SEMESTER SEVENTH

7KS01 / 7KE01 SOCIAL SCIENCES AND ENGINEERING ECONOMICS

Course Objectives:

The phenomenal progress of technology in the twentieth century has brought dramatic changes in human lifestyles from the social and economic point of view. This subject helps students to get an understanding of market trends, economic transformations, changes in the laws and equip them to have a better understanding of the market.

Course objectives are:

1. To help students to understand the importance of economics to engineers
2. To let them know about the Indian Parliament
3. To enhance their knowledge about culture and civilization
4. To help students to get an understanding of Market Trends, Economic Transformations, Changes in the Laws & equip them to have a better understanding of Market
5. To critically examine the market trends.

Course Outcomes:

At the end of the course, students will have-

1. An ability to understand the importance of social science and economics in professional life.
2. An ability to utilize high-level interpersonal skills to negotiate with stakeholders and maintain cordial relationships with them reflecting the professional ethics and responsibilities.
3. Understanding of professional responsibility with socioeconomic constraints and norms
4. An ability to understand the need of society and design the system to fulfil it with deep analysis.
5. An ability to understand the social science and engage in a lifelong learning process performing better in the group as well as individually.

SECTION - A

Unit I : Study of Social Science : Importance to Engineer, salient features of Indian constitution. Fundamental Rights and Duties. Directive Principles of State Policy. (8)

Unit II : Indian Parliament : Composition and powers, President of India : Election and Powers. Council of Ministers and Prime Minister (8)

Unit III : Impact of Science and Technology on culture and Civilization. Human Society: Community Groups. Marriage and Family: Functions, Types and problems. (8)

SECTION – B

Unit IV: Production : Factors of production, Laws of return, Forms of Business Organization. (8)

Unit V: Banking : Functions of Central and Commercial Banks. Introduction to GST, Market : Forms, perfect, imperfect competition and monopoly. (8)

Unit VI: Nature and scope of Economics : Special significance of Economics to Engineers. Economics of Development : Meaning, Characteristics of under development, obstacles to Economic growth and vicious circle of poverty. (8)

Books Recommended :

1. Pylee M.V. : Constitutional Govt. in India, S.Chand and Co.
2. C N Shankar Rao: Sociology, S.Chand and Co.
3. Dewett and Varma J.D. : Elementary Economic Theory, S.Chand and Co.
4. A.N.Agrawal : Indian Economy, Problem of Development and Planning (Wiley Eastern Ltd), New Delhi.
5. S.K.Mishra : Indian Economy, Its Development Experience. Himalaya Pub.House, Bombay.
6. E.Kuper : Economics of W.R. Development, McGraw Hill Co.,
7. Brij Kishore Sharma. : The Constitution of India, PHI.
8. Mahajan : The Constitution of India, S.Chand, New Delhi.
9. Maclaver and Page : Principle of Sociology.
10. Davis K. : Human Society
11. Datt R.K. : Indian Economy, S.Chand and Comp. New Delhi P.M.Sundharam
12. Dhingra I.C. : Indian Economy
13. Jemes L.E., R.R.Lee : Economics of W.R.Planning, McGraw Hill Co.

7KS02 COMPUTER GRAPHICS (L-3, T-0, C-3)

Course Prerequisite: Data Structures and algorithms, Basic Mathematics, Geometry, linear algebra, vectors and matrices.

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

· To acquaint the learner with the basic concepts of Computer Graphics.

· To learn the various algorithms for generating and rendering graphical figures.

· To get familiar with mathematics behind the graphical transformations.

· To understand various methods and techniques regarding projections, animation, shading, illumination and lighting

Course Outcomes (Expected Outcome): On completion of the course, the students will be able to:

1. Describe the basic concepts of Computer Graphics.
2. Demonstrate various algorithms for basic graphics primitives.
3. Apply 2-D geometric transformations on graphical objects.
4. Use various Clipping algorithms on graphical objects
5. Explore 3-D geometric transformations, curve representation techniques and projections methods
6. Explain visible surface detection techniques and Animation.

Unit I: Introduction and Overview of Graphics System Hours: 7

Definition and Representative uses of computer graphics, Overview of coordinate system, Definition of scan conversion, rasterization and rendering. Raster scan & random scan displays, Architecture of raster graphics system with display processor, Architecture of random scan systems.

Unit II: Output Primitives Hours: 7

Scan conversions of point, line, circle and ellipse: DDA algorithm and Bresenham algorithm for line drawing, midpoint algorithm for circle, midpoint algorithm for ellipse drawing (Mathematical derivation for above algorithms is expected); Aliasing, Antialiasing techniques like Pre and post filtering, super sampling, and pixel phasing).; Filled Area Primitive: Scan line Polygon Fill algorithm, inside outside tests, Boundary Fill and Flood fill algorithm

Unit III: Two Dimensional Geometric Transformations Hours: 7

Basic transformations: Translation, Scaling, Rotation , Matrix representation and Homogeneous Coordinates Composite transformation Other transformations: Reflection and Shear

Unit IV: Two-Dimensional Viewing and Clipping Hours: 7

Viewing transformation pipeline and Window to Viewport coordinate transformation , Clipping operations: Point clipping, Line clipping algorithms: Cohen-Sutherland, Liang: Barsky, Polygon Clipping Algorithms: Sutherland-Hodgeman, Weiler-Atherton.

