4.3.4 SYLLABI OF PROGRAM CORE COURSES : IV SEMESTER

Course Code	Type	Subject	L	T	P	Credits	CA	MS	ES	PCA	PES	Pre-Requisites
ITITC09	CC	Operating system	3	0	2	4	15	15	40	15	15	None

COURSE OUTCOMES (COs)

By the end of the course students will be able to:

CO1: Describe the general architecture of computers and **explain** different structures for operating systems.

CO2: Summarize the services provided and the design of an operating system.

CO3: Relate the different concepts behind processes (scheduling algorithms, inter- process communication, deadlock, synchronization among processes) and **correlate** the structure and organization of the file system

CO4: Appraise the advantages of virtual memory and different approaches to memory management techniques.

CO5: Design programs based on operating system services and functionalities.

COURSE CONTENT **No. of hours:36**

Unit 1

Introduction: What is an Operating System, Types of OS: Classification on the basis of Performance, Open Source Operating System and Proprietory Operating System, Mobile, Web, Server and Computer OS, their advantages and disadvantages.

Processes: Definition of process, process states, PCB, process scheduling, inter-process communication, threads. [8 hrs]

Unit 2

CPU Scheduling: Basic concepts, Scheduling Criteria, Scheduling Algorithms, Multiple-Processor Scheduling.

Deadlocks: System Model, Starvation, deadlock characterization, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock. [9 hrs]

Unit 3

Process Synchronization: Critical-Section Problem, Solutions to synchronization-software approach, hardware approach, support from OS and complier (Semaphores), Classical Problems of Synchronization. [8 hrs]

Unit 4

Memory Management: Logical versus Physical Address space, swapping, Contiguous allocation, Paging, Segmentation.

Virtual Memory: Demand paging, page replacement, page replacement algorithms, demand paging, allocation of frames, thrashing. [9 hrs]

Unit 5

File - System Interface: File concept, access methods, directory structure, file - system structure, allocation

methods.
Mass Storage Structure: Disk structure, disk scheduling, RAID structure. [6 hrs]

SUGGESTED READINGS:

1. Silbersachatz and Galvin, "Operating System Concepts", John Wiley, 8th Ed.
2. Milan Kovic., "Operating Systems", Tata McGraw Hill
3. Deitel, Deitel and Choffnes, "Operating Systems", Pearson ,3rd Edition
4. Tannenbaum, "Operating Systems", PHI, 4th Ed.
5. Madnick E. and Donovan J., "Operating Systems", Tata McGraw Hill
6. Flynn McHoes, "Operating System", Cengage Learning
7. Sibsankar Halder and Alex A. Aravind, "Operating System", Pearson
8. William Stallings, "Operating Systems Internals & Design Principles", Pearson Education, 6th Ed

Course Code	Type	Subject	L	T	P	Credits	CA	MS	ES	PCA	PES	Pre-Requisites
ITITC10	CC	Design and Analysis of Algorithm	3	0	2	4	15	15	40	15	15	Data Structures

COURSE OUTCOMES (COs)
By the end of the course students will be able to:

CO1: Understand the complexity of algorithms with regard to their run time and space time.
CO2: Analyze the asymptotic performance of algorithms.
CO3: Write rigorous correctness proofs for design of algorithms.
CO4: Apply suitable algorithmic design paradigms and methods of analysis.
CO5: Synthesize efficient algorithms in engineering applications.

COURSE CONTENT **No. of hours:36**

Unit 1
Introduction: Fundamentals of the Analysis of Algorithmic. Performance Analysis-Space complexity, Time complexity, Efficiency –Asymptotic Notations and their properties. Mathematical analysis for Recursive and Non-recursive algorithms.

[6 hrs]

Unit 2
Brute Force and Divide & Conquer: Brute Force – Computing. Exhaustive Search. Divide and Conquer Methodology – Binary Search – Merge sort – Quick sort. Multiplication of Large Integers and Matrix Multiplication. [8 hrs]

Unit 3

Greedy Technique and Dynamic Programming: Greedy Technique –0/1 Knapsack problem, Optimal Merge pattern – Huffman Trees. Prim's algorithm and Kruskal's Algorithm.

Dynamic programming – Principle of optimality. All pair shortest paths, Floyd's algorithm, Matrix chain multiplication, 0/1 knapsack problem and Optimal Binary Search Trees. [9 hrs]

Unit 4

Backtracking and Branch & Bound: Backtracking – n-Queen problem – Hamiltonian Circuit Problem – Subset Sum Problem. Branch and Bound – LIFO Search and FIFO search – Knapsack Problem – Travelling Salesman Problem

[8 hrs]

Unit 5

NP-Hard and NP-Complete problems: Basic concepts, Non deterministic algorithms, NP – Hard and NP Complete classes, Cook's theorem. [5 hrs]

SUGGESTED READINGS:

1. Introduction to Algorithms by Thomas H. Coreman, Charles E. Leiserson and Ronald L. Rivest.
2. Fundamentals of Computer Algorithms by E. Horowitz & S Sahni.
3. The Design and Analysis of Computer Algorithms by Aho, Hopcraft, Ullman.

