
5.	CLPC14	Momentum Transfer	-	3
6.	CLPC15	Process Calculations	-	4
7.	CLPC16	Chemical Technology	-	3
8.	CLPC17	Chemical Engineering Thermodynamics	CLPC15	3
9.	CLPC18	Particulate Science and Technology	-	3
10.	CLPC19	Chemical Reaction Engineering– I	CLPC17	3
11.	CLPC20	Mass Transfer	CLPC15	3
12.	CLPC21	Heat Transfer	-	3
13.	CLPC22	Safety in Chemical Industries	CLPC16	3
14.	CLPC23	Chemical Reaction Engineering– II	CLPC19	3
15.	CLPC24	Equilibrium staged Operations	CLPC20	4
16.	CLPC25	Process Dynamics and Control	CLIR10	3
17.	CLPC26	Biochemical Engineering	CLPC19	3
18.	CLPC27	Chemical Process Equipment Design	CLPC10, CLPC19, CLPC20, CLPC21	4
19.	CLPC28	Project Engineering and Economics	CLPC16	3
20.	CLPC29	Transport Phenomena	CLPC14, CLPC20, CLPC21	3
Total				**63**

(III) ELECTIVES

a. PROGRAMME ELECTIVE (PE)

Students pursuing B.Tech. in Chemical Engineering should complete at least three courses from the Programme Electives listed below.

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	CLPE10	Petroleum and Petrochemical Engineering	-	3
2.	CLPE11	Fertilizer Technology	-	3
3.	CLPE12	Industrial Process Biotechnology	-	3
4.	CLPE13	Polymer science and Technology	-	3
5.	CLPE14	New Separation Process	CLPC20	3
6.	CLPE15	Nano Technology	-	3
7.	CLPE16	Fluidization Engineering	CLPC14, CLPC18	3
8.	CLPE17	Pharmaceutical Technology	-	3
9.	CLPE18	Process Intensification	CLPC21	3
10.	CLPE19	Electrochemical Reaction Engineering	CLPC19, CLPC20	3
11.	CLPE20	Food Processing Technology	-	3

b. OPEN ELECTIVE (OE)

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

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	CLOE10	Environmental Engineering	-	3
2.	CLOE11	Nuclear Engineering	-	3
3.	CLOE12	Renewable Energy	-	3
4.	CLOE13	Pipe line Corrosion and Cathodic Protection	-	3
5.	CLOE14	Electrochemical Engineering	-	3

c. MINOR (MI) [offered for the students of other departments]

Students who have registered for B.Tech. Minor in Chemical Engineering can opt to study any 5 of the courses listed below.

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	CLMI10	Chemical Process Calculations	-	3
2.	CLMI11	Transfer Operations - I	-	3
3.	CLMI12	Transfer Operations - II	CLMI11	3
4.	CLMI13	Chemical Reaction Engineering	CLMI10, CLMI11, CLMI12	3
5.	CLMI14	Chemical Technology	-	3
Total				**15**

However, the above courses will also be offered as an Open Elective for other branch students.

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.

(IV) ESSENTIAL PROGRAMME LABORATORY REQUIREMENT (ELR)

Sl. No.	Course Code	Course Title	Co requisites	Credits
1.	CLLR10	Applied Electrical and Electronics Engineering Laboratory	CLPC12	2
2.	CLLR11	Momentum Transfer Laboratory	CLPC14	2
3.	CLLR12	Instrumental Analysis and Thermodynamics Laboratory	CLPC17	2
4.	CLLR13	Particulate Science and Technology Laboratory	CLPC18	2
5.	CLLR14	Heat Transfer Laboratory	CLPC21	2
6.	CLLR15	Chemical Reaction Engineering Laboratory	CLPC19	2
7.	CLLR16	Mass Transfer Laboratory	CLPC20, CLPC24	2
8.	CLLR17	Process Dynamics and Control Laboratory	CLPC25	2
Total				**16**

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

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

A student can obtain B.Tech. (Honors) degree provided the student has:

i. Registered at least for 12 theory courses and 2 ELRs in the second year.
ii. Consistently obtained a minimum GPA of 8.5 in the first four sessions.
iii. Continue to maintain the same GPA of 8.5 in the subsequent sessions (including the Honors courses).
iv. Completed 3 additional theory courses specified for the Honors degree of the programme.
v. Completed all the courses registered, in the first attempt and in four years of study.

Sl. No.	Course Code	Course Title	Pre requisites	Credits
1.	CLHO10	Advanced Process control	CLPC25	3
2.	CLHO11	Advances in Fluidization Engineering	CLPC14, CLPC18	3
3.	CLHO12	Process Modelling and Simulation	CLPC14, CLPC20, CLPC21	3
4.	CLHO13	Pinch Analysis and Heat Exchange Network Design	CLPC17, CLPC21	3
5.	CLHO14	Applied Mathematics in Chemical Engineering	CLPC19, CLPC20, CLPC21	3
6.	CLHO15	Advances in Heat Transfer	CLPC21	3

CIVIL ENGINEERING

The total minimum credits for completing the B.Tech. programme in Civil Engineering is **179** (68 + 111).

I. GENERAL INSTITUTE REQUIREMENTS

1. MATHEMATICS

Sl. No.	Course Code	Course Title	Credits
1.	MAIR11	Mathematics - I	4
2.	MAIR21	Mathematics - II	4
3.	MAIR33	Probability, Statistics and Linear Programming	3
4.	MAIR41	Numerical Techniques	3
		Total	**14**

2. PHYSICS

Sl. No.	Course Code	Course Title	Credits
1.	PHIR11	Physics – I	3
2.	PHIR12	Physics – II	4
		Total	**7**

3. CHEMISTRY

Sl. No.	Course Code	Course Title	Credits
1.	CHIR11	Chemistry – I	3
2.	CHIR12	Chemistry – II	4
		Total	**7**

4. COMMUNICATION

Sl. No.	Course Code	Course Title	Credits
1.	HSIR11	English for Communication	3
2.	HSIR12	Professional Communication	3
		Total	**6**

5. HUMANITIES

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

*The above course will be offered in January session

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**

*The above course will be offered in July session

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.	CSIR11	Basics of 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.	CEIR16[#]	INTERNSHIP / INDUSTRIAL TRAINING / ACADEMIC ATTACHMENT (2 to 3 months duration during summer vacation)	2
		Total	**2**

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.

14. PROJECT WORK

Sl. No.	Course Code	Course Title	Credits
1.	CEIR17	Project Work	6
		Total	**6**

15. COMPREHENSIVE VIVA

Sl. No.	Course Code	Course Title	Credits
1.	CEIR18	Comprehensive Viva	3
		Total	**3**

16. INDUSTRIAL LECTURE

Sl. No.	Course Code	Course Title	Credits
1.	CEIR19	Industrial Lecture	1
		Total	**1**

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.

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.	CEPC10	Engineering Mechanics	-	3
2.	CEPC11	Strength of Materials	-	3
3.	CEPC12	Mechanics of Fluids	-	3
4.	CEPC13	Environmental Engineering -I	-	3
5.	CEPC14	Surveying	-	3
6.	CEPC15	Concrete Technology	-	3
7.	CEPC16	Mechanics of Solids	CEPC11	3
8.	CEPC17	Hydrology and Water Resources Engineering	CEPC12	3
9.	CEPC18	Environmental Engineering-II	CEPC13	4
10.	CEPC19	Geotechnical Engineering-I	-	3
11.	CEPC20	Highway and Pavement Engineering	-	4
12.	CEPC21	Analysis of Indeterminate Structures	CEPC16	3
13.	CEPC22	Basic Reinforced Concrete Design	-	4
14.	CEPC23	Geotechnical Engineering-II	CEPC19	3
15.	CEPC24	Basic Steel Structural Elements	-	3
16.	CEPC25	Advanced Structural Analysis	CEPC21	3
17.	CEPC26	Advanced Reinforced Concrete Design	CEPC22	4
18.	CEPC27	Advanced Steel Structural Elements	CEPC24	4
19.	CEPC28	Railway, Airport and Harbour Engineering	-	3
20.	CEPC29	Irrigation and Hydraulic Engineering	CEPC17	3
Total				**65**

(III) ELECTIVES

a. PROGRAMME ELECTIVE (PE)

Students pursuing B.Tech. in Civil Engineering should complete at least five courses from the Programme Electives listed below.

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	CEPE10	Construction Techniques and Equipments	-	3
2.	CEPE11	Elementary Structural Dynamics	CEPE10	3
3.	CEPE12	Maintenance and Rehabilitation of Structures	CEPC15	3

4.	CEPE13	Construction Management	-	3
5.	CEPE14	Structural System Analysis	CEPC25	3
6.	CEPE15	Concrete Structural Systems	CEPC26	
7.	CEPE16	Steel Structural Systems	CEPC27	3
8.	CEPE17	Steel Concrete Composite Structures	CEPC26 CEPC27	3
9.	CEPE18	Earthquake Resistant Structures	CEPC25 CEPE11	3
10.	CEPE19	Traffic Engineering and Safety	CEPC20	3
11.	CEPE20	Pavement Analysis and Design	CEPC20	
12.	CEPE21	Transportation Planning	CEPC20	3
13.	CEPE22	Air Pollution Management	CEPC18	3
14.	CEPE23	Industrial Wastewater Treatment	CEPC18	3
15.	CEPE24	Environmental Management and Impact Assessment	CEPC18	3
16.	CEPE25	Solid Waste Management Techniques	CEPC18	3
17.	CEPE26	Models for Air and Water Quality	CEPC18	3
18.	CEPE27	Advanced Foundation Engineering	CEPC23	3
19.	CEPE28	Geotechnical Earthquake Engineering	CEPC23	3
20.	CEPE29	Reinforced Earth and Geotextiles	CEPC23	3
21.	CEPE30	Earth and Earth Retaining Structures	CEPC23	3
22.	CEPE31	Marine Foundation Engineering	CEPC23	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	CEPE37	3
28.	CEPE37	Simulation Modelling for Water Resources Engineering	CEPC17	3
29.	CEPE38	Design of Offshore and Coastal Structures	-	3
30.	CEPE39	Coastal Engineering	CEPC12	3
31.	CEPE40	Disaster Modelling and Management	-	3
32.	CEPE41	Prefabricated Structures		3

b. OPEN ELECTIVE (OE)

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

Sl. No.	Course Code	Course Title	Prerequisites	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

c. MINOR (MI) [offered for the students of other departments]

Students who have registered for 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	Soil and Foundation	-	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

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.