Unit V: Three Dimensional Geometric Transformations, Curves and Fractal Generation Hours: 7

3D Transformations: Translation, Rotation, Scaling and Reflection, Composite transformations: Rotation about an arbitrary axis, Projections – Parallel, Perspective. (Matrix Representation), Bezier Curve, B-Spline Curve, Fractal-Geometry: Fractal Dimension, Koch Curve.

Unit VI: Visible Surface Detection and Animation Hours: 7

Visible Surface Detection: Classification of Visible Surface Detection algorithm, Back Surface detection method, Depth Buffer method, Area Subdivision method

Animation: Introduction, Design of animation sequences, Animation languages, Keyframe, Morphing, Motion specification.

Text Book: Hearn, Baker, “Computer Graphics (C version)” – Pearson Education.

Reference Books:

1. J. Foley, V. Dam, S. Feiner, J. Hughes, ―Computer Graphics Principles and Practice‖, 2nd Edition,Pearson Education, 2003, ISBN 81 – 7808 – 038 – 9.
2. D. Rogers, J. Adams, ―Mathematical Elements for Computer Graphics‖, 2nd Edition, TataMcGrawHill Publication, 2002, ISBN 0 – 07 – 048677 – 8.
3. Mario Zechner, Robert Green, ―Beginning Android 4 Games Development‖, Apress, ISBN: 978-81- 322-0575-3.

7KS03 CLOUD COMPUTING (L-4, T-0, C-4)

Course Prerequisite: Data Communication and Networks

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:

· To provide students with the fundamentals and essentials of Cloud Computing.

· To provide students a foundation of Cloud Computing, Cloud Computing services and tools in real life scenarios.

· To enable student to explore some important Cloud Computing driven commercial systems and applications.

· To provide students with essentials of Cloud Computing architecture, Virtualization, Storage and Network concepts.

Course Outcomes (Expected 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: Hours: 8

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: Hours: 8

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: Hours: 8

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 API's. Virtualization: Introduction, Virtualization Opportunities, Approaches to Virtualization, Hypervisors, Virtualization to Cloud Computing.

Unit IV: Software Development in Cloud and Networking for Cloud Computing: Hours: 8

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: Hours: 8

Introduction, EMC: IT, and captive cloud toolkit, Google: Platform, Storage, Cloud connects, 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.

Unit VI: Open-Source Support for Cloud and Security in Cloud Computing : Hours: 8

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.

7KS04 ROBOTICS (L-3, T-0, C-3)

Course Prerequisite: Mathematics

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

· To introduce the functional elements of Robotics
· To impart knowledge on the direct and inverse kinematics
· To introduce the manipulator differential motion and control
· To educate on various path planning techniques
· To introduce the dynamics and control of manipulators

Course Outcomes (Expected Outcome): On completion of the course, the students will be able to

1. Describe basic concept of robotics.
2. Explain Components of a Robot System & Mechanical Systems
3. Illustrate Control of Actuators in Robotic Mechanisms
4. Compare and contrast Robotic Sensory Devices
5. Recommend Robotics Hardware & Software Considerations in Computer Vision
6. Design Robotic system by taking real time considerations.

Unit I: Introduction to Robotics: Objectives, Motivation, Historical Perspective of Robots, Classification of Robots, Classification by Control Method, Continuous-path servo-controlled robots, Major Components of a Robot, Fixed versus Flexible Automation. (**Hours: 7)**

Unit II: Components of a Robot System & Mechanical Systems: Basic Components of a Robot System, Functions of a Robot System Specifications of Robot Systems, Kinematic Chains the Manipulator End Effectors, Resolution, Forces Encountered in Moving Coordinate Systems Lagrangian Analysis of a Manipulator. (**Hours: 7)**

Unit III: Control of Actuators in Robotic Mechanisms: Closed-Loop Control in a Position Servo, the Effect of Friction and Gravity, Frequency-Domain Considerations, Control of a Robotic Joint Brushless DC Motors, Direct-Drive Actuator, Hydraulic Actuators. (**Hours: 7)**

Unit IV: Robotic Sensory Devices: Non-Optical-Position Sensors, Optical Position Sensors, Robot Calibration Using an Optical Incremental Encoder, Instability Resulting from Using an Incremental Encoder, Velocity Sensors, Accelerometers. **(Hours: 7)**

Unit V: Computer Vision for Robotics Systems: A Functional Approach: Imaging Components, Image Representation, Hardware Considerations, Picture Coding, Object Recognition and Categorization, Software Considerations, Need for Vision Training and Adaptations. **(Hours: 7)**

Unit VI: Computer Considerations for Robotic Systems: Architectural Considerations, Hardware Considerations, Computational Elements in Robotic Applications Real-Time Considerations, Robot Programming, Path Planning, The Robot's Computer System. **(Hours: 7)**

Text Books:

1. Richard D.Klafter Thomas , Achmielewski and Michael Negin Robotic Engineering- An Integrated Approach Prentice Hall India – New Delhi.
2. Saeed B Nikku Introduction to Robotics , analysis control and applications Wiley-India 2nd Edition-2011

Reference Books:

1. B.K.Ghosh, Control in Robotics and Automation: Sensor Based Integration, Allied Publishers, Chennai, 1998.
2. S.Ghoshal, " Embedded Systems & Robotics" – Projects using the 8051 Microcontroller", Cengage Learning, 2009.
3. David Jefferis, "Artificial Intelligence: Robotics and Machine Evolution", Crabtree Publishing Company, 1992.
4. Robin Murphy, Robin R. Murphy, Ronald C. Arkin, "Introduction to AI Robotics", MIT Press, 2000.
5. Francis.X.Govers, "Artificial Intelligence for Robotics", Packt Publishing, 2018.
6. Huimin Lu, Xing Lu, "Artificial Intelligence and Robotics", Springer, 2017.

