



NETAJI SUBHAS UNIVERSITY

JAMSHEDPUR, JHARKHAND

Established under the Jharkhand State Private University Act, 2018

Approved by AICTE, PCI, BCI, NCTE, INC & JNRC

COURSE STRUCTURE & DETAILED SYLLABUS

OF

COMPUTER SCIENCE & ENGINEERING



FOR

B.TECH. FOUR YEAR DEGREE COURSE

(Applicable for the batches admitted from 2025-2026)

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

NETAJI SUBHAS UNIVERSITY, JAMSHEDPUR

Pokhari, Near Bhilai Pahadi, Jamshedpur, Jharkhand

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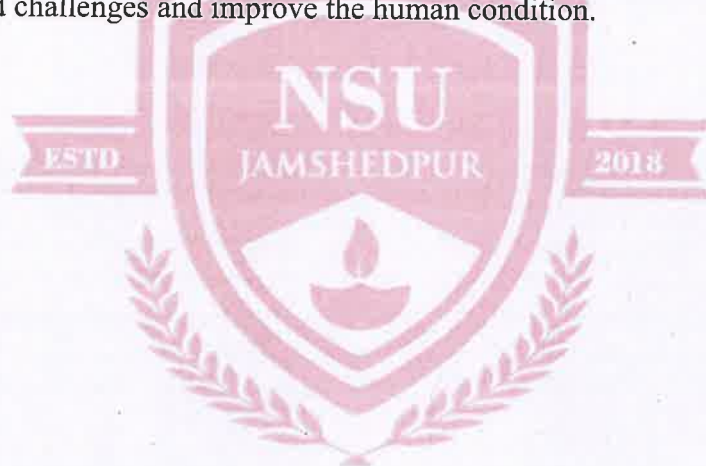
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PREAMBLE

The field of Computer Science and Engineering (CSE) stands at the forefront of technological innovation, driving progress across industries, economies, and societies. This course is designed to provide students with a strong foundation in both theoretical principles and practical skills, enabling them to analyse, design, and implement complex computing systems. It encompasses a broad spectrum of topics including algorithms, data structures, computer architecture, software engineering, artificial intelligence, cyber security, and emerging technologies such as cloud computing and machine learning.

The program emphasizes critical thinking, problem-solving, ethical practices, and lifelong learning, aiming to cultivate professionals who can adapt to the rapidly evolving technological landscape. Students are encouraged to apply their knowledge through hands-on projects, research, and interdisciplinary collaboration, preparing them for diverse careers in software development, data science, hardware systems, and beyond.

Through this course, we strive to develop not only proficient engineers and computer scientists, but also responsible global citizens who can harness the power of computing to address real-world challenges and improve the human condition.



Sudhin Datta

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VISION

To strive for excellence in education, research, and entrepreneurship, with the ultimate goal of becoming a global hub for innovation. Committed to advancing scientific and technological services, we aim to contribute meaningfully to society.

MISSION

- ❖ To provide high-quality education that nurtures innovation, entrepreneurship, and ethical values, shaping future professionals equipped for a globally competitive landscape.
- ❖ To collaborate with stakeholders by sharing institutional expertise in education and knowledge, fostering mutual growth in technical learning.
- ❖ To Cultivate an environment that encourages fresh ideas, groundbreaking research, and academic excellence, paving the way for future leaders, innovators, and entrepreneurs.
- ❖ To drive socio-economic progress by offering impactful scientific and technological solutions to society.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO-1	Apply core principles of computer science, engineering, and mathematics to excel in professional careers, competitive examinations, or higher education in India and abroad.
PEO-2	Demonstrate technical proficiency and innovative thinking by designing, developing, and managing efficient computing solutions using modern technologies and industry-standard practices.
PEO-3	Uphold professional ethics, integrity, and environmental sustainability, and contribute meaningfully to society by applying computing solutions to address local and global challenges.
PEO-4	Work effectively in multidisciplinary teams, with strong communication, collaboration, and leadership skills, suitable for both national and international work environments.