(IV) ESSENTIAL PROGRAMME LABORATORY REQUIREMENT (ELR)

Sl. No.	Course Code	Course Title	Co requisites	Credits
1.	CELR10	Strength of Materials and Concrete Laboratory	-	2
2.	CELR11	Survey Laboratory	-	2
3.	CELR12	Fluid Mechanics Laboratory	-	2
4.	CELR13	Environmental Engineering Laboratory	-	2
5.	CELR14	Geotechnical Engineering Laboratory	-	2
6.	CELR15	Building Planning and Drawing	-	2
7.	CELR17	Computational Laboratory	-	2
8.	CELR19	Estimating, Costing and Valuation	-	2
Total				**16**

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

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

A student can obtain B.Tech. (Honors) degree provided the student has:

i. Registered at least for 12 theory courses and 2 ELRs in the second year.
ii. Consistently obtained a minimum GPA of 8.5 in the first four sessions.
iii. Continue to maintain the same GPA of 8.5 in the subsequent sessions (including the Honours courses).
iv. Completed 3 additional theory courses specified for the Honors degree of the programme.
v. Completed all the courses registered, in the first attempt and in four years of study.

Sl. No.	Course Code	Course Title	Pre requisites	Credits
1.	CEHO10	Advanced Strength of Materials	-	3
2.	CEHO11	Basics of Finite Element Methods	-	3
3.	CEHO12	Elementary Theory of Elasticity and Introduction to Plasticity	-	3
4.	CEHO13	Non linear Analysis of Structures	-	3
5.	CEHO14	Theory of Plates And Introduction to Shells	-	3
6.	CEHO15	Theories of Traffic Flow	-	3
7.	CEHO16	Pavement Construction and Management	-	3

8.	CEHO17	Soil Dynamics and Machine Foundations	CEPC19 CEPC23	3
9.	CEHO18	Numerical Modelling in Geotechnical Engineering	CEPC19 CEPC23	3
10.	CEHO19	Physicochemical Treatment of Water and Wastewater	-	3
11.	CEHO20	Biological Treatment of Wastewater	-	3
12.	CEHO21	Free Surface Flow	-	3
13.	CEHO22	Computational Fluid Dynamics	-	3
14.	CEHO23	Wave Hydrodynamics	-	3
15.	CEHO24	Advanced Remote Sensing Techniques	-	3

COMPUTER SCIENCE AND ENGINEERING

The total minimum credits for completing the B.Tech. programme in Computer Science and Engineering is **178** (68 + 110).

I. GENERAL INSTITUTE REQUIREMENTS

1. MATHEMATICS

Sl. No.	Course Code	Course Title	Credits
1.	MAIR11	Mathematics - I	4
2.	MAIR21	Mathematics - II	4
3.	MAIR37	Introduction to Probability Theory	3
4.	MAIR44	Principles of Operations Research	3
		Total	**14**

2. PHYSICS

Sl. No.	Course Code	Course Title	Credits
1.	PHIR11	Physics – I	3
2.	PHIR13	Physics – II	4
		Total	**7**

3. CHEMISTRY

Sl. No.	Course Code	Course Title	Credits
1.	CHIR11	Chemistry – I	3
2.	CHIR13	Chemistry – II	4
		Total	**7**

4. COMMUNICATION

Sl. No.	Course Code	Course Title	Credits
1.	HSIR11	English for Communication	3
2.	HSIR12	Professional Communication	3
		Total	**6**

5. HUMANITIES

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

* The above course will be offered in July session

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**

[+]The above course will be offered in January session

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
3.	MEIR11	Basics of Mechanical Engineering	2
		Total	**4**

11. INTRODUCTION TO COMPUTER PROGRAMMING

Sl. No.	Course Code	Course Title	Credits
1.	CSIR11	Basics of Programming	3
		Total	**3**

12. BRANCH SPECIFIC COURSE

Sl. No.	Course Code	Course Title	Credits
1.	CSIR15	Introduction to Computer Science Engineering	2
		Total	**2**

13. SUMMER INTERNSHIP

Sl. No.	Course Code	Course Title	Credits
1.	CSIR16[#]	INTERNSHIP / INDUSTRIAL TRAINING / ACADEMIC ATTACHMENT (2 to 3 months duration during summer vacation)	2
		Total	**2**

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.

14. PROJECT WORK

Sl. No.	Course Code	Course Title	Credits
1.	CSIR17	Project Work	6
		Total	**6**

15. COMPREHENSIVE VIVA

Sl. No.	Course Code	Course Title	Credits
1.	CSIR18	Comprehensive Viva	3
		Total	**3**

16. INDUSTRIAL LECTURE

Sl. No.	Course Code	Course Title	Credits
1.	CSIR19	Industrial Lecture	1
		Total	**1**

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.

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.	CSPC11	Discrete Structures	-	4
2.	CSPC21	Data Structures	-	3
3.	CSPC22	Digital Systems Design	-	3
4.	CSPC23	Principles of Programming Languages	-	3
5.	CSPC24	Computer Organization	-	3
6.	CSPC25	Combinatorics and Graph Theory	CSPC11	3
7.	CSPC26	Operating Systems	CSPC24	3
8.	CSPC27	Data Communications and Networks	-	3
9.	CSPC28	Automata and Formal Languages	CSPC11	4
10.	CSPC29	Introduction to Algorithms	CSPC21	3
11.	CSPC31	Computer Architecture	CSPC24	4
12.	CSPC32	Internetworking Protocols	CSPC27	3
13.	CSPC33	Database Management Systems	-	3
14.	CSPC34	Software Engineering	-	4
15.	CSPC35	Principles of Cryptography	CSPC25	3
16.	CSPC36	Microprocessors and Microcontrollers	CSPC22	3
17.	CSPC37	Mobile Applications Development	CSPC32	3
18.	CSPC41	Principles of Compiler Design	CSPC28	3
Total				**58**

(III) ELECTIVES

a. PROGRAMME ELECTIVE (PE)

Students pursuing B.Tech in Computer Science and Engineering should complete at least three courses from the Programme Electives listed below.

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	CSPE11	Mobile Computing And Communication	CSPC27	3
2.	CSPE12	Design and Analysis of Parallel Algorithms	CSPC29	3

3.	CSPE13	Real Time Systems	CSPC26	3
4.	CSPE14	Data Warehousing and Data Mining	CSPC33	3
5.	CSPE15	Wireless Network Systems	CSPC32	3
6.	CSPE16	Principles of Processor Design	CSPC31	3
7.	CSPE17	Advanced Database Management Systems	CSPC33, CSPE14	3
8.	CSPE18	Advanced Cryptography	CSPC35	3
9.	CSPE19	Network Processors Design	CSPC32, CSPE16	3
10.	CSPE20	Programming for Embedded Systems	CSPC36	3
11.	CSPE21	Machine Learning	CSPC25	3
12.	CSPE22	Randomized Algorithms	CSPC29	3
13.	CSPE23	Natural Language Processing	CSPC28	3
14.	CSPE24	Artificial Intelligence and Expert Systems	CSPC11	3
15.	CSPE25	Software Quality Assurance	CSPC34	3
16.	CSPE26	Parallel Architectures and Programming	CSPC26, CSPC31	3
17.	CSPE27	Service Oriented Architecture	-	3
18.	CSPE28	Data Sciences	CSPC33, CSPE14	3

b. OPEN ELECTIVE (OE)

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

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	CSOE11	Computer Graphics	-	3
2.	CSOE12	Human Computer Interaction	-	3
3.	CSOE13	Web Technology	-	3
4.	CSOE14	Multimedia Systems	-	3
5.	CSOE15	Cloud Computing	-	3
6.	CSOE16	Network Security	-	3
7.	CSOE17	Big Data Analytics	-	3
8.	CSOE18	Image Processing	-	3
9.	CSOE19	Internet of Things	-	3
10.	CSOE20	Bitcoin and Crypto Currencies	-	3
11.	CSOE21	Probability, Queuing Theory, and Statistics for CS	-	3
12.	CSOE22	Software Project Management	-	3

c. MINOR (MI) [offered for the students of other departments]

Students who have registered for B.Tech. Minor in Computer Science and Engineering can opt to study any 5 of 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	Digital Systems Design	-	3
7.	CSMI17	Data Communications and Networks	-	3

However, the above courses will also be offered as an Open Elective for other branch students.

