Dhirubhai Ambani
Institute of Information and Communication Technology

DA-IICT Road, Gandhinagar, Gujarat, India 382007.
Tel.: +91 79 6826 1700 I Fax: +91 79 6826 1710 I Web: www.daiict.ac.in

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: BACHELOR OF TECHNOLOGY IN MATHEMATICS AND COMPUTING, BTECH (MnC)

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

DA-IICT GANDHINAGAR

	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	PSO1: To model computational problems by applying mathematical concepts and solving real-world problems using algorithmic techniques.
PSO2	To apply the mathematical and statistical approaches for analyzing, designing and development of computing systems in interdisciplinary applications.

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

MC111 Mathematical, Algorithmic, and Computational Thinking (3-1-0-4)

Course objective: This course aims to motivate students with mathematical, analytical, logical thinking with emphasis on algorithmic and computational thinking.

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

- Understand logical, analytical, quantitative and computational thinking [PO1, PO12].
- Learn and apply algorithmic and computational thinking [PO1, PO2, PO6].
- Use modern tools and technologies for mathematical and computational problems [PO2, PO3, PO5, PO11].

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					X	X

Course Outcomes and Competencies

Sr. No.	Course Outcome	PO/PSO	CPD	KD
1	CO1: Understand logical, analytical, quantitative and computational thinking	PO1, PO12 / PSO1	U	F, C
2	CO2: Learn and apply algorithmic and computational thinking	PO1, PO2, PO6 / PSO1, PSO2	U, AP	F, C
3	CO3: Use modern tools and technologies for mathematical and computational problems	PO2, PO3, PO5, 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 computing.
Focus on Skill development	Yes	The students develop necessary skills to develop foundational knowledge in mathematical and algorithmic thinking.
Focus on entrepreneurship	No	-

MC112 Computer Organization and Programming (3-0-0-3)

Course objective: This course provides an introduction to the design and implementation of digital circuits and microprocessors. Topics include transistor network design, Boolean algebra, combinational circuits, sequential circuits, finite state machine design, processor pipelines, and memory hierarchy. Design methodology using both discrete components and hardware description languages is covered in the course.

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

- Understand and verify digital logic gates using IC chips, and realize the combinational digital circuit for a given logical function [PO1, PO3, PO12].
- Understand Instruction cycle, I/O fundamentals and interrupts [PO1, PO2, PO5].
- Design a data and control path for the MIPS instruction set architecture [PO2, PO3, PO5]

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 and verify digital logic gates using IC chips, and realize the combinational digital circuit for a given logical function	PO1, PO3, PO12 / PSO1	U	F, C
2	CO2: Understand Instruction cycle, I/O fundamentals and interrupts	PO1, PO2, PO5 / PSO1, PSO2	U	F, C
3	CO3: Design a data and control path for the MIPS instruction set architecture	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 systems design and VLSI.
Focus on Skill development	Yes	The students develop necessary skills to

		develop foundational knowledge in computer organization that become prerequisite for other subsequent courses.
Focus on entrepreneurship	No	

MC113 Computer Organization and Programming Lab 0-0-4-2)

Course objective: This course provides an introduction to the design and implementation of digital circuits and microprocessors. Topics include transistor network design, Boolean algebra, combinational circuits, sequential circuits, finite state machine design, processor pipelines, and memory hierarchy. Design methodology using both discrete components and hardware description languages is covered in the course.

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

- Understand and verify digital logic gates using IC chips, and realize the combinational digital circuit for a given logical function [PO1, PO3, PO12].
- Understand Instruction cycle, I/O fundamentals and interrupts [PO1, PO2, PO5].
- Design a data and control path for the MIPS instruction set architecture [PO2, PO3, PO5]

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 and verify digital logic gates using IC chips, and realize the combinational digital circuit for a given logical function	PO1 PO3, PO12 / PSO1	U	F, C
2	CO2: Understand Instruction cycle, I/O fundamentals and interrupts	PO1, PO2, PO5 / PSO1, PSO2	U	F, C
3	CO3: Design a data and control path for the MIPS instruction set architecture	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 systems design and VLSI.
Focus on Skill development	Yes	The students develop necessary skills to develop foundational knowledge in computer organization that become prerequisite for other subsequent courses.
Focus on entrepreneurship	No	-

MC116 Digital Logic Design (1-0-2-2)

Course objective: This course provides an introduction to digital logic design and its applications.