PROGRAM OUTCOMES (POs)

PO-1	Engineering knowledge: Apply knowledge of mathematics, science, engineering fundamentals, and computer science to solve complex engineering problems.
PO-2	Problem analysis: Identify, formulate, research literature, and analyse complex computer engineering problems to reach valid conclusions.

PO-3	Design/Development of solutions: Design computer-based systems, components, or processes that meet specified needs, with consideration for public health, safety, and environmental concerns.
PO-4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO-5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern computing and engineering tools to complex engineering activities.
PO-6	The engineer and society: Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal, and cultural issues related to computing practices.
PO-7	Environment and sustainability: Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge of sustainable development.
PO-8	Ethics: Apply ethical principles and commit to professional ethics, responsibilities, and norms of engineering practice.
PO-9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse and multidisciplinary teams.
PO-10	Communication: Communicate effectively on complex engineering activities with engineering community and society at large, including writing reports, making presentations, and giving/receiving instructions.
PO-11	Project management and finance: Demonstrate knowledge and understanding of engineering and management principles and apply these to manage projects and work as a team leader or member.
PO-12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in lifelong learning in the context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO-1	Software Development Proficiency: Apply software engineering principles, programming languages, and algorithms to develop efficient software systems.
PSO-2	Computing System Design and Analysis: Analyse, design, and implement secure, scalable, and robust computing systems using modern technologies.
PSO-3	Emerging Technology Integration: Demonstrate ability to adapt and apply contemporary technologies (e.g., AI, Machine Learning, Data Science, Cloud Computing) to solve industry and societal problems.

Gudhu Dawn



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Seetha Das



B. TECH IN COMPUTER SCIENCE & ENGINEERING

COURSE STRUCTURE

GENERAL COURSE STRUCTURE & THEME

A. Definition of Credit:

1 Hr. Lecture (L) per week	1 Credit
1 Hr. Tutorial (T) per week	1 Credit
1 Hr. Practical (P) per week	0.5 Credit
2 Hours Practical (P) per week	1 Credit

B. Range of Credits: In the light of the fact that a typical Model Four-year Under Graduate degree program in Engineering has about 160 credits, the total number of credits proposed for the four-year B. Tech/B.E. in Computer Science & Engineering (Engineering & Technology) is kept as 163.

C. Structure of UG Program in ME: The structure of UG program in Computer Science & Engineering shall have essentially the following categories of courses with the breakup of credits as given:

S. No.	Category	Credit Breakup for CSE students
1	Humanities and Social Sciences including Management courses	16
2	Basic Science courses	23
3	Engineering Science courses including workshop, drawing, basics of electrical/mechanical/computer etc.	29
4	Professional core courses	59
5	Professional Elective courses relevant to chosen specialization/branch	12
6	Open subjects – Electives from other technical and /or emerging subjects	9
7	Project work, seminar and internship in industry or elsewhere	15
8	Mandatory Courses [Environmental Sciences, Induction Program, Indian Constitution, Essence of Indian Knowledge Tradition]	(non-credit)
	Total	163*

**Minor variation is allowed as per need of the respective disciplines.*




D. Course code and definition:

Course code	Definitions
L	Lecture
T	Tutorial
P	Practical
C	Credits
BSC	Basic Science Courses
ESC	Engineering Science Courses
HSMC	Humanities and Social Sciences including Management courses
PCC-CS	Professional core courses
PEC -CS	Professional Elective courses
OEC-CS	Open Elective courses
LC	Laboratory course
MC	Mandatory courses

Category-wise Courses

HUMANITIES & SOCIAL SCIENCES COURSES [HS] & MANAGEMENT COURSES

(2 compulsory + 2 others)

Number of Humanities & Social Science Courses: 6

Credits: 16

Sl.	Code No.	Subject	Semester	Credits
1	HSMC-201	English	I	3
2	HSMC-102	Design Thinking	I	1
3	HSMC (H-102)	Universal Human Values-II: Understanding Harmony and Ethical Human Conduct	II	3
4	HSMC-301	Humanities – I	III	3
5	HSMC-401	Management-I (Organizational Behavior)/ Finance & Accounting	IV	3
6	HSMC-501	Humanities – II	V	3
Total Credits:				16

BASIC SCIENCE COURSE [BSC] (Total 6)

