V SEMESTER
B.E - COMPUTER SCEINCE AND ENGINEERING
Scheme of Teaching and Examination (Autonomous Scheme)

Sl. No	Subject Code	Course Title	Teaching Dept.	Contact Hours / Week				Credits
				L	T*	P*	Total	
1	CS0407	Data Communication and Networking	CS & E	4	0	0	4	4
2	CS0413	Operating Systems	CS & E	4	0	0	4	4
3	CS0414	Database Management Systems	CS & E	4	0	0	4	4
4	CS0512	System Software	CS & E	4	2	0	6	5
5	CS0424	Management and Entrepreneurship	CS & E	4	0	0	4	4
6	CS------	Elective – I (GROUP 1 MOOC)	CS & E	3	0	0	3	3
7	CS0106	Microprocessor Interfacing Laboratory	CS & E	0	0	3	3	1.5
8	CS0107	Database Laboratory	CS & E	0	0	3	3	1.5
			TOTAL				31	27

* 1 Hour = 0.5 Credits

Pattern of course evaluation for both CIE and SEE will be mentioned in the abridged lesson plan and the Course Instructor (CI) will discuss the same with the students during the first/second session of the semester.

VI SEMESTER
B.E - COMPUTER SCEINCE AND ENGINEERING
Scheme of Teaching and Examination (Autonomous Scheme)

Sl. No	Subject Code	Course Title	Teaching Dept	Contact Hours / Week				Credits
				L	T*	P*	Total	
1	CS0418	Computer Networks	CS & E	4	0	0	4	4
2	CS0523	Object Oriented Modeling and Design	CS & E	4	2	0	6	5
3	CS0425	Compiler Design	CS & E	4	0	0	4	4
4	CS0450	Web Technologies and Applications	CS & E	4	0	0	4	4
5	CS-----	Elective – II (GROUP 2)	CS & E	3	0	0	3	3
6	CS-----	Elective – III (GROUP 3)	CS & E	3	0	0	3	3
7	CS0112	Web Technologies and Applications laboratory	CS & E	0	0	3	3	1.5
8	CS0109	Computer Networking Laboratory	CS & E	0	0	3	3	1.5
			TOTAL				31	26

* 1 Hour = 0.5 Credits

Pattern of course evaluation for both CIE and SEE will be mentioned in the abridged lesson plan and the Course Instructor (CI) will discuss the same with the students during the first

BLOWN-UP SYLLABUS - V SEMESTER

DATA COMMUNICATIONS AND NETWORKING (4:0:0)

Sub code	**:**	**CS0407**	**CIE**	**:**	**50 %**
Hours / week	**:**	**04**	**SEE**	**:**	**50 %**
SEE Hours	**:**	**3 Hours**	**Max. Marks**	**:**	**100**

Course Outcome

On successful completion of the course the students will be able to

1. Describe the basic concepts of data communication, networks, internet, OSI and TCP/IP models
2. Understand the digital conversion techniques, different transmission modes and transmission media.
3. Analyze the different functionalities of data link layer and examine error detection and correction codes used
4. Categorize the different data link layer protocols and media access control protocols
5. Discuss the IEEE standards for wired and wireless LANs
6. Discuss the current wireless networks and understand the various connecting device usage

UNIT 1

Introduction: Data Communications, Networks, Network types, Internet history, Standards and administration. **Network Models:** Protocol layering, TCP/IP Protocol suite, the OSI Model. **Introduction to Physical Layer:** Data and Signals, Periodic Analog Signals, Digital Signals, Data rate limits.

SLE: Transmission impairment, Performance. **9 Hours**

UNIT 2

Digital Transmission: Digital-to-Digital conversion, Analog-to-Digital conversion. Transmission Modes.**Bandwidth utilization:** Multiplexing, Spread Spectrum. **Transmission Media:** Guided media – Twisted Pair, Coaxial Cable, Fibre Optic Cable, Unguided media – Radio waves, Microwaves.