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

- Understand and verify digital logic gates using IC chips, and realize the combinational digital circuit for a given logical function [PO1, PO3, PO12].
- Understand Instruction cycle, I/O fundamentals and interrupts [PO1, PO2, PO5].
- Design a data and control path for the MIPS instruction set architecture [PO2, PO3, PO5]

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 and verify digital logic gates using IC chips, and realize the combinational digital circuit for a given logical function	PO1, PO3, PO12 / PSO1	U	F, C
2	CO2: Understand Instruction cycle, I/O fundamentals and interrupts	PO1, PO2, PO5 / PSO1, PSO2	U	F, C
3	CO3: Design a data and control path for the MIPS instruction set architecture	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 systems design and VLSI.
Focus on Skill development	Yes	The students develop necessary skills to develop foundational knowledge in computer organization that become prerequisite for other subsequent courses.
Focus on entrepreneurship	No	-

MC123 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:

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							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	-

PC110 Language and Literature (3-0-0-3)

Course Objective: This course is designed to introduce students to the study of the English language and literature at the undergraduate level. It follows a two-pronged approach, first, teaching the English language through literature; secondly, introducing the students to the world of literature and teaching them strategies of reading and comprehending.

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

- Upskills their language proficiency [PO4, PO6, PO8, PO12].
- Understand post-colonial literature [PO7, PO8, PO12].

POs-COs Matrix:

PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
			X		X	X	X				X

Course Outcomes and Competencies

Sr. No.	Course Outcome	PO/PSO	CPD	KD
1	CO1: Upskills their language proficiency	PO4, PO6, PO8, PO12 / PSO1	U	F, C
2	CO2: Understand post-colonial literature	PO7, PO8, PO12 / PSO1, PSO2	U	F, C

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	-

MC125 Functions of Single Variable and ODEs (3-1-0-4)

Course Objective: The course provides foundational knowledge in functions of single variable and ODEs.

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

- Understand the basics of functions of two and more variables [PO1, PO12].
- Learn and apply series and sequences [PO2, PO4, PO5, PO12]
- Understand and apply ODEs [PO2, PO4, PO5, 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 basics of functions of two and more variables	PO1, PO12 / PSO1	U	F, C
2	CO2: Learn and apply series and sequences	PO2, PO4, PO5, PO12 / PSO1, PSO2	U, Ap	F, C, P
3	CO3: Understand and apply Vector calculus	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 this course can be employed to industries focusing on Maths and Computing.
Focus on Skill development	Yes	The students develop necessary foundational skills in functions of single variable and ODEs.
Focus on entrepreneurship	No	-

MC212 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: After completion of the course students should 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:

PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
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.

MC215 Linear Algebra (3-1-0-4)

Course Objective: Vectors are an essential idea to understand numerous natural phenomena. Its applications start right from mechanics and electrostatics and magnetostatics. These applications use equations involving vectors. Such ideas are abstracted to study solutions of a system of linear equations in several variables.

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

- Solve systems of linear equations and understand the nature of the solutions [PO1, PO2, PO12].
- Demonstrate matrix representation of linear operators and understand the concepts through linear operators and matrices [PO1, PO2].
- Perform calculations with vectors, eigenvalues and eigenvectors in "n" dimensions [PO2, 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

Course Outcomes and Competencies

Sr. No.	Course Outcome	PO/PSO	CPD	KD
1	CO1: Solve systems of linear equations and understand the nature of the solutions	PO1, PO2, PO12 / PSO1	U, Ap	F, C
2	CO2: Demonstrate matrix representation of linear operators and understand the concepts through linear operators and matrices	PO1, PO2 / PSO1, PSO2	U, Ap	F, C, P
3	CO3: Perform calculations with vectors, eigenvalues and eigenvectors in "n" dimensions	PO2, 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 Machine Learning, Data Science.
Focus on Skill development	Yes	The students develop necessary skills to develop foundational knowledge in Linear Algebra that become

		prerequisite for other subsequent courses.
Focus on entrepreneurship	No	-

MC122 Object Oriented Programming (2-0-2-3)

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:

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 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.

MC211Functions of Several Variables and PDEs (3-1-0-4)

Course Objective: The course provides foundational knowledge in functions of several variables and PDEs.

