



The South Indian Association's  
**The S.I.A. College of Higher Education(Autonomous)**  
 Affiliated to University of Mumbai  
 Reaccredited B+ by NAAC  
 P-88, MIDC Residential Area Dombivli Gymkhana Road,  
 Near Balaji Mandir, Dombivli (East), 421203.

## Department of Information Technology & Mathematics

### Post-Graduation (M.Sc.I.T.)

### Course Outcomes – 2025-26

#### M.Sc.I.T. -Sem I

Course Name	Course Outcome
Data Science	Upon completing this course, the student will be able to: OC1: Explain the core concepts of Data Science and distinguish it from Business Intelligence and Statistics. OC2: Use Python libraries such as NumPy and Pandas for data manipulation and numerical computing. OC3: Perform data cleaning, transformation, and wrangling tasks including missing data handling, merging, and reshaping datasets. OC4: Create effective visualizations using Matplotlib, Seaborn, and perform data aggregation using GroupBy and PivotTables. OC5: Implement machine learning models such as Linear/Logistic Regression, k-NN, Decision Trees, and Clustering techniques. OC6: Apply time series forecasting using ARIMA models and handle time-indexed data in Pandas
Data Science Practical	OC1: Load, inspect, and preprocess data using Pandas, including handling missing values and performing data aggregation. OC2: Apply filtering, transformation, and feature engineering techniques on datasets. OC3: Convert datasets from formats like Text-Delimited and XML into custom formats such as HORUS. OC4: Visualize and merge datasets to uncover trends and relationships using Python libraries and Power BI. OC5: Build and evaluate machine learning models for regression and

	<p>classification tasks.</p> <p>OC6: Apply K-Means clustering for customer segmentation and interpret clustering results.</p> <p>OC7: Forecast time-series data using ARIMA and interpret future trends.</p> <p>OC8: Create interactive dashboards and visual reports using Power BI for decision support</p>
<p>Soft Computing Techniques</p>	<p>Upon completing this course, the student will be able to:</p> <p>OC1: Gain a solid understanding of the fundamental concepts underlying soft computing, including the differences between soft computing and traditional hard computing methods.</p> <p>OC2: Familiarize with a variety of soft computing techniques such as fuzzy logic, neural networks, genetic algorithms, swarm intelligence, and probabilistic reasoning.</p> <p>OC3: Apply soft computing techniques to solve real-world problems from various domains such as engineering, finance, healthcare, and more.</p> <p>OC4: Formulate problems in a way that lends itself to the application of soft computing techniques, taking into account the uncertainties and imprecisions present in real-world data.</p> <p>OC5: Understand of how fuzzy logic works and its applications in modeling and decisionmaking under uncertainty.</p> <p>OC6: Gain knowledge of neural network architectures, training algorithms, and their applications in pattern recognition, regression, and classification tasks.</p> <p>OC7: Understand genetic algorithms, their components, and their use in optimization problems and search spaces.</p> <p>OC8: Familiarize with swarm intelligence algorithms such as ant colony optimization and particle swarm optimization, and their applications in optimization and search problems</p>
	<p>Upon completing this course, the student will be able to:</p> <p>OC 1: Identify and describe soft computing techniques and their roles in building intelligent machines</p> <p>OC 2: Recognize the feasibility of applying a soft computing methodology for a particular problem</p> <p>OC 3: Apply fuzzy logic and reasoning to handle uncertainty and solve engineering problems</p> <p>OC4: Apply genetic algorithms to combinatorial optimization problems</p>

