

NOTIFICATION

No. 64/2022

Date : 18 /06/2022

**Subject : Implementation of new Syllabi of Semester VII & VIII of B.E. (Information Technology) (C.B.C.S.) as per A.I.C.T.E. Model Curriculum.**

It is notified for general information of all concerned that the authorities of the University have accepted to implement new Syllabi of Semester VII & VIII of B.E. (Information Technology) (C.B.C.S.) as per A.I.C.T.E. model curriculum to be implemented from the academic session 2022-23 onwards as per Appendix – A as given below:

Sd/-  
(Dr.T.R.Deshmukh)  
Registrar

Appendix A

**Syllabus of B.E. Semester VII & VIII [(Information Technology) (CBCS)]**

**7IT01 MOBILE COMPUTING**

**Course Objectives:**

1. To introduce to basic concepts of Mobile Computing and Principals of cellular communication.
2. To familiarize different components, devices for mobile computing and understand wireless application protocol.
3. Make students proficient in implementing mobile computing fundamentals using wireless scripting language.
4. To gain knowledge about open platform mobile development
5. To understand concept of distributed mobile computing.
6. Analyze different security issues in mobile computing

**Course Outcomes:** On completion of the course, the students will be able to-

1. Gain knowledge of basic concepts of Mobile Computing and Principals of cellular communication.
2. Understand different components, devices for mobile computing and understand wireless application protocol
3. Able to implement different concepts of mobile computing fundamentals using wireless scripting language.
4. To develop ability for developing open platform mobile development.
5. Explore concepts of distributed mobile computing
6. Identify & understand different security issues in mobile computing.

**Unit I: Wireless and Mobile architecture:**

Principal of cellular communication. Overview 1G,2G,3G,4G and 5G technology. GSM Architecture and Mobility management handoff management, network signaling. Mobile computing fundamental challenges, mobile device-PDA and mobile OS, Palm OS, WinCE and Symbian.

**Unit II: Mobile Infrastructure and Wireless Application Protocol (WAP):**

Mobile device types, components, connection method. Mobile client application, Thin client, Fat client. wireless application protocol gateways, implementing wireless enterprise wireless application protocol strategy.

**Unit III: Fundamental of WML:**

Writing and formatting text navigating between cards and decks, displaying images, tables using variables acquiring user input. WML Script- Control structure, events, phone.com extension and usability.

**Unit IV: Building reach user interface:**

Open platform for mobile development, Android SDK features, developing for mobile devices and development tools.

**Unit V: Distributed Mobile Computing:**

Distributed OS and file computing Mobile computing software, Pervasive computing, development strategies and tools, Data Base management for Mobile computing.

**Unit VI: Security:** User to mobile Client security issues, mobile client security issues, Client server communication security issues, existing web architecture and back end system security issues and case study.

**Text Books:**

1. UweHansmann, Pervasive computing Hand book . The mobile world, IEEE Publication 2002.
2. Raj Kamal, Mobile Computing, 2/e , Oxford University Press-New Delhi.

**Reference Books:**

1. Yi Bing LöWireless and mobile network architecture, John Wiley.
2. Valentino Lee; Heather Schneider; Robbie Schell, Mobile applications: Architecture, Design and development, Prentice Hall April 16 2004.
3. Retro Meler, Professional Android application development, John wiley and sons 2010.

7 IT 02                      EMBEDDED SYSTEM

**Course Objectives:**

Students will be expected to demonstrate their understanding of Embedded System by being able to do each of the following:

- 1) Introduce the fundamental and building blocks of Embedded System.
- 2) Impart the knowledge of basic embedded programming in various languages as well as data structures.
- 3) Introduce hardware units, bus communication in processors and input/output interfacing.
- 4) Impart knowledge of real-time operating system and various task scheduling algorithms.
- 5) Introduce basics of real-time operating system and case study example to elaborate importance of real-time operating system and software development tools.

**Course Outcomes:** On completion of the course, the students will be able to:

- 1) Describe the basic structural units of a processor as well as hardware units of embedded systems.
- 2) Explain architecture of microcontroller, and processor-memory organization for embedded system.
- 3) Use knowledge of programming to do embedded programming in various languages and use of data structures for programming.
- 4) Examine the basic concepts of operating systems with real-time operating systems aspects.
- 5) Assess the Real-Time Operating System programming concepts with Design examples and case studies.
- 6) Design embedded systems based various applications using embedded software development process and tools.

**UNIT I: Introduction to Embedded Systems, Design and Development Process:**

Embedded systems, Processor embedded into a system, Embedded hardware units and devices in a system, Embedded software in a system, Classification of embedded systems, Skills required for an embedded system designer, Examples of embedded systems. Embedded SOC and use of VLSI circuit design technology, Complex systems design and processors, Design process in embedded system, Design challenges in embedded-system design, Hardware-software Co-Design in an embedded system, Embedded system design technologies, Design process and design examples.

**UNIT II: 8051 Microcontroller, Advance Processor Architectures, Processor-Memory Organization and Communication Buses:**

Introduction to Microcontroller and Microprocessor, 8051 Microcontroller Architecture. Introduction to advanced processor architecture, Processor and memory organization, Processor Organization, Instruction-Level parallelism, Memory types and memory maps and addresses, Memory Hierarchy and Cache, Selection of processor and Memory devices. Serial bus communication Protocols, Parallel bus device Protocols.

**UNIT III: Programming Concepts and Embedded Programming, and Program Modeling Concept:**

Software programming in assembly language and in high level language -C/C++ Program Elements: Header and Source files and Processor Directives, Macros and Functions, Data Types, Data Structures, Modifiers, Statements, Loops and Conditions, Use of Loops, Infinite Loops and Conditions, Use of Function Calls, Function Pointers and Function Queues, Queuing of Functions on Interrupts and ISR Queues, Embedded programming in C++ and Java. Program Models, DFG models, State machine programming models for event controlled program flow, modeling of multiprocessor systems, UML modelling.

**UNIT IV: Basic Function of Operating Systems and Real-time Operating Systems:**

Operating system services, Process management, Timer functions, Event function, memory management, Device, File, and I/O Subsystems Management, Interrupt routines in RTOS Environment and Handling of Interrupt-Source Calls, Inter process Communication and Synchronization of Process, Thread and Tasks.

Introduction to RTOS, Basic design using RTOS, RTOS task-scheduling models, OS Security Issues, OS Standards: POSIX, RTOS Interrupt Latency and Response Times of the Tasks as Performance Metrics, OS performance guidelines.

**UNIT V: RTOS Programming, Design Examples and Case Studies:**

Real-Time Operating Systems (RTOSes), RTOS VxWorks. Design examples and case studies: Case Study of Digital Camera, RTOS for Control Systems, Embedded system for an Adaptive Cruise Control System in a Car, Embedded system for a Smart Card, Access Control Systems (Smart Cards, RFIDs, Fingerscan).

**Unit VI: Embedded Software Development Process and Tools:**

Introduction to Embedded software development process and tools, Host and Target machines, Linking and Locating software, Getting embedded software into the targeting system, Issues in Hardware-Software design and Co-Design, Program-Level performance analysis and performance modeling, Testing, Simulation, and Debugging Techniques and Tools.

**Text Book:** Rajkamal, Embedded Systems, Architecture, Programming & Design, Third Edition TMH.

**Reference Books:**

1. Shibu K V Introduction to Embedded Systems McGraw-Hill.
2. Andrew N. Sloss, Dominic Symes, Chris Wright, ARM Systems Developer's Guide- Designing and Optimizing System Software, 2008, Elsevier.
3. Rajkamal, Embedded Systems, Architecture, Programming & Design, Second edition, TMH.
4. Mohammad Ali Mazidi The 8051 Microcontroller and Embedded System using Assembly and C Pearson.
5. Frank Vahid and Tony Givargis, Embedded System Design, A Unified Hardware/Software Introduction, John Wiley & Sons Pvt. Ltd.
6. Jane W. S. Liu, Real Time Systems, Pearson Education.
7. Tammy Noergaard Embedded Systems Architecture Elsevier Newnes Publication.