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

- Understand the basics of functions of two and more variables [PO1, PO12].
- Learn and apply series and sequences [PO2, PO4, PO5, PO12]
- Understand and apply Vector calculus [PO2, PO4, PO5, 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 basics of functions of two and more variables	PO1, PO12 / PSO1	U	F, C
2	CO2: Learn and apply series and sequences	PO2, PO4, PO5, PO12 / PSO1, PSO2	U, Ap	F, C, P
3	CO3: Understand and apply Vector calculus	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 this course can be employed to industries focusing on Maths and Computing.
Focus on Skill development	Yes	The students develop necessary foundational skills in functions of several variables.
Focus on entrepreneurship	No	-

MC124 Data Structures and Algorithms (3-0-2-4)

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:

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							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.

HM106 Approaches to Indian Society (3-0-0-3)

Course Objective: This course aims to construct a comparative framework for the understanding of different cultures with particular reference to social organization, politics, religion and symbolism illustrated with various ethnographic examples. The course is designed to provide with the means to apply basic anthropological understandings of society and culture in the analysis of meanings, actions and explanations that is the basis for communication in the society. Students will be expected to reflect upon the Indian society utilizing the readings and lectures.

Course Outcomes: Upon passing the courses, students should have a:

- Basic critical and analytical understanding of how social and cultural diversity is approached in anthropology [PO1, PO7, PO12]
- How the diversity of culture, implicit in anthropological explanations, is to be understood [PO6, PO7, PO8].

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: Basic critical and analytical understanding of how social and cultural diversity is approached in anthropology	PO1, PO7, PO12 / PSO1	U	F, C
2	CO2: How the diversity of culture, implicit in anthropological explanations, is to be understood	PO6, PO7, PO8 / 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	No	-
Focus on Skill development	Yes	The students develop necessary skills to develop knowledge in culture, society and identity.
Focus on entrepreneurship	No	-

MC216 Probability and Random Processes (3-1-0-4)

Course Objectives: This course aims to provide foundational knowledge in probability, random variables, and random processes.

Course Outcomes: After completing this course, a student

- Should be able to understand the basic concepts of 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:

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	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	PO2, PO3, PO4, PO11 / PSO1, PSO2	U, Ap, An	F, C, P

	applications and thus demonstrating professional ethics & concern for societal wellbeing			

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	-

MC213 Design and Analysis of Algorithms (3-1-0-4)

Course Objective: This course intends to provide a rigorous introduction to fundamental techniques in the design and analysis of algorithms.

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	PO 10	PO 11	PO 12
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, PSO3	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.

MC214 Operating Systems (3-0-2-4)

Course Objective: The purpose of this course is to provide the students with an introduction to system-level programming in a UNIX/Linux environment. Students will be introduced with the standard Linux commands, memory management, interacting with the operating system by making system calls for file management, file execution, process control, and inter-process communication, shell scripting, Sockets and using TCP/IP, Shell principles, exec family of functions, naming conventions, and so on. A primary goal of the course then is to train the students in a systems programming context to develop code that is robust.

Course Outcomes:

- Understand the importance of system programming, kernel subsystems, types

of kerne , 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, IPC [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 operating systems.
Focus on entrepreneurship	No	-

MC221 Mathematical Statistics (3-1-0-4)

Course Objective: The objective of this course is to cover the basic methods of Statistical decision making. Initial lectures are devoted to strengthening the statistical foundation of students. Thereafter, different statistical decision making methods have been briefly introduced.

Course Outcomes: After completion of this course, students will

- Learn the fundamental concepts and the basic tools of statistics used in Data Science [PO1, PO12].
- Learn to use R/Python for implementation of the statistical tools [PO1, PO2, PO11].
- Acquire the skill to analyze data in a systematic and logical manner to answer important research questions arising in different disciplines [PO2, PO4].
- Know how to measure and attach a measure of uncertainty to the inference drawn from data [PO4, PO5].

COs-POs 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	X

Course Outcomes and Competencies

Sr. No.	Course Outcome	PO/PSO	CPD	KD
1	CO1: Learn the fundamental concepts and the basic tools of statistics used in Data Science	PO1, PO12 / PSO1	U	F, C
2	CO2: Learn to use R/Python for implementation of the statistical tools	PO1, PO2, PO11 / PSO1, PSO2	U, Ap	F, C, P
3	CO3: Acquire the skill to analyze data in a systematic and logical manner to answer important research questions arising in different disciplines	PO2, PO4 / PSO1, PSO2	U, An	F, C, P
4	CO4: Know how to measure and attach a measure of uncertainty to the inference drawn from data	PO4, PO5 / 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 data science.
Focus on Skill development	Yes	The students develop necessary skills to develop foundational knowledge in statistical methods.
Focus on entrepreneurship	No	-

MC222 Theory of Computation (3-1-0-4)

Course Objective: The objective of this course is to discuss history of computing, models of computing, regular expressions.

