First Semester

Software Engineering and Paradigm (MCS-111)

Discipline Core (DC); 4 Credits (3-1-0)

Course Objectives:-

• To understand software engineering process and models of software development.
• To gain familiarization with Quality management concepts, Quality Standards and various metrics.

Unit	Contents	No. of Lectures
Unit 1	**Introduction**: Software and changing nature of software, Software Engineering-A layered technology, Process models: classical waterfall model, incremental process model, RAD model, evolutionary process model. **Requirement Engineering**: Requirement gathering and analysis, software requirement specification (SRS). **Software design:** Characteristics of good software design, cohesion and coupling. Function oriented and object oriented design.	**14**
Unit 2	**Coding and testing**: Coding standards and guidelines, code reviews, **Testing**: Test strategies for conventional and object oriented software. Blackbox and whitebox testing, System testing. **Software Maintenance**: Characteristics of software maintenance, Software reverse engineering, software maintenance models **Product metrics**: Framework for product metrics, metrics for analysis, design, source code, testing and maintenance.	**14**
Unit 3	**Software project management**: Responsibilities of software project manager, project planning, Metrics for project cost estimation. Project estimation techniques. Scheduling, organization and team structure. Risk management. SCM **Software quality management:** Quality concepts, software quality assurance, software reliability and reliability metrics. ISO 9000 quality standards, SEI Capability Maturity Model, Six Sigma. Metrics for Software Quality. **Recent trends:** Component based software development and software	**14**

	reuse, Software Re-Engineering.	
		42

Reference/Text Books:

1. Pressman,Roger.S, "*Software Engineering: A Practitioner's Approach*", 6th Edition, Tata McGraw-Hill.
2. Mall, R., "*Fundamentals of Software Engineering*", 3rd Edition, PHI.
3. Sommerville, I., "*Software Engineering*", 7th Edition, Pearson Education.
4. Limaye, Milind,"*Software Quality Assurance*",Tata McGraw-Hill Education.
5. Gustafson,David,"*Software Engineering*" ,Schaum's Outline, McGraw Hill Professional.

Advanced design and Analysis of Algorithm(MCS-112)

Discipline Core (DC); 4 Credits (3-1-0)

S. No.	Topic	No. of Lectures
Unit 1	**Algorithm Analysis** – Time Space Tradeoff – Asymptotic Notations – Conditional asymptotic notation – Removing condition from the conditional asymptotic notation - Properties of big-Oh notation – Recurrence equations – Solving recurrence equations – Analysis of linear search.	**6**
Unit 2	**Divide and Conquer: General Method** – Binary Search – Finding Maximum and Minimum – Merge Sort – Greedy Algorithms: General Method – Container Loading – Knapsack Problem.	**12**
Unit 3	**Dynamic Programming**: General Method – Multistage Graphs – All-Pair shortest paths – Optimal binary search trees – 0/1 Knapsack – Travelling salesperson problem .	**5**
Unit 4	**Backtracking**: General Method – 8 Queens problem – sum of subsets – graph coloring – Hamiltonian problem – knapsack problem.	**6**
Unite 5	**Graph Traversals** – Connected Components – Spanning Trees – Biconnected	**10**

	components – Branch and Bound: General Methods (FIFO & LC) – 0/1 Knapsack problem – Introduction to NP-Hard and NP-Completeness.	
		39

Text Books:-

1. T H Cormen, C E Leiserson, and R L Rivest, Introduction to Algorithms, 2nd Edn, Pearson Education

2. Ellis Horowitz and Sartaj Sahani, Fundamental of Computer Algorithm, Galgotia Publications.

Reference Books:-

1. Aho, Ullman and Hopcroft, *Design and Analysis of Algorithms*, Pearson Education
2. Michael T Goodrich & Roberto Tamassia, *Algorithm Design: Foundations, Analysis & Internet Examples*, Wiley Student Ed., 2002.

Advanced Computer Networks (MCS-113)
Departmental Electives (DE-I); 4 Credits (3-1-0)

OBJECTIVE:

- The objective of the course is to introduce the students with the various upcoming technologies in the area of Computer Networks computing including GSM, GPRS and WSN etc.
- The Advanced Computer Networks provides a structured environment to develop critical understanding of relevant, m odern theories associated with practical expertise in networking technologies and applications in a wide range of contexts, preparing students for employment in the network industry.

