SRI MANAKULA VINAYAGAR
ENGINEERING COLLEGE
(AN AUTONOMOUS INSTITUTION)

8th - Board of Studies Meeting
in the
Department of
Computer and Communication Engineering

for the Programme
B.Tech – Computer and Communication Engineering

Venue
Seminar Hall, Department of CCE
Sri ManakulaVinayagar Engineering College
Madagadipet, Puducherry – 605 107

Date & Time
23.09.2024 & 2.30 pm

8th - Board of Studies Meeting

In the

Department of

Computer and Communication Engineering

for the Programme

B.Tech – Computer and Communication Engineering

Venue

Seminar Hall, Department of CCE,

Sri Manakula Vinayagar Engineering College

Madagadipet, Puducherry - 605 107

Date & Time

23.05.2024 @ 2.30 pm

MINUTES OF BOARD OF STUDIES

The Eighth Board of Studies meeting for B.Tech. Computer and Communication Engineering was held on 23rd September 2024 at 2.30 PM in the Seminar Hall, Department of CCE, Sri Manakula Vinayagar Engineering College with the Head of the Department in the Chair.

The following members were present for the BoS meeting

Sl.No	Name of the Member with Designation and official Address	Responsibility in the BoS
1	**Dr. R.Ramya** Professor and Head, Department of CCE	Chairperson
2	**Dr.P.Varalakshmi** Professor Department of Computer Science and Engineering MIT, Chrompet	Member
3	**Dr. Sangeetha R.G** Professor, School of Electronics Engineering VIT University Chennai Campus, Vandalur - Kelambakkam Road, Chennai 600 127	Member
4	**Dr. T. Subbulakshmi** Professor, School of Computer Science and Engineering, Vellore Institute of Technology, Chennai.	Member
5	**Dr. V.Vijayalakshmi** Professor, Department of Electronics and Communication Engineering Pondicherry Technological University Puducherry	Member
6	**Deepan Chandrasekaran** Project Manager, Manager-Projects Test Lead- Cognizant Technology Solutions	Member
7	**Mrs. V. Gomathi** Assistant Professor/CCE Sri Manakula Vinayagar Engineering College	Member
8	**Mrs. T.Sivaranjani** Assistant Professor/CCE Sri Manakula Vinayagar Engineering College	Member
9	**Mr.G.K. Senthil kumar** Assistant Professor/CCE Sri Manakula Vinayagar Engineering College	Member
10	**Mr.J. Saravanan** Assistant Professor/CCE Sri Manakula Vinayagar Engineering College	Member
11	**Ms. S.Keerthana** Assistant Professor /CCE Sri Manakula Vinayagar Engineering College	Member
12	**Ms.J.Rekha** Assistant Professor /CCE Sri Manakula Vinayagar Engineering College	Member
13	**Mrs.M.Abirami** Assistant Professor /CCE Sri Manakula Vinayagar Engineering College	Member

2.A.12.1

14	**Ms. Mishael Sneha** Assistant Professor /CCE Sri Manakula Vinayagar Engineering College	Member
15	**Dr. D. Devi** Associate Professor /English Sri Manakula Vinayagar Engineering College	Member
16	**Dr. K.Samuvelraj** Assistant Professor /Physics Sri Manakula Vinayagar Engineering College	Member
17	**Dr. K. Karthikeyan** Professor /Chemistry Sri Manakula Vinayagar Engineering College	Member
18	**Dr. A.Ashok** Assistant Professor / Mathematics Sri Manakula Vinayagar Engineering College	Member
19	**Mr.M.Saravanan,** Senior Software Engineer, Verizon,	Member (Alumni)

AGENDA OF THE MEETING

Item No.	Particulars
BoS /2024 /UG/CCE 8.1	Welcome BOS members and apprise the credentials of college and department
BoS /2024 /UG/CCE 8.2	To review and confirm the minutes of 7th Board of studies meeting.
BoS /2024 /UG/CCE 8.3	To discuss and approve the curriculum and syllabi of V and VI semester courses under Regulations 2023.
BoS /2024 /UG/CCE 8.4	To discuss and approve the professional and open elective courses offered for Semester V and VI under Regulations 2023.
BoS /2024 /UG/CCE 8.5	To discuss and approve the Ability Enhancement courses, Mandatory Courses offered for V and VI semester under Regulations 2023.
BoS /2024 /UG/CCE 8.6	To discuss the syllabi of Honours / Minor degree programmes under Regulations 2023.
BoS /2024 /UG/CCE 8.7	To discuss the Ability Enhancement courses, Mandatory Courses offered for I and III semester under Regulations 2023.
BoS /2024 /UG/CCE 8.8	To discuss the Elective courses, Employability Enhancement courses, Mandatory Courses opted by students for V and VII semester under Regulations 2020.
BoS /2024 /UG/CCE 8.9	To ratify the change of course name as "Principles of Computer Organization" instead of Computer Organization and Architecture" in Semester-III for Regulation 2023.
BoS /2024 /UG/CCE 8.10	To discuss the process of Equivalent Certificate providing for the course Computer and Communication Engineering.
BoS /2024 /UG/CCE 8.11	To apprise Department calendar, NPTEL course registration, Guest Lectures and other Department activities

2.A-12.2

BoS /2024 /UG/CCE 8.12	To apprise the students end semester examination results in August 2024.
BoS /2024 /UG/CCE 8.13	Any other item with the permission of chair

MINUTES OF THE MEETING

Dr.R.Ramya, Chairperson, BoS initiated the meeting with a warm welcome and introduced the external members, the internal and other members, and thanked them for accepting the invitation to the 8th BoS meeting. The Chairperson proceeded with the presentation to deliberate on the agenda items.

BoS /2024 /UG/CCE 8.1

Welcome BOS members and apprise the credentials of college and department

The Board chairperson apprised the following details of the Institution and Department

The Institution details are,

- Available Programme with intake
- Institution Ranking Details
- Placement Details
- Centre of Excellence
- Social Activities

The Department details are,

- Establishment Details
- Vision and Mission
- Programme Educational Objectives
- Programme Specific Outcomes
- Faculty and Student strength
- Department Publication and patent
- Department Placement details

Appreciated the College and Department Credentials

BoS /2024 /UG/CCE 8.2

To review and confirm the minutes of 7th Board of studies meeting.

The Board of Studies members reviewed curriculum highlights under R-2023 and minutes of seventh BOS meeting as follows,

Seventh Board of Studies meeting was held on 28.02.2024, and following points are discussed,

- Described the constitution of Governing Body, Academic Council and Finance Committee under UGC regulation 2018 and 2023
- Examined the Board of Studies (BoS) constituted in 2020 under UGC Regulation 2018, and provide an overview of meetings conducted, apprising the highlights of Regulation 2020, including curriculum and syllabi.
- Described the Board of Studies (BoS) reconstituted under UGC Regulation 2023 and review the suggestions from the Curriculum Advisory Committee and stakeholders for revising the curriculum and syllabi under Regulation 2020

2.A.12.3

- Examined the regulation 2023, the curriculum structure under Regulation 2023, and the minutes of the seventh BoS meeting.
- Discussed and Approved the syllabi of Semester III and IV for B.Tech Computer and Communication Engineering Programme under R-2023 regulation
- Discussed and Approved the Syllabi of Professional Elective-I for B.Tech Computer and Communication Engineering Programme under R-2023 regulation
- Discussed and Approved the Syllabi of course offered for Honours degree in the fourth semester for B.Tech Computer and Communication Engineering Programme under R-2023 regulation
- Discussed and approved the elective courses and certification courses opted by our students under regulation 2020.

Minutes of 7th BOS meeting and highlights of R-2023 are reviewed

BoS /2024 /UG/CCE 8.3

To discuss and approve the curriculum and syllabi of V and VI semester courses under Regulations 2023.

The Board of Studies members reviewed the Semester V and VI syllabi in depth and suggested the following changes,

S.No	Regulation	Semester	Particulars
1	R2023	V	BOS members suggested to add Generative AI if possible.
2	R2023	VI	

Suggestions are considered and updated in the syllabi.The details are provided in Annexure-I

Semester V and VI syllabi are approved and recommended to Academic council

BoS /2024 /UG/CCE 8.4

To discuss and approve the professional and open elective courses offered for Semester V and VI under Regulations 2023.

The Board of Studies members reviewed the Professional Elective-II, Professional Elective-III and open elective courses and syllabi in depth and suggested the following changes,

S.No	Regulation	Semester	Particulars
1	R2023	V / VI	BOS members suggested to check reprint publication of both text book and reference book.

Suggestions are considered and updated in the syllabi.The details are provided in Annexure-II

Professional Elective-II, Professional Elective-III and Open Elective course syllabi are approved and recommended to Academic council

2.A.12.4

BoS /2024 /UG/CCE 8.5

To discuss and approve the Ability Enhancement courses, Mandatory Courses offered for V and VI semester under Regulations 2023.

BoS Chairperson presented the following Ability Enhancement courses, Mandatory Courses offered for V and VI semester under Regulations 2023.Ensure no change with respect to previous BoS.

Ability Enhancement courses	Annexure III
Mandatory Courses	Essence of Indian Traditional Knowledge

Ability Enhancement courses	Annexure III
Mandatory Courses	Gender Equality

Suggestions are considered and updated in the syllabi. The details of Ability Enhancement courses *are provided in Annexure-III*

Ability Enhancement courses, Mandatory Courses are approved and recommended to Academic council

BoS /2024 /UG/CCE 8.6

To discuss the syllabi of Honours / Minor degree programme under Regulations 2023

The Honours degree courses are lifted by the Computer Science and Engineering Department and no Minor degree is provided by CCE. Discussed the course titles offered by CSE with the members.

Honours degree programme Courses are discussed

BoS /2024 /UG/CCE 8.7

To discuss the Ability Enhancement Courses, Mandatory Courses offered for I and III semester under Regulations 2023.

BoS Chairperson presented the following Ability Enhancement courses, Mandatory Courses offered for I and III semester under Regulations 2023.Ensure no change with respect to previous BoS.

Batch	**2024 - 2028**
Ability Enhancement courses	Web Application Development (HTML, CSS, JS)
Mandatory Courses	Induction Program

Batch	**2023 - 2027**
Ability Enhancement courses	Cisco Certified Network Associate - Level 2
Mandatory Courses	Climate Change

Ability Enhancement Courses, Mandatory Courses are approved and recommended to Academic council

2.A.12.5

BoS /2024 /UG/CCE 8.8

To discuss the Elective courses, Employability Enhancement courses, Mandatory Courses opted by students for V and VII semester under Regulations 2020.

BoS Chairperson presented the following Elective courses, Employability Enhancement courses, Mandatory Courses and certification courses are opted by the students in the odd Semester of academic year 2024-25

Batch 2021-2025	
Professional Elective course	Green Computing
Open Elective course	Automation Tools and Techniques - DevOps
Mandatory Course	Professional Ethics
Batch 2022-2026	
Professional Elective	Computer Vision Technology
Open Elective	Product Development and Design
Certification Course	Cyber Security
Skill Development Courses	Skill Development Course 4: Career and Professional Skill Development Program -1 Skill Development Course 5: Presentation Skill using ICT
Mandatory Course	Indian Constitution

BoS /2024 /UG/CCE 8.9

To ratify the new course title named as "Principles of Computer Organization" instead of Computer Organization and Architecture" in Semester-III for Regulation 2023.

BoS Chairperson with BoS experts approved the new course title as "Principles of Computer Organization" instead of Computer Organization and Architecture" in Semester-III for Regulation 2023 due to this subject is major comprises of Organization.

Suggestions are considered and updated in the syllabi.The details are provided in Annexure-I

Ratification are updated in the curriculum and syllabi.

BoS /2024 /UG/CCE 8.10

To discuss the process of Equivalent Certificate providing for the course Computer and Communication Engineering.

BoS Chairperson discussed the process of Equivalent Certificate providing for the course Computer and Communication Engineering with BOS experts and the following suggestion were given by them.

- If the CCE curriculum is more similar to another programme than 75%, then supporting document proof can be provided for Equivalence Certificate.

Suggestions are considered and the details are provided in Annexure- IV

2.A.12.6

BoS /2024 /UG/CCE 8.11

To apprise Department calendar, NPTEL courseregistration, Guest Lectures and other Department activities

The Board Chairperson Briefed about the following Department activities carried out in the academic year 2024-25 as per academic calendar

- Continuous Assessment Test
- Project Reviews
- Guest Lectures organized
- Students Achievements
- NPTEL registered details

Appreciated for the activities carried in the Department

BoS /2024 /UG/CCE 8.12

To apprise the students end semester examination results in August 2024.

The BoS members reviewed the following end Semester results of present students

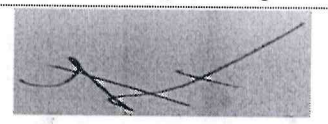
Year	Total No students	No of Students Pass in that semester	Pass Percentage in Current Sem	No of students passed overall	Overall Pass Percentage
IV Year	57	56	98	48	84
III Year	59	47	80	46	78
II Year	57	49	86	45	79

Appreciated for the good result

BoS /2024 /UG/CCE 8.13

Any other item with the permission of chair

The Board of Studies resolved to approve the above suggestions for B.Tech. Computer and Communication Engineering brought forward by the Chairperson incorporating the above changes. The meeting was concluded at 4:30 PM with a vote of thanks by **Dr.R.Ramya,** Head of the Department, Computer and Communication Engineering.



Dr. R.Ramya
Chairperson
Professor and Head
Department of CCE, SMVEC

Dr. P.Varalakshmi
Professor, Department of CSE
MIT, Chrompet Chennai

2.A.12.7

Dr. Sangeetha R.G Professor, School of Electronics Engineering VIT University, Chennai	**Dr. T. Subbulakshmi** Professor, School of Computer Science Engineering, VIT, Chennai.
Mr.DeepanChandrasekaran **Project Manager, Manager-Projects** Test Lead-Cognizant Technology Solutions	**Dr. V.Vijayalakshmi** Professor, Department of ECE Pondicherry Technological University **Puducherry**
Mrs.V.Gomathi Assistant Professor/CCE	**Mrs. T.Sivaranjani** Assistant Professor /CCE
Mr. J.Saravanan Assistant Professor/CCE	**Mr. G.K.Senthil Kumar** Assistant Professor/CCE
Ms. S.Keerthana Assistant Professor /CCE	**Mrs. M. Abirami** Assistant Professor /CCE
Mrs. J.Rekha Assistant Professor /CCE	**Ms. Mishael Sneha** Assistant Professor /CCE
Dr.K.Samuvelraj Assistant Professor /Physics	Dr.K.Karthikeyan Assistant Professor/Chemistry
Dr.D. Devi Assistant Professor/Englsih	**Dr.A.Ashok** Assistant Professor /Mathematics
Mr. M.Saravanan(Alumini) Senior Software Engineer, Verizon	

2.A.12.8

SRI MANAKULA VINAYAGAR
ENGINEERING COLLEGE

(An Autonomous Institution)

Puducherry

B.TECH.

COMPUTER AND COMMUNICATION ENGINEERING

ACADEMIC REGULATIONS 2023
(R-2023)

CURRICULUM AND SYLLABI

25 years of ACADEMIC EXCELLENCE

D.A.12.9

VISION AND MISSION OF THE INSTITUTE

Vision

To be globally recognized for excellence in quality education, innovation and research for thetransformation of lives to serve the society

Mission

M1 - Quality Education	To provide comprehensive academic system that amalgamates the cutting edge technologies with best practices.
M2 -Research and Innovation	To foster value based research and innovation in collaboration with industries and institutions globally for creating intellectuals with new avenues.
M3 - Employability and Entrepreneurship	To inculcate the employability and entrepreneurial skills through value and skill based training
M4:- Ethical values	To instill deep sense of human values by blending societal righteousness with academic professionalism for growth of society

VISION AND MISSION OF THE DEPARTMENT

Vision

To promote students with latest technology and research in the field of Computer and Communication Engineering to meet global socio-economic needs

Mission

M1- Technical Knowledge:	To provide academic excellence in the field of computer and Communication engineering to meet the needs of the Society.
M2-Innovation and Exposure:	To conduct recognized research analytically in multi-disciplinary Research areas of the framework at National and International levels
M3-Employability and Entrepreneurship:	To provide complementary technical, inter and intrapersonal skills for employability and entrepreneurship
M4-Ethics:	To instruct integrity, ethical principles and interactive skills among the students to form a better nation

2.A.12.10

PROGRAM OUTCOMES

PO1: Engineering knowledge:

Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis:

Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/development of solutions:

Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: 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.

PO5: Modern tool usage:

Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: The engineer and society:

Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and sustainability:

Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of and need for sustainable development.

PO8: Ethics:

Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and team work:

Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication:

Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project management and finance:

Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Life-long learning:

Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

2.A.12.11

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO1: Technical Knowledge	To satisfy the requirements of industry, Research and Development organizations by employing technological knowledge in Computer and Communication Engineering.
PEO2: Leadership Skill	To lead, contribute and innovate new technologies and systems in the key domains of Computer and Communication Engineering
PEO3: Research and Development	To get exposed to collaborative work that can be implemented for society's well-being through advance research expertise
PEO4: Professional Behavior	Gains code of conduct, etiquettes to establish boundaries in environment.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

PSO1- Basic Knowledge in CCE	Use the latest tools and technologies to apply the fundamental concepts of computer and communication engineering principles to software development, mobile communication and computing
PSO 2-Network Design and Security	Design and Interpret computer networks, Internet of Things with efficient data analytics and security.
PSO 3- Algorithmic Thinking and Programming Skill	Develop efficient algorithms to solve real time problems through powerful programming and problem solving skills

2.A.12.12

STRUCTURE FOR UNDERGRADUATE ENGINEERING PROGRAM

Sl. No	Course Category	Breakdown of Credits
1	Humanities and Social Sciences including Management courses (HS)	15
2	Basic Science Courses (BS)	20
3	Engineering Science including workshop, drawing, basics of electrical / mechanical / computer etc. (ES)	29
4	Professional Core Courses (PC)	65
5	Professional Electives Courses (PE)	18
6	Open Electives Courses (OE)	9
7	Project Work and Internship (PA)	13
8	Ability Enhancement Courses (AEC*)	
9	Mandatory Courses (MC*)	-
Total		**169**

SCHEME OF CREDIT DISTRIBUTION – SUMMARY

Sl. No	AICTE Suggested Course Category	Credits per Semester								Total Credits
		I	II	III	IV	V	VI	VII	VIII	
1	Humanities and Social Science (HS)	5	3	1	1	2			3	15
2	Basic Sciences(BS)	4	7	5	4					20
3	Engineering Sciences (ES)	12	13		4					29
4	Professional Core (PC)			16	11	12	15	11		65
5	Professional Electives (PE)				3	3	3	3	6	18
6	Open Electives (OE)				-	3	3	3		9
7	Project Work (PA)					1	1	2	8	12
8	Internship (PA)							1		**1**
9	Ability Enhancement Courses (AEC*)	-	-	-	-	-	-	-	-	-
10	Mandatory courses (MC*)	-	-	-	-	-	-	-	-	-
Total		**22**	**21**	**23**	**22**	**23**	**21**	**22**	**20**	**169**

**** AEC and MC are not included for CGPA calculation***

HONOURS / MINOR DEGREE PROGRAMME:

The student is permitted to opt for earning an Honours / Minor degree in the same discipline of engineering in addition to the degree in his/her own discipline. To earn an Honours / Minor degree the student is required to earn an additional 18 - 20 credits (over and above the total 170 credits prescribed in the curriculum) starting from fourth semester onwards by completing 5 additional courses offered in respective semesters. A student is eligible to exercise this option if he/she has passed all the courses offered upto third semester in the first attempt itself and has earned a CGPA / GPA* (*for lateral entry) of not less than 8.0. The prescribed courses offered for Honours / Minor degree are given in **Annexure -V**

2.A.19.13

SEMESTER-I										
Sl.No	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U23MATC01	Engineering Mathematics – I	BS	3	1	0	4	25	75	100
2	U23HSTC01	Universal Human Values- II	HS	2	0	0	2	25	75	100
3	U23CSTC01	Programming in C	ES	3	0	0	3	25	75	100
4	U23CSTC02	Problem Solving Approach	ES	3	0	0	3	25	75	100
5	U23ESTC03	Basics of Electrical and Electronics Engineering	ES	3	0	0	3	25	75	100
Theory Cum Practical										
6	U23ENBC01	Communicative English - I	HS	2	0	2	3	50	50	100
Practical										
7	U23ESPC01	Basics of Electrical and Electronics Engineering Laboratory	ES	0	0	2	1	50	50	100
8	U23CSPC01	Programming in C Laboratory	ES	0	0	2	1	50	50	100
9	U23ESPC03	Engineering Graphics using AutoCAD	ES	0	0	2	1	50	50	100
Ability Enhancement Course										
10	U23CCC1XX	Certification Course – I**	AEC	0	0	4	-	100	-	100
Mandatory Course										
11	U23CCM101	Induction Program	MC	2 Weeks			-	-	-	-
							21	425	575	1000

***** Certification Courses are to be selected from the list given in Annexure III***

SEMESTER – II										
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U23MATC02	Engineering Mathematics -II	BS	3	1	0	4	25	75	100
2	U23BSTC01	Physical Science for Engineers	BS	3	0	0	3	25	75	100
3	U23CSTC03	Data Structures	ES	3	0	0	3	25	75	100
4	U23ADTC01	Programming in Python	ES	3	0	0	3	25	75	100
5	U23CCT201	Digital Electronics	PC	3	0	0	3	25	75	100
Theory Cum Practical										
6	U23ENBC02	Communicative English - II	HS	2	0	2	3	50	50	100
Practical										
7	U23ADPC01	Programming in Python Laboratory	ES	0	0	2	1	50	50	100
8	U23CSPC02	Data Structures Laboratory	ES	0	0	2	1	50	50	100
9	U23CCP201	Digital Electronics Laboratory	PC	0	0	2	1	50	50	100
10	U23ESPC02	Design Thinking and Idea Lab	ES	0	0	2	1	50	50	100
Ability Enhancement Course										
11	U23CCC2XX	Certification Course - II**	AEC	0	0	4	-	100	-	100
Mandatory Course										
12	U23CCM202	Sports Yoga and NSS	MC	0	0	2	-	100	-	100
							23	575	625	1200

***** Certification Courses are to be selected from the list given in Annexure III***

2.A.12.14

SEMESTER – III										
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U23MATC03	Probability and Statistics	BS	3	1	0	4	25	75	100
2	U23CCT302	Principles of Computer Organization	PC	3	0	0	3	25	75	100
3	U23CCT303	Analog Electronics	PC	3	0	0	3	25	75	100
4	U23CCT304	Principles of Communication Engineering	PC	3	0	0	3	25	75	100
5	U23CCT305	Software Engineering Principles and Testing Techniques	PC	3	0	0	3	25	75	100
Theory Cum Practical										
6	U23CSBC01	Design and Analysis of Algorithms	PC	2	0	2	3	50	50	100
Practical										
7	U23MAPC01	Engineering Mathematics Laboratory	BS	0	0	2	1	50	50	100
8	U23ENPC01	General Proficiency-I	HS	0	0	2	1	50	50	100
9	U23CCP302	Principles of Communication Engineering Laboratory	PC	0	0	2	1	50	50	100
Ability Enhancement Course										
10	U23CCS301	Skill Enhancement Course-I*	AEC	0	0	4	-	100	-	100
11	U23CCC3XX	Certification Course -III**	AEC	0	0	4	-	100	-	100
Mandatory Course										
12	U23CCM303	Climate Change	MC	2	0	0	-	100	-	100
							22	625	575	1200

SEMESTER – IV										
Sl. No	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U23MATC05	Discrete Mathematics and Graph theory	BS	3	1	0	4	25	75	100
2	U23ITTC02	Programming in Java	ES	3	0	0	3	25	75	100
3	U23CSTC04	Database Management Systems	PC	3	0	0	3	25	75	100
4	U23CCT406	Computer and Communication Networks	PC	3	0	0	3	25	75	100
5	U23CCE4XX	Professional Elective - I#	PE	3	0	0	3	25	75	100
Theory Cum Practical										
6	U23CCB401	Operating Systems Principles and Practices	PC	2	0	2	3	50	50	100
Practical										
7	U23ENPC02	General Proficiency - II	HS	0	0	2	1	50	50	100
8	U23ITPC02	Programming in Java Laboratory	ES	0	0	2	1	50	50	100
9	U23CSPC03	Database Management Systems Laboratory	PC	0	0	2	1	50	50	100
10	U23CCP403	Computer and Communication Networks Laboratory	PC	0	0	2	1	50	50	100
Ability Enhancement Course										
11	U23CCS402	Skill Enhancement Course-II*	AEC	0	0	4	-	100	-	100
12	U23CCC4XX	Certification Course -IV**	AEC	0	0	4	-	100	-	100
Mandatory Course										
13	U23CCM404	Right to Information and Good Governance	MC	2	0	0	-	100	-	100
							23	675	625	1300

#Professional Electives are to be selected from the list given in Annexure I

***** Certification Courses are to be selected from the list given in Annexure III***

**** Skill Development Courses (1 and 2) are to be selected from the list given in Annexure IV***

2. A. 12.15

SEMESTER – V										
Sl.No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U23HSTC02	Research Methodology	HS	2	0	0	2	25	75	100
2	U23CSTC06	Artificial Intelligence	PC	3	0	0	3	25	75	100
3	U23CCT507	Signal Processing	PC	3	0	0	3	25	75	100
4	U23CCT508	Cyber Physical System Design	PC	3	0	0	3	25	75	100
5	U23CCE5XX	Professional Elective - II#	PE	3	0	0	3	25	75	100
6	U23XXOC0X	Open Elective-I$	OE	3	0	0	3	25	75	100
Practical										
7	U23CSPC05	Artificial Intelligence Laboratory	PC	0	0	2	1	50	50	100
8	U23CCP504	Signal Processing Laboratory	PC	0	0	2	1	50	50	100
9	U23CCP505	Cyber Physical System Design Laboratory	PC	0	0	2	1	50	50	100
Project Work										
10	U23CCW501	Micro Project	PA	0	0	2	1	100	-	100
Ability Enhancement Course										
11	U23CCC5XX	Certification Course - V**	AEC	0	0	4	-	100	-	100
Mandatory Course										
12	U23CCM505	Essence of Indian Traditional Knowledge	MC	2	0	0	-	100	-	100
							21	600	600	1200

SEMESTER – VI										
Sl. No	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U23ITTC03	Machine Learning	PC	3	0	0	3	25	75	100
2	U23CCT609	Microprocessor and Embedded Systems	PC	3	0	0	3	25	75	100
3	U23CCT610	Internet and Web Programming	PC	3	0	0	3	25	75	100
4	U23CCE6XX	Professional Elective - III#	PE	3	0	0	3	25	75	100
5	U23XXOC0X	Open Elective-II$	OE	3	0	0	3	25	75	100
Theory Cum Practical										
6	U23CCB602	Data Science for Networking	PC	2	0	2	3	50	50	100
Practical										
7	U23ITPC03	Machine Learning Laboratory	PC	0	0	2	1	50	50	100
8	U23CCP606	Microprocessor and Embedded Systems Laboratory	PC	0	0	2	1	50	50	100
9	U23CCP607	Internet and Web Programming Laboratory	PC	0	0	2	1	50	50	100
Project Work										
10	U23CCW602	Mini Project	PA	0	0	2	1	100	-	100
Ability Enhancement Course										
11	U23CCC6XX	Certification Course - VI**	AEC	0	0	4	-	100	-	100
Mandatory Course										
12	U23CCM606	Gender Equality	MC	2	0	0	-	100	-	100
							22	575	625	1200

#Professional Electives are to be selected from the list given in Annexure I
$ Open Electives are to be selected from the list given in Annexure II
***** Certification Courses are to be selected from the list given in Annexure III***

2.A.12.15

SEMESTER – VII										
Sl. No	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U23ECTC01	Internet of Things	PC	3	0	0	3	25	75	100
2	U23CCT711	Cloud Computing and Distributed Systems	PC	3	0	0	3	25	75	100
3	U23CCT712	Blockchain Technology and Application	PC	3	0	0	3	25	75	100
4	U23CCE7XX	Professional Elective - IV#	PE	3	0	0	3	25	75	100
5	U23XXOC0X	Open Elective -III$	OE	3	0	0	3	25	75	100
Practical										
6	U23ECPC01	Internet of Things Laboratory	PC	0	0	2	1	50	50	100
7	U23CCP708	Cloud Computing and Distributed Systems Laboratory	PC	0	0	2	1	50	50	100
Project Work										
8	U23CCW703	Project Phase - I	PA	0	0	4	2	50	50	100
9	U23CCW704	Internship / Inplant Training	PA	0	0	2	1	100	-	100
							20	475	525	1000

SEMESTER – VIII										
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U23HSTC03	Entrepreneurship and Business Management	HS	3	0	0	3	25	75	100
2	U23CCE8XX	Professional Elective - V#	PE	3	0	0	3	25	75	100
3	U23CCE8XX	Professional Elective - VI#	PE	3	0	0	3	25	75	100
Project Work										
5	U23CCW805	Project phase - II	PA	0	0	16	8	50	100	150
							17	125	325	450

#Professional Electives are to be selected from the list given in Annexure I .