7. Lentin Joseph, "Robot Operating Systems (ROS) for Absolute Beginners, Apress, 2018
8. Aaron Martinez, Enrique Fernández, "Learning ROS for Robotics Programming", Packt Publishing Ltd, 2013.
9. Wyatt Newman, "A Systematic Approach to learning Robot Programming with ROS", CRC Press, 2017.
10. Ashitava Ghoshal, Robotics-Fundamental Concepts and Analysis', Oxford University Press, Sixth impression, 2010.
11. K. K.AppuKuttan, Robotics, I K International, 2007.
12. Edwin Wise, Applied Robotics, Cengage Learning, 2003.
13. Richard D. Klafter, Thomas .A, ChriElewski, Michael Negin - Robotic Engineering–An Integrated Approach, Prentice Hall of India, New Delhi, 2009.
14. S.R. Deb, Robotics Technology and flexible automation, Tata McGraw-Hill Education., 2009
15. Mikell P Groover & Nicholas G Odrey, Mitchel Weiss, Roger N Nagel, Ashish Dutta, Industrial Robotics, Technology programming and Applications, McGraw Hill, 2012
16. Deb. S. R. "Robotics technology and flexible automation", Tata McGraw Hill publishing company.

7KS04 DATA WAREHOUSE AND MINING (L-3, T-0, C-3)

Course Prerequisite: Basic knowledge of Database management system

Course Objectives: Throughout the course, students will be expected to demonstrate their understanding of Data Warehouse and Mining by being able to do each of the following:

1. Introduce the basics of data mining, data types, similarity and dissimilarity measures
2. Explain association rules and algorithms
3. Be familiar with mathematical foundations of data mining tools.
4. To identify the scope and essentiality of Data Warehousing and Mining
5. Demonstrate the appropriate data mining techniques for decision making.
6. To develop research interest towards advances in data mining.

Course Outcomes (Expected Outcome): On completion of the course, the students will be able to

1. Explain the basics of data mining techniques.
2. Identify the similarity and dissimilarity between the data sets.
3. Apply Data Preprocessing to techniques.
4. Describe Data Warehouse fundamentals, Data Mining Principles.
5. Illustrate Multidimensional Data Analysis in Cube Space
6. Assess Mining Frequent Patterns, Associations, and Correlations

Unit I: Introduction: Why Data Mining?, What Is Data Mining? , What Kinds of Data Can Be Mined? What Kinds of Patterns Can Be Mined? Which Technologies Are Used? , Which Kinds of Applications Are Targeted? , Major Issues in Data Mining. **(Hours: 7)**

Unit II: Getting to Know Your Data: Data Objects and Attribute Types, Basic Statistical Descriptions of Data, Data Visualization, Measuring Data Similarity and Dissimilarity. **(Hours: 7)**

Unit III: Data Preprocessing: Data Preprocessing: An Overview , Data Cleaning , Data Integration , Data Reduction , Data Transformation and Data Discretization. **(Hours: 7)**

Unit IV: Data Warehousing and Online Analytical Processing:

Data Warehousing and Online Analytical Processing: Data Warehouse: Basic Concepts, Data Warehouse Modeling: Data Cube and OLAP, Data Warehouse Design and Usage, Data Warehouse Implementation, Data Generalization by Attribute-Oriented Induction. **(Hours: 7)**

Unit V: Data Cube Technology

Data Cube Computation: Preliminary Concepts, Data Cube Computation Methods, Processing Advanced Kinds of Queries by Exploring Cube Technology, Multidimensional Data Analysis in Cube Space. **(Hours: 7)**

Unit VI: Mining Frequent Patterns, Associations, and Correlations :

Basic Concepts and Methods: Basic Concepts , Frequent Itemset Mining Methods , Which Patterns Are Interesting?-Pattern Evaluation Methods . **(Hours: 7)**

Text Book:

Data Mining – Concepts and Techniques, Jiawei Han & Micheline Kamber, Morgan Kaufmann(MK) Publishers, Elsevier, 3rd Edition, 2006.

Reference Books:

1. Data Mining Techniques, Arun K Pujari, 3rd edition, Orient Blackswan/Universities Press, 2013.
2. Data Warehousing Fundamentals, PaulrajPonnaiah, John Wiley & Sons, 2001.
3. Introduction to Data Mining, Pang-Ning Tan, Michael Steinbach and Vipin Kumar, Pearson Education, 2007
4. Insight into Data mining Theory and Practice, K.P. Soman, Shyam Diwakar and V. Ajay, Easter Economy Edition, Prentice Hall of India, 2006.
5. G. K. Gupta, “Introduction to Data Mining with Case Studies”, Easter Economy Edition, Prentice Hall of India, 2006.

7KS04 EMBEDDED SYSTEM (L-3, T-0, C-3)

Course Pre-requisite: Microprocessor and Assembly Language Programming, Computer Architecture and Organization

Course Objectives: Throughout the course, students will be expected to demonstrate their understanding of Embedded System by being able to do each of the following:

1. Introduce the fundamentals 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.

Course Outcomes (Expected Outcomes): On completion of the course, the students will be able to:

1. Describe the basics of embedded systems and structural core units as well as memory organization for embedded system.
2. Explain components of embedded system, characteristics and quality attributes of embedded systems.
3. Discuss role of 8051 microcontroller and its architecture in design of embedded systems
4. Examine the different Addressing modes and Instruction Set of 8051 microcontrollers.
5. Use knowledge of C programming to do embedded programming.
6. Assess the Real-Time Operating System concepts with VxWorks RTOS.

