B. Tech.

IN

COMPUTER SCIENCE AND ENGINEERING

FLEXIBLE CURRICULUM

(For students admitted in 2015-16 onwards)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
NATIONAL INSTITUTE OF TECHNOLOGY
TIRUCHIRAPPALLI – 620 015

TAMIL NADU, INDIA

CURRICULUM

The total minimum credits for completing the B.Tech. programme in Computer Science and Engineering is 177, [68 + 109].

MINIMUM CREDIT REQUIREMENT FOR THE VARIOUS COURSE CATEGORIES

SI.No.	COURSE CATEGORY	No. of Courses	No. of Credits
1.	GENERAL INSTITUTE REQUIREMENT (GIR)	17	68
2.	PROGRAMME CORE (PC)	20	63
3.	ESSENTIAL PROGRAMME LABORATORY (ELR)	8	16
4.	ELECTIVE COURSES A. PROGRAMME ELECTIVES (PE) B. OPEN ELECTIVES (OE) C. MINOR (MI)	10	30
TOTAL			177

Programme Electives (PE) are offered by the Department of Computer Science and Engineering for students of B.Tech. in Computer Science and Engineeringprogramme. A minimum of 9 credits out of the 30 credits allotted for Electives category must be earned from the courses listed in the PE section.

To meet the minimum credit requirement for Electives, the remaining elective courses can be chosen from either the PE courses offered by the Department of Computer Science and Engineering, or Open Electives offered by any other Department within National Institute of Technology, Tiruchchirappalli. In addition to the above, if a student has registered for courses under B.Tech. (Minor) programme of any other Department, they will be considered under Elective Course category.

I. GENERAL INSTITUTE REQUIREMENTS

SI.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

1. MATHEMATICS

SL.NO.	COURSE CODE	COURSE TITLE	CREDITS
1.	MAIR11	Mathematics I	4
2.	MAIR12	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. HUMANITIES

SL.NO.	COURSE CODE	COURSE TITLE	CREDITS
1.	HSIR13	Industrial Economics and Foreign Trade(VII Semester)	3
Total			**3**

5. COMMUNICATION

SL.NO.	COURSE CODE	COURSE TITLE	CREDITS
1.	HSIR11	English for Communication	3
2.	HSIR12	Professional Communication	3
Total			**6**

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 (V Semester)	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	Basics of Programming	3
Total			3

12. BRANCH SPECIFIC COURSE

SL.NO.	COURSE CODE	COURSE TITLE	CREDITS
1.	CSIR15	Elements of Computing Systems	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)(VI Semester)	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(VIII Semester)	6
		Total	**6**

15. COMPREHENSIVE VIVA

SL.NO.	COURSE CODE	COURSE TITLE	CREDITS
1.	CSIR18	Comprehensive Viva(VII Semester)	3
		Total	**3**

16. INDUSTRIAL LECTURE

SL.NO.	COURSE CODE	COURSE TITLE	CREDITS
1.	CSIR19	Industrial Lecture(VI Semester)	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	PRE-REQ.	CREDITS
1.	CSPC11	Discrete Structures	-	3
2.	CSPC21	Data Structures	-	3
3.	CSPC22	Digital Systems Design	-	3
4.	CSPC23	Data Communication	-	3
5.	CSPC24	Computer Organization	-	3
6.	CSPC25	Combinatorics and Graph Theory	CSPC11	3
7.	CSPC26	Operating Systems	CSPC24	3
8.	CSPC27	Computer Networks	CSPC23	3
9.	CSPC28	Automata and Formal Languages	CSPC11	4
10.	CSPC29	Introduction to Algorithms	CSPC11, CSPC21	3
11.	CSPC31	Computer Architecture	CSPC24	4
12.	CSPC32	Internetworking Protocols	CSPC27	3
13.	CSPC33	Database Management System	CSPC26	3
14.	CSPC34	Software Engineering	-	3
15.	CSPC35	Principles of Cryptography	CSPC25	3
16.	CSPC36	Service Oriented Architecture	-	3
17.	CSPC37	Microprocessors and Microcontrollers	CSPC22	3
18.	CSPC38	Mobile Applications Development	CSPC32	3
19.	CSPC41	Principles of Compiler Design	CSPC28	3
20.	CSPC42	Data Sciences and Machine Learning Essentials	CSPC33	3
Total				**62**