<p>Soft Computing Techniques Practical</p>	<p>OC 5: Apply neural networks for classification and regression problems OC 6: Effectively use existing software tools to solve real problems using a soft computing approach OC 7: Evaluate and compare solutions by various soft computing approaches for a given problem.</p>
<p>Cloud Computing</p>	<p>Upon completing this course, the student will be able to: OC1: Analyze the Cloud computing setup with its vulnerabilities and applications using different architectures. OC2: Design different workflows according to requirements and apply map reduce programming model. OC3: Apply and design suitable Virtualization concept, Cloud Resource Management and design scheduling algorithms. OC4: Create combinatorial auctions for cloud resources and design scheduling algorithms for computing cloud. OC5: Assess cloud Storage systems and Cloud security, the risks involved, its impact and develop cloud application OC6: Broadly educate to know the impact of engineering on legal and societal issues involved in addressing the security issues of cloud computing</p>
<p>Image Processing</p>	<p>A learner will be able to: OC1: Understand the relevant aspects of digital image representation and their practical implications. OC2: Have the ability to design pointwise intensity transformations to meet stated specifications. OC3: Understand 2-D convolution, the 2-D DFT, and have the ability to design systems using these concepts. OC4: Have a command of basic image restoration techniques. OC 5: Understand the role of alternative color spaces, and the design requirements leading to choices of color space. OC6: Appreciate the utility of wavelet decompositions and their role in image processing systems. OC7: Have an understanding of the underlying mechanisms of image compression, and the ability to design systems using standard algorithms to meet design specifications</p>
	<p>A learner will be able to: OC1: solve real world problems with scientific approach. OC2: develop analytical skills by applying scientific methods.</p>

Research Methodology	<p>OC3: recognize, understand and apply the language, theory and models of the field of business analytics</p> <p>OC4: foster an ability to critically analyze, synthesize and solve complex unstructured business problems</p> <p>OC5: interpret results/solutions and identify appropriate courses of action for a given managerial situation whether a problem or an opportunity</p>
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## M.Sc.I.T. -Sem II

Course Name	Course Outcome
Machine Learning	<p>OC1: Define and demonstrate an understanding of Machine Learning and its related terms conceptually and mathematically</p> <p>OC2: Implement classifier algorithms for supervised learning tasks.</p> <p>OC3: Apply feature engineering techniques to improve a dataset for machine learning.</p> <p>OC4: Evaluate the performance of different machine learning models on a given dataset.</p> <p>OC5: Analyze the ethical implications of a machine learning system.</p>
Machine Learning Practical	<p>OC1: Preprocess the given dataset and perform a relevant assessment of data.</p> <p>OC2: Implement classifier algorithms for supervised learning tasks.</p> <p>OC3: Apply feature engineering techniques to improve a dataset for machine learning.</p> <p>OC4: Evaluate the performance of different machine learning models on a given dataset.</p>
Modern Networking	<p>OC1: Demonstrate in-depth knowledge in the area of Computer Networking.</p> <p>OC2: To demonstrate scholarship of knowledge through performing in a group to identify, formulate and solve a problem related to Computer Networks</p> <p>OC3: Prepare a technical document for the identified Networking System</p> <p>OC4: Conducting experiments to analyze the identified research work in building Computer Networks</p>
Modern Networking Practical	<p>OC1: Configure and verify advanced IP SLA tracking, BGP path attributes, and policy-based routing for traffic engineering.</p> <p>OC2: Implement secure network management practices using AAA, SNMPv3, and role-based access controls.</p>