UNIT I: Introduction to Embedded System: What is Embedded System, Embedded Systems Vs General Computing Systems, History, classification, major application areas and purpose of Embedded Systems, Wearable Devices. The Typical Embedded System: Core of the Embedded System, Memory. **(Hours: 7)**

UNIT II: The Typical Embedded System: Sensors & Actuators, Communication Interface, Embedded Firmware, Other System Components, PCB and Passive Components. Characteristics of an Embedded System, Quality Attributes of Embedded Systems. Embedded Systems Application and Domain Specific Examples: Washing machine, Automotive. **(Hours: 7)**

UNIT III: Designing Embedded Systems with 8-bit Microcontroller - 8051: Factors to be considered in Selecting a Controller. Why 8051 Microcontroller. Designing with 8051 Microcontroller: 8051 Architecture, 8051 Memory Organization, Registers, Oscillator Unit, Ports, 8051 Interrupt System, Timer units, the Serial Port, 8051 Power Saving Modes. **(Hours: 7)**

.

UNIT IV: Programming the 8051 Microcontroller: Different Addressing modes supported by 8051. The 8051 Instruction Set: Data transfer instructions, Arithmetic instructions, Logical instructions, Boolean instructions, and Program Control Transfer instructions. Embedded Firmware Design Approaches, Assembly Language based Embedded Firmware development. **(Hours: 7)**

UNIT V:

Programming in Embedded C: Review of various constructs in C. Constant declarations, ‘volatile’ type qualifier, Delay generation and Infinite loops in Embedded C. Coding Interrupt Service Routines, Recursive and Re-entrant Functions, Dynamic memory allocation. **(Hours: 7)**

UNIT VI:

VxWorks Real Time Operating System (RTOS): How to choose an RTOS, Characteristics, Real Time Kernel, Hard/Soft Real time. VxWorks Task Creation, Management and Task Scheduling, Kernel Services, Inter Task Communication, VxWorks Task Synchronization and Mutual Exclusion, Interrupt Handling, Watchdog for task Execution monitoring, Timing and Reference in VxWorks.

The Embedded Product Development Life Cycle (EDLC): What is EDLC, Why EDLC, Objectives of EDLC, Different Phases of EDLC, EDLC approaches. **(Hours: 7)**

Text Book: Shibu K V “Introduction to Embedded Systems”, Second Edition, McGraw-Hill.

References:

1. Rajkamal, “Embedded Systems, Architecture, Programming & Design”, Third Edition, TMH.
2. Tammy Noergaard, “Embedded Systems Architecture” Elsevier Newness Publication.
3. Vahid and Givargis, “Embedded System Design” John Wiley & Sons P Ltd.
4. Peter Marwedel, “Embedded Systems Design” Springer, Netherland.
5. Jane W. S. Liu, “Real Time Systems”, Pearson Education.
6. Mohammad Ali Mazidi, “The 8051 Microcontroller and Embedded System using Assembly and C” Pearson.

7KS04 DIGITAL FORENSICS (L-3, T-0, C-3)

Course Prerequisite: Data Communication & Networking, Introduction to Cyber Security, Cryptography

Course Objectives: Throughout the course, students will be expected to demonstrate their understanding of Digital Forensics 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.

· To understand the basics of mobile phone forensics.

· To understand the network based cyber security intrusion detection.

· To know the various forensics tool.

Course Outcomes (Expected Outcome): On completion of the course, the students will be able to:

1. Describe Digital Forensics and its related preparation
2. Outline Data Acquisition tools
3. Use knowledgeto improve crime investigations.
4. Examine Digital Forensic and its validation
5. Assess role of email and social media in investigations
6. Discuss Cloud Forensics.

Unit I: Hours: 7

Introduction: An Overview of Digital Forensics, Preparing for Digital Investigations, Preparing A Digital Forensics Investigations, Procedure for Private Sector High-Tech investigations, understanding data recovery work station and software, conducting and investigations.

Unit II: Hours: 7

Data Acquisition: Understanding storage formats for digital evidence, determining the best acquisition method, Contingency planning for Image acquisition, acquisition tools, validating data acquisitions, performing RAID data acquisitions, remote network acquisition tools, other forensics acquisitions tools.

Unit III: Hours: 7

Processing Crime and Incident Scenes: Identifying Digital Evidence, Collection Evidence in Private Sector Scenes, Processing Law Enforcement Crime Scenes, Preparing for a search, Securing a Digital Incident or Crime Scene, Seizing Digital Evidence at the scene, Storing a Digital Evidence, Obtaining a Digital Hash,

Unit IV: Hours: 7

Digital Forensic Analysis and Validation: Data to collect and analyze, Validating Forensic data, Addressing data hiding techniques, Virtual Machine Forensics, Live Acquisition and Network Forensics

Unit V: Hours:7

Email and Social Media Investigations: Role of Email in investigations, Roles of Client and server in Email, Investigating Emails Crimes and Violations, Email Servers, Specialize Email Forensic Tools, Digital Forensics to Social Media Communications. Mobile Device Forensics and Internet of Anything: Mobile Device Forensics, Acquisitions procedure for Mobile Devices, Forensics in Internet of Anything.