SLE: Infrared transmission **9 Hours**

UNIT 3

Introduction to Data Link Layer: Introduction, Link-layer addressing. **Error Detection and Correction**: Introduction, Block coding, cyclic codes, Forward Error Correction.

SLE: Checksum. **8 Hours**

UNIT 4

Data Link Control: DLC Services, DLL Protocols, HDLC, PPP – Services, Framing, Transition Phases. **Media Access Control:** Random Access, Controlled Access, Channelization.

SLE: PPP – Multiplexing **9 Hours**

UNIT 5

Wired LANs: Ethernet Protocol, Standard Ethernet. **Wireless LANs:** Introduction, IEEE 802.11 Project, Bluetooth.

SLE: Fast Ethernet, Gigabit Ethernet. **9 Hours**

UNIT 6

Other Wireless Networks: WiMAX, Cellular Telephony, Satellite Networks – Operation, GEO Satellites, **Connection Of LANs:** Connecting Devices, Virtual LANS

SLE: MEO and LEO Satellites **8 Hours**

TEXT BOOK:

1. **Data Communications And Networking by BehrouzForouzan, Fifth Edition, McGraw Hill Education (India) Pvt. Ltd., 2013.**

REFERENCE BOOK:

1. **Communication Networks by Alberto Leon-Garcia and IndraWidjaja, Second Edition, Tata McGraw Hill Publications.**

OPERATING SYSTEMS (4:0:0)

Sub code	**: CS0413**	**CIE**	**: 50 %**
Hrs / week	**: 04**	**SEE**	**: 50 %**
SEE Hrs	**: 3 Hrs**	**Max. Marks**	**: 100**

Course Outcomes

On successful completion of the course the students will be able to

1. Analyze the mechanisms of Operating Systems to handle processes and threads and their communication
2. Identify the issues and various solutions for inter-process communication
3. Understand the different approaches to memory management.
4. Identify the design and implementation issues in virtual memory management
5. Explain the concepts of file system and its implementation
6. Explain the concepts of deadlock and analyze how they can be managed / avoided

UNIT 1

INTRODUCTION, PROCESSES AND THREADS: WHAT IS AN OPERATING SYSTEM? : The Operating system as an extended machine, The Operating system as a resource manager.
PROCESSES: The process model, Process creation, Process termination, Process hierarchies, Process states. THREADS: The thread model, Thread usage, implementing threads in user space, implementing threads in the kernel, Hybrid implementations, Scheduler activations. SCHEDULING: Introduction to scheduling, Scheduling in batch Systems, Scheduling in interactive systems.

SLE: Thread scheduling **9 Hours**

UNIT 2

INTERPROCESS COMMUNICATION
Race conditions, Critical regions, Mutual exclusion with busy waiting, Sleep and wakeup, Semaphores, Mutexes, CLASSICAL IPC PROBLEMS: The dining philosophers problem, The readers and writers problem.
Memory Management: No Memory Abstraction, A Memory Abstraction: Address Spaces - The Notion of an Address Space, Swapping, Managing Free Memory.

SLE: Barriers **8 Hours**

UNIT 3
MEMORY MANAGEMENT, PAGE REPLACEMENT ALGORITHMS & DESIGN ISSUES: Virtual Memory: Paging, Page Tables, Speeding Up Paging, Page Tables for large memories.
PAGE REPLACEMENT ALGORITHMS: The optimal page replacement algorithm, The not recently used page replacement algorithm, The first-in first-out, The second chance page replacement algorithm, The clock page replacement algorithm, The least recently used,

SLE: Comparison of Page Replacement Algorithms **9 Hours**

UNIT 4

DESIGN ISSUES FOR PAGING SYSTEMS: Local versus Global allocation policies, Load control, Page size, Separate instruction and data spaces, Shared pages, Virtual memory interface. IMPLEMENTATION ISSUES: Operating system involvement with paging, Page fault handling, Instruction backup, locking pages in memory, Backing store, SEGMENTATION: Implementation of pure segmentation, Segmentation with paging:Multics.

