Shree Mahavir Education Society's

**Sanghavi College of Engineering, Nashik**

## Department of Computer Engineering

## Course Outcomes

## Final Year (2019 Pattern) : Semester-I

| Course code | Course Name | Course Outcomes(Cos) |
|---|---|---|
| 410241 | Design and Analysis of Algorithms | CO1: Formulate the problem<br>CO2: Analyze the asymptotic performance of algorithms<br>CO3: Decide and apply algorithmic strategies to solve given problem<br>CO4: Find optimal solution by applying various methods<br>CO5: Analyze and Apply Scheduling and Sorting Algorithms.<br>CO6: Solve problems for multi-core or distributed or concurrent environments |
| 410242 | Machine Learning | CO1: Identify the needs and challenges of machine learning for real time applications.<br>CO2: Apply various data pre-processing techniques to simplify and speed up machine learning algorithms.<br>CO3: Select and apply appropriately supervised machine learning algorithms for real timeapplications.<br>CO4: Implement variants of multi-class classifier and measure its performance.<br>CO5 :Compare and contrast different clustering algorithms.<br>CO6: Design a neural network for solving engineering problems. |
| 410243 | Blockchain Technology | CO1: Interpret the fundamentals and basic concepts in Blockchain<br>CO2: Compare the working of different blockchain platforms<br>CO3: Use Crypto wallet for cryptocurrency based transactions<br>CO4: Analyze the importance of blockchain in finding the solution to the real-world problems.<br>CO5: Illustrate the Ethereum public block chain platform<br>CO6: Identify relative application where block chain technology can be effectively used andimplemented. |
| 410244(A) | Elective-III-(A)Pervasive Computing | CO1.Demonstrate fundamental concepts in pervasive computing.<br>CO2.Explain pervasive devices and decide appropriate one as per the need of real timeapplications. |

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| 410244(A) | Elective-III-(A)Pervasive Computing | CO3.Classify and analyze context aware systems for their efficiency in different ICT systems.<br>CO4.Illustrate intelligent systems and generic intelligent interactive applications.<br>CO5.Design HCI systems in pervasive computing environment.<br>CO6.Explore the security challenges and know the role of ethics in the context of pervasivecomputing. |
| 410244(B) | Elective-III-(B)Multimedia Techniques | CO1: Describe the media and supporting devices commonly associated with multimedia information andsystems.<br>CO2: Demonstrate the use of content-based information analysis in a multimedia information system.<br>CO3: Critique multimedia presentations in terms of their appropriate use of audio, video, graphics, color,and other information presentation concepts.<br>CO4: Implement a multimedia application using an authoring system.<br>CO5: Understanding of technologies for tracking, navigation and gestural control.<br>CO6: Implement Multimedia Internet of Things Architectures. |
| 410244© | Elective-III-(C)Cyber Security and Digital Forensics | CO1: Analyze threats in order to protect or defend it in cyberspace from cyber-attacks.<br>CO2: Build appropriate security solutions against cyber-attacks.<br>CO3:Underline the need of digital forensic and role of digital evidences.<br>CO4: Explain rules and types of evidence collection<br>CO5: Analyze, validate and process crime scenes<br>CO6: Identify the methods to generate legal evidence and supporting investigation reports. |
| 410244(D) | Elective-III-(D)Object oriented Modeling and Design | CO1: Describe the concepts of object-oriented and basic class modelling.<br>CO2: Draw class diagrams, sequence diagrams and interaction diagrams to solve problems.<br>CO3: Choose and apply a befitting design pattern for the given problem<br>CO4: To Analyze applications, architectural Styles & software control strategies<br>CO5: To develop Class design Models & choose Legacy Systems.<br>CO6:To Understand Design Patterns |