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

(IV) ESSENTIAL PROGRAMME LABORATORY REQUIREMENT (ELR)

Sl. No.	Course Code	Course Title	Co requisites	Credits
1.	CSLR21	Data Structures Laboratory	CSPC21	2
2.	CSLR22	Digital Systems Design Laboratory	CSPC22	2
3.	CSLR23	Algorithms Laboratory	CSPC29	2
4.	CSLR24	Operating Systems Laboratory	CSPC26	2
5.	CSLR31	Network Programming Laboratory	CSPC32	2
6.	CSLR32	DBMS Laboratory	CSPC33	2
7.	CSLR33	Mobile Applications Development Laboratory	CSPC37	2
8.	CSLR34	Microprocessors and Microcontroller Laboratory	CSPC36	2
Total				**16**

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

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

A student can obtain B.Tech. (Honors) degree provided the student has:

i. Registered at least for 12 theory courses and 2 ELRs in the second year.
ii. Consistently obtained a minimum GPA of 8.5 in the first four sessions.
iii. Continue to maintain the same GPA of 8.5 in the subsequent sessions (including the Honors courses).
iv. Completed 3 additional theory courses specified for the Honors degree of the programme.
v. Completed all the courses registered, in the first attempt and in four years of study.

Sl. No.	Course Code	Course Title	Pre requisites	Credits
1.	CSHO11	Distributed Algorithms	-	3
2.	CSHO12	High Speed Networks	-	3
3.	CSHO13	Software Defined Networking	-	3
4.	CSHO14	Transaction Processing Systems	-	3
5.	CSHO15	Pervasive Computing	-	3
6.	CSHO16	Programming for Multi Core Systems	-	3
7.	CSHO17	Soft Computing	-	3
8.	CSHO18	Digital System Testing and Verification	-	3
9.	CSHO19	CAD for VLSI	-	3
10.	CSHO20	Middleware Technologies	-	3

ELECTRICAL AND ELECTRONICS ENGINEERING

The total minimum credits for completing the B.Tech. programme in Electrical and Electronics Engineering is **179** (68 + 111).

I. GENERAL INSTITUTE REQUIREMENTS

1. MATHEMATICS

Sl. No.	Course Code	Course Title	Credits
1.	MAIR11	Mathematics - I	4
2.	MAIR21	Mathematics - II	4
3.	MAIR32	Transforms and Partial Differential Equations	3
4.	MAIR42	Numerical Methods for Electrical Engineers	3
		Total	**14**

2. PHYSICS

Sl. No.	Course Code	Course Title	Credits
1.	PHIR11	Physics – I	3
2.	PHIR13	Physics – II	4
		Total	**7**

3. CHEMISTRY

Sl. No.	Course Code	Course Title	Credits
1.	CHIR11	Chemistry – I	3
2.	CHIR13	Chemistry – II	4
		Total	**7**

4. COMMUNICATION

Sl. No.	Course Code	Course Title	Credits
1.	HSIR11	English for Communication	3
2.	HSIR12	Professional Communication	3
		Total	**6**

5. HUMANITIES

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

*The above course will be offered in July session

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**

[+]The above course will be offered in January session

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	Basics of Programming	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**

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.

14. PROJECT WORK

Sl. No.	Course Code	Course Title	Credits
1.	EEIR17	Project Work	6
		Total	**6**

15. COMPREHENSIVE VIVA

Sl. No.	Course Code	Course Title	Credits
1.	EEIR18	Comprehensive Viva	3
		Total	**3**

16. INDUSTRIAL LECTURE

Sl. No.	Course Code	Course Title	Credits
1.	EEIR19	Industrial Lecture	1
		Total	**1**

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.

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.	EEPC10	Electron Devices	-	3
2.	EEPC11	Circuit Theory	MAIR21	4
3.	EEPC12	DC Machines and Transformers	-	4
4.	EEPC13	Data Structures and Algorithms	CSIR11	4
5.	EEPC14	Analog Electronic Circuits	EEPC10	3
6.	EEPC15	Digital Electronics	EEPC10	3
7.	EEPC16	Transmission and Distribution of Electrical Energy	EEPC11	3
8.	EEPC17	Linear Integrated Circuits	EEPC11	3
9.	EEPC18	AC Machines	EEPC12	4
10.	EEPC19	Networks and Linear Systems	MAIR32 EEPC11	4
11.	EEPC20	Control Systems	MAIR32	4
12.	EEPC21	Power Electronics	MAIR32 EEPC10 EEPC11	3
13.	EEPC22	Microprocessors and Microcontrollers	EEPC15	3
14.	EEPC23	Measurements and Instrumentation	EEPC17	4
15.	EEPC24	VLSI Design	EEPC15 EEPC17	3
16.	EEPC25	Power System Analysis	MAIR42 EEPC16	4
17.	EEPC26	Power System Protection and Switchgear	EEPC25	3
18.	EEPC27[#]	Communication Systems	EEPC15, EEPC19	3
19.	EEPC28[##]	Thermodynamics and Mechanics of Fluids	-	3
Total				**65**

[#] will be offered by the Department of Electronics and Communication Engineering.
[##] will be offered by the Department of Mechanical Engineering.

(III) ELECTIVES

a. PROGRAMME ELECTIVE (PE)

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

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	EEPE10	Power Generation Systems	-	3
2.	EEPE11	Electrical Safety	-	3
3.	EEPE12	Operating System Concepts	-	3
4.	EEPE13	Fuzzy Systems and Genetic Algorithms	-	3
5.	EEPE14	Industrial Automation	-	3
6.	EEPE15	High Voltage Engineering	EEPC11	3
7.	EEPE16	Object Oriented Programming Using C++	EEPC13	3
8.	EEPE17	Computer Architecture	EEPC15	3
9.	EEPE18	Digital System Design and HDLS	EEPC15	3
10.	EEPE19	Design with PIC Microcontrollers	EEPC15	3
11.	EEPE20	Digital Signal Processing	MAIR32, EEPC15	3
12.	EEPE21	Artificial Neural Networks	MAIR42	3
13.	EEPE22	Distribution System Automation	EEPC16	3
14.	EEPE23	EHV AC and DC Transmission	EEPC16	3
15.	EEPE24	Design of Electrical Apparatus	EEPC18	3
16.	EEPE25	Utilization of Electrical Energy	EEPC18	3
17.	EEPE26	Computer Networks	EEPC27	3
18.	EEPE27	Non-linear Control Systems	EEPC20	3
19.	EEPE28	Modern Control Systems	EEPC20	3
20.	EEPE29	Power Switching Converters	EEPC21	3
21.	EEPE30	Fundamentals of FACTS	EEPC16, EEPC21	3
22.	EEPE31	Special Electrical Machines	EEPC18, EEPC21	3
23.	EEPE32	Wind and Solar Electrical Systems	EEPC18, EEPC21	3
24.	EEPE33	Solid State Drives	EEPC18, EEPC21	3
25.	EEPE34	Vehicular Electric Power Systems	EEPC18, EEPC21	3
26.	EEPE35	Embedded System Design	EEPC22	3

27.	EEPE36	Low Power Microcontroller	EEPC22	3
28.	EEPE37	Aircraft Electronic Systems	EEPC22	3
29.	EEPE38	Applied Signal Processing	EEPC22	3
30.	EEPE39	Power System Dynamics	EEPC25	3
31.	EEPE40	Modern Optimization Techniques for Electric Power Systems	EEPC25	3
32.	EEPE41	Power System Economics and Control Techniques	EEPC25	3
33.	EEPE42	Computer Relaying and Phasor Measurement Unit	EEPE20	3
34.	EEPE43	Digital Control Systems	EEPE20	3
35.	EEPE44	Power System Restructuring	EEPE41	3
36.	EEPE45*	Operations Research	MAIR42	3

*Will be offered by the Department of Mathematics.

b. OPEN ELECTIVE (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	Prerequisites	Credits
1.	EEOE10	Electrical Safety	-	3
2.	EEOE11	Fuzzy Systems and Genetic Algorithms	-	3
3.	EEOE12	Artificial Neural Networks	-	3
4.	EEOE13	Non-Linear Control Systems	-	3
5.	EEOE14	Modern Control Systems	-	3
6.	EEOE15	Digital Control Systems	-	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	Micro-Computing Systems*	-	3
15.	EEOE24	Renewable Power Generation Systems*	-	3

* Offered for non-circuit Branches only.

c. MINOR (MI) [offered for the students of other than Circuit branches]

Students who have registered for B.Tech Minor in Electrical and Electronics Engineering can opt to study any 5 of the courses listed below.

Sl. No.	Course Code	Course Title	Prerequisites	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	Micro-Computing Systems	EEMI13	3
9.	EEMI18	Renewable Power Generation Systems	EEMI14	3

However, the above courses will also be offered as an Open Elective for other branch students.

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.

(IV) ESSENTIAL PROGRAMME LABORATORY REQUIREMENT (ELR)

Sl. No.	Course Code	Course Title	Co requisites	Credits
1.	EELR10	Circuits and Devices Laboratory	EEPC11	2
2.	EELR11	Dc machines and Transformers Laboratory	EEPC12	2
3.	EELR12	Electronic Circuits Laboratory	EEPC14	2
4.	EELR13	Integrated Circuits Laboratory	EEPC17	2
5.	EELR14	Synchronous and Induction Machines Laboratory	EEPC18	2
6.	EELR15	Power Electronics Laboratory	EEPC21	2
7.	EELR16	Micro-Computing and VLSI Design Laboratory	EEPC22, EEPC24	2
8.	EELR17	Power Systems Laboratory	EEPC25	2
Total				**16**

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

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

A student can obtain B.Tech. (Honours) degree provided the student has;

i. Registered at least for 12 theory courses and 2 ELRs in the second year.
ii. Consistently obtained a minimum GPA of 8.5 in the first four sessions
iii. Continue to maintain the same GPA of 8.5 in the subsequent sessions (including the Honours courses)
iv. Completed 3 additional theory courses specified for the Honors degree of the programme.
v. Completed all the courses registered, in the first attempt and in four years of study.