SLE: Separation of policy and mechanism. **8 Hours**

UNIT 5

INPUT/OUTPUT: I/O SOFTWARE LAYERS: Interrupt handlers, Device drivers, Device-Independent I/O software.
FILE SYSTEMS: DIRECTORIES: Single-Level directory systems, Hierarchical directory systems, FILE SYSTEM IMPLEMENTATION: File system layout, implementing files, Implementing directories, Shared files, Log-Structured file systems, Disk space management, File system performance.

SLE: Defragmenting Disks **9 Hours**

UNIT 6

DEADLOCKS: INTRODUCTION TO DEADLOCKS: Conditions for deadlock, Deadlock modeling. THE OSTRICH ALGORITHM, DEADLOCK DETECTION AND RECOVERY: Deadlock detection with one resource of each type, Deadlock detection with multiple resource of each type, Recovery from deadlock, DEADLOCK AVOIDANCE: Resource trajectories, Safe and Unsafe States, The Banker's algorithm for a single resource, The banker's algorithm for multiple resources, DEADLOCK PREVENTION: Attacking the mutual exclusion condition, Attacking the Hold and Wait condition, Attacking the No Preemption condition.

SLE: Attacking the Circular Wait condition **9 Hours**

TEXT BOOK:
1. Modern operating systems, 4th /E, Tanenbaum, A., PHI / Pearson Edition Asia, 2001.

REFERENCE BOOKS:
1. Operating Systems, William Stallings, PHI, Fourth Edition
2. Operating System Principles – Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Wiley-India, 7th edition, 2006.
3. Operating Systems, Milan Kovic, **,** Tata McGraw Hill, 2001.
4. Operating System Design: v. 1: The Xinu Approach (Prentice-hall Software) Douglas Comer.
5. TUNIX Operating Systems: A Practical Approach, Robert Switzer, Prentice-Hall, 1993.

DATABASE MANAGEMENT SYSTEMS (4:0:0)

Sub code	**: CS0414**	**CIE**	**: 50 %**
Hrs / week	**: 04**	**SEE**	**: 50 %**
SEE Hrs	**: 03 Hrs**	**Max. Marks**	**: 100**

Prerequisite: File Systems

Course Outcome:

On successful completion of the course the students will be able to

1. Describe different database models and creation of MySQL database.
2. Design the database using Entity Relationship model and Normalization.
3. Write the SQL query to interact with the database and illustrate transaction concepts.
4. Create triggers, constraints and objects in MySQL.
5. Demonstrate the use of Indexes and Views.
6. Differentiate different types of failures and recovery techniques.

UNIT 1

Introduction: Advantages of using a DBMS approaches, Definition of schema, data model and instances, Three-schema architecture and data independence, Different Database Models, Interfacingwith a Database, The Mechanics, Disk versus Main-Memory,
An Example Database: The Everest Books Database
Relational Databases (with a MySQL Flavor): MySQL Database System, DatabaseOrganization, Creating and using the Database,

SLE: Steps in Designing a Database. **9 Hours**

UNIT 2

Manipulating the Database: Example Tables, Relational Algebra.
Database Design 1: ***The Entity-Relationship Model-*** Entity, Entity Sets, Attributes, Relationships, Constraints on Relationship types, Weak entity type, Notations for ER Diagrams, Modeling The Everest Books' Database
Database Design 2: Definition of Functional Dependencies, Normal Forms Based on Primary Keys - 1NF, 2NF, 3NF, BCNF

SLE: Ad Hoc Database Design **9 Hours**

UNIT 3

SQL: Basics, Data Definition Language, Data Manipulation Language, Stored Routines, Formatting and SQL.
Transactions: Informally Speaking, Transactions in SQL, Transaction Semantics, Serializability,Locks, SQL Isolation Levels, Transactions in MySQL

