37351

COMPUTER NETWORKS

(IT & EIE)

Instruction	:	3 Periods / week	Sessional Marks	:	30
Tutorial	:	1 Period / week	End Examination Marks	:	70
Credits	:	3	End Exam Duration	:	3 Hours

Course Objectives:

1. To learn computer networking models.
2. To understand computer networking theory and various protocols used in various layers.
3. To Design and implement various protocols of transport and application layer.
4. To understand security and various methods to implement security in computer networks.

Unit I – Introduction to Networks, Physical Layer

Introduction to networks, Network types, standards and administration, Protocol layering, TCP/IP Protocol suite, The OSI model, layers in the OSI model.
Physical layer: Digital transmission-Digital to Digital conversion, Multiplexing-FDM, WDM, TDM, Transmission media-guided and unguided, Switching- circuit switched networks, datagram networks, virtual circuit networks, structure of a switch.

Unit II – Data Link Layer, Medium Access Sub Layer

Data link layer : Introduction, link layer addressing, Error Detection and Correction – Introduction, block coding, cyclic codes, checksum, FEC,DLC Services, DLC layer Protocols, HDLC, point to point protocol.
Medium Access sub layer: Random access, controlled access, channelization, Ethernet protocol, standard Ethernet, Fast Ethernet, Giga bit Ethernet, SONET.

Unit III – Connecting LANs, Network Layer-1

Connecting LANs: IEEE 802.11 Project, WiMAX, Cellular telephony, Connecting Devices, Virtual LANs.
Network Layer-1: Network-layer services, Packet switching, Network layer performance, IPV4 addresses, Forwarding of IP packets, tunneling, IP, and ICMPV4.

Unit IV – Network Layer-2, Transport Layer-1

Network Layer-2: Unicast routing, multicast routing, Next generation IP.
Transport Layer-1: Introduction, Transport-layer protocols, Services, Port Numbers, UDP and TCP protocol, SCTP.

Unit V – Transport Layer -2, Application Layer

Transport Layer-2: QoS- Data flow characteristics, flow control characteristics, integrated services, and differentiated services.
Application Layer: Client-server programming, WWW, HTTP, FTP, Email, TELNET, SSH, DNS SNMP, Network security.

Course Outcomes: At the end of the course, the student should be able to

CO 1 : Understand network hardware and software issues such as different networks topologies and reference models.
CO 2 : Demonstrate various error correction and detection techniques, framing techniques & channel access protocols.
CO 3 : Realize address mapping and routing protocols.

CO 4 : Identify the differences between connection oriented & connection less services and congestion control techniques.
CO 5 : Explore various QOS parameters and evaluate the performance
CO 6 : Demonstrate user-level network programs using the underlying network protocols at application layer.

Text Books:

1. Data Communications and Networking, Behrouz A. Forouzan, 5th Edition, TMH, 2009.
2. Computer Networks, Andrew S Tanenbaum, 4th Edition, Pearson Education, 2008.

References:

1. Computer Networking: A Top-Down Approach, James F. Kurose, and K.W.Ross, 7th Edition, Pearson Education, 2017.
2. Introduction to Data Communications and Networking, W.Tomasi, Pearson Education, 2009.
3. Engineering Approach to Computer Networks, S. Keshav, 2nd Edition, Pearson Education, 2008.

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CLOUD COMPUTING

Instruction	: 4 Periods / week	Sessional Marks	:	30
Credits	: 4	End Examination Marks	:	70
		End Exam Duration	:	3 Hours

Course Objectives:

1. Able to differentiate the architectures of distributed systems and parallel computing and the role of virtualization in cloud
2. Overview of cloud computing and identify various cloud services.
3. Importance of scheduling in cloud architecture and standards to be followed
4. Specify security threat exposure within a cloud computing infrastructure.
5. Contrast the risks and benefits of implementing cloud computing.

