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ENGINEERS WITH
SOCIAL RESPONSIBILITY

NAAC Accredited
Recipient of Centre of Excellence Award by the Government of Gujarat
Recipient of '5 Star' in GSIRF Ranking by Government of Gujarat

PROGRAM: MASTER OF TECHNOLOGY, M.TECH

PO No.	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, review 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.

PSO No.	Program Specific Outcomes (PSOs)
PSO1	To apply the theoretical concepts of computer engineering and practical knowledge in analysis, design and development of computing systems and interdisciplinary applications.
PSO2	To work as a socially responsible professional by applying ICT principles in real-world problems.

Course Outcomes (COs) – Program Outcomes (POs) - Program Specific Outcomes (PSOs)

PC512 Technical Writing and Communication Skills (2-0-0-2)

Course Objectives. In this course first-year M.Tech. students are introduced to the basics of technical writing and communication skills that are essential in their professional life. A set of guidelines on several important aspects of technical writing and presentations are discussed. Several technical writing exercises and technical presentations would be carried out using public-domain (free) software packages (esp. LaTeX and Beamer) for practical training of the students.

Course Outcomes: After completion of this course, students will be able to:

- Start reading technical literature and collecting material for their research projects [PO2, PO12].
- Present the research progress seminars, defend their thesis, and make technical presentations with confidence [PO8, PO9, PO10].
- Become familiar with writing memorandums, minutes, etc, in the corporate world [PO5, PO6].
- Work in small groups for presentation and discussions [PO11, PO12].

POs-COs Matrix:

PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
	X			X	X		X	X	X	X	X

Course Outcomes and Competencies

Sr. No.	Course Outcome	PO/PSO	CPD	KD
1	CO1: Start reading technical literature and collecting material for their research projects	PO2, PO12 / PSO1	U	F, C

2	CO2: Present the research progress seminars, defend their thesis, and make technical presentations with confidence	PO8, PO9, PO10 / PSO1, PSO2	U, Ap	F, C, P
3	CO3: Become familiar with writing memorandums, minutes, etc, in the corporate world	PO5, PO6 / PSO1	U	F, C, P
4	CO4: Work in small groups for presentation and discussions	PO11, PO12 / PSO1	U, Ap	F, C, P

CL: Cognitive Process Domain [R: Remember; U: Understand; Ap: Apply; An: Analyze; E: Evaluate; C: Crete]

KC: Knowledge Domain [F: Factual; C: Conceptual; P: Procedural; M: Metacognitive]

Focus Area	Yes/No	Details
Focus on Employability	Yes	Communication skills and language proficiency helps students in employment.
Focus on Skill development	Yes	The students develop necessary skills for communicative english, writing and presentation skills
Focus on entrepreneurship	No	-

PC503 Programming Lab (3-0-0-3)

This course aims to provide hands-on practice in software tools and technologies to MTech (ICT) and MTech (EC) students. The broad coverage of this course is as follows: Familiarity in Linux; Shell Programming; Programming tools (Make files, version control, debugger, GitHub). Problem solving and programming using Python, Introduction to Circuit Modelling and Analysis; System Design, Lab on Sampling and Quantization.

Course Outcomes:

- This course will give an opportunity to the MTech- CT (SS, ML, VLSI & ES) and MTech(EC) students to gain skills in Python, MATLAB, familiarity in programming and EDA tools Database and Web Development, Data Science, AI/ML, Web Scraping and GUI development [PO1, PO12].
- Students will learn SQL, HTML5, CSS3; Flask and Django for web application, Pandas, NumPy, and Matplotlib for DS (Data Science), Scikit-learn for ML (Machine Learning), Soup, Scrapy Spiders and tkinter for GUI (Graphical User Interfaces) [PO9].
- Students will acquire skills to deploy the code in prototype systems to solve real-world problems [PO5].
- This course will provide a platform to develop skills for which companies are interested in hiring professionals [PO6].