SLE: Orders,Invoices & Reports **8 Hours**

UNIT 4

Constraints: Constraints in SQL, Constraint Check Time.
Triggers: Triggers in SQL.
Objects: Objects in SQL, Referencing Objects

SLE: Comparing Objects. **9 Hours**

UNIT 5

Indexes: How does an Index Work?, Types of Indexes, Different Types of Indexes, HashIndexes, Indexes in MySQL,
Views: Two Implementations of Views, Views in MySQL, Examples.

SLE: Some Thoughts on Indexing. **9 Hours**

UNIT 6

Spatial Databases: MySQL, Example
Logs and Recovery: Failure Types, Logs, Log Details, Some Log Characteristics, Database Recovery, Database Recovery Example, MySQL.

SLE: **Spatial Databases:** Example **8 Hours**

TEXT BOOKS:

1. **The Database Book: Principles and Practice using MySQL, Narain Gehani,** Universities Press(India) Private Limited 2008.
2. **Fundamentals of Database Systems, Elmasri and Navathe,** Addison-Wesley, 5th Edition,2007.

REFERENCE BOOKS:

1. Database Management Systems, Raghu Ramakrishnan and Johannes Gehrke McGraw-Hill, 3rd Edition, 2003.
2. Silberschatz, Korth and Sudharshan: Database System Concepts, 6th Edition, McGrawHill, 2010.

SYSTEM SOFTWARE (4:2:0)

Sub code	**: CS0512**	**CIE**	**: 50 %**
Hrs / week	**: 06**	**SEE**	**: 50 %**
SEE Hrs	**: 3 Hrs**	**Max. Marks**	**: 100**

Prerequisite: Computer Organization

Course Outcome

On successful completion of the course the students will be able to

1. Differentiate between SIC and SIC/XE machine architecture and instruction set.
2. Analysis of basic concepts of an assembler's functions and characteristics.
3. Compare the design and implementation of One-Pass and Multi-Pass Assembler.
4. Describe the design and implementation of Loaders and Linkers.
5. Explains the function of Macroprocessors.
6. Demonstrate the use of Lex and Yacc to write compiler.

UNIT 1

Introduction: System software and machine architecture
Machine Architecture: The Simplified Instructional Computer (SIC) – SIC Machine Architecture, SIC/XE Machine Architecture, SIC, SIC/XE Programming Examples.

SLE: CISC machines, RISC machines, Comparison of CISC and RISC. **8 Hours**

UNIT 2

Assemblers – 1: Basic Assembler Function – A Simple SIC Assembler, Assembler Algorithm and Data Structures. **Machine Dependent Assembler Features** – Instruction Formats & Addressing Modes,

SLE: Implementing Assembler Data structure like symbol table etc. **8 Hours**

UNIT 3

Assemblers – 2: Machine Independent Assembler Features – Literals, Symbol-Definition Statements, Expression, Program Blocks, Control Sections and Programming Linking. **Assembler Design Options** – One-Pass Assembler, Multi-Pass Assembler.

SLE: Case Study Multi-Pass Assembler. **9 Hours**

UNIT – 4

Loaders and Linkers: Basic Loader Functions – Design of an Absolute Loader, A Simple Bootstrap Loader.
Machine-Dependent Loader Features – Relocation, Program Linking, Algorithm and Data Structures for a Linking Loader.
Loader Design Options - Linkage editors, Dynamic Linking.

SLE: Case study Bootstrap Loaders**.** **9 Hours**

UNIT – 5

Macro Processor: Basic Macro Processor Functions – Macro Definitions and Expansion, Macro Processor Algorithm and Data Structures, Machine- Independent Macro Processors Features.