Unit I - Introductory Concepts and Virtualization

Distributed systems – Parallel computing architectures: Vector processing, Symmetric multi processing and Massively parallel processing systems -High performance Cluster computing – Grid computing – Service Oriented Architecture overview-concept of virtualization- hypervisor types xen and vmware

Unit II - Cloud Computing Overview

The evolution of cloud computing-Meaning of the terms cloud and cloud computing – Key characteristics of cloud computing -Cloud computing Architecture-cloud based service offerings – Infrastructure as a service – Platform-as-a-service- Software-as-a-service. Grid computing Vs Cloud computing –Benefits of cloud model – limitations – legal issues - – Challenges for the cloud.

Unit III - Scheduling in Cloud and Common Standards in Cloud Computing

Scheduling in cloud: static scheduling vs. dynamic scheduling, dynamic scheduling algorithms, virtual machine scheduling and task scheduling in cloud.
Common standards in cloud computing: The open cloud consortium – The distributed management task force – standards for application developers – standards for messaging - standards for security.

Unit IV - Federation Presence, Identity and Privacy in the Cloud

Federation in the cloud – Presence in the cloud – Privacy and its relation to cloud based information system-SLA Management in Cloud Computing, cloud security-data security in cloud, security controls at infrastructure.

Unit V - Cloud Computing Case Studies, End User Access to Cloud Computing

Cloud computing case studies: Manjrasoft Aneka-Amazon EC2- Google App Engine – Microsoft Azure Services platform-developing cloud based applications.
End user access to cloud computing: YouTube – zimbra – Facebook – Zoho-DimDim Collaboration

Course Outcomes: At the end of the course, the student should be able to

CO 1	:	Learn about Cloud Provider, User and Services provided by Cloud.
CO 2	:	Explore the Cloud Architecture, SOA
CO 3	:	Realize the importance of Virtualization, How it is useful to Cloud Computing.
CO 4	:	Learn federation presence, identity and privacy in the cloud, common standards in cloud computing
CO 5	:	Know about end user access to cloud computing and also mobile platform virtualization
CO 6	:	Explore case studies like Amazon S3, Amazon cloud front and Amazon SQS, Google App Engine, Microsoft Dynamic CRM

Text Books:

1. Cloud Computing Implementation Management and Security, John W. Rittinghouse, and James F.Ransome, CRC Press, Taylor & Francis Group, 2010.
2. Cloud Computing: A Practical Approach, Anthony T.Velte, Toby J.Velte and Robert Elsenpeter, Tata McGraw-Hill, 2010.
3. Cloud Computing: Implementation, Management and Security, John W. Rittinghouse and James F Ransome. CRC Press, rp2012.

References:

1. Cloud Application Architectures: Building Applications and Infrastructure in the Cloud, George Reese, Oreilly Publishers.
2. Cloud Computing and SOA: Convergence in Your Enterprise- A Step by Step Guide, David S. Linthicum, Addison-Wesley, 2009.

ARTIFICIAL INTELLIGENCE
(Professional Elective-I)

Instruction	:	3 Periods / week	Sessional Marks	: 30
Tutorial	:	1 Period / week	End Examination Marks	: 70
Credits	:	3	End Exam Duration	: 3 Hours

Course Objectives:

1. Introducing the concepts of Artificial Intelligence(AI) and knowledge of AI techniques
2. Implementing Predicate logic in AI techniques
3. Implementing AI search techniques and providing statistical analysis
4. Designing compilers based on AI techniques
5. Representing knowledge and building expert systems

Unit I – Introduction to Artificial Intelligence

The AI Problems, The Underlying Assumption, What is an AI Technique?, The Levels of the Model, Criteria of Success, Some General References, One Final Word and Beyond.
Problems, Problem Spaces, and Search: Defining the Problem as a State Space Search, Production Systems, Problem Characteristics, Production System Characteristics
Problem-Solving: Uninformed Search Strategies, Avoiding Repeated States.
Informed Search and Exploration: Informed (Heuristic) Search Strategies, Heuristic Functions, Local Search Algorithms and optimization Problems, Local Search in Continuous Spaces, Backtracking.