POs-COs Matrix:

PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
X	X			X	X			X	X	X	

Course Outcomes and Competencies

Sr. No.	Course Outcome	PO/PSO	CPD	KD
1	CO1: This course will give an opportunity to the MTech-ICT (SS, ML, VLSI & ES) and MTech(EC) students to gain skills in Python, MATLAB, familiarity in programming and EDA tools, Database and Web Development, Data Science, AI/ML, Web Scraping and GUI development	PO1, PO12 / PSO1	U	F, C

2	CO2: Students will learn SQL, HTML5, CSS3; Flask and Django for web application, Pandas, NumPy, and Matplotlib for DS (Data Science), Scikit-learn for ML (Machine Learning), Soup, Scrapy Spiders and tkinter for GUI	PO9 / PSO1, PSO2	U, Ap	F, C, P
3	CO3: Students will acquire skills to deploy the code in prototype systems to solve real-world problems	PO5 / PSO1, PSO2	U, An	F, C, P
4	CO4: This course will provide a platform to develop skills for which companies are interested in hiring professionals	PO6 / PSO2	Ap, An	F, C, P

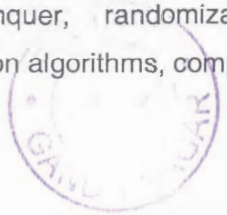
CL: Cognitive Process Domain [R: Remember; U: Understand; Ap: Apply; An: Analyze; E: Evaluate; C: Crete]

KC: Knowledge Domain [F: Factual; C: Conceptual; P: Procedural; M: Metacognitive]

Focus Area	Yes/No	Details
Focus on Employability	Yes	The students taking the course can be employed in industries focusing on coding and web development.
Focus on Skill development	Yes	The students develop necessary skills to develop foundational knowledge in programming.
Focus on entrepreneurship	No	-

IT580 Advanced Algorithm (3-1-0-4)

This is an algorithms course with an emphasis on teaching techniques for the design and analysis of efficient algorithms, emphasizing methods of application. Topics include divide-and-conquer, randomization, dynamic programming, greedy algorithms, approximation algorithms, complexity theory etc.



Course Outcomes: Students who complete the course should have the ability to do the following:

- Understand the correctness of algorithms using inductive proofs and invariants [PO1].
- Analyze worst-case running times of algorithms using asymptotic analysis. Describe the divide and conquer paradigm and explain when an algorithmic design situation calls for it. Synthesize divide-and-conquer algorithms and analyze them [PO2].
- Describe the dynamic-programming paradigm and explain when an algorithmic design situation calls for it. Synthesize dynamic programming algorithms, and analyze them [PO2,PO3].
- Describe the greedy paradigm and explain when an algorithmic design situation calls for it. Synthesize greedy algorithms, and analyze them [PO2,PO3, PO4, PO12].

POs-COs Matrix:

PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2
X	X	X	X								X

Course Outcomes and Competencies

Sr. No.	Course Outcome	PO/PSO	CPD	KD
1	CO1: Understand the correctness of algorithms using inductive proofs and invariants	PO1 / PSO1	U	F, C
2	CO2: Analyze worst-case running times of algorithms using asymptotic analysis. Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it. Synthesize divide-and-conquer algorithms and analyze them	PO2 / PSO1, PSO2	U, An	F, C, P

3	CO3: Describe the dynamic-programming paradigm and explain when an algorithmic design situation calls for it. Synthesize dynamic programming algorithms, and analyze them	PO2, PO3 / PSO1, PSO2	U An	F C P
4	CO4: Describe the greedy paradigm and explain when an algorithmic design situation calls for it. Synthesize greedy algorithms, and analyze them	PO2, PO3, PO4, PO11 / PSO2	Ap, An, E	F, C, P

CL: Cognitive Process Domain [R: Remember; U: Understand; Ap: Apply; An: Analyze; E: Evaluate; C: Crete]

KC: Knowledge Domain [F: Factual; C: Conceptual; P: Procedural; M: Metacognitive]

Focus Area	Yes/No	Details
Focus on Employability	Yes	The students taking the course can be employed in industries focusing on software development, coding and computing.
Focus on Skill development	Yes	The students develop necessary skills to develop foundational knowledge in Algorithms that become prerequisite for other subsequent courses.
Focus on entrepreneurship	Yes	Algorithms is a foundational course that helps in exploring startups, entrepreneurship.

