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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 SCIENCE IN INFORMATION TECHNOLOGY, M.SC (IT)

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.

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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 information technology and practical knowledge in analysis, design and development of computing systems and interdisciplinary applications.
PSO2	To work as a socially responsible professional by applying IT principles in real-world problems.

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

SC612 Discrete Mathematics 3-1-0-4

Course objective: Students are expected to learn logical reasoning to solve a variety of problems to learn different proof methods, algorithms to solve problems, and to learn discrete probability and number theory to solve problems.

Course Outcomes: After completion of the course, the students should acquire:

- A basic overview of discrete mathematics [PO1, PO12]
- Understand how the concepts are used in various applications [PO3, PO4, PO5].
- Apply skills learned in the course for problem solving [PO2, 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: A basic overview of discrete mathematics	PO1, PO12 / PSO1	U	F, C
2	CO2: Understand how the concepts are used in various applications	PO3, PO4, PO5 / PSO1, PSO2	U	F, C, P
3	CO3: Apply skills learned in the course for problem solving	PO2, PO3, 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 software development.
Focus on Skill development	Yes	The students develop necessary skills to develop foundational knowledge in discrete mathematics that become prerequisite for other subsequent courses.
Focus on entrepreneurship	No	-

IT603 C Programming 3-0-2-4

Course objective: This course aims to introduce problem solving techniques using C programming to help the students to develop analytical and logical skills. The course starts with basic concepts of computer programming and follows in building up knowledge in program development, deployment and testing to solve computational problems. The course also provides visualization of memory and time requirements for solving problems using C programming language. The coverage of this course includes problem solving techniques, flow charts, algorithms development, pseudo codes, and implementation of algorithms using C programming.

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

- Understand the basic programming skills in C. [PO1, PO12]
- Understand the syntax and semantics of flow-chart, data types and structured programming. [PO1, PO4]
- Apply skills in problem solving techniques. [PO2, PO3, PO4]

POs and COs Matrix:

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

Course Outcomes and Competencies

Sr. No.	Course Outcome	PO/PSO	CPD	KD
1	CO1: Understand the basic programming skills in C	PO1, PO12 / PSO1	U	F, C
2	CO2: Understand the syntax and semantics of flow-chart, data types and structured programming	PO1, PO4 / PSO1, PSO2	U, Ap	F, C, P
3	CO3: Apply skills in problem solving techniques.	PO1, PO3, PO4 / 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 Programming course can be employed in industries focusing on coding, web development.
Focus on Skill development	Yes	The students develop necessary skills to develop foundational knowledge in basic programming skills that become prerequisite for other subsequent courses..

Focus on entrepreneurship	Yes	The students apply their coding skills in entrepreneurship, start-up.

IT616 Algorithms and Data Structures 3-1-0-4

Course objective: The course aims to introduce the concept of data structures, and their indispensability in implementing algorithms and also how they aid in improving performance. An extensive coverage of the well-known and important data structures and routines/algorithms associated with them will be covered.

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

- Understand basic and abstract data types [PO1, PO12].
- Analyze complexity of various data structures [PO2, PO3, PO4].
- Apply skills for solving problems [PO2, PO3, PO4]

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 basic and abstract data types	PO1, PO12 / PSO1	U	F, C
2	CO2: Analyze complexity of various data structures	PO2, PO3, PO4 / PSO1, PSO2	U, An	F, C, P
3	CO3: Apply skills for solving problems	PO2, PO3, PO4 / 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 development, coding and computing.
Focus on Skill development	Yes	The students develop necessary skills to develop foundational knowledge in data structures that become prerequisite for other subsequent courses.
Focus on entrepreneurship	Yes	Data structure is a foundational course that helps in exploring startups, entrepreneurship.

IT615 Database Management Systems 3-0-2-4

Course objective: This course covers all essential topics in database management, in particular, relational databases. The exposure obtained by the students in this course serve as a required prerequisite to several elective courses in the areas of Software Engineering.