Unit II - Knowledge and Reasoning

Logical Agents, Knowledge–Based Agents, the Wumpus World, Logic, Propositional Logic a Very Simple Logic, Reasoning Patterns in Propositional Logic, Effective Propositional Inference, and Agents Based on Propositional Logic.
First-Order Logic: Representation Revisited, Syntax and Semantic of First-Order Logic, Using First-Order Logic, Knowledge Engineering in First-Order Logic.
Inference in First-Order Logic: Propositional Vs. First-Order Inference, Unification and Lifting, Forward Chaining.

Unit III - Knowledge Representation, Uncertain Knowledge and Reasoning

Knowledge Representation: Ontological Engineering, Categories and Objects, Actions, Situations, and Events, Mental Events and Mental Objects, The Internet Shopping World, Reasoning Systems for Categories, Reasoning with Default Information, Truth Maintenance Systems.

Uncertain Knowledge and Reasoning: Uncertainty, Acting Under Uncertainty, Basic Probability Notation, The Axioms of Probability, Inference using Full Joint Distributions, Independence, Bayes' Rule and its use.

Unit IV - Learning

Learning from Observations, Forms of Learning, Inductive Learning, Learning Decision Trees, Ensemble Learning, Why Learning Works: Computational Learning Theory, Knowledge in Learning: A Logical Formulation of Learning, Knowledge in Learning.

Unit V - Statistical Learning Methods

Neural Networks. Fuzzy Logic Systems: Introduction, Crisp Sets, Fuzzy Sets, Some Fuzzy Terminology, Fuzzy Logic Control, Sugeno Style of Fuzzy Inference Processing, Fuzzy Hedges, α Cut Threshold.

Course Outcomes: At the end of the course, the student should be able to

CO 1 : Use various predicate logic knowledge representations to specify domains and reasoning tasks of an expert system with Heuristic Search Techniques.
CO 2 : Use different logical systems for inference over formal domain representations and trace how a particular inference algorithm works on a given problem specification.
CO 3 : Provide Statistical Analysis for Knowledge representation problems.
CO 4 : Use key logic-based techniques in variety of AI problems.
CO 5 : Communicate Scientific Knowledge at different levels of abstraction with AI techniques.
CO 6 : Design decision support systems.

Text Books:

1. Artificial Intelligence, Elaine Rich, Kevin Knight and Shivashankar B Nair, 3rd Edition, Tata McGraw-Hill.
2. Artificial Intelligence: A Modern Approach, Stuart Russell and Peter Norvig, 2nd Edition, Pearson Education.

References:

1. Artificial Intelligence: Structures and Strategies for Complex Problem Solving, George F Luther, 5th Edition, Pearson Education.
2. Introduction to Artificial Intelligence, Eugene Charniak and Drew McDermott, Pearson Education.

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COMPUTER GRAPHICS

(Professional Elective – I)
(Common to CSE & IT)

Instruction	:	3 Periods / week	Sessional Marks	:	30
Tutorial	:	1 Period / week	End Examination Marks	:	70
Credits	:	3	End Exam Duration	:	3 Hours

Prerequisites: Computer Organization

Course Objectives:

1. To provide a comprehensive introduction to computer graphics leading to the ability to understand contemporary terminology, progress, issues, and trends.
2. A thorough introduction to computer graphics techniques, focusing on 3D modeling, image synthesis, and rendering., sampling, Monte Carlo path tracing, photon mapping, and anti-aliasing.

Unit I – Overview of Graphics Systems

Application areas of computer graphics Overview of graphics systems, Video display devices, Raster scan Systems, Random scan systems. Points and Lines, Line drawing algorithms, Mid-point Circle and Ellipse algorithms, Filled Area Primitives, Scan line polygon fill algorithm, Boundary fill algorithm, Flood fill algorithm, Implementation of Primitives through WebGL, Line, Circle and Ellipse, Filled Area Primitives

Unit II - Transformations

2-D Geometrical Transformations: Basic Transformations, Matrix Representations and Homogeneous Coordinates, Composite Transformations and Other Transformations. Transformations between two coordinate systems.