IT561 Advanced Software Engineering (3-0-2-4)

Course Objectives: The course focuses on tools and techniques for the development of software systems, with an emphasis on the construction and management of internet-oriented, agent-oriented and large software systems. The course is equipped with essential research, analytical and critical thinking skills.

Course Outcomes: After completion of the course, students should be able to:

- Understand software engineering principles and existing software process models [PO1, PO12].
- Develop software requirement specification documents for a given project using software requirement engineering principles [PO5, PO6].
- Implement software project management including project scheduling, software size metrics and cost estimation methods [PO11].

POs-COs Matrix:

PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
X				X	X					X	X

Course Outcomes and Competencies

Sr. No.	Course Outcome	PO/PSO	CPD	KD
1	CO1: Understand software engineering principles and existing software process models	PO1, PO12 / PSO1	U	F, C
2	CO2: Develop software requirement specification documents for a given project using software requirement engineering principles	PO5, PO6 / PSO1, PSO2	U, Ap	F, C, P
3	CO3: Implement software project management including project scheduling, software size metrics and cost estimation methods	PO11 / PSO1, PSO2	U, Ap	F, C, P

CL: Cognitive Process Domain [R: Remember; U: Understand; Ap: Apply; An: Analyze; E: Evaluate; C: Crete]

KC: Knowledge Domain [F: Factual; C: Conceptual; P: Procedural; M: Metacognitive]

Focus Area	Yes/No	Details
Focus on Employability	Yes	The students taking the course can be employed in industries focusing on Software Engineering.
Focus on Skill development	Yes	The students develop necessary skills to develop foundational knowledge in software engineering.
Focus on entrepreneurship	Yes	Software Engineering is an essential course for start-ups and entrepreneurship.

IT486 Blockchain and Cryptocurrencies (3-0-0-3)

Course Objective: Basics of blockchains and cryptocurrencies such as Bitcoin and their applications.

Course Outcomes: Upon completion of the course:

- Students should be able to understand properties of blockchains and their applications [PO1, PO2].
- Students should be able to understand the fundamental principles and algorithms underlying bitcoin [PO2, PO3, PO8].
- Students should be able to understand the limitations of cryptocurrencies such as bitcoin [PO5, PO8].

POs-COs Matrix:

PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
X	X	X		X			X				

Course Outcomes and Competencies

Sr. No.	Course Outcome	PO/PSO	CPD	KD
1	CO1: Students should be able to understand properties of blockchains and their applications	PO1, PO2 / PSO1	U	F, C
2	CO2: Students should be able to understand the fundamental principles and algorithms underlying bitcoin	PO2, PO3, PO8 / PSO1, PSO2	U, Ap	F, C, P
3	CO3: Students should be able to understand the limitations of cryptocurrencies such as bitcoin	PO5, PO8 / PSO1, PSO2	U, An	F, C, P

CL: Cognitive Process Domain [R: Remember; U: Understand; Ap. Apply: An: Analyze; E: Evaluate; C: Crete]

KC: Knowledge Domain [F: Factual; C: Conceptual; P: Procedural; M: Metacognitive]

Focus Area	Yes/No	Details
Focus on Employability	Yes	The students taking the course can be employed in industries focusing on blockchains.
Focus on Skill development	Yes	The students develop necessary skills to develop knowledge in blockchains and its applications.
Focus on entrepreneurship	Yes	Blockchains found enormous scope in start-ups and entrepreneurship.

IT544 Modern Cryptography (3-0-2-4)

Course Objectives: Cryptography is concerned with the mathematical, algorithmic, and implementation aspects of information and network security.