Sl. No.	Course Code	Course Title	Pre requisites	Credits
1.	EEHO10	Distribution System Automation	EEPC16	3
2.	EEHO11	Ehv AC and DC Transmission	EEPC16	3
3.	EEHO12	Non-Linear Control Systems	EEPC20	3
4.	EEHO13	Modern Control Systems	EEPC20	3
5.	EEHO14	Power Switching Converters	EEPC21	3
6.	EEHO15	Solid State Drives	EEPC18, EEPC21	3
7.	EEHO16	Vehicular Electric power Systems	EEPC18, EEPC21	3
8.	EEHO17	Aircraft Electronic Systems	EEPC22	3
9.	EEHO18	Applied Signal Processing	EEPC22	3
10.	EEHO19	Power System Dynamics	EEPC25	3
11.	EEHO20	Modern Optimization Techniques for Electric Power Systems	EEPC25	3
12.	EEHO21	Power System Economics and Control Techniques	EEPC25	3
13.	EEHO22	Computer Relaying and Phasor Measurement Unit	EEPE20	3
14.	EEHO23	Digital Control Systems	EEPE20	3
15.	EEHO24	Power System Restructuring	EEPE41 or EEHO21	3

B.Tech. (Honours) students are permitted to take one M.Tech. (Power Systems/Power Electronics) course offered during a session in their 4th year of study.

ELECTRONICS AND COMMUNICATION ENGINEERING

The total minimum credits for completing the B.Tech. Programme in Electronics and Communication Engineering is **179** (68 + 111).

I. GENERAL INSTITUTE REQUIREMENTS

1. MATHEMATICS

Sl. No.	Course Code	Course Title	Credits
1.	MAIR11	Mathematics - I	4
2.	MAIR21	Mathematics -II	4
3.	MAIR34	Real Analysis and Partial Differential Equations	3
4.	MAIR45	Probability Theory and Random Processes	3
		Total	**14**

2. PHYSICS

Sl. No.	Course Code	Course Title	Credits
1.	PHIR11	Physics – I	3
2.	PHIR13	Physics – II	4
		Total	**7**

3. CHEMISTRY

Sl. No.	Course Code	Course Title	Credits
1.	CHIR11	Chemistry – I	3
2.	CHIR13	Chemistry – II	4
		Total	**7**

4. COMMUNICATION

Sl. No.	Course Code	Course Title	Credits
1.	HSIR11	English for Communication	3
2.	HSIR12	Professional Communication	3
		Total	**6**

5. HUMANITIES

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

*The above course will be offered in July session

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**

[+]The above course is to be offered in January session

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	Basics of Programming	3
		Total	**3**

12. BRANCH SPECIFIC COURSE

Sl. No.	Course Code	Course Title	Credits
1.	ECIR15	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**

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.

14. PROJECT WORK

Sl. No.	Course Code	Course Title	Credits
1.	ECIR17	Project Work	6
		Total	**6**

15. COMPREHENSIVE VIVA

Sl. No.	Course Code	Course Title	Credits
1.	ECIR18	Comprehensive Viva	3
		Total	**3**

16. INDUSTRIAL LECTURE

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

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.

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	-	3
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	Microprocessors and Micro Controllers	ECPC14	3
10.	ECPC19	Statistical Theory of Communication	MAIR 45	4
11.	ECPC20	Digital Signal Processors and Applications	ECPC15	3
12.	ECPC21	Analog Communication	ECPC10	3
13.	ECPC22	Antennas and Propagation	ECPC12	3
14.	ECPC23	Analog Integrated Circuits	ECPC17	3
15.	ECPC24	Digital Communication	ECPC21	3
16.	ECPC25	Microwave Components and Circuits	ECPC16	3
17.	ECPC26	VLSI Systems	ECPC14	3
18.	ECPC27	Wireless Communication	NONE	3
19.	ECPC28	Fiber Optic Communication	ECPC12 & ECPC21	3
20.	ECPC29	Microwave Electronics	ECPC25	3
Total				**65**

(III) ELECTIVES

a. PROGRAMME ELECTIVE (PE)

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

Sl. No.	Course Code	Course title	Prerequisites	Credits
1.	ECPE10	Principles of Radar	ECPC19	3
2.	ECPE11	Satellite Communication	ECPC24	3

3.	ECPE12	Cognitive Radio	ECPC15	3
4.	ECPE13	Multimedia Communication Technology	ECPC15	3
5.	ECPE14	Communication Switching Systems	ECPC21	3
6.	ECPE15	Broadband Access Technologies	ECPC21 & ECPC24	3
7.	ECPE16	Digital Signal Processing For Wireless Communication	ECPC15 & ECPC27	3
8.	ECPE17	Microwave Integrated Circuit Design	ECPC16 & ECPC25	3
9.	ECPE18	RF MEMS Circuit Design	ECPC16 & ECPC25	3
10.	ECPE19	Electronic Packaging	-	3
11.	ECPE20	Digital Speech Processing	-	3
12.	ECPE21	Digital Image Processing	-	3
13.	ECPE22	Pattern Recognition	-	3
14.	ECPE23	Computer Architecture And Organization	-	3
15.	ECPE24	Embedded Systems	ECPE23	3
16.	ECPE25	Arm System Architecture	ECPE23	3
17.	ECPE26	Operating Systems	-	3
18.	ECPE27	Display Systems	ECPC13	3
19.	ECPE28	Statistical Signal Processing	ECPC15	3
20.	ECPE29	Networks And Protocols	-	3
21.	ECPE30	Adhoc Wireless Networks	ECPE29	3
22.	ECPE31	Wireless Sensor Networks	ECPE29	3

b. OPEN ELECTIVE (OE)

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	ECOE10	Microwave Integrated Circuits	-	3
2.	ECOE11	RF MEMS Circuit	-	3
3.	ECOE12	Electronic Packaging	-	3
4.	ECOE13	Digital Speech Processing	-	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	Adhoc Wireless Networks	-	3
10.	ECOE19	Wireless Sensor Networks	-	3

c. MINOR (MI) [offered for the students of other departments]

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	Statistical Signal Processing	ECMI15	3
11.	ECMI20	Digital Signal Processors and Applications	ECMI15	3
12.	ECMI21	Analog Communication	ECMI10	3
13.	ECMI22	Antennas and Propagation	ECMI12	3
14.	ECMI23	Analog Integrated Circuits	ECMI17	3
15.	ECMI24	Digital Communication	ECMI21	3
16.	ECMI25	Microwave Components and Circuits	ECMI16	3
17.	ECMI26	VLSI Systems	ECMI14	3
18.	ECMI27	Wireless Communication	ECMI24	3
19.	ECMI28	Fiber Optic Communication	ECMI12 & ECMI21	3
20.	ECMI29	Microwave Electronics	ECMI25	3

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.

(IV) ESSENTIAL PROGRAMME LABORATORY REQUIREMENT (ELR)

Sl. No.	Course Code	Course Title	Co requisites	Credits
1.	ECLR10	Devices and Networks Laboratory	ECPC11 & ECPC13	1
2.	ECLR11	Digital Electronics Laboratory	ECPC14	1
3.	ECLR12	Electronic Circuits Laboratory	ECPC17	2
4.	ECLR13	Microprocessor and Microcontroller Laboratory	ECPC18	2
5.	ECLR14	Analog Integrated Circuits Laboratory	ECPC23	2

6.	ECLR15	Digital Signal Processing and Simulation Laboratory	ECPC15 & ECPC20	2
7.	ECLR16	VLSI and Embedded System Design Laboratory	ECPC26	2
8.	ECLR17	Communication Engineering Laboratory	ECPC21 & ECPC24	2
9.	ECLR18	Fiber Optic Communication Laboratory	ECPC28	1
10.	ECLR19	Microwave Laboratory	ECPC25 & ECPC29	1
Total				**16**

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

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

A student can obtain B.Tech. (Honors) degree provided the student has:

i. Registered at least for 12 theory courses and 2 ELRs in the second year.
ii. Consistently obtained a minimum GPA of 8.5 in the first four sessions.
iii. Continue to maintain the same GPA of 8.5 in the subsequent sessions (including the Honors courses).
iv. Completed 3 additional theory courses specified for the Honors degree of the programme.
v. Completed all the courses registered, in the first attempt and in four years of study.