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| 4102244E | Elective-III-(E)Digital Signal Processing | CO1: Understand the mathematical models and representations of DT Signals and Systems<br>CO2: Apply different transforms like Fourier and Z-Transform from applications point of view.<br>CO3: Understand the design and implementation of DT systems as DT filters with filter structuresand different transforms.<br>CO4: Demonstrate the knowledge of signals and systems for design and analysis of systems<br>CO5: Apply knowledge and use the signal transforms for digital processing applications<br>CO6:To understand Filtering and Different Filter Structures |
| 410245(A | Elective-IV(A): Information Retrieval | CO1:Implement the concept of Information Retrieval<br>CO2:Generate quality information out of retrieved information<br>CO3:Apply techniques such as classification, clustering, and filtering over multimedia to analyzethe information<br>CO4:Evaluate and analyze retrieved information<br>CO5:Understand the data in various Application and Extensions of information retrieval<br>CO6: Understand Parallel information retrieving and web structure. |
| 410245(B) | Elective-IV(B):GPU Programming and Architecture | CO1: Describe GPU architecture<br>CO2: Write programs using CUDA, identify issues and debug them.<br>CO3: Implement efficient algorithms in GPUs for common application kernels, such as matrix multiplication<br>CO4: Write simple programs using OpenCL<br>CO5: Identify efficient parallel programming patterns to solve problems<br>CO6: Explore the modern GPUs architecture and it’s Applications. |
| 410245(C ) | Elective-IV(C):Mobile Computing | CO1: Develop a strong grounding in the fundamentals of mobile Networks<br>CO2: Apply knowledge in MAC, Network, and Transport Layer protocols ofWireless Network<br>CO3: Illustrate Global System for Mobile Communications<br>CO4: Use the 3G/4G technology based network with bandwidth capacity planning,VLR and HLR identification algorithms<br>CO5: Classify network and transport layer of mobile communication<br>CO6: Design & development of various wireless network protocols using simulationtools |

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| 410245(D) | Elective-IV(D)Software Testing and Quality Assurance | CO1: Describe fundamental concepts in software testing such as manual testing, automation testingand software quality assurance.<br>CO2: Design and Develop project test plan, design test cases, test data, and conduct test operations.<br>CO3: Apply recent automation tool for various software testing for testing software.<br>CO4: Apply different approaches of quality management, assurance, and quality standard to softwaresystem.<br>CO5: Apply and analyze effectiveness Software Quality Tools.<br>CO6: Apply tools necessary for efficient testing framework. |
| 410245E | Elective-IV(E)Compilers | CO1: Design and implement a lexical analyzer using LEX tools<br>CO2: Design and implement a syntax analyzer using YACC tools<br>CO3:Understand syntax-directed translation and run-time environment<br>CO4 : Generate intermediate codes for high-level statements.<br>CO5 :Construct algorithms to produce computer code.<br>CO6: Analyze and transform programs to improve their time and memory efficiency |
| 410246: | Laboratory Practice III | CO1: Apply preprocessing techniques on datasets.<br>CO2: Implement and evaluate linear regression and random forest regression models.<br>CO3: Apply and evaluate classification and clustering techniques.<br>CO4: Analyze performance of an algorithm.<br>CO5: Implement an algorithm that follows one of the following algorithm design strategies: divide and conquer, greedy, dynamic programming, backtracking, branch and bound.<br>CO6: Interpret the basic concepts in Blockchain technology and its applications |
| 410247 | Laboratory Practice IV | CO1: Apply android application development for solving real life problems<br>CO2: Design and develop system using various multimedia components.<br>CO3: Identify various vulnerabilities and demonstrate using various tools.<br>CO4: Apply information retrieval tools for natural language processing<br>CO5: Develop an application using open source GPU programming languages<br>CO6: Apply software testing tools to perform automated testing |
| 410248 | Project Work Stage I | • Solve real life problems by applying knowledge.<br>• Analyze alternative approaches, apply and use most appropriate one for feasible solution. |

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| 410248 | Project Work Stage I | • Write precise reports and technical documents in a nutshell.<br>• Participate effectively in multi-disciplinary and heterogeneous teams exhibiting team work<br>• Inter-personal relationships, conflict management and leadership quality. |
| 410249 | Audit Course 7: I: MOOC-learn New Skill | CO1: To acquire additional knowledge and skill. |
| 410249 | Audit Course 7: II:Entrepreneurship Development | CO1: Understand the legalities in product development<br>CO2: Undertake the process of IPR, Trademarks, Copyright and patenting<br>CO3: Understand and apply functional plans<br>CO4: Manage Entrepreneurial Finance<br>CO5: Inculcate managerial skill as an entrepreneur |
| 410249 | Audit Course 7: III:Botnet of Things | CO1: Implement security as a culture and show mistakes that make applications vulnerable to attacks.<br>CO2: Understand various attacks like DoS, buffer overflow, web specific, database specific, web-spoofing attacks.<br>CO3: Demonstrate skills needed to deal with common programming errors that lead to most securityproblems and to learn how to develop secure applications |
| 410249 | Audit Course 7: IV: 3D Printing | CO1: Understand the basic knowledge of Shop Floor Safety rules and regulations basics of Machinetools and 3D printing machines<br>CO2: Understand the concept of concept of technical sketching, multi-view drawings, Lettering,tolerance, and metric construction<br>CO3:Identify and Distinguish drafting terminologies and construction of geometrical figures using drawing instruments, procedure to prepare a drawing sheet as per SP-46:2003<br>CO4:Describe and Explain practical aspects to generate detailed and assembly views with dimensions,annotations, in 3D Modeling software.<br>CO5: Apply concepts and Fabricate the simple mechanical parts, prototype/ end use product for 3D Printing |
| 410249 | Audit Course 7:V: Industrial Safety and Environment Consciousness | CO1: Develop the plan for Safety performance<br>CO2: Demonstrate the action plan for accidents and hazards<br>CO3: Apply the safety and security norms in the industry<br>CO4: Evaluate the environmental issues of Industrialization |