S. No.	Topic	No. of Lectures
Unit 1	**Introduction to the computer networks:** Review of layered Architecture, Interconnection of different network connecting devices Introduction to Packet Switching Networks Asynchronous Transfer Technology (ATM),Introduction to TCP/IP architecture (IP,ARP,RARP and ICMP protocols),Transport Protocols (TCP,UDP),SCTP	**8**

Unit 2	**High Speed Networks**: Frame Relay, ATM, SONET, SDH, Gigabit Ethernet & High Speed LANs **Introduction to Wireless Networks**: Wireless LANs:-Infrared Vs Radio Transmission, Infrastructure & ad-hoc n/ws, IEEE 802.11 HIPERLAN, blue tooth **Wireless WANs:** GSM & TDMA technology, CDMA technology, IS-95, IMT-2000, Mobile data networks **Wireless ATMs:** Motivation for WATM, WATM services, Reference Model, Functions, Radio Access layers, Handover, Location Management, Addressing, Mobile QOS, Access Point Control Protocol	**8**
Unit 3	Introduction to Wireless Sensor Networks (WSN) and its applications (hardware and physical layer) Wireless Application Protocol: Architecture, WDP, WTP, WSP, WML, WML Script, Wireless Telephone Applications, Examples Stacks with WAP. Wireless Sensor Networks Application Protocols WSNs MAC Layer Protocols, WSNs Transport Protocol and Reliability	**8**
Unit 4	**Routing**: Ad-hoc routing: DSR, DSDV, AODV, Fisheye state routing, Hierarchical routing, Signaling: ICMP, LDP, Multi- Protocol Label Switching (MPLS), MPLS Label, Distribution Protocols and Traffic Engineering, Multicast routing: IGMP, , Multicast Trees, MBONE, Multicast Routing Protocols: DVMRP, MOSPF, CBT, PIM,WSNs Routing Protocols.	**8**
Unit 5	**Congestion Control and Active Queue Management (AQM)**: Open loop and Closed loop congestion control, Congestion control in packet networks, ECN and RED Algorithm, TCP and SCTP congestion control, Congestion Control in Frame Relay **Quality of Services (QoS)** Principles (Integrated Services and Differentiated Services) IP traffic models, Classes and subclasses, Integrated services archi tecture, Differentiated Service Architecture	**8**
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Text Books:-

1. Kurose and Ross, “Computer Networking: A top-down approach”, 4th edition, Addison Wesley. Murthy, “Ad Hoc Wireless Networks: Architectures And Protocols”, Pearson William Stallings, “High Speed Networks and Internets, 2/e”, Pearson

References:

1. Waltenegus Dargie, Christian Poellabauer,"Fundamentals of Wireless Sensor Networks: Theory and Practice", Willey Publication
2. William Stallings, "ISDN and broadband ISDN with frame relay and ATM", Pearson Education Asia, Fourth Edition, 2001.
3. Jean Walrand and Pravin Varaiya, "High Performance Communication networks", HARCOURT Asia PTE Ltd., 2nd edition, 2001.

Distributed Operating Systems (MCS-114)
Discipline Core (DC); 4 Credits (3-1-0)

S. No.	Topic	No. of Lectures
Unit 1	**Multiple Processor Systems**: Multiprocessors, Multiprocessor Hardware, Multiprocessor Operating System Types, Multiprocessor Synchronization, Multiprocessor Scheduling, Multicomputer: Multicomputer Hardware, Low-Level Communication Software, User-Level Communication Software, Remote Procedure Call, Distributed Shared Memory, Multicomputer Scheduling, Load Balancing. Distributed Systems: Network Hardware, Network Services and Protocols, Document-Based Middleware, File-System-Based Middleware, Object-Based Middleware, Coordination-Based Middleware, Grids.	**8**
Unit 2	**Process Synchronization and Deadlocks**: The Critical-Section problem, synchronization hardware, Semaphores, Classical problems of synchronization, Critical regions, Monitors, Deadlocks-System model, Characterization, Deadlock prevention, Avoidance and Detection, Recovery from deadlock, Combined approach to deadlock handling.	**8**
Unit 3	**Memory Management:** Paging, Segmentation, Segmentation with paging, Virtual Memory, Demand Paging, Page Replacement Algorithms, Thrashing. Distributed Shared Memory: Architecture, The Central Server Algorithm, The Migration Algorithm, The Read Replication Algorithm and Full Replication Algorithm for implementing Distributed Shared Memory, Memory Coherence and Design Issues.	**8**