Course Code	Type	Subject	L	T	P	Credits	CA	MS	ES	PCA	PES	Pre-Requisites
ITITC11	CC	Software Engineering	3	1	0	4	25	25	50	-	-	None

COURSE OUTCOMES (COs)

By the end of the course students will be able to:

CO1: Define the fundamental concepts of Software engineering.

CO2: **Compare and Contrast** various process models for development of software applications.

CO3: **Use** different conceptual modeling techniques for information system design (including ER Diagrams, DFDs)

CO4: Implement logic modeling techniques (decision tree/table, structured English), and **illustrate** the managerial issues involved in SA & D

CO5: Design test cases using software testing techniques

Course Content: **No of Hours: 40**

Unit 1

Introduction: Introduction to software Engineering, Need of Software Engineering, Software

characteristics, Software development life-cycle models: Build and Fix, Water fall model, V-model, Prototyping model, Incremental model, Iterative enhancement Model, RAD model, Spiral models, Comparison of the models, Introduction to Agile methodology and Design for Software Engineering. [8 Hrs]

Unit 2

Requirement Engineering: Software Requirement Analysis and Specification: Requirements Elicitation Techniques, Requirements analysis, Models for Requirements analysis, requirements specification, requirements validation, ER diagrams, data flow diagrams, Data Dictionaries, Functional and non-Functional requirements, Software Requirement Specification (SRS). [8 Hrs]

Unit 3

System Design: Design Principles: Problem partitioning, Software Design: Modularity, Cohesion & Coupling, Classification of Cohesiveness & Coupling, Design Strategies, Function Oriented Design, Object Oriented Design, User Interface Design, structured analysis, extending DFD to structure chart. [4 Hrs]

Unit 4

Software project Management: Project planning and Project scheduling. Software Metrics: Size Metrics like LOC, Token Count, Function Count. Cost estimation using models like COCOMO, Risk Analysis and Risk Management.

Software Reliability and Quality Assurance: Reliability issues, Reliability metrics, reliability models, Software quality, software quality metrices, ISO 9000 certification for software industry, SEI CMM [8 Hrs]

Unit 5

Software Testing: Software Testing process and Terminologies, Verification and Validation, White box testing, Black box testing, Level of testing: Unit, Integration Testing, System Testing, Acceptance testing, Regression Testing, Mutation testing, Testing Tools and Standards, Introduction to continuous testing and deployment.

Software Maintenance: Management of Maintenance, Maintenance Process, Maintenance Models, Reverse Engineering, Software Re-engineering, Configuration Management, Documentation, Introduction to CASE tools and CASE shells, CASE Tool architectures, Introduction to continuous integration and maintenance. [12 Hrs]

SUGGESTED READINGS:

1. K. K. Aggarwal and Yogesh Singh, "Software Engineering", New Age International,
2. R. S. Pressman, "Software Engineering – A Practitioner's Approach", McGraw Hill Int. , 5th Ed.
3. Pankaj Jalote, "An Integrated Approach to Software Engineering", Narosa, 3rd Ed.
4. Stephen R. Schach, "Classical & Object Oriented Software Engineering", IRWIN,
5. James Peter, W. Pedrycz, "Software Engineering: An Engineering Approach", John Wiley & Sons.
6. I. Sommerville, "Software Engineering", Addison Wesley,8th Ed.
7. Frank Tsui and Orlando Karan, "Essentials of Software Engineering", Joes and Bartlett,
8. Kassem A. Saleh, "Software Engineering", Cengage Learning,
9. Rajib Mall, "Fundamrntal of Software Engineering", PHI, 3rd Ed.

10. Carlo Ghizzi , Mehdi Jazayeri and Dino Mandrioli, " Fundamental of Software Engineering", PHI.

Course Code	Type	Subject	L	T	P	Credits	CA	MS	ES	PCA	PES	Pre-Requisites
ITITC12	CC	Computer Networks	3	0	2	4	15	15	40	15	15	None

COURSE OUTCOMES (COs)

By the end of the course students will be able to:

CO1: Describe the basic computer network technology, data communications system and its components.

CO2: Classify the different types of network topologies and protocols. **Compare** and **summarize** the functioning of the layers of the OSI model and TCP/IP protocol suit.

CO3: Discover various types of MAC protocols and their function.

CO4: Analyze techniques/algorithms to solve different layers problems and issues in computer networks.

CO5: Design the protocols and services for different layers of OSI model.

COURSE CONTENT **No. of hours:38**

Unit 1

Introductory Concepts: Introduction to Computer Networks, Goals and Applications of networks, OSI Reference Model: A Layered Approach, Introduction to TCP/IP Protocol Suite.

Connecting Devices: Hubs, Repeaters, Bridges, Two-Layer Switches, Routers, Three-Layer Switches, Gateway.

Physical Layer: The Physical Layer, Network structure and architecture, services, networks topology. Transmission Media - Guided and Unguided, Switching- Circuit Switching, Packet Switching- Virtual Circuits and Datagram Approach, Message Switching. [8 hrs]

Unit 2

The Data Link Layer: Data Link Layer Design Issues, Framing, Error Detection and Correction Techniques e.g Parity, CRC, Checksum, Hamming Code etc., Flow Control Protocols, Stop-and- wait Flow Control, Sliding – Window Flow Control, Error Control, Stop-and-wait ARQ, Go-back-N, Selective-repeat, Data Link Protocols- HDLC.