2.A.12.17

Annexure – I

PROFESSIONAL ELECTIVE COURSES

Professional Elective – I (Offered in Semester IV)		
Sl. No.	**Course Code**	**Course Title**
1	U23CCE401	Mobile Communication and Networks
2	U23CCE402	Network Analysis and Management
3	U23CCE403	Information and Image coding Theory
4	U23CCE404	Compiler Design
5	U23CCE405	Azure Development and Operations
Professional Elective – II (Offered in Semester V)		
Sl. No.	**Course Code**	**Course Title**
1	U23CCE506	Wireless Adhoc and Sensor Networks
2	U23CCE507	Data Mining and Information Warehousing
3	U23CCE508	Multimedia Graphics Design
4	U23CCE509	Theory of Computation
5	U23ITEC01	Software Defined Networks
Professional Elective – III (Offered in Semester VI)		
Sl. No.	**Course Code**	**Course Title**
1	U23CCE610	Advanced Communication Techniques
2	U23ECEC01	Digital Image Processing
3	U23CCE611	Computational Intelligence
4	U23CCE612	Artificial Neural Networks
5	U23ITEC02	Natural Language Processing
Professional Elective – IV (Offered in Semester VII)		
Sl. No.	**Course Code**	**Course Title**
1	U23CCE713	Optical and Satellite Communication
2	U23CCE714	Video Processing
3	U23CCE715	Software Design and Project Management
4	U23CCE716	Quantum Cryptography
5	U23ITEC03	Robotic Process Automation
Professional Elective – V (Offered in Semester VIII)		
Sl. No.	**Course Code**	**Course Title**
1	U23CCE817	Massive MIMO Networks
2	U23CCE818	Telecommunication and Switching Techniques
3	U23CCE819	Deep Learning and Applications
4	U23CCE820	Game Theory and its Application
5	U23ECEC02	High Speed Networks
Professional Elective – VI (Offered in Semester VIII)		
Sl. No.	**Course Code**	**Course Title**
1	U23CCE821	4G/5G Communication Networks
2	U23CCE822	AI Principles for Edge Computing
3	U23CCE823	Bigdata Analytics
4	U23CCE824	Mobile Application Engineering
5	U23ITEC04	Human Computer Interaction

9.A.12.18

Annexure – II

OPEN ELECTIVE COURSES

S. No	Course Code	Course Title	Offering Department	Permitted Departments
Open Elective – I / II (Offered in Semester V/VI)				
1	U23CCOC01	Introduction to Communication Technologies	CCE	EEE, MECH, CSE,IT, CIVIL, ICE, Mechatronics, BME, AI&DS
2	U23CCOC02	Introduction to Computer Networks	CCE	EEE, MECH, CIVIL, ICE, Mechatronics, BME, AI&DS
Open Elective – III (Offered in Semester VII)				
3	U23CCOC03	Flutter Application Development	CCE	EEE, ECE, MECH, CSE,IT, CIVIL, ICE, Mechatronics, BME, AI&DS
4	U23CCOC04	Network Essentials and Security	CCE	EEE, MECH, CSE,IT, CIVIL, ICE, Mechatronics, BME, AI&DS

2.A.12.19

Annexure – III

ABILITY ENHANCEMENT COURSES – (A). CERTIFICATION COURSES

S. No	Course Code	Course Title	Certified By
1	U23CCCX01	Adobe Photoshop	Adobe
2	U23CCCX02	Adobe Animate	Adobe
3	U23CCCX03	Adobe Dreamweaver	Adobe
4	U23CCCX04	Adobe After Effects	Adobe
5	U23CCCX05	Adobe Illustrator	Adobe
6	U23CCCX06	Adobe InDesign	Adobe
7	U23CCCX07	Autodesk AutoCAD -ACU	Autodesk
8	U23CCCX08	Autodesk Inventor - ACU	Autodesk
9	U23CCCX09	Autodesk Revit - ACU	Autodesk
10	U23CCCX10	Autodesk Fusion 360 - ACU	Autodesk
11	U23CCCX11	Autodesk 3ds Max - ACU	Autodesk
12	U23CCCX12	Autodesk Maya - ACU	Autodesk
13	U23CCCX13	Cloud Security Foundations	AWS
14	U23CCCX14	Cloud Computing Architecture	AWS
15	U23CCCX15	Cloud Foundation	AWS
16	U23CCCX16	Cloud Practitioner	AWS
17	U23CCCX17	Cloud Solution Architect	AWS
18	U23CCCX18	Data Engineering	AWS
19	U23CCCX19	Machine Learning Foundation	AWS
20	U23CCCX20	Robotic Process Automation / Medical Robotics	Blue Prism
21	U23CCCX21	Advance Programming Using C	CISCO
22	U23CCCX22	Advance Programming Using C ++	CISCO
23	U23CCCX23	C Programming	CISCO
24	U23CCCX24	C++ Programming	CISCO
25	U23CCCX25	CCNP Enterprise: Advanced Routing	CISCO
26	U23CCCX26	CCNP Enterprise: Core Networking	CISCO
27	U23CCCX27	Cisco Certified Network Associate - Level 2	CISCO
28	U23CCCX28	Cisco Certified Network Associate- Level 1	CISCO
29	U23CCCX29	Cisco Certified Network Associate- Level 3	CISCO
30	U23CCCX30	Fundamentals Of Internet of Things	CISCO
31	U23CCCX31	Internet Of Things / Solar and Smart Energy System with IoT	CISCO
32	U23CCCX32	Java Script Programming	CISCO
33	U23CCCX33	NGD Linux Essentials	CISCO
34	U23CCCX34	NGD Linux I	CISCO
35	U23CCCX35	NGD Linux II	CISCO
36	U23CCCX36	Advance Java Programming	Ethnotech
37	U23CCCX37	Android Programming / Android Medical App Development	Ethnotech
38	U23CCCX38	Angular JS	Ethnotech

2.A.18.20

39	U23CCCX39	Catia	Ethnotech
40	U23CCCX40	Communication Skills for Business	Ethnotech
41	U23CCCX41	Coral Draw	Ethnotech
42	U23CCCX42	Data Science Using R	Ethnotech
43	U23CCCX43	Digital Marketing	Ethnotech
44	U23CCCX44	Embedded System Using C	Ethnotech
45	U23CCCX45	Embedded System with IOT / Arduino	Ethnotech
46	U23CCCX46	English For IT	Ethnotech
47	U23CCCX47	Plaxis	Ethnotech
48	U23CCCX48	Sketch Up	Ethnotech
49	U23CCCX49	Financial Planning, Banking and Investment Management	Ethnotech
50	U23CCCX50	Foundation Of Stock Market Investing	Ethnotech
51	U23CCCX51	Machine Learning / Machine Learning for Medical Diagnosis	Ethnotech
52	U23CCCX52	IOT Using Python	Ethnotech
53	U23CCCX53	Creo (Modelling & Simulation)	Ethnotech
54	U23CCCX54	Soft Skills, Verbal, Aptitude	Ethnotech
55	U23CCCX55	Software Testing	Ethnotech
56	U23CCCX56	MX-Road	Ethnotech
57	U23CCCX57	CLO 3D	Ethnotech
58	U23CCCX58	Solid works	Ethnotech
59	U23CCCX59	Staad Pro	Ethnotech
60	U23CCCX60	Total Station	Ethnotech
61	U23CCCX61	Hydraulic Automation	Festo
62	U23CCCX62	Industrial Automation	Festo
63	U23CCCX63	Pneumatics Automation	Festo
64	U23CCCX64	Agile Methodologies	IBM
65	U23CCCX65	Block Chain	IBM
66	U23CCCX66	Devops	IBM
67	U23CCCX67	Artificial Intelligence	ITS
68	U23CCCX68	Cloud Computing	ITS
69	U23CCCX69	Computational Thinking	ITS
70	U23CCCX70	Cyber Security	ITS
71	U23CCCX71	Data Analytics	ITS
72	U23CCCX72	Databases	ITS
73	U23CCCX73	Java Programming	ITS
74	U23CCCX74	Networking	ITS
75	U23CCCX75	Python Programming	ITS
76	U23CCCX76	Web Application Development (HTML, CSS, JS)	ITS
77	U23CCCX77	Network Security	ITS & Palo alto
78	U23CCCX78	MATLAB	MathWorks
79	U23CCCX79	Azure Fundamentals	Microsoft
80	U23CCCX80	Azure AI (AI-900)	Microsoft
81	U23CCCX81	Azure Data (DP -900)	Microsoft

2.A.12.21

82	U23CCCX82	Microsoft 365 Fundamentals (SS-900)	Microsoft
83	U23CCCX83	Microsoft Security, Compliance and Identity (SC-900)	Microsoft
84	U23CCCX84	Microsoft Power Platform (PI-900)	Microsoft
85	U23CCCX85	Microsoft Dynamics Fundamentals 365 – CRM	Microsoft
86	U23CCCX86	Microsoft Excel	Microsoft
87	U23CCCX87	Microsoft Excel Expert	Microsoft
88	U23CCCX88	Securities Market Foundation	NISM
89	U23CCCX89	Derivatives Equinity	NISM
90	U23CCCX90	Research Analyst	NISM
91	U23CCCX91	Portfolio Management Services	NISM
92	U23CCCX92	Cyber Security	Palo alto
93	U23CCCX93	Cloud Security	Palo alto
94	U23CCCX94	PMI – Ready	PMI
95	U23CCCX95	Tally – GST & TDS	Tally
96	U23CCCX96	Advance Tally	Tally
97	U23CCCX97	Associate Artist	Unity
98	U23CCCX98	Certified Unity Programming	Unity
99	U23CCCX99	VR Development	Unity

2.A.12.22

Annexure – IV

ABILITY ENHANCEMENT COURSES – (B). SKILL ENHANCEMENT COURSES

Sl. No	Course Code	Course Title
1	U23CCS301	Skill Enhancement Course I: *
		1)Computer on Office Automation
		2)Animation Practices
		3)PCB and Circuit Design
2	U23CCS402	Skill Enhancemet Course II: *
		1)Computer Hardware and Troubleshooting
		2)Mobile Servicing
		3)Android App Development

**** Any one course to be selected from the list***

2.A.12.23

Annexure – V

- B.Tech. Computer and Communication Engineering Honours in **Cyber Security**

Courses Offered in various Semesters

Semester	Course Code	Course Title	Periods			Credits	Max.Marks		
			L	T	P		CAM	ESM	Total
IV	U23CSX401	Cryptography and data privacy	3	1	0	4	25	75	100
V	U23CSX502	Cyber Security Essentials	3	1	0	4	25	75	100
VI	U23CSX603	Malware Analysis and Reverse Engineering	3	1	0	4	25	75	100
VII	U23CSX704	Security Incident and Response Management	3	1	0	4	25	75	100
VIII	U23CSX805	Artificial Intelligence for Cyber Security	3	1	0	4	25	75	100
Total						**20**	125	375	500
Equivalent NPTEL courses##									
IV to VII Sem	U23CSXN01	**Cyber Security Equivalent NPTEL courses**				**3**	**12 Weeks Course**		

students shall be given an option to earn 3 credits through one equivalent 12 weeks NPTEL course instead of any one course listed for honours degree programme that should be completed before the commencement of eighth semester. The Equivalent courses are subject to change based on its availability as per NPTEL course list.

2.A.12.24

Annexure - I

2.A.12.25

2.A.12.25

SEMESTER–III										
Sl. No.	Course Code	CourseTitle	Category	Periods			Credits	Max.Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U23MATC03	Probability and Statistics	BS	3	1	0	4	25	75	100
2	U23CCT302	Principles of Computer Organization	PC	3	0	0	3	25	75	100
3	U23CCT303	Analog Electronics	PC	3	0	0	3	25	75	100
4	U23CCT304	Principles of Communication Engineering	PC	3	0	0	3	25	75	100
5	U23CCT305	Software Engineering Principles and Testing Techniques	PC	3	0	0	3	25	75	100
Theory Cum Practical										
6	U23CSBC01	Design and Analysis of Algorithms	PC	2	0	2	3	50	50	100
Practical										
7	U23MAPC01	Engineering Mathematics Laboratory	BS	0	0	2	1	50	50	100
8	U23ENPC01	General Proficiency-I	HS	0	0	2	1	50	50	100
9	U23CCP302	Principles of Communication Engineering Laboratory	PC	0	0	2	1	50	50	100
AbilityEnhancementCourse										
10	U23CCS301	Skill Enhancement Course-I*	AEC	0	0	4	-	100	-	100
11	U23CCC3XX	CertificationCourse–III**	AEC	0	0	4	-	100	-	100
MandatoryCourse										
12	U23CCM303	Climate Change	MC	2	0	0	-	100	-	100
							22	625	575	1200

2.A.12.07

2.A-12-28

Department	Mathematics	Programme: B.Tech.						
Semester	III	Course Category Code: BS				*End Semester Exam Type:TE		
Course Code	U23MATC03	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	PROBABILITY AND STATISTICS	3	1	0	4	25	75	100

(Common to All Branches Except CSBS)

Prerequisite	Basic Probability	
Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1 Understand the concept of probability.	K3
	CO2 Solve the problem on Random variables.	K3
	CO3 Understand the concepts of Analysis of variance.	K3
	CO4 Learn the applications of Large Samples.	K3
	CO5 Analyze the problems in small samples.	K3

UNIT – I	THEORY OF PROBABILITY	Periods:12
Random Experiments - Sample Space - Exhaustive events- Axioms of probability – Conditional probability – Total probability – Bayes theorem.		CO1
UNIT – II	**RANDOM VARIABLES**	**Periods:12**
Discrete Random Variable – Binomial distribution – Poisson distribution. Continuous Random Variable – Exponential distribution – Normal distribution (Excluding Derivation of Mean, Variance and MGF).		CO2
UNIT – III	**STATISTICS & ANALYSIS OF VARIANCES**	**Periods:12**
Correlation – Rank correlation and Regression. Analysis of variance: One-way classifications. and two-way classifications.		CO3
UNIT – IV	**LARGE SAMPLES**	**Periods:12**
Large Samples: Single Propositions – Difference of Proportions – Single Mean – Difference of Mean – Difference of Standard Deviations.		CO4
UNIT – V	**SMALL SAMPLES**	**Periods:12**
Test for Single and Difference Mean – Test for Ratio of Variances – Chi-Square test for Goodness of Fit and Independence of Attributes.		CO5

Lecture Periods:45	Tutorial Periods:15	Practical Periods: -	Total Periods:60

Text Books

1. T. Veerarajan, "Probability, Statistics and Random Processes", Tata McGraw-Hill, 3rd Edition, 2008.
2. A. Singaravelu, "Probability and Statistics", Meenakshi Agency, 2019.
3. S.C. Gupta, V.K. Kapur "Fundamental of Mathematical Statistics" Sultan Chand & sons, 12th Edition, 2022.

Reference Books

1. B.S. Grewal, "Higher Engineering Mathematics", Khanna publishers, 3rd Edition,2017
2. William Mendenhall, Robert J. Beaver and Barbara M. Beaver: "Introduction to Probability & Statistics", Cengage Learning, 15thEdition, 2019.
3. Richard. A. Johnson, Irwin Miller and John E. Freund," Probability and Statistics for Engineers", Pearson Education, Asia, 9th Edition, 2018.
4. Vijay K. Rohatgi and A.K. Md. Ehsanes Saleh, "An Introduction to Probability and Statistics", Wiley, 3rd Edition 2008.

Web References

1. www.stat110.net
2. http://www.nptel.ac.in/courses/111105035 (R.V)
3. http:// www.probabilitycourse.com.
4. www.edx.org/Probability
5. http://www2.aueb.gr/users/demos/pro-stat.pdf

TE – Theory Exam, LE – Lab Exam

2.A.12.29

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	1	-	-	-	-	-	-	-	1	3	-	-
2	3	2	1	1	-	-	-	-	-	-	-	1	3	-	-
3	2	2	-	-	-	1	-	-	-	-	-	1	3	-	-
4	3	2	1	1	-	1	-	-	-	1	-	1	3	-	1
5	3	2	1	1	-	1	-	-	-	1	-	1	3	-	1

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

2.A.12.30

Department	Computer and Communication Engineering	Programme:**B.Tech.**						
Semester	III	Course Category Code:**PC**			End Semester Exam Type:**TE**			
Course Code	U23CCT302	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**PRINCIPLES OF COMPUTER ORGANIZATION**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
(CCE)								
Prerequisite	Computer Basics							

Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1 Explain the basic functional blocks of computer	**K2**
	CO2 Describing the basic Computer organization and addressing modes	**K2**
	CO3 Solve arithmetic problems by 2's complement and Booth's algorithm	**K3**
	CO4 Classify types of memory used for various applications	**K3**
	CO5 Classify various Input-Output Interface and Multiprocessors	**K3**

UNIT-I	**Structure of Computers**	**Periods:09**
Introduction - IAS Computer - Von Neumann Architecture -Bus Structure and its Types. Data Representation, CPU Organization: Arithmetic and Logic Unit, Control Unit, CPU Registers, Instruction Registers, Program Counter, Stack Pointer. CISC &RISC processors, Performance - Processor clock, Basic performance equation, Clock rate, Performance measurement.		**CO1**
UNIT-II	**Basic Computer Organization and Design**	**Periods:09**
Instruction Codes-Computer Instructions-Instruction Cycle-Timing and Control. Central processing unit: Stack Organization- Instruction Formats -Addressing Modes - Data Transfer and manipulation-Program Control.		**CO2**
UNIT-III	**ALU**	**Periods:09**
Basic Structure of ALU, Addressing mode, Instruction Formats, Handling of interrupts and subroutines, Combinational ALU, 2's Complement Addition, Subtraction Unit, Booth's Algorithm for multiplication and division.		**CO3**
UNIT-IV	**Memory System**	**Periods:09**
Memory System: Memory Hierarchy, Semiconductor Memories, RAM(Random Access Memory), Read Only Memory (ROM), Types of ROM, Cache Memory, Performance considerations.		**CO4**
UNIT-V	**Input-Output and Multiprocessors**	**Periods:09**
Input Output: I/O interface, Programmed IO, Memory Mapped IO, Interrupt Driven IO, DMA. Multiprocessors: Characteristics of multiprocessors, Interconnection structures, Inter Processor Arbitration, Inter processor Communication and Synchronization, Cache Coherence.		**CO5**

Lecture Periods:45	**Tutorial Periods:-**	**Practical Periods:-**	**Total Periods: 45**

Text Book

1. M. Moris Mano (2006), Computer System Architecture, 3rd edition, Pearson/PHI, India.
2. J.P.Hayes, "Computer Architecture and Organization", 3rd edition, TMH, 2017.
3. Thomas C. Bartee, "Computer Architecture and Logic Design", Mc. Graw Hill, 2010

Reference Books

1. Carl Hamacher, Zvonks Vranesic, SafeaZaky (2002), Computer Organization, 5th edition, McGraw Hill, New Delhi, India.
2. William Stallings (2010), Computer Organization and Architecture- designing for performance, 8th edition, Prentice Hall, New Jersy.
3. Anrew S. Tanenbaum (2006), Structured Computer Organization, 5th edition, Pearson Education Inc,
4. John P. Hayes (1998), Computer Architecture and Organization, 3rd edition, Tata McGrawHill

Web References

1. https://nptel.ac.in/courses/106/106/106106092/
2. https://nptel.ac.in/courses/106/106/106106166/
3. https://nptel.ac.in/courses/106/105/106105163/

TE – Theory Exam, LE – Lab Exam

2.A.12.31

COs/POs/PSOs Mapping

COs	ProgramOutcomes (POs)												ProgramSpecific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	1	2	1	-	-	-	-	-	-	1	1	1	-	-
2	3	1	2	1	-	-	-	-	-	-	1	1	1	-	-
3	3	1	2	1	-	-	-	-	-	-	1	1	1	-	-
4	3	1	2	1	-	-	-	-	-	-	1	1	1	-	-
5	3	1	2	1	-	-	-	-	-	-	1	1	1	-	-

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

2-A-12.32

Department	Computer and Communication Engineering	Programme: **B.Tech.**						
Semester	III	Course Category Code: **PC**			*End Semester Exam Type: **TE**			
Course Code	U23CCT303	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**ANALOG ELECTRONICS**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
(CCE)								
Prerequisite	Basic Electronics							

Course Outcomes		On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1	Design BJT amplifier using different types of Biasing	K3
	CO2	Describe different types of power amplifier and its efficiency	K2
	CO3	Design and analyze different type of oscillators	K3
	CO4	Describe characteristics of operational amplifier and design basic circuits using opamp	K2
	CO5	Use opamp for designing basic active electronic circuits	K3

UNIT – I	**BJT AMPLIFIER**	**Periods:09**	
BJT– Need for biasing – DC Load Line and Bias Point – DC analysis of Transistor circuits – Various biasing methods of BJT – Bias Circuit Design – Thermal stability – Stability factors – Bias compensation techniques using Diode, thermistor and sensistor- Features and Comparison of CB,CC and CE amplifiers			**CO1**
UNIT – II	**POWER AMPLIFIER**	**Periods:09**	
Introduction, series –fed Class A amplifier, Transformer-Coupled Class A amplifier, Class B amplifier operation, Class B amplifier circuits, Amplifier distortion, Class C and Class D amplifier			**CO2**
UNIT – III	**OSCILLATORS**	**Periods:09**	
Classification of oscillators, Barkhausen criterion, Analysis of RC phase shift and Wien bridge oscillators, Working of Hartley, Colpitts and Crystal oscillators			**CO3**
UNIT – IV	**OPERATIONAL AMPLIFIERS**	**Periods:09**	
Functional block diagram of Operational amplifier- Ideal Characteristics of an operational Amplifier , frequency response of OP-AMP–Common Mode Rejection Ratio-CMRR, Basic Applications of OP-Amp as an Inverting and Non-Inverting Amplifier, Integrator, Differentiator, Summer ,Subtractor, V to I converter, I to V converter.			**CO4**
UNIT – V	**APPLICATIONS OF OPERATIONAL AMPLIFIERS**	**Periods:09**	
Instrumentation amplifier, Log and Antilog Amplifiers, first order active filters, comparators, multivibrators, waveform generators, S and H circuit, D/A converter (R- 2R ladder and weighted resistor types), A/D converters using opamps			**CO5**

Lecture Periods:45	**Tutorial Periods:-**	**Practical Periods:**	**Total Periods:45**

Text Books

1. Adel .S. Sedra, Kenneth C. Smith, "Micro Electronic Circuits", 6th Edition, Oxford University Press, 2013.
2. Robert L. Boylestad and Louis Nasheresky, "Electronic Devices and Circuit Theory", 10th Edition, Pearson Education /PHI, 2008.
3. D.Roy Choudhry, Shail Jain, "Linear Integrated Circuits", New Age International Pvt. Ltd., 5thEdition, 2018

Reference Books

1. David A., Bell "Electronic Devices and Circuits", Oxford Higher Education Press, 5th Edition, 2010
2. D.Schilling and C.Belove, "Electronic Circuits", 3rd Edition, McGraw Hill, 2009
3. Donald .A. Neamen, "Electronic Circuit Analysis and Design", 2nd Edition,Tata McGraw Hill, 2009
4. Millman J. and C. Halkias, Integrated Electronics, 2/e, McGraw-Hill, 2010·
5. R.S.Sedha, "Applied Electronics", S.Chand& co, 2000

Web References

1. http://www.build-electronic-circuits.com/
2. https://www.allaboutcircuits.com/
3. https://www.electronics-tutorials.ws/amplifier/amp_1.html
4. https://nptel.ac.in/courses/117/103/117103063/
5. https://www.electronics-lab.com/

TE – Theory Exam, LE – Lab Exam

2.A.12.33

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	2	2	1	1			1	1	1	2	2	-
2	3	3	2	1	2	1	1			1	1	1	2	2	-
3	3	3	3	2	2	1	1			1	1	1	2	2	-
4	3	3	3	2	2	1	1			1	2	1	2	2	-
5	3	3	2	1	2	1	1			1	2	1	2	2	-

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

2.A.12.34

Department	Computer and Communication Engineering			Programme:B. Tech			
Semester	III			Course Category Code:PC		End Semester Exam Type:TE	
Course Code	U23CCT304	Periods/Week			Credit	Maximum Marks	
		L	T	P	C	CAM	ESE	TM
Course Name	PRINCIPLES OF COMMUNICATION ENGINEERING	3	0	0	3	25	75	100
(CCE)								

Prerequisite	NIL	
Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1 Comprehend needs of modulation and various analog modulation techniques	K2
	CO2 Describe the principles of Angle Modulation techniques	K2
	CO3 Illustrate pulse modulation techniques.	K3
	CO4 Describe the concept of Digital modulation techniques	K3
	CO5 Impart knowledge on the concepts of fiber optical communication system.	K3

UNIT-I	Amplitude Modulation	Periods:09
Amplitude modulation – frequency spectrum of AM– Power in AM wave – Generation of AM signal - square law modulator, switching modulator, AM demodulation - Envelope and square law demodulation. DSB-SC modulation Balanced and Ring Modulator DSBSC-coherent detector & Costas receiver SSB-SC, VSB generation and demodulation- –Comparison of different AM techniques, Superheterodyne Receiver.		CO1

UNIT-II	Angle Modulation	Periods:09
Basic Definitions, Types of Angle Modulation, Relationship between PM and FM Frequency deviation – Types of FM – Single tone Narrow Band, Wide-Band FM, Remarks about PM – Multi tone Wide-Band FM – Transmission Bandwidth of FM Waves– FM Modulators–Parameter Variation Method (Direct Method), Armstrong method (Indirect Method) – FM Demodulators – Slope Detector, Balanced Slope Detector, Foster Seely Discriminator – Ratio Detector.		CO2

UNIT-III	Pulse Modulation	Periods:09
Generation of PAM, PPM and PWM waves – Demodulation of PAM, PWM Pulse Modulation-Principles of pulse modulation – sampling theorem - PCM - DPCM - Delta modulation and Adaptive delta modulation.		CO3

UNIT-IV	Digital Modulation	Periods:09
Phase shift keying – BPSK, DPSK, QPSK – Principles of M-ary signaling M-ary PSK & QAM – Comparison, ISI – Eye pattern, equalizers.		CO4

UNIT-V	Fiber Optical Communication Systems	Periods:09
Need for fiber optics, introduction to optical fiber, principle of light transmission through a fiber, fiber characteristics and classification, various fiber losses- Light sources and photo detectors- Block diagram of a fiber optic system- Power budget analysis for a optical link-Recent applications of fiber optics.		CO5

Lecture Periods:45	Tutorial Periods:	Practical Periods:-	Total Periods:45

Text Books

1. H Taub, D L Schilling, G Saha, "Principles of Communication Systems", 4th edition, TMH 2017
2. B.P.Lathi," Modern Digital and Analog Communication Systems", 4th edition, Oxford University Press, 2011.
3. Gerd Keiser, Optical fiber Communications, McGraw Hill International Edition, 5th edition, 2017.