Sl. No.	Course Code	Course Title	Pre requisites	Credits
1.	ECHO10	Advanced Digital Signal Processing	ECPC15	3
2.	ECHO11	Spectral Analysis of Signals	ECPC15	3
3.	ECHO12	Detection and Estimation	MAIR 45	3
4.	ECHO13	Wavelet Signal Processing	ECPC15	3
5.	ECHO14	RF Circuits	-	3
6.	ECHO15	Numerical Techniques for MIC	ECPC25	3
7.	ECHO16	Applied Photonics	-	3
8.	ECHO17	Advanced Radiation Systems	ECPC22	3
9.	ECHO18	Bio MEMS	ECPC18	3
10.	ECHO19	Analog IC Design	ECPC23	3
11.	ECHO20	VLSI System Testing	ECPC26	3
12.	ECHO21	Electronic Design Automation Tools	-	3
13.	ECHO22	Design of ASICS	-	3
14.	ECHO23	Digital System Design	ECPC14	3

15.	ECHO24	Optimizations of Digital Signal Processing Structures for VLSI	ECPC20 & ECPC26	3
16.	ECHO25	Low Power VLSI Circuits	ECPC26	3
17.	ECHO26	VLSI Digital Signal Processing Systems	ECPC15 & ECPC26	3
18.	ECHO27	Asynchronous System Design	ECPC14	3
19.	ECHO28	Physical Design Automation	-	3
20.	ECHO29	Mixed - Signal Circuit Design	-	3
21.	ECHO30	Digital Signal Processing For Medical Imaging	ECPC20	3

INSTRUMENTATION AND CONTROL ENGINEERING

The total minimum credits for completing the B.Tech. programme in Instrumentation and Control Engineering is **176** (68 + 108).

I. GENERAL INSTITUTE REQUIREMENTS

1. MATHEMATICS

Sl. No.	Course Code	Course Title	Credits
1.	MAIR11	Mathematics - I	4
2.	MAIR21	Mathematics - II	4
3.	MAIR36	Algebra and Probability Theory	3
4.	MAIR43	Numerical Methods	3
		Total	**14**

2. PHYSICS

Sl. No.	Course Code	Course Title	Credits
1.	PHIR11	Physics – I	3
2.	PHIR13	Physics – II	4
		Total	**7**

3. CHEMISTRY

Sl. No.	Course Code	Course Title	Credits
1.	CHIR11	Chemistry – I	3
2.	CHIR13	Chemistry – II	4
		Total	**7**

4. COMMUNICATION

Sl. No.	Course Code	Course Title	Credits
1.	HSIR11	English for Communication	3
2.	HSIR12	Professional Communication	3
		Total	**6**

5. HUMANITIES

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

* The above course will be offered in July session

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**

[+]The above course is to be offered in January session

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	Basics of Programming	3
		Total	**3**

12. BRANCH SPECIFIC COURSE

Sl. No.	Course Code	Course Title	Credits
1.	ICIR15	Instrumentation and Control 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**

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.

14. PROJECT WORK

Sl. No.	Course Code	Course Title	Credits
1.	ICIR17	Project Work	6
		Total	**6**

15. COMPREHENSIVE VIVA

Sl. No.	Course Code	Course Title	Credits
1.	ICIR18	Comprehensive Viva	3
		Total	**3**

16. INDUSTRIAL LECTURE

Sl. No.	Course Code	Course Title	Credits
1.	ICIR19	Industrial Lecture	1
		Total	**1**

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.

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.	ICPC10	Engineering Mechanics	-	3
2.	ICPC11	Sensors and Transducers	-	3
3.	ICPC12	Material Science	-	3
4.	ICPC13	Thermodynamics and Fluid Mechanics	-	4
5.	ICPC14	Circuit Theory	-	4
6.	ICPC15	Digital Electronics	-	3
7.	ICPC16	Signals and Systems	-	3
8.	ICPC17	Industrial Instrumentation	ICPC11	3
9.	ICPC18	Analog Signal Processing	-	3
10.	ICPC19	Electrical and Electronic Measurements	-	3
11.	ICPC20	Microprocessors and Microcontrollers	ICPC15	3
12.	ICPC21	Control System – I	ICPC16	4
13.	ICPC22	Instrumentation Practices in Industries	ICPC17	3
14.	ICPC23	Principles of Communication Systems	-	3
15.	ICPC24	Control System – II	ICPC21	3
16.	ICPC25	Process Control	ICPC17, ICPC21	4
17.	ICPC26	Product Design and Development (Theory)	-	2
18.	ICPC27	Product Design and Development (Practice)	-	2
19.	ICPC28	Analytical Instrumentation	-	3
20.	ICPC29	Logic and Distributed Control System	ICPC15, ICPC20	3
Total				**62**

(III) ELECTIVES

a. PROGRAMME ELECTIVE (PE)

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

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	ICPE10	Optical Instrumentation	-	3
2.	ICPE11	Medical Instrumentation	-	3
3.	ICPE12	Micro Electro Mechanical System	ICPC11, ICPC12	3
4.	ICPE13	Automotive Instrumentation	ICPC11, ICPC17	3

5.	ICPE14	Instrumentation and Control for Power Plant	ICPC11, ICPC17	3
6.	ICPE15	Instrumentation and Control for Petrochemical Industries	ICPC11, ICPC17	3
7.	ICPE16	Instrumentation and Control for Paper and Cement Industries	ICPC11, ICPC17	3
8.	ICPE17	Instrumentation for Agricultural and Food Processing Industries	ICPC11, ICPC17	3
9.	ICPE18	Software Design Tools for Sensing and Control	-	3
10.	ICPE19	Measurement Data Analysis	-	3
11.	ICPE20	Building Automation	-	3
12.	ICPE21	Digital Control Systems	ICPC21, ICPC24	3
13.	ICPE22	Neural Networks and Fuzzy Logic	-	3
14.	ICPE23	Non Linear Control	ICPC21, ICPC24	3
15.	ICPE24	System Identification and Adaptive Control	ICPC24	3
16.	ICPE25	Fault Detection and Diagnosis	-	3
17.	ICPE26	Computational Techniques in Control Systems	ICPC21, ICPC24	3
18.	ICPE27	Process Modeling and Optimization	ICPC24	3
19.	ICPE28	Control System Components	ICPC21	3
20.	ICPE29	Networked Control Systems	-	3
21.	ICPE30	Digital Signal Processing	ICPC16	3
22.	ICPE31	Power Electronics	ICPC18	3
23.	ICPE32	Embedded Systems	ICPC15, ICPC20	3
24.	ICPE33	Smart and Wireless Instrumentation	-	3
25.	ICPE34	Digital Image Processing	ICPE30	3
26.	ICPE35	Multisensor Data Fusion	-	3
27.	ICPE36	Medical Imaging Systems	-	3
28.	ICPE37	Industrial Data Communication	ICPC28	3
29.	ICPE38	Energy Harvesting Systems	-	3
30.	ICPE39	Smart Materials and Structures	-	3
31.	ICPE40	Hydraulics and Pneumatics	-	3
32.	ICPE41	Industrial Internet of Things	-	3
33.	ICPE42	Industrial Chemical Process	-	3

b. OPEN ELECTIVE (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	Prerequisites	Credits
1.	ICOE10	Building Automation	-	3
2.	ICOE11	Project Engineering and Management	-	3
3.	ICOE12	Medical Instrumentation	-	3
4.	ICOE13	Micro Electro Mechanical System	-	3
5.	ICOE14	Measurement and Control	-	3
6.	ICOE15	Industrial Measurements	-	3
7.	ICOE16	Virtual Instrument Design	-	3
8.	ICOE17	Neural Networks and Fuzzy Logic	-	3
9.	ICOE18	Networked Control System	-	3
10.	ICOE19	Control System – I	-	3
11.	ICOE20	Energy Harvesting Systems	-	3
12.	ICOE21	Industrial Internet of Things	-	3
13.	ICOE22	Intellectual Property Rights	-	3
Total				

c. MINOR (MI) [offered for the students of other departments]

Students who have registered for B.Tech Minor in Instrumentation and Control Engineering can opt to study any 5 of the courses listed below.

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	ICMI10	Measurement and Control	-	3
2.	ICMI11	Test and Measuring Instruments	-	3
3.	ICMI12	Measurements in Process Industries	-	3
4.	ICMI13	Essentials of Control Engineering	-	3
5.	ICMI14	Industrial Automation and Control	-	3
Total				

However, the above courses will also be offered as an Open Elective for other branch students.

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.

(IV) ESSENTIAL PROGRAMME LABORATORY REQUIREMENT (ELR)

Sl. No.	Course Code	Course Title	Co requisites	Credits
1.	ICLR10	Thermodynamics and Fluid Mechanics Laboratory	ICPC13	2
2.	ICLR11	Circuits and Digital Laboratory	ICPC14, ICPC15	2
3.	ICLR12	Sensors and Transducers Laboratory	ICPC11	2
4.	ICLR13	Analog Signal Processing Laboratory	ICPC18, ICPC22	2
5.	ICLR14	Instrumentation Laboratory	ICPC17	2
6.	ICLR15	Microprocessors and Microcontrollers Laboratory	ICPC20	2
7.	ICLR16	Control Engineering Laboratory	ICPC16, ICPC21	2
8.	ICLR17	Industrial Automation and Process Control Laboratory	ICPC17, ICPC25	2
Total				**16**

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

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

A student can obtain B.Tech. (Honors) degree provided the student has:

i. Registered at least for 12 theory courses and 2 ELRs in the second year.
ii. Consistently obtained a minimum GPA of 8.5 in the first four sessions.
iii. Continue to maintain the same GPA of 8.5 in the subsequent sessions (including the Honors courses).
iv. Completed 3 additional theory courses specified for the Honors degree of the programme.
v. Completed all the courses registered, in the first attempt and in four years of study.