Sl.	Code No.	Subject	Semester	Credits
1	BSC-101	Physics-I (Semi-conductor Physics)	I	5
2	BSC-201	Mathematics-II (Probability and Statistics)	II	4
3	BSC-102	Mathematics-I (Calculus and Linear Algebra)	I	4
4	BSC-202	Chemistry-I	II	
5	BSC-301	Mathematics-III (Differential Calculus)	III	
Total Credits:				20

Sudhir Datta



ENGINEERING SCIENCE COURSE [ESC] (Total 7)

Sl.	Code No.	Subject	Semester	Credits
1	ESC-101	Basic Electrical Engineering	I	5
2	ESC-102	Engineering Graphics & Design	I	3
3	ESC-201	Programming for Problem Solving	II	5
4	ESC-202	Workshop/Manufacturing Practices	II	3
5	ESC-301	Analog Electronic Circuits	III	5
6	ESC-302	Digital Electronics	III	5
7	ESC-501	Signals and Systems	V	3
Total Credits:				29

PROFESSIONAL CORE COURSES [PCC] (Total 13)


Sl.	Code No.	Subject	Semester	Credits
1	PCC CS-301	Data Structure and Algorithms	III	5
2	PCC CS-302	IT Workshop – (Sci Lab/MATLAB)	III	3
3	PCC CS-401	Discrete Mathematics	IV	4
4	PCC CS-402	Computer Organization and Architecture	IV	5
5	PCC CS-403	Operating Systems	V	5
6	PCC CS-404	Design and Analysis of Algorithms	IV	5
7	PCC CS-405	Advanced Programming	IV	4
8	PCC CS-505	Introduction to Database Systems	V	5
9	PCC CS-603	Machine Learning	V	4
10	PCC CS-504	Theory of Computation	VI	4
11	PCC CS-601	Introductory Cyber Security	VI	5
12	PCC CS-601	Computer Networks	VI	5
13	PCC CS-602	Compiler Design	VII	5
14	PCC CS-603	Deep Learning	VII	4
Total Credits:				63

PROFESSIONAL ELECTIVE [PEC]

(Total 4 to be taken)

Sl.	Code No.	Subject	Semester	Credits
1	BTPEC 601	Software Engineering	VI/ VII/ VIII	3
2	BTPEC 602	Machine Learning	VI/ VII/ VIII	3
3	BTPEC 603	Distributed and Cloud Systems	VI/ VII/ VIII	3
4	BTPEC 604	Human Computer Interaction	VI/ VII/ VIII	3
5	BTPEC 605	Advanced Mobile Communications/ 5G Micro Specialization	VI/ VII/ VIII	3
Total Credits:				12

Jyoti Datta



OPEN ELECTIVE COURSE [OEC]

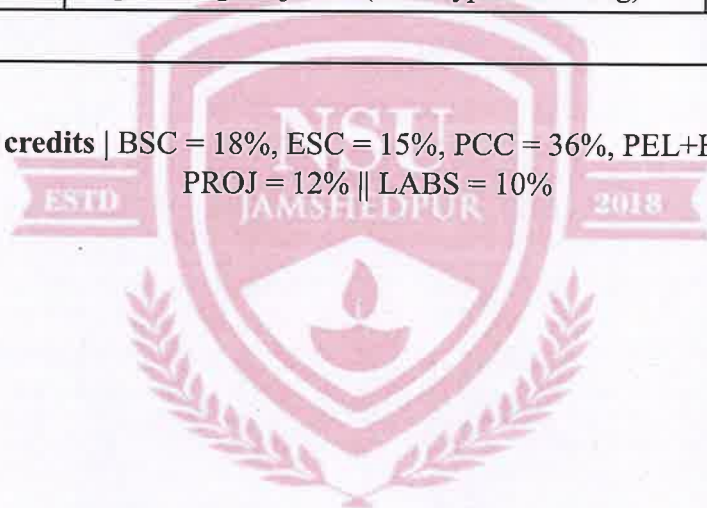
(Total 3 to be taken)