Reference Books

1. H P Hsu, Schaum Outline Series, "Analog and Digital Communications", TMH 2006
2. Wayne Tomasi, Electronics Communication systems, Pearson Education Private Limited, 5th edition, 2004.
3. A.Bource Carson and Paul B.Crilly, "Communication Systems", 5th Edition, Mc Graw Hill, 2010
4. Torrieri, Don, "Principles of Spread Spectrum Communication Systems", Springer, 2015
5. S. Haykin, "Digital Communications", John Wiley 1st edition 2013

Web References

1. www.allaboutcircuits.com
2. https://nptel.ac.in/courses/108/102/108102096/
3. http://www.electronics-tutorials.ws
4. www.tutorialspoint.com
5. https://nptel.ac.in/courses/108/104/108104091/

TE – Theory Exam, LE – Lab Exam

2.A.12.35

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	1	2	1	-	-	-	-	-	1	-	1	2	3	-
2	3	1	2	3	-	-	-	-	-	1	-	1	2	2	-
3	3	1	2	3	-	-	-	-	-	1	1	1	2	2	-
4	3	1	2	3	-	-	-	-	1	1	1	1	2	3	-
5	3	1	2	3	-	-	-	-	1	1	1	1	2	3	-

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

2. A. 12. 36

Department	Computer and Communication Engineering			Programme:B.Tech.				
Semester	III			Course Category Code:PC			*End Semester Exam Type:TE	
Course Code	U23CCT305	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	SOFTWARE ENGINEERING PRINCIPLES AND TESTING TECHNIQUES	3	0	0	3	25	75	100
(CCE)								

Prerequisite	NIL	
Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1 Identify various Software Development Life Cycle Models.	K3
	CO2 Utilize Project Management and Requirement Analysis.	K3
	CO3 Apply the appropriate Software Design.	K3
	CO4 Identify appropriate test strategies that can be applied to a given software application.	K3
	CO5 Demonstrate various Quality Metrics and Management Techniques.	K3

UNIT-I	INTRODUCTION	Periods:09
Introduction to Software engineering concepts – The Software Process- Development activities – Software lifecycle models - Waterfall - Incremental – Prototyping – Evolutionary - RAD - Spiral – Agile Development.		CO1

UNIT-II	SOFTWARE MANAGEMENT AND REQUIREMENTS	Periods:09
Software Project management – Project planning – Estimation –Metrics for Project Size Estimation— Empirical Estimation Techniques – COCOMO -Scheduling –Organization and Team structures – Staffing – Risk management – Software configuration management. Requirements Gathering and Analysis: Software Requirements –The Requirements Engineering Process, Requirements Elicitation Process and Analysis.		CO2

UNIT-III	SOFTWARE DESIGN	Periods:09
Design Process and Design Quality– Coupling and Cohesion – Software Design approaches: Object Oriented Design – UML – Use case model – Class diagrams – Interaction diagrams – Activity diagrams – State chart diagrams. Function Oriented Design: Data Flow Diagrams. User Interface Design - Principles and Activities.		CO3

UNIT-IV	SOFTWARE TESTING STRATEGIES	Periods:09
Introduction to software testing - Testing objectives, strategies, and techniques - Types of software testing: Unit testing, Black Box testing – White Box testing, Integration testing, System testing. Test planning process- Test execution process - Automated testing tools and frameworks.		CO4

UNIT-V	SOFTWARE METRICS AND MANAGEMENT	Periods:09
Software Metrics: Types of metrics, Product Metrics - Process Metrics - Object oriented Metrics. Quality management: Overview of Quality concepts, Software Quality Assurance, Software Quality Standards and Models: ISO 9000,CMMI - Quality assurance processes and techniques, Software Maintenance and Evolution.		CO5

Lecture Periods:45	Tutorial Periods:	Practical Periods:-	Total Periods:45

Text Books

1. Roger S. Pressman, Software Engineering a Practitioner's Approach, 9th Edition, TMH, 2014.
2. Ian Sommerville, Software Engineering, 10th Edition, Pearson Education,2015.
3. Roger S. Pressman, "Software Engineering: A Practitioner's Approach", McGraw-Hill International Edition,8th edition, 2019.

Reference Books

1. S. L. Pfleeger and J.M. Atlee, "Software Engineering Theory and Practice", Pearson Education, 4th edition, 2010.
2. Carlo Ghezzi, Mehdi Jazayeri, Dino Mandrioli, "Fundamentals of Software Engineering", 2nd edition, PHI Learning Pvt. Ltd., 2010.
3. K.K Aggarwal and Yogesh Singh, "Software Engineering", 3rd Waman S jawadekar, "Software Engineering Principles and Practices", McGraw-Hill. Companies, 2007.
4. PankajJalote, An Integrated Approach to Software Engineering, 3rd Edition, Narosa Publishing House, 2011.

Web References

1. https://nptel.ac.in/courses/Software Engineering
2. https://www.coursera.org/courses?query=software engineering
3. https://www.tutorialspoint.com/software_engineering/index.htm
4. https://www.udemy.com/course/the-complete-software-engineering-from-basics-to-advanced/
5. http://philip.greenspun.com/teaching/teaching-software-engineering

2 A · 12.37

TE – Theory Exam, LE -- Lab Exam

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	1	2	1	1	-	-	-	-	1	-	1	1	-	-
2	3	1	2	1	1	-	-	-	-	1	-	1	1	-	-
3	3	1	2	1	1	-	-	-	-	1	-	1	1	-	-
4	3	1	2	1	1	-	-	-	-	1	-	1	1	-	-
5	3	1	2	1	1	-	-	-	-	1	-	1	1	-	-

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

2.A.12.38

Department	Computer Science and Engineering	Programme:B.Tech.						
Semester	III	Course Category:PC			End Semester Exam Type:TE			
Course Code	U23CSBC01	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	DESIGN AND ANALYSIS OF ALGORITHMS	2	0	2	3	50	50	100
(Common to CSE & CCE)								
Prerequisite	Programming (C or C++), Data Structures and Problem Solving Approaches.							

Course Outcomes	Oncompletionofthecourse,thestudentswillbe ableto	BT Mapping (HighestLevel)
	CO1 Analyze and improve the efficiency of algorithms and estimate the performance of algorithm and Divide and Conquer.	K2
	CO2 Determine the Greedy paradigms, Dynamic Programming and explain when an algorithmic design situation calls for it.	K3
	CO3 Interpret the Backtracking paradigms , Branch and Bound , NP-Hard paradigms and explain when an algorithmic design situation calls for it.	K3
	CO4 Demonstrate programs using Divide and Conquer, Greedy paradigms.	K3
	CO5 Build the programs using Dynamic Programming, Backtracking and Branch and Bound.	K2

UNIT-I	Introduction To Algorithm and Divide and Conquer	Periods:10
Introduction – Algorithm – Pseudo code for expressing algorithms – Performance Analysis – Time complexity – Space complexity – Asymptotic Notation – Big oh notation – Omega notation – Theta notation and Little oh notation. Divide and Conquer method: Binary search – Merge sort – Quick sort		CO1
UNIT-II	**Greedy Method and Dynamic Programming**	**Periods:10**
Greedy method: General method – applications– Knapsack problem – Minimum cost spanning trees –Single source shortest path problem. Dynamic Programming: Applications – Multistage graphs – 0/1 knapsack problem, All pairs shortest path problem – Traveling sales person problem		CO2
UNIT-III	**Backtracking and Branch and Bound**	**Periods:10**
Backtracking: General method. Applications – N – queen problem – Sum of subsets problem – Graph coloring – Hamiltonian cycle – 0/1 Knapsack Problem. Branch and Bound: General method – Applications – Traveling sales person problem – 0/1 knapsack problem – LC Branch and Bound solution –FIFO Branch and Bound solution		CO3
UNIT-IV	**Laboratory Exercises**	**Periods:15**
1. Implementation of binary search using Divide-and-Conquer technique 2. Implementation of Finding Maximum and Minimum using Divide-and-Conquer technique. 3. Implementation of Knapsack using Greedy technique. 4. Implementation of Minimum Spanning Tree using Prim's and Kruskal's Algorithm using Greedy technique. 5. Implementation of Single-Source Shortest Paths algorithms using Greedy technique.		CO4
UNIT-V	**Laboratory Exercises**	**Periods:15**
6. Implementation of All Pairs Shortest Paths using Dynamic Programming technique. 7. Implementation of Traveling Salesman algorithms using Dynamic Programming technique. 8. Implementation of 8 Queens with the design of Backtracking. 9. Implementation of sum of subsets with the design of Backtracking. 10. Implementation of Traveling Salesman problems with Branch-and-Bound technique.		CO5

Lecture Periods:30	Tutorial Periods:-	Practical Periods:30	Total Periods:60

Text Books

1. Levitin Anany," Introduction to the Design and Analysis of Algorithms", Pearson Education India,1st Edition,2019.
2. E. Horowitz and S.Sahni, "Fundamentals of Algorithms", Galgotia Publications, 2nd Edition, 2010.
3. T.H.Cormen, C.E.Leiserson, R.L.Rivest, and C.Stein, "Introduction to Algorithms",PHI/Pearson Education,3rd Edition,2009.

Reference Books

1. Anany Levitin, "Introduction to the Design and Analysis of Algorithms", Pearson Education, Third Edition, 2012.
2. Aho Alfred V.,"Design & Analysis of Computer Algorithms", Pearson Education India,2nd Edition,2018
3. Basu S. K.," Design Methods and Analysis of Algorithms", PHI Learning,3rd Edition, 2018.
4. E. Horowitz and S.Sahni, "Fundamentals of Algorithms", 2nd Edition, Galgotia Publications, 2010.
5. T.H.Cormen, C.E.Leiserson, R.L.Rivest, and C.Stein, "Introduction to Algorithms, 3rd Edition, PHI/Pearson Education, 2009.

2.A.12.39

Web References
1. https://www.tutorialspoint.com/design_and_analysis_of_algorithms/
2. https://www.javatpoint.com/daa-tutorial
3. https://www.guru99.com/design-analysis-algorithms-tutorial.html
4. https://www.geeksforgeeks.org/fundamentals-of-algorithms/
5. https://swayam.gov.in/nd1_noc20_cs71/preview

*TE–Theory Exam,LE–Lab Exam

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	2	3	2	2	1	-	-	-	-	-	2	1	2
2	3	3	3	3	2	2	1	-	-	-	-	-	2	1	3
3	3	3	3	3	2	2	2	-	-	-	-	-	2	1	3
4	3	3	3	3	2	2	2	-	-	-	-	-	2	1	3
5	3	3	3	3	2	2	2	-	-	-	-	-	2	1	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	ContinuousAssessmentMarks(CAM)									End Semester Examination (ESE) Marks (Practical – Internal Evaluation)	End Semester Examination (ESE) Marks (Theory)	Total Marks
	Continuous assessment(Theory)					Continuous assessment (Practical)						
	CAT 1	CAT 2	Model	Attendance	Total	Conduction of Practical	Report	Viva	Total			
Marks	5	5	5	5	20*	15	10	5	30*		75**	-
*To be weighted for 10 Marks					10	*To be weighted for 10 Marks			10	30	*To be weighted for 50 Marks	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

2.A.12.40

Department	Mathematics	Programme: B.Tech.						
Semester	III	Course Category Code: BS			*End Semester Exam Type: LE			
Course Code	U23MAPC01	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Engineering Mathematics Laboratory**	**0**	**0**	**2**	**1**	**50**	**50**	**100**

(Common to all Branches Except CSBS)

Prerequisite	Matrices, Fourier Transforms, Laplace Transforms	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Perform and evaluate Matrix Operations	**K3**
	CO2 Solve Differential and Integral Equations	**K3**
	CO3 Construct Fourier series and Fourier Transforms of the given function	**K3**
	CO4 Find the Measures of Central tendency	**K3**
	CO5 Analyze Correlation and Regression lines	**K3**

List of Experiments:

1. Find the Inverse, Rank, Eigen values and Eigen Vectors of the matrix.
2. Solve the first order differential equation.
3. Find the integration of $\int_a^b f(x)dx$.
4. Find the Fourier series of f(x).
5. Find the Fourier Transform of f(x).
6. Find the Laplace Transform of f(x).
7. Find the Mean, Median and Mode.
8. Construct the Pie and Bar Diagram.
9. Find the Correlation coefficient.
10. Find the Regression lines.

Lecture Periods:- Nil	**Tutorial Periods:- Nil**	**Practical Periods: 30**	**Total Periods :30**

Reference Books

1. T. Veerarajan, "Engineering Mathematics, Tata McGraw Hill Education (India) Private Limited Chennai 2nd Edition Paperback – 1 January 2018.
2. M.K. Venkataraman, "Engineering Mathematics, The National Publishing Company, Madras, 2016.
3. Dr. A. Singaravelu, "Probability and Statistics", Meenakshi Agency, Paperback – 1, 2019.

Web References

1. https://www.mccormick.northwestern.edu/documents/students/undergraduate/introduction-to-matlab.pdf
2. https://www.nrigroupindia.com/niist/wp-content/uploads/sites/6/2022/02/lab-manual-it406matlab.pdf
3. https://www.studocu.com/row/document/comsats-university-islamabad/signals-and-systems/lab-lab-manual/38332410

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	1	1	-	1	-	-	-	-	-	1	1	-	-
2	3	2	1	1	-	1	-	-	-	-	-	1	1	-	-
3	2	1	-	-	-	1	-	-	-	-	-	1	1	-	1
4	2	1	-	-	-	1	-	-	-	-	-	1	1	-	-
5	3	2	1	1	-	1	-	-	-	-	-	1	1	-	-

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Q.A.12.41

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100

2.A.12.42

Department	English	Programme: B.Tech.						
Semester	III	Course Category Code: HS			*End Semester Exam Type: LE			
Course Code	U23ENPC01	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	GENERAL PROFICIENCY- I	0	0	2	1	50	50	100

(Common to ALL Branches except CSBS)

Prerequisite	Basics of English Language	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Interpret meaning and apply reading strategies in technical and non-technical context	**K3**
	CO2 Develop interpersonal communication skills professionally	**K4**
	CO3 Demonstrate various forms of formal writing	**K3**
	CO4 Decode graphical data coherently	**K2**
	CO5 Apply the techniques of verbal aptitude in competitive exams	**K3**

UNIT- I	**COMPREHENSION ANALYSIS**	**Periods:6**
Listening: Dialogue based on social contexts (IELTS based) - Speaking: Break the iceberg (IELTS based) Submitting Video Recording - Reading: Reading technical passage (IELTS based) - Writing: Writing Task: 2 (IELTS Academic) - Vocabulary: Synonyms (IELTS)		**CO1**
UNIT- II	**PERSONALITY DEVELOPMENT**	**Periods:6**
Listening: Monologue about the everyday social issues (IELTS based) - Interview Videos - Speaking: Speak about the topic in the Flash Card (IELTS based) - Reading: British & American Vocabulary - Writing: SWOT Analysis - Vocabulary: Idioms and Phrases (IELTS)		**CO2**
UNIT- III	**INFERENTIAL LEARNING**	**Periods:6**
Listening: Conversation between 4 people regarding education (IELTS based), Anecdotes - Speaking: Structure Discussion (IELTS based) - Reading: Distinguish between facts & opinions (IELTS based), - Writing: Writing Conversation to different context - Vocabulary: Phrasal Verbs (IELTS)		**CO3**
UNIT- IV	**INTERPRETATION AND FUNCTIONAL WRITING**	**Periods:6**
Listening: Monologue on an academic subject (IELTS based), Group Discussion videos - Speaking: Group Discussion Practice - Reading: Read and review (Books, Magazines) - Writing: Writing Task 1: (IELTS Academic: Graph/ chart/tables description) - Vocabulary: Collocations (IELTS)		**CO4**
UNIT-V	**VERBAL APTITUDE - I**	**Periods:6**
Language Enhancement: Articles, Preposition, Conjunction Verbal Ability Enhancement: Ordering of sentences, Blood Relation, Completing Statements- Cloze test, Spotting Errors - Sentence Improvement, Word Analogy, Word Groups **(GATE)**		**CO5**

Lecture Periods: -	**Tutorial Periods: -**	**Practical Periods:30**	**Total Periods:30**

Reference Books

1.Lewis, Norman, "Word Power Made Easy".Goyal Publishers and Distributors Pvt.Ltd., Latest Edition, 2020.
2.Patterson,Kerry, Joseph Grenny,Ron McMillan, Al Switzler, "Crucial Conversation Tools for talking when Stakes are High", Kindle Publication,2nd Edition, 2011.
3.Comfort, Jeremy,et.al. "Speaking Effectively: Developing Speaking Skills for Business English", Cambridge University Press, Cambridge: Reprint 2011.
4.Agarwal, R. S. "A Modern Approach to Verbal & Non Verbal Reasoning". S. Chand, 2010.
5.Wren, Percival Christopher, and Wren Martin. "High School English Grammar and Composition". S Chand, 2005.

Web References

1.https://www.ielts-exam.net/grammar/
2.https://ieltsfocus.com/2017/08/02/collocations-ielts/
3.https://www.fresherslive.com/online-test/blood-relations-questions-and-answers
4.https://www.toppr.com/guides/english-language/reading-comprehension/cloze-test/
5.https://www.examsbook.com/word-analogy-test-questions-with-answers

* TE – Theory Exam, LE – Lab Exam

2.A.12.A3

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	1	-	-	-	-	-	-	1	-	3	-	2	-	-	-
2	1	-	-	-	-	-	-	1	-	3	-	2	-	-	-
3	1	-	-	-	-	-	-	1	-	3	-	2	-	-	-
4	1	-	-	-	-	-	-	1	-	3	-	2	-	-	-
5	1	-	-	-	-	-	-	1	-	3	-	2	-	-	-

Correlation Level: 1-Low, 2-Medium, 3-High

Evaluation Methods

Practical				
Continuous Assessment Internal Evaluation		**End Semester External Evaluation**		**Total Marks**
50 marks		**50 marks**		
Conduction of Practical (Assignment 1&2 -10 Marks Performance in practical classes - 5 Marks)	15	Listening (L)	20	100
Record	5	Speaking(S)	10	
Viva	5	Reading(R)	10	
Model Practical Examination (Model Exam is conducted for 50 Marks that will be converted to 15 Marks)	15	Writing(W)	10	
Attendance	10			

2.4.12.44

Department	Computer and Communication Engineering	Programme: B. Tech						
Semester	III	Course Category:PC			End Semester Exam Type:LE			
Course Code	U23CCP302	Periods/Week			Credit	MaximumMarks		
		L	T	P	C	CAM	ESE	TM
Course Name	PRINCIPLES OF COMMUNICATION ENGINEERING LABORATORY	0	0	2	1	50	50	100
(CCE)								
Prerequisite	NIL							

Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
CO1	Demonstrate the effects of sampling and TDM.	K3
CO2	Implement AM & FM modulation and demodulation.	K3
CO3	Implement PCM & DM.	K3
CO4	Simulate and validate the various of digital modulation techniques.	K3
CO5	Simulate and validate line coding and error control coding.	K3

List of Exercises

1. Study of line coding and decoding techniques
2. Study of sampling
3. AM Modulator and Demodulator
4. FM Modulator and Demodulator
5. Pre-emphasis and de-emphasis
6. Pulse Code Modulation and Demodulation
7. Pulse Amplitude Modulation and Demodulation.
8. Pulse Position Modulation and Demodulation and Pulse Width Modulation and Demodulation.
9. Delta Modulation and Demodulation
10. QAM modulation and demodulation using MATLAB.
11. To simulate ASK, FSK, DPSK Generation and Detection Schemes using MATLAB.
12. To Simulation of Linear Block and Cyclic Error Control Coding Schemes.
13. To simulate Pre-emphasis and De-emphasis and to trace their characteristics.

Lecture Periods:	Tutorial Periods:	Practical Periods:30	Total Periods:30

ReferenceBooks

1. H Taub, D L Schilling, G Saha, "Principles of Communication Systems", 3/e, TMH 2007
2. S. Haykin, "Digital Communications", John Wiley 2005
3. B.P.Lathi," Modern Digital and Analog Communication Systems", 3rd edition, Oxford University Press, 2007
4. H P Hsu, Schaum Outline Series, "Analog and Digital Communications", TMH 2006
5. B.Sklar," Digital Communications Fundamentals and Applications", 2/e Pearson Education 2007.

Web References

1. www.allaboutcircuits.com
2. www.circuitstoday.com
3. http://www.electronics-tutorials.ws
4. www.tutorialspoint.com
5. https://nptel.ac.in/courses/108/104/108104091/

* TE – Theory Exam, LE – Lab Exam

2.A.12.45

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	1	1	-	-	-	-	-	1	2	2	-	-
2	3	3	3	1	1	-	-	-	-	-	1	2	2	-	-
3	3	3	3	1	1	-	-	-	-	-	1	2	2	-	-
4	3	3	3	1	1	-	-	-	-	-	1	2	2	-	-
5	3	3	3	1	1	-	-	-	-	-	1	2	2	-	-

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100

2.9.12.46

Department	Computer and Communication Engineering	Programme: B.Tech.						
Semester	III	Course Category Code: AEC			*End Semester Exam Type:			
Course Code	U23CCS301	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	SKILL ENHANCEMENT COURSE- I 1. Computer on Office Automation	0	0	4	-	100	-	100
		(CCE)						
Prerequisite	Basic knowledge in computer							

Microsoft Access

- Build custom applications to track any type of information your company needs: Contacts, Appointments, Sales, Employees, Expenses, Telemarketing, Service, Human Resources, Ordering, Inventory, Engineering, etc
- Create Word documents on the fly to populate letters, envelopes and custom reports based ondata in a database
- Create functionality that can open up a Word template, fill the document with data, print the document and save the document with 1 click of a button
- Create functionality that can open up an Excel spreadsheet and populate it with data
- Create functionality that can open up an Excel spreadsheet and populate it with information aswell as determine where to insert/delete rows if needed to keep the integrity of formulas in tact

Microsoft Excel

- Create worksheets that have to be validated before the system lets the user save the spreadsheet
- Create worksheets that can read information from another system (i.e. database) to populate dropdown boxes, etc
- Create company expense report that saves the information into a database for summary/analysis purposes
- Combine data from multiple Excels spreadsheets/worksheets to create a new formatted Excel spreadsheet
- Create automations that can open a master spreadsheet with many tabs and determine whichof the tabs (single or multiple) need to be populated with data and which tabs need to be removed from the spreadsheet if they aren't needed
- Create automations to eliminate people having to re-key/massage/format data

Microsoft Word

- Create documents that can read information from another system (i.e. database) to populate dropdown boxes, etc
- Create documents that have to be validated before the system lets the user save the document
- Create documents that upon saving can save the information on the document into a database
- Create documents that can popup and format an Outlook email with data from the document tobe sent out upon saving a document.

Lecture Periods: -	Tutorial Periods: -	Practical Periods: 30	Total Periods: 30

Reference Books

1. Remya Chandran, "A Text Book of Introduction to Computers & Office Automation", Independently published, 2019
2. James W Driscoll, "Office Automation: The Dynamics of a Technological Boondoggle", Palala Press, 2018

Web References

1. https://www.referenceforbusiness.com/encyclopedia/Mor-Off/Office-Automation.html

2.A.12.47

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	1	-	-	-	1	-	-	-	-	-	1	2	-	-	-
2	1	-	-	-	1	-	-	-	-	-	1	2	-	-	-
3	1	-	-	-	1	-	-	-	-	-	1	2	-	-	-
4	1	-	-	-	1	-	-	-	-	-	1	2	-	-	-
5	1	-	-	-	1	-	-	-	-	-	1	2	-	-	-

Correlation Level: 1 - Low, 2 - Medium, 3 – High

2.9.12.48

Department	Computer and Communication Engineering	Programme: **B. Tech**						
Semester	III	Course Category: **AEC**			End Semester Exam Type: -			
Course Code	U23CCS301	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**SKILL ENHANCEMENT COURSE- I 2. Animation Practices**	**0**	**0**	**4**	**-**	**100**	**-**	**100**
(CCE)								
Prerequisite	NIL							

Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1 Implement algorithm for drawing	**K3**
	CO2 Use 2D Geometric Transformation	**K3**
	CO3 Implement image manipulation and enhancement	**K3**
	CO4 Implement 2D animations using tools	**K3**
	CO5 Implement 3D graphical scenes using open graphics library suits	**K3**

List of Exercises

Implement the Exercises Using C / OPENGL / JAVA

1. Implementation of Algorithms for drawing 2D Primitives – Line (DDA, Bresenham) – all slopes Circle (Midpoint)
2. 2D Geometric transformations:
   Translation
   Rotation
   Scaling
   Reflection
   Shear
   Window-Viewport
3. Composite 2D Transformations
4. Line Clipping
5. 3D Transformations – Translation, Rotation, Scaling.
6. 3D Projections – Parallel, Perspective.
7. Creating 3D Scenes.
8. Image Editing and Manipulation – Basic Operations on image using any image editing software, Creating gif animated images, Image optimization.
9. 2D Animation – To create Interactive animation using any authoring tool.

Lecture Periods:	**Tutorial Periods:**	**Practical Periods: 30**	**Total Periods: 30**

Reference Books

1. J. D. Foley, A. Van Dam, S. K. Feiner, J. F. Hughes, "Computer Graphics: Principles and Practicein C", 3rd ed, Addison-Wesley, 2013
2. Eric Lengyel , "Mathematics for 3D Game Programming and Computer Graphics", CourseTechnology PTR, 2012

Web References

1. https://www.cs.brandeis.edu/~cs155/

2.A.12.A9

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	1	-	-	-	1	-	-	-	-	-	1	2	-	-	-
2	1	-	-	-	1	-	-	-	-	-	1	2	-	-	-
3	1	-	-	-	1	-	-	-	-	-	1	2	-	-	-
4	1	-	-	-	1	-	-	-	-	-	1	2	-	-	-
5	1	-	-	-	1	-	-	-	-	-	1	2	-	-	-

Correlation Level: 1 - Low, 2 - Medium, 3 – High

2.4.12.50

Department	Computer and Communication Engineering			Programme: B. Tech			
Semester	III			Course Category: AEC		End Semester Exam Type:-	
Course Code	U23CCS301	Periods / Week			Credit	Maximum Marks	
		L	T	P	C	CAM	ESE	TM
Course Name	SKILL ENHANCEMENT COURSE- I 3. PCB and Circuit Design	0	0	4	-	100	-	100
(CCE)								

Prerequisite	NIL	
Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1 Infer the fundamental of circuit design	K2
	CO2 Describes PCB design and its types	K2
	CO3 Demonstrate the Proteus PCB schematic	K3
	CO4 Examines the design synchronization	K4
	CO5 Tests the various routing guidelines	K4

List of Exercises

1. **Introduction to Circuit Designing:** Fundamental of circuit design - Creating New Components - Introduction to Analog Circuit Design - Introduction to Digital Circuit Design - Placing Symbols and Ports - Labeling components - Circuit optimization

2. **Introduction to PCB Design -** Definition and Evolution of PCB - Purposes of a PCB - Types of PCBs Creating the Blank PCB - Defining a sheet template - Printed Circuit Technology - PCB Construction (Power and Ground Plane) - PCB Printing & Etching process

3. **Proteus PCB Schematic -** Defining the Board Shape & Placement Boundary - Creating a board outline & placement / routing boundary - Basic concepts of PCB Designing - Schematic capture - From schematic to PCB - Placing, editing, and connecting parts and electrical symbols - Adding and editing graphics and text

4. **Proteus PCB Editor -** Creating and editing parts - Preparing to create a net list - Creating a net list- Exporting and importing schematic data - PCB Material. - Board Layers, Colors and Grids. - Defining the Electrical/Mechanical Layer - Defining PWR/GND layers.