Course Outcomes: After completion of this course, students will be able to understand:

- Notion and Assumptions of security primitives [PO1, PO2, PO12].
- Design principles of security primitives and applications [PO3, PO4].
- Students will display a breadth of knowledge in applied cryptography and be able to build secure systems for real world problems. [PO3, PO5].

POs-COs Matrix:

PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
X	X	X	X	X							X

Course Outcomes and Competencies

Sr. No.	Course Outcome	PO/PSO	CPD	KD
1	CO1: Notion and Assumptions of security primitives	PO1, PO2, PO12 / PSO1	U	F, C
2	CO2: Design principles of security primitives and applications	PO3, PO4 / PSO1, PSO2	U, Ap	F, C, P
3	CO3: Students will display a breadth of knowledge in applied cryptography and be able to build secure systems for real-world problems	PO3, PO5 / PSO1, PSO2	U, An	F, C, P

CL: Cognitive Process Domain [R: Remember; U: Understand; Ap: Apply; An: Analyze; E: Evaluate; C: Crete]

KC: Knowledge Domain [F: Factual; C: Conceptual; P: Procedural; M: Metacognitive]

Focus Area	Yes/No	Details
Focus on Employability	Yes	The students taking the course can be employed in industries focusing on security engineering.
Focus on Skill development	Yes	The students develop necessary skills to develop knowledge in cryptography and information security.
Focus on entrepreneurship	No	-

IT582 Foundations of Machine Learning (3-0-2-4)

Course Outcomes: After completion of this course, students will develop the deep understanding of the fundamental mathematical and statistical concepts used in machine learning models.

- Develop the systematic and deep understanding of the popular machine learning models [PO1, PO12].
- Learn to implement the machine learning models from scratch [PO4, PO5].
- Will be able to apply the variants of machine learning models to solve real-time problems [PO4, PO5].

POs-COs Matrix:

PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
X			X	X							

Course Outcomes and Competencies

Sr. No.	Course Outcome	PO/PSO	CPD	KD
1	CO1: Develop the systematic and deep understanding of the popular machine learning models	PO1, PO12 / PSO1	U	F, C

2	CO2: Learn to implement the machine learning models from scratch	PO4, PO5 / PSO1, PSO2	U, Ap	F, C, P
3	CO3: Will be able to apply the variants of machine learning models to solve real-time problems	PO4, PO5 / PSO1, PSO2	U, An	F, C, P

CL: Cognitive Process Domain [R: Remember; U: Understand; Ap: Apply; An: Analyze; E: Evaluate; C: Crete]

KC: Knowledge Domain [F: Factual; C: Conceptual; P: Procedural; M: Metacognitive]

Focus Area	Yes/No	Details
Focus on Employability	Yes	The students taking the course can be employed in industries focusing on machine learning, data science.
Focus on Skill development	Yes	The students develop necessary skills to develop knowledge in machine learning.
Focus on entrepreneurship	Yes	Machine Learning is an emerging area for start-ups and entrepreneurship.

IT585 Advanced Machine Learning (3-0-2-4)

Course Outcomes: After successful completion of this course, students will be able to:

- Understand some of the ML techniques in details [PO1, PO12].
- Read and Understand research papers in the domain of ML [PO2, PO3, PO10].
- Develop an ML model, implement it , deploy it, evaluate it and report about it for a given project [PO3, PO6, PO11].

POs-COs Matrix:

PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
X	X	X			X				X	X	X

Course Outcomes and Competencies

Sr. No.	Course Outcome	PO/PSO	CPD	KD
1	CO1: Understand some of the ML techniques in details	PO1, PO12 / PSO1	U	F, C
2	CO2: Read and Understand research papers in the domain of ML	PO2, PO3, PO10 / PSO1, PSO2	U, Ap	F, C, P
3	CO3: Develop an ML model, implement it , deploy it, evaluate it and report about it for a given project	PO3, PO6, PO11 / PSO1, PSO2	U, An	F, C, P

CL: Cognitive Process Domain [R: Remember; U: Understand; Ap: Apply; An: Analyze; E: Evaluate; C: Crete]

KC: Knowledge Domain [F: Factual; C: Conceptual; P: Procedural; M: Metacognitive]

Focus Area	Yes/No	Details
Focus on Employability	Yes	The students taking the course can be employed in industries focusing on machine learning, data science.
Focus on Skill development	Yes	The students develop necessary skills to develop knowledge in machine learning.
Focus on entrepreneurship	Yes	Machine Learning is an emerging area for start-ups and entrepreneurship.