III. ESSENTIAL PROGRAMME LABORATORY REQUIREMENT (ELR)

Sl.No.	Course Code	Course Title	Co-Req.	Credits
1.	CSLR21	Data Structures Laboratory	CSPC21	2
2.	CSLR22	Digital Systems Design Laboratory	CSPC22	2
3.	CSLR23	Algorithms Lab	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	CSPC38	2
8.	CSLR34	Microprocessors and Microcontroller Laboratory	CSPC37	2
Total				**16**

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

IV. ELECTIVES

a. PROGRAMME ELECTIVE (PE)

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

SL.NO.	COURSE CODE	COURSE TITLE	PRE-REQ.	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	CSPC27	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	CSPC27, CSPE16	3
10.	CSPE20	Programming for Embedded Systems	CSPC37	3
11.	CSPE21	Machine Learning	CSPC25, MAIR37	3
12.	CSPE22	Randomized Algorithms	CSPC29	3
13.	CSPE23	Natural Language Processing	CSPC28	3
14.	CSPE24	Artificial Intelligence and Expert Systems	CSPE21	3
15.	CSPE25	Software Quality Assurance	CSPC34	3
16.	CSPE26	Parallel Architectures and Programming	CSPC26, CSPC37	3
Total				**48**

b. MINOR (MI)

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	CREDITS
1.	CSMI11	Data Structures	3
2.	CSMI12	Digital System Design	3
3.	CSMI13	Computer Organization	3
4.	CSMI14	Operating System	3
5.	CSMI15	Theoretical Computer Science	3
6.	CSMI16	Database Management System	3
7.	CSMI17	Computer Networks	3
8.	CSMI18	Software Engineering	3

c. OPEN ELECTIVES (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	PRE-REQ.	CREDITS
1.	CSOE11	Computer Graphics	-	3
2.	CSOE12	Human Computer Interaction	-	3
3.	CSOE13	Web Technology	-	3
4.	CSOE14	Multimedia Systems	CSOE11	3
5.	CSOE15	Cloud Computing	CSMI17	3
6.	CSOE16	Network Security	CSMI17	3
7.	CSOE17	Big Data Analytics	CSMI16	3
8.	CSOE18	Image Processing	CSOE11	3
9.	CSOE19	Internet Of Things	CSMI17	3
10.	MBXXXX*	Software Project Management	-	3
Total				**30**

*Course code to be obtained from Management Studies Department

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-REQ.	CREDITS
1.	CSHO11	Distributed Algorithms	CSPC29	3
2.	CSHO12	High Speed Networks	CSPC32	3
3.	CSHO13	Software Defined Networking	CSPC32	3
4.	CSHO14	Transaction Processing Systems	CSPE13	3
5.	CSHO15	Pervasive Computing	CSPC36, CSPC27	3
6.	CSHO16	Programming for Multi Core Systems	CSPC37	3
7.	CSHO17	Soft Computing	CSPE21	3
8.	CSHO18	Digital System Testing and Verification	CSPC22	3
9.	CSHO19	CAD for VLSI	CSPC22	3
10.	CSHO20	Middleware Technologies	CSOE13	3
Total				**30**

Type of Course offered and their Credits

Sl. No.	Type of Course	Required Courses / Credits	Offered Courses/Credits
1.	General Institute Requirement (GIR)	17/68	17/68
2.	Programme Core (PC)	16-20/ 56-65	20/63
3.	Essential Programme Laboratory (ELR) Courses	2 per session / 10-16	8/16
4.	Program Electives		
5.	Open Electives	10 – 15 / 30 -50	10/30
6.	Minor Electives		
	Total Credits	**175 - 180**	**177**

A PROPOSED ROADMAP OF FLEXIBLE CURRICULUM

FOR B.Tech., (COMPUTER SCIENCE AND ENGINEERING) STUDENTS

The following table should be prepared before the commencement of the programme.