Medium Access Sub Layer: Channel allocations, ALOHA Protocols (Pure and Slotted), Carrier Sense Multiple Access Protocols (persistent and non-persistent etc.), CSMA with Collision Detection, CSMA/CA, Collision free protocols, IEEE Standards- Ethernet, Token Bus and Token Ring. [10 hrs]

Unit 3

Network Layer: Routing algorithms (Link state, Distant Vector etc.), IP addressing (Classful and Classless), subnetting, IPv4 frame format and functions, IPv6, Congestion Control Algorithms, Packet discarding, Choke packets, Congestion prevention policies, Traffic shaping, Leaky bucket algorithm, Token bucket algorithm, Quality Control.

[8 hrs]

Unit 4

Transport Layer: Design Issue, Connection management, User Datagram Protocol, TCP Services, TCP Features, TCP window management, TCP frame format and functions.

[6 hrs]

Unit 5

Application Layer: Application Layer Protocols, DNS, Electronic Mail, WWW, FTP, Telnet.

Network Security: Introduction to network security**,** Message Confidentiality, Message Integrity, Message Authentication, Message Nonrepudiation, Digital signature, and Entity Authentication.
[6 hrs]

SUGGESTED READINGS:

1. Forouzan, "Data Communication and Networking", TMH, 4th Edition.
2. A.S. Tanenbaum, "Computer Networks", PHI, 4th Edition.
3. W. Stallings, "Data and Computer Communication", Macmillan Press.
4. Comer, "Computer Networks and Internet", PHI.
5. Comer, "Internetworking with TCP/IP", PHI.
6. W. Stallings, "Data and Computer Communication", McMillan.
7. J. Martin, "Computer Network and Distributed Data Processing", PHI.
8. W. Stallings, "Local Networks", McMillan.
9. M. Schwertz, "Computer Communication Network Design and Analysis", PHI.
10. S. Keshav, "An Engineering Approach to Computer Networking, Pearson"

Course No.	Title of the Course	Credits	Course Structure	Pre-Requisite
ITECC13	Analog and Digital Communication	4	L-T-P 3-0-2	Probability and Stochastic Process

COURSE OUTCOMES (CO)

By the end of the course students will be able to:

CO1: Understand and remember different modulation and demodulation schemes for analog and digital communications.

CO2: Illustrate the basic knowledge of probability theory and understand the effect of Noise in communication system.

CO3: To design, implement and compare various modulation and demodulation schemes.

CO4: To select different pattern of voltage, current used to represent digital data transmitted down a transmission line.

CO5: To formulate mathematical model of a given communication system.

UNITS	Topics
UNIT-1	INTRODUCTION: Introduction to communication system, Communication Channels, Review of signals, time scaling and shifting of signals, Fourier transform and its properties, Bandpass representation of Signals, Need for modulation.
UNIT-2	ANALOG MODULATION: Definition, Time domain and frequency domain description - AM, DSBSC, single tone modulation, power relations in AM waves, Generation and Demodulation of AM waves, Generation and demodulation of DSBSC Waves. Noise analysis of AM and DSB receivers, SSB modulation and demodulation. Introduction to FM and PM, Frequency Modulation: Single tone frequency modulation, Spectrum Analysis of Sinusoidal FM Wave, Narrow band FM, Wide band FM, Generation and Demodulation of FM Waves, Noise in FM Receiver.
UNIT-3	PULSE MODULATION TECHNIQUES: Sampling, TDM, Pulse Code Modulation, Differential PCM systems (DPCM), Delta modulation, adaptive Delta modulation, comparison of PCM and DM systems, noise in PCM and DM systems.
UNIT-4	BASEBAND MODULATION: Model of Digital Communication Systems, Gram-Schmidt Orthogonalization, Geometric interpretation of signals, detection of known signals in noise, probability of error, matched filter receiver, correlation receiver, Requirements of a line encoding format, various line encoding formats- Unipolar, Polar, Bipolar, Manchester encoding, Digital subscriber line.
UNIT-5	DIGITAL MODULATION TECHNIQUES: Digital Modulation formats, Coherent binary modulation techniques (BPSK, BFSK), Coherent quadrature modulation techniques (QPSK), Non-Coherent binary modulation techniques (DPSK), BER for BPSK, Huffman and Shannon Fano encoding.

TEXT BOOKS:

[T1] S. Haykin, Communication Systems, 4thEdn, John Wiley & Sons, Singapore, 2001.

[T2] B.P. Lathi, Modern Digital & Analog Communication Systems, 3rdEdition, Oxford University Press, Chennai, 1998.

[T3] Leon W. Couch II. Digital and Analog Communication Systems, 6thEdition, Pearson Education Inc., New Delhi, 2001.

[T4] A Bruce Carlson, PB Crilly, JC Rutledge, Communication Systems, 4th Edition, MGH, New York, 2002.