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

- Learn the fundamental concepts models of computation [PO1, PO12]
- Understand and analyse automata and regular expressions [PO2, PO4, PO5].

CO-PO 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: Learn the fundamental concepts models of computation	PO1, PO12 / PSO1	U	F, C
2	CO2: Understand and analyze automata and regular expressions	PO2, PO4, 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 theory of computation.
Focus on Skill development	Yes	The students develop necessary skills to develop foundational knowledge in models of computation.
Focus on entrepreneurship	No	-

MC224 Parallel and Distributed Algorithms (3-1-0-4)

Course Objective: The objective of this course is to discuss history of computing, models of computing, regular expressions.

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

- Understand parallel algorithm models - Shared memory models and interconnection networks, performance of parallel algorithms, cost and optimality, dense algorithms [PO1, PO12].
- Learn and apply parallel query processing, dense LU factorization, comparator networks and sorting – OEMS, BSMS, analysis and applications of parallel algorithmic techniques, optimal list colouring, optimal list ranking, expression tree evaluation [PO2, PO4, PO5].

CO-PO 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 parallel algorithm models - Shared memory models and interconnection networks, performance of parallel algorithms, cost and optimality, dense algorithms	PO1, PO12 PSO1	U	F, C
2	CO2: Learn and apply parallel query processing, dense LU factorization, comparator networks and sorting – OEMS, BSMS, analysis and applications of parallel algorithmic techniques, optimal list colouring, optimal list ranking, expression tree evaluation	PO2, PO4, 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 distributed systems.
Focus on Skill development	Yes	The students develop necessary skills to develop foundational knowledge in parallel and distributed algorithms.
Focus on entrepreneurship	No	-

MC225 Numerical and Computational Methods (3-0-2-4)

Course Objective: The course discusses the role of numerical methods for computational science.

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

- Understand the depth understanding of the fundamental numerical and mathematical concepts used in computational science [PO1, PO12].
- Ability to understand the precision issues that arise when applying iterative numerical methods to solve optimization problems [PO4, PO5].

CO-PO 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 depth understanding of the fundamental numerical and mathematical concepts used in data science methods	PO1, PO12 / PSO1	U	F, C
2	CO2: Ability to understand the precision issues that arise when applying iterative numerical methods to solve optimization problems	PO4, 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 computational and data science.
Focus on Skill development	Yes	The students develop necessary skills to develop foundational knowledge in numerical methods for computational problems.
Focus on entrepreneurship	No	-

MC222 Real and Complex Analysis (3-1-0-4)

Course Objective: The course provides foundational knowledge in real and complex analysis.

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

- Understand countable and uncountable sets, concepts of metric space, open ball, closed ball, limit point of a set, ordered set, lub, glb, compact set, Heine Borel theorem, Weierstrass theorem, Cantor set [PO1, PO12].
- Learn Cauchy's theorems on limits of sequences of real numbers, fundamental theorem of limits, Bolzano-Weierstrass theorem, criteria for convergent sequence, criteria for divergent sequence, Cauchy sequence [PO2, PO4, PO5, PO12]
- Understand and apply min-max theorem, location of root and Bolzano's theorem, uniform continuity [PO2, PO4, PO5, PO12]

POs COs Matrix.

PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12
X	X		X	X							X

Course Outcomes and Competencies

Sr. No.	Course Outcome	PO/PSO	CPD	KD
1	CO1: Understand countable and uncountable sets, concepts of metric space, open ball, closed ball, limit point of a set, ordered set, lub, glb, compact set, Heine Borel theorem, Weierstrass theorem, Cantor set	PO1, PO12 / PSO1	U	F, C
2	CO2: Learn Cauchy's theorems on limits of sequences of real numbers, fundamental theorem of limits, Bolzano-Weierstrass theorem, criteria for convergent sequence, criteria for divergent sequence, Cauchy sequence	PO2, PO4, PO5, PO12 / PSO1, PSO2	U, Ap	F, C, P
3	CO3: Understand and apply min-max theorem, location of root and Bolzano's theorem, uniform continuity	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 this course can be employed to industries focusing on Maths and Computing.
Focus on Skill development	Yes	The students develop necessary foundational skills in real and complex analysis.
Focus on entrepreneurship	No	-

MC313 Algebraic Structures (3-1-0-4)

Course Objective: Algebraic structures are an essential idea to understand numerous natural phenomena.