SLE: Working of different macro processors. **8 Hours**

UNIT – 6

Lex And Yacc : The Simplest Lex Program, Recognizing Words With LEX, Symbol Tables, Grammars, Parser-Lexer Communication, The Parts of Speech Lexer, A YACC Parser, The Rules Section, Running LEX and YACC, LEX and Hand- Written Lexers, Using LEX - Regular Expression, Examples of Regular Expressions, A Word Counting Program, Parsing a Command Line. Using YACC - Grammars, Recursive Rules A YACC Parser – The Definition Section, The Rules Section, Symbol Values and Actions, The LEXER, Compiling and Running a Simple Parser.

SLE: Implementing a simple SIC assembler **9 Hours**

Note: Implementation of the concepts taught in the theory classes will be done in laboratory sessions.

TEXT BOOKS

1. **System Software,** Leland L Beck, 3rd Edition, Addison-Wesley Reprint 2010.
2. **Lex and Yacc** – John R Levine Mason and Doug Brown, O'Reilly, SPD, 1998

REFERENCE BOOKS

1. **System Programming and Operating Systems,** D M Dhamdhere, TATA McGraw Hill, 2nd Edition.

MANAGEMENT AND ENTREPRENEURSHIP (4:0:0)

Sub Code: CS0424 **CIE: 50%**
Hrs/week: 04 **SEE: 50%**
See Hrs: 3 Hrs **Max Marks: 100**

Course Outcome

On successful completion of the course the students will be able to

1. Provide the information about management as science, art, administration and as a key approach in doing a assigned work.
2. Explain planning and organizing, with planning students learn its importance and hierarchy and with organizing students learn about departmentation, committees, centralization and decentralization.
3. Explain the importance of staffing directing and controlling, meaning and steps in controlling.
4. Identifying who is an entrepreneur, his functions and types and identifying based on geography.
5. Provide knowledge of small scale industry and institutional support.
6. Prepare project Selection; Project Report; Need and Significance of Report.

UNIT 1

Management: Introduction: Meaning - nature and characteristics of Management, Scope and functional areas of management - Management as a science, art or profession Management & Administration - Roles of Management, Levels of Management.

SLE: Development of Management Thought - early management approaches - Modern management approaches, case studies on administration and management. **7 Hours**

UNIT 2

Planning: Nature, importance and purpose of planning process - Objectives - Types of plans (Meaning only) - Decision making - Importance of planning - steps in planning & planning premises - Hierarchy of plans.

Organizing: Nature and purpose of organization - Principles of organization - Types of organization - Departmentation - Committees – CentralizationVsDecentralization of authority andresponsibility - Span of control - MBO and MBE (Meaning only).

SLE: Case studies on planning and organizing. **9 Hours**

UNIT 3

Staffing: Nature and importance of Staffing - Process of Selection & Recruitment Directing & Controlling: Meaning and nature of directing - Leadership styles, Motivation Theories, Communication-Meaning and importance - Coordination, meaning and importance and Techniques of Co - ordination. Meaning and steps in controlling - Essentials of a sound control system - Methods of establishing control.

SLE: Cases studies on staffing, directing & controlling. **10 Hours**

UNIT 4

Entrepreneur: Meaning of Entrepreneur; Evolution of the Concept, Functions of an Entrepreneur, Types of Entrepreneur, Entrepreneur - an emerging Class. Concept of Entrepreneurship-Evolution of Entrepreneurship, Development of Entrepreneurship; Stages in entrepreneurial process; Role of entrepreneurs in Economic Development; Entrepreneurship in India; Entrepreneurship – its Barriers.

SLE: Case studies on entrepreneurs and overcoming barriers. **8 Hours**

UNIT 5

Small Scale Industry: Definition; Characteristics; Need and rationale: Objectives; Scope; role of SSI in Economic Development. Advantages of SSI Steps to start an SSI - Government policy towards SSI; Different Policies of S.S.I.; Government Support for S.S.I. during 5 year plans, Impact of Liberalization, Privatization, Globalization on S.5.1., Effect of WTO/GATT Supporting Agencies of Government for S.5.!.,Meaning; Nature of Support; Objectives; Functions; Types of Help; Ancillary Industry and Tiny Industry (Definition only).