Sl.	Code No.	Subject	Semester	Credits
1	BTOEC 703	Data Warehousing & Data Mining	VII/VIII	3
2	BTOEC 802	Signals and Systems	VII/VIII	3
3	BTOEC 803	Advanced Operating Systems	VII/VIII	3
Total Credits:				9

ENGINEERING PROJECT (3 Stages)

Sl.	Code No.	Subject	Semester	Credits
1	PROJ CS-601	Engineering Project-1 (Literature Review)	VI	3
2	PROJ CS-701	Engineering Project-2 (Design & Analysis)	VII	6
4	PROJ CS-801	Engineering Project-3 (Prototype & Testing)	VIII	6
Total Credits:				15

TOTAL = 163 credits | BSC = 18%, ESC = 15%, PCC = 36%, PEL+HSM+OEL = 9%,
PROJ = 12% || LABS = 10%



Indhu Datta



INDUCTION PROGRAM

The Essence and Details of Induction program can also be understood from the 'Detailed Guide on Student Induction program', as available on AICTE Portal, (Link: <https://www.aicteindia.org/sites/default/files/Detailed%20Guide%20on%20Student%20Induction%20program.pdf>).

Induction program (mandatory)	Three-week duration
Induction program for students to be offered right at the start of the first year.	<ul style="list-style-type: none"> • Physical activity • Creative Arts • Universal Human Values • Literary • Proficiency Modules • Lectures by Eminent People • Visits to local Areas • Familiarization to Dept./Branch & Innovations

Mandatory Visits/ Workshop/Expert Lectures:

- a. It is mandatory to arrange one industrial visit every semester for the students of each branch.
- b. It is mandatory to conduct a One-week workshop during the winter break after fifth semester on professional/ industry/ entrepreneurial orientation.
- c. It is mandatory to organize at least one expert lecture per semester for each branch by inviting resource persons from domain specific industry.

Evaluation Scheme (Suggestive only):

a. For Theory Courses:

(The weightage of Internal assessment is 40% and for End Semester Exam is 60%)

b. For Practical Courses:

(The weightage of Internal assessment is 60% and for End Semester Exam is 40%)

c. For Summer Internship / Projects / Seminar etc.

Evaluation is based on work done, quality of report, performance in viva-voce presentation etc.

Note: The internal assessment is based on the student's performance in mid semester tests (two best out of three), quizzes, assignments, class performance, attendance viva-voce in practical, lab record etc.



Subhojit Das

Subhojit Das

Mapping of Marks to Grades

Each course (Theory/Practical) is to be assigned 100 marks, irrespective of the number of credits, and the mapping of marks to grades may be done as per the following table:

Range of Marks	Assigned Grade
91-100	A ⁺
81-90	A
71-80	B ⁺
61-70	B
51-60	C ⁺
46-50	C
40-45	D
< 40	F (Fail due to less marks)



Sanjay Das



Sanjay

Semester wise Structure

SEMESTER-I

Sl.	Code No.	Category	Name of the Subjects	Periods			Credits	Marks		
				L	T	P		IA	TE	TM
1	BTBSC 101	BSC	Engineering Mathematics- I	3	1	0	4	40	60	100
2	BTBSC 102	BSC	Engineering Physics-1	3	1	-	4	40	60	100
3	BTESC 103	ESC	Basics of Electrical Engineering	3	0	-	3	40	60	100
4	BTESC 104	ESC	Engineering Drawing	1	0	-	1	40	60	100
5	BTMC 105	MC	Indian Knowledge System	3	0	-	3	40	60	100
Practical										
6	BTBSC 102P	BSC	Engineering Physics Lab	-	-	2	1	30	20	50
7	BTESC 103P	ESC	Basics of Electrical Engineering Lab	-	-	2	1	30	20	50
8	BTESC 104P	ESC	Engineering Drawing & Computer Graphics Lab	-	-	4	2	30	20	50
9	BTESC 107P	ESC	Design Thinking & IDEA Lab	-	-	2	1	30	20	50
10	BTAU 106	AU	Sports/NSS/NCC/YOGA/Painting/Music/Classical dance	-	-	2	0	-	-	-
Total				13	2	12	20	320	380	700