	<p>OC3: Demonstrate inter-VLAN routing, MPLS, and VRF-based segmentation in simulated environments.</p> <p>OC4: Deploy and test SDN controllers (OpenDaylight, OFNet) and emulate OpenFlow-based networks using Mininet.</p> <p>OC5: Analyze, troubleshoot, and optimize network performance in both traditional (MPLS, VLANs, BGP) and modern (SDN, OpenFlow) architectures.</p>
Microservices Architecture	<p>OC1: Develop web applications using Model View Controller.</p> <p>OC2: Think and apply the microservices way to software development.</p>
Computer Vision Practical	<p>OC1: Read, display, and manipulate images using OpenCV and apply basic image processing techniques.</p> <p>OC2: Perform geometric and morphological transformations on images and analyze their effects.</p> <p>OC3: Implement edge detection, histogram analysis, and image segmentation techniques.</p> <p>OC4: Extract features using keypoint detectors (SIFT, SURF, ORB) and perform feature matching.</p> <p>OC5: Build image stitching systems to create panoramas using matched features.</p> <p>OC6: Implement object detection and tracking using classical and deep learning-based methods.</p> <p>OC7: Train and evaluate a CNN for image classification tasks (e.g., handwritten digit recognition).</p> <p>OC8: Use pre-trained deep models (YOLOv5, ResNet, FaceNet) for classification, detection, and recognition.</p> <p>OC9: Perform real-time face detection and recognition using deep learning and OpenCV.</p> <p>OC10: Implement semantic segmentation and pose estimation using advanced models like U-Net or MediaPipe.</p> <p>OC11: Integrate OCR techniques to read license plates and extract text from images and videos</p>

### M.Sc.I.T. -Sem III

Course Name	Course Outcome
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Advanced Artificial Intelligence	<ol style="list-style-type: none"> <li>1. Understand the fundamental principles and concepts of Artificial Intelligence.</li> <li>2. Implement intelligent agents for different applications.</li> <li>3. Understand advanced AI concepts and techniques</li> <li>4. Demonstrate proficiency in deep learning and neural networks</li> <li>5. Understand the concepts and applications of generative AI</li> <li>6. Implement generative adversarial networks and variational autoencoders</li> <li>7. Develop skills in using neural networks for image recognition and text generation</li> <li>8. Create and train GAN models for image synthesis</li> </ol>
Advanced AI Practical	<p>Upon completion of this course, students will be able to:</p> <ol style="list-style-type: none"> <li>1. Understand Deep Learning Fundamentals.</li> <li>2. Understand NLP Fundamentals.</li> <li>3. Implement Chatbot Architectures</li> <li>4. Implement Deep Learning approach</li> <li>5. Understand Computer Vision</li> <li>6. Understand Generative Adversarial Networks (GANs)</li> <li>7. Understand reinforcement learning algorithms</li> <li>8. Understand Transfer learning fundamentals</li> <li>9. Implement anomaly detection technique</li> <li>10. Understand Automated techniques</li> <li>11. Implement evolutionary algorithms</li> <li>12. Deploying a machine learning model</li> <li>13. Deploying Python Libraries</li> <li>14. Understand Generative Adversarial Networks implementation</li> </ol>
Machine Learning	<p>Upon completion of this course, students will be able to:</p> <ol style="list-style-type: none"> <li>1. Define and demonstrate an understanding of Machine Learning and its related terms conceptually and mathematically</li> <li>2. Identify and differentiate the advantages and limitations of Machine Learning algorithms and their use cases.</li> <li>3. Implement classifier algorithms for supervised learning tasks.</li> <li>4. Apply feature engineering techniques to improve a dataset for machine learning.</li> <li>5. Evaluate the performance of different machine learning models on a given dataset.</li> <li>6. Diagnose reasons for poor performance in a machine learning model.</li> </ol>