2-D Viewing: The Viewing Pipeline, Viewing coordinate reference frame, Window to view-port coordinate transformation. Cohen Sutherland and Cyrus beck line clipping algorithms, Sutherland –Hodgeman Polygon clipping algorithm

Unit III – 3D Object Representation

Polygon surfaces, Quadratic surfaces, Spline representation, Hermite curve, Bezier curve and B-Spline curves, Bezier and B-Spline surfaces. Illumination models and surface rendering methods: Basic Illumination Models, Polygon rendering methods. Hermite, Bezier, and Bezier surfaces

Unit IV – 3D Geometric Transformations

Translation, rotation, scaling, Reflection and shear transformations, Composite transformations. 3-D Viewing: Viewing pipeline, Viewing coordinates, Projections, View volume and general projection transformations, and clipping strategies.

Unit V – Surface Detection Methods

Visible Surface Detection Methods: Classification of Visible –Surface Detection Algorithms, Back-face detection, Depth–buffer, scan-line and depth sorting methods BSP-tree, area sub-division and octree methods.

Computer Animation: Design of Animation sequence, General Computer Animation Functions and Raster animation, Computer Animation Languages, Key frame systems. Motion Specifications: Principles of Animation and Advanced Animation Techniques.

Course Outcomes: At the end of the course, the student should be able to

CO 1 : Realize the application areas of computer graphic systems and output device primitives.

CO 2 : Demonstrate 2D geometric transforms and 2D viewing

CO 3 : Design 3D Object representations, 3D transformations and illumination models.
CO 4 : Learn visible surface detection methods and design framework.
CO 5 : Appreciate different animation techniques for classification.
CO 6 : Design surface contours and able to animate 3D systems.

Text Books:

1. Computer Graphics : C version , Donald Hearn and M.Pauline Baker, Pearson Education, 2008
2. WebGL Programming Guide: Interactive 3D Graphics Programming with Web GL, Kouichi Matsuda and Rodger Lea, Addition-Wesley, 2013.

References:

1. Computer Graphics: Principles and Practice in C, Foley, Van Dam, Feiner and Hughes, 2nd Edition, Pearson Education, 2013
2. Principles of Computer Graphics, Shalini Govil-Pai, Springer-Verlag, 2004.
3. Procedural Elements for Computer Graphics, David F Rogers, 2nd Edition, TMH, 2001.
4. Computer Graphics, Steven Harrington, Tata McGraw-Hill, 2001.
5. Principles of Interactive Computer Graphics: Neuman and Sproul, Tata McGraw-Hill.

EMBEDDED SYSTEMS
(Professional Elective-I)

Instruction	:	3 Periods / week	Sessional Marks	: 30
Tutorial	:	1 Period / week	End Examination Marks	: 70
Credits	:	3	End Exam Duration	: 3 Hours

Course Objectives:

1. The students must be able to understand the basic characteristics of an embedded system and the underlying issues in design of an Embedded System.
2. The students must develop an understanding of the basic concepts of assembly language programming and the ability to write assembly language programs.
3. The students should develop the ability to interface the 8051 microcontroller with other peripheral devices.
4. The students should develop thorough understanding of an operating system designed to run on an embedded system and are expected to learn to deploy programs in an embedded environment.
5. The students must develop understanding of advanced embedded architectures and their networking environment.

Unit I - Embedded Computing Introduction, The 8051 Architecture

Embedded Computing Introduction, Complex Systems and Microprocessor, the Embedded System Design Process for System Design, Design Examples (Chapter 1 from Textbook I, Wolf)
The 8051 Architecture: Introduction, 8051 Microcontroller Hardware, Input/output Ports and Circuits, External Memory, Counter and Timers, Serial data Input/output, Interrupts (Chapter 3 from Textbook 2, Ayala)