Course Outcomes: At the end of the course, students will be able to:

- Understand the principles of relational algebra and entity-relationship diagrams [PO1, PO2, PO4].
- Understand and apply the concepts of database design and implementation [PO2, PO4, PO5, PO12]

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 the principles of relational algebra and entity-relationship diagrams	PO1, PO2, PO4 / PSO1	U	F, C
2	CO2: Understand and apply the concepts of database design and implementation	PO2, PO4, PO5, PO12 / 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 DBMS course can be employed to industries focusing on database and software development.
Focus on Skill development	Yes	The students develop necessary skills to work with real use cases using databases.
Focus on entrepreneurship	Yes	The students can work on real time projects focusing on development of small, medium and large enterprises through entrepreneurship/self-employability and start-ups.

PC613 Communication Skills 3-0-2-4

Course Objectives: The course trains students with communication skills that are essential in their professional life.

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

- Upskills their Englisn proficiency [PO6, PO8, PO12]
- Work in group discussion and presentations [PO7, PO8, PO11, POP12]

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: Upskills their english proficiency	PO6, PO8, PO12 / PSO1	U	F, C
4	CO2: Work in group discussion and presentations	PO7, PO8, PO11, PO12 / 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	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	-

IT602 Object Oriented Programming 3-0-2-4

Course Objective: This course introduces basic concepts of object-oriented programming principles, design techniques, and analysis tools.

Course Outcomes: After successful completion of the course, the student will have the ability to:

- Understand and apply the core concepts of object-oriented programming efficiently [PO1, PO12].
- Use Java-based tools/libraries and develop basic software applications [PO3, PO5].

POs-COs Matrix:

PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO 11	PO 12
X		X		X							X

Course Outcomes and Competencies

Sr. No.	Course Outcome	PO/PSO	CPD	KD
1	CO1: Understand and apply the core concepts of object-oriented programming efficiently	PO1, PO12 / PSO1	U	F, C
2	CO2: Use Java-based tools/libraries and develop basic software applications	PO3, 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 Programming course can be employed in industries focusing on coding, web development.
Focus on Skill development	Yes	The students develop necessary skills to develop knowledge in OOPs and OODs.
Focus on entrepreneurship	Yes	The students apply their coding skills in entrepreneurship, start-up.

IT632 Software Engineering 3-0-2-4

Course objective: The Software Engineering course introduces the basic principles, practices, tools and techniques required to engineer large complex software systems.

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.

IT628 Systems Programming 3-0-2-4

Course Outcomes:

- Understand the importance of system programming, kernel subsystems, types of kernel, embedded and real time systems [PO1, PO2, PO12].
- Implement process scheduling policy and signaling mechanisms for real time and non-real time processes [PO2, PO5].
- Understand and implement I/O features device drivers [PO1, 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

Course Outcomes and Competencies

Sr. No.	Course Outcome	PO/PSO	CPD	KD
1	CO1: Understand the importance of system programming, kernel subsystems, types of kernel, embedded and real time systems	PO1, PO2, PO12 / PSO1	U	F, C
2	CO2: Implement process scheduling policy and signaling mechanisms for real time and non-real time processes	PO2, PO5 / PSO1, PSO2	U, Ap	F, C, P
3	CO3: Understand and implement I/O features device drivers	PO1, PO12 / 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 software engineering, developer.
Focus on Skill development	Yes	The students develop necessary skills to develop foundational knowledge in systems programming.
Focus on entrepreneurship	No	-

IT694 Computer Networks 3-0-2-4

Course Outcomes:

- Understand digital information flow from source to destination over OSI and TCP stack [PO1, PO12].
- Understand the network protocol stacks in the Internet [PO1, PO3].
- Determine and implement appropriate medium access control protocol to avoid collision of packets during transmission in a given medium [PO3, PO4].