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|---|---|---|
| **Final Year (2019 Pattern) : Semester-II** | | |
| 410250 | High Performance Computing | CO1: Understand various Parallel Paradigm<br>CO2: Design and Develop an efficient parallel algorithm to solve given problem<br>CO3: Illustrate data communication operations on various parallel architecture<br>CO4: Analyze and measure performance of modern parallel computing systems<br>CO5: Apply CUDA architecture for parallel programming<br>CO6: Analyze the performance of HPC applications |
| 410251 | Deep Learning | CO1: Understand the basics of Deep Learning and apply the tools to implement deep learningapplications<br>CO2: Evaluate the performance of deep learning models (e.g., with respect to the bias-variance tradeoff, overfitting and underfitting, estimation of test error).<br>CO3: To apply the technique of Convolution (CNN) and Recurrent Neural Network (RNN) forimplementing Deep Learning models<br>CO4: To implement and apply deep generative models.<br>CO5: Construct and apply on-policy reinforcement learning algorithms<br>CO6:To Understand Reinforcement Learning Process |
| 410252(A) | Elective V(A):Natural Language Processing | CO1: Describe the fundamental concepts of NLP, challenges and issues in NLP<br>CO2: Analyze Natural languages morphologically, syntactical and semantically OR Describe the concepts of morphology, syntax, semantics of natural language<br>CO3: Illustrate various language modelling techniques<br>CO4: Integrate the NLP techniques for the information retrieval task<br>CO5: Demonstrate the use of NLP tools and techniques for text-based processing of natural languages<br>CO6: Develop real world NLP applications |
| 410252 (B) | Elective V(B):Image Processing | CO1: Apply Relevant Mathematics Required for Digital Image Processing.<br>CO2: Apply Special and Frequency Domain Method for Image Enhancement.<br>CO3: Apply algorithmic approaches for Image segmentation.<br>CO4: Summarize the Concept of Image Compression and Object Recognition.<br>CO5: Explore the Image Restoration Techniques.<br>CO6: Explore the Medical and Satellite Image Processing Applications. |

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| 410252© | Elective V(C):Software Defined Networks | CO1: Interpret the need of Software Defined networking solutions.<br>CO2: Analyze different methodologies for sustainable Software Defined Networkingsolutions.<br>CO3: Select best practices for design, deploy and troubleshoot of next generation networks.<br>CO4: Develop programmability of network elements.<br>CO5: Demonstrate virtualization and SDN Controllers using Open Flow protocol<br>CO6: Design and develop various applications of SDN |
| 410252(D) | Elective V(D):Advanced Digital Signal Processing | CO1: Understand and apply different transforms for the design of DT/Digital systems<br>CO2: Explore the knowledge of adaptive filtering and Multi-rate DSP<br>CO3: Design DT systems in the field/area of adaptive filtering, spectral estimation and multi-rateDSP<br>CO4: Explore use of DCT and WT in speech and image processing<br>CO5: Develop algorithms in the field of speech , image processing and other DSP applications<br>CO6:Identify Image Processing Techniques |
| 410253(A) | Elective VI(A):Pattern Recognition | CO1: Analyze various type of pattern recognition techniques<br>CO2: Identify and apply various pattern recognition and classification approaches to solvethe problems<br>CO3: Evaluate statistical and structural pattern recognition<br>CO4: Percept recent advances in pattern recognition confined to various applications<br>CO5:Implement Bellman's optimality principle and dynamic programming<br>CO6:Analyze Patterns using Genetic Algorithms & Pattern recognition applications. |
| 410253( B) | Elective VI(B):Soft Computing | CO1: Understand requirement of soft computing and be aware of various soft computing techniques.<br>CO2: Understand Artificial Neural Network and its characteristics and implement ANN algorithms.<br>CO3: Understand and Implement Evolutionary Computing Techniques.<br>CO4: Understand the Fuzzy logic and Implement fuzzy algorithms for solving real life problems.<br>CO5: Apply knowledge of Genetic algorithms for problem solving.<br>CO6: Develop hybrid systems for problem solving. |