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

- Solve systems of linear equations and understand the nature of the solutions [PO1, PO2, PO12].
- Demonstrate matrix representation of linear operators and understand the concepts through linear operators and matrices [PO1, PO2].
- Perform calculations with vectors, eigenvalues and eigenvectors in "n" dimensions [PO2, 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

Course Outcomes and Competencies

Sr. No.	Course Outcome	PO/PSO	CPD	KD
1	CO1: Solve systems of linear equations and understand the nature of the solutions	PO1, PO2, PO12 / PSO1	U, Ap	F, C
2	CO2: Demonstrate matrix representation of linear operators and understand the concepts through linear operators and matrices	PO1, PO2 / PSO1, PSO2	U, Ap	F, C, P
3	CO3: Perform calculations with vectors, eigenvalues and eigenvectors in "n" dimensions	PO2, 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 Machine Learning, Data Science.
Focus on Skill development	Yes	The students develop necessary skills to develop foundational knowledge in Algebraic structures.
Focus on entrepreneurship	No	-

HM216 Science, Technology, Society (3-0-0-3)

Course objective: This course is designed to encourage students to understand, explore and critically analyze ways in which science and technology work in diverse social contexts. It draws its basic approaches from Science and Technology studies (STS) which is a growing field of interdisciplinary studies that seeks to understand how science and technology shape human lives and livelihoods and how society and culture, in turn, shape the development of science and technology.

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

- What are the debates STS studies raise about science and technology and society that compel us to question our received ideas and assumptions about science, technology and human progress? [PO1, PO12]
- How have the questions and problems raised by historical and sociological studies of science and technology informed our understanding of the career of modern science and technology in India? [PO4, PO6, PO7]
- What are the techno-social imaginaries that influence our attitude toward science and technology in contemporary times? [PO7, PO8]
- How do we deploy the benefits of science and technology to build more inclusive societies and economies? [PO6, PO10, 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		X		X

Course Outcomes and Competencies

Sr. No.	Course Outcome	PO/PSO	CPD	KD
1	CO1: What are the debates STS studies raise about science and technology and society that compel us to question our received ideas and assumptions about science, technology and human progress?	PO1, PO12 / PSO1	U	F, C
2	CO2: How have the questions and problems raised by historical and sociological studies of science and technology informed our understanding of the career of modern science and technology in India?	PO4, PO6, PO7 / PSO1, PSO2	U, Ap	F, C, P
3	CO3: What are the techno-social imaginaries that influence our attitude toward science and technology in contemporary times?	PO7, PO8 / PSO1, PSO2	U, Ap	F, C, P
4	CO4: How do we deploy the benefits of science and technology to build more inclusive societies and economies?	PO6, PO10, PO12 / PSO2, PSO3	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 science, technology and society.
Focus on entrepreneurship	No	-

MC226 Environmental Studies (2-0-0-2)

Course objective: Sensitize students on various issues and problems of the environment affecting our society. Allow students to do hands-on exercise on a few specific problems related to the environment. Enable the student to conceive ICT based solutions to environmental problems. With the broad understanding of the environment and underlying principles, the students should be able to relate the changes and challenges of environment related issues.

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

- Understand the importance of the environment for our society [PO1, PO7, PO12].
- Visualize ICT based solutions to environmental problems [PO7, PO8].
- Relate the changes and challenges of environment related issues [PO7, PO8]

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 the environment for our society	PO1, PO7, PO12 / PSO1	U	F, C
2	CO2: Visualize ICT based solutions to environmental problems	PO7, PO8 / PSO1, PSO2	U, Ap	F, C, P
3	CO3: Relate the changes and challenges of environment related issues	PO7, PO8 / 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	No	-
Focus on Skill development	Yes	The students develop necessary skills to develop foundational knowledge in environmental science.
Focus on entrepreneurship	No	-

MC311 Mathematical Optimization (3-1-0-4)

Course Objective: The main purpose of this course is to provide the students working knowledge of optimization methods in a few selected areas.

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

- Understand and analyze complicated engineering and real-world situations by physical reasoning in terms of simple fundamental physical laws [PO1, PO12].
- Formulate mathematical models by applying abstract concepts to complex problems and solving the model using approximations if necessary [PO2, PO3, PO4].