Unit VI: Hours: 7

Cloud Forensics: Cloud Computing, Legal Challenges in Cloud Forensics, Technical Challenges in Cloud Forensics, Acquisitions in the cloud, Conducting a cloud investigation, Tools for Cloud Forensics. Digital Forensics Tools: Evaluating Digital Forensics Tools Needs, Software and Hardware Tools, Validating and Testing Software.

Text Book: Nelson, B, Phillips, A, Stuart, C., “Guide to Computer Forensics and Investigations”, 6th Ed., Cengage Learning.

Reference Books:

1. Warren G. Kruse II and Jay G. Heiser, “Computer Forensics: Incident Response Essentials”, Addison Wesley, 2002.
2. Davidoff, S. and Ham, J., Network Forensics Tracking Hackers through Cyberspace, Prentice Hall, 2012.
3. Michael G. Solomon, K Rudolph, Ed Tittel, Broom N., and Barrett D., Computer Forensics Jump Start, Willey Publishing, Inc., 2011.
4. Marcella, Albert J., Cyber forensics: A field manual for collecting, examining and preserving evidence of computer crimes, New York, Auerbach publications, 2008.
5. Davidoff, Sherri, Network forensics: Tracking hackers through cyberspace, Pearson education India private limited, 2017.
6. John Sammons, The Basics of Digital Forensics, Elsevier, 1st Edition, 2015.

7KS05 BLOCK CHAIN FUNDAMENTALS (L-3, T-0, C-3)

Course Prerequisite: Expertise in Programming, Basic Knowledge of Computer Security, Cryptography, Networking, Computer Systems Security

Course Objectives: Throughout the course, students will be expected to demonstrate their understanding of Block Chain Fundamentals by being able to do each of the following:

· To provide conceptual understanding of the function of Block chain as a method of securing distributed ledgers.

· To understand the structure of a block chain and why/when it is better than a simple distributed database

· To understand the technological underpinnings of block chain operations as distributed data structures and decision-making systems.

· To gain understanding of a "smart" contract and its legal implications.

· To provide a critical evaluation of existing "smart contract" capabilities and platforms, and examine their future directions, opportunities, risks and challenges.

Course Outcomes (Expected Outcome): On completion of the course, the students will be able to

1. Describe Crypto currency as application of block chain technology
2. Examine Basic Cryptographic primitives used in Block chain
3. Illustrate Consensus in a Blockchain
4. Discuss empirical study oof bitcoin the mining
5. Compare and contrast Ethereum and Bitcoin
6. Use concepts of Block chain technology that are commonly used across multiple industries to solve large scale problems.

Unit I: Introduction to Block Chain: Hours: 7

Introduction to Block chain, Structure of a Block, Types of Block chain, Public Ledgers, Block chain as public ledgers, Crypto currency as application of block chain technology

Unit II: Basic Cryptographic primitives used in Block chain: Hours: 7

Basic Cryptographic primitives used in Block chain – Secure, Collision-resistant hash functions, Digital signature, Public key cryptosystems, Zero-knowledge proof systems Cryptographic Hash Function, SHA-256,Properties of a hash function, Hash pointer and Merkle tree.

Unit III: Consensus: Hours: 7

Consensus, Distributed consensus in open environments, Consensus in a Bitcoin network, Types of consensus algorithm: Proof of Work (PoW), Proof of Stake (PoS), Delegated Proof of Stake (DPoS), Ripple, Proof of Burn

Unit IV: Introduction to Bitcoin: Hours: 7

Introduction to Bitcoin, History of Bitcoin, Bitcoin Transactions, Bitcoin Mining,Bitcoin Address.

Unit V: Introduction to Ethereum: Hours: 7

Introduction to Ethereum - Ethereum Virtual Machine (EVM), Wallets for Ethereum, Differences between Ethereum and Bitcoin, Block format, Mining algorithm, Solidity, Smart Contracts, Some attacks on smart contracts.

Unit VI: Block chain Technology Hours: 7

Blockchain Technology: Hyper ledger Fabric: System architecture, ledger format, chain code execution, transaction flow and ordering, private channels, membership service providers, Fabric Peer and Certificate Authority, Case studies of applications

Text Book: S. Shukla, M. Dhawan, S. Sharma, S. Venkatesan, 'Block chain Technology: Crypto currency and Applications', Oxford University Press, 2019.

Reference Books:

1. Mastering Bitcoin: Unlocking Digital Crypto currencies, by Andreas Antonopoulos, O'Reilly publisher
2. Blockchain Blueprint for a New Economy, by Melanie Swan, O'Reilly.
3. Narayanan, Arvind, et al. Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction. Princeton University Press, 2016.
4. Antonopoulos, Andreas M. Mastering Bitcoin: Programming the Open Blockchain. O'Reilly Media, Inc., 2017
5. Antonopoulos, Andreas M. and Wood, Gavin. Mastering Ethereum. O'Reilly Media, Inc., 2018. (Free draft available at https://github.com/ethereumbook/ethereumbook)
6. Ethereum project documentation. Online: http://www.ethdocs.org/en/latest/
7. Zero to Blockchain - An IBM Redbooks course, by Bob Dill, David Smits - https://www.redbooks.ibm.com/Redbooks.nsf/RedbookAbstracts/crse0401.html

7KS05 (Prof. Elect. - IV (i)) BLOCKCHAIN FUNDAMENTALS (L-3, T-0, C-3**)**

Course Pre-requisite:Basic Knowledge of Distributed systems and Networking, Basic knowledge of Data Structure

Course Objectives: Throughout the course, students will be expected to demonstrate their understanding of blockchain fundamental by being able to do each of the following:

1. A comprehensive understanding of how blockchain systems (mainly Bitcoin and Ethereum) work,
2. To securely interact with them
3. Design, build, and deploy smart contracts and distributed applications,
4. Integrate ideas from blockchain technology into applications.