5. **Design Transfer to the PCB and Design Rule Check -** Design synchronization with schematic tool. - Design transfer using a Net list. - Design rules concepts. - Design Rule Checking

6. **Component Placement & Shielding -** Placing components. - Finding components for placement. Moving components. - Shielding Practices. - Copper Pour

7. **Routing PCB Layout Routing and Grounding** - Routing guidelines

Lecture Periods:	Tutorial Periods:	Practical Periods: 30	Total Periods: 30

Reference Books

1. Bruce R. Archambeault , James Drewniak "PCB Design for Real-World EMI Control", Springer- Verlag New York Inc., United States, 2002.
2. Kraig Mitzner, "Complete PCB Design Using OrCAD Capture and PCB Editor", ElsevierScience & Technology, Oxford, United Kingdom, 2009.
3. Keng Tiong Ng , "PCB-RE: Real-World Examples", Independently Published, 2019.
4. Roger Hu, "PCB Design and Layout Fundamentals for EMC", Independently Published, 2019.
5. Matthew Scarpino, "Designing Circuit Boards with EAGLE: Make High-Quality PCBs at Low cost Pearson Education, United States, 2014

Web References

1. https://engineering.eckovation.com/learn-design-pcb/
2. https://www.tronicszone.com/blog/steps-pcb-design-manufacturing/
3. https://www.elprocus.com/what-is-printed-circuit-board-and-designing-process-of-pcb/
4. https://www.electronics-notes.com/articles/analogue_circuits/pcb-design/how-to- design-pcb-board-basics.php
5. https://resources.pcb.cadence.com/blog/2019-what-is-the-pcb-fabrication-process-an-introduction

2.4.19.51

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	1	-	-	-	-	-	-	-	-	1	2	1	1	-	-
2	1	-	-	-	-	-	-	-	-	1	2	1	1	-	-
3	1	-	-	-	-	-	-	-	-	1	2	1	1	-	-
4	1	-	-	-	-	-	-	-	-	1	2	1	1	-	-
5	1	-	-	-	-	-	-	-	-	1	2	1	1	-	-

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Department	**Computer and Communication Engineering**	Programme: **B.Tech.**						
Semester	**III**	Course Category Code: **AEC**			*End Semester Exam Type:			
Course Code	**U23CCC3XX**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Certification Course- III**	**0**	**0**	**4**	**-**	**100**	**-**	**100**

(Common to all Branches)

Students shall choose an International certification course offered by the reputed organizations like Google, Microsoft, IBM, Texas Instruments, Bentley, Autodesk, Eplan and CISCO, etc. The duration of the course is 40-50 hours specified in the curriculum, which will be offered throughCentre of Excellence.

Pass /Fail will be determined on the basis of participation, attendance, performance and completion of the course. If a candidate Fails, he/she has to repeat the course in the subsequent years.Pass in this course is mandatory for the award of degree.

2.A.12.53

Department	Computer and Communication Engineering	Programme: B.Tech.						
Semester	III	Course Category Code: MC			*End Semester Exam Type: -			
Course Code	U23CCM303	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	CLIMATE CHANGE	0	0	2	-	100	-	100

(Common to all Branches)

UNIT – I	ATMOSPHERE AND ITS COMPONENTS	Periods:6
Importance of Atmosphere-Physical Chemical Characteristics of Atmosphere- Vertical structure of the atmosphere Composition of the atmosphere -Atmospheric stability-Temperature profile of the atmosphere-Lapse rates-Temperature inversion-effects of inversion on pollution dispersion.		CO1
UNIT – II	**GLOBAL CLIMATE**	**Periods:6**
Account of past climate Environmental indicators and instrumental records Human Footprints on global warming-Predicting future climates- Temperature regime - Extreme climate events		CO2
UNIT – III	**IMPACTS OF CLIMATE CHANGE**	**Periods:6**
Causes of Climate change: Change of Temperature in the environment- Melting of ice Pole-sea level rise-Impacts of Climate Change on various sectors Agriculture, Forestry and Ecosystem - Water Resources Human Health Industry, Settlement and Society Methods and Scenarios - Projected Impacts for Different Regions- Uncertainties in the Projected Impacts of Climate Change - Risk of Irreversible Changes.		CO3
UNIT – IV	**OBSERVED CHANGES AND ITS CAUSES**	**Periods:6**
Climate change and Carbon credits- Initiatives in India-Kyoto Protocol-Intergovernmental Panel on Climate change-Climate Sensitivity and Feedbacks-The Montreal Protocol UNFCCC - IPCC Evidences of Changes in Climate and Environment on a Global Scale and in India.		CO4
UNIT – V	**CLIMATE CHANGE AND MITIGATION MEASURES**	**Periods:6**
Clean Development Mechanism -Carbon Trading- examples of future Clean Technology - Biodiesel Natural Compost Eco Friendly Plastic Alternate Energy Hydrogen Bio-fuels-Mitigation Efforts in India and Adaptation funding. Key Mitigation Technologies and Practices-Carbon sequestration - Carbon capture and storage (CCS) - International and Regional cooperation- Remedial measures.		CO5

Lecture Periods:45	Tutorial Periods:-	Practical Periods:	Total Periods:45

Text Books

1. Joan Fitzgerald "Greenovation: Urban Leadership on Climate Change, Oxford University Press 2020.
2. J. David Neelin" Climate change and climate modelling" Cambridge University press (2011).
3. Robin Moilveen "Fundamentals of weather and climate" Oxford University Press (2nd Edition) (2010),
4. Andrew Dessler and Edward A. Parson "The Science and Politics of Global Climate Change" 2009

Reference Books

1. Bill McKibben (2012), The Global Warming Reader: A Century of Writing About Climate Change,Penguin.
2. JasonSmerdon(2009) Climate Change: The Science of Global Warming and Our Energy Future, Columbia University
3. Adaptation (2006) and mitigation of climate change-Scientific Technical Analysis. Cambridge University Press, Cambridge.
4. J.M. Wallace and P.V. Hobbs (2006) Atmospheric Science, Elsevier / Academic Press.
5. Jan C. van Dam, (2003) Impacts of "Climate Change and Climate Variability on Hydrological Regimes", Cambridge University Press,.

Web References

1. https://nptel.ac.in/courses/105102089/
2. https://www.warmheartworldwide
3. https://nptel.ac.in/content/storage

2.A.12.54

Department	Computer and Communication Engineering	Programme: **B.Tech.**					
Semester	VI	Course Category Code: **PC**			End Semester Exam Type: **TE**		
Course Code	U23CCB602	Periods/Week			Credit	Maximum Marks	
		L	T	P	C	CAM	ESE	TM
Course Name	**Data Science for Networking**	**2**	**0**	**2**	**3**	**50**	**50**	**100**
CCE(Theory cum Practical)								
Prerequisite	Networking Basics, Programming Skills							

Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1 Analyze data science techniques for network data collection, preprocessing, and statistical analysis.	**K2**
	CO2 Implement machine learning algorithms to classify, cluster, and predict network traffic.	**K2**
	CO3 Evaluate deep learning, security analytics, and big data processing for network challenges.	**K3**
	CO4 Demonstrate skills in network data collection, preprocessing, and basic machine learning models.	**K3**
	CO5 Apply advanced techniques like time series analysis and real-time analytics for network security and visualization.	**K3**

UNIT – I	**Introduction to Data Science in Networking**	**Periods:10**	
Introduction to Data Science-Networking Fundamentals-Data Collection in Networks-Data Preprocessing-Statistical Methods-Case Studies			**CO1**
UNIT – II	**Machine Learning and Data Analytics for Networking**	**Periods:10**	
Introduction to Machine Learning-Classification Techniques-Clustering Methods-Dimensionality Reduction-Time Series Analysis-Real-time Analytics			**CO2**
UNIT – III	**Advanced Topics in Network Data Science**	**Periods:10**	
Deep Learning for Networking-Network Security Analytics-Big Data in Networking-Visualization of Network Data-Network Traffic Engineering-Ethical and Privacy Concerns			**CO3**
UNIT – IV	**Laboratory Exercises: Network Data Analysis and Machine Learning Techniques**	**Periods:15**	
1. Capture and preprocess network data using tools like Wireshark and Python libraries. 2. Perform Exploratory Data Analysis(EDA) on captured network data to identify patterns and anomalies. 3. Implement and compare machine learning models (e.g., Decision Trees, SVM) for classifying network traffic. 4. Apply clustering algorithms (e.g., K-means) to network traffic data to identify anomalies or similar traffic patterns. 5. Analyze and forecast network traffic using time series techniques. 6. Implement a Support Vector Machine (SVM) model for classifying network traffic and compare its performance with the Decision tree model.			**CO4**
UNIT – V	**Laboratory Exercises: Advanced Network Analytics and Security Techniques**	**Periods:15**	
7. Perform PCA on network traffic data to reduce dimensionality and improve model performance. 8. Develop and evaluate models for detecting network intrusions using historical network data. 9. Implement a basic real-time analytics pipeline using Apache Kafka and Spark Streaming tools. 10. Create visualizations of network traffic and analysis results using tools like Matplotlib, Seaborn, or Tableau. 11. Analyze network traffic for potential security threats and implement basic mitigation techniques. 12. Use Clustering techniques(eg.DBSCAN) to detect anomalies in network traffic and evaluate their potential security impact.			**CO5**

Lecture Periods:30	**Tutorial Periods: -**	**Practical Periods: 30**	**Total Periods:60**

Text Books

1. "Data Science for Network Security" by Kurt R. Riedel, 2nd edition, 2023.
2. "Machine Learning for Networking and Security" by Shashi Shekhar, springer,2022.
3. "Data Science for the Internet of Things: Leveraging Data and Algorithms for IoT" by S. K. Singh, Wiley publication, 2021.

Reference Books

2.A.12.83

1. "Computer Networking: Principles, Protocols, and Practice" by Olivier Bonaventure
2. "Data Science for Business: What You Need to Know about Data Mining and Data-Analytic Thinking" by Foster Provost and Tom Fawcett
3. "Introduction to Machine Learning with Python: A Guide for Data Scientists" by Andreas C. Müller and Sarah Guido
4. "Big Data: Principles and Paradigms" by Rajkumar Buyya, et al.
5. "Network Security Through Data Analysis: Building Situational Awareness" by Michael Collins

Web References

1. https://www.geeksforgeeks.org/basics-computer-networking/
2. https://www.w3schools.com/datascience/default.asp
3. https://www.guru99.com/data-communication-computer-network-tutorial.html

TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2	2	-	-	-	-	-	-	-	-	2	2	-
2	3	2	2	2	-	-	-	-	-	-	-	-	2	2	-
3	3	2	2	2	-	-	-	-	-	-	-	-	2	3	-
4	3	2	2	2	-	-	-	-	-	-	-	-	2	3	-
5	3	2	2	2	-	-	-	-	-	-	-	-	2	3	-

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks(CAM)									EndSemester Examination (ESE) Marks (Practical – Internal Evaluation)	EndSemesterExamination (ESE) Marks (Theory)	Total Marks
	Continuous assessment (Theory)					Continuous assessment (Practical)						
	CAT1	CAT 2	Model	Attendance	Total	ConductionofPractical	Report	Viva	Total			
Marks	5	5	5	5	20*	15	10	5	30*	30	75**	-
*Tobeweightedfor10Marks					10	*Tobeweightedfor10 Marks			10		*Tobeweightedfor 50Marks	100

Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

2.A.12.84

Department	**Information Technology**	Programme: **B.Tech.**						
Semester	**VI**	Course Category Code: **PC**			*End Semester Exam Type: **LE**			
Course Code	**U23ITPC03**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Machine Learning Laboratory**	**0**	**0**	**2**	**1**	**50**	**50**	**100**
Common to CSE, IT and CCE								
Prerequisite	Mathematics							

Course Outcomes		On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1	Apply python packages and libraries for various problems	**K3**
	CO2	Apply supervised learning techniques for various problems	**K3**
	CO3	Develop an open-ended solution with data privacy and ethical concerns, for a given realworld problem.	**K3**
	CO4	Apply unsupervised and reinforcement learning techniques for various problems	**K3**
	CO5	Apply ensemble techniques to solve the problems and demonstrate the working of dimensionality reduction methods	**K3**

List of Exercises

1. Working with Python packages - Numpy, Scipy, Scikit-learn, Matplotlib
2. Loan amount prediction using linear regression and visualize the interpretation
3. Handwritten character recognition using neural networks
4. Classification of Email spam and MNIST data using Support Vector Machines.
5. Predicting Diabetes using decision tree
6. Applications of Random Forest and AdaBoost ensemble techniques
7. K-means clustering for Euclidean distance metric
8. k-Nearest Neighbor algorithm
9. Applications of dimensionality reduction techniques on any dataset
10. Analyze any two supervised / unsupervised machine learning algorithms for any of the following real-time applications: (a) Text processing (b) Image processing (c) IoT systems

Lecture Periods: -	**Tutorial Periods: -**	**Practical Periods: 30**	**Total Periods: 30**

Reference Books

1. Jason Bell, "Machine learning – Hands on for Developers and Technical Professionals", 1st Edition, Wiley, 2014.
2. Peter Flach, "Machine Learning: The Art and Science of Algorithms that Make Sense of Data", 1st Edition, Cambridge University Press, 2012.
3. Richert, Willi, "Building machine learning systems with Python", Packt Publishing, 2013.
4. Tom M Mitchell, "Machine Learning", McGraw-Hill Education (India), 2013.
5. Y S Abu-Mostafa, M Magdon-Ismail, H T Lin, "Learning from Data", AML Book Publishers, 2012

Web References

1. https://nptel.ac.in/courses/106/105/106105152/
2. https://www.coursera.org/learn/machine-learning
3. https://machinelearningmastery.com/
4. https://towardsdatascience.com/machine-learning/home/
5. https://www.analyticsvidhya.com/blog/2017/09/common-machine-learning-algorithms/

TE – Theory Exam, LE – Lab Exam

2.A.12.85

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2	-	2	-	-	-	1	-	-	2	3	1	2
2	3	2	2	-	2	-	-	-	1	-	-	2	3	1	2
3	3	3	3	-	2	-	-	-	1	-	-	2	3	1	2
4	3	2	3	-	2	-	-	-	1	-	-	2	3	1	2
5	3	2	3	3	2	-	-	-	2	3	-	2	3	2	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100

2.A.12.86

Department	Computer and Communication Engineering	Programme: B.Tech.						
Semester	VI	Course Category : PC			*End Semester Exam Type: LE			
Course Code	U23CCP606	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	Microprocessor and Embedded Systems Laboratory	0	0	2	1	50	50	100

(CCE)

Prerequisite	Knowledge of digital electronics and Programming in C	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Understand 8086 architecture	**K2**
	CO2 Apply assembly and C programming for embedded systems	**K3**
	CO3 Analyze timer, UART, and I/O interfacing	**K3**
	CO4 Implement embedded systems applications with Arduino / Raspberry Pi	**K3**
	CO5 Evaluate embedded system performance and data handling	**K3**

List of Exercises

1. Write an Embedded C program to interface a 7-segment display with the 8051 microcontroller and display numbers from 0 to 9.
2. Develop a program to interface a 4x4 matrix keypad with the 8051 and display the key pressed on an LCD or serial terminal.
3. Write a program to control the speed of a DC motor using Pulse Width Modulation (PWM) on the 8051 microcontroller.
4. Write an Embedded C program to interface a stepper motor with the 8051 microcontroller and control its direction and steps (clockwise and counterclockwise rotation).
5. Interface a temperature sensor (e.g., LM35) with the 8051 and write a program to display the temperature on an LCD or serial monitor.
6. Write an Embedded C program to interface a switch with the Arduino board and control an LED.
7. Interface a temperature sensor (e.g., LM35) with Arduino and display the temperature readings on the serial monitor.
8. Set up a temperature sensor with the Raspberry Pi and use Python to send data to a cloud platform for monitoring.
9. Control GPIO pins of Raspberry Pi using Python to turn an LED on and off
10. Interface an ultrasonic sensor with the Raspberry Pi and measure the distance to an object using Python programming.
11. Generate a PWM signal using Arduino and vary the brightness of an LED or control the speed of a DC motor.
12. Write an Embedded C program to simulate a buzzer control system. The buzzer should be activated when a certain condition is met, such as pressing a simulated button.

Lecture Periods:	Tutorial Periods:	Practical Periods: 30	Total Periods: 30

Reference Books

1. The 8051 Microcontroller and Embedded Systems: Using Assembly and C Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D. McKinlay Pearson 2011
2. 8051 Microcontroller: Internals, Instructions, Programming & Interfacing, Subrata Ghoshal, Pearson 2013.
3. Programming and Customizing the 8051 Microcontroller, Ajit Pal, PHI Learning, 2009

Web References

1. https://www.esacademy.com/en/library/8051/
2. https://www.keil.com/dd/chip/3499.htm
3. https://computerscience junction.in/2020/02/10/8051-microcontroller-projects-in-c/
4. https://circuitdigest.com/microcontroller-projects/8051-microcontroller
5. https://www.keil.com/support/man/docs/gsac/gsac_intro.htm

TE – Theory Exam, LE – Lab Exam

2.A.12.87

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2	2	1	-	-	-	-	-	-	-	3	2	-
2	3	2	2	2	1	-	-	-	-	-	-	-	3	2	-
3	3	2	2	2	1	-	-	-	-	-	-	-	3	2	-
4	3	2	2	2	1	-	-	-	-	-	-	-	3	2	-
5	3	2	2	2	1	-	-	-	-	-	-	-	3	2	-

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100

2-A.12.88

Department	Computer and Communication Engineering				Programme:B.Tech.			
Semester	VI				CourseCategoryCode: PC		*End SemesterExamType:LE	
CourseCode	U23CCP607	Periods/Week			Credit	MaximumMarks		
		L	T	P	C	CAM	ESE	TM
Course Name	Internet and Web Programming Laboratory	0	0	2	1	50	50	100
(CCE)								
Prerequisite	Nil							

Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1 Construct Web pages using HTML and style sheets.	K3
	CO2 Build dynamic web page with validation using Java Script objects and by applying different event handling mechanisms.	K3
	CO3 Use PHP programming to develop web applications.	K3
	CO4 Develop Angular JS programs using basic features	K3
	CO5 Deploy server side applications using NodeJS.	K3

List of Experiments

1. Create a web page with the following using HTML
   a. To embed a map in a web page
   b. To fix the hot spots in that map
   c. Show all the related information when the hot spots are clicked.
2. Create a web page with the following.
   a. Cascading style sheets.
   b. Embedded style sheets.
   c. Inline style sheets. Use our college information for the web pages.
3. Validate the Registration, user login, user profile and payment by credit card pages using JavaScript.
4. Write a JavaScript that calculates the squares and cubes of the numbers from 0 to 10 and outputs HTML text that displays the resulting values in an HTML table format.
5. Write a program to create and Build a star rating system using Jquery.
6. Write programs in PHP
   a. Validate the form using PHP regular expression.
   b. PHP stores a form data into database.
7. Write a web service for finding what people think by asking 500 people's opinion for any consumer product.
8. Write a PHP program to store page views count in SESSION, to increment the count on each refresh, and to show the count on web page.
9. Develop an Angular JS application that displays a list of shopping items. Allow users to add and remove items from the list using directives and controllers.
10. Write an Angular JS application that can calculate factorial and compute square based on given user input.
11. Create a NodeJS server that serves static HTML and CSS files to the user.
12. Create a NodeJS server using Express that stores data from a form as a JSON file and displays it in another page. The redirect page should be prepared using Handlebars.

LecturePeriods:	TutorialPeriods:	PracticalPeriods: 30	TotalPeriods:30

ReferenceBooks

1. Stephen Wynkoop and John Burke, "Running a Perfect Website", QUE, 2nd Edition,1999.
2. Chris Bates, Web Programming, "Building Intranet Applications", Wiley Publications, 3rd Edition, 2009.
3. Robin Nixon, "Learning PHP, MySQL, JavaScript, CSS & HTML5" Third Edition, O'Reilly publishers, 2014.
4. Vasan Subramanian,'Pro MERN Stack, Full Stack Web App Development with Mongo, Express, React, and Node', Second Edition, Apress, 2019.
5. AgusKurniawan–"AngularJS Programming by Example", First Edition, PE Press, 2014

Web References

1. www. w3schools.com
2. https://www.javatpoint.com
3. https://www.tutorialspoint.com

TE – Theory Exam, LE – Lab Exam

2.A.12.89

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2	2	2	-	-	-	-	-	-	-	3	2	2
2	3	2	2	2	2	-	-	-	-	-	-	-	3	2	2
3	3	2	2	2	2	-	-	-	-	-	-	-	3	2	2
4	3	2	2	2	2	-	-	-	-	-	-	-	3	2	2
5	3	2	2	2	2	-	-	-	-	-	-	-	3	2	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in Practical classes			Model Practical Examination	Attendance		
	Conduction of Practical	Record work	viva				
Marks	15	5	5	15	10	50	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

2.12.12.90

Department	Computer and Communication Engineering	Programme: **B. Tech.**						
Semester	VI	Course Category Code: **PA**				*End Semester Exam Type: -		
Course Code	U23CCW602	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Mini Project**	**0**	**0**	**2**	**1**	**100**	**-**	**100**
(CCE)								
Prerequisite	Computer and Communication Engineering							

Course Outcomes	On completion of the course, the students will be able to		BT Mapping* (Highest Level)
	CO1	Identify the problem statement for the mini project work through the literature survey	K2
	CO2	Choose the proper components as per the requirements of the design/ system.	K2
	CO3	Apply the acquainted skills to develop final model/system	K3

There shall be a Mini Project, which the student shall pursue as a team consists of maximum 4 students during the third year, fifth semester. The aim of the mini project is that the student has to understand the real time hardware / software applications. The student should gain a thorough knowledge in the problem he/she has selected and in the hardware / software he/she using in the Project. The Mini-project is an application that should be formally initiated and should be developed and also to be implemented by the respective team.

The Mini Project shall be submitted in a report form along with the hardware model / software developed, duly approved by the department internal evaluation committee. It shall be evaluated for 100 marks as Continuous Assessment. The department internal evaluation committee shall consist of faculty coordinator, supervisor of the project and a senior faculty member of the department. There shall be two reviews that will be considered for assessing a Mini Project work with weightage as indicated evaluation Methods.

Lecture Periods: -	**Tutorial Periods: -**	**Practical Periods: 30**	**Total Periods: 30**

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2	2	-	-	-	-	3	3	-	1	1	1	1
2	3	3	3	2	2	2	2	2	3	3	3	1	2	2	2
3	3	2	2	1	-	2	-	-	3	3	3	1	2	2	2

Correlation Level: 1 – Low, 2 – Medium, 3 – High

Evaluation Method

Assessment	Review 1			Review 2				Total Marks
	Novelty	Presentation	Viva	Presentation	Demonstration	Viva	Report	
Marks	10	20	10	20	20	10	10	100

2.A.12.91

Department	**Computer and Communication Engineering**	Programme: **B.Tech.**						
Semester	**VI**	Course Category Code: **AEC**			*End Semester Exam Type:			
Course Code	**U23CCC6XX**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Certification Course- VI**	**0**	**0**	**4**	**-**	**100**	**-**	**100**

(Common to all Branches)

Students shall choose an International / Reputed organization certification course of 40-50 hours duration specified in the curriculum (It is mandatory to do a minimum of six courses) which will be offered through the Centre of Excellence. These courses have no credit and will not be considered for CGPA calculation.

(i) Certification Courses are required to be completed to fulfil the degree requirements. All Certification courses are assessed internally for 100 marks.

(ii) The Course coordinator handling the course will assess the student through attendance and MCQ test, and declare the student as "pass" on satisfactory completion. A letter grade "P" is awarded to declare pass.

(iii) The marks scored in these courses will not be taken into consideration for the SGPA / CGPA calculations in the grade sheet.

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)		Total Marks
	Attendance	MCQ Test	
Marks	10	90	100

2.A.12.92

Department	Computer and Communication Engineering	Programme: B. Tech.						
Semester	VI	Course Category: MC			End Semester Exam Type :			
Course Code	U23CCM606	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	Gender Equality	2	0	0	-	100	-	100

Common to ALL Branches

Prerequisite	-

Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
CO1	Describe the general identity, social construction of gender roles.	K2
CO2	Illustrate the causes and issues of gender discrimination in Indian society.	K2
CO3	Describe the workplace discrimination, media influences on gender and culture.	K2
CO4	Familiarize with international and Indian frameworks on gender equality.	K2
CO5	Illustrate the current challenges in gender equality, including the glass ceiling and the role of technology.	K2

UNIT - I	Introduction to Gender Equality	Periods:06
Gender equality – exploring gender identity and expression, Understanding the social construction of general roles and norms, historical perspectives on gender roles, Analyzing key milestones in the fight for gender equality.		CO1

UNIT - II	Gender Inequality and Its Manifestations	Periods:06
Gender discrimination in Indian society – causes of gender inequality – Illiteracy, patriarchal set up, lack of awareness, social beliefs, practice and custom – Issues of gender discrimination – Child marriage, child domestic work, poor education and health, violence and exploitation in workplace.		CO2

UNIT - III	Gender and Culture	Periods:06
Workplace discrimination, Media influences on gender and culture, Gender and power dynamics in society. Strategies for promoting gender equality and cultural understanding.		CO3

UNIT - IV	Promoting Gender Equality	Periods:06
Gender Equality and Human Rights – International frameworks and Conventions on Gender Equality – Equality under the Indian Constitution – Policies and initiatives for gender mainstreaming – Strategies for promoting Gender Equality in various contexts.		CO4

UNIT - V	Contemporary Challenges and Future Directions	Periods:06
Current challenges and emerging issues in gender equality – Glass ceiling – role of technology in continuing or challenging gender inequality – Exploring possibilities for transformative change and envisioning a gender-equal future.		CO5

Lecture Periods: 30	Tutorial Periods: -	Practical Periods: -	Total Periods: 30

Text Books

1. "Gender and Society" by Raewyn Connell- This book provides a comprehensive overview of gender roles, power dynamics, and the social construction of gender.
2. "The Second Sex" by Simone de Beauvoir- A historical and philosophical examination of women's oppression and gender inequality.
3. "Women and Gender in the Indian Society" by Neera Desai and Usha Thakkar- Focuses on the context of gender roles, inequality, and feminist movements in India.

Reference Books

1. Woman in early Indian societies, New Delhi: Manohar Publications. Sita A. Raman (2009).
2. A social and Cultural history, Volume1. Connecticut: Oxford: Praeger. Sita Raman (2009).
3. A social and Cultural history, Volume2. Connecticut: Oxford: Praeger Iftikhar R. (2016).
4. Indian Feminism: Class, Gender and Identity in Medieval Ages. Chennai: Notion Press. Iftikhar, R. (2012).

Web References

1. https://www.unwomen.org
2. https://ncw.nic.in
3. https://en.unesco.org/themes/gender-equality

2.A.12.93.