Institutional Support: Different Schemes; TECKSOK; KIADB; KSSIDC; KSIMC; DIC Single Window Agency: SISI; NSIC; SIDBI;KSFC.

SLE: Case studies on setting up of small scale industries and institutional support. **10 Hours**

UNIT 6

Preparation Of Project : Meaning of Project; Project Identification; Project Selection; Project Report; Need and Significance of Report; Contents; formulation; Guidelines by Planning Commission for Project report; Network Analysis; Errors of Project Report; Project Appraisal. Identification of Business Opportunities: Market,Feasibility Study; Technical Feasibility Study; Financial Feasibility Study & Social Feasibility Study.

SLE: Case study on preparation of the project report and feasibility study . **8 Hours**

TEXT BOOKS

1. Entrepreneurship development text and cases, B Janakiram, M Rizwana.
2. Management and Entrepreneurship, NVR Naidu,T Krishna Rao.

REFERENCE BOOKS

1. Management Fundamentals Concepts, Application,Skill Development, Robert Lusier ,Thompson, 2007.
2. Principles of Management, P.C. Tripathi, P.N. Reddy,Tata McGraw Hill, 2007.
3. Entrepreneurship Development, S S Khanka, S Chand & Co, 2007.
4. Management, Stephen Robbins, 17th Edition, Pearson Education / PHI, 2003.
5. Web Sites for the Institutions listed in the Unit 5 on Institutional Support.

MICROPROCESSOR INTERFACING LABORATORY (0:0:3)

Sub code : CS0106 **Hrs / week : 03**

Course Outcome

On successful completion of the course the students will be able to

1. Implement assembly language programs for 8086 microprocessor for the given applications.
2. Implement assembly language interfacing applications for Elevator, Stepper Motor, Keypad, logic controller Display interface.

DATABASE LABORATORY (0:0:3)

Sub code: CS0107 **Hrs/week : 03**

Course Outcome:

At the end of this course the student will be able to

1. Explain his/her knowledge of database technology, its importance, its architectures, and the central role Database technology plays in Information Systems.
2. Apply appropriate development methodologies of data analysis, design and use appropriate modeling techniques for databases.
3. Demonstrate query facilities to formulate queries and manipulate the database e.g. Structured Query Language (SQL)
4. Appreciate the issues underlying database implementation in any database
5. Concentrate on a methodology for good database design and practical experience in designing and implementing standalone database system.

BLOWN-UP SYLLABUS - VI SEMESTER

COMPUTER NETWORKS (4:0:0)

Sub code	**: CS0418**	**CIE**	**: 50 %**
Hrs / week	**: 04**	**SEE**	**: 50 %**
SEE Hrs	**: 03 Hours**	**Max. Marks**	**: 100**

Prerequisite: Data Communications and Networking

Course Outcomes:

On successful completion of the course the students will be able to

1. Discuss the network layer services and learn the concepts of IP address, Classes, IPv4 Datagram.
2. Learn the auxiliary protocols in IPv4 and working of different Unicast Routing algorithms and protocols.
3. Discuss the concepts and working of IPv6 and various Multicast routing protocols.
4. Identify the services of the Transport layer and analyze the performances of UDP and TCP protocols.
5. Explain the congestion control in TCP and the working of SCTP.
6. Distinguish between various application layer protocols and analyze the need for information on DNS.

UNIT 1

Network Layer-I: Network layer services: Packetizing, Routing and forwarding, other services, Packet switching: Datagram approach, Virtual circuit approach.IPv4 addresses: Address space, Classful addressing, Classless addressing, DHCP, Network Address Resolution (NAT),Network Layer Protocols: Internet Protocol (IP): Datagram format, fragmentation, options.