Course Outcomes (Expected Outcome): On completion of the course, the students will be able to:

1. Understand the concept of decentralization of the block chain with different layers of blockchain
2. Apply basic cryptographic primitives with encryption standards.
3. Analyze & Design Consensus Algorithms.
4. Examine fundamentals of Bitcoin, how Bitcoin transactions are constructed and used with Bitcoin addresses, accounts, and mining
5. Understand foundation, architecture, and use of the Ethereum blockchain.
6. Execute & build block chain application/ transaction

Unit I: Blockchain Fundamentals (Hours: 7)

Introduction to Blockchain, History, Centralised versus Decentralised systems, Layers of blockchain, Importance of blockchain, Blockchain uses and use cases.

Unit II:Blockchain Working with Cryptography (Hours: 7)

Laying the Blockchain Foundation, Cryptography, Symmetric Key Cryptography, DES cryptography, Advanced Encryption Standard, Cryptographic Hash Functions, MAC and HMAC, Asymmetric Key Cryptography, Diffie-Hellman Key Exchange, Symmetric vs. Asymmetric Key Cryptography

Unit III:Consensus Algorithms (Hours: 6)

Introducing the consensus problem, Analysis and design, Classification, Algorithms: CFT algorithms, BFT algorithms, Choosing an algorithm

Unit IV:Bitcoin & Its Working (Hours: 7)

The History of Money, Dawn of Bitcoin: What Is Bitcoin, Working with Bitcoins. The Bitcoin Blockchain: Block Structure, The Genesis Block. The Bitcoin Network: Network Discovery for a New Node Bitcoin Transactions, Bitcoin Wallets

Unit V: Ethereum (Hours: 7)

From Bitcoin to Ethereum, Ethereum as a Next-Gen Blockchain Design Philosophy of Ethereum Enter the Ethereum Blockchain Ethereum Blockchain Ethereum Accounts Trie Usage Merkle Patricia Tree RLP Encoding Ethereum Transaction and Message Structure. Ethereum Smart Contracts Contract Creation

Unit VI: Blockchain Application Development (Hours: 6)

Decentralized Applications, Blockchain Application Development, interacting with the Bitcoin Blockchain, Interacting Programmatically with Ethereum, Sending Transactions

Text Books:

1. Beginning Blockchain : A Beginner’s Guide to Building Blockchain Solutions Bikramaditya Singhal, Gautam Dhameja, Priyansu Sekhar Panda Apress 2018
2. Mastering Blockchain, Imran Bashir: Packt- Birmingham-Mumbai Third Edition A deep dive into distributed ledgers, consensus protocols, smart contracts, DApps, crypto currencies, Ethereum, and more

Reference Books:

1. Blockchain – Blueprint for new Economy Melanie Swan - O’reilly
2. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Princeton University Press, 2016.
3. Sainul Abideen, Blockchain- ebook, Cybrosys Private Limited.

7KS05 IMAGE PROCESSING (L-3, T-0, C-3)
Course Prerequisite: Calculus, Linear Algebra, Differential Equation

---

Course Objectives: Throughout the course, students will be expected to demonstrate their understanding of Image Processing by being able to do each of the following:

· To introduce and discuss the fundamental concepts and applications of Digital Image Processing.

· To discuss various basic operations in Digital Image Processing.

· To know various transform domains

Course Outcomes (Expected Outcome): On completion of the course, the students will be able to

1. Explain fundamental steps in Image Processing
2. Compare different methods for image transform with its properties
3. Illustrate Image Enhancement in spatial domain
4. Examine Image Enhancement in Frequency Domain
5. Apply various methods for segmenting image and identifying image components
6. Investigate morphological operations to improve the quality of image.

Unit I: Introduction to Image processing: Hours: 7

Fundamental steps in image processing, Components of image processing system, Pixels, coordinate conventions, Imaging Geometry, Spatial Domain, Frequency Domain, sampling and quantization, Basic relationship between pixels, Applications of Image Processing.

Unit II : Image transforms and its properties: Hours: 7

Unitary transform, Discrete Fourier Transform, Discrete Cosine Transform, Walsh Transform, Hadamard Transform.

Unit III: Image Enhancement in spatial domain: Hours: 7

Basic Gray Level Transformation functions – Image Negatives, Log Transformations, Power- Law Transformations. Piecewise-Linear Transformation Functions: Contrast Stretching, Gray Level Slicing, Bit Plane Slicing, Histogram Processing–Equalization, Specification. Basics of Spatial Filtering – Smoothing: Smoothing Linear Filters, Ordered Statistic Filters, Sharpening: Laplacian, Unsharp Masking and High Boost Filtering.

Unit IV: Image Enhancement in Frequency Domain: Hours: 7

Basics of Filtering in Frequency Domain, Filters -Smoothing Frequency Domain Filters : Ideal Low Pass Filter, Gaussian Low Pass Filter, Butterworth Low Pass Filter, Sharpening Frequency Domain Filters: Ideal High Pass Filter, Gaussian High Pass Filter, Butterworth High Pass Filter, Homomorphic Filtering.