Sl. No.	Course Code	Course Title	Pre requisites	Credits
1.	ICHO10	Design of Sensors and Transducers	ICPC11	3
2.	ICHO11	Instrumentation System Design	ICPC17, ICPC22	3
3.	ICHO12	Instrumentation for System Analysis	ICPC17, ICPC22	3

4.	ICHO13	Micro System Design	ICPC14	3
5.	ICHO14	Real time Control System Design	ICPC25	3
6.	ICHO15	Advanced Process Control	ICPC26	3
7.	ICHO16	Optimal and Robust Control	ICPC26	3
8.	ICHO17	Electronics for Sensor Design	ICPC11, ICPC17, ICPC22	3
9.	ICHO18	System on Chip	ICPC18, ICPE32	3

MECHANICAL ENGINEERING

The total minimum credits for completing the B.Tech. programme in Mechanical Engineering is **176** (68 + 109).

I. GENERAL INSTITUTE REQUIREMENTS

1. MATHEMATICS

Sl. No.	Course Code	Course Title	Credits
1.	MAIR11	Mathematics - I	4
2.	MAIR21	Mathematics - II	4
3.	MAIR32	Transforms and Partial differential Equations	3
4.	MAIR41	Numerical Techniques	3
		Total	**14**

2. PHYSICS

Sl. No.	Course Code	Course Title	Credits
1.	PHIR11	Physics – I	3
2.	PHIR12	Physics – II	4
		Total	**7**

3. CHEMISTRY

Sl. No.	Course Code	Course Title	Credits
1.	CHIR11	Chemistry – I	3
2.	CHIR12	Chemistry – II	4
		Total	**7**

4. COMMUNICATION

Sl. No.	Course Code	Course Title	Credits
1.	HSIR11	English for Communication	3
2.	HSIR12	Professional Communication	3
		Total	**6**

5. HUMANITIES

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

*The above course will be offered in January session

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**

[+]The above course will be offered in July session

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.	CSIR11	Basics of 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#	INTERNSHIP / INDUSTRIAL TRAINING / ACADEMIC ATTACHMENT (2 to 3 months duration during summer vacation)	2
		Total	**2**

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.

14. PROJECT WORK

Sl. No.	Course Code	Course Title	Credits
1.	MEIR17	Project Work	6
		Total	**6**

15. COMPREHENSIVE VIVA

Sl. No.	Course Code	Course Title	Credits
1.	MEIR18	Comprehensive Viva	3
		Total	**3**

16. INDUSTRIAL LECTURE

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

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.

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.	MEPC10	Engineering Mechanics	-	3
2.	MEPC11	Engineering Thermodynamics	-	4
3.	MEPC12	Strength of Materials	-	3
4.	MEPC13	Applied Electrical and Electronics Engineering	EEIR11	4
5.	MEPC14	Instrumentation and Control Engineering	-	3
6.	MEPC15	Production Technology – I	-	4
7.	MEPC16	Thermal Engineering	MEPC11	3
8.	MEPC17	Mechanics of Machines - I	MEPC10	3
9.	MEPC18	Fluid Mechanics	-	3
10.	MEPC19	Production Technology – II	-	4
11.	MEPC20	Engineering Materials	-	4
12.	MEPC21	Turbo machines	MEPC18	3
13.	MEPC22	Heat and Mass Transfer	MEPC11	3
14.	MEPC23	Mechanics of Machines - II	MEPC17	3
15.	MEPC24	Analysis and Design of Machine Components	MEPC12	3
16.	MEPC25	Automobile Engineering	-	3
17.	MEPC26	Design of Mechanical Drives	MEPC12	3
18.	MEPC27	Computer Aided Design and Drafting	MEIR12	3
19.	MEPC28	Power Plant Engineering	MEPC21	3
20.	MEPC29	Metrology and Quality Control	-	3
Total				**65**

(III) ELECTIVES

a. PROGRAMME ELECTIVE (PE)

Students pursuing B.Tech. in Mechanical Engineering should take at least three courses from the Programme Electives listed below.

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	MEPE10	Compressible Flow and Jet Propulsion	MEPC18	3
2.	MEPE11	Computational Fluid Dynamics	MEPC18	3
3.	MEPE12	Advanced IC Engines	MEPC16	3

4.	MEPE13	Combustion Engineering	MEPC16	3
5.	MEPE14	Biofuels	MEPC16	3
6.	MEPE15	Refrigeration and Air Conditioning	MEPC16	3
7.	MEPE16	Fundamentals of HVAC Systems	MEPC16	3
8.	MEPE17	Cryogenic Engineering	MEPC16	3
9.	MEPE18	Nano Technology	MEPC20	3
10.	MEPE19	Vehicle Dynamics	MEPC25	3
11.	MEPE20	Computer Applications in Design	MEPC27	3
12.	MEPE21	Dynamics of Machinery	MEPC23	3
13.	MEPE22	MEMS Devices – Design and Fabrication	MEPC13	3
14.	MEPE23	Vibration Analysis and Control	MEPC23	3
15.	MEPE24	Oil Hydraulics and Pneumatics	MEPC18	3
16.	MEPE25	Industrial Robotics	MEPC13	3
17.	MEPE26	Mechatronics	MEPC13	3
18.	MEPE27	Industrial Tribology	MEPC20	3
19.	MEPE28	Optimization in Engineering Design	MAIR31, MAIR46	3

b. OPEN ELECTIVE (OE)

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	MEOE10	Renewable Energy	-	3
2.	MEOE11	Finite Element Method	-	3
3.	MEOE12	Composite Materials	-	3
4.	MEOE13	Advances in Welding Technology	-	3
5.	MEOE14	Industrial Safety Engineering	-	3

c. MINOR (MI) [offered for the students of other departments]

Students who have registered for B.Tech Minor in Mechanical Engineering can opt to study any 5 of the courses listed below.

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Sl. No.	Course Code	Course Title	Prerequisites	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
5.	MEMI14	Machine Design	-	3
6.	MEMI15	Fundamentals of Automotive Technology	-	3
7.	MEMI16	Power Plant Technology	-	3
8.	MEMI17	Fundamentals of Refrigeration and Air Conditioning	-	3
9.	MEMI18	Principles of Turbomachinery	-	3
10.	MEMI19	Fundamentals of Internal Combustion Engines	-	3
11.	MEMI20	Engine Pollution and Control	-	3
12.	MEMI21	CAD/CAM	-	3

(IV) ESSENTIAL PROGRAMME LABORATORY REQUIREMENT (ELR)

Sl. No.	Course Code	Course Title	Co requisites	Credits
1.	MELR10	Machine Drawing	MEIR12	2
2.	MELR11	Strength of Materials Laboratory	MEPC12	1
3.	MELR12	Thermal Engineering Laboratory	MEPC16	1
4.	MELR13	Fluid Mechanics Laboratory	MEPC18	1
5.	MELR14	Heat Transfer, Refrigeration and Air Conditioning Laboratory	MEPC22	1
6.	MELR15	Dynamics Laboratory	MEPC23	1
7.	MELR16	Automobile Engineering Laboratory	MEPC25	1
8.	MELR17	Computer Aided Design Laboratory	MEPC27	1
9.	MELR18	Metrology and Quality Control Laboratory	MEPC29	1
10.	MELR19	Mechatronics Laboratory	MEPE26	1
Total				**11**

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

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

A student can obtain B.Tech. (Honors) degree provided the student has:

i. Registered at least for 12 theory courses and 2 ELRs in the second year.
ii. Consistently obtained a minimum GPA of 8.5 in the first four sessions.
iii. Continue to maintain the same GPA of 8.5 in the subsequent sessions (including the Honors courses).
iv. Completed 3 additional theory courses specified for the Honors degree of the programme.
v. Completed all the courses registered, in the first attempt and in four years of study.

Sl. No.	Course Code	Course Title	Pre requisites	Credits
1.	MEHO10	Advanced Heat Transfer	MEPC22	3
2.	MEHO11	Advanced Fluid Mechanics	MEPC18	3
3.	MEHO12	Simulation of IC Engines	MEPC16	3
4.	MEHO13	Design and Analysis of Turbo Machines	MEPC21	3
5.	MEHO14	Advanced Engineering Materials	MEPC20	3
6.	MEHO15	Design of Heat Exchangers	MEPC22	3
7.	MEHO16	Design and Optimization of Thermal Energy Systems	MEPC16	3

METALLURGICAL AND MATERIALS ENGINEERING

The total minimum credits for completing the B.Tech. programme in Metallurgical and Materials Engineering is **180** (68 + 112).

I. GENERAL INSTITUTE REQUIREMENTS

1. MATHEMATICS

Sl. No.	Course Code	Course Title	Credits
1.	MAIR11	Mathematics - I	4
2.	MAIR21	Mathematics -II	4
3.	MAIR32	Transforms and Partial Differential Equations	3
4.	MAIR41	Numerical Techniques	3
		Total	**14**

2. PHYSICS

Sl. No.	Course Code	Course Title	Credits
1.	PHIR11	Physics - I	3
2.	PHIR12	Physics - II	4
		Total	**7**

3. CHEMISTRY

Sl. No.	Course Code	Course Title	Credits
1.	CHIR11	Chemistry - I	3
2.	CHIR14	Chemistry - II	4
		Total	**7**

4. COMMUNICATION

Sl. No.	Course Code	Course Title	Credits
1.	HSIR11	English for Communication	3
2.	HSIR12	Professional Communication	3
		Total	**6**

5. HUMANITIES

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

*The above course will be offered in January session

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**

*The above course will be offered in July session

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.	CEIR 11	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.	CSIR11	Basics of Programming	3
		Total	**3**

12. BRANCH SPECIFIC COURSE

Sl. No.	Course Code	Course Title	Credits
2.	MTIR15	Introduction to Metallurgical and Materials Engineering	2
		Total	**2**

13. SUMMER INTERNSHIP#

Sl. No.	Course Code	Course Title	Credits
1.	MTIR16	INTERNSHIP / INDUSTRIAL TRAINING / ACADEMIC ATTACHMENT (2 to 3 months duration during summer vacation)	2
		Total	**2**

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.