**7IT06 EMBEDDED SYSTEM – LAB.**

Minimum **Eight** experiments/programming assignments must be completed based on the syllabus covering each of the units.

**7 IT 03 CLOUD COMPUTING**

**Course Objectives:**

Throughout the course, students will be expected to demonstrate their understanding of Cloud Computing by being able to do each of the following:

1. To provide students with the fundamentals and essentials of Cloud Computing.
2. To provide students a foundation of Cloud Computing, Cloud Computing services and tools in real life scenarios.
3. To enable student to explore some important Cloud Computing driven commercial systems and applications.
4. To provide students with essentials of Cloud Computing architecture, Virtualization, Storage and Network concepts.

**Course Outcomes:** On completion of the course, the students will be able to:

1. Describe the fundamental concept, architecture and applications of Cloud Computing.
2. Discuss the problems related to cloud deployment model.
3. Examine the concept of virtualization.
4. Identify the role of network connectivity in the cloud.
5. Assess different Cloud service providers.
6. Inspect the security issues in cloud service models.

**Unit I: Cloud Computing Fundamental, Architecture and Management:**

Computing Paradigm and various computing types, Cloud Computing Fundamentals: Motivation for Cloud Computing, The need for Cloud Computing, Defining Cloud Computing, Principles of Cloud Computing, Requirements of Cloud Services, Cloud Applications, Benefits and Drawbacks. Cloud Computing Architecture and Management: Introduction, Cloud Architecture, Network connectivity in Cloud Computing, Applications on the cloud, Managing Cloud, Migrating Application to cloud.

**Unit II: Cloud Deployment and Service Models:**

Cloud Deployment Models: Introduction, Private Cloud, Public Cloud, Community Cloud, Hybrid Cloud. Cloud Service Models: Introduction, Infrastructure as a Service, Platform as a Service, Software as a Service, Other Cloud Service Models.

**Unit III: Operating System and Virtualization:**

Types of Operating Systems, Role of OS in Cloud Computing, Features of Cloud OS. Application Environment: Need for Effective ADE, Application Development Methodologies, Cloud Application Development Platforms and Cloud Computing APIs. Virtualization: Introduction, Virtualization Opportunities, Approaches to Virtualization, Hypervisors, Virtualization to Cloud Computing.

**Unit IV: Software Development in Cloud and Networking for Cloud Computing:**

Introduction, Different Perspectives on SaaS Development, New Challenges, Cloud-Aware Software Development Using PaaS Technology. Networking for Cloud Computing: Introduction, Overview of Data Center Environment, Networking Issues in Data Centers, Transport Layer Issues in DCNs.

**Unit V: Cloud Service Providers:**

Introduction, EMC: IT, and captive cloud toolkit, Google: Platform, Storage, Cloud connect, Cloud Print and App Engine, Amazon Web Services: Elastic Compute Cloud, Simple storage, Simple Queue Service, Microsoft: Windows Azure, IBM Cloud models and IBM Smart Cloud, SAP Labs: SAP HANA Cloud Platform, Virtualization Services Salesforce: Sales Cloud and Service Cloud, Rackspace and VMware. Advances in Cloud Computing: Inter-cloud, Cloud Management, Mobile Cloud, Media Cloud, Interoperability and Standards, Cloud Governance Computational Intelligence in Cloud, Green Cloud, Cloud Analytics

**Unit VI: Open Source Support for Cloud and Security in Cloud Computing:**

Open Source Support for Cloud: Introduction, Open Source Tools for IaaS, Open Source Tools for PaaS, Open Source Tools for SaaS, Open Source Tools for Research, Distributed Computing Tools for Management of Distributed Systems. Security in Cloud Computing: Introduction, Security Aspects: Data, Virtualization and Network Security, Platform-Related Security: Security issues in Cloud Service Models, SaaS, PaaS, IaaS security issues, Audit and Compliance: Disaster Recovery, Privacy and Integrity.

**Text Book:** K. Chandrasekaran: Essentials of Cloud Computing, Edition, CRC Press Taylor & Francis Group.

**Reference Books:**

1. A. Shrinivasan, J. Suresh: Cloud computing a practical approach for learning and implementation, Pearson publication.
2. M.N. Rao: Cloud Computing, PHI Learning Pvt. Ltd, 2015.
3. Dr. Kumar Saurabh: Cloud computing, 2nd Edition, Wiley India 2012.
4. Rajkumar Buyya, James Broberg and Andrzej M. Goscinski: Cloud Computing: Principles and Paradigms, John Wiley & Sons, Inc. 2011.
5. Anthony T. Velte, Toby J. Velte and Robert Elsenpeter, Cloud computing a practical approach, Tata McGraw-Hill, New Delhi 2010.
6. Judith Hurwitz, Robin Bloor, Marcia Kaufman and Fern Halper, Cloud computing for dummies, Wiley Publishing, Inc, 2010.

**7IT04 (Prof. Elect.-III) (i) MACHINE LEARNING**

**Course Objectives:**

1. To imbibe the concepts, techniques and building blocks of machine learning.
2. To understand mathematics for modeling and evaluation.
3. To Learn various algorithms of classification & regression for supervised machine learning.
4. To Learn various algorithms of clustering for unsupervised machine learning.
5. To Introduce the concept of Reinforcement Learning.
6. To Learn the Concept of Neural network.

**Course Outcomes:** On completion of the course, the students will be able to:

1. Understand the concept of Machine Learning
1. Understand how to evaluate models generated from data.
2. Implement the variety of algorithms for Supervised Learning
3. Implement the variety of algorithms for Unsupervised Learning
4. Implement the variety of algorithms for Reinforcement Learning
5. Understand the concept of Neural Network

**Unit I:** Machine Learning: The three different types of machine learning, Introduction to the basic terminology and notations, A roadmap for building machine learning systems, Using Python for machine learning, Training Simple Machine Learning Algorithms for Classification, Artificial neurons & a brief glimpse into the early history of machine learning, Implementing a perceptron learning algorithm in Python, Adaptive linear neurons and the convergence of learning, A Tour of Machine Learning Classifiers Using scikit-learn, Choosing a classification algorithm, First steps with scikit-learn & training a perceptron, Modeling class probabilities via logistic regression, Maximum margin classification with support vector machines, Solving nonlinear problems using a kernel SVM, Decision tree learning, K-nearest neighbors & a lazy learning algorithm

**Unit II:** Data Preprocessing, Hyperparameter Tuning: Building Good Training Sets, Dealing with missing data, Handling categorical data, Partitioning a dataset into separate training and test sets, Bringing features onto the same scale, Selecting meaningful features, Assessing feature importance with random forests, Compressing Data via Dimensionality Reduction, Unsupervised dimensionality reduction via principal component analysis, Supervised data compression via linear discriminant analysis, Using kernel principal component analysis for nonlinear mappings, Learning Best Practices for Model Evaluation and Hyperparameter Tuning, Streamlining workflows with pipelines, Using k-fold cross-validation to assess model performance, Debugging algorithms with learning and validation curves, Fine-tuning machine learning models via grid search, Looking at different performance evaluation metrics, Dealing with class imbalance

**Unit III:** Different Models for Ensemble Learning: Learning with ensembles, Combining classifiers via majority vote, Bagging & building an ensemble of classifiers from bootstrap samples, Leveraging weak learners via adaptive boosting, Applying Machine Learning to Sentiment Analysis, Preparing the IMDb movie review data for text processing, Introducing the bag-of-words model, Training a logistic regression model for document classification, Working with bigger data & online algorithms and out-of-core learning, Topic modeling with Latent Dirichlet Allocation, Embedding a Machine Learning Model into a Web Application, Serializing fitted scikit-learn estimators, Setting up an SQLite database for data storage, Developing a web application with Flask, Turning the movie review classifier into a web application, Deploying the web application to a public server