SLE: Security of IPv4 datagrams.

9 hours

UNIT 2

Network Layer Protocols-II ICMPv4: Messages, debugging tools, ICMP Checksum, Mobile IP: Addressing, Agents, Three phases, Inefficiency in Mobile IP, Unicast Routing: Introduction, General Idea, Least cost routing, Routing Algorithms: Distance Vector Routing, Link State routing, Unicast Routing Protocols: Internet Structure, Routing Information Protocol(RIP), Path Vector Routing Algorithm Border Gateway Protocol(BGP): operation of External BGP(eBGP),Operation of Internal BGP(eBGP)

SLE: OSPF **8 hours**

UNIT 3

Network Layer Protocols-III: Multicast Routing: Introduction, Unicasting, Multicasting, broadcasting, Intra-domain Multicast Protocols: DVMRP, PIM. Inter-Domain Multicast Protocols; IGMP: Messages, Propagation of Membership Information and Encapsulation. IPv6 Addressing: Representation, Address space, Address space allocation, Auto configuration and Renumbering, The IPv6 Protocol: Packet Format, Extension Header, The ICMPv6 Protocol: Error Reporting Messages, Information Messages, Neighbor Discovery Messages and Group Membership Messages.

SLE: Transition from IPV4 to IPV6 **9 hours**

UNIT 4

Transport Layer-I: Introduction to Transport layer: Process-to-process communication, Addressing, Encapsulation and Decapsulation, Multiplexing and De-multiplexing, Flow Control. Transport-Layer Protocols: Introduction: Services, Port Numbers, User Datagram Protocol: User Datagram, UDP Services. Transmission Control Protocol: TCP services, TCP Features, Segment, A TCP Connection, Windows in TCP, Flow Control, Error control.

SLE: UDP Applications

9 hours

UNIT 5

Transport Layer-II: TCP congestion control: Congestion Window, Congestion detection, Congestion policies, Fast Recovery, TCP timers, options. SCTP: SCTP Services, SCTP features, Packet Format, An SCTP Association, Flow Control, Error Control

SLE: Taho TCP

8 hours

UNIT 6

Application Layer: Introduction: Transport-Layer Services: Providing Services, Application layer Paradigms, World Wide Web and HTTP. FTP: Two connections, Control, connection, Data Connection, Security for FTP. Electronic Mail: Architecture, Web based Mail, Email Security. Telnet: Local versus Remote Logging .Domain Name System: Name Space, Flat Name Space, DNS in the Internet, Resolution, Caching, Resource Records, DNS messages, Registrars, DDNS, Security of DNS

SLE : Web documents **9 hours**

TEXT BOOK:

1. **Data Communications and Networking,** BehrouzA. Forouzan, Tata McGraw-Hill, 5th Edition, 2013.

REFERENCEBOOKS:

1. **Computer Networks,** Andrew S. Tanenbaum, Pearson Education, 4th Edition, 2002.

2. **Data and Computer Communication,** William Stallings, Pearson Education, 8th Edition 2007.

OBJECT ORIENTED MODELING AND DESIGN (4:2:0)

Sub Code: CS0523 **CIE: 50%**
Hrs/week: 6 **SEE: 50%**
SEE Hrs: 3 Hrs **Max Marks: 100**

Prerequisite: Object Oriented Concepts

Course Outcomes

On successful completion of the course the students will be able to

1. Understand the importance of Classes, Objects and their relationships.
2. Identify proper classification technique and apply suitable modeling notations..
3. Make use of suitable modeling notations to solve problems.
4. Explain the process mechanisms of software development life cycle.
5. Apply object-oriented techniques to solve real-world applications.
6. Classify and use patterns.

UNIT – 1

The Object Model: The Foundations of the Object Model, Elements of the Object Model, Applying the Object Model.
Classes and Objects: The Nature of an Object, Relationships among Objects, The Nature of a Class, Relationships among Classes, The Interplay of Classes and Objects, On Building Quality Classes and Objects.