	<p>7. Analyze the ethical implications of a machine learning system.</p> <p>8. Critique the suitability of a machine learning solution for a real-world problem, considering factors beyond just model performance.</p> <p>9. Assess the potential biases and fairness concerns in a machine learning model.</p> <p>10. Develop a custom machine learning algorithm for a specific real-world problem.</p> <p>11. Propose a comprehensive machine learning solution to address a complex real-world challenge.</p>
<p>Machine Learning Practical</p>	<p>Upon completion of this course, students will be able to:</p> <ol style="list-style-type: none"> <li>1. Define and demonstrate an understanding of Machine Learning and its related terms conceptually and mathematically</li> <li>2. Identify and differentiate the advantages and limitations of Machine Learning algorithms and their use cases.</li> <li>3. Implement classifier algorithms for supervised learning tasks.</li> <li>4. Apply feature engineering techniques to improve a dataset for machine learning.</li> <li>5. Evaluate the performance of different machine learning models on a given dataset.</li> <li>6. Diagnose reasons for poor performance in a machine learning model.</li> <li>7. Analyze the ethical implications of a machine learning system.</li> <li>8. Critique the suitability of a machine learning solution for a real-world problem, considering factors beyond just model performance.</li> <li>9. Assess the potential biases and fairness concerns in a machine learning model.</li> <li>10. Develop a custom machine learning algorithm for a specific real-world problem.</li> <li>11. Propose a comprehensive machine learning solution to address a complex real-world challenge.</li> </ol>
<p>Storage as a Service</p>	<p>Upon completing this course, the student will be able to:</p> <ol style="list-style-type: none"> <li>1. Covers the evolution of data access methods and introduces concepts like network storage architectures, storage networking functions, and storage I/O requirements.</li> <li>2. Discusses different types of storage devices (disk drives, tape drives) and subsystem architectures, along with storage interconnect technologies like SCSI.</li> </ol>

	<p>3. Explores the concept of storage virtualization, its technologies, and implications for performance and reliability, as well as the fundamentals of network backup.</p> <p>4. Covers the relationship between file systems and operating systems, network file system basics, and protocols like NFS and CIFS.</p> <p>5. Discusses clustered and distributed file systems, network storage for databases, and data management techniques including historical file versions and compliance storage.</p> <p>6. Provides a historical context for storage networking, reviews block and file storage protocols, optical technologies, virtualization implementations, and network operating principles.</p>
<p>Natural Language Processing</p>	<p>Upon completing this course, the student will be able to:</p> <ol style="list-style-type: none"> <li>1. Students will get idea about know-hows, issues and challenge in Natural Language Processing and NLP applications and their relevance in the classical and modern context.</li> <li>2. Student will get understanding of Computational techniques and approaches for solving NLP problems and develop modules for NLP tasks and tools such as Morph Analyzer, POS tagger, Chunker, Parser, WSD tool etc.</li> <li>3. Students will also be introduced to various grammar formalisms, which they can apply in different fields of study.</li> <li>4. Students can take up project work or work in R&amp;D firms working in NLP and its allied areas.</li> <li>5. Student will be able to understand applications in different sectors</li> </ol>
<p>Research Project</p>	<ol style="list-style-type: none"> <li>1. The student is expected to gain expertise in research methodologies, critical thinking, data analysis, and problem-solving, equipping them with skills essential for further academic or professional endeavors .</li> <li>2. The research contributes new knowledge, insights, or innovations in the chosen field, pushing the boundaries of understanding and addressing current challenges or gaps in the literature.</li> <li>3. Completing the research project enhances the student's academic credibility and professional skills, positioning them for leadership roles, higher positions in academia, or specialized careers in their field.</li> <li>4. The research might lead to published papers, conference presentations, or recognition within academic communities, establishing the student as a contributor to scholarly discourse and increasing visibility in their field.</li> </ol>

	<p>5. The project often has practical applications in solving real-world problems, influencing policies, technologies, or practices within industries, healthcare, social services, or public administration.</p> <p>6. Through the research process, students may collaborate with faculty, industry professionals, or other researchers, broadening their academic and professional network and gaining exposure to interdisciplinary work.</p> <p>7. The research outcomes can contribute to societal progress by addressing pressing global issues, such as sustainability, health, education, or technology, potentially influencing public policy, industry standards, and community practices.</p> <p>8. The postgraduate research project fosters self-reliance, perseverance, and the ability to manage complex tasks, helping students develop critical personal attributes like time management, resilience, and intellectual independence.</p>
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### M.Sc.I.T. -Sem IV