**Unit IV:** Regression Analysis and Clustering Analysis: Predicting Continuous Target Variables, Introducing linear regression, Exploring the Housing dataset, Implementing an ordinary least squares linear regression model, Fitting a robust regression model using RANSAC, Evaluating the performance of linear regression models, Using regularized methods for regression, Turning a linear regression model into a curve ó polynomial regression, Dealing with nonlinear relationships using random forests, Working with Unlabeled Data ó Clustering Analysis, Grouping objects by similarity using k-means, Organizing clusters as a hierarchical tree, Locating regions of high density via DBSCAN

**Unit V:** Multilayer Artificial Neural Network and Deep Learning: Modeling complex functions with artificial neural networks, Classifying handwritten digits, Training an artificial neural network, About the convergence in neural networks, A few last words about the neural network implementation, Parallelizing Neural Network Training with Tensor Flow, Tensor Flow and training performance, Training neural networks efficiently with high-level Tensor Flow APIs, Choosing activation functions for multilayer networks

**Unit VI:** CNN and RNN: The Mechanics of Tensor Flow, Key features of Tensor Flow, Tensor Flow ranks and tensors, How to get the rank and shape of a tensor, Understanding Tensor Flow's computation graphs, Placeholders in Tensor Flow, Variables in Tensor Flow, Building a regression model, Executing objects in a Tensor Flow graph using their names, Saving and restoring a model in Tensor Flow, Transforming Tensors as multidimensional data arrays, Utilizing control flow mechanics in building graphs, Visualizing the graph with Tensor Board, Classifying Images with Deep Convolutional Neural Networks, Building blocks of convolutional neural networks, Putting everything together to build a CNN, Implementing a deep convolutional neural network using Tensor Flow, Modeling Sequential Data Using Recurrent Neural Networks, Introducing sequential data, RNNs for modeling sequences, Implementing a multilayer RNN for sequence modeling in Tensor Flow, Performing sentiment analysis of IMDb movie reviews using multilayer RNNs, Implementing an RNN for character-level language modeling in Tensor Flow.

**Text Book:**

Sebastian Raschka, and Vahid Mirjalili Python Machine Learning: Machine Learning and Deep Learning with Python, scikit-learn, and Tensor Flow.

**Reference Books:**

1. Andriy Burkov The Hundred-Page Machine Learning Book
2. Aurélien Géron Hands-on Machine Learning with Scikit-Learn, Keras, and Tensor Flow: Concepts, Tools, and Techniques to Build Intelligent Systems
3. Andreas C. Müller & Sarah Guido Introduction to Machine Learning with Python: A Guide for Data Scientists
4. Chris Albon Machine Learning with Python Cookbook: Practical Solutions from Preprocessing to Deep Learning.

**7IT07 (Prof. Elect. – III) (i) MACHINE LEARNING – LAB.**

Minimum **Eight** experiments/programming assignments must be completed based on the syllabus covering each of the units.

**7IT04 (Prof. Elect.- III) (ii) DATA WAREHOUSING & MINING**

**Course Objectives:**

Throughout the course, students will be expected to demonstrate their understanding of Data Science & Statistics by being able to do each of the following:

1. To understand the principles of Data warehousing, Architecture and Implementation.
2. To be familiar with the basic concepts of data mining and various methods for data preprocessing.
3. To study different association rules and algorithms for finding hidden and interesting patterns in data.
4. To impart the knowledge of various classification tools.
5. To understand types of data in cluster analysis and classical partitioning.
6. To understand complex data with respect to spatial and web mining.

**Course Outcomes :**

On completion of the course, the students will be able to:

1. Be familiar with basic concepts of Data Warehousing and OLAP operations.
2. Understand the principal of data warehousing and data preprocessing
3. Identify appropriate data mining algorithm to solve real world problems.
4. Characterize the kind of patterns that can be discovered by association rules.
5. Understand various classification and clustering technique and tools.
6. Describe complete data types with respect to spatial and web mining.

**Unit I: Data Ware Housing:**

Data Ware House, A Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation.

**Unit II: Introduction to Data Mining:**

Introduction to Data Mining, Data Mining Functionalities Classification of Data Mining Systems, Data Mining Task Primitives, Integration of a Data Mining System with a Database or Data Warehousing System, Major issues in Data Mining. **Data Preprocessing:** Descriptive Data Summarization, Data Cleaning, Data Integration and Transformation, Data Reduction.

**Unit III: Patterns, Associations Rules:**

**Basic Concepts and Road Map:** Market base analysis, frequent item sets, closed item set and association rules, frequent pattern mining. **Efficient and scalable frequent item set mining methods:** the Apriori algorithm, generation association rules from frequent item sets, improving the efficiency of Apriori, Mining frequent item sets, Mining closed item sets.

**Unit IV: Classification:**

Problem definition, classification by decision tree induction, Bayesian classification, Rule Based classification, K-Nearest Neighbor classifiers, K $\phi$  Based Reasoning.

**Unit V: Clustering:**

Problem Definition, types of data in cluster analysis, Classical partitioning: K-Means and K-Medoids methods, Hierarchical Methods, Density based Methods, Outlier Analysis.

**Unit VI: Mining Object, Spatial, Multimedia, Text and Web Data:**

Multidimensional Analysis and Descriptive Mining of Complex Data Objects  $\phi$  Spatial Data Mining  $\phi$  Multimedia Data Mining  $\phi$  Text Mining  $\phi$  Mining the World Wide Web.

**Text Book:** Jiawei Han, Micheline Kamber and Jian Pei  $\phi$  Data Mining Concepts and Techniques  $\phi$ , Second Edition.

**Reference Books:**

- [1] Alex Berson and Stephen J. Smith  $\phi$  Data Warehousing, Data Mining & OLAP  $\phi$ , Tata McGraw  $\phi$  Hill Edition, Tenth Reprint 2007.
- [2] G. K. Gupta  $\phi$  Introduction to Data Mining with Case Studies  $\phi$ , Easter Economy Edition, Prentice Hall of India, 2006.
- [3] Pang-Ning Tan, Michael Steinbach and Vipin Kumar  $\phi$  Introduction to Data Mining  $\phi$ , Pearson Education, 2007.

**7IT07 (Prof. Elect.- III) (ii) DATA WAREHOUSING & MINING**

Minimum **Eight** experiments / programming assignments must be completed based on the syllabus covering each of the units.

**7IT04 (Prof. Elect.- III) (iii) WIRELESS SENSOR NETWORKS**

**Course Objectives:** The student should be made to:

1. To understand basic concept, challenges, building blocks and technology in WSN
2. To make capable to design WSN for given application
3. Aware with advance technology in Wireless Sensor Network
4. To understand use of routing, MAC Protocols and study
5. protocols at various layers
6. To explore knowledge about new protocols in WSN
7. To study architecture of WSNs, node and hardware
8. To understand node level software platforms
9. To study emerging field of WSN, which consist of many tiny, low power devices equipped with sensing, computation and wireless communication
10. To understand Operating Systems, Radio Communication & Networking Protocols
11. Identify the requirements for the specific applications in wireless sensor networks

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

1. Understand basic building blocks & concepts of Wireless Sensor Networks
2. Design wireless sensor networks for a given application
3. Understand emerging research areas in the field of sensor networks
4. Understand MAC protocols used for different communication standards used in WSN
5. Explore new protocols for WSN
6. Understand architectures of Wireless Sensor Networks, its related hardware and protocols
7. Familiarized with deployment and configuration methods
8. Get acquainted to Node-level Software Platforms.