Unit V: Image Segmentation: Hours: 7

Pixel-Based Approach- Multi-Level Thresholding, Local Thresholding, Threshold Detection Method, Region-Based Approach- Region Growing Based Segmentation, Region Splitting, Region Merging, Split and Merge, Edge Detection - Edge Operators, Line Detection, Corner Detection.

Unit VI: Morphological Operations: Hours: 7

Basics of Set Theory, Dilation and Erosion - Dilation, Erosion, Structuring Element, Opening and Closing, Hit or Miss Transformation. Representation and Description Representation - Boundary, Chain codes, Polygonal approximation approaches, Boundary segments.

Text Books:

1. A K. Jain, Fundamentals of digital image processing, Prentice Hall of India, 1989.
2. Rafael C. Gonzalez, Richard E. Woods, Digital Image Processing (English) 3rd Edition, Pearson India, 2013.

Reference Books:

1. Al Bovik, The Essential Guide to Image Processing, Academic Press, 2009.
2. Milan Sonka, Vaclav Hlavac and Roger Boyle, Image Processing, Analysis, and Machine Vision, Thomson Learning, 2008.
3. S Jayaraman, S Esakkirajan and T Veerakumar, Digital Image Procesing, McGraw Hill Education , 2009.

7KS05 OPTIMIZATION TECHNIQUES (L-3, T-0, C-3)

Course Prerequisite: Mathematics III

Course Objectives:

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

· To familiarize with optimization techniques using both linear and non-linear programming.

· To study convex optimization though some techniques

· To gain understanding of linear algebra and probability theory

Course Outcomes (Expected Outcome): On completion of the course, the students will be able to:

1. Describe statement of an optimization problem
2. Examine linear programming procedures to solve optimization problems.
3. Compare different nonlinear programming methods of optimization
4. Discuss Geometric Programming with different constraint
5. Identify the appropriate optimization technique for the given problem
6. Synthesize algorithms to solve real time optimization problems.

Unit I: Hours: 7

Introduction to Optimization: Introduction, Historical Development, Engineering Applications of Optimization, Statement of an Optimization Problem, Classification of Optimization Problems, Classification Based on the Existence of Constraints.

Classical Optimization Techniques: Introduction, Single-Variable Optimization, Multivariable Optimization with No Constraints, Multivariable Optimization with Equality Constraints, Multivariable Optimization with Inequality Constraints.

Unit II: Hours: 7

Linear Programming I: Simplex Method Introduction, Applications of Linear Programming, Standard Form of a Linear Programming Problem, Geometry of Linear Programming Problems, Definitions and Theorems, Solution of a System of Linear Simultaneous Equations, Pivotal Reduction of a General System of Equations, Motivation of the Simplex Method, Simplex Algorithm, Two Phases of the Simplex Method, Revised Simplex Method, Duality in Linear Programming, Decomposition Principle Sensitivity or Post optimality Analysis, Transportation Problem.

Unit III: Hours: 7

Nonlinear Programming: One-Dimensional Minimization Methods Unimodal Function, ELIMINATION METHODS: Unrestricted Search, Search with Fixed Step Size, Search with Accelerated Step Size, Exhaustive Search, Dichotomous Search, Interval Halving Method, Fibonacci Method, Golden Section Method, Comparison of Elimination Methods, INTERPOLATION METHODS, Quadratic Interpolation Method, Cubic Interpolation Method, Direct Root Methods, Newton Method, Quasi-Newton Method , Secant Method.

Unit IV: Hours: 7

Nonlinear Programming: Unconstrained Optimization Techniques Introduction, Classification of Unconstrained Minimization Methods, General Approach, Rate of Convergence, Scaling of Design Variables, DIRECT SEARCH METHODS Random Search Methods, Random Jumping Method, Random Walk Method, Random Walk Method with Direction Exploitation, Advantages of Random Search Methods, Grid Search Method, Univariate Method ,Pattern Directions, Powell's Method, Simplex Method, INDIRECT SEARCH (DESCENT) METHODS Gradient of a Function, Steepest Descent (Cauchy) Method, Conjugate Gradient (Fletcher–Reeves) Method, Newton's Method, Marquardt Method, Quasi-Newton Methods, Davidon–Fletcher–Powell Method, Broyden–Fletcher–Goldfarb–Shanno Method

Unit V: Hours: 7

Nonlinear Programming: Constrained Optimization Techniques Introduction, Characteristics of a Constrained Problem, DIRECT METHODS Random Search Methods, Complex Method, Sequential Linear Programming , Basic Approach in the Methods of Feasible Directions, Zoutendijk's Method of Feasible Directions, Rosen's Gradient Projection Method, Generalized Reduced Gradient Method, Sequential Quadratic Programming, INDIRECT METHODS Transformation Techniques, Basic Approach of the Penalty Function Method, Interior Penalty Function Method, Convex Programming Problem, Exterior Penalty Function Method, Extrapolation Techniques in the Interior Penalty Function Method, Extended Interior Penalty Function Methods

Unit VI: Hours: 7

Dynamic Programming Introduction, Multistage Decision Processes, Concept of Sub optimization and Principle of Optimality, Computational Procedure in Dynamic Programming, Conversion of a Final Value Problem into an Initial Value Problem, Linear Programming as a Case of Dynamic Programming, Continuous Dynamic Programming Stochastic Programming Introduction, Basic Concepts of Probability Theory, Stochastic Linear Programming, Stochastic Nonlinear Programming, Stochastic Geometric Programming.