Sl. No.	Course Code	Course Title	Year of Study	Session/s
1	HSIR11	English for Communication	I	July
2	MAIR11	Mathematics I	I	July
3	PHIR11	Physics – I (Theory & Lab)	I	July
4	CHIR11	Chemistry – I (Theory & Lab)	I	July
5	CSIR11	Basics of Programming (Theory and Lab)	I	July
6	CSIR15	Elements of Computing Systems (Branch Specific Course)	I	July
7	CEIR11	Basics of Civil Engineering	I	July
8	MEIR11	Basics of Mechanical Engineering	I	July
9	MEIR12	Engineering Graphics	I	July
10	SWIR11	NSS/NCC/NSC	I	July
11	HSIR12	Professional Communication	I	January
12	MAIR12	Mathematics II	I	January
13	PHIR13	Physics - II (Theory & Lab)	I	January
14	CHIR13	Chemistry - II (Theory & Lab)	I	January
15	ENIR11	Energy and Environmental Engineering	I	January
16	CSPC11	Discrete Structures	I	January
17	PRIR11	Engineering Practice	I	January
18	SWIR11	NSS/NCC/NSC	I	January
19	CSPC21	Data Structures	II	July
20	CSPC22	Digital Systems Design	II	July
21	CSPC23	Data Communication	II	July
22	CSPC24	Computer Organization	II	July
23	MAIR37	Introduction to Probability Theory	II	July
24	CSPC25	Combinatorics and Graph Theory	II	July
25	CSLR21	Data Structures Laboratory	II	July
26	CSLR22	Digital Systems Design Laboratory	II	July
27	CSPC26	Operating Systems	II	January
28	MAIR44	Principles of Operations Research	II	January
29	CSPC27	Computer Networks	II	January
30	CSPC28	Automata and Formal Languages	II	January
31	CSPC29	Introduction to Algorithms	II	January
32	HSIR14	Professional Ethics	II	January
33	CSLR23	Algorithms Laboratory	II	January
34	CSLR24	Operating Systems Laboratory	II	January
35	CSPC31	Computer Architecture	III	July
36	CSPC32	Internetworking Protocols	III	July
37	CSPC33	Database Management System	III	July
38	CSPC34	Software Engineering	III	July
39	E1	PE – I	III	July
40	E2	PE / OE / MI – I	III	July
41	CSLR31	Networks Laboratory	III	July

Sl. No.	Course Code	Course Title	Year of Study	Session/s
42	CSLR32	DBMS Laboratory	III	July
43	CSPC35	Principles of Cryptography	III	January
44	CSPC36	Service Oriented Architecture	III	January
45	CSPC37	Microprocessors and Microcontrollers	III	January
46	CSPC38	Mobile Applications Development	III	January
47	E3	PE – II	III	January
48	E4	PE / OE / MI – II	III	January
49	CSLR33	Mobile Applications Development Lab	III	January
50	CSLR34	Microprocessors and Microcontrollers Laboratory	III	January
51	CSIR16	Internship/ Industrial Training/ Academic Attachment	III	January
52	CSIR19	Industrial Lecture	III	January
53	HSIR13	Industrial Economics and Foreign Trade	IV	July
54	CSPC41	Principles of Compiler Design	IV	July
55	E5	PE –III	IV	July
56	E6	PE / OE / MI – III	IV	July
57	E7	PE / OE / MI – IV	IV	July
58	CSIR18	Comprehensive Viva-Voce	IV	July
59	CSPC42	Data Sciences and Machine Learning Essentials	IV	January
60	E8	PE –IV	IV	January
61	E9	PE / OE / MI – V	IV	January
62	E10	PE / OE / MI – VI	IV	January
63	CSIR17	Project Work	IV	January

YEAR WISE CURRICULUM

The courses that must be completed by the students of Computer Science and Engineering Department over a period of eight sessions, and the courses offered during each session are listed below. The order in which students may register for a course is formulated based on prerequisite requirements. However, students may register for courses by virtue of their choice, provided that they meet the prerequisite requirement.

I Semester

Sl. No.	Course Code	Course Type	Course Name	L	T	P	C
1	HSIR11	GIR	English for Communication	3	0	0	3
2	MAIR11	GIR	Mathematics I	3	1	0	4
3	PHIR11	GIR	Physics – I (Theory & Lab)	2	0	3	3
4	CHIR11	GIR	Chemistry – I (Theory & Lab)	2	0	3	3
5	CSIR11	GIR	Basics of Programming (Theory and Lab)	2	0	2	3
6	CSIR15	GIR	Elements of Computing Systems (Branch Specific Course)	2	0	0	2
7	CEIR11	GIR	Basics of Civil Engineering	2	0	0	2
8	MEIR11	GIR	Basics of Mechanical Engineering	2	0	0	2
9	MEIR12	GIR	Engineering Graphics	1	0	4	3
10	SWIR11	GIR	NSS/NCC/NSC	0	0	0	0

Total Credits: 25

II Semester

Sl. No.	Course Code	Course Type	Course Name	L	T	P	C
1	HSIR12	GIR	Professional Communication	3	0	0	3
2	MAIR12	GIR	Mathematics II	3	1	0	4
3	PHIR13	GIR	Physics - II (Theory & Lab)	3	0	3	4
4	CHIR13	GIR	Chemistry - II (Theory & Lab)	3	0	3	4
5	ENIR11	GIR	Energy and Environmental Engineering	2	0	0	2
6	CSPC11	GIR	Discrete Structures	3	1	0	4
7	PRIR11	GIR	Engineering Practice	0	0	4	2
8	SWIR11	GIR	NSS/NCC/NSC	0	0	0	0