SEMESTER-II

Sl.	Code No.	Category	Name of the Subjects	Periods			Cre dits	Marks		
				L	T	P		IA	TE	TM
1	BTBSC 201	BSC	Engineering Mathematics -II	3	1	-	4	40	60	100
2	BTBSC 202	BSC	Engineering Chemistry	3	0	-	3	40	60	100
3	BTHSMC 203	HSMC	English for technical writing	2	0	0	2	40	60	100
4	BTESC 204	ESC	Programming for Problem Solving	2	0	-	2	40	60	100
5	BTHSMC 205	HSMC	Universal Human Values	2	1	0	3	40	60	100
Practical										
6	BTBSC 202P	BSC	Engineering Chemistry Lab	-	-	2	1	30	20	50
7	BTHSMC 203P	HSMC	English for technical writing	0	0	2	1	30	20	50
8	BTESC 204P	ESC	Programming for Problem Solving Lab	-	-	4	2	30	20	50
9	BTESC 206P	ESC	Manufacturing Practices Workshop	-	-	4	2	30	20	50
Total				12	2	12	20	320	380	700

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SEMESTER-III

Sl.	Code No.	Category	Name of the Subjects	Periods			Credits	Marks		
				L	T	P		IA	TE	TM
1	BTESC 301	ESC	Analog Electronic Circuits	3	0	-	3	40	60	100
2	BTCS 302	PCC	Data structure and Algorithms	3	0	-	3	40	60	100
3	BTESC 303	ESC	Digital Electronics	3	0	-	3	40	60	100
4	BTCS 304	PCC	IT Workshop Sciab/MATLAB)	1	0	-	1	40	60	100
5	BTBSC 305	BSC	Mathematics-III (Differential Calculus)	2	0	0	2	40	60	100
6	BTHSMC 306	HSMC	Humanities-I	3	0	0	3	40	60	100
Practical										
7	BTESC 301P	ESC	Analog Electronic Circuits Lab	-	-	4	2	30	20	50
8	BTCS 302P	PCC	Data structure and Algorithms Lab	-	-	4	2	30	20	50
9	BTESC 303P	ESC	Digital Electronics Lab	-	-	4	2	30	20	50
10	BTCS 304P	PCC	IT Workshop Sciab/MATLAB)	-	-	4	2	30	20	50
Total				15	0	16	23	360	440	800

Gudh Dano



SEMESTER-IV

Sl.	Code No.	Category	Name of the Subjects	Periods			Credits	Marks		
				L	T	P		IA	TE	TM
1	BTCS 401	PCC	Discrete Mathematics	3	1	0	4	40	60	100
2	BTCS 402	PCC	Computer Organization & Architecture	3	0	-	3	40	60	100
3	BTCS 403	PCC	Design & Analysis of Algorithms	3	0	-	3	40	60	100
4	BTCS 404	PCC	Advanced Programming	3	1	0	4	40	60	100
5	BTHSMC 405	HSMC	Management I (Organizational Behavior /Finance & counting)	3	0	0	3	40	60	100
6	BTMC 406	MC	Environmental Sciences	-	-	-	0	40	60	100
Practical										
7	BTCS 402P	PCC	Computer Organization & Architecture Lab	-	-	4	2	30	20	50
8	BTCS 403P	PCC	Design & Analysis of Algorithms Lab	-	-	4	2	30	20	50
Total				15	2	8	21	300	400	700



Sudhu Das



SEMESTER-V

Sl	Code No.	Category	Name of the Subjects	Periods			Credits	Marks		
				L	T	P		IA	TE	TM
1	BTESC 501	ESC	Signals & Systems	3	0	0	3	40	60	100
2	BTCS 502	PCC	Introduction to Database Systems	3	0	-	3	40	60	100
3	BTCS 503	PCC	Machine Learning	3	1	0	4	40	60	100
4	BTCS 504	PCC	Operating Systems	3	0	-	3	40	60	100
5	BTHSMC 505	HSMC	Humanities II	3	0	0	3	40	60	100
6	BTMC 506	MC	Constitution of India	-	-	-	0	0	0	0
Practical										
7	BTCS 502P	PCC	Introduction to Database Systems Lab	-	-	4	2	30	20	50
8	BTCS 504P	PCC	Operating Systems Lab	-	-	4	2	30	20	50
9	BTEEC 507P	EEC	Internship /Summer Industrial Training/ Seminar (4-6 Week)	-	-	-	2	30	20	50
TOTAL				15	1	8	22	290	360	650