**Unit I: Introduction & Overview of WSN:**

Introduction to Wireless Sensor Networks, WSN Architecture, Design Issues and challenges, Characteristics of WSN, Types of wireless sensor networks, Advantages, Applications of WSNs

**Unit II: Wireless Sensor Network & Technology:**

Mobile Ad-hoc Networks and Wireless Sensor Networks, Architectures of Sensor Network & node, Wireless Hardware, Wireless Sensor Technology, Structure of WSN (topology), Design principles for WSNs, Service interfaces of WSNs

**Unit III: Wireless Transmission Technology:**

Radio Technology, Deployment and Configuration: Localization and positioning, Coverage and connectivity, Single-hop and multihop localization, self configuring localization systems, sensor management; Topology control, clustering protocols, transport protocols, security information assurance protocols, access control techniques, location awareness and estimation, data fusion and resource management techniques, query processing, energy efficiency

**Unit IV: Protocols:**

Routing protocols: Algorithms and data aggregation techniques, Routing challenges, design issues and routing strategies in WSN, Energy-efficient routing, Unicast, Broadcast and multicast geographic routing; MAC Protocols: Classification, Issues in designing MAC protocol for WSNs, IEEE 802.15.4 standard and Zig Bee; Transport Control Protocol.

**Unit-V: Data Storage and Manipulation:**

Data centric and content based routing, storage and retrieval in network, compression technologies for WSN, Data aggregation technique, Applications: Detecting unauthorized activity using a sensor network, WSN for Habitat Monitoring

**Unit VI Network Management, Traffic Management and OS:**

Design Principles for WSNs, Gateway Concepts Need for gateway, WSN to Internet Communication, and Internet to WSN Communication. Single-node architecture, Hardware components & design constraints, Operating Systems: Tiny OS, Magnet OS & Others

**Text Books:**

1. Kazem Sohrby, Daniel Minoli, Wireless Sensor Networks: Technology, Protocols and Applications, Wiley-Inter Science
2. Walteneus Dargie, Christian Poellabauer, Fundamentals of Wireless Sensor Networks Theory and Practice, John Wiley & Sons Publications, 2011

**Reference Books:**

1. SabrieSoloman, Sensors Handbook, McGraw Hill Publication, 2009
2. Feng Zhao, Leonidas Guibas, Wireless Sensor Networks, Elsevier Publications, 2004
3. Philip Levis, David Gay, TinyOS Programming, Cambridge University Press, 2009

**Web References:**

1. TinyOS. <http://www.tinyos.net>
2. [https://link.springer.com/content/pdf/10.1007%2F978-3-540-30141-7\\_84.pdf](https://link.springer.com/content/pdf/10.1007%2F978-3-540-30141-7_84.pdf)  
(Sensor Node Architecture)

**7IT07 (Prof. Elect.- III) (iii) WIRELESS SENSOR NETWORKS – LAB.**

Minimum **Eight** experiments/programming assignments must be completed based on the syllabus covering each of the units.

**7IT05 (Prof. Elect.- IV) (i) BLOCK-CHAIN FUNDAMENTALS**

**Course Pre-requisite:** Knowledge of Computer Network and Network Analysis & Security.

**Course Objectives:**

Throughout the course, students will be expected to demonstrate their understanding of Blockchain Technology by being able to do each of the following:

1. To understand Blockchain's fundamental components, and examine decentralization using blockchain.
2. To explain how cryptocurrency works, from when a transaction is created to when it is considered part of the Blockchain.
3. To explain the components of Ethereum and Programming Languages for Ethereum.
4. To study the basics of Hyperledger and Web3.
5. To know about alternative Blockchains and Blockchain projects in different domains.

**Course Outcomes:** On completion of the course, the students will be able to:

1. Understand the technology components of Blockchain and how it works behind the scenes.
2. Identify different approaches to developing decentralized applications.
3. Understand Bitcoin and its limitations by comparing with other alternative coins.
4. Devise solution using the Ethereum model.
5. Understand and use Hyperledger and its development framework.
6. Track alternative Blockchains and emerging trends in Blockchain.

**Unit I: Introduction To Blockchain:**

History of Blockchain ó Types of Blockchain ó Consensus ó Decentralization using Blockchain ó Blockchain and Full Ecosystem Decentralization ó Platforms for Decentralization.

**Unit II: Introduction To Crypto currency:**

**Bitcoin** ó Digital Keys and Addresses ó Transactions ó Mining ó Bitcoin Networks and Payments ó Wallets

**Unit III: Alternative Coins & Smart Contract:**

**Alternative Coins** ó Theoretical foundations ó Bitcoin limitations ó Smart Contracts ó Ricardian Contracts.

**Unit IV: Ethereum:**

**The Ethereum Network** ó Components of Ethereum Ecosystem ó Ethereum Programming Languages: Runtime Byte Code, Blocks and Blockchain, Fee Schedule ó Supporting Protocols ó Solidity Language.

**Unit V: Web3 & Hyperledger:**

**Introduction to Web3** ó Contract Deployment ó POST Requests ó Development Frameworks **Hyperledger as a Protocol** ó The Reference Architecture ó Hyperledger Fabric ó Distributed Ledger ó Corda.

**Unit VI: Alternative Blockchains And Next Emerging Trends:**

Kadena ó Ripple ó Rootstock ó Quorum ó Tendermint ó Scalability ó Privacy ó Other Challenges.

**Text Book:** Imran Bashir, õMastering Blockchain: Distributed Ledger Technology, Decentralization and Smart Contracts Explainedö, Second Edition, Packt Publishing, 2018.

**Reference Books:**

1. ArshdeepBahga, Vijay Madiseti, õBlockchain Applications: A Hands on Approachö, VPT, 2017.
2. Andreas Antonopoulos, Satoshi Nakamoto, õMastering Bitcoinö, OReilly, 2014.
3. Roger Wattenhofer, õThe Science of the Blockchainö Create Space Independent Publishing, 2016.

**7IT08 (PE-III) (i) BLOCK-CHAIN FUNDAMENTALS**

Minimum **Eight** experiments/programming assignments must be completed based on the syllabus covering each of the units.

**7IT05 (ii) BUSINESS INTELLIGENCE**

**Course Objectives:** With this course the students should be able:

- To be able to formulate and understand the business problem and provide analytical solution for the same
- To be able to understand the various methods of finding proper required data and mining of appropriate contents
- To be able to use of the data science concepts in business decision making
- To be able to represent the complete Business Case in the form of Dashboards and presentation that are understandable by all stakeholders

**Course Outcomes:**

After the successful completion of this course the students will be able:

- To obtain sound knowledge of the theory and concepts that are required for a Business Intelligent System.
- To understand the various business problems and design various models that help in making business decisions.
- To understand and implement the mathematical concepts to develop data centric decision models.
- To generate various dashboards that will help explain the Business Problem to stakeholders at different levels of the business process.

**Unit I: Overview of Business Intelligence, Analytics and Data Science:** Changing business environments and evolving needs for decision support and Analytics, Evolution of Computerized Decision Support, Framework for BI, Analytics Overview, Analytics example from different domains, Introduction to Big Data analytics, overview of analytical ecosystems

**Unit II: Data Modelling and Visualization:** Nature of Data, Art and Science of Data Pre-processing, Statistical Modelling for Business Analytics, Regression Modelling for Inferential Statistics, Business Reporting, Data Visualization, Different types of Charts and Graphs, The Emergence of Visual Analytics, Dashboards Designing and Best Practices for Dashboards Designing

**Unit III: ANALYTICS:** Analytics concepts and use in Business Intelligence, Exploratory and statistical techniques: - Cluster analysis, Data visualization, Predictive analysis: - Regression, Time series, Data Mining: - Hierarchical clustering, Decision tree Text analytics: - Text mining, In-Memory Analytics and In-DB Analytics, Case study: Google Analytics

**Unit IV: Business Intelligence and Data Warehousing:** Star schema, Snow flake schema, and Fact Constellation schema, Grain of dimensional model, transactions, Recurring Snapshots, Accumulating Snapshots, Dimensions (SCD types, conformed dimensions) Clickstream Source Data (Google Analytics as a Clickstream Data Source), Facts (additive, semi-additive, non-additive), Hierarchy in dimensions, parent child relationships, Many-Many Dimensional relationship, Multi Valued Dimensions and Dimension Attributes

**Unit V: ETL:** Data Quality, Data profiling, Data enrichment, data duplication, ETL Architecture and what is ETL, Extraction concept and Change data capture, Transformation concept, lookups, time lag, formats, consistency, loading concept, Initial and Incremental loading, late arriving facts, what is Staging, Data marts, Cubes, Scheduling and dependency matrix.

