Hope Foundation's
International Institute of Information Technology
P-14, Rajiv Gandhi Info Tech Park, Phase – 1, Hinjawadi, Pune – 411 057
Department of Computer Engineering

Course Outcomes (COs)

BE (Computer Engineering) -2019 Pattern

Course Code	Name of Subject/ Course	Course Outcome (COs)
SEM I		
410241	Design and Analysis of Algorithms	❑ Formulate the problem ❑ Analyze the asymptotic performance of algorithms ❑ Decide and apply algorithmic strategies to solve given problem ❑ Find optimal solution by applying various methods ❑ Analyze and Apply Scheduling and Sorting Algorithms. ❑ Solve problems for multi-core or distributed or concurrent environments
410242	Machine Learning	❑ Identify the needs and challenges of machine learning for real time applications. ❑ Apply various data pre-processing techniques to simplify and speed up machine learning algorithms. ❑ Select and apply appropriately supervised machine learning algorithms for real timeapplications. ❑ Implement variants of multi-class classifier and measure its performance. ❑ Compare and contrast different clustering algorithms. ❑ Design a neural network for solving engineering problems.
410243	Blockchain Technology	❑ Interpret the fundamentals and basic concepts in Blockchain ❑ Compare the working of different blockchain platforms ❑ Use Crypto wallet for cryptocurrency based transactions ❑ Analyze the importance of blockchain in finding the solution to the real-world problems. ❑ Illustrate the Ethereum public block chain platform ❑ Identify relative application where block chain technology can be effectively used andimplemented.

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

410244(E)	Digital Signal Processing	❑ Understand the mathematical models and representations of DT Signals and Systems ❑ Apply different transforms like Fourier and Z-Transform from applications point of view. ❑ Understand the design and implementation of DT systems as DT filters with filter structuresand different transforms. ❑ Demonstrate the knowledge of signals and systems for design and analysis of systems ❑ Apply knowledge and use the signal transforms for digital processing applications ❑ To understand Filtering and Different Filter Structures
410245(A)	Information Retrieval	❑ Implement the concept of Information Retrieval ❑ Generate quality information out of retrieved information ❑ Apply techniques such as classification, clustering, and filtering over multimedia to analyzethe information ❑ Evaluate and analyze retrieved information ❑ Understand the data in various Application and Extensions of information retrieval ❑ Understand Parallel information retrieving and web structure.
410245(B)	GPU Programming and Architecture	❑ Describe GPU architecture ❑ Write programs using CUDA, identify issues and debug them. ❑ Implement efficient algorithms in GPUs for common application kernels, such as matrix multiplication ❑ Write simple programs using OpenCL ❑ Identify efficient parallel programming patterns to solve problems ❑ Explore the modern GPUs architecture and it‘s Applications.
410245(C)	Mobile Computing	❑ Develop a strong grounding in the fundamentals of mobile Networks ❑ Apply knowledge in MAC, Network, and Transport Layer protocols of Wireless Network ❑ Illustrate Global System for Mobile Communications ❑ Use the 3G/4G technology based network with bandwidth capacity planning,VLR and HLR identification algorithms ❑ Classify network and transport layer of mobile communication ❑ Design & development of various wireless network protocols using simulation tools

410245(D)	Software Testing and Quality Assurance	❑ Describe fundamental concepts in software testing such as manual testing, automation testing and software quality assurance. ❑ Design and Develop project test plan, design test cases, test data, and conduct test operations. ❑ Apply recent automation tool for various software testing for testing software. ❑ Apply different approaches of quality management, assurance, and quality standard to software system. ❑ Apply and analyze effectiveness Software Quality Tools. ❑ Apply tools necessary for efficient testing framework.
410245(E)	Compilers	❑ Design and implement a lexical analyzer using LEX tools ❑ Design and implement a syntax analyzer using YACC tools ❑ Understand syntax-directed translation and run-time environment ❑ Generate intermediate codes for high-level statements. ❑ Construct algorithms to produce computer code. ❑ Analyze and transform programs to improve their time and memory efficiency
410246	Laboratory Practice III	❑ Apply preprocessing techniques on datasets. ❑ Implement and evaluate linear regression and random forest regression models. ❑ Apply and evaluate classification and clustering techniques. ❑ Analyze performance of an algorithm. ❑ Implement an algorithm that follows one of the following algorithm design strategies: divide and conquer, greedy, dynamic programming, backtracking, branch and bound. ❑ Interpret the basic concepts in Blockchain technology and its applications
410247	Laboratory Practice IV	❑ Apply android application development for solving real life problems ❑ Design and develop system using various multimedia components. ❑ Identify various vulnerabilities and demonstrate using various tools. ❑ Apply information retrieval tools for natural language processing ❑ Develop an application using open source GPU programming languages ❑ Apply software testing tools to perform automated testing
410248	Project Work Stage I	❑ Solve real life problems by applying knowledge. ❑ Analyze alternative approaches, apply and use most appropriate one for feasible solution. ❑ Write precise reports and technical documents in a nutshell. ❑ Participate effectively in multi-disciplinary and heterogeneous teams exhibiting team work ❑ Inter-personal relationships, conflict management and leadership quality.
410249	Audit Course 7: MOOC-learn New Skill	❑ To acquire additional knowledge and skill.