Sachin Das



SEMESTER-VI

S l.	Code No	Catego ry	Name of the subjects	Periods			Credits	Marks		
				L	T	P		IA	TE	TM
1	BTCS 601	PCC	Computer Networks	3	0	-	3	40	60	100
2	BTCS 602	PCC	Introductory Cyber Security	3	0	-	3	40	60	100
3	BTCS 603	PEC	Professional Elective-I	3	0	0	3	40	60	100
4	BTCS 604	PEC	Professional Elective-II	3	0	0	3	40	60	100
5	BTCS 605	PCC	Theory of Computation	3	1	0	4	40	60	100
Practical										
7	BTCS 601P	PCC	Computer Networks Lab	-	-	4	2	30	20	50
8	BTCS 602P	PEC	Introductory Cyber Security Lab	-	-	4	2	30	20	50
9	BTESC 606P	EEC	Project-1	-	-	6	3	30	20	50
TOTAL				15	1	14	23	330	420	750

Professional Elective I & II	
S.No	Subject
1.	Software Engineering
2.	Machine Learning
3.	Distributed and Cloud Systems
4.	Human Computer Interaction
5.	Advanced Mobile Communications/ 5G Micro Specialization

Jyoti Das



SEMESTER-VII

Sl	Code No	Category	Name of the subjects	Periods			Credits	Marks		
				L	T	P		IA	TE	TM
1	BTCS 701	PCC	Compiler Design	3	0	-	3	40	60	100
2	BTCS 704	PCC	Deep Learning	3	0	-	3	40	60	100
3	BTCS 702	PEC	Professional Elective-III	3	0	0	3	40	60	100
4	BTCS 703	OEC	Open Elective-I	3	0	0	3	40	60	100
Practical										
5	BTCS 701P	PCC	Compiler Design Lab	-	-	4	2	30	20	50
6	BTCS 704	PCC	Deep Learning	-	0	2	1	30	20	50
7	BTCS 705P	EEC	Project-II	-	-	12	6	40	60	100
8	BTEEC 706P	EEC	Internship /Summer Industrial Training/ Seminar (4-6 Week)	-	-	-	2	30	20	50
TOTAL				11	1	16	22	260	340	600

Open Elective I

S.No	Subject
1.	Data Warehousing & Data Mining
2.	Signals and Systems
3.	Advanced Operating Systems
4.	Non-Traditional Machine
5.	Computational Fluid Dynamics
6.	Industrial Safety
7.	Metal Forming
8.	Data Warehousing & Data Mining

Professional Elective III

S.No	Subject
1.	Software Engineering
2.	Machine Learning
3.	Distributed and Cloud Systems
4.	Human Computer Interaction
5.	Advanced Mobile Communications/ 5G Micro Specialization




SEMESTER -VIII

Sl	Code No.	Category	Name of the Subjects	Periods			Credits	Marks		
				L	T	P		IA	TE	TM
1	BTPEC 801	PEC	Professional Elective- IV	3	0	0	3	40	60	100
2	BTOEC 802	OEC	Open Elective-II	3	0	0	3	40	60	100
3	BTOEC 803	OEC	Open Elective-III	3	0	0	3	40	60	100
Practical										
5	BTCSE 804P	EEC	Engineering Project-3 (Prototype & Testing)	-	-	12	6	80	120	200
Total				9	0	12	15	240	360	600

Open Elective II & III

S.No	Subject
1.	Data Warehousing & Data Mining
2.	Signals and Systems
3.	Advanced Operating Systems
4.	Non-Traditional Machine
5.	Computational Fluid Dynamics
6.	Industrial Safety
7.	Metal Forming
8.	Data Warehousing & Data Mining

Professional Elective IV

S.No	Subject
1.	Software Engineering
2.	Machine Learning
3.	Distributed and Cloud Systems
4.	Human Computer Interaction
5.	Advanced Mobile Communications/ 5G Micro Specialization



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