**Unit VI: Future Trends, Privacy in Analytics:** IoT, Issues in Legality, Privacy and Ethic, Cloud Computing and Business Analytics, Location based analytics for Organizations, Impact of Analytics on Organizations.

**Text Books:**

1. Turban E., Sharda R., Delen D., King D., Business Intelligence, Analytics and Data Science Pearson Edn., 4e
2. Efreem G. Mallach, õDecision Support and Data Warehouse Systemsö, 1st Edition Publisher: Tata McGraw-Hill Education



**Reference Books:**

1. Reema Thareja, *Data Warehouse*, Publisher: Oxford University Press
2. Jiawei Han, Micheline Kamber, Jian Pei *Data Mining: concepts and techniques*, 2nd Edition, Publisher: Elsevier/Morgan Kaufmann
3. Dorian Pyle, *Business Modeling and Data Mining*, Elsevier Publication MK.

**7IT08 (PE-III) (ii) BUSINESS INTELLIGENCE- LAB.**

Minimum **Eight** experiments/programming assignments must be completed based on the syllabus covering each of the units.

**7IT05 (PE-IV) (iii) DIGITAL FORENSIC**

**Course Prerequisite:** Cryptography and Security, Computer Networks

**Course Objectives:**

Throughout the course, students will be expected to demonstrate their understanding of digital security by being able to do each of the following:

- To understand the basic digital forensics and techniques for conducting the forensic examination on different digital devices.
- To understand how to examine digital evidences such as the data acquisition, identification analysis.

**Course Outcomes:** On completion of the course learner will be able to-

- Know how to apply forensic analysis tools to recover important evidence for identifying computer crime.
- To be well-trained as next-generation computer crime investigators.
- Explain the methodology of incident response and various security issues in ICT world, and identify digital forensic tools for data collection.
- Recognize the importance of digital forensic duplication and various tools for analysis to achieve adequate perspectives of digital forensic investigation in various applications /devices like Windows/Unix system.
- Apply the knowledge of IDS to secure network and performing router and network analysis
- List the method to generate legal evidence and supporting investigation reports and will also be able to use various digital forensic tools .

**Unit I: Introduction Computer Forensic:**

Computer forensics fundamentals, Benefits of forensics, computer crimes, computer forensics evidence and courts, legal concerns and private issues.

**Unit II: Computing Investigations:**

Understanding Computing Investigations ó Procedure for corporate High-Tech investigations, understanding data recovery work station and software, conducting and investigations.

**Unit III: Data Acquisition and Process:**

Data acquisition- understanding storage formats and digital evidence, determining the best acquisition method, acquisition tools, validating data acquisitions, performing RAID data acquisitions, remote network acquisition tools, other forensics acquisitions tools.

**Unit IV: Mobile Phone HCI:**

Processing crimes and incident scenes, securing a computer incident or crime, seizing digital evidence at scene, storing digital evidence, obtaining digital hash, reviewing case.

**Unit V: Computer Forensic Tools:**

Current computer forensics tools- software, hardware tools, validating and testing forensic software, addressing data-hiding techniques, performing remote acquisitions, E-Mail investigations- investigating email crime and violations, understanding E-Mail servers, specialized E-Mail forensics tool.

**Unit VI: Study of Report:**

Forensic Investigation Report: Goals of Report, Layout of an Report and Forensic Tools Investigative Report, Guidelines for Writing a Report, sample for writing a forensic report . Computer Forensic Tools : need and types of computer forensic tools, task performed by computer forensic tools.

**Text Books:**

1. Warren G. Kruse II and Jay G. Heiser, *Computer Forensics: Incident Response Essentials*, Addison Wesley, 2002.
2. Nelson, B, Phillips, A, Enfinger, F, Stuart, C., *Guide to Computer Forensics and Investigations*, 2nd ed., Thomson Course Technology, 2006, ISBN: 0-619-21706-5.

**Reference Book:**

Vacca, J, *Computer Forensics, Computer Crime Scene Investigation*, 2nd Ed, Charles River Media, 2005, ISBN: 1-58450-389.

**7IT08 (PE-III) (iii) DIGITAL FORENSIC- Lab.**

Minimum **Eight** experiments/programming assignments must be completed based on the syllabus covering each of the units.

**7IT09 PROJECT & SEMINAR**

Students should complete the following:

Literature Review  
Problem scope  
Problem Definition  
Requirement Analysis  
Methodology to solve problem  
Preliminary Implementation  
Preliminary Results.

**B.E. Semester VIII [(Information Technology) (C.B.C.S.)]**

**8IT01 OBJECT ORIENTED ANALYSIS AND DESIGN**

**Course Prerequisite:**

1. Students should have knowledge of object oriented concepts
2. Students should have knowledge of Software Development Life Cycle.

**Course Objectives:**

1. To understand concept of Object oriented modeling.
2. To analyses the concept of Unified Modeling Language (UML) for representation of an object-oriented system.
3. To learn software development using Object oriented approach.

**Unit I: Modeling Concept:** Introduction, Object orientation, OO Development, OO themes, Modeling as a design technique, Class Modeling. Abstraction, The three models, Object and class concepts, Link and association concepts, Generalization & Inheritance, Navigation of class models.

**Unit II: Advanced Class Modeling:** Advanced object and class concepts, Association Ends, N-ary association, Aggregation, Abstract classes, Multiple inheritance, Metadata, Reification, Constraints, Derived data, Packages, State Modeling: Events, States, Transitions and Conditions, State diagrams, State diagram behavior.

**Unit III: Advanced State Modeling:** Nested state diagram, Signal Generalization, Nested states, Concurrency, Relation of class and state models, Use case model, Sequence models, Activity models, Use case relationships, Procedural sequence model, Special constructs for activity models.

**Unit IV: Domain Analysis:** Development stages, Development life cycle, Devising a system concepts, Elaborating a concepts, Preparing a problem statements, Overview of analysis, Domain class models, Domain state model, Domain Interaction model.

**Unit V: Application Analysis:** Application Analysis. Overview of System Design, Estimating Performance, Making a reuse plan, Breaking a system into subsystems, Identifying Concurrency, Allocation of subsystems, Management of data storage, Handling global resources, Choosing a software control strategy, Handling boundary conditions, Setting trade-off priorities, Architecture of the ATM system.

**Unit VI: Class Design:** Overview of class design, Realizing the use cases, Designing algorithm, Recurring Downwards, Refactoring, Design Optimization, Reification of behavior, Adjustment of Inheritance, Organizing a class design.

**Text Book:** Blaha, Rumbaugh, Object Oriented Modeling and Design with UML (2/e) Pearson Education.

**Reference Books:**

1. Dathan, Ramnath: Object Oriented Analysis, Design & Implementation, OUP.
2. McRobb & Farmer: Object Oriented System Analysis & Design McGraw Hill.
3. Booch, Rumbaugh & Jacobson: The UML User guide Pearson Education.
4. Whitten & Bentley: System Analysis & Design Methods Tata McGraw Hill.
5. Booch: Object Oriented Analysis & Design with Applications, Pearson Education.

**8IT05 Object Oriented Analysis & Design – Lab.**

Minimum **Eight** experiments/programming assignments must be completed based on the syllabus covering each of the units.

**8IT02 PROFESSIONAL ETHICS AND MANAGEMENT**

**Course Objectives:**

1. To enable the students to create an awareness of engineering and professional ethics
2. To instill moral, social values and appreciate the rights of others
3. To regulate the student's behavior in a professional environment
4. To be conscious about the impact of non-ethical engineering decisions
5. To comprehend mind and desire control needs for being ethical
6. To understand the moral values of engineering professional ethics
7. To resolve the moral problems and issues in engineering
8. To learn the duty & responsibility towards society and environment
9. To be aware with code of conduct and code of ethics.