Unit II - Basic Assembly Language Programming Concepts, Arithmetic Operations

Basic Assembly Language Programming Concepts, The Assembly Language Programming Process, Tools and Techniques, Programming the 8051, Data Transfer and Logical Instructions (Chapter 4, 5&6 from Textbook 2, Ayala)
Arithmetic Operations, Decimal Arithmetic, Jump and Call Instructions, Further Details on Interrupts (Chapters 7 &8 from TextBook2, Ayala)

Unit III - Applications

Interfacing with Keyboards, Displays, D/A and A/D Conversions, Multiple Interrupts, Serial Data Communication (Chapter 7&8 from TextBook2, Ayala)

Unit IV - Introduction To Real Time Operating Systems, Development Environment

Introduction To Real Time Operating Systems: Tasks and Task States, Tasks and Data, Semaphores and Shared Data, Message Queues, Mailboxes and Pipes, Timer Functions, Events, Memory management, Interrupt Routines in RTOS Environment (Chapters 6&7 from Text Book3, Simon)
Development Environment: Embedded Software Development Tools: Host and Target machines, Linker/Locator for Embedded Software, Getting Embedded Software into Target System, Debugging Techniques: Testing on Host Machine, Using Laboratory Tools, An Example System (Chapters 8, 9, 10&11 from Textbook 3, Simon)

Unit V - Introduction to Advanced Architectures

ARM and SHARC, Processor and Memory Organization and Instruction Level parallelism, Networked embedded Systems: Bus Protocols, 12Cbus and CAN bus, Internet-Enabled Systems, Design Example-Elevator Controller (Chapter 8 from TextBook1, Wolf)

Course Outcomes: At the end of the course, the student should be able to

CO 1 : Understand inherent complexity in the design of an embedded system.
CO 2 : Explore different functional units of a micro-controller with 8051 as an example.
CO 3 : Explore tools and techniques in an embedded environment, and will be able to develop assembly language programs for 8051 based systems.
CO 4 : Appreciate the primitives of a real time operating system and will be able to differentiate between a generic OS and an RTOS.
CO 5 : Develop and deploy an assembly language program from host machine to target machine.
CO 6 : Explore different embedded architectures such as SHARC, ARM and their networking.

Text Books:

1. Computers as Components: Principles of Embedded Computing System Design, Wayne Hendrix Wolf, Morgan Kaufmann, 2001.
2. The 8051 Microcontroller, Kenneth J Ayala, 3rd Edition, Thomson.
3. An Embedded Software Timer, David E Simon, Addison Wesley.

References:

1. Embedding System Building Blocks: Complete and Ready-To-Use Modules in C, Jean J. Labrosse, CMP Books, 2000.
2. Embedded Systems: Architecture, Programming and Design, Raj Kamal, Tata McGraw-Hill Education.

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INTRODUCTION TO ANALYTICS

(Professional Elective – I)
(Common to CSE & IT)

Instruction	:	3 Periods / week	Sessional Marks	:	30
Tutorial	:	1 Period / week	End Examination Marks	:	70
Credits	:	3	End Exam Duration	:	3 Hours

Prerequisites: Design and Analysis of Algorithms

Course Objectives:

1. To introduce the terminology, technology and its applications
2. To introduce the concept of Analytics for Business
3. To introduce the tools, techniques and programming languages which are used in day to day analytics cycle

Unit I – Introduction to Analytics and R Programming

Introduction to Analytics and R programming : Introduction to R, RStudio, R Windows Environment, Introduction to various data types: numeric, character, date, data frame, array, matrix, etc., Reading datasets, Working with different file types such as .txt, .csv, etc., Outliers, Combining datasets, R functions and loops.
Managing your work to meet requirements: Understanding learning objectives, Introduction to work and meeting requirements, Time management, Work management and prioritization, Quality and Standards adherence.

Unit II – Summarizing Data & Revisiting Probability

Summarizing Data & Revisiting probability: Summary Statistics – Summarizing data with R, Probability, Expected, Random, Bivariate random variables, Probability distribution, Central Limit Theorem, etc.
Work effectively with colleagues: Introduction to working effectively, Team work, Professionalism, Effective communication skills, etc.