Unit 4	**Distributed Transaction Management and Concurrency Control**: Distributed Transaction Processing: Concurrency Control, Classification of Failures, Backward and Forward Error Recovery, Recovery in Concurrent Systems, Consistent set of Checkpoints, Synchronous Checkpoints, Commit Protocols, Non-Blocking Commit Protocols and Voting Protocols.	**8**
Unit 5	**Security**: Security Environment, Threats, Intruders, Accidental Data Loss. Basics Of Cryptography: Secret-Key, Public-Key, One-Way Functions, Digital Signatures. Protection Mechanisms : Protection Domains, Access Control, Capabilities , Trusted Systems ,Trusted Computing Base Formal Models Of Secure Systems, Multilevel Security Authentication : Authentication Using Passwords, Using A Physical Object, Authentication Using Biometrics Malware: Trojan Horses, Viruses, Worms, Spyware, Rootkits. Defenses: Firewalls, Antivirus And Anti-Antivirus Techniques, Code Signing, Jailing, Model-Based Intrusion Detection, Java Security.	**8**
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Reference/Text Books:

1. Distributed Operating Systems, Andrew S. Tanenbaum, Pearson Education India, ISBN 8177581791.

2. Distributed Operating Systems: Concepts and Design, Pradeep K. Sinha, Prentice Hall India Learning Private Limited,ISBN-10: 8120313801

3. Operating System, Deitel, Pearson Education India,ISBN-10: 8131712893

Digital Image Processing (MCS-115)
Discipline Core (DC); 4 Credits (3-0-2)

Objectives:

The objectives of this course are to:

1. Cover the basic theory and algorithms that are widely used in digital image processing
2. Expose students to current technologies and issues that are specific to image processing systems

3. Develop hands-on experience in using computers to process images
4. Familiarize with MATLAB Image Processing Toolbox
5. Develop critical thinking about shortcomings of the state of the art in image processing

Unit	Contents	No. of Lectures
	Introduction and Fundamentals: Motivation and Perspective, Applications, Components of Image Processing System, Element of Visual Perception, A Simple Image Model, Sampling and Quantization.	
Unit 1	**Image Enhancement in Frequency Domain:**Fourier Transform and the Frequency Domain, Basis of Filtering in Frequency Domain, Filters - Low-pass, High-pass; Correspondence Between Filtering in Spatial and Frequency Domain; Smoothing Frequency Domain Filters - Gaussian Lowpass Filters; Sharpening Frequency Domain Filters - Gaussian Highpass Filters; Homomorphic Filtering.	**8**
Unit 2	**Image Enhancement in Spatial Domain:**Introduction; Basic Gray Level Functions - Piecewise-Linear Transformation Functions: Contrast Stretching; Histogram Specification; Histogram Equalization; Local Enhancement; Enhancement using Arithmetic/Logic Operations - Image Subtraction, Image Averaging; Basics of Spatial Filtering; Smoothing - Mean filter, Ordered Statistic Filter; Sharpening - The Laplacian.	**8**
Unit 3	**Image Restoration:**A Model of Restoration Process, Noise Models, Restoration in the presence of Noise only-Spatial Filtering - Mean Filters: Arithmetic Mean filter, Geometric Mean Filter, Order Statistic Filters - Median Filter, Max and Min filters; Periodic Noise Reduction by Frequency Domain Filtering - Bandpass Filters; Minimum Mean-square Error Restoration.	**12**
Unit 4	**Morphological Image Processing:**Introduction, Logic Operations involving Binary Images, Dilation and Erosion, Opening and Closing, Morphological Algorithms - Boundary Extraction, Region Filling, Extraction of Connected Components, Convex Hull, Thinning, Thickening	**8**
Unit 5	**Registration:** Introduction, Geometric Transformation - Plane to Plane transformation, Mapping, Stereo Imaging - Algorithms to Establish Correspondence, Algorithms to Recover Depth	**8**
	Segmentation: Introduction, Region Extraction, Pixel-Based Approach,	

Multi-level Thresholding, Local Thresholding, Region-based Approach, Edge and Line Detection: Edge Detection, Edge Operators, Pattern Fitting Approach, Edge Linking and Edge Following, Edge Elements Extraction by Thresholding, Edge Detector Performance, Line Detection, Corner Detection.

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Reference/Text Books:

1. Digital Image Processing 2nd Edition, Rafael C. Gonzalvez and Richard E. Woods. Published by: Pearson Education.
2. Digital Image Processing and Computer Vision, R.J. Schalkoff. Published by: John Wiley and Sons, NY.
3. Fundamentals of Digital Image Processing, A.K. Jain. Published by Prentice Hall, Upper Saddle River, NJ.