**Course Outcomes:**

1. Ability to Distinguish between ethical and non ethical situations
2. The student should be able to apply engineering ethics in the society & environment
3. Infer the moral judgment & correlate the concepts in addressing the ethical dilemmas
4. Resolve the moral issues in the profession
5. Relate the code of ethics to social experimentation
6. Able to apply risk and safety measures in various engineering fields
7. Develop concepts based on moral issues and enquiry
8. Discuss ethical issues related to engineering & realize the responsibilities and rights
9. Develop cognitive skills in solving social problems.

**Unit I: Introduction to Ethics:** Senses of Engineering and professional ethics, Engineering profession & its view, Ethical issues for engineers, distinction between ethics, morals and laws, opinions vs. judgments, Ethical theories: utilitarianism, duty, right, virtue; Cost-benefit analysis in engineering, McCuen's ethical dimensions, IEEE: Code of conducts & Code of ethics.

**Unit II: Professional Practices in Engineering:** Professional attributes, Difference in engineering and other professions; Ethical dilemma: right-wrong or better-worse; Code of ethics for engineers in India: need and its roles; abuse of codes, ethical relativism, well-being and profession, Ethics as Design - Doing Justice to Moral Problems, Kohlberg's theory & Gilligan's theory

**Unit III: Central Professional Responsibilities of Engineers:** Confidentiality and Proprietary Information, Conflict of interest, Competitive bidding, rights of Engineers: fundamental, professional conscience, conscientious refusal, professional recognition, employee, privacy; types of conflict of interest, avoiding conflict of interest, competitive bidding, situations for conflict of interest, ethical corporate climate & its features

**Unit IV: Intellectual Property Rights and Ethics:** Patent: IP chain of activities, IP as intangible property, protection offered by patent, right of patent owner; Trademarks(TM): purpose, what can be registered under trademark, categories of TM, industrial design, geographical indications; Copyright & related rights: advances in technology and copyright, benefits, World IP organization, TRIPS & WTO

**Unit V: Computers, Software and Digital Information:** Emergence of Computer ethics, issues in Computer ethics: distribution of power issues, property issues, issues of privacy, professional issues, Computer crimes, Computer Software and Digital Information: Characteristics of digital information, s/w as IP, and challenges in information age, IEEE code of conduct and code of ethics

**Unit VI: Responsibilities and Management:** Responsibility for the Environment, Engineering as Social Experimentation, Safety and Risk management, IT Professional relationship management with: Employers, Clients, Suppliers, IT Users, other professionals, and society at large

**Text Books:**

1. Prof. Susmita Mukhopadhyay, 'Ethics in Engineering Practice' IIT Kharagpur
2. Mike Martin and Roland Schinzinger, 'Ethics in Engineering' Tata McGraw Hill, New York, 2005

**Reference Books:**

1. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, 'Engineering Ethics & Concepts and Cases' Cengage Learning, 2009 & Thompson Learning, 2000
2. Govindarajan M., Natarajan, 'Engineering Ethics' Prentice Hall of India, New Delhi, 2004
3. Stephen Byars, 'Business Ethics' USC Marshall School of Business Kurt Stanberry, University of Houston (<https://openstax.org/details/books/business-ethics>)

**Web Resources:**

1. <https://nptel.ac.in/courses/110/105/110105097/>
2. [www.nspe.org](http://www.nspe.org)
3. <https://www.global-ethic.org/global-ethic-institute/>
4. [www.ethics.org](http://www.ethics.org)
5. <https://er.educause.edu/articles/2017/3/ethics-and-the-it-professional>
6. <https://www.ieee.org/about/corporate/governance/p7-8.html>
7. <https://www.ieee.org/about/compliance.html>

**8IT03: PROJECT MANAGEMENT & ENTREPRENEURSHIP**

**Course Objectives:**

1. Gain knowledge of a broad range of topics related to entrepreneurship and entrepreneurial strategies
2. Gain knowledge on entrepreneurial potential as an individual
3. Gain knowledge on discovering opportunities
4. Gain knowledge on business models

**Course Outcomes:**

1. Gain knowledge on opportunities / ideas screening
2. Gain knowledge on basic entrepreneurial issues Develop critical thinking skills to solve real life Entrepreneurship and SME problems
3. Develop critical thinking skills to solve real life Entrepreneurship and SME problems
4. Develop critical thinking skills on developing a career as entrepreneurs

**Unit I: Entrepreneurship: Entrepreneurship:** need, scope, Entrepreneurial competencies & traits, Factors affecting entrepreneurial development, Entrepreneurial motivation (McClelland's Achievement motivation theory), conceptual model of entrepreneurship , entrepreneur vs. intrapreneur; Classification of entrepreneurs; Entrepreneurial Development Programmes.

**Unit II: Entrepreneurial Idea and Innovation:** Introduction to Innovation, Entrepreneurial Idea Generation and Identifying Business Opportunities, Management skills for Entrepreneurs and managing for Value Creation, Creating and Sustaining Enterprising Model & Organizational Effectiveness 8

**Unit III: Project Management:** Project management: meaning, scope & importance, role of project manager project life-cycle Project appraisal: Preparation of a real time project feasibility report containing Technical appraisal,; Environmental appraisal, Market appraisal (including market survey for forecasting future demand and sales) and Managerial appraisal.

**Unit IV: Project Financing:** Project cost estimation & working capital requirements, sources of funds, capital budgeting, Risk & uncertainty in project evaluation , preparation of projected financial statements viz. Projected balance sheet, projected income statement, projected funds & cash flow statements, Preparation of detailed project report, Project finance.

**Unit V: Management of Enterprises** Objectives and functions of management, scientific management, general and strategic management; introduction to human resource management: planning, job analysis, training, recruitment and selection, etc.; marketing and organizational dimension of enterprises; enterprise financing : raising and managing capital, shares, debentures and bonds, cost of capital; break- even analysis, balance sheet its analysis.

**Unit VI: Social Entrepreneurship:** Social Sector Perspectives and Social Entrepreneurship, Social Entrepreneurship Opportunities and Successful Models, Social Innovations and Sustainability, Marketing Management for Social Ventures, Risk Management in Social Enterprises, Legal Framework for Social Ventures.

**Text Books:**

1. Innovation and Entrepreneurship by Drucker, P.F.; Harper and Row
2. Business, Entrepreneurship and Management: Rao, V.S.P. ;Vikas

**Reference Books:**

1. Entrepreneurship: Roy Rajeev; OUP.
2. Text Book of Project Management: Gopalkrishnan, P. and Ramamoorthy, V.E.; McMillan
3. Project Management for Engineering, Business and Technology: Nicholas, J.M., and Steyn, H.PHI
4. Project Management: The Managerial Process: Gray, C.F., Larson, E.W. and Desai, G.V.; MGH

**8IT04 (Prof.Elect.-V) (i) ROBOTICS**

**Course Prerequisite:** Knowledge of Real Time Embedded System and Artificial Intelligence.

**Course Objectives:**

Throughout the course, students will be expected to demonstrate their understanding of the following:

1. To understand the functions of the basic components of a Robot.
2. To study the use of various types of End of Effectors and Sensors
3. To impart knowledge in Robot Kinematics and Programming.
4. To learn Robot safety issues and economics.

**Course Outcomes :** On completion of the course, the students will be able to:

1. Be familiar with basic concepts of Robot.
2. Understand the use of various types of End of Effectors and Sensors
3. Get appropriate knowledge in Robot Kinematics and Programming.
4. Understand the Robot safety issues and economics.

**Unit I: Fundamentals of Robot:**

Robot - Definition - Robot Anatomy - Coordinate Systems, Work Envelope Types and Classification- Specifications-Pitch, Yaw, Roll, Joint Notations, Speed of Motion, Pay Load- Robot Parts and their Functions-Need for Robots-Different Applications.

**Unit II: Robot Drive Systems and End Effectors:**

Pneumatic Drives-Hydraulic Drives-Mechanical Drives-Electrical Drives-D.C. Servo Motors, Stepper Motors, A.C. Servo Motors-Salient Features, Applications and Comparison of all these Drives, End Effectors-Grippers-Mechanical Grippers, Pneumatic and Hydraulic- Grippers, Magnetic Grippers, Vacuum Grippers; Two Fingered and Three Fingered Grippers; Internal Grippers and External Grippers; Selection and Design Considerations.