CO-PO 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 and analyze complicated engineering and real-world situations by physical reasoning in terms of simple fundamental physical laws	PO1, PO12 / PSO1	U	F, C
2	CO2: Formulate mathematical models by applying abstract concepts to complex problems and solving the model using approximations if necessary	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 data science.
Focus on Skill development	Yes	The students develop necessary skills to develop knowledge in optimization.
Focus on entrepreneurship	No	-

MC312 Modelling and Simulation (3-0-2-4)

Course Objective: The course aims to provide exposure in modelling and simulation.

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

- Understand modeling process, Modeling Concepts, Model Classifications, System Dynamics Models [PO1, PO12].
- Learn Stochastic Models, Discrete and Continuous distributions, Markov Chains, Limit theorem for Markov Chains in discrete and continuous time, Poisson processes [PO2, PO3, PO4, PO5].
- Understand Cellular Automata Simulations, Binary and probabilistic cellular automata, using spin system and applications [PO4, PO5].

CO-PO Matrix :

PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	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 modeling process, Modeling Concepts, Model Classifications, System Dynamics Models	PO1, PO12 / PSO1	U	F, C
2	CO2: Learn Stochastic Models, Discrete and Continuous distributions, Markov Chains, Limit theorem for Markov Chains in discrete and continuous time, Poisson processes	PO2, PO3, PO4, PO5 / PSO1, PSO2	U, Ap	F, C, P
3	CO3: Understand Cellular Automata Simulations, Binary and probabilistic cellular automata, Ising spin system and applications	PO4, 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 machine learning.
Focus on Skill development	Yes	The students develop necessary skills to develop knowledge in machine learning.
Focus on entrepreneurship	Yes	Machine Learning offers enormous scope for entrepreneurship.

MC321 Machine Learning (3-0-2-4)

Course Objective. The course starts with linear regression and then discusses supervised and unsupervised learning.

Course Outcomes: After completion of this course, students will

- Develop a deep understanding of the fundamental mathematical and statistical concepts used in machine learning models [PO1, PO12].
- Develop the systematic and deep understanding of the popular machine learning models [PO4, PO5].
- Apply the variants of machine learning model to solve the real-time problems [PO4, PO5].

CO-PO 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: Develop a deep understanding of the fundamental mathematical and statistical concepts used in machine learning models	PO1, PO12 / PSO1	U	F, C
2	CO2: Develop the systematic and deep understanding of the popular machine learning models	PO4, PO5 / PSO1, PSO2	U, Ap	F, C, P
3	CO3: Apply the variants of machine learning model to solve the real-time problems	PO4, 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 machine learning.
Focus on Skill development	Yes	The students develop necessary skills to develop knowledge in machine learning.
Focus on entrepreneurship	Yes	Machine Learning offers enormous scope for entrepreneurship.

HM116 Principles of Economics (3-0-0-3)

Course Objective: This course provides students an understanding of what is Economics, the problems of Economic Organization, what, how and for whom to produce.

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

- Understand the functioning of different types of markets including Monopoly, Monopolistic competition, Oligopoly, and Perfect Competition and the corresponding equilibrium conditions in each market [PO1, PO6, PO12].
- Analyze market efficiencies, consumer surplus, producer surplus and social welfare in economic markets [PO6, PO7].
- Understand theory of labour markets and associated equilibrium wages, employment and unemployment rates with applications in the ICT industry [PO6, PO7].
- Apply macroeconomics principles to estimate the welfare of countries including

the determination of GDP, standard of living and unemployment rates [PO6, PO7 PO12].

POs COs Matrix:

PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
					X	X					X

Course Outcomes and Competencies

Sr. No.	Course Outcome	PO/PSO	CPD	KD
1	CO1: Understand the functioning of different types of markets including Monopoly, Monopolistic competition, Oligopoly, and Perfect Competition and the corresponding equilibrium conditions in each market	PO1, PO6, PO12 / PSO1	U	F, C
2	CO2: Analyze market efficiencies, consumer surplus, producer surplus and social welfare in economic markets	PO6, PO7 / PSO1, PSO2	U, An	F, C, P
3	CO3: Understand theory of labour markets and associated equilibrium wages, employment and unemployment rates with applications in the ICT industry	PO6, PO7 / PSO1	U	F, C
4	CO4: Apply macroeconomics principles to estimate the welfare of countries including the determination of GDP, standard of living and unemployment rates	PO6, PO7, 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	No	-
Focus on Skill development	Yes	The students develop necessary skills to develop foundational knowledge in economics that helps students taking related elective courses.
Focus on entrepreneurship	No	-

DA-IICT GANDHINAGAR

Executive Registrar
DA-IICT, Gandhinagar