Unit III – SQL using R

SQL using R: Introduction to NoSQL, Connecting R to NoSQL databases, Excel and R integration with R connector.

Unit IV – Correlation and Regression Analysis

Regression Analysis: Regression Analysis, Assumptions of OLS Regression, Regression modelling.
Correlation: ANOVA, Forecasting, Heteroscedasticity, Autocorrelation, Introduction to multiple regression, etc.

Unit V – Understanding the Verticals – Engineering, Financial and Others

Understanding the Verticals – Engineering, Financial and Others: Understanding the systems viz. Engineering Design, Manufacturing, Smart Utilities, Production Lines, Automotive, Technology, etc., Understanding business problems related to various businesses
Requirements Gathering: Gathering all the data related to the business objective

Course Outcomes: At the end of the course, the student should be able to

CO 1	:	Acquire an understanding of fundamental programming/data structures in R.
CO 2	:	Develop an ability to choose among vectors, matrices and frames for processing real-world data
CO 3	:	Understand the various dynamics of working on projects in various verticals.
CO 4	:	Depict data in various graphical forms for better data visualization.
CO 5	:	Understand the application of statistical techniques

Text Book:

1. Student's Handbook for Associate Analytics. NASSCOM.

References:

1. Introduction to Probability and Statistics Using R, G. Jay Kerns.
2. An Introduction to R, W N Venables, D M Smith and the R Development Core Team (http://www.r-project.org).
3. Applied Statistics and Probability for Engineers, Montgomery, Douglas C and George C. Runger, John Wiley & Sons, 2010.
4. The Basic Concepts of Time Series Analysis and Mining with R, Yanchang Zhao.

INFORMATION SECURITY MANANGAMENT

(Professional Elective-I)
(Common to CSE & IT)

Instruction	: 3 Periods / week	Sessional Marks	:	30
Tutorial	: 1 Period / week	End Examination Marks	:	70
Credits	: 3	End Exam Duration	:	3 Hours

Course Objectives:

1. To introduce the terminology, technology and its applications
2. To introduce the concept of Security Analyst
3. To introduce the tools, technologies& programming languages which is used in day to day security analyst job role.

Unit I - Information Security Management

Information Security Overview, Threats and Attack Vectors, Types of Attacks, Common Vulnerabilities and Exposures (CVE), Security Attacks, Fundamentals of Information Security, Computer Security Concerns, Information Security Measures etc., Manage your work to meet requirements (NOS 9001)*.

Unit II – Fundamentals of Information Security

Key Elements of Networks, Logical Elements of Network, Critical Information Characteristics, Information States etc., Work effectively with Colleagues (NOS 9002)*

Unit III – Data Leakage

What is Data Leakage and statistics, Data Leakage Threats, Reducing the Risk of Data Loss, Key Performance Indicators (KPI) and Database Security etc.,

Unit IV – Information Security Policies, Procedures and Audits

Information Security Policies, necessity, key elements & characteristics, Security Policy Implementation, Configuration, Security Standards-Guidelines & Frameworks etc.

Unit V – Information Security Management- Roles and Responsibilities

Security Roles & Responsibilities, Accountability, Roles and Responsibilities of Information Security Management, team-responding to emergency situation, risk analysis process etc.

*** NOS: National Occupational Standards**

Course Outcomes: At the end of the course, the student should be able to

CO 1 : Identify and prioritize information assets, threats to information assets.
CO 2 : Define an information security strategy, architecture, policy and understand its central role in a successful information security program.
CO 3 : Define risk management and its role in the organization.
CO 4 : Describe the various access control approaches including authentication, authorization and biometric access controls.
CO 5 : Respond to intruders in an information system and identify the skills and requirements for information security positions.

Text Book:

1. Management of Information Security, Michael E Whitman and Herbed J Mattord, 2nd Edition, Course Technology, 2007.

References:

1. http//www.iso.org/isolhomelstandardslmanagement-standardsliso27001.htm
2. http//www.licsrc.nistmovlpublicationslnistpubs/800-55-Rev1ISP800-55-revl.pdf