5. https://wcd.nic.in

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	1	-	-	-	-	-	-	-	-	3	-	1	1	-	1
2	1	-	-	-	-	-	-	-	-	3	-	1	1	-	1
3	1	-	-	-	-	-	-	-	-	3	-	1	1	-	1
4	1	-	-	-	-	-	-	-	-	3	-	1	1	-	1
5	1	-	-	-	-	-	-	-	-	3	-	1	1	-	1

Correlation Level: 1 - Low, 2 - Medium, 3 - High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)			Total Marks
	Attendance	MCQ Test	Presentation / Activity / Assignment	
Marks	10	30	60	100

2.A.12.94

Annexure - II

2.A.95

2.A.12.96

Professional Elective – I (Offered in Semester IV)		
Sl.No.	**Course Code**	**CourseTitle**
1	U23CCE401	Mobile Communication and Networks
2	U23CCE402	Network Analysis and Management
3	U23CCE403	Information and Image coding Theory
4	U23CCE404	Compiler Design
5	U23CCE405	Azure Development and Operations

2.A.12.97

2.A.12.98

Department	**Computer and Communication Engineering**	Programme:**B.Tech.**						
Semester	**IV**	Course Category Code: **PE**			*End Semester Exam Type:**TE**			
Course Code	**U23CCE401**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Mobile Communication and Networks**	**3**	**0**	**0**	**3**	**25**	**75**	**100**

CCE (Professional Elective-I)

Prerequisite	Principles of Communication		
Course Outcomes	**On completion of the course, the students will be able to**		BT Mapping (Highest Level)
	CO1	Understand cellular concepts and signal propagation in mobile communication.	**K2**
	CO2	Understand the fundamental principles of signal propagation in wireless communication.	**K2**
	CO3	Compare and contrast various multiple access techniques and their suitability for different applications.	**K3**
	CO4	Illustrate the architecture of mobile communication networks, including GSM, CDMA, 3G, 4G LTE, and 5G.	**K3**
	CO5	Discuss the performance requirements of various Antennas for wireless communication.	**K3**

Unit- I	**Basics of Cellular Concepts**	**Periods:09**	
Cellular Communication Fundamentals: Cellular system design, Frequency reuse, cell splitting, handover concepts, Co channel and adjacent channel interference, interference reduction. techniques and methods to improve cell coverage, Frequency management and channel assignment.			**CO1**
Unit- II	**Signal Propagation**	**Periods:09**	
Propagation mechanism, reflection, refraction, diffraction and scattering, large scale signal propagation and lognormal shadowing. Fading channels-Multipath and small-scale fading- Doppler shift, statistical multipath channel models, narrowband and wideband fading models, power delay profile, average and rms delay spread, coherence bandwidth and coherence time, flat and frequency selective fading, slow and fast fading, average fade duration and level crossing rate.			**CO2**
Unit- III	**Multiple Access and Modulation Techniques**	**Periods:09**	
FDMA, TDMA, CDMA, SDMA, OFDM. Receiver structure- Diversity receivers- selection and MRC receivers, RAKE receiver, equalization: linear-ZFE and adaptive, DFE.			**CO3**
Unit- IV	**Cellular Wireless Standards**	**Periods:09**	
Wireless Standards: Overview of 2G 3G, 4G and 5G cellular mobile standards. System examples- GSM, EDGE, GPRS, IS-95, CDMA 2000 and WCDMA.			**CO4**
Unit- V	**Antennas for wireless communications**	**Periods:09**	
Mobile terminal Antennas: Performance requirements -Dipoles- Helical- inverted F, patches- MEGSAR-Mobile satellite Antennas.Base station antennas: Performance requirements in macro cellCO4 antenna design and diversity-micro/pico cell antennas, WLAN antennas. Adaptive antennas: Adaptive antenna applications.			**CO5**

Lecture Periods:45	**Tutorial Periods:**	**Practical Periods:**	**Total Periods:45**

Text Books

1. William Lee ,"Mobile Cellular Telecommunications: Analog and Digital Systems", McGraw Hill Education, 2nd Edition, July 2017.
2. AfifOsseiran, Jose F. Monserrat, Patrick Marsch, "5G Mobile and Wireless Communications Technology", Cambridge University Press, 2016.
3. Andreas F. Molisch, "Wireless Communications", Publisher: Wiley, 2nd edition, 2011.
4. T.S.Rappaport, "Wireless Communications Principles and Practice", PHI, 2nd Edition, 2006.

Reference Books

1. Vijay K. Garg, "Wireless Communication and Networking", Elsevier, Morgan Kaufmann, Reprinted 2012.
2. Erik Dahlman ," 4G, LTE-Advanced Pro and The Road to 5G", 3rd Edition, 2016.
3. Sassan Ahmadi, "5G NR: Architecture, Technology, Implementation, and Operation of 3GPP New Radio Standards "Hardcover – 1, June 2019.
4. Antennas for all applications, 3rd edition, by J.D. Krauss, TMH.
5. C.A.Balanis - Antenna Theory and Design, 3rd Ed., John Wiley & Sons., 2005

2.A.12.99

Web References

1. https://nptel.ac.in/courses/106/105/106105152/
2. https://www.coursera.org/learn/machine-learning
3. https://machinelearningmastery.com/
4. https://towardsdatascience.com/machine-learning/home/
5. https://archive.nptel.ac.in/courses/108/101/108101092/

TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2	-	2	-	-	-	-	-	-	-	3	2	-
2	3	2	2	-	2	-	-	-	-	-	-	-	3	2	-
3	3	2	2	-	2	-	-	-	-	-	-	-	3	2	-
4	3	2	2	-	2	-	-	-	-	-	-	-	3	2	-
5	3	2	2	-	2	-	-	-	-	-	-	-	3	2	-

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

*Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

2.9.12.100

Department	Computer and Communication Engineering	Programme:B.Tech					
Semester	IV	Course Category Code:PE			End Semester Exam Type:TE		
CourseCode	U23CCE402	Periods/Week			Credit	Maximum Marks	
		L	T	P	C	CAM	ESE	TM
Course Name	Network Analysis and Management	3	0	0	3	25	75	100
CCE (Professional Elective- I)								
Prerequisite	Computer and Communication Networks							

Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1 Explain the key concepts of networks and analysis	K2
	CO2 Apply the principles of flow models to analyze data within network systems, establishing connections between data sources and sinks.	K3
	CO3 Discuss the foundational concepts of network design, establishing design goals that align with organizational objectives.	K3
	CO4 Demonstrate knowledge of network performance issues, including bottlenecks and congestion	K3
	CO5 Discuss advanced networking concepts such as SNMP all the versions	K3

UNIT-I	Introduction to Network Analysis	Periods:09
Overview of computer networks -Types of networks (LAN, WAN, MAN) - Characteristics and applications of Local Area Networks (LAN), Wide Area Networks (WAN) and their use cases , Metropolitan Area Networks (MAN) and their significance Network topologies and architectures, Introduction to network protocols (TCP/IP, OSI model)- TCP/IP protocol suite, OSI model and its layers , Basics of network analysis tools and methodologies,- Overview of network analyzers, Packet capturing and analysis.		CO1

UNIT-II	Flow Analysis	Periods:09
Background- Flows- Data sources and sinks- Flow models- Flow boundaries- Flow distributions - Flow specifications- Applying the flow model - Establishing flow boundaries - Applying flow distributions- Combining flow models, boundaries and distributions- Developing flow specifications - Prioritizing flow, simplifying flow analysis process - examples of applying flow specs.		CO2

UNIT-III	Logical Design	Periods:09
Background- Establishing design goals - Shared Medium - Switching - Routing- Hybrid Routing/Switching Mechanisms – Applying Interconnection Mechanism to Design – Integrating Network management and security into the Design- Defining Network Management- Designing with manageable resources- Network Management Architecture- Security and Security mechanism- Network Management and security.		CO3

UNIT-IV	Performance Optimization and Troubleshooting	Periods:09
Performance metrics and monitoring tools- Bandwidth, latency, and throughput, Performance monitoring tools - Identifying and resolving network performance issues, Analyzing bottlenecks and congestion QoS (Quality of Service) considerations - Using diagnostic tools (ping, traceroute) - Resolving common connectivity issues, Diagnosing and resolving common network errors - Error detection and correction mechanisms, Performance optimization techniques, Load balancing, caching, and compression, Network optimization best practices.		CO4

UNIT-V	Network Management and SNMP Protocol Model	Periods:09
Network and System management, Network management system platform; Current SNMP Broadband and TMN management, Network management standards. SNMPV1, SNMPV2 system architecture, SNMPV2 structure of management information. SNMPV2 MIB – SNMPV2 protocol, SNMPV3-Architecture, Application, Security user based security model, Access control RMON.		CO5

Lecture Periods:45	Tutorial Periods:	Practical Periods:	Total Periods:45

Text Books

1. James. D. McCabe, Practical Computer Network Analysis and Design, 3rdEdition, Morgan Kaufaman, 2007.
2. Mani Subramanian, Network Management – Principles and Practice – 2nd Edition Prentice Hall, 2012.

Reference Books

1. J.Radz, Fundamentals of Computer Network Analysis and Engineering: Basic Approaches for Solving Problems in the Networked Computing Environment, Universe, 2005.
2. Mark Newman, Networks: An Introduction, Kindle Edition, 2010.
3. Laura Chappel and Gerald Combs, Wireshark 101: Essential Skills for Network Analysis, Kindle Edition, 2013.
4. William Stallings., SNMP, SNMP2, SNMP3 and RMON1 and 2, Pearson Education, 2004.
5. Daw Sudira, Network Management, Sonali Publications, 2004.

2.A.18.101

Web References

1. https://www.cisco.com/c/en/us/solutions/small-business/resource-center/networking/networking-basics.html
2. https://www.geeksforgeeks.org/basics-computer-networking/
3. https://datatracker.ietf.org/meeting/106/materials/slides-106-edu-sesse-ietf-106-newcomers-overview-01.pdf
4. https://www.researchgate.net/publication/338220481_Network_requirement_analysis
5. https://nptel.ac.in/courses/106/106/106106091/

TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2	1	1	-	-	-	-	-	-	-	3	2	-
2	3	2	2	1	1	-	-	-	-	-	-	-	3	2	-
3	3	2	2	1	1	-	-	-	-	-	-	-	3	2	-
4	3	2	2	1	1	-	-	-	-	-	-	-	3	2	-
5	2	2	2	1	1	-	-	-	-	-	-	-	3	2	-

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

2.A.12.102

Department	Computer and Communication Engineering	Programme:B.Tech					
Semester	IV	Course Category Code: PE			End Semester Exam Type:TE		
CourseCode	U23CCE403	Periods/Week			Credit	Maximum Marks	
		L	T	P	C	CAM	ESE	TM
Course Name	Information and Image Coding Theory	3	0	0	3	25	75	100

CCE (Professional Elective-I)

Prerequisite	NIL	
Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1 Describe the channel performance using Information theory.	K2
	CO2 Apply source coding techniques of Audio and speech coding algorithms.	K3
	CO3 Impart knowledge on source coding techniques of image coding algorithms.	K3
	CO4 Illustrate source coding techniques of video coding algorithms.	K3
	CO5 Apply error control codes in Communication systems.	K3

UNIT-I	Information Theory	Periods:09
Information entropy fundamentals: Information – entropy - properties of information and entropy - relation between information and probability - mutual and self-information - coding theory- code efficiency and redundancy - Shannon's theorem - construction of basic codes-Shannon and Fanon coding, Huffman coding – arithmetic coding.		CO1
UNIT-II	**Voice Coding**	**Periods:09**
Adaptive Differential Pulse Code Modulation, Adaptive delta modulation, Adaptive sub band coding, Adaptive transform coding, Linear predictive vocoder and comparison of various voice coding techniques.		CO2
UNIT-III	**Image Coding**	**Periods:09**
CODING Image compression and its need, Shift codes, Arithmetic Coding, run length coding, Transform coding and JPEG standard.		CO3
UNIT-IV	**Video Coding**	**Periods:09**
Video Compression: Principles-I, B, P frames, Motion estimation, Motion compensation, Introduction to H.261, MPEG Video compression standard.		CO4
UNIT-V	**Error Control Coding**	**Periods:09**
Error Control Coding: Convolutional codes, Cyclic codes, Cyclic Redundancy Check codes, Reed Solomon codes, BCH Codes, Repetition codes and Principle of Turbo coding.		CO5

Lecture Periods:45	Tutorial Periods:	Practical Periods:	Total Periods:45

TextBooks

1. Simon Haykin, "Digital Communications", John Wiley and Sons, 2013.
2. Ranjan Bose, Information Theory, Coding and Cryptography, 1st Edition, McGraw Hill Education (India) Pvt. Ltd., 2015.
3. K Sayood, "Introduction to Data Compression" 5/e, Elsevier 2017.
4. Khalid Sayood, Introduction to Data Compression, 4th Edition, Elsevier, Reprint: 2015.

ReferenceBooks

1. R Bose, "Information Theory, Coding and Cryptography", TMH 2007
2. S Gravano, "Introduction to Error Control Codes", Oxford University Press 2007
3. Mark Nelson, "Data Compression Book", BPB Publication 1992.
4. Watkinson J, "Compression in Video and Audio", Focal Press, London, 1995.
5. Rafael C. Gonzalez, Richard E. Woods, 'Digital Image Processing', Pearson, 2nd Edition, 2004
6. Fred Halsall, "Multimedia Communications: Applications, Networks, Protocols and Standards", Perason Education Asia, 2002

Web References

1. https://onlinelibrary.wiley.com/doi/full/10.1002/inf2.12016
2. https://nptel.ac.in/courses/117/101/117101053/
3. https://en.wikipedia.org/wiki/Information_theory
4. https://ieeexplore.ieee.org/xpl/mostRecentIssue.jsp?punumber=18
5. https://www.codeandtheory.com/

TE – Theory Exam, LE – Lab Exam

2.A.12.103

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2	-	-	-	-	-	-	-	-	-	3	2	-
2	3	2	2	-	-	-	-	-	-	-	-	-	3	2	-
3	3	2	2	-	-	-	-	-	-	-	-	-	3	2	-
4	3	2	2	-	-	-	-	-	-	-	-	-	3	2	-
5	3	2	2	-	-	-	-	-	-	-	-	-	3	2	-

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

2.A.12.104

Department	Computer and Communication Engineering			Programme:**B.Tech.**					
Semester	IV			Course Category Code:**PE**			*End Semester Exam Type:**TE**		
Course Code	U23CCE404			Periods/Week			Credit	Maximum Marks	
				L	T	P	C	CAM	ESE	TM
Course Name	Compiler Design			3	0	0	3	25	75	100
CCE (Professional Elective -I)										
Prerequisite	Nil									
Course Outcomes	On completion of the course, the students will be able to							BT Mapping (Highest Level)		
	CO1	Explain lexical analyzer from a specification of a language's lexical rules.						K2		
	CO2	Understand context-free grammar, top down and bottom up parsing techniques						K2		
	CO3	Applydifferentparsingalgorithmstodeveloptheparsers for agivengrammar.						K3		
	CO4	Implement asyntax-directedtranslationand run-timeenvironment.						K3		
	CO5	Apply optimization techniques to intermediate code and generate machine code						K3		
UNIT-I	**Introduction to Compilers**						**Periods:09**			
Structure of a compiler – Lexical Analysis – Role of Lexical Analyzer – Input Buffering – Specification of Tokens – Recognition of Tokens – Lex – Finite Automata – Regular Expressions to Automata – Minimizing DFA.										**CO1**
UNIT-II	**Syntax Analysis**						**Periods:09**			
Role of Parser – Grammars – Error Handling – Context-free grammars – Writing a grammar – Top Down Parsing - General Strategies Recursive Descent Parser Predictive Parser-LL(1) Parser-Shift Reduce Parser-LR Parser-LR (0)Item Construction of SLR Parsing Table - Introduction to LALR Parser - Error Handling and Recovery in Syntax Analyzer-YACC										**CO2**
UNIT-III	**Intermediate Code Generation**						**Periods:09**			
Syntax Directed Definitions, Evaluation Orders for Syntax Directed Definitions, Intermediate Languages: Syntax Tree, Three Address Code, Types and Declarations, Translation of Expressions, Type Checking.										**CO3**
UNIT-IV	**Run-Time Environment and Code Generation**						**Periods:09**			
Storage Organization, Stack Allocation Space, Access to Non-local Data on the Stack, Heap Management - Issues in Code Generation - Design of a simple Code Generator.										**CO4**
UNIT-V	**Code Optimization**						**Periods:09**			
Principal Sources of Optimization – Peep-hole optimization - DAG- Optimization of Basic Blocks-Global Data Flow Analysis - Efficient Data Flow Algorithm.										**CO5**
LecturePeriods:45	**TutorialPeriods:**	**PracticalPeriods:-**	**TotalPeriods:45**							

TextBooks

1. Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, Compilers: Principles, Techniques and Toolsǁ, 2nd Edition, Pearson Education, 2009.
2. Kenneth C. Louden (1997), Compiler Construction– Principles and Practice, 1stedition, PWS Publishing.
3. K. L. P Mishra, N. Chandrashekaran (2003), Theory of computer science- Automata Languages and computation, 2nd edition, Prentice Hall of India, New Delhi, India.

ReferenceBooks.

1. Des Watson,A Practical Approach to Compiler Construction- 2017
2. Allen I. Holub, Compiler Design in Cǁ, Prentice-Hall Software Series, 2014.
3. Randy Allen, Ken Kennedy, and Optimizing Compilers for Modern Architectures: A Dependence based Approach, Morgan Kaufmann Publishers, 2002.
4. Steven S. Muchnick, Advanced Compiler Design and Implementationǁ, Morgan Kaufmann Publishers - Elsevier Science, India, Indian Reprint 2003
5. Keith D Cooper and Linda Torczon, "Engineering a Compiler", Morgan Kaufmann Publishers Elsevier Science, 2004.

Web References

1. https://www.tutorialspoint.com/compiler_design/
2. https://www.javatpoint.com/compiler-tutorial
3. https://www.geeksforgeeks.org/introduction-of-compiler-design/
4. https://nptel.ac.in/courses/106/105/106105190/
5. https://www.guru99.com/compiler-design-tutorial.html

TE – Theory Exam, LE – Lab Exam

2.A.12.105

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	2	2	-	-	-	-	-	-	-	-	3	3	1
2	3	3	2	2	-	-	-	-	-	-	-	-	3	3	1
3	3	3	2	2	-	-	-	-	-	-	-	-	3	3	1
4	3	3	2	2	-	-	-	-	-	-	-	-	3	3	1
5	3	3	2	2	-	-	-	-	-	-	-	-	3	3	1

Correlation Level: 1-Low, 2-Medium, 3- High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

2.A.12.106

Department	Computer and Communication Engineering	Programme:**B.Tech.**						
Semester	IV	Course Category Code:**PE**			*End Semester Exam Type:**TE**			
Course Code	U23CCE405	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Azure Development and Operations**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
CCE (Professional Elective - I)								
Prerequisite	Software Engineering							

Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1 Explain traditional software development methodologies like waterfall.	**K2**
	CO2 Apply the Agile Methodology and comparing various other software development models with agile.	**K3**
	CO3 Explain implementing Continuous Integration and Continuous Delivery.	**K2**
	CO4 Create quick MVP prototypes for modules and functionalities.	**K3**
	CO5 Explain CAMS for DevOps (Culture, Automation, Measurement and Sharing).	**K2**

UNIT-I	**Traditional Software Development**	**Periods:09**
The Advent of Software Engineering - Software Process, Perspective and Specialized Process Models – Software Project Management: Estimation - Developers vs IT Operations conflict.		**CO1**

UNIT-II	**Rise of Agile Methodologies**	**Periods:09**
Agile movement in 2000 - Agile Vs Waterfall Method - Iterative Agile Software Development - Individual and team interactions over processes and tools - Working software over comprehensive documentation - Customer collaboration over contract negotiation - Responding to change over following a plan		**CO2**

UNIT-III	**Introduction DevOps**	**Periods:09**
Introduction to DevOps - Version control - Automated testing - Continuous integration - Continuous delivery - Deployment pipeline - Infrastructure management – Databases		**CO3**

UNIT-IV	**Purpose of DevOps**	**Periods:09**
Minimum Viable Product- Application Deployment- Continuous Integration- Continuous Delivery.		**CO4**

UNIT-V	**CAMS (Culture, Automation, Measurement and Sharing)**	**Periods:09**
CAMS – Culture, CAMS – Automation, CAMS – Measurement, CAMS – Sharing, Test-Driven Development, Configuration Management-Infrastructure Automation- Root Cause Analysis- Blamelessness- Organizational Learning		**CO5**

Lecture Periods:45	**Tutorial Periods:**	**Practical Periods:**	**Total Periods:45**

Text Books

1. GrigGheorghiu, Alfredo Deza, Kennedy Behrman, Noah Gift, "Python for DevOps", .
2. Len Bass, Ingo Weber, Liming Zhu, "DevOps - A Software Architect's Perspective", Pearson Education.

Reference Books.

1. Deepak Gaikwad, Viral Thakkar, DevOps Tools: from practioner's point of view, Wiley, 1st Edition, 2019.
2. Gene Kim, Jez Humble, Patrick Debois, and Willis," The DevOps Handbook", IT Revolution Press, 2016.
3. JoakimVerona, "Practical DevOps", O'Reilly, 2016.

Web References

1. https://azure.microsoft.com/en-in/overview/devops-tutorial/
2. https://www.javatpoint.com/devops

TE – Theory Exam, LE – Lab Exam

2.A.12.107

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	2	2	1	-	-	-	-	-	-	-	3	3	2
2	3	3	2	2	1	-	-	-	-	-	-	-	3	3	2
3	3	3	2	2	1	-	-	-	-	-	-	-	3	3	2
4	3	3	2	2	1	-	-	-	-	-	-	-	3	3	2
5	3	3	2	2	1	-	-	-	-	-	-	-	3	3	2

Correlation Level: 1-Low, 2-Medium, 3- High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

2.A-12.108

Professional Elective – II (Offered in Semester V)		
Sl. No.	**Course Code**	**Course Title**
1	U23CCE506	Wireless Adhoc and Sensor Networks
2	U23CCE507	Data Mining and Information Warehousing
3	U23CCE508	Multimedia Graphics Design
4	U23CCE509	Theory of Computation
5	U23ITEC01	Software Defined Networks

2.A.12.109

2-A-12.110

Department	Computer and Communication Engineering	Programme: **B.Tech.**						
Semester	V	Course Category: **PE**			End Semester Exam Type: **TE**			
Course Code	U23CCE506	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Wireless Adhoc and Sensor Networks**	**3**	**0**	**0**	**3**	**25**	**75**	**100**

CCE (Professional Elective-II)

Prerequisite	**NIL**	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Explain the basics of Ad hoc networks and routing protocols.	**K2**
	CO2 Apply the knowledge to identify appropriate physical and MAC layer protocols.	**K3**
	CO3 Interpret the basics of Sensor networks and routing protocols.	**K3**
	CO4 Apply the knowledge to identify the suitable routing algorithm based on the network and user requirement.	**K3**
	CO5 Analyze the security issues possible in Ad hoc and sensor networks.	**K4**

UNIT - I	**Introduction to Ad-Hoc Networks and Routing Protocols**	**Periods:09**
Ad-Hoc Networks: Fundamentals of Wireless Communication Technology- Characteristics of the Wireless Channel - mobile ad hoc networks (MANETs) - concepts and architectures. **Ad-Hoc Networks Routing Protocols**: Issues in designing a routing protocol for Ad hoc networksproactive routing, reactive routing (on-demand), hybrid routing- Classification of routing protocols. Transport Layer solutions-TCP over Ad hoc wireless Networks		**CO1**
UNIT - II	**MAC Protocols for Ad-Hoc Wireless Networks**	**Periods:09**
Protocol- Design goal of MAC Protocol-Classification of MAC Protocols- Contention based protocols Contention based protocols with Reservation Mechanisms- Contention based protocols with Scheduling Mechanisms.MAC Protocols that use directional Antennas and Multichannel MAC Protocols.		**CO2**
UNIT - III	**Sensor Networks and its Architecture**	**Periods:09**
Introduction to Sensor Networks: Challenges for Wireless Sensor Networks, Enabling Technologies for Wireless Sensor Networks, WSN application examples, Single-Node Architecture - Hardware Components, Energy Consumption of Sensor Nodes. **Sensor Networks Architecture**: Sensor Network Architecture - Sensor Network Scenarios, Transceiver Design Considerations, Optimization Goals and Figures of Merit.		**CO3**
UNIT - IV	**WSN Networking Concepts and Routing Protocols**	**Periods:09**
WSN Networking concepts: MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols and Wakeup Concepts - S-MAC, The Mediation Device Protocol, Contention based protocols - PAMAS, Schedule based protocols – LEACH, IEEE 802.15.4 MAC protocol. **WSN Routing Protocols:** Routing Protocols- Energy Efficient Routing, Geographic routing Challenges and Issues in Transport layer protocol.		**CO4**
UNIT - V	**Sensor Network Security**	**Periods:09**
Network Security Requirements, Issues and Challenges in Security Provisioning, Network Security Attacks, Layer wise attacks in wireless sensor networks, possible solutions for jamming, tampering, black hole attack, flooding attack. Key Distribution and Management, Secure Routing – SPINS, reliability requirements in sensor networks.		**CO5**

Lecture Periods: 45	**Tutorial Periods:**	**Practical Periods: -**	**Total Periods: 45**

Text Books

1. C. Siva Ram Murthy and B. S. Manoj," Ad Hoc Wireless Networks Architectures and Protocols", 2nd Edition, Pearson Publication, Reprinted in 2015.
2. Holger Karl and Andreas Willig," Protocol and Architecture for Wireless Sensor Networks", 1st Edition, John Wiley publication, Reprinted in 2011.
3. Anna Ha´c, "Wireless Sensor Network Designs", John Wiley & Sons Ltd,2nd Edition2003.

Reference Books

1. Raheem Beyah, Janise McNair and Cherita Corbett." Security in Ad hoc and Sensor Networks" World Scientific Publications / Cambridge University Press,Volume 3, 2010
2. Jagannathan Sarangapani," Wireless Ad hoc and Sensor Networks — Protocols", Performance and Control, CRC Press, Taylor & Francis Group, 2010.
3. Charles E. Perkins, "Ad Hoc Networking", Addison Wesley, 2000.

2.A.12.111

4. I.F. Akyildiz, W. Su, Sankarasubramaniam, E. Cayirci, "Wireless sensor networks: a survey , computer networks", Elsevier, 2002, 394 - 422.
5. Fei Hu, Xiaojun Cao and Auerbach," Wireless Sensor Networks — Principles and Practice," CRC Press, Taylor &Francis Group, 1St Edition, 2010.