14. PROJECT WORK

Sl. No.	Course Code	Course Title	Credits
1.	MTIR17	Project Work	6
		Total	**6**

15. COMPREHENSIVE VIVA

Sl. No.	Course Code	Course Title	Credits
1.	MTIR18	Comprehensive Viva	3
		Total	**3**

16. INDUSTRIAL LECTURE

Sl. No.	Course Code	Course Title	Credits
1.	MTIR19	Industrial Lecture	1
		Total	**1**

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.

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.	MTPC10	Engineering Mechanics	-	3
2.	MTPC11	Strength of Materials	MTPC10	3
3.	MTPC12	Electrical, Electronic and Magnetic Materials	MTIR15	3
4.	MTPC13	Metallurgical Thermodynamics	-	4
5.	MTPC14	Mineral Processing and Metallurgical analysis	-	3
6.	MTPC15	Physical Metallurgy	-	4
7.	MTPC16	Instrumentation and Control Engineering	-	3
8.	MTPC17	Transport Phenomena	-	3
9.	MTPC18	Phase Transformation and Heat Treatment	MTPC15	4
10.	MTPC19	Metal Casting Technology	-	3
11.	MTPC20	Materials Joining Technology	-	3
12.	MTPC21	Iron Making and Steel Making	MTPC13, MTPC17	4
13.	MTPC22	Polymers, Composites and Ceramics	-	3
14.	MTPC23	Mechanical Behaviour of Materials	MTPC11, MTPC15	3
15.	MTPC24	Metal forming Technology	MTPC23	3
16.	MTPC25	Particulate processing	MTPC23	3
17.	MTPC26	Non-Ferrous extraction	MTPC13, MTPC14	3
18.	MTPC27	Non-Ferrous Physical Metallurgy	MTPC15	3
19.	MTPC28	Corrosion Engineering	-	3
20.	MTPC29	Testing and Characterization of Materials	-	3
Total				**64**

(III) ELECTIVES

(a) PROGRAMME ELECTIVE (PE)

Students pursuing B.Tech. in MME should take at least **FOUR** courses from the Programme Electives listed below. There are Nine Programme Electives in Metallurgy stream (Sl. No. 1-9), one Computer science basic (Sl. No.10) and Nine Programme Electives in Materials stream (Sl. No. 11-19).

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	MTPE01	Fatigue, Creep and Fracture Mechanics	MTPC23	3

2.	MTPE02	Special Steels and Cast Irons	MTPC18	3
3.	MTPE03	Special Casting Techniques	MTPC19	3
4.	MTPE04	Special Topics in Metal Forming	MTPC24	3
5.	MTPE05	Ladle Metallurgy and Continuous Casting of steels	MTPC21	3
6.	MTPE06	Welding Metallurgy	MTPC20	3
7.	MTPE07	Processing of Light Alloys	MTPC27	3
8.	MTPE08	Design aspects of Welding and Casting	MTPC19, MTPC20	3
9.	MTPE09	Alloy Development	MTPC18	3
10.	MTPE10	C++ and UNIX	-	3
11.	MTPE11	Ceramic Materials	-	3
12.	MTPE12	Ceramic Processing	MTPC22	3
13.	MTPE13	High Temperature Materials	MTPC15	3
14.	MTPE14	Emerging Materials	-	3
15.	MTPE15	Automotive Materials	MTPC15	3
16.	MTPE16	Physics of Materials	MTPC12	3
17.	MTPE17	Biomaterials	-	3
18.	MTPE18	Advanced Characterization Techniques	MTPC29	3
19.	MTPE19	Materials for extreme environments	-	3

b. OPEN ELECTIVE (OE) (Offered by Dept. of MME)

Students pursuing B.Tech. in MME should take at least **THREE** courses from the Open Electives. MME is offering nine open electives which are listed here. Student of MME can also register for Open Electives offered by other departments.

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	MTOE10	Non Destructive Testing and Failure Analysis	-	3
2.	MTOE11	Process Modelling and Applications	-	3
3.	MTOE12	Computational Techniques	-	3
4.	MTOE13	Design and Selection of Materials	-	3
5.	MTOE14	New Product Development	-	3

6.	MTOE15	Introduction to Quality Management	-	3
7.	MTOE16	Surface Engineering	-	3
8.	MTOE17	Nanomaterials and Applications	-	3
9.	MTOE18	Intellectual Property Rights	-	3

Considering the courses covered in Programme Core of B.Tech. (MME), Programme Electives of B.Tech. (MME), and the expectations from the field (industry/ research / service sectors) and possible gaps, IT IS RECOMMENDED THAT every student of B.Tech. (MME) explore studying one or more electives in areas such as – Management, Industrial Relations, Applied Statistics and Probability, Higher Mathematics, Automation, Neural Networks, Artificial Intelligence, Man-Machine Interface, Design of Machine Elements, Design of Reactors and Project Management.

c. MINOR (MI) [offered for the students of other departments]

Students from other departments who have registered for B.Tech. Minor in Metallurgical and Materials Engineering should take minimum FIVE of the listed seven minor courses, in order to earn MINOR in Metallurgical and Materials Engineering. *Students of* Metallurgical and Materials Engineering may *take five minor courses in chosen discipline outside* Metallurgical and Materials Engineering*. Student of B.Tech.* Metallurgical and Materials Engineering *is not permitted to register for the following minor courses offered by* Metallurgical and Materials Engineering*.*

Sl. No.	Course Code	Course Title	Prerequisites	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

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.

[Student of B.Tech MME has to take a total of twelve electives spread over PE, OE, MI. It has been stipulated that the student has to take minimum four courses from Programme electives of MME. The student of B.Tech MME has been enabled to take as many as eight courses from OE and MI (67% against 50% specified by the Institute).]

(IV) ESSENTIAL PROGRAMME LABORATORY REQUIREMENT (ELR)

Sl. No.	Course Code	Course Title	Co requisites	Credits
1.	MTLR10	Process Metallurgy Laboratory	MTPC14	1
2.	MTLR11	Ferrous Metallography Laboratory	MTPC18	1
3.	MTLR12	Instrumentation & Control Laboratory	MTPC16	1
4.	MTLR13	Foundry and Welding Laboratory	MTPC19, MTPC20	1
5.	MTLR14	Materials Testing Laboratory	MTPC23	1
6.	MTLR15	Heat Treatment Laboratory	MTPC18	1
7.	MTLR16	Non-Ferrous Metallography and Characterization Laboratory	MTPC27	1
8.	MTLR17	Corrosion Engineering Laboratory	MTPC28	1
9.	MTLR18	Ceramic Materials Laboratory	MTPC22	1
10.	MTLR19	Surface Engineering Laboratory	-	1
11.	MTLR20	Particulate Processing Laboratory	MTPC25	1
12.	MTLR21	Non-Destructive Testing Laboratory	-	1
Total				**12**

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

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

A student can obtain B.Tech. (Honors) degree provided the student has:

i. Registered at least for 12 theory courses and 2 ELRs in the second year.
ii. Consistently obtained a minimum GPA of 8.5 in the first four sessions.
iii. Continue to maintain the same GPA of 8.5 in the subsequent sessions (including the Honors courses).
iv. Completed 3 additional theory courses specified for the Honors degree of the programme.
v. Completed all the courses registered, in the first attempt and in four years of study.

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	MTHO10	Advanced Thermodynamics of Materials	MTPC13	3
2.	MTHO11	Advanced Solidification Processing	MTPC19	3
3.	MTHO12	Crystallography	MTPC15	3

4.	MTHO13	Aerospace Materials	Nil	3
5.	MTHO14	Recent Developments in Welding Processes	MTPC20	3
6.	MTHO15	Recent Developments in Forming Processes	MTPC24	3
7.	MTHO16	Recent Trends in Nano materials	Nil	3
8.	MTHO17	Economics of Metal Production Processes	MTPC14, MTPC21	3

PRODUCTION ENGINEERING

The total minimum credits for completing the B.Tech. programme in Production Engineering is **176** (68 + 108).

I. GENERAL INSTITUTE REQUIREMENTS

1. MATHEMATICS

Sl. No.	Course Code	Course Title	Credits
1.	MAIR11	Mathematics I	4
2.	MAIR21	Mathematics II	4
3.	MAIR35	Mathematics for Production Engineers	3
4.	MAIR46	Probability and Statistics	3
		Total	**14**

2. PHYSICS

Sl. No.	Course Code	Course Title	Credits
1.	PHIR11	Physics - I	3
2.	PHIR12	Physics - II	4
		Total	**7**

3. CHEMISTRY

Sl. No.	Course Code	Course Title	Credits
1.	CHIR11	Chemistry - I	3
2.	CHIR12	Chemistry - II	4
		Total	**7**

4. COMMUNICATION

Sl. No.	Course Code	Course Title	Credits
1.	HSIR11	English for communication	3
2.	HSIR12	Professional communication	3
		Total	**6**

5. HUMANITIES

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

*The above course will be offered in January session

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 and Values	3
		Total	**3**

[+]The above course will be offered in July session

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.	CSIR11	Basics of Programming	3
		Total	**3**

12. BRANCH SPECIFIC COURSE

Sl. No.	Course Code	Course Title	Credits
1.	PRIR15	Introduction to Production Engineering	2
		Total	**2**

13. SUMMER INTERNSHIP

Sl. No.	Course Code	Course Title	Credits
1.	PRIR16[#]	INTERNSHIP / INDUSTRIAL TRAINING / ACADEMIC ATTACHMENT (2 to 3 months duration during summer vacation)	**2**
		Total	**2**

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.