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

410252(C)	Software Defined Networks	❑ Interpret the need of Software Defined networking solutions. ❑ Analyze different methodologies for sustainable Software Defined Networkingsolutions. ❑ Select best practices for design, deploy and troubleshoot of next generation networks. ❑ Develop programmability of network elements. ❑ Demonstrate virtualization and SDN Controllers using Open Flow protocol ❑ Design and develop various applications of SDN
410252(D)	Advanced Digital Signal Processing	❑ Understand and apply different transforms for the design of DT/Digital systems ❑ Explore the knowledge of adaptive filtering and Multi-rate DSP ❑ Design DT systems in the field/area of adaptive filtering, spectral estimation and multi-rateDSP ❑ Explore use of DCT and WT in speech and image processing ❑ Develop algorithms in the field of speech , image processing and other DSP applications ❑ Identify Image Processing Techniques
410253(A)	Pattern Recognition	❑ Analyze various type of pattern recognition techniques ❑ Identify and apply various pattern recognition and classification approaches to solvethe problems ❑ Evaluate statistical and structural pattern recognition ❑ Percept recent advances in pattern recognition confined to various applications ❑ Implement Bellman‘s optimality principle and dynamic programming ❑ Analyze Patterns using Genetic Algorithms & Pattern recognition applications.
410253(B)	Soft Computing	❑ Understand requirement of soft computing and be aware of various soft computing techniques. ❑ Understand Artificial Neural Network and its characteristics and implement ANN algorithms. ❑ Understand and Implement Evolutionary Computing Techniques. ❑ Understand the Fuzzy logic and Implement fuzzy algorithms for solving real life problems. ❑ Apply knowledge of Genetic algorithms for problem solving. ❑ Develop hybrid systems for problem solving.
410253(C)	Business Intelligence	❑ Differentiate the concepts of Decision Support System & Business Intelligence ❑ Use Data Warehouse & Business Architecture to design a BI system. ❑ Build graphical reports ❑ Apply different data preprocessing techniques on dataset ❑ Implement machine learning algorithms as per business needs ❑ Identify role of BI in marketing, logistics, and finance and telecommunication sector

410253(D)	Quantum Computing	❑ To understand the concepts of Quantum Computing ❑ To understand and get exposure to mathematical foundation and quantum mechanics ❑ To understand and implement buiding blocks of Quantum circuits ❑ To understand quantum information, its processing and Simulation tools ❑ To understand basic signal processing algorithms FT, DFT and FFT ❑ To study and solve examples of Quantum Fourier Transforms and their applications
410254	Laboratory Practice V	❑ Analyze and measure performance of sequential and parallel algorithms. ❑ Design and Implement solutions for multicore/Distributed/parallel environment. ❑ Identify and apply the suitable algorithms to solve AI/ML problems. CO4: Apply the technique of Deep Neural network for implementing Linear regression andclassification. ❑ Apply the technique of Convolution (CNN) for implementing Deep Learning models. ❑ Design and develop Recurrent Neural Network (RNN) for prediction.
410255	Laboratory Practice VI	❑ Apply basic principles of elective subjects to problem solving and modeling. ❑ Use tools and techniques in the area of software development to build mini projects ❑ Design and develop applications on subjects of their choice. ❑ Generate and manage deployment, administration & security.
410256	Project Work Stage II	❑ Show evidence of independent investigation ❑ Critically analyze the results and their interpretation. ❑ Report and present the original results in an orderly way and placing the open questions in the rightperspective. ❑ Link techniques and results from literature as well as actual research and future research lines withthe research. ❑ Appreciate practical implications and constraints of the specialist subject
410257	Audit Course 8: IV: MOOC-learn New Skill	❑ CO1: To acquire additional knowledge and skill.