**Unit III: Sensors and Machine Vision:**

Requirements of a sensor, Principles and Applications of the following types of sensors- Position sensors - Piezo Electric Sensor, LVDT, Resolvers, Optical Encoders, pneumatic Position Sensors, Range Sensors Triangulations Principles, Structured, Lighting Approach, Time of Flight, Range Finders, Laser Range Meters, Touch Sensors ,binary Sensors., Analog Sensors, Wrist Sensors, Compliance Sensors, Slip Sensors, Camera, Frame Grabber, Sensing and Digitizing Image Data- Signal Conversion, Image Storage, Lighting Techniques.

**Unit IV: Robot Kinematics:**

Forward Kinematics, Inverse Kinematics and Difference; Forward Kinematics and Reverse Kinematics of manipulators with Two, Three Degrees of Freedom (in 2 Dimension), Four Degrees of freedom (in 3 Dimension) Jacobians, Velocity and Forces-Manipulator Dynamics, Trajectory Generator, Manipulator Mechanism Design.

**Unit V: Robot Programming:** Lead through Programming, Robot programming Languages-VAL Programming- Motion Commands, Sensor Commands, End Effector commands and simple Programs.

**Unit VI: Implementation and Robot Economics:**

RGV, AGV; Implementation of Robots in Industries-Various Steps; Safety Considerations for Robot Operations - Economic Analysis of Robots.

**Text Books:**

1. Klafter R.D., Chmielewski T.A and Negin M., "Robotic Engineering - An Integrated Approach", Prentice Hall, 2003.
2. Groover M.P., "Industrial Robotics -Technology Programming and Applications", McGraw Hill, 2001.

**Reference Books:**

1. Craig J.J., "Introduction to Robotics Mechanics and Control", Pearson Education, 2008.
2. Deb S.R., "Robotics Technology and Flexible Automation", Tata McGraw Hill Book Co., 1994.
3. Koren Y., "Robotics for Engineers", McGraw Hill Book Co., 1992
4. Fu.K.S.,Gonzalez R.C. and Lee C.S.G., "Robotics Control, Sensing, Vision and Intelligence", McGraw Hill Book Co., 1987.
5. Janakiraman P.A., "Robotics and Image Processing", Tata McGraw Hill, 1995.
6. Rajput R.K., "Robotics and Industrial Automation", S.Chand and Company, 2008.
7. Surender Kumar, "Industrial Robots and Computer Integrated Manufacturing", Oxford and IBH Publishing Co. Pvt. Ltd., 1991.

**8IT06 ROBOTICS – Lab.**

Minimum **Eight** experiments/programming assignments must be completed based on the syllabus covering each of the units.

**8IT04 (Prof.Elect.-V) (ii) VIRTUAL AND AUGMENTED REALITY**

**Course Pre-requisite:** Fundamental mathematics knowledge:

**Course Objectives:**

The objective of this course is to provide a foundation to the fast growing field of virtual and augmented reality and make the students aware of its applications.

**Course Outcomes:** On completion of the course, the students will be able to:

1. Understand basic concepts of virtual reality with its applications.
2. Understand and describe computing architectures, hardware and software needed for virtual reality.
3. Learn the basic knowledge of augmented reality.
4. Understand and analyze hardware and software needed for augmented reality.
5. Understand the knowledge about various applications of augmented reality.

**Unit I: Introduction of Virtual Reality Hours:**

Defining Virtual Reality, History of Virtual Reality, Human Physiology and Perception, Five Classic components of VR, Applications of VR.

**Unit II: Input and Output Devices for Virtual Reality:**

Three dimensional position tracker and mechanical tracker, Navigation and manipulation Interfaces, Gesture Interfaces, Graphic displays, Sound Displays and Human Haptic System.

**Unit III: Virtual Reality Computing Architectures:**

Rendering Pipeline, Graphics Rendering Pipeline, Haptic Rendering Pipeline, PC Graphics Architecture, Workstation Based Architectures and Distributed VR Architectures.

**Unit IV: Introduction to Augmented Reality:**

Defining Augmented reality, History of augmented reality, The Relationship Between Augmented Reality and Other Technologies- Media. components of VR, Applications of VR.

**Unit V: Augmented Reality Hardware and software:** Major Hardware Components for AR System:- Overview of Sensor, Processor and Display. Major Software Components for AR System:- Software or editing and creating 2D and 3D Graphics. components of VR, Applications of VR.

**Unit VI: Augmented Reality Applications:**

Define: Content, Introduction to Mobile Augmented Reality with its advantages and its disadvantages, Application Areas, Future and trends of Augmented Reality.

**Text Books:**

1. Grigore C. Burdea, Philippe Coiffet, "Virtual Reality Technology", Wiley 2016.
2. Alan B. Craig, "Understanding Augmented Reality, Concepts and Applications" Morgan Kaufmann, 2013.

**Reference Books:**

1. "Virtual Reality", Steven M. LaValle, Cambridge University Press, 2016.
2. Alan Craig, William Sherman and Jeffrey Will, "Developing Virtual Reality Applications :Foundations of Effective Design", Morgan Kaufmann, 2009.
3. John Vince, "Virtual Reality Systems", Pearson Education Asia, 2007.
4. Anand R., "Augmented and Virtual Reality", Khanna Publishing House, Delhi.

**8IT06 Virtual and Augmented reality Lab:**

Minimum **Eight** experiments/programming assignments must be completed based on the syllabus covering each of the units.

**8IT04 (Prof.Elect.-V) (ii) HUMAN COMPUTER INTERACTION**

**Course Objectives:**

Throughout the course, students will be expected to demonstrate their understanding of Human Computer Interaction by being able to do each of the following:

- To understand the fundamental concepts of Human Computer Interaction.
- To familiarize the students with basic taxonomy and terminology of HCI.
- To understand various model based designs and research methods in HCI.
- To design the effective web interface and evaluate the various design case studies.

**Course Outcomes:** On completion of the course learner will be able to:

1. Understand the principles and fundamental concept of Human Computer Interaction.
2. To learn Model based designs and graphical user interfaces in HCI.
3. Evaluate various research methods and task modeling analysis in HCI.
4. Design effective HCI for mobile phone interface.
5. Explore the HCI implications for designing multimedia/ ecommerce/e-learning Web sites.
6. To Understand Cognitive Architecture and Evaluate the design case studies.

**Unit I: Introduction:**

Human factors of interactive software: Goals of system engineering & User-interface design, accommodation of human diversity, Shneiderman's eight golden rules of interface design, The three pillars of design, Interactive System Design: Concept of usability: definition and elaboration, GUI design and aesthetics, Prototyping techniques.

**Unit II: Model-based design in HCI:**

Introduction to different types of models, GOMS family of models (KLM and CMN-GOMS), Cognitive Models, Communication and collaboration models: Multimedia and WWW, Object-Action interface model, Norman's Model of Interaction.

**Unit III: Research Methods and Task Modeling in HCI:**

Imperical Research Methods: Introduction, motivation, issues, research questions formulation Task Modeling and Analysis: Hierarchical task analysis (HTA), Engineering task models and Concur Task Tree (CTT)

**Unit IV: Mobile Phone HCI:**

Mobile Ecosystem: Platforms, Application frameworks- Types of Mobile Applications: Widgets, Applications, Games- Mobile Information Architecture, Mobile 2.0, Mobile Design: Elements of Mobile Design, Software Tools.

**Unit V: Web Interaction Design:**

Multiple window strategies, Computer supported cooperative work: Goals of cooperation, Asynchronous interaction, Synchronous distributed and face-to-face, Information search and visualization, Database Query and phrase search in textual documents, multimedia documents searches, Web Interface Design: Hypermedia and the World Wide Web, designer goals, Users and their tasks, Object action interface model for web site design.