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| 410253© | Elective VI(C):Business Intelligence | CO1: Differentiate the concepts of Decision Support System & Business Intelligence<br>CO2:Use Data Warehouse & Business Architecture to design a BI system.<br>CO3:Build graphical reports<br>CO4:Apply different data preprocessing techniques on dataset<br>CO5:mplement machine learning algorithms as per business needs<br>CO6:Identify role of BI in marketing, logistics, and finance and telecommunication sector |
| 410253(D) | Elective VI(D):Quantum Computing | CO1: To understand the concepts of Quantum Computing<br>CO2: To understand and get exposure to mathematical foundation and quantum mechanics<br>CO3: To understand and implement buiding blocks of Quantum circuits<br>CO4: To understand quantum information, its processing and Simulation tools<br>CO5: To understand basic signal processing algorithms FT, DFT and FFT<br>CO6 : To study and solve examples of Quantum Fourier Transforms and their applications |
| 410254 | Laboratory Practice V | CO1: Analyze and measure performance of sequential and parallel algorithms.<br>CO2: Design and Implement solutions for multicore/Distributed/parallel environment.<br>CO3: Identify and apply the suitable algorithms to solve AI/ML problems.<br>CO4: Apply the technique of Deep Neural network for implementing Linear regression andclassification.<br>CO5: Apply the technique of Convolution (CNN) for implementing Deep Learning models.<br>CO6: Design and develop Recurrent Neural Network (RNN) for prediction. |
| 410255 | Laboratory Practice VI | CO1: Apply basic principles of elective subjects to problem solving and modeling.<br>CO2: Use tools and techniques in the area of software development to build mini projects<br>CO3: Design and develop applications on subjects of their choice.<br>CO4: Generate and manage deployment, administration & security. |

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| 410256 | Project Work Stage II | CO1: Show evidence of independent investigation<br>CO2: Critically analyze the results and their interpretation.<br>CO3: Report and present the original results in an orderly way and placing the open questions in the right perspective.<br>CO4: Link techniques and results from literature as well as actual research and future research lines withthe research.<br>CO5: Appreciate practical implications and constraints of the specialist subject |
| 410257 | Audit Course 8-I-Usability Engineering | CO1: Describe the human centered design process and usability engineering process and theirroles in system design and development.<br>CO2: Discuss usability design guidelines, their foundations, assumptions, advantages, andweaknesses.<br>CO3: Design a user interface based on analysis of human needs and prepare a prototype system.<br>CO4: Assess user interfaces using different usability engineering techniques.<br>CO5: Present the design decisions |
| 410257 | Audit Course 8– II: Conversational Interfaces | CO1: Develop an effective interface for conversation<br>CO2: Explore advanced concepts in user interface |
| 410257 | Audit Course 8-III-Social Media And Analytics | CO1: Develop a far deeper understanding of the changing digital land scape.<br>CO2: Identify some of the latest digital marketing trends and skill sets needed for today's marketer.<br>CO3: Successful planning, prediction, and management of digital marketing campaigns<br>CO4:Assess user interfaces using different usability engineering techniques.<br>CO5: Implement smart management of different digital assets for marketing needs.<br>CO6: Assess digital marketing as a long term career opportunity. |
| 410257 | Audit Course 8-IV: MOOC-learn New Skill | CO1: To acquire additional knowledge and skill. |
| 410257 | Audit Course 8-V: Emotional Intelligence | CO1: Expand your knowledge of emotional patterns in yourself and others<br>CO2: Discover how you can manage your emotions, and positively influence yourself and others<br>CO3: Build more effective relationships with people at work and at home<br>CO4: Positively influence and motivate colleagues, team |

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| 410257 | Audit Course 8-V: Emotional Intelligence | members, managers<br>CO5: Increase the leadership effectiveness by creating an atmosphere that engages others |