Web References

1. https://www.tutorialspoint.com
2. https://nptel.ac.in/wireless Ad Hoc and Sensor Networks.pdf 3.
3. https://www.techtarget.com/searchmobilecomputing/definition/ad-hoc-network
4. https://www.geeksforgeeks.org
5. https://archive.nptel.ac.in/courses/106/105/106105160/

TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2	-	2	-	-	-	-	-	-	-	3	2	-
2	3	2	2	-	2	-	-	-	-	-	-	-	3	2	-
3	3	2	2	-	2	-	-	-	-	-	-	-	3	2	-
4	3	2	2	-	2	-	-	-	-	-	-	-	3	2	-
5	3	2	2	-	2	-	-	-	-	-	-	-	3	2	-

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

*Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

2.A.12.112

Department	Computer and Communication Engineering	Programme: B.Tech.						
Semester	V	Course Category: PE			End Semester Exam Type: TE			
Course Code	U23CCE507	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	Data Mining and Information Warehousing	3	0	0	3	25	75	100

CCE (Professional Elective-II)

Prerequisite	Basic knowledge of databases, statistics, and programming	
Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1 Understand the basic concepts and scope of data mining and warehousing	K2
	CO2 Master the techniques for preprocessing data to enhance quality	K3
	CO3 Apply OLAP techniques to analyze and visualize data stored in a warehouse	K3
	CO4 Implement various classification algorithms to classify data	K3
	CO5 Analyze and apply data mining techniques through real-world case studies	K3

UNIT-I	Introduction to Data Mining and Data Warehousing	Periods: 09
Introduction to Data Mining: Data Mining vs. Machine Learning vs. Data Science, Data Mining Applications and Challenges, Data Mining Process: Data Cleaning, Data Integration, Data Selection, and Transformation. Introduction to Data Warehousing: Overview of Data Warehousing Concepts, Data Warehousing Architecture, Differences between OLAP and OLTP, Data Marts and Metadata.		CO1
UNIT-II	**Data Preprocessing and ETL Processes**	**Periods: 09**
Data Preprocessing- Data Quality and Cleaning- Handling Missing Data- Dealing with Noisy Data, Data Integration and Transformation Techniques, Data Reduction: Dimensionality Reduction -Data Discretization and Concept Hierarchy Generation ETL Process: Importance of ETL in Data Warehousing, Steps Involved in ETL, Tools and Technologies for ETL		CO2
UNIT-III	**Data Warehousing Design and OLAP**	**Periods: 09**
Data Warehouse Design: Designing Star Schema, Snowflake Schema, and Fact Constellations, Implementing Data Marts, Data Warehouse Implementation Considerations. OLAP (Online Analytical Processing): OLAP Operations: Roll-up, Drill-down, Slice, Dice, Pivot, Types of OLAP: ROLAP, MOLAP, HOLAP, Implementing OLAP Cubes		CO3
UNIT-IV	**Data Mining Techniques: Association, Classification, and Clustering**	**Periods: 09**
Association Rule Mining: Introduction, Apriori Algorithm and FP-Growth Algorithm, Mining Multilevel and Multidimensional Association Rules, Applications of Association Rule Mining. Classification: Introduction to Classification Techniques, Decision Trees: ID3, C4.5, CART, Bayesian Classification, k-Nearest Neighbor (k-NN), Support Vector Machines (SVM), Model Evaluation: Cross-Validation, Confusion Matrix, Precision, Recall, Clustering Techniques		CO4
UNIT-V	**Advanced Topics in Data Mining and Case Studies**	**Periods: 09**
Advanced Data Mining Techniques: Web Mining: Web Content Mining, Web Structure Mining, Web Usage Mining, Temporal and Spatial Data Mining, Big Data Mining: Challenges and Techniques. Case Studies and Applications: Real-World Case Studies on Data Mining and Warehousing, Application of Data Mining in Business, Future Trends in Data Mining and Warehousing		CO5

Lecture Periods: 45	Tutorial Periods:	Practical Periods: -	Total Periods: 45

Text Books

1. Han, J., Kamber, M., & Pei, J. Data Mining: Concepts and Techniques. Elsevier 2011.
2. Inmon, W. H.. Building the Data Warehouse. Wiley. 2005
3. Matthew A, Russell, Mining the Social Web: Analyzing Data from Facebook, Twitter, LinkedIn, and Other Social Media Sites. by O'Reilly Media 2011.

Reference Books

1. Tan, P.-N., Steinbach, M., & Kumar, V.. Introduction to Data Mining. Pearson 2006
2. Ponniah, P.. Data Warehousing Fundamentals. Wiley 2004
3. JiaweiHan,Micheline-Kamber,Jian-Pei,Data-Mining.-Concepts-and-Techniques-3rd Edition, Morgan Kaufmann 2012
4. Daniel T. Larose , Data Mining and Predictive Analytics (Wiley Series on Methods and Applications in Data Mining) 2nd Edition 2012
5. Michael J.A. Berry , Gordon S. Linoff, Data Mining Techniques: For Marketing, Sales, and Customer Relationship Management by Wiley 2004

Web References

2.A.19.113.

1. https://www.geeksforgeeks.org/difference-between-data-warehousing-and-data-mining/
2. https://www.vssut.ac.in/lecture_notes/lecture1428550844.pdf
3. https://www.geeksforgeeks.org/data-warehousing/
4. https://www.snowflake.com/trending/data-warehousing-and-data-mining-for-bi/
5. https://www.egyankosh.ac.in/bitstream/123456789/89128/3/Block-1.pdf

TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	2	2	-	-	-	-	-	-	-	-	3	2	-
2	3	3	2	2	-	-	-	-	-	-	-	-	3	2	-
3	3	3	2	2	-	-	-	-	-	-	-	-	3	2	-
4	3	3	2	2	-	-	-	-	-	-	-	-	3	2	-
5	3	3	2	2	-	-	-	-	-	-	-	-	3	2	-

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

24.12.14

Department	Computer and Communication Engineering	Programme: B.Tech						
Semester	V	Course Category Code: PE			End Semester Exam Type: TE			
Course Code	U23CCE508	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	Multimedia Graphics Design	3	0	0	3	25	75	100

CCE (Professional Elective- II)

Prerequisite	NIL	
Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1 Explain graphics systems and its software	K2
	CO2 Apply two dimensional transformations graphics design	K3
	CO3 Apply three dimensional transformations graphics design	K3
	CO4 Apply Illumination and color models	K3
	CO5 Implementing animation graphics sequences and realism	K3

UNIT-I	Introduction Computer Graphics	Periods:09	
Introduction to Image and Objects, Image Representation, Basic Graphics Pipeline, Bitmap and Vector-Based Graphics, Applications of Computer Graphics, Display Devices, Cathode Ray Tubes, Raster-Scan Display, Random-Scan Display, Flat Panel Display, Input Technology, Coordinate System Overview.			CO1
UNIT-II	**Two Dimensional Transformation**	**Periods:09**	
Introduction to transformations, Transformation Matrix, Types of Transformations in Two-Dimensional Graphics: Identity Transformation, Scaling, Reflection, Shear Transformations, Rotation, Translation, Rotation about an Arbitrary Point, Combined Transformation, Homogeneous Coordinates, 2D Transformations using Homogeneous Coordinates			CO2
UNIT-III	**Three Dimensional Transformation**	**Periods:09**	
Three-dimensional transformations, Objects in Homogeneous Coordinates; Three-Dimensional Transformations: Scaling, Translation, Rotation, Shear Transformations, Reflection, World Coordinates and Viewing Coordinates, Projection, Parallel Projection, Perspective Projection.			CO3
UNIT-IV	**Illumination and Colour Models**	**Periods:09**	
Light sources - Basic Illumination Models – Halftone Patterns and Dithering Techniques; Properties of light - Standard Primaries and Chromaticity Diagram; Intuitive Colour Concepts - RGB Colour Model - YIQ Colour Model - CMY Colour Model - HSV Colour Model - HLS Colour Model; Colour Selection.			CO4
UNIT-V	**Animations & Realism**	**Periods:09**	
Animation Graphics: Design of Animation Sequences – Animation Function – Raster Animation – Key Frame Systems – Motion Specification –Morphing – Tweening. **Computer Graphics Realism:** Tiling the Plane – Recursively defined curves – Koch curves – C curves – Dragons – Space Filling Curves – Fractals – Grammar based Models – Fractals – Turtle Graphics – Ray Tracing.			CO5

LecturePeriods:45	Tutorial Periods:-	Practical Periods:-	TotalPeriods:45

Text Books

1. Computer Graphics, R. K. Maurya, John Wiley.
2. Mathematical elements of Computer Graphics, David F. Rogers, J. Alan Adams, Tata McGraw-Hill.
3. Procedural elements of Computer Graphics, David F. Rogers, Tata McGraw-Hill.

Reference Books

1. Computer Graphics, Donald Hearn and M. Pauline Baker, Prentice Hall of India.
2. Computer Graphics, Steven Harrington, McGraw-Hill.
3. Computer Graphics Principles and Practice, J.D. Foley, A Van Dam, S. K. Feiner and R. L. Phillips, Addision Wesley.
4. Principles of Interactive Computer Graphics, William M. Newman, Robert F. Sproull, Tata McGraw-Hill.
5. Introduction to Computer Graphics, J.D. Foley, A. Van Dam, S. K. Feiner, J.F. Hughes and R.L. Phillips, Addision Wesley.

Web References

1. https://nptel.ac.in/courses/106/106/106106090/
2. https://nptel.ac.in/courses/106/102/106102065/
3. https://nptel.ac.in/courses/106/102/106102063/
4. https://en.wikipedia.org/wiki/Hyperlink 5. http://www.weblinkcomputers.com/diploma-in-computer-application-graphics

TE – Theory Exam, LE – Lab Exam

2.A.12.115

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	1	-	-	-	-	-	-	-	1	1	-	2
2	3	2	2	1	-	-	-	-	-	-	-	1	1	-	2
3	3	2	2	1	-	-	-	-	-	-	-	1	1	-	2
4	3	2	2	1	-	-	-	-	-	-	-	1	1	-	2
5	2	2	2	1	-	-	-	-	-	-	-	1	1	-	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

2.9.12.116

Department	Computer and Communication Engineering	Programme: B.Tech						
Semester	V	Course Category Code: PE			End Semester Exam Type: TE			
Course Code	U23CCE509	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	Theory of Computation	3	0	0	3	25	75	100

CCE (Professional Elective -II)

Prerequisite	Discrete Mathematics, Digital Electronics and System, Design and Analysis of Algorithms	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Understand models and abstractions: automata as a basic model of computation	**K2**
	CO2 Understand link between languages, automata, and decision problems.	**K3**
	CO3 Understand layering as a means of tackling complexity, layering applied to the Internet.	**K2**
	CO4 Understand algebraic formalisms of languages such as regular expressions, context-free grammar.	**K3**
	CO5 Understand algorithms and computability through the lens of Turing machines.	**K2**

UNIT - I	**Finite Automaton**	**Periods:09**	
Alphabets, formal languages and problems. Regular languages and automata models- Deterministic Finite automaton, Formal argument of correctness, Regular languages -Properties of regular languages, Closure, properties, product construction, Limitations of Automata Nonregularity, Pumping Lemma, Non-Deterministic Finite Automaton, Subset construction, Equivalence with DFAs.			**CO1**
UNIT - II	**Regular Expressions**	**Periods:09**	
Equivalence with regular languages- Algorithms for regular languages, Minimization and its algorithm. Myhill- Nerode relations, Characterization of regular languages.			**CO2**
UNIT - III	**Grammars, Context-Free Languages And Machine Models**	**Periods:09**	
Grammars and the motivation from language theory- Context-free grammars, closure properties- Chomsky Normal Form for CFGs. PDAs - Empty- stack vs Final state acceptance conditions - Equivalence of PDAs and CFGs. Limitations of PDA computation, non- context-free language - Pumping Lemma for CFLs.			**CO3**
UNIT - IV	**Turing Machines and Computability**	**Periods:09**	
Modeling computation using Turing Machines - Equivalent mod- els - Church Turing Hypothesis - Decidability and Turing recognizability (i.e., recursive and recursively enumerable)- Closure properties - Undecidability by diagonalization.		**CO4**	**CO4**
UNIT - V	**Resource Bounded Turing Machines & Intro To Complexity**	**Periods:09**	
Basic complexity classes- Time bounded classes Post's correspondence problem, undecidable problems, Polytime reductions, NP -completeness, Cook- Levin Theorem without proof.			**CO5**

LecturePeriods:45	**Tutorial Periods:-**	**Practical Periods:-**	**TotalPeriods:45**

Text Books

1. Michael Sipser, "Introduction to the Theory of Computation", Cengage Publications, 3rd Edition 2012.
2. John Hopcroft, Rajeev Motwani, Jeffrey D. Ullmann, "Introduction to Automata, Theory, Languages and Com- putation".Pearson Publications, 3rd Edition, 2008.
3. Elaine Rich "Automata, Computability and Complexity: Theory and Applications", 1st edition, Pearson education, 2007.

Reference Books

1. R.B. Patel, "Theory of Computation", Khanna Book Publishing, 2020.
2. Harry Lewis, Christos Papadimitriou, "Elements of the Theory of Computation", Prentice Hall, Pearson Pub- lisher, 2nd Edition, 1997.
3. Sanjeev Arora and Boaz Barak,"Computational Complexity: A Modern Approach", Cambridge University Press, 2009.
4. Peter Linz, "An Introduction to Formal Languages and Automata", Jones & Bartlett Learning, 6th edition, 2016.

Web References

1. What is theory of computation? Set membership problem, basic notions like alphabet, strings, formal languages:
2. https://nptel.ac.in/courses/106104028
3. Introduction- Theory of Computation: https://nptel.ac.in/courses/106104148

TE – Theory Exam, LE – Lab Exam

2.A.12.117

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2	2	-	-	-	-	-	-	-	-	3	2	3
2	3	2	2	2	-	-	-	-	-	-	-	-	3	2	3
3	3	2	2	2	-	-	-	-	-	-	-	-	3	2	3
4	3	2	2	2	-	-	-	-	-	-	-	-	3	2	3
5	3	2	2	2	-	-	-	-	-	-	-	-	3	2	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

2.A.12.118

Department	**Information Technology**	Programme: **B.Tech.**					
Semester	**V**	Course Category Code: **PE**			*End Semester Exam Type:**TE**		
Course Code	**U23ITEC01**	Periods/Week			Credit	Maximum Marks	
		L	T	P	C	CAM	ESE	TM
Course Name	**Software Defined Networks**	**3**	**0**	**0**	**3**	**25**	**75**	**100**

CCE (Professional Elective-II)

Prerequisite	Computer Networks	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Express the basics of networking and working of SDN	**K2**
	CO2 Articulate SDN controllers	**K2**
	CO3 Describe the protocol, controller and application models	**K2**
	CO4 Explain the use of SDN in data centers	**K2**
	CO5 Expound the exploration of SDN in other environments	**K2**

UNIT-I	**Introduction**	**Periods:9**	
History of Software Defined Networking (SDN) – Modern Data Center – Traditional Switch Architecture-Evolution of Switches and Control Planes, Data Center Needs, The Evolution of Networking Technology, Evolution of SDN – How SDN Works- Centralized and Distributed Control and Data Planes			**CO1**
UNIT-II	**Open Flow & SDN Controllers**	**Periods:9**	
OpenFlow Overview, Potential Drawbacks of Open SDN, Opendaylight, Floodlight controllers, SDN via APIs, SDN via Hypervisor-Based Overlays, SDN via Opening Up the Device, Alternatives Overlap and Ranking			**CO2**
UNIT-III	**Emerging Protocol, Controller, and Application Models**	**Periods:9**	
Expanded Definitions of SDN, SDN Protocol Models, SDN Controller Models, Application Models, New Approaches to SDN Security, The P4 Programming Language, SDN programming interfaces			**CO3**
UNIT-IV	**SDN in the Data Center**	**Periods:9**	
Data Center Definition, Data Center Demands, Tunneling Technologies for the Data Center, Path Technologies in the Data Center, Ethernet Fabrics in the Data Center, SDN Use Cases in the Data Center, Comparison of Open SDN, Overlays, and APIs, Real-World Data Center Implementations			**CO4**
UNIT-V	**SDN in Other Environments**	**Periods:9**	
Wide Area Networks- Service Provider and Carrier Networks- Campus Networks-Hospitality Networks-Mobile Networks-Optical Networks-SDN vs P2P/Overlay Networks-Network Function Virtualization, SDN Platforms-Juniper, IETF			**CO5**

Lecture Periods:45	**Tutorial Periods: -**	**Practical Periods:-**	**Total Periods:45**

Text Books

1. P. Goransson, C. Black, T. Culver, "Software Defined Networks – A Comprehensive Approach", 2nd Edition, Elsevier, 2016,
2. Siamak Azodolmolky, "Software Defined Networking with OpenFlow", Packt, 2013

Reference Books

1. Anand Nayyar, Bhawna Singla, Preeti Nagrath, "Software Defined Networks: Architecture and Applications", Wiley, 2022
2. Doug Marschke, Jeff Doyle, Pete Moyer, "Software Defined Networking (SDN): Anatomy of OpenFlow", Lulu Publishing Services, 2015

Web References

1. https://sdn.systemsapproach.org/
2. https://www.ciscopress.com/articles/article.asp?p=3145761&seqNum=4

TE – Theory Exam, LE – Lab Exam

2. A. 12.119

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	2	1	2	1	1	-	-	2	1	1	2	2	2
2	2	1	2	1	2	1	1	-	-	2	1	1	2	2	2
3	2	1	2	1	2	1	1	-	-	2	1	1	2	2	2
4	2	1	2	1	2	1	1	-	-	2	1	1	2	2	2
5	2	1	2	1	2	1	1	-	-	2	1	1	2	2	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

*Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

2.A.12.20

Professional Elective – III (Offered in Semester VI)		
Sl.No.	**Course Code**	**Course Title**
1	U23CCE610	Advanced Communication Techniques
2	U23ECEC01	Digital Image Processing
3	U23CCE611	Computational Intelligence
4	U23CCE612	Artificial Neural Networks
5	U23ITEC02	Natural Language Processing

2.A.12.121

2.A.12.122

Department	Computer and Communication Engineering	Programme: B.Tech						
Semester	VI	Course Category Code: PE			End Semester Exam Type:TE			
Course Code	U23CCE610	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	Advanced Communication Techniques	3	0	0	3	25	75	100

CCE (Professional Elective III)

Prerequisite	Basic knowledge of Communication Systems	
Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1 Recall the requirements and key functionalities of 4G LTEA/5G NR technology.	K2
	CO2 Understand the principles of advanced Modulation and channel coding	K2
	CO3 Compare various channel access technologies used in 5G wireless systems.	K3
	CO4 Explore the principles of 5G Architecture	K2
	CO5 Understand the different 6G technologies	K2

UNIT-I	Overview of 5G Wireless Communications	Periods: 09
Evolution of mobile technologies (1G-5G), 3GPP Releases & its key aspects, Overview of 5G, three high level 5G usage scenarios (eMBB, URLLC, mMTC), Key capabilities & requirements, 5G vs. LTE-A Comparison, 5G frequency bands, 5G Use cases.		CO1
UNIT-II	**Introduction to Advanced Modulation and channel coding**	**Periods: 09**
Review of Basic Modulation Schemes (ASK,FSK,PSK,QPSK), Wideband modulation techniques (QAM,OFDM). Error correction codes (ECCs), Forward error correction (FEC), Polar codes, Low-density parity-check (LDPC) codes, and Turbo codes.		CO2
UNIT-III	**Waveform Design for 5G & Beyond**	**Periods: 09**
Introduction - 5G Waveform Design and Waveform Requirements – Flexible OFDM comparison with CP-OFDM, generalized frequency division multiplexing (GFDM), filter bank multicarriers (FBMC) and universal filtered multicarrier (UFMC), Multiple Accesses Techniques –non-orthogonal multiple accesses (NOMA), Sparse Code Multiple Access (SCMA) – Comparison of multiple access methods.		CO3
UNIT-IV	**5G Architecture**	**Periods: 09**
Introduction, 5G Architecture framework, 3GPP 5G architecture, Non-Roaming 5G system architecture, overall RAN architecture, Functional Split Between NG-RAN and 5G Core Network. 5G NextGen core network: Modern network requirements, SDN architecture, NFV benefits and requirements, – NFV Reference Architecture, Network Slicing concepts & requirements.		CO4
UNIT-V	**6G Communications**	**Periods: 09**
6G Use Cases Requirements and Metrics, 6G Enabling Technologies, Physical Layer Design Challenges for 6G Wireless, PHY Layer Design Challenges in Reconfigurable Intelligent Surface Aided 6G Wireless Networks, Millimeter Wave and Terahertz Spectrum for 6G Wireless, Challenges in Transport Layer .		CO5

Lecture Periods: 45	Tutorial Periods:	Practical Periods: -	Total Periods: 45

Text Books

1. Saad Z. Asif, "5G Mobile Communications Concepts and Technologies" CRC Press, 2019.
2. William Stallings "5G Wireless: A Comprehensive Introduction", Pearson Education, 2021
3. Suvra Sekhar Das and Ramjee Prasad, "Evolution of Air Interface Towards 5G: Radio Access Technology and Performance Analysis", Gistrup, Denmark: River Publishers series in Communication, 2018.

Reference Books

1. Tao Jiang, Lingyang Song, and Yan Zhang, "Orthogonal Frequency Division Multiple Access (OFDMA) Fundamentals and Applications", Auberbach Publications, Taylor & Francis Group, 2010.
2. Afif Osseiran, Jose F. Monserrat, Patrick Marsch, "5G Mobile and Wireless Communications Technology" Cambridge University Press-2016.
3. Yulei Wu, Sukhdeep Singh, Tarik Taleb, Abhishek Roy, Harpreet S. Dhillon, Madhan Raj Kanagarathinam, Aloknath De , 6G Mobile Wireless Networks, Springer Nature, 24-Aug-2021
4. Jonathan Rodriguez, "Fundamentals of 5G Mobile Networks" first edition, John Wiley & Sons, 2015.

2.A.12.123

Web References
1. https://onlinecourses.nptel.ac.in/noc24_ee152/preview 2. https://onlinecourses.nptel.ac.in/noc22_ee56/preview 3. https://archive.nptel.ac.in/courses/108/106/106106167/

COs/POs/PSOs Mapping

CO's	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2	2	-	-	-	-	-	-	-	-	-	-	-
2	3	2	2	2	-	-	-	-	-	-	-	-	-	-	-
3	3	2	2	2	-	-	-	-	-	-	-	-	-	-	-
4	3	2	2	2	-	-	-	-	-	-	-	-	-	-	-
5	3	2	2	2	-	-	-	-	-	-	-	-	-	-	-

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks(CAM)					End Semester Examination (ESE)Marks	Total Marks
	CAT1	CAT2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

*Application oriented/Problem solving/Design/Analytical in content beyond the syllabus

2-A-12.12.24

Department	**Electronics and Communication Engineering**		Programme: **B.Tech.**					
Semester	**VI**		Course Category: **PE**			*End Semester Exam: **TE**		
Course Code	**U23ECEC01**		Periods/Week			Credit	Maximum Marks		
			L	T	P	C	CAM	ESE	TM
Course Name	**Digital Image Processing**		**3**	**0**	**0**	**3**	**25**	**75**	**100**
CCE(Professional Elective III)									
Prerequisite	**Signal processing**								
Course Outcomes	On completion of the course, the students will be able to						BT Mapping		
	CO1	Understand fundamentals, visual perception, and pixel relationships.					**K2**		
	CO2	Correlate the various image processing technique with the help of mathematical preliminaries					**K3**		
	CO3	Apply different types of image enhancement and restoration techniques in various applications					**K3**		
	CO4	Illustrate the significance of Colour Image Processing and Image Segmentation techniques					**K4**		
	CO5	Explore image compression techniques, coding methods, and pattern recognition based on matching.					**K4**		
UNIT-I	**Digital Image Fundamentals**						**Periods:09**		
Introduction – Origin – Steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels., simple image formation model, Brightness, contrast, hue, saturation, Mach band effect							**CO1**		
UNIT-II	**Image Transform**						**Periods:09**		
Two-dimensional Fourier Transform- Properties – Fast Fourier Transform – Inverse FFT- Image transforms – 1D DFT, 2D DFT, Discrete Cosine transform, Discrete Sine transform, Hadamard transform, Haar transform, Slant transform, KL transform, SVD transform, Wavelet transform.							**CO2**		
UNIT-III	**Image Enhancement and Image Restoration**						**Periods:09**		
Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering– Smoothing and Sharpening Spatial Filtering – Frequency Domain: Introduction to Fourier Transform – Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters. Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering.							**CO3**		
UNIT-IV	**Colour Image Processing and Image Segmentation**						**Periods:09**		
Colour fundamentals – Colour models – HIS to RGB and RGB to HIS. Detection of Discontinuities– Edge Linking and Boundary detection – Region based segmentation- Morphological processing- erosion and dilation. Segmentation by morphological watersheds – basic concepts – Dam construction – Watershed segmentation algorithm							**CO4**		
UNIT-V	**Image Compression and Recognition**						**Periods:09**		
Need for compression – Coding Redundancy - Interpixel Redundancy - Psycho visual Redundancy - Bit plane coding - Variable length coding – Adaptive coding – Arithmetic coding – LZW coding – Hybrid coding – Wavelet – JPEG – MPEG. Boundary representation, Boundary description, Fourier Descriptor, Regional Descriptors – Topological feature, Texture – Patterns and Pattern classes – Recognition based on matching.							**CO5**		
Lecture Periods: 45	**Tutorial Periods: -**		**Practical Periods: -**			**Total Periods: 45**			

Textbooks

1. Rafael C. Gonzalez & Richard E. Woods, Digital Image Processing, 2017, 4th edition, Pearson Education, USA
2. Anil K. Jain, Fundamentals of Digital Image Processing, 2015, 1st edition, Pearson India, India
3. Kenneth R. Castleman, Digital Image Processing, Pearson, 2006.

2.A.12.185

Reference Books

1. Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins, "Digital Image Processing Using MATLAB", Third Edition Tata Mc Graw Hill Pvt. Ltd., 2011.
2. Willliam K Pratt, "Digital Image Processing", John Willey, 2002.
3. Malay K. Pakhira, "Digital Image Processing and Pattern Recognition", First Edition, PHI Learning Pvt. Ltd., 2011.
4. John C. Russ, F. Brent Neal-The Image Processing Handbook, Seventh Edition, The Kindle edition (2016), CRC Press,Taylor & Francis Group.
5. P.Ramesh Babu, Digital Image Processing, Scitech Publications., 2003

Web References

1. http://eeweb.poly.edu/~onur/lectures/lectures.html
2. http://www.caen.uiowa.edu/~dip/LECTURE/lecture.html
3. https://nptel.ac.in/courses/117/105/117105079/
4. https://nptel.ac.in/courses/117/105/117105135/
5. https://www.csie.nuk.edu.tw/

COs/POs/PSOs Mapping

CO's	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2	-	-	-	-	-	-	-	-	-	2	2	-
2	3	2	2	2	-	-	-	-	-	-	-	-	2	2	-
3	3	2	2	2	-	-	-	-	-	-	-	-	2	2	-
4	3	2	2	2	-	-	-	-	-	-	-	-	2	2	-
5	3	2	2	2	-	-	-	-	-	-	-	-	2	2	-

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

* Application-oriented / Problem-solving / Design / Analytical in content beyond the syllabus

2.A.12.126

Department	Computer and Communication Engineering	Programme: B.Tech.						
Semester	VI	Course Category Code: PE			*End Semester Exam Type: TE			
Course Code	U23CCE611	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	Computational Intelligence	3	0	0	3	25	75	100

CCE(Professional Elective III)

Prerequisite	Artificial Intelligence	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Understand the fundaments of Computational Intelligence and Fuzzy Logic.	**K2**
	CO2 Explain the types of Artificial Neural Networks and its applications	**K3**
	CO3 Describe Evolutionary Computation Intelligence and its applications.	**K3**
	CO4 Analyze hybrid Computational intelligence systems.	**K3**
	CO5 Apply Computational Intelligence in real time applications.	**K3**

Unit- I	**Introduction to Computational Intelligence and Fuzzy Logic**	**Periods: 09**
Overview of Computational Intelligence(CI) - Comparison with traditional Artificial Intelligence -Computational Intelligence techniques - Expert Systems: Rule-based expert systems – Uncertainty management - Fuzzy expert systems: Fuzzy sets and operations of fuzzy sets - Fuzzy rules and fuzzy inference - Fuzzy expert systems.		**CO1**
Unit- II	**Artificial Neural Networks**	**Periods: 09**
Introduction to Artificial Neural Networks(ANN), Neural Networks Architecture, Types of ANN: Feedforward Neural network, Recurrent Neural network, Convolutional Neural network and Deep Networks, Applications of ANN.		**CO2**
Unit- III	**Evolutionary Computation**	**Periods: 09**
Introduction to Evolutionary Computation, Genetic Algorithms (GA): Representation, Selection, Crossover, and Mutation, Genetic Programming (GP), Differential Evolution (DE) and Evolution Strategies. Applications of Evolutionary Computation in Optimization and Search Problems.		**CO3**
Unit- IV	**Hybrid Computational Intelligence Systems**	**Periods: 09**
Hybrid Intelligent Systems: Combining Neural Networks, Fuzzy Logic, and Evolutionary Computation, Neural expert systems -Neuro fuzzy systems -Evolutionary neural networks, Applications of Hybrid CI Systems in Complex Problem Solving.		**CO4**
Unit- V	**Recent Advances and Applications in CI**	**Periods: 09**
Deep Reinforcement Learning (DRL), Explainable AI (XAI), CI in Healthcare: Medical Diagnosis, Bioinformatics, and Personalized Medicine - CI in Finance: Algorithmic Trading, Risk Management, and Fraud Detection - CI in Robotics and Autonomous Systems.		**CO5**

Lecture Periods: 45	**Tutorial Periods:**	**Practical Periods: -**	**Total Periods: 45**

Text Books

1. Andries P. Engelbrecht, Computational Intelligence: An Introduction, 2nd Edition, John Wiley & Sons, 2012.
2. S. N. Sivanandam and S. N. Deepa, "Principles of Soft Computing", 2nd Edition, John Wiley & Sons, 2011.