Total Credits: 23

III Semester

Sl. No.	Course Code	Course Type	Course Name	L	T	P	C
1	CSPC21	PC	Data Structures	3	0	0	3
2	CSPC22	PC	Digital Systems Design	3	0	0	3
3	CSPC23	PC	Data Communication	3	0	0	3
4	CSPC24	PC	Computer Organization	3	0	0	3
5	MAIR37	GIR	Introduction to Probability Theory	3	0	0	3
6	CSPC25	PC	Combinatorics and Graph Theory	3	0	0	3
7	CSLR21	ELR	Data Structures Laboratory	0	0	3	2
8	CSLR22	ELR	Digital Systems Design Laboratory	0	0	3	2

Total Credits: 22

IV Semester

Sl. No.	Course Code	Course Type	Course Name	L	T	P	C
1	CSPC26	PC	Operating Systems	3	0	0	3
2	MAIR44	GIR	Principles of Operations Research	3	0	0	3
3	CSPC27	PC	Computer Networks	3	0	0	3
4	CSPC28	PC	Automata and Formal Languages	3	1	0	4
5	CSPC29	PC	Introduction to Algorithms	3	0	0	3
6	HSIR14	GIR	Professional Ethics	3	0	0	3
7	CSLR23	ELR	Algorithms Laboratory	0	0	3	2
8	CSLR24	ELR	Operating Systems Laboratory	0	0	3	2

Total Credits: 23

V Semester

Sl. No.	Course Code	Course Type	Course Name	L	T	P	C
1	CSPC31	PC	Computer Architecture	3	1	0	4
2	CSPC32	PC	Internetworking Protocols	3	0	0	3
3	CSPC33	PC	Database Management System	3	0	0	3
4	CSPC34	PC	Software Engineering	3	0	0	3
5	E1		PE – I	3	0	0	3
6	E2		PE / OE / MI – I	3	0	0	3
7	CSLR31	ELR	Networks Laboratory	0	0	3	2
8	CSLR32	ELR	DBMS Laboratory	0	0	3	2

Total Credits: 23

VI Semester

Sl. No.	Course Code	Course Type	Course Name	L	T	P	C
1	CSPC35	PC	Principles of Cryptography	3	0	0	3
2	CSPC36	PC	Service Oriented Architecture	3	0	0	3
3	CSPC37	PC	Microprocessors and Microcontrollers	3	0	0	3
4	CSPC38	PC	Mobile Applications Development	3	0	0	3
5	E3		PE – II	3	0	0	3
6	E4		PE / OE / MI – II	3	0	0	3
7	CSLR33	ELR	Mobile Applications Development Lab	0	0	3	2
8	CSLR34	ELR	Microprocessors and Microcontrollers Laboratory	0	0	3	2
9	CSIR16	GIR	Internship/ Industrial Training/ Academic Attachment	0	0	0	2
10	CSIR19	GIR	Industrial Lecture	0	0	0	1

Total Credits: 25

VII Semester

Sl. No.	Course Code	Course Type	Course Name	L	T	P	C
1	HSIR13	GIR	Industrial Economics and Foreign Trade	3	0	0	3
2	CSPC41	PC	Principles of Compiler Design	3	0	0	3
3	E5		PE –III	3	0	0	3
4	E6		PE / OE / MI – III	3	0	0	3
5	E7		PE / OE / MI – IV	3	0	0	3
6	CSIR18	GIR	Comprehensive Viva-Voce	3	0	0	3

Total Credits: 18

VIII Semester

Sl. No.	Course Code	Course Type	Course Name	L	T	P	C
1	CSPC42	PC	Data Sciences and Machine Learning Essentials	3	0	0	3
2	E8		PE –IV	3	0	0	3
3	E9		PE / OE / MI – V	3	0	0	3
4	E10		PE / OE / MI – VI	3	0	0	3
5	CSIR17	GIR	Project Work	6	0	0	6

Total Credits: 18

Summary

Semester	I	II	III	IV	V	VI	VII	VIII	Total
Credits	25	23	22	23	23	25	18	18	177

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Pre-requisite Chart

Pre-requisite Chart for Minor Courses and Open Electives
(For Other Departments)