IT524 Computer Vision (3-0-2-4)

Course Objective: This course will cover classical computer vision algorithms like shape from shading, stereovision, depth from defocus, optical flow and the mathematics behind them, as well as high level applications such as classification, detection and segmentation.

Course Outcomes: After successful completion of this course, students will be able to:

- Developing computer vision algorithms [PO1, PO12].
- Understanding, formulating and solving research problems in computer vision [PO2, PO3].
- Applying deep learning based solutions for real-world applications [PO4, PO5, PO9].

POs-COs Matrix:

PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
X	X	X	X	X				X			X

Course Outcomes and Competencies

Sr. No.	Course Outcome	PO/PSO	CPD	KD
1	CO1: Developing computer vision algorithms	PO1, PO12 / PSO1	U	F, C
2	CO2: Understanding, formulating and solving research problems in computer vision	PO2, PO3 / PSO1, PSO2	U, Ap	F, C, P
3	CO3: Applying deep learning based solutions for real-world applications	PO4, PO5, PO9 / PSO1, PSO2	U, An	F, C, P

CL: Cognitive Process Domain [R: Remember; U: Understand; Ap: Apply; An: Analyze; E: Evaluate; C: Crete]

KC: Knowledge Domain [F: Factual; C: Conceptual; P: Procedural; M: Metacognitive]

Focus Area	Yes/No	Details
Focus on Employability	Yes	The students taking the course can be employed in industries focusing on computer vision, image processing.
Focus on Skill development	Yes	The students develop necessary skills to develop knowledge in computer vision.
Focus on entrepreneurship	Yes	Computer Vision is an emerging area for start-ups and entrepreneurship.

VLSI System Design (3-0-2-4)

The course aims to impart basics of VLSI circuit and system designs. This will be covered by incorporating various practical examples. Different combinational and sequential circuit designs and their co-integration for system implementation will be taught.

Course Outcomes: After successful completion of this course, students should be able to:

- Understand the concept of MOS transistors, circuit design, their applications in the field of VLSI and semiconductor technology [PO1, PO2, PO3, PO4].
- The students shall be able to design different circuits with optimization with respect to different parameters such as speed, power and area [PO3, PO4, PO12].
- Use of EDA tools and their efficient execution to implement the system design [PO5].

POs COs Matrix:

PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
X	X	X	X	X							X

Course Outcomes and Competencies

Sr. No.	Course Outcome	PO/PSO	CPD	KD
1	CO1: Understand the concept of MOS transistors, circuit design, their applications in the field of VLSI and semiconductor technology	PO1, PO2, PO3, PO4 / PSO1	U	F, C
2	CO2: The students shall be able to design different circuits with optimization with respect to different parameters such as speed, power and area	PO3, PO4, PO12 / PSO1, PSO2	U, Ap	F, C, P
3	CO3: Use of EDA tools and their efficient execution to implement the system design	PO5 / PSO1, PSO2	U, Ap	F, C, P

CL: Cognitive Process Domain [R: Remember; U: Understand; Ap: Apply; An: Analyze; E: Evaluate; C: Crete]

KC: Knowledge Domain [F: Factual; C: Conceptual; P: Procedural; M: Metacognitive]

Focus Area	Yes/No	Details
Focus on Employability	Yes	The students taking the course can be employed in industries focusing on VLSI.
Focus on Skill development	Yes	The students develop necessary skills to develop knowledge in basic electronics, VLSI.
Focus on entrepreneurship	No	-

EL504 Selected Topics in VLSI (3-0-2-4)