Reference Books

1. S.Rajasekaran and G.A. Vijayalakshmi Pai, Neural Networks, Fuzzy logic and Genetic Algorithms-Synthesis and Applications, PHI Learning, 2003.
2. Marsland S, Machine Learning: An Algorithmic Perspective, CRC Press, 2009.
3. S. Russell and P. Norvig, Artificial Intelligence – A Modern Approach, Prentice Hall, 2010.
4. J.S.R.Jang, C.T.Sun and E.Mizutani, Neuro-Fuzzy and Soft Computing, PHI, Pearson Education,2004.

Web References

1. https://nptel.ac.in/courses/106/105/106105152/
2. https://www.coursera.org/learn/machine-learning
3. https://machinelearningmastery.com/
4. https://towardsdatascience.com/machine-learning/home/
5. https://www.analyticsvidhya.com/blog/2017/09/common-machine-learning-algorithms/

TE – Theory Exam, LE – Lab Exam

2.A.12.127

COs/POs/PSOs Mapping

CO's	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2	-	-	-	-	-	-	-	-	-	2	2	-
2	3	2	2	-	-	-	-	-	-	-	-	-	2	2	-
3	3	2	2	-	-	-	-	-	-	-	-	-	2	2	-
4	3	2	2	-	-	-	-	-	-	-	-	-	2	2	-
5	3	2	2	-	-	-	-	-	-	-	-	-	2	2	-

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

*Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

2.A.12.128

Department	**Computer and Communication Engineering**	Programme: **B.Tech.**						
Semester	**VI**	Course Category: **PE**			End Semester ExamType:**TE**			
Course Code	**U23CCE612**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Artificial Neural Networks**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
CCE(Professional Elective III)								

Prerequisite	Engineering Mathematics, signals and systems		
Course Outcomes	**On completion of the course, the students will be able to**		BT Mapping (Highest Level)
	CO1	Understand the principles of Neural Networks	**K2**
	CO2	Identify different types of models of artificial neural networks	**K3**
	CO3	Analyze the feed-forward neural networks	**K3**
	CO4	Analyze the feedback neural networks	**K3**
	CO5	Implementing different applications of artificial neural networks	**K3**

UNIT-I	**Basics of Artificial Neural Networks**	**Periods:09**
Characteristics of Neural Networks, Historical Development of Neural Network , Artificial Neural Networks-Terminology, Models of Neuron, Topology, Basic Learning Laws.		**CO1**
UNIT-II	**Activation and Synaptic Dynamics:**	**Periods:09**
Introduction, Common Activation functions ,Activation Dynamics Models, Synaptic Dynamics Models, Learning Methods.		**CO2**
UNIT-III	**Feed forward Neural Network:**	**Periods:09**
Introduction, Analysis of Pattern Association Networks, Analysis of Pattern Classification Networks. Training Algorithm for Pattern Association-Hetero associative memory neural network		**CO3**
UNIT-IV	**Feedback Neural Networks**	**Periods:09**
Introduction, Analysis of Linear Auto associative FF Networks, Analysis of Pattern Storage Networks. Auto associative net-Iterative Auto associative net-Bidirectional Associative Memory.		**CO4**
UNIT-V	**Architecture, Memory and Applications**	**Periods:09**
Neural Architecture for complex pattern recognition task — Associative memory — Data and Image compression — Pattern Classification —Spatio temporal patterns (Avalanche) — Pattern variability (Neocognitron) — Other Applications.		**CO5**

Lecture Periods:45	**Tutorial Periods:-**	**Practical Periods:-**	**TotalPeriods:45**

Text Books:

1. B.Yegnanarayana-Artificial neural network, PHI Publication, 2005
2. Laurene Fausett, "Fundamentals of Neural Networks-Architectures, Algorithms and Applications", Pearson Education, 2004
3. S.Raj sekaran,Vijayalakshmi Pari- Neural networks, Fuzzy logic and Genetic Algorithms

Reference Books:

1. Kevin L.Priddy, Paul E.Keller – Artificial neural networks: An Introduction-SPIE Press, 2005
2. Mohammad H.Hassoun–Fundamentals of artificial neural networks -MITPress,1995
3. James.A. Freeman and David. M.Skapura,"Neural Networks Algorithms, Applications and Programming Techniques " Pearson Education, 2002.
4. Simon Haykin, "Neural Networks- A Comprehensive Foundation', Pearson Education – 2001

Web References

1. https://ocw.mit.edu/courses/9-641j-introduction-to-neural-networks-spring-2005/
2. https://nptel.ac.in/courses/117105084/

TE – Theory Exam, LE – Lab Exam

2.A-12.129.

COs/POs/PSOs Mapping

CO's	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2	2	1	-	-	-	-	-	-	-	2	2	-
2	3	2	2	2	1	-	-	-	-	-	-	-	2	2	-
3	3	2	2	2	1	-	-	-	-	-	-	-	2	2	-
4	3	2	2	2	1	-	-	-	-	-	-	-	2	2	-
5	3	2	2	2	1	-	-	-	-	-	-	-	2	2	-

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks(CAM)					End Semester Examination (ESE)Marks	Total Marks
	CAT1	CAT2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

*Applicationoriented/Problemsolving/Design/Analyticalincontentbeyondthesyllabus

2.A.12.130

Department	**Information Technology**	Programme :**B.Tech.**						
Semester	**VI**	Course Category Code: **PE**			*End Semester Exam Type:**TE**			
Course Code	**U23ITEC02**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Natural Language Processing**	**3**	**0**	**0**	**3**	**25**	**75**	**100**

Common to IT and CCE (Professional Elective III)

Prerequisite	Basic mathematics, Fundamentals of Machine Learning

Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1 Understand the Fundamental Models in NLP.	**K2**
	CO2 Describe various Language Models in NLP.	**K2**
	CO3 Perform POS tagging for a given natural language and Select a suitable language modelling technique based on the structure of the language.	**K3**
	CO4 Demonstrate the state-of-the-art algorithms and techniques for text-based processing of natural language with respect to morphology.	**K2**
	CO5 Apply learning algorithms for various NLP applications	**K3**

Unit-I	**Introduction to NLP**	**Periods:09**
Introduction to NLP - Various stages of NLP –The Ambiguity of Language: Why NLP Is Difficult. Parts of Speech: Nouns and Pronouns, Words: Determiners and adjectives, verbs, Phrase Structure. Statistics Essential Information Theory: Entropy, perplexity, The relation to language, Cross entropy		**CO1**
Unit-II	**Language Modelling**	**Periods:09**
Words: Collocations - Frequency-Mean and Variance – Hypothesis testing: The t test, Hypothesis testing of differences, Pearson's chi-square test, Likelihood ratios. Statistical Inference: n - gram Models over Sparse Data: Bins: Forming Equivalence Classes- N gram model - Statistical Estimators- Combining Estimators		**CO2**
Unit-III	**Markov Model and POS Tagging**	**Periods:09**
Markov Model: Hidden Markov model, Fundamentals, Probability of properties, Parameter estimation, Variants, Multiple input observation. The Information Sources in Tagging: Markov model taggers, Viterbi algorithm, Applying HMMs to POS tagging, Applications of Tagging		**CO3**
Unit-IV	**Probabilistic Context Free Grammars and Probabilistic**	**Periods:09**
The Probability of a String, Problems with the Inside-Outside Algorithm, Parsing for disambiguation, Tree banks, Parsing models vs. language models, Phrase structure grammars and dependency, Lexicalized models using derivational histories, Dependency-based models.		**CO4**
Unit-V	**NLP Applications**	**Periods:09**
Text Alignment - Word Alignment - Clustering - Vector Space Model - Term Distribution Model – Latent Semantic Indexing –Discourse Segmentation - Decision Trees – Maximum Entropy Modeling – k- Neighbor Classification		**CO5**

LecturePeriods:45	**TutorialPeriods:-**	**PracticalPeriods:-**	**LecturePeriods:45**

TextBooks

1. Christopher D. Manning and Hinrich Schutze, "Foundations of Natural Language Processing" , 6th Edition, The MIT Press Cambridge, Massachusetts London, England, 2003
2. Daniel Jurafsky and James H. Martin "Speech and Language Processing", 3rd edition, Prentice Hall, 2024.
3. James Allen "Natural Language Understanding", Pearson Publication 8th Edition. 2012.

ReferenceBooks

1. Nitin Indurkhya, Fred J. Damerau "Handbook of Natural Language Processing", 2nd Edition, CRC Press, 2010.
2. Chris Manning and Hinrich Schütze, "Foundations of Statistical Natural Language Processing", 2nd edition, MIT Press Cambridge, 2003.
3. Hobson lane, Cole Howard, Hannes Hapke, "Natural language processing in action", MANNING Publications, 2019.
4. Alexander Clark, Chris Fox, Shalom Lappin, "The Handbook of Computational Linguistics and Natural Language Processing", Wiley-Blackwell, 2012

2.A.12.131

Web References

1. https://machinelearningmastery.com/natural-language-processing/
2. https://towardsdatascience.com/your-guide-to-natural-language-processing-nlp-48ea2511f6e1
3. https://www.nlp.com/what-is-nlp/

TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	2	2	-	1	-	-	-	-	1	-	-	3	1	-
2	2	2	2	-	1	-	-	-	-	1	-	-	3	1	-
3	2	2	2	-	1	-	-	-	-	1	-	-	3	1	-
4	1	2	2	2	1	-	-	-	-	1	-	-	3	1	-
5	3	1	2	2	1	-	-	-	-	1	-	-	3	1	-

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

*Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

2-A-12.132

OPEN ELECTIVE COURSES

S. No	Course Code	Course Title	Offering Department	Permitted Departments
Open Elective – I / II (Offered in Semester V/VI)				
1	U23CCOC01	Introduction to Communication Technologies	CCE	EEE, MECH, CSE,IT, CIVIL, ICE, Mechatronics, BME, AI&DS
2	U23CCOC02	Introduction to Computer Networks	CCE	EEE, MECH, CIVIL, ICE, Mechatronics, BME, AI&DS
Open Elective – III (Offered in Semester VII)				
3	U23CCOC03	Flutter Application Development	CCE	EEE, ECE, MECH, CSE,IT, CIVIL, ICE, Mechatronics, BME, AI&DS
4	U23CCOC04	Network Essentials and Security	CCE	EEE, MECH, CSE,IT, CIVIL, ICE, Mechatronics, BME, AI&DS

2.A.12.134

Department	Computer and Communication Engineering	Programme: **B.Tech.**						
Semester	V / VI	Course Category: **OE**			End Semester Exam Type: **TE**			
Course Code	U23CCOC01	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	Introduction to Communication Technologies	3	0	0	3	25	75	100

(Common to EEE, MECH, CSE, IT, CIVIL, ICE, Mechatronics, BME, AIDS)

Prerequisite	Nil	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Digitally represent analog signals through sampling & quantization	**K2**
	CO2 Compare the error probability of different digital modulation schemes	**K2**
	CO3 Illustrate the different Multiple Access techniques	**K2**
	CO4 Understand the recent trends in communication technologies	**K2**
	CO5 Summarize the various spread spectrum technologies	**K2**

UNIT - I	**SAMPLING & QUANTIZATION**	**Periods:9**	
Sampling–Aliasing–Quantization – Uniform & non-uniform quantization –Quantization noise – companding – PCM – DPCM – Delta modulation – ADPCM & ADM - Linear predictive coding - Line codes and PSD of line codes.			**CO1**
UNIT - II	**DIGITAL MODULATION SCHEMES**	**Periods:9**	
Signal space representation – Generation, detection, PSD & BER of coherent BPSK, BFSK, QPSK and DPSK – QAM –Detection of binary modulated signals in the presence of noise, BER analysis.			**CO2**
UNIT - III	**CELLULAR ARCHITECTURE**	**Periods:9**	
Multiple Access techniques — FDMA, TDMA, CDMA, OFDM, CSMA Protocols., NOMA — Capacity calculations– Cellular concept- Frequency reuse — channel assignment- hand-off- interference & system capacity- trunking & grade of service — Coverage and capacity improvement.			**CO3**
UNIT - IV	**RECENT TRENDS**	**Periods:9**	
Introduction to Wi-Fi, WiMAX, ZigBee Networks, MIMO, Software Defined Radio, UWB Radio, Wireless Ad hoc Network and Mobile Portability, Security issues and challenges in 5G and above Wireless networks			**CO4**
UNIT - V	**SPREAD SPECTRUM TECHNOLOGY**	**Periods:9**	
Introduction to spread spectrum, spread spectrum techniques, Direct sequence system, frequency hopping system, pulse FM (chirp) system, and hybrid systems.			**CO5**

Lecture Periods:45	**Tutorial Periods: -**	**Practical Periods:**	**Total Periods:45**

Text Books

1. Haykin S, Digital Communications, John Wiley, 2005. 56
2. Sklar B, Digital Communication Fundamentals and Applications, Pearson Education, Second Edition, 2009.
3. Proakis J.G, Digital Communication, Tata Mc Graw Hill Company, Fifth Edition, 2018.

Reference Books

1. Lathi B. P, Modern Digital and Analog Communication Systems, Oxford University Press, Third Edition, 2007.
2. Hsu H.P, Schaum's Outline Series – Analog and Digital Communications, Tata Mc Graw Hill Company, Third Edition, 2006.
3. Roody D, Coolen J, Electronic Communications, PHI, Fourth Edition, 2006.
4. Wireless Communication, Theodore S. Rappaport, Prentice hall
5. Wireless Communications and Networking, Vijay Garg, Elsevier
6. Wireless digital communication, Kamilo Feher, PHI

Web References

1. www.nptel.ac.in
2. https://www.tutorialspoint.com/communication_technologies/index.htm

* TE – Theory Exam, LE – Lab Exam

2.A.12.135

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	1	2	1	3	-	-	-	1	1	1	2	2	2	1
2	3	3	1	2	3	-	-	-	1	1	1	-	2	2	2
3	2	3	1	1	-	3	2	3	1	1	2	-	2	3	1
4	3	1	3	1	2	-	-	-	2	1	2	-	2	3	1
5	3	1	2	1	2	-	-	2	1	1	2	2	2	3	1

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

D.A-12.136

Department	Computer and Communication Engineering	Programme: B.Tech.						
Semester	V / VI	Course Category: OE			End Semester Exam Type: TE			
Course Code	U23CCOC02	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	Introduction to Computer Networks	3	0	0	3	25	75	100

(Common to EEE, MECH, CIVIL, ICE, Mechatronics, BME, AIDS)

Prerequisite	Basic Knowledge in Computer	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Summarize the required functionality at each layer for given application.	**K2**
	CO2 Sketch the flow of information from one node to another node in the network.	**K3**
	CO3 Apply the knowledge of addressing scheme and various routing protocols in data communication to select optimal path.	**K3**
	CO4 Illustrate the traffic within the network and analyze the transfer of packets.	**K3**
	CO5 Develop real time applications of networks using socket programming.	**K4**

UNIT - I	**FUNDAMENTALS AND PHYSICAL LAYER**	**Periods:09**
Introduction: Computer networks and distributed systems, Classifications of computer networks, Preliminaries of layered network structures. Data communication components: Representation of data and its flow, Various connection topology, Protocols and standards, OSI model, Transmission Media. LAN: Wired LAN, Wireless LAN, Virtual LAN. Techniques for Bandwidth utilization: Multiplexing - Frequency division, Time division and Wave division, Concepts on spread spectrum.		**CO1**
UNIT - II	**DATA LINK LAYER AND MEDIUM ACCESS SUB LAYER**	**Periods:09**
Fundamentals of Error Detection and Error Correction, Block coding, Hamming Distance, CRC; Flow Control and Error control protocols - Stop and Wait, Go-back–N ARQ, Selective Repeat ARQ, Sliding Window, Piggybacking, Random Access, Multiple access protocols -Pure ALOHA, Slotted ALOHA, CSMA/CD, CDMA/CA.		**CO2**
UNIT - III	**NETWORK LAYER**	**Periods:09**
Switching, Logical addressing – IPV4, IPV6; Address mapping – ARP, RARP, BOOTP and DHCP–Delivery, Forwarding and Unicast Routing protocols.		**CO3**
UNIT - IV	**TRANSPORT LAYER**	**Periods:09**
Process to Process Communication, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), SCTP Congestion Control; Quality of Service (QoS), QoS improving techniques - Leaky Bucket and Token Bucket algorithms.		**CO4**
UNIT - V	**APPLICATION LAYER AND SECURITY**	**Periods:09**
Application Layer: DNS, DDNS, TELNET, EMAIL, FTP, WWW, HTTP, SNMP, Bluetooth, Firewalls. Network Security: Electronic mail, directory services and network management, Basic concepts of Cryptography.		**CO5**

Lecture Periods:45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods:45**

Text Books

1. Andrew S. Tanenbaum and David J. Wetherall, "Computer Networks", 6th edition, Pearson education, 2022.
2. William Stallings, "Data and Computer Communication", 10th edition, Pearson education, 2017.
3. Behrouz A. Forouzan, "Data Communications and Networking", 6 Edition, McGrawHill, 2022.
4. James F. Kurose, Keith W. Ross," Computer Networking - A Top-Down Approach Featuring the Internet", 8 Edition, Pearson Education, 2022.
5. James F Kurose "computer networking", 8th edition, 2022

Reference Books

1. Larry L. Peterson, Bruce S. Davie, "Computer Networks: A Systems Approach", Fifth Edition, Morgan Kaufmann Publishers Inc., 2011.
2. Kaufman, R. Perlman and M. Speicher, "Network Security", Pearson education, 2017.
3. Thomas Robertazzt, "Basics of Computer Networking" Springer,2012

Web References

1. https://www.tutorialspoint.com/data_communication_computer_network/index.htm
2. https://en.wikipedia.org/wiki/Computer_network
3. https://www.javatpoint.com/computer-network-tutorial
4. https://www.geeksforgeeks.org/basics-computer-networking/
5. https://archive.nptel.ac.in/courses/106/105/106105183/

* TE – Theory Exam, LE – Lab Exam

2.A.12.137

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	2	2	2	-	-	-	1	1	1	-	2	1	1
2	3	3	2	2	2	-	-	-	1	1	1	-	2	1	1
3	3	3	2	2	2	-	-	-	1	1	1	-	2	1	1
4	3	3	3	3	2	-	-	-	1	1	1	-	2	1	1
5	3	3	3	3	2	-	-	-	1	1	1	-	2	1	1

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

2.A.12.138

Annexure - III

2.A.12.139

2.A.12.140

Annexure – III

ABILITY ENHANCEMENT COURSES – (A) CERTIFICATION COURSES

S. No	Course Code	Course Title	Certified By
1	U23CCCX01	Adobe Photoshop	Adobe
2	U23CCCX02	Adobe Animate	Adobe
3	U23CCCX03	Adobe Dreamweaver	Adobe
4	U23CCCX04	Adobe After Effects	Adobe
5	U23CCCX05	Adobe Illustrator	Adobe
6	U23CCCX06	Adobe InDesign	Adobe
7	U23CCCX07	Autodesk AutoCAD -ACU	Autodesk
8	U23CCCX08	Autodesk Inventor - ACU	Autodesk
9	U23CCCX09	Autodesk Revit - ACU	Autodesk
10	U23CCCX10	Autodesk Fusion 360 - ACU	Autodesk
11	U23CCCX11	Autodesk 3ds Max - ACU	Autodesk
12	U23CCCX12	Autodesk Maya - ACU	Autodesk
13	U23CCCX13	Cloud Security Foundations	AWS
14	U23CCCX14	Cloud Computing Architecture	AWS
15	U23CCCX15	Cloud Foundation	AWS
16	U23CCCX16	Cloud Practitioner	AWS
17	U23CCCX17	Cloud Solution Architect	AWS
18	U23CCCX18	Data Engineering	AWS
19	U23CCCX19	Machine Learning Foundation	AWS
20	U23CCCX20	Robotic Process Automation / Medical Robotics	Blue Prism
21	U23CCCX21	Advance Programming Using C	CISCO
22	U23CCCX22	Advance Programming Using C ++	CISCO
23	U23CCCX23	C Programming	CISCO
24	U23CCCX24	C++ Programming	CISCO
25	U23CCCX25	CCNP Enterprise: Advanced Routing	CISCO
26	U23CCCX26	CCNP Enterprise: Core Networking	CISCO
27	U23CCCX27	Cisco Certified Network Associate - Level 2	CISCO
28	U23CCCX28	Cisco Certified Network Associate- Level 1	CISCO
29	U23CCCX29	Cisco Certified Network Associate- Level 3	CISCO
30	U23CCCX30	Fundamentals Of Internet of Things	CISCO
31	U23CCCX31	Internet Of Things / Solar and Smart Energy System with IoT	CISCO
32	U23CCCX32	Java Script Programming	CISCO
33	U23CCCX33	NGD Linux Essentials	CISCO
34	U23CCCX34	NGD Linux I	CISCO
35	U23CCCX35	NGD Linux II	CISCO
36	U23CCCX36	Advance Java Programming	Ethnotech
37	U23CCCX37	Android Programming / Android Medical App Development	Ethnotech
38	U23CCCX38	Angular JS	Ethnotech

2. A-12.141

39	U23CCCX39	Catia	Ethnotech
40	U23CCCX40	Communication Skills for Business	Ethnotech
41	U23CCCX41	Coral Draw	Ethnotech
42	U23CCCX42	Data Science Using R	Ethnotech
43	U23CCCX43	Digital Marketing	Ethnotech
44	U23CCCX44	Embedded System Using C	Ethnotech
45	U23CCCX45	Embedded System with IOT / Arduino	Ethnotech
46	U23CCCX46	English For IT	Ethnotech
47	U23CCCX47	Plaxis	Ethnotech
48	U23CCCX48	Sketch Up	Ethnotech
49	U23CCCX49	Financial Planning, Banking and Investment Management	Ethnotech
50	U23CCCX50	Foundation Of Stock Market Investing	Ethnotech
51	U23CCCX51	Machine Learning / Machine Learning for Medical Diagnosis	Ethnotech
52	U23CCCX52	IOT Using Python	Ethnotech
53	U23CCCX53	Creo (Modelling & Simulation)	Ethnotech
54	U23CCCX54	Soft Skills, Verbal, Aptitude	Ethnotech
55	U23CCCX55	Software Testing	Ethnotech
56	U23CCCX56	MX-Road	Ethnotech
57	U23CCCX57	CLO 3D	Ethnotech
58	U23CCCX58	Solid works	Ethnotech
59	U23CCCX59	Staad Pro	Ethnotech
60	U23CCCX60	Total Station	Ethnotech
61	U23CCCX61	Hydraulic Automation	Festo
62	U23CCCX62	Industrial Automation	Festo
63	U23CCCX63	Pneumatics Automation	Festo
64	U23CCCX64	Agile Methodologies	IBM
65	U23CCCX65	Block Chain	IBM
66	U23CCCX66	Devops	IBM
67	U23CCCX67	Artificial Intelligence	ITS
68	U23CCCX68	Cloud Computing	ITS
69	U23CCCX69	Computational Thinking	ITS
70	U23CCCX70	Cyber Security	ITS
71	U23CCCX71	Data Analytics	ITS
72	U23CCCX72	Databases	ITS
73	U23CCCX73	Java Programming	ITS
74	U23CCCX74	Networking	ITS
75	U23CCCX75	Python Programming	ITS
76	U23CCCX76	Web Application Development (HTML, CSS, JS)	ITS
77	U23CCCX77	Network Security	ITS & Palo alto
78	U23CCCX78	MATLAB	MathWorks
79	U23CCCX79	Azure Fundamentals	Microsoft
80	U23CCCX80	Azure AI (AI-900)	Microsoft
81	U23CCCX81	Azure Data (DP -900)	Microsoft
82	U23CCCX82	Microsoft 365 Fundamentals (SS-900)	Microsoft

83	U23CCCX83	Microsoft Security, Compliance and Identity (SC-900)	Microsoft
84	U23CCCX84	Microsoft Power Platform (PI-900)	Microsoft
85	U23CCCX85	Microsoft Dynamics Fundamentals 365 – CRM	Microsoft
86	U23CCCX86	Microsoft Excel	Microsoft
87	U23CCCX87	Microsoft Excel Expert	Microsoft
88	U23CCCX88	Securities Market Foundation	NISM
89	U23CCCX89	Derivatives Equinity	NISM
90	U23CCCX90	Research Analyst	NISM
91	U23CCCX91	Portfolio Management Services	NISM
92	U23CCCX92	Cyber Security	Palo alto
93	U23CCCX93	Cloud Security	Palo alto
94	U23CCCX94	PMI – Ready	PMI
95	U23CCCX95	Tally – GST & TDS	Tally
96	U23CCCX96	Advance Tally	Tally
97	U23CCCX97	Associate Artist	Unity
98	U23CCCX98	Certified Unity Programming	Unity
99	U23CCCX99	VR Development	Unity

2.A.12.144

Annexure – IV

O.A.12.145

2.A.12.146

SRI MANAKULA VINAYAGAR ENGINEERING COLLEGE

(AN AUTONOMOUS INSTITUTION)

(Approved by AICTE, New Delhi and Affiliated to Pondicherry University)
(Accredited by NBA-AICTE, New Delhi, Accredited by NAAC with "A" Grade)
MADAGADIPET, PUDUCHERRY - 605 107

Department of Computer and Communication Engineering

Equivalence Subjects -R2020 (CCE Vs IT)