14. PROJECT WORK

Sl. No.	Course Code	Course Title	Credits
1.	PRIR17	Project Work	6
		Total	**6**

15. COMPREHENSIVE VIVA

Sl. No.	Course Code	Course Title	Credits
1.	PRIR18	Comprehensive Viva	3
		Total	**3**

16. INDUSTRIAL LECTURE

Sl. No.	Course Code	Course Title	Credits
1.	PRIR19	Industrial Lectures	1
		Total	**1**

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.

(II) PROGRAMME CORE (PC)

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	PRPC10	Engineering Mechanics	-	4
2.	PRPC11	Casting and Welding Technology	PRIR15	3

3.	PRPC12	Machining Technology	PRIR15	3
4.	PRPC13	Metallurgy and Materials Engineering	CHIR12	3
5.	PRPC14	Mechanics of Solids and Fluids	PRPC10	3
6.	PRPC15	Thermal Engineering	-	3
7.	PRPC16	Kinematics and Dynamics of Machines	PRPC10	4
8.	PRPC17	Forming Technology	PRPC13	3
9.	PRPC18	Metrology (Theory and Laboratory)	PHIR12	3
10.	PRPC19	Electrical and Control Systems (Theory and Laboratory)	EEIR11	3
11.	PRPC20	Design of Machine Elements	PRPC14	4
12.	PRPC21	Tooling for Manufacturing	PRPC20	4
13.	PRPC22	Quality, Reliability and Safety Engineering	-	3
14.	PRPC23	Computer Integrated Manufacturing (Theory and Laboratory)	PRPC12	3
15.	PRPC24	Operations Research	MAIR47	4
16.	PRPC25	Work Design and Facilities Planning	PRPC22	3
17.	PRPC26	Computer Aided Design and Engineering (Theory and Laboratory)	CSIR11	3
18.	PRPC27	Mechatronics and Industrial Automation (Theory and Laboratory)	EEIR11	3
19.	PRPC28	Analysis of Production Systems and IE Laboratory	PRPC25	3
20.	PRPC29	Manufacturing System Simulation (Theory and Laboratory)	MAIR47	3
Total				**65**

(III) ELECTIVES

a. PROGRAMME ELECTIVE (PE)

Students pursuing B.Tech. in Production Engineering should take at least three courses from the Programme Electives listed below.

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	PRPE10	Unconventional Machining Processes	PRPC12	3
2.	PRPE11	Precision Engineering (Theory and Lab)	PRPC12	3
3.	PRPE12	Material Handling & Storage	PRPC25	3

4.	PRPE13	Manufacturing of Composite Materials	PRPC14	3
5.	PRPE14	Machine Tool Technology	PRPC12	3
6.	PRPE15	Industrial Robotics	PRPC25	3
7.	PRPE16	Plant Engineering	PRPC25	3
8.	PRPE17	Non Destructive Testing	-	3
9.	PRPE18	Micro Fabrication Processes	PRPC12	3
10.	PRPE19	Surface Engineering	PRPC14	3
11.	PRPE20	Processing of Friction composites	PRPC14	3
12.	PRPE21	Processing of Polymeric Composites	PRPC14	3
13.	PRPE22	Sustainable Manufacturing (Theory and Lab)	PRIR15	3
14.	PRPE23	Rapid prototyping, Tooling and Manufacturing	PRPC12	3
15.	PRPE24	Finite Element Methods	PRPC14	3
16.	PRPE25	Product Development Strategies	PRPC22	3
17.	PRPE26	Design for Manufacture and Assembly	PRPC22	3
18.	PRPE27	Vibration and Noise Engineering	PRPC16	3
19.	PRPE28	Concepts of Engineering Design	PRPC20	3
20.	PRPE29	Engineering Optimization	PRPC22	3
21.	PRPE30	Computational Fluid Dynamics	PRPC14	3
22.	PRPE31	Experimental Stress Analysis	PRPC14	3
23.	PRPE32	Design of Automated Manufacturing System	PRPC23	3
24.	PRPE33	Design and Analysis of Experiments	PRPC22	3
25.	PRPE34	Agile Manufacturing	PRPC22	3
26.	PRPE35	Integrated Materials Management	PRPE28	3
27.	PRPE36	Lean Manufacturing	PRPC22	3
28.	PRPE37	Total Quality Management	PRPC22	3
29.	PRPE38	Supply Chain Management	PRPC24	3

b. OPEN ELECTIVE (OE)

Sl. No.	Course Code	Course Title	Prerequisites	Credits
1.	PROE10	Operations Management	MAIR11	3
2.	PROE11	Project Management	MAIR12	3
3.	PROE12	Value Engineering	-	3
4.	PROE13	Artificial Intelligence and Expert systems	CSIR11	3

5.	PROE14	Processing and manufacturing of semiconductors	-	3
6.	PROE15	Automobile component manufacturing processes	-	3
7.	PROE16	Laser Materials processing	PHIR12	3

c. MINOR (MI) [offered for the students of other departments]

Students who have registered for B.Tech Minor in Production Engineering can opt to study any 5 of the courses listed below.

Sl. No.	Course Code	Course Title	Prerequi-sites	Credits
1.	PRMI10	Manufacturing Processes	-	3
2.	PRMI11	CAD, CAM and CAE	-	3
3.	PRMI12	Unconventional Manufacturing Processes	-	3
4.	PRMI13	Industrial Engineering and Management	-	3
5.	PRMI14	Quality Engineering	-	3
Total				**15**

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.

(IV) ESSENTIAL PROGRAMME LABORATORY REQUIREMENT (ELR)

Sl. No.	Course Code	Course Title	Co requisites	Credits
1.	PRLR10	Manufacturing Processes Laboratory-I	PRPC12	2
2.	PRLR11	Mechanics of Solids & Fluids and Thermal Engineering Laboratory	PRPC14, PRPC15	2
3.	PRLR12	Manufacturing Processes Laboratory -II	PRPC12	2
4.	PRLR13	Weldability and Formability Testing Laboratory	PRPC11	2
5.	PRLR14	Machine Drawing Practice	MEIR12	3
6.	PRLR15	Production Drawing and Cost Estimation	PRLR14	2
Total				**13**

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

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

A student can obtain B.Tech. (Honors) degree provided the student has:

i. Registered at least for 12 theory courses and 2 ELRs in the second year.
ii. Consistently obtained a minimum GPA of 8.5 in the first four sessions.
iii. Continue to maintain the same GPA of 8.5 in the subsequent sessions (including the Honors courses).
iv. Completed 3 additional theory courses specified for the Honors degree of the programme.
v. Completed all the courses registered, in the first attempt and in four years of study.

Sl. No.	Course Code	Course Title	Pre requisites	Credits
1.	PRHO10	Tolerance Technology	-	3
2.	PRHO11	Robotics	-	3
3.	PRHO12	Intelligent Manufacturing Systems	-	3
4.	PRHO13	Total Quality Engineering	-	3
5.	PRHO14	Product Analysis and Cost Optimization	-	3
6.	PRHO15	Decision Support Systems	-	3
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

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	Prerequisites (if any)	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.	CAMI12	Problem Solving Techniques	-	3
4.	CAMI13	Data base Management Systems	-	3
5.	CAMI14	Data Structures and Applications	-	3
6.	CAMI15	Data mining Techniques	CAMI13	3
7.	CAMI16	Big Data Analytics	CAMI13	3
8.	CAMI17	Design and Analysis of algorithms	CAMI14	3
9.	CAMI18	Unix and Shell Programming	CAMI11	3
10.	CAMI19	Information Security	CAMI10	3

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	Prerequisites (if any)	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.	HSOE11	Creative writing through literature	3	All Branches **(July session)**
2.	HSOE12	Executive Communication	3	All Branches **(January session)**
3.	HSOE13	Entrepreneurship development	3	CL, CE, ME, MT, PR **(July session)** CS, EE, EC, IC **(January session)**
4.	HSOE14	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	Prerequisites (if any)	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	Prerequisites (if any)	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	Prerequisites (if any)	Credits
1.	MBOE11	Organization Behaviour	-	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	Prerequisites (if any)	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	Prerequisites (if any)	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	Prerequisites (if any)	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
Total				

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.

Sl. No.	Course Code	Course Title	Prerequisites (if any)	Credits
1.	PHMI11	Quantum Mechanics	-	4
2.	PHMI12	Electromagnetic Theory	-	4
3.	PHMI14	Statistical Mechanics	-	4
4.	PHMI13	Solid State Physics	-	3
5.	PHMI16	Lasers and Applications	-	3
	PHMI17	Sensors and Transducers	-	3
	PHMI18	Nanoscience and Technology and Applications	-	3
	PHMI19	Physics and Technology of Thin Films	-	3
	PHMI21	Magnetism and Superconducting Levitation	-	3

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