Text Book: Engineering Optimization: Theory and Practice, Fourth Edition Singiresu S. Rao Copyright © 2009 by John Wiley & Sons, Inc.

Reference Books:

1. Mokhtar S. Bazaaraa, Hanif D. Shirali and M.C.Shetty, "Nonlinear Programming, Theory and Algorithms", John Wiley & Sons, New York (2004).
2. Kwang Y. Lee, Mohamed A. El-Sharkawi, "Modern heuristic optimization techniques: theory and applications", Kluwer (2008).
3. Hamdy A. Taha, "Operations Research: An Introduction", 8th Edition, Pearson Education (2008).
4. G. V. Reklaitis, A. Ravindran, K. M. Ragsdell, "Engineering Optimization: Methods and Applications", Wiley (2006).
5. Michael C. Bartholomew-Biggs, "Nonlinear optimization with engineering applications", Springer (2008).

7KS06 COMPUTER GRAPHICS – LAB. (P-2, C-1)

Course Prerequisite: Knowledge of C or C++ Programming

Course Objectives: Throughout the course, students will be expected to demonstrate their understanding of Computer Graphics Lab by being able to do each of the following:

· To acquaint the learner with the basic concepts of Computer Graphics.

· To learn the various algorithms for generating and rendering graphical figures.

· To get familiar with mathematics behind the graphical transformations.

· To understand and apply various methods and techniques regarding projections, animation, shading, illumination and lighting

· To prepare the student for advance areas like Image Processing or Computer Vision or Virtual Reality and professional avenues in the field of Computer Graphics.

Course Outcomes (Expected Outcome): On completion of the course, the students will be able to:

1. Describe the basic concepts of Computer Graphics.
2. Demonstrate various algorithms for basic graphics primitives.
3. Apply 2-D geometric transformations on graphical objects.
4. Use various Clipping algorithms on graphical objects
5. Explore 3-D geometric transformations, curve representation techniques and projections methods
6. Explain visible surface detection techniques and Animation.

List of Experiments: This is the sample list of Experiments; **minimum 12 experiments** are to be performed covering the entire syllabus. At least two experiments should be beyond syllabi based on learning of syllabi (Apply)

1. Write a program to draw line using DDA algorithm.
2. Write a program to draw line using Bresenham‘s algorithm
3. Write a program to draw circle using Bresenham‘s algorithm
4. Write a program for 2-D transformations, a) Scaling b) Translation c) Rotation
5. Write a program for 3-D transformations, a) Scaling b) Translation c) Rotation
6. Write program to fill polygon using scan line algorithm
7. Write a program to draw the polygons by using the mouse. Choose colors by clicking on the designed color pane. Use window port to draw. Use DDA algorithm for line drawing.
8. Write a program to clip line using following algorithm : Cohen-Sutherland algorithm
9. Write a program to draw following type of curve-Hilbert’s Curve
10. Write a program to draw following type of curve-Koch curve, Bezier curves
11. Write a program to draw inscribed and Circumscribed circles in the triangle as shown as an example below. (Use any Circle drawing and Line drawing algorithms)
12. Write a program to move circle to forward direction.
13. Write a program to draw a cube using in build library function and perform 3D transformations
14. Write a program to fill color in rectangle
15. Write a program to generate Bouncing ball animation using Direct3D/Maya/Blender
16. Write a program to generate snowflake using concept of fractals.
17. Write a program to implement translation, sheer, rotation and scaling transformations on equilateral triangle and rhombus
18. Write program to draw any object such as flower, waves using any curve generation technique
19. Write a program of man walking in rain
20. Write a program to draw a house
21. Write a program for moving a cycle
22. Write a graphics program analog clock
23. Write a program to draw 3-D cube and perform following transformations on it using OpenGL.

7KS07 EMERGING TECHNOLOGY LAB III (P-2, C-1)

7KS07 Emerging Technology Lab III is based on 7KS04 Professional Elective-III. Tentative FOSS Tools & Technology for Practical’s are as follows:

AI : ROS, YARP, MRPT, Gazebo, OROCOS.

DS :RapidMiner, Weka, Scrapy, Pandas

IoT :ThingsBoard, Kinoma, SiteWhere

Cyber Security: Security Onion, LastPass,KeePAss.

7KS08 EMERGING TECHNOLOGY LAB IV(P-2, C-1)

7KS08 Emerging Technology Lab IV is based on 7KS05 Professional Elective-IV. Tentative FOSS Tools & Technology for Practical’s are as follows:

Blockchain: Ethereum,Bigchain DB, Corda

Image Processing:Open CV, SimpleCV, Keras, Caffe

Optimization :Open Eaagles, Repast, Open Simulator.

7KS09 PROJECT AND SEMINAR (P-8, C-4)

Seminar shall bebased on the advanced topic in thefield. It may be related to domain of the project. The seminar should be conducted in seventh semester andevaluated. Each candidate shall submit a seminar report, deliver the seminarand face the viva-voce. The distribution of internal 50 marks shall be asfollows.

1. Seminar report preparation and submission :- 10 marks
2. Seminar delivery/ presentation:- 20 marks
3. Seminar viva-voce:- 10 marks
4. Attendance in all seminar sessions:- 10 marks.

****