**Unit VI: Cognitive Architecture and HCI:**

Introduction to Cognitive Architecture, Cognitive Architecture types, relevance of Cognitive Architecture in interface design. OOM-Object Oriented Modeling of User Interface Design, Design Case Studies.

**Text Books:**

1. B. Shneiderman; *Designing the User Interface*, Addison Wesley 2000 (Indian Reprint).
2. Dix A., Finlay J., Abowd G. D. and Beale R. *Human Computer Interaction*, 3rd edition, Pearson Education, 2005.

**Reference Books:**

1. Preece J., Rogers Y., Sharp H., Baniyon D., Holland S. and Carey T. *Human Computer Interaction*, Addison-Wesley, 1994.
2. Brian Fling, *Mobile Design and Development*, First Edition, O'Reilly Media Inc., 2009
3. Bill Scott and Theresa Neil, *Designing Web Interfaces*, First Edition, O'Reilly, 2009.

**8IT06 Human Computer Interaction - Lab.**

Minimum **Eight** experiments/programming assignments must be completed based on the syllabus covering each of the units.

**8IT04 (Prof. Elect.-V) (iv) CROSS-PLATFORM DEVELOPMENT**

**Course Objectives:**

Throughout the course, students will be expected to demonstrate their understanding of the following:

1. To understand the different cross platform mobile application development tools.
2. To understand various Object-oriented programming concepts.
3. To study and understand flutter framework for building beautiful, natively compiled, multi-platform applications from a single codebase.
4. To impart knowledge in development of packages and widgets.
5. To learn layout management in widget.
6. To design and develop cross platform application.

**Course Outcomes:** On completion of the course, the students will be able to:

1. Be familiar with different cross platform mobile application development tools.
2. Get appropriate knowledge of Object-oriented programming concepts.
3. Learn fundamental concepts of flutter.
4. Declare and construct UI.
5. Understand layout management in widget.
6. Design and develop cross platform application

**Unit I:** Introduction: Before Cross-Platform Mobile Application Development, Early Cross-Platform Development Tools, Development Tools That Used Native Libraries, Development Tools That Didn't Use Native Libraries, Modern Cross-Platform Development Tools, React Native, Google Flutter, Introduction to Dart, Platforms, Dart SDK, Command-Line Tools, Libraries, Introduction to Typing, Dart Typing, Static Types, Dynamic Types (aka Untyped), Type Inference, Type Matching, Type Information, Strings, Object-Oriented Language Features

**Unit II:** More Advanced Dart: Operator Overloading, Reflection, Mixins, Collections, Assertions, Assertions & Modes (Flutter), Errors & Exceptions, Handling Errors, Handling Exceptions, Console Output, Asynchronicity, Reactive Programming.

**Unit III:** Introduction to Flutter: What is Flutter?, Fuchsia, Flutter Source Code, Flutter SDK, Installing Flutter, Issues, Install Process, Your First App, Default Flutter App, Generate Your First App, Emulators, Open Android Emulator & Run Your First App, Open iOS Emulator & Run Your First App, Connect Your Device & Run Your First App, Hot Restarting & Reloading

**Unit IV:** Dependencies, Packages & Widgets: Website, Core Packages, Non-Core Packages, Most Useful Non-Core Packages, How to Use an External Package, Package Version Numbers, Project Files, How to Publish Your Own Packages, Default Flutter Application Project, Introduction to Widgets, User Interface: Material & Cupertino, User Interface: Cupertino, Building Widgets, Widgets Have No Mutable State, Stateless Widgets, Minimum Code, Creation, Rendering, Lifecycle, Stateful Widgets, Minimum Code, Two Classes, Creation, Rendering, Lifecycle Methods, Basic Material Widgets, Text, Image, Icon, Buttons.

**Unit V:** Multi-Child Layout Widgets, Column, Row, Flex, List View, Stack, Single-Child Layout Widgets, Padding, Container, Card, Expanded, Flexible, Center, Gesture Detector, Positioned, Safe Area, Single Child Scroll View, App Scaffolding Widgets, Material App, Scaffold, App Bar, Body, Bottom Navigation Bar, Drawer, Bottom Sheet, Persistent Footer Buttons, Checkbox, Dialog, Dropdown Button & Dropdown Menu Item, Expansion Panel List & Expansion Panel, Grid View, Popup Menu Button, Radio, Snack Bar, Spacer, Switch, Tab Bar, Tabs and Tab Bar View Widgets, Table.

**Unit VI:** Complete Cross-Platform Applications: Builders, Routing & Navigation, Forms, HTTP, APIs, REST & JSON, Flutter with HTTP, APIs, REST & JSON, State, State & Stateful Widget Approach, State & Inherited Widget Approach, State & Scope Model Approach, State & BLoCs w/Streams Approach, Local Persistence, Mixins, Debugging & Performance Profiling, Change Detection, Keys & Rendering, Other Performance Considerations, Publishing Your App

**Text Book:** Mark Clow Learn Google Flutter Fast 65 Example Apps.

**Reference Books:**

1. Marco L. Napoli Beginning Flutter: a hands on guide to app development
2. Frank Zammetti Practical Flutter: Improve your Mobile Development with Google's Latest Open-Source SDK
3. Simone Alessandria Flutter Projects: A practical, project-based guide to building real-world cross-platform mobile applications and games
4. Prajyot Mainkar Salvatore Giordano Google Flutter Mobile Development Quick Start Guide.

**8IT06 (Prof. Elect.-V) (iv) Cross Platform Application Development – Lab.**

Minimum **Eight** experiments/programming assignments must be completed based on the syllabus covering each of the units.

**Suggested List of Experiments:**

1. Install Dart and set the environment of Flutter SDK.
2. Write a program to display "Hello World"
3. Write a program to create your own stateless widgets
4. Write a program to use different fields like text field, button etc..using flutter
5. Write a program on Form widget
6. Write a program on Validate only after submit attempt
7. Write a program to use Custom gestures for your custom widgets
8. Write a program App Bar widget
9. Write a program to apply the layout and animation on your own Application
10. Write a program to implement the firebase in your own application

**8IT07 PROJECT & SEMINAR**

**Course Objectives:**

- 1) To work in a team in a planned manner on a chosen engineering topic based on the knowledge gained throughout the engineering programme.
- 2) Major project should be real time and research based problems based on the courses studied.
- 3) Project to be completed with detailed design, implementation, test case preparations, testing and demonstration
- 4) It is having Group formation, discussion with faculty advisor, formation of the project statement, resource requirement, identification and implementation and Time scheduling of the project.
- 5) Continuous assessment for the activities mentioned has been carried out throughout the semester.
- 6) The student should prepare a consolidated report in LaTeX /word and submit it before term end.
- 7) Project consists of presentation and oral examination based upon the project work demonstration of the fabricated/ designed equipment or software developed for simulation. The said examination will be conducted by a panel of examiners, consisting of preferably guide working as internal examiners and another external examiner preferably from an industry or university.

**Course Outcomes:**

- 1) Design solutions for given engineering problem.
- 2) Demonstrate practical knowledge by constructing models/algorithms for real time applications.
- 3) Express effectively in written and oral communication.
- 4) Exhibit the skills to work in a team.
- 5) Prepare a time chart and financial record for execution of the project.
- 6) Personal competences of students are reinforced most during the Final Year Project process, including the preparation, elaboration, presentation and defense stage.
- 7) Final Year Projects represent the culmination of study towards the Bachelor of Engineering degree. Projects offer the opportunity to apply and extend material learned throughout the program. Assessment is by means of a seminar presentation, submission of a thesis, and a public demonstration of work undertaken.

**List of thrust areas: #**

1. Control
2. Sensor
3. Embedded
4. Automotive
5. Automation (PLC, SCADA)
6. Process Instrumentation
7. Healthcare
8. Signal Processing
9. Image processing
10. Artificial Intelligence
11. IoT
12. Application Software development

**# Please note that the above list is an indicative list (not an exhaustive) and students are free to select project areas other than the list.**