CCE DEPARTMENT SUBJECTS				IT DEPARTMENT SUBJECTS	
S.NO	COURSE CODE	COURSE NAME	MAPPING	COURSE CODE	COURSE NAME
	PROFESSIONAL COURSES (PC)			PROFESSIONAL COURSES (PC)	
1	U20CCT201	Introduction to Web Technologies	1	U20ITT201	Microprocessors and Microcontrollers
2	U20CCT202	Electronic Circuits	2	U20ITT202	Front End Web Development
3	U20CCT203	Digital Electronics	3	U20ITT203	Computer Organization and Architecture
4	U20CCT204	Computer Organization	4	U20ITT204	Information Systems : Theory and Applications
5	U20CCP201	Electronic Circuits Laboratory	5	U20ITP201	Microprocessors and Microcontrollers Laboratory
6	U20CCP202	Digital Electronics Laboratory	6	U20ITP202	Front End Web Development Laboratory
7	U20CCT305	Communication Systems	7	U20ITT305	Computer Networks
8	U20CCT306	Signal Processing	8	U20ITT306	Database Management Systems
9	U20CCT307	Software Engineering	9	U20ITT307	Software Engineering and Project Management
10	U20CCP303	Communication Systems Laboratory	10	U20ITP303	Database Management Systems Laboratory
11	U20CCT408	Principles of Data Communication	11	U20ITT408	Operating System
12	U20CCT409	Design and Analysis of algorithms	12	U20ITT409	Web Application Development
13	U20CCP404	Data Communication Laboratory	13	U20ITP404	Operating System Laboratory
14	U20CCP405	Design and Analysis of Algorithms Laboratory	14	U20ITP405	Web Application Development Laboratory
15	U20CCT510	Database Systems	15	U20ITCM02	Mobile Computing
16	U20CCT511	Cryptography and Network Security	16	U20ITT511	Data Warehousing and Data Mining
17	U20CCT512	Microcontroller and Interfacing	17	U20ITCM01	Network Security
18	U20CCP506	Cryptography and Network Security Laboratory	18	U20ITP506	Mobile Computing Laboratory
19	U20CCP507	Microcontroller and Interfacing Laboratory	19	U20ITP507	Data Warehousing and Data Mining Laboratory
20	U20CCP508	Database Systems Laboratory	20	U20ITP508	Network Security Laboratory
21	U20ECCM04	Internet of Things	21	U20ITT613	Artificial Intelligence
22	U20CCT614	Internet Programming	22	U20ITT614	Data Science and Analytics
23	U20CCT615	Wireless Communication Systems	23	U20ITT615	Design Thinking
24	U20CCT616	Data Science	24	U20ITT616	Block Chain Technology
25	U20CCP609	Internet of Things Applications Laboratory	25	U20ITP609	Artificial Intelligence Laboratory
26	U20CCP610	Internet Programming Laboratory	26	U20ITP610	Data Science Laboratory
27	U20CCP611	Wireless Communication Systems Laboratory	27	U20ITCM05	Cloud Computing
28	U20CCT717	Machine Learning and Artificial Intelligence	28	U20ITCM03	IoT and Edge Computing
29	U20CCT718	Cloud Computing and Distributed Systems	29	U20ITP712	Cloud Computing Laboratory
30	U20CCP712	Artificial Intelligence Laboratory	30	U20ITP713	IoT and Edge Computing Laboratory
31	U20CCP713	Cloud Computing and Distributed Systems Laboratory	31	U20ITP714	Comprehensive Viva Voce
32	U20CCP714	Comprehensive Viva Voce	32	U20ITCM09	Deep Learning
33	U20CCT819	Blockchain Technology and Application		PROFESSIONAL ELECTIVE	
			33	U20ITE401	Storage Technologies
33	U20CCE401	Spread Spectrum Communication	34	U20ITE402	Computer Vision
34	U20CCE402	Network Analysis and Management	35	U20ITE403	Object Oriented Analysis and Design
35	U20CCE403	Information Coding Theory	36	U20ITE404	Agile Methodologies
36	U20CCE404	Computer Graphics	37	U20ITE405	Information Coding Techniques
37	U20CCE405	Operating Systems	38	U20ITE506	Software Testing
38	U20ECCM01	Vehicular Communication	39	U20ITE507	Data Visualization
39	U20CCE507	Wireless Adhoc and Sensor Networks	40	U20ITE508	Brain Computer Interface and its Application
40	U20CCE508	Data Mining and Warehouse	41	U20ITE509	Linux Internals
41	U20CCE509	Computer Vision Technology	42	U20ITCM08	Automation Techniques & Tools - DevOps
42	U20ICCM01	Fuzzy Logic and Neural Networks	43	U20ITE611	Open Source Software
43	U20ECCM03	Digital Image Processing	44	U20ITE612	E-Commerce
44	U20CCE612	Wireless Networking	45	U20ITE613	Parallel and Distributed Systems
45	U20CCE613	Information Retrieval	46	U20ITE614	Big Data
46	U20CSCM05	Human Computer Interaction	47	U20ITE615	Bio-inspired Computing
47	U20BMCM01	Soft computing	48	U20ITE716	Machine Learning
48	U20CCE716	OFDM Systems	49	U20ITE719	Wireless Sensor Network
49	U20ITCM07	Social Network Analysis	50	U20ITCM04	Robotics Process Automation
50	U20CSCM01	Software Project Management	51	U20ITCM06	Green Computing
51	U20ECCM05	Satellite Communication	52	U20ITCM07	Social Network Analysis
52	U20ITCM06	Green Computing	53	U20ITE821	Human Computing Interface
53	U20CCE821	Multiple Input Multiple Output Communication	54	U20ITE823	Information Management
54	U20CCE822	Software Defined Networks	55	U20ITE824	Mixed Reality
55	U20CCE823	Information Security	56	U20ITE825	Game Development
56	U20CCE824	Bigdata Analytics	57	U20ITCM10	Business Intelligence
57	U20ITCM09	Deep Learning	58	U20ITE826	Cyber Security
58	U20CCE826	Millimeter Wave Personal Communication Systems	59	U20ITE827	Computer Animation: Algorithms and Techniques
59	U20CCE827	Advanced Telecommunication Networks	60	U20CSCM02	C# and .Net Programming
60	U20ADCM01	Mobile Application Development	61	U20ITE829	High Performance Computing
61	U20CCE829	Pattern Recognition	62	U20ITE830	Streaming Analytics
62	U20ITCM10	Business Intelligence		OPEN ELECTIVE COURSES	
	OPEN ELECTIVE COURSES		63	U20EEO401	Solar Photovoltaic Fundamental and applications
63	U20EEO401	Solar Photovoltaic Fundamental and applications	64	U20EEO402	Electrical Safety
64	U20EEO402	Electrical Safety	65	U20ECO401	Engineering Computation with MATLAB

2.A.12.147

65	U20ECO401	Engineering Computation with MATLAB	66	U20ECO402	Consumer Electronics
66	U20ECO402	Consumer Electronics	67	U20CSO401	Web Development
67	U20CSO401	Web Development	68	U20CSO402	Analysis of Algorithms
68	U20CSO402	Analysis of Algorithms	69	U20ITO401	Database System: Design & Development
69	U20ITO401	Database System. Design & Development	70	U20ITO402	R programming
70	U20ITO402	R programming	71	U20ICO401	Sensors and Transducers
71	U20ICO401	Sensors and Transducers	72	U20ICO402	Industrial Safety Management
72	U20ICO402	Industrial Safety Management	73	U20MEO401	Rapid Prototyping
73	U20MEO401	Rapid Prototyping	74	U20MEO402	Material Handling System
74	U20MEO402	Material Handling System	75	U20MEO403	Industrial Engineering for Textile
75	U20MEO403	Industrial Engineering for Textile	76	U20CEO401	Energy and Environment
76	U20CEO401	Energy and Environment	77	U20CEO401	Building Science and Engineering
77	U20CEO402	Building Science and Engineering	78	U20BMO401	Medical Electronics
78	U20BMO401	Medical Electronics	79	U20BMO402	Telemedicine
79	U20BMO402	Telemedicine	80	U20CCO401	Basic DBMS
80	U20CCO401	Basic DBMS	81	U20CCO402	Introduction to Communication Systems
81	U20CCO402	Introduction to Communication Systems	82	U20ADO401	Knowledge Representation and Reasoning
82	U20ADO401	Knowledge Representation and Reasoning	83	U20ADO402	Introduction to Data Science
83	U20ADO402	Introduction to Data Science	84	U20HSO601	Product Development and Design
84	U20HSO501/ U20HSO601	Product Development and Design	85	U20HSO502/ U20HSO602	Intellectual Property and Rights
85	U20HSO502/ U20HSO602	Intellectual Property and Rights	86	U20HSO503/ U20HSO603	Marketing Management and Research
86	U20HSO503/ U20HSO603	Marketing Management and Research	87	U20HSO504/ U20HSO604	Project Management for Engineers
87	U20HSO504/ U20HSO604	Project Management for Engineers	88	U20HSO505/ U20HSO605	Finance for Engineers
88	U20HSO505/ U20HSO605	Finance for Engineers	89	U20EEO503/ U20EEO603	Conventional and Non- Conventional Energy Sources
89	U20EEO503/ U20EEO603	Conventional and Non Conventional Energy Sources	90	U20EEO504/ U20EEO604	Industrial Drives and Control
90	U20EEO504/ U20EEO604	Industrial Drives and Control	91	U20ECO503/ U20ECO603	Electronic Product Design and Packaging
91	U20ECO503/ U20ECO603	Electronic Product Design and Packaging	92	U20ECO504/ U20ECO604	Automotive Electronics
92	U20ECO504/ U20ECO604	Automotive Electronics	93	U20CSO503/ U20CSO603	Platform Technology
93	U20CSO503/ U20CSO603	Platform Technology	94	U20CSO504/ U20CSO604	Graphics Designing
94	U20CSO504/ U20CSO604	Graphics Designing	95	U20ITO503/ U20ITO603	Essentials of Data Science
95	U20ITO503/ U20ITO603	Essentials of Data Science	96	U20ITO504/ U20ITO604	Mobile App Development
96	U20ITO504/ U20ITO604	Mobile App Development	97	U20ICCM01	Fuzzy logic and Neural Networks
97	U20ICCM02	Fuzzy logic and neural networks	98	U20ICO504/ U20ICO604	Measurement and Instrumentation
98	U20ICO504/ U20ICO604	Measurement and Instrumentation	99	U20MEO504/ U20MEO604	Heating, ventilation and air conditioning system (HVAC)
99	U20MEO504/ U20MEO604	Heating, ventilation and air conditioning system (HVAC)	100	U20MEO505/ U20MEO605	Creativity Innovation and New Product Development
100	U20MEO505/ U20MEO605	Creativity Innovation and New Product Development	101	U20CEO503/ U20CEO603	Disaster Management
101	U20CEO503/ U20CEO603	Disaster Management	102	U20CEO504/ U20CEO604	Air Pollution and Solid Waste Management
102	U20CEO504/ U20CEO604	Air Pollution and Solid Waste Management	103	U20BMO503/ U20BMO603	Biometric Systems
103	U20BMO503/ U20BMO603	Biometric Systems	104	U20BMO504/ U20BMO604	Medical Robotics
104	U20BMO504/ U20BMO604	Medical Robotics	105	U20CCO503/ U20CCO603	Network Essentials
105	U20CCO503/ U20CCO603	Network Essentials	106	U20CCO504/ U20CCO604	Web Programming
106	U20CCO504/ U20CCO604	Web Programming	107	U20ADO503/ U20ADO603	Principle of Artificial Intelligence and Machine Learning
107	U20ADO503/ U20ADO603	Principle of Artificial Intelligence and Machine Learning	108	U20ADO504/ U20ADO604	Data science Application of Vision
108	U20ADO504/ U20ADO604	Data science Application of Vision	109	U20MCO501/ U20MCO601	Industrial Automation for Textile
109	U20MCO501/ U20MCO601	Industrial Automation for Textile	110	U20EEO705	Hybrid and Electrical Vehicle
110	U20EEO705	Hybrid and Electrical Vehicle	111	U20EEO706	Electrical Energy Conservation and auditing
111	U20EEO706	Electrical Energy Conservation and auditing	112	U20ECO705	IoT and its Applications
112	U20ECO705	IoT and its Applications	113	U20ECO706	Sensors for Industrial Applications
113	U20ECO706	Sensors for Industrial Applications	114	U20CSO705	Artificial Intelligence
114	U20CSO705	Artificial Intelligence	115	U20CSO706	Cloud Technology and its Applications
115	U20CSO706	Cloud Technology and its Applications	116	U20ITCM08	Automation Techniques & Tools - DevOps
116	U20ITCM08	Automation Techniques & Tools- DevOps	117	U20ITO706	Augmented and Virtual Reality
117	U20ITO706	Augmented and Virtual Reality	118	U20ICO705	Industrial Automation
118	U20ICO705	Industrial Automation	119	U20ICO706	Virtual Instrumentation
119	U20ICO706	Ultrasonic Instrumentation	120	U20MEO706	Principles of Hydraulic and Pneumatic System

2.A.12.148

120	U20MEO706	Principles of Hydraulic and Pneumatic System
121	U20MEO707	Supply Chain Management
122	U20CEO705	Energy Efficient Buildings
123	U20CEO706	Global Warming and Climate Change
124	U20MCO702	Building Automation
125	U20MCO703	Automation in Manufacturing Systems
126	U20BMO705	Internet of Things for Healthcare
127	U20BMO706	Telehealth Technology
128	U20CCO705	Data Science using python
129	U20CCO706	Mobile Applications Development using Android
130	U20ADO705	Data Science Application of NLP
131	U20ADO706	Artificial Intelligence Applications
132	U20HSO706	Industrial Safety and Human Resource Management
133	U20HSO707	Operation Research in Textile Industry
134	U20HSO708	Global marketing and Sourcing Strategies
135	U20HSO709	Fashion Advertising and sales promotions
136	U20HSO710	Luxury Brand management
137	U20HSO711	Fashion Retail Store Operations
EMPLOYABILITY ENHANCEMENT COURSES		
138	U20CCCX01	3ds Max
139	U20CCCX02	Advance Structural Analysis of Building using Etabs
140	U20CCCX03	Advanced Java Programming
141	U20CCCX04	Advanced Python Programming
142	U20CCCX05	Analog System Lab Kit
143	U20CCCX06	Android Medical app development
144	U20CCCX07	Android Programming
145	U20CCCX08	Ansys -Multiphysics
146	U20CCCX09	Artificial Intelligence
147	U20CCCX10	Artificial Intelligence And Edge Computing
148	U20CCCX11	Artificial Intelligence in Medicines
149	U20CCCX12	AutoCAD For Architecture
150	U20CCCX13	AutoCAD for Civil
151	U20CCCX14	AutoCAD for Electrical
152	U20CCCX15	AutoCAD for Mechanical
153	U20CCCX16	Azure DevOps
154	U20CCCX17	Basic Course on EPlan
155	U20CCCX18	Basic Electro Pneumatics
156	U20CCCX19	Basic Hydraulics
157	U20CCCX20	Bio signal and Image processing development system
158	U20CCCX21	Blockchain
159	U20CCCX22	Bridge Analysis
160	U20CCCX23	Building Analysis and construction Management
161	U20CCCX24	Building Design & Analysis Using AECO sim Building Designer
162	U20CCCX25	CATIA
163	U20CCCX26	CCNA (Routing and Switching)
164	U20CCCX27	CCNA (Wireless)
165	U20CCCX28	Cloud Computing
166	U20CCCX29	Computer Programming for Medical Equipments
167	U20CCCX30	Corel Draw
168	U20CCCX31	Creo (Modeling and Simulation)
169	U20CCCX32	Cyber Security
170	U20CCCX33	Data Science and Data Analytics
171	U20CCCX34	Data Science using Python
172	U20CCCX35	Data Science Using R
173	U20CCCX36	Deep Learning
174	U20CCCX37	Design & Documentation Using Eplan Electric P8
175	U20CCCX38	Design of Biomedical Devices and systems
176	U20CCCX39	Digital Marketing
177	U20CCCX40	Digital Signal Processing Development System
178	U20CCCX41	Digsilent Power Factory
179	U20CCCX42	Electro Hydraulic Automation With PLC
180	U20CCCX43	Embedded System Using Arduino
181	U20CCCX44	Embedded System Using C
182	U20CCCX45	Embedded System With IoT
183	U20CCCX46	Eplan Data Portal
184	U20CCCX47	E-Plan Electric P8
185	U20CCCX48	Eplan Fluid

121	U20MEO707	Supply Chain Management
122	U20CEO705	Energy Efficient Buildings
123	U20CEO706	Global Warming and Climate Change
124	U20MCO702	Building Automation
125	U20MCO703	Automation in Manufacturing Systems
126	U20BMO705	Internet of Things for Healthcare
127	U20BMO706	Telehealth Technology
128	U20CCO705	Data Science using python
129	U20CCO706	.s Development using Android
130	U20ADO705	Data Science Application of NLP
131	U20ADO706	Artificial Intelligence Applications
132	U20HSO706	Industrial Safety and Human Resource Management
133	U20HSO707	Operation Research in Textile Industry
134	U20HSO708	Global marketing and Sourcing Strategies
135	U20HSO709	Fashion Advertising and sales promotions
136	U20HSO710	Luxury Brand management
137	U20HSO711	Fashion Retail Store Operations
EMPLOYABILITY ENHANCEMENT COURSES		
138	U20CCCX01	3ds Max
139	U20CCCX02	Advance Structural Analysis of Building using Etabs
140	U20CCCX03	Advanced Java Programming
141	U20CCCX04	Advanced Python Programming
142	U20CCCX05	Analog System Lab Kit
143	U20CCCX06	Android Medical app development
144	U20CCCX07	Android Programming
145	U20CCCX08	Ansys -Multiphysics
146	U20CCCX09	Artificial Intelligence
147	U20CCCX10	Artificial Intelligence And Edge Computing
148	U20CCCX11	Artificial Intelligence in Medicines
149	U20CCCX12	AutoCAD For Architecture
150	U20CCCX13	AutoCAD for Civil
151	U20CCCX14	AutoCAD for Electrical
152	U20CCCX15	AutoCAD for Mechanical
153	U20CCCX16	Azure DevOps
154	U20CCCX17	Basic Course on EPlan
155	U20CCCX18	Basic Electro Pneumatics
156	U20CCCX19	Basic Hydraulics
157	U20CCCX20	Bio signal and Image processing development system
158	U20CCCX21	Blockchain
159	U20CCCX22	Bridge Analysis
160	U20CCCX23	Building Analysis and construction Management
161	U20CCCX24	Building Design & Analysis Using AECO sim Building Designer
162	U20CCCX25	CATIA
163	U20CCCX26	CCNA (Routing and Switching)
164	U20CCCX27	CCNA (Wireless)
165	U20CCCX28	Cloud Computing
166	U20CCCX29	Computer Programming for Medical Equipments
167	U20CCCX30	Corel Draw
168	U20CCCX31	Creo (Modeling and Simulation)
169	U20CCCX32	Cyber Security
170	U20CCCX33	Data Science and Data Analytics
171	U20CCCX34	Data Science using Python
172	U20CCCX35	Data Science Using R
173	U20CCCX36	Deep Learning
174	U20CCCX37	Design & Documentation Using Eplan Electric P8
175	U20CCCX38	Design of Biomedical Devices and systems
176	U20CCCX39	Digital Marketing
177	U20CCCX40	Digital Signal Processing Development System
178	U20CCCX41	Digsilent Power Factory
179	U20CCCX42	Electro Hydraulic Automation With PLC
180	U20CCCX43	Embedded System Using Arduino
181	U20CCCX44	Embedded System Using C
182	U20CCCX45	Embedded System With IoT
183	U20CCCX46	Eplan Data Portal
184	U20CCCX47	E-Plan Electric P8
185	U20CCCX48	Eplan Fluid
186	U20CCCX49	Eplan PPE

2.A.12.149

186	U20CCCX49	Eplan PPE
187	U20CCCX50	Fusion 360
188	U20CCCX51	Fuzzy logic and neural networks
189	U20CCCX52	Google Analytics
190	U20CCCX53	Hydraulic Automation
191	U20CCCX54	Industrial Automation
192	U20CCCX55	Industry 4.0
193	U20CCCX56	Internet of Things
194	U20CCCX57	Introduction to C Programming
195	U20CCCX58	Introduction to C++ Programming
196	U20CCCX59	IoT using Python
197	U20CCCX60	Java Programming
198	U20CCCX61	Machine Learning
199	U20CCCX62	Machine Learning and Deep Learning
200	U20CCCX63	Machine Learning for Medical Diagnosis
201	U20CCCX64	Mechatronics
202	U20CCCX65	Medical Robotics
203	U20CCCX66	Microsoft Dynamics 365 ERP for HR , Marketing and Finance
204	U20CCCX67	Mobile Edge Computing
205	U20CCCX68	Modeling and Visualization Using Micro station
206	U20CCCX69	MX Road
207	U20CCCX70	Photoshop
208	U20CCCX71	PLC
209	U20CCCX72	Pneumatics Automation
210	U20CCCX73	Project Management
211	U20CCCX74	Python Programming
212	U20CCCX75	Revit Architecture
213	U20CCCX76	Revit Inventor
214	U20CCCX77	Revit MEP
215	U20CCCX78	Robotics
216	U20CCCX79	Search Engine Optimization
217	U20CCCX80	Software Testing
218	U20CCCX81	Solar and Smart Energy System with IOT
219	U20CCCX82	Solid Works
220	U20CCCX83	Solid works with Electrical Schematics
221	U20CCCX84	Speech Processing
222	U20CCCX85	STAAD PRO V8i
223	U20CCCX86	Structural Design & Analysis using Bentley
224	U20CCCX87	Total Station
225	U20CCCX88	Video and Image Processing Development System
226	U20CCCX89	VLSI Design
227	U20CCCX90	Web Programming -I
228	U20CCCX91	Web Programming-II
		SKILL DEVELOPMENT COURSES
229	U20CCS201	Skill Development Course 1 : Demonstration of Workshop Practices
230	U20CCS302	Skill Development Course 2 * 1)Computer on Office Automation 2)Animation Practice
231	U20CCS403	Skill Development Course 3 * 1)Computer Hardware and Troubleshooting 2)Mobile Servicing 3)PCB and Circuit Design
232	U20CCS504	Skill Development Course 4 : Career and Professional Skill Development Program - I
233	U20CCS505	Skill Development Course 5 : Presentation Skills using ICT
234	U20CCS606	Skill Development Course 6 : Career and Professional Skill Development Program - II
235	U20CCS607	Skill Development Course 7 : Technical Seminar
236	U20CCS608	Skill Development Course 8 : NPTEL / MOOC - I
237	U20CCS809	Skill Development Course 9 : NPTEL / MOOC-II
		Humanities and Social Science (HS)
238	U20HSP301	General Proficiency -- I
239	U20HSP402	General Proficiency -- II
240	U20XXO5XX	Open Elective-II$
241	U20HSP703	Business Basics for Entrepreneur
242	U20HSP804	Entrepreneurship Management
		Basic Sciences(BS)
243	U20BST101	Engineering Mathematics -- I Calculus and Linear Algebra
244	U20BST215	Engineering Mathematics --II Multiple Integrals and Transforms
245	U20BST325	Discrete Mathematics and Graph Theory
246	U20BST436	Probability and Stochastic Process
247	U20BST548	Numerical Methods and Statistics
		Engineering Sciences (ES)
248	U20EST122	Elements of Engineering
249	U20EST110	Programming in Python

187	U20CCCX50	Fusion 360
188	U20CCCX51	Fuzzy logic and neural networks
189	U20CCCX52	Google Analytics
190	U20CCCX53	Hydraulic Automation
191	U20CCCX54	Industrial Automation
192	U20CCCX55	Industry 4.0
193	U20CCCX56	Internet of Things
194	U20CCCX57	Introduction to C Programming
195	U20CCCX58	Introduction to C++ Programming
196	U20CCCX59	IoT using Python
197	U20CCCX60	Java Programming
198	U20CCCX61	Machine Learning
199	U20CCCX62	Machine Learning and Deep Learning
200	U20CCCX63	Machine Learning for Medical Diagnosis
201	U20CCCX64	Mechatronics
202	U20CCCX65	Medical Robotics
203	U20CCCX66	Microsoft Dynamics 365 ERP for HR , Marketing and Finance
204	U20CCCX67	Mobile Edge Computing
205	U20CCCX68	Modeling and Visualization Using Micro station
206	U20CCCX69	MX Road
207	U20CCCX70	Photoshop
208	U20CCCX71	PLC
209	U20CCCX72	Pneumatics Automation
210	U20CCCX73	Project Management
211	U20CCCX74	Python Programming
212	U20CCCX75	Revit Architecture
213	U20CCCX76	Revit Inventor
214	U20CCCX77	Revit MEP
215	U20CCCX78	Robotics
216	U20CCCX79	Search Engine Optimization
217	U20CCCX80	Software Testing
218	U20CCCX81	Solar and Smart Energy System with IOT
219	U20CCCX82	Solid Works
220	U20CCCX83	Solid works with Electrical Schematics
221	U20CCCX84	Speech Processing
222	U20CCCX85	STAAD PRO V8i
223	U20CCCX86	Structural Design & Analysis using Bentley
224	U20CCCX87	Total Station
225	U20CCCX88	Video and Image Processing Development System
226	U20CCCX89	VLSI Design
227	U20CCCX90	Web Programming -I
228	U20CCCX91	Web Programming-II
		SKILL DEVELOPMENT COURSES
229	U20ITS201	Skill Development Course I. Demonstration of Workshop Practices
230	U20ITS302	Skill Development Course II:* 1) Hardware and Troubleshooting 2) Electronic Devices and Circuits 3) General Aptitude - I
231	U20ITS403	Skill Development Course III:* 1) Graphic Design 2) Networking 3) General Aptitude - II
232	U20ITS504	Skill Development Course 4: Career and Professional Skill Development Program - I
233	U20ITS505	Skill Development Course 5: Presentation Skills Using ICT
234	U20ITS606	Skill Development Course 6: Career and Professional Skill Development Program - II
235	U20ITS607	Skill Development Course 7: Technical Seminar
236	U20ITS608	Skill Development Course 8: NPTEL / MOOC - I
237	U20ITS809	Skill Development Course 9. NPTEL / MOOC-II
		Humanities and Social Science (HS)
238	U20HSP301	General Proficiency -- I
239	U20HSP402	General Proficiency -- II
240	U20XXO5XX	Open Elective-II$
241	U20HSP703	Business Basics for Entrepreneur
242	U20HSP804	Entrepreneurship Management
		244
243	U20BST101	Engineering Mathematics -- I Calculus and Linear Algebra
244	U20BST215	Engineering Mathematics --II Multiple Integrals and Transforms
245	U20BST322	Numerical Methods
246	U20BSP323	Numerical Methods Laboratory
247	U20BST432	Discrete Mathematics and Graph Theory
248	U20BST546	Probability and Statistics
		Engineering Sciences (ES)
249	U20EST106	Introduction to Engineering : Distinction, Principles and Application
250	U20EST107	Micro Electronics and Digital System Design

2.A.12.158

250	U20EST109	Problem Solving Approach	251	U20EST109	Problem Solving Approach
251	U20EST123	Basics of Electronics Engineering	252	U20EST110	Programming in Python
252	U20ESP124	Basic Electronics Engineering Laboratory	253	U20EST106	Introduction to Engineering : Distinction, Principles and Application
253	U20ESP111	Programming in Python Laboratory	254	U20EST107	Micro Electronics and Digital System Design
256	U20ESP202	Programming in C Laboratory	257	U20ESP108	Micro Electronics and Digital System Design Laboratory
257	U20EST359	Programming in C++	258	U20ESP111	Programming in Python Laboratory
258	U20EST359	Data Structures	259	U20ESP112	Engineering Graphics using AutoCAD
259	U20ESP360	Programming in C++ Laboratory	260	U20EST201	Programming in C
260	U20ESP357	Data Structures Laboratory	261	U20ESP202	Programming in C Laboratory
261	U20EST467	Programming in Java	262	U20EST356	Data Structures
262	U20ESP468	Programming in Java Laboratory	263	U20EST359	Programming in C++
Mandatory courses (MC*)			264	U20ESP357	Data Structures Laboratory
263	U20CCM101	Induction Program	265	U20ESP360	Programming in C++ Laboratory
264	U20CCM202	Environmental Science	266	U20EST467	Programming in Java
265	U20CCM303	Physical Education	267	U20ESP468	Programming in Java Laboratory
266	U20CCM404	NSS	Mandatory Course(MC)		
267	U20CCM505	Indian Constitution	268	U20CCM101	Induction Program
268	U20CCM606	Essence of Indian Traditional Knowledge	269	U20CCM202	Environmental Science
269	U20CCM707	Professional Ethics	270	U20CCM303	Physical Education
Project Work and Internship (PW)			271	U20CCM404	NSS
264	U20CCW701	Project Phase – I	272	U20CCM505	Indian Constitution
265	U20CCW702	Internship / Inplant Training	273	U20CCM606	Essence of Indian Traditional Knowledge
266	U20CCW803	Project phase – II	274	U20CCM707	Professional Ethics
			Project Work and Internship (PW)		
		228/266	275	U20CCW701	Project Phase – I
			276	U20CCW702	Internship / Inplant Training
			277	U20CCW803	Project phase – II
					228/277

Name of the Programme	CCE	IT
Total number of Courses	266	277
Number of simillar courses	228	228
Percentage of similarity	85.71%	

2.A.12.159