POs-COs Matrix:

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

Course Outcomes and Competencies

Sr. No.	Course Outcome	PO/PSO	CPD	KD
1	CO1: Understand digital information flow from source to destination over OSI and TCP stack	PO1, PO12 / PSO1	U	F, C

2	CO2: Understand the network protocol stacks in the Internet	PO1, PO3 / PSO1, PSO2	U	F, C, P
3	CO3: Determine and implement appropriate medium access control protocol to avoid collision of packets during transmission in a given medium	PO3, PO4 / 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, Network Administrator.
Focus on Skill development	Yes	The students develop necessary skills to develop foundational knowledge in computer networks
Focus on entrepreneurship	No	-

IT629 Web Programming 3-0-2-4

Course Objective: The objective of this course is to provide an overview of the building blocks of a functional webpage and to understand the frontend and backend technologies that power the modern websites. Students will learn to develop dynamic web pages and make use of the web services through Javascript-enabled frontend framework, ReactJS and backend of NodeJS.

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

- Understand the basic principles of web development [PO1, PO4, PO12].

- Learn Javascripts, backend and frontend technologies [PO4, PO7, PO11].
- Develop web applications [PO1, PO11].

POs-COs Matrix:

PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO 11	PO 12
X	X		X			X				X	X

Course Outcomes and Competencies

Sr. No.	Course Outcome	PO/PSO	CPD	KD
1	CO1: Understand the basic principles of web development	PO1, PO4, PO12 / PSO1	U	F, C
2	CO2: Learn Javascripts, backend and frontend technologies	PO4, PO7, PO11 / PSO1, PSO2	U, Ap	F, C, P
3	CO3: Develop web applications	PO1, 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 software developer, web developer.
Focus on Skill development	Yes	The students develop necessary skills to develop knowledge in web development

Focus on entrepreneurship	Yes	The students taking this course will be equipped with the required exposure for initiating start-ups, entrepreneurship

IT619 Design of Software Systems 3-0-2-4

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

- Understand and apply object-oriented design techniques [PO1, PO12].
- Understand design principles of software systems [PO5, PO6].
- Select and use appropriate software design patterns [PO2, PO6, PO12].

POs-COs Matrix:

PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO 11	PO 12
X				X	X						X

Course Outcomes and Competencies

Sr. No.	Course Outcome	PO/PSO	CPD	KD
1	CO1: Understand and apply object-oriented design techniques	PO1, PO12 / PSO1	U	F, C
2	CO2: Understand design principles of software systems	PO5, PO6 / PSO1, PSO2	U, Ap	F, C, P
3	CO3: Select and use appropriate software design patterns	PO2, PO6, PO12 / 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 developer, web developer.
Focus on Skill development	Yes	The students develop necessary skills to develop knowledge in web development
Focus on entrepreneurship	No	-

IT618 Enterprise Computing 3-0-2-4

Course Objective: This course aims to teach J2EE technologies for building scalable enterprise applications.

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

- Understand the basic principles of web development [PO1, PO4, PO12].
- Learn J2EE technologies [PO4, PO7, PO11].
- Develop components of enterprise applications [PO1, PO11].

POs-COs Matrix:

PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO 11	PO 12
X	X		X			X				X	X

Course Outcomes and Competencies

Sr. No.	Course Outcome	PO/PSO	CPD	KD
1	CO1: Understand the basic principles of web development	PO1, PO4, PO12 / PSO1	U	F, C
2	CO2: Learn J2EE technologies	PO4, PO7, PO11 / PSO1, PSO2	U, Ap	F, C, P
3	CO3: Develop components of enterprise applications	PO1, 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 developer, web developer.
Focus on Skill development	Yes	The students develop necessary skills to develop knowledge in enterprise applications.
Focus on entrepreneurship	Yes	The students taking this course will be equipped with the required exposure for initiating start-ups, entrepreneurship.