<b>Course Name</b>	<b>Course Outcome</b>
Blockchain	<p>Upon completing this course, the student will be able to:</p> <ol style="list-style-type: none"> <li>1. provide conceptual understanding of the function of Blockchain as a method of securing distributed ledgers, how consensus on their contents is achieved.</li> <li>2. demonstrate blockchain applications.</li> <li>3. gain the ability to write and deploy basic smart contracts on the Ethereum blockchain using Solidity programming language and tools like Truffle and Remix.</li> <li>4. able to analyze crypto economic design and learn NFT and permissioned blockchains.</li> </ol>
Blockchain Practical	<p>Upon completing this course, the student will be able to:</p> <ol style="list-style-type: none"> <li>1. Develop a mechanism for generating RSA key pairs, enabling users to securely encrypt and decrypt messages.</li> <li>2. Explore the architecture and components of the Bitcoin blockchain, including blocks, transactions.</li> <li>3. Demonstrate smart contracts and their deployment in decentralized applications (DApps).</li> </ol>

	4. Evaluate the security and privacy challenges in blockchain systems.
Deep Learning	<p>After completion of the course, a student will be able to:</p> <ol style="list-style-type: none"> <li>1. Describe basics of mathematical foundation that will help the learner to understand the Concepts of Deep Learning.</li> <li>2. Understand and describe model of deep learning</li> <li>3. Understand various deep supervised learning architectures for text &amp; image data.</li> <li>4. Gain knowledge about various deep learning models and architectures.</li> <li>5. Familiarize various deep learning techniques to design efficient algorithms for real- world applications.</li> </ol>
Deep Learning Practical	<p>Upon completion of this course, students will be able to:</p> <ol style="list-style-type: none"> <li>1. Use tensors to implement deep learning algorithms and techniques.</li> <li>2. Apply deep neural network models.</li> <li>3. Analyze the impact of hyperparameter tuning on optimization.</li> <li>4. Evaluate and visualize the performance of the model.</li> </ol>
Robotic Process Automation	<p>Upon the successful completion of this course, students will be able to:</p> <ol style="list-style-type: none"> <li>1. Recall and describe fundamental RPA and UiPath concepts, including key features of Studio and Orchestrator.</li> <li>2. Explain RPA principles and how UiPath facilitates process automation through its mechanisms.</li> <li>3. Interpret roles of components and tools in the UiPath ecosystem, understanding their functions.</li> <li>4. Summarize UiPath's data manipulation and integration capabilities for efficient automation.</li> <li>5. Utilize UiPath Studio to create workflows for simple business processes, incorporating data extraction and manipulation techniques.</li> </ol>
	<ol style="list-style-type: none"> <li>1. The student is expected to gain expertise in research methodologies, critical thinking, data analysis, and problem-solving, equipping them with skills essential for further academic or professional endeavors .</li> <li>2. The research contributes new knowledge, insights, or innovations in the chosen field, pushing the boundaries of understanding and addressing current challenges or gaps in the literature.</li> <li>3. Completing the research project enhances the student's academic credibility and professional skills, positioning them for leadership roles, higher positions in academia, or specialized careers in their field.</li> <li>4. The research might lead to published papers, conference presentations, or</li> </ol>

Research Project	<p>recognition within academic communities, establishing the student as a contributor to scholarly discourse and increasing visibility in their field.</p> <ol style="list-style-type: none"><li data-bbox="450 293 1374 427">5. The project often has practical applications in solving real-world problems, influencing policies, technologies, or practices within industries, healthcare, social services, or public administration.</li><li data-bbox="450 450 1374 584">6. Through the research process, students may collaborate with faculty, industry professionals, or other researchers, broadening their academic and professional network and gaining exposure to interdisciplinary work.</li><li data-bbox="450 607 1374 786">7. The research outcomes can contribute to societal progress by addressing pressing global issues, such as sustainability, health, education, or technology, potentially influencing public policy, industry standards, and community practices.</li><li data-bbox="450 808 1374 987">8. The postgraduate research project fosters self-reliance, perseverance, and the ability to manage complex tasks, helping students develop critical personal attributes like time management, resilience, and intellectual independence.</li></ol>
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