Course Outcomes: Learn about the various ASIC architectures, ASIC design flow, issues in ASIC design and verification and its fix. The following are the highlights:

- Describe architecture based on application specifications. Identify circuit topology. [PO1, PO4, PO6, PO12]
- Derive, design and define circuit parameters. [PO3, PO4]
- Perform synthesis, process design flow, CTS, routing etc. [PO1 PO5]
- Verifying and validating the integrated circuit at various stages of design. [PO5]

POs-COs Matrix:

PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
X		X	X	X	X		X	X	X	X	X

Course Outcomes and Competencies

Sr. No.	Course Outcome	PO/PSO	CPD	KD
1	CO1: Describe architecture based on application specifications. Identify circuit topology	PO1, PO4, PO6, PO12 / PSO1	U	F, C
2	CO2: Derive, design and define circuit parameters	PO3, PO4 / PSO1, PSO2	U, Ap	F, C, P
3	CO3: Perform synthesis, process design flow, CTS, routing etc	PO1- PO5 / PSO1, PSO2	U, An	F, C, P
4	CO4: Verifying and validating the integrated circuit at various stages of design	PO5 / PSO2	Ap, An, E	F, C, P

CL: Cognitive Process Domain [R: Remember; U: Understand; Ap: Apply; An: Analyze; E: Evaluate; C: Crete]

KC: Knowledge Domain [F: Factual; C: Conceptual; P: Procedural; M: Metacognitive]

Focus Area	Yes/No	Details
Focus on Employability	Yes	The students taking the course can be employed in industries focusing on VLSI.
Focus on Skill development	Yes	The students develop necessary skills to develop knowledge in basic electronics, VLSI.
Focus on entrepreneurship	No	-

IT 584 Approximation Algorithms (3-1-0-4)

Course Outcomes: After successful completion of this course, students will be able to:

- Understand the notion of hard problems and need of approximation algorithms [PO1, PO12]
- Understand techniques to design approximation algorithms for various problems [PO2, PO4, PO11]
- Analyze approximation algorithms for different problems [PO2, PO4, PO10, PO11]

POs-COs Matrix:

PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
X	X		X						X	X	X

Course Outcomes and Competencies

Sr. No.	Course Outcome	PO/PSO	CPD	KD
1	CO1: Understand the notion of hard problems and need of approximation algorithms	PO1, PO12 / PSO1	U	F, C

2	CO2: Understand techniques to design approximation algorithms for various problems	PO2, PO4, PO11 / PSO1, PSO2	U Ap	F. C. P
3	CO3: Analyze approximation algorithms for different problems	PO2, PO4, PO10, PO11 / PSO1, PSO2	U. An	F. C. P

CL: Cognitive Process Domain [R: Remember; U: Understand; Ap: Apply; An: Analyze; E: Evaluate; C: Crete]

KC: Knowledge Domain [F: Factual; C: Conceptual; P: Procedural; M: Metacognitive]

Focus Area	Yes/No	Details
Focus on Employability	Yes	The students taking the course can be employed in industries focusing on software development and computing.
Focus on Skill development	Yes	The students develop necessary skills to develop foundational knowledge in Algorithms that become prerequisite for other subsequent courses.
Focus on entrepreneurship	No	-

CT546 Introduction to Wireless Communication Systems (3-0-2-4)

The course CT546 introduces the student to the principles and the engineering practices that drive today's wireless communication systems.

Course Outcomes: After completing the course, students should be able to:

- The course introduces the students to the engineering knowledge of the mathematics and engineering fundamentals of the next generation wireless

communication systems [PO1 PO12].

- The students engage in the analysis and design of the basic modules of a communication system [PO2, PO3].
- Through the Lab and the Project works that are team-based and require a formal presentation by the students, they acquire the team-work and the technical communication skills [PO9, PO10].

POs-COs Matrix:

PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
X	X	X	X	X				X	X		

Course Outcomes and Competencies

Sr. No.	Course Outcome	PO/PSO	CPD	KD
1	CO1: The course introduces the students to the engineering knowledge of the mathematics and engineering fundamentals of the next generation wireless communication systems	PO1, PO12 / PSO1	U	F, C
2	CO2: The students engage in the analysis and design of the basic modules of a communication system	PO2, PO3 / PSO1, PSO2	U, An	F, C, P
3	CO3: Through the Lab and the Project works that are team-based and require a formal presentation by the students, they acquire the team-work and the technical communication skills	PO9, PO10 / PSO1, PSO2	U, Ap	F, C, P

CL: Cognitive Process Domain [R: Remember; U: Understand; Ap: Apply; An: Analyze; E: Evaluate; C: Crete]

KC: Knowledge Domain [F: Factual; C: Conceptual; P: Procedural; M: Metacognitive]

Focus Area	Yes/No	Details
Focus on Employability	Yes	The students taking the course can be employed in industries focusing on communication engineering.
Focus on Skill development	Yes	The students develop necessary skills to develop knowledge in wireless communication..
Focus on entrepreneurship	No	-

CT 516 Advanced Digital Communication (3-0-2-4)

Course Outcomes: After completing the course, students should be able to:

- Understand the mathematical concepts required for modeling and study of digital communication systems [PO1, PO12].
- Study the effect of noise on the communication systems [PO3].
- Quantify information and decide on the resource required to transmit and receive data [PO3].
- Simulate communication systems and do a performance study [PO3].

POs-COs Matrix:

PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
X		X									X

Course Outcomes and Competencies

Sr. No.	Course Outcome	PO/PSO	CPD	KD
1	CO1: Understand the mathematical concepts required for modeling and study of digital communication systems	PO1, PO12 / PSO1	U	F, C

2	CO2: Study the effect of noise on the communication systems	PO3 / PSO1, PSO2	U	F, C
3	CO3: Quantify information and decide on the resource required to transmit and receive data	PO3 / PSO1, PSO2	U, An	F, C, P
4	CO4: Simulate communication systems and do a performance study	PO3 / PSO2	Ap, An	F, C, P

CL: Cognitive Process Domain [R: Remember; U: Understand; Ap: Apply; An: Analyze; E: Evaluate; C: Crete]

KC: Knowledge Domain [F: Factual; C: Conceptual; P: Procedural; M: Metacognitive]

Focus Area	Yes/No	Details
Focus on Employability	Yes	The students taking the course can be employed in industries focusing on communication engineering.
Focus on Skill development	Yes	The students develop necessary skills to develop knowledge in digital communication..
Focus on entrepreneurship	No	-

SC532 Linear Algebra, Random Variables and Random Processes (3-0-0-3)

Course Objective: This course is designed to revise the knowledge of linear algebra and probability, random variables, and random processes to the incoming M.Tech. students.

Course Outcomes: After completing this course, a student

- Should be able to understand the basic concepts of linear algebra, probability, random variables, stochastic processes, and a few of their applications in various scientific, technological, and societal applications [PO1, PO12].

- Should have the capability to analyze, comprehend, design & develop engineering processes and systems for a variety of applications and thus demonstrating professional ethics & concern for societal wellbeing [PO2, PO3, PO4, PO11].

POs-COs Matrix:

PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
X	X	X	X							X	X

Course Outcomes and Competencies

Sr. No.	Course Outcome	PO/PSO	CPD	KD
1	CO1: Should be able to understand the basic concepts of linear algebra, probability, random variables, stochastic processes, and a few of their applications in various scientific, technological, and societal applications	PO1, PO12 / PSO1	U	F, C
2	CO2: Should have the capability to analyze, comprehend, design & develop engineering processes and systems for a variety of applications and thus demonstrating professional ethics & concern for societal wellbeing	PO2, PO3, PO4, PO11 / PSO1, PSO2	U, Ap, An	F, C, P

CL: Cognitive Process Domain [R: Remember; U: Understand; Ap: Apply; An: Analyze; E: Evaluate; C: Crete]

KC: Knowledge Domain [F: Factual; C: Conceptual; P: Procedural; M: Metacognitive]

Focus Area	Yes/No	Details
Focus on Employability	Yes	The students taking the course can be employed in industries focusing on machine learning, data science.
Focus on Skill development	Yes	The students develop necessary skills to develop foundational knowledge in linear algebra and random processes.
Focus on entrepreneurship	No	-

CT505 Detection and Estimation Theory (3-0-0-3)

Course Objectives: Different problems in signal processing and communication involve detection and processing of the signals to make inference. In a practical scenario, the signals could be noisy. The objective of this course is to provide fundamental and theoretical concepts to develop frameworks such that the inference problem can be addressed in those areas.

Course Outcomes: After completion of this course, students should be able to:

- Understand the methods of estimating parameters of observed signals. [PO1, PO12]
- Formulate models for signal estimation and detection. [PO2]
- Analyze the existing detection and estimation methods for further improvements. [PO2, PO3, PO4, PO5]
- Work in a group for a project, and present their work to the engineering community [PO9, PO10].

POs-COs Matrix:

PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
X	X	X	X	X				X	X		X

Course Outcomes and Competencies

Sr. No.	Course Outcome	PO/PSO	CPD	KD
1	CO1: Understand the methods of estimating parameters of observed signals.	PO1, PO12 / PSO1	U	F, C
2	CO2: Formulate models for signal estimation and detection.	PO2 / PSO1, PSO2	U, Ap	F, C, P
3	CO3: Analyze the existing detection and estimation methods for further improvements	PO2, PO3, PO4, PO5 / PSO1, PSO2	U, An	F, C, P
4	CO4: Work in a group for a project, and present their work to the engineering community	PO9, PO10 / PSO2	Ap, An, E	F, C, P

CL: Cognitive Process Domain [R: Remember; U: Understand; Ap: Apply; An: Analyze; E: Evaluate; C: Crete]

KC: Knowledge Domain [F: Factual; C: Conceptual; P: Procedural; M: Metacognitive]

Focus Area	Yes/No	Details
Focus on Employability	Yes	The students taking the course can be employed in industries focusing on communication engineering.
Focus on Skill development	Yes	The students develop necessary skills to

		develop knowledge in detection and estimation theory and its applications.
Focus on entrepreneurship	No	-

PC 874 Research Methodology (3-0-0-3)

Course Outcomes: After completion of this course, students will be able to

- Start reading technical literature and collecting material for their research projects [PO1, PO2, PO3, PO12].
- Present the research progress seminars, defend their thesis, and make technical presentations with confidence [PO4, PO5, PO6]
- Write papers, proposals, and technical reports [PO8, PO9, PO10, PO11].
- Work in small groups for presentation and discussions [PO8, PO9, PO10, PO11].

POs-COs Matrix:

PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
X	X	X	X	X	X		X	X	X	X	X

Course Outcomes and Competencies

Sr. No.	Course Outcome	PO/PSO	CPD	KD
1	CO1: Start reading technical literature and collecting material for their research projects	PO1, PO2, PO3, PO12 / PSO1	U	F, C
2	CO2: Present the research progress seminars, defend their thesis, and make technical presentations with confidence	PO4, PO5, PO6 / PSO1, PSO2	U, Ap	F, C, P

3	CO3: Write papers, proposals, and technical reports	PO8-PO11 / PSO1, PSO2	U, An	F, C, P
4	CO4: Work in small groups for presentation and discussions	PO8-PO11 / PSO2	Ap, An, E	F, C, P

CL: Cognitive Process Domain [R: Remember; U: Understand; Ap: Apply; An: Analyze; E: Evaluate; C: Crete]

KC: Knowledge Domain [F: Factual; C: Conceptual; P: Procedural; M: Metacognitive]

Focus Area	Yes/No	Details
Focus on Employability	No	-
Focus on Skill development	Yes	The students develop necessary skills to develop knowledge in writing and presentation.
Focus on entrepreneurship	No	-

DA-IICT GANDHINAGAR

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