SLE: The Inherent Complexity of Software, the Five Attributes of a Complex System **8 Hours**

UNIT – 2

Classifications: The importance of Proper Classification, Identifying Classes and Objects.
Method: Notation - The Unified Modeling Language, Package Diagrams, Component Diagrams, Deployment Diagrams, Use Case Diagrams, Activity Diagrams**.**

SLE: Key Abstractions and Mechanisms.

9 Hours

UNIT – 3

Method: Notation - Class Diagrams, Sequence Diagrams, Interaction Overview Diagrams, Composite Structure Diagrams, State Machine Diagrams, Object Diagrams**.**

SLE: Timing Diagrams, Communication Diagrams.

9 Hours

UNIT – 4

Process: The Macro Process: The Software development Lifecycle, The Micro Process: The Analysis and Design Process.

SLE: First Principles. **8 Hours**

UNIT – 5

Pragmatics: Management and Planning, Staffing, Release Management, Reuse.
Applications: Control System - Traffic Management: Inception, Elaboration, Construction, Post Transition.
Data Acquisition: Weather Monitoring Station: Inception, Elaboration, Construction, Post Transition.

SLE: The Benefits and Risks of Object Oriented Development.

9 Hours

UNIT – 6

Patterns: What is a pattern and what makes a pattern? Pattern categories: Relationships between patterns, Pattern description. Communication Patterns: Forwarder-Receiver; Client-Dispatcher-Server; Publisher-Subscriber.
Idioms: Introduction, what can idioms provide? , Where to find idioms?

SLE: Counted Pointer example.

9 Hours

TEXT BOOKS

1. **Object-Oriented Analysis and Design with Applications** ,Grady Booch, Robert A. Maksimchuk, Michael W. Engle, Bobbi J.Young, Jim Conallen, Kelli A.Houston, 3rd Edition, Pearson, 2007. (Chapters 1,2,3,4,5,6,7,9,11)

2. **Pattern-Oriented Software Architecture, A System of Patterns**, Frank Buschmann, Regine Meunier, Hans Rohnert, Peter Sommerlad, Michael Stal, Volume 1, John Wiley and Sons, 2006. (Chapters 1, 3.5, 3.6, 4)

REFERENCE BOOKS

1. **Object-Oriented Systems Analysis and Design Using UML,** Simon Bennett, Steve McRobb and Ray Farmer:, 2nd Edition, Tata McGraw-Hill, 2002.

2. **Object-Oriented Modeling and Design with UML**, Michael Blaha, James Rumbaugh, 2nd Edition, Pearson Education, 2005.

3. **Object-Oriented Analysis, Design, and Implementation**,Brahma Dathan, Sarnath Ramnath, Universities Press, 2009.

4. **UML 2 Toolkit**, Hans-Erik Eriksson, Magnus Penker, Brian Lyons, David Fado, Wiley Dreamtech India, 2004.

5. **Object-Oriented Systems Analysis and Design Using UML**, Simon Bennett, Steve McRobb and Ray Farmer, 2nd Edition, Tata McGraw-Hill, 2002.

COMPILER DESIGN (4:0:0)

Sub code	**: CS0425**	**CIE**	**: 50 %**
Hrs / week	**: 04**	**SEE**	**: 50 %**
SEE Hrs	**: 03 Hours**	**Max. Marks**	**: 100**

Course Outcome

On successful completion of the course the students will be able to

1. Explain Translation Process and Scanning Process of a Compiler.
2. Apply CFG to generate Syntax tree.
3. Describe top down parsing techniques for different languages.
4. Explain Semantic Analysis Phase of the compiler.
5. Compare memory organization of different run-time environments
6. Explain code generation techniques.

UNIT 1

INTRODUCTION AND SCANNERS: The Translation Process, The Scanning Process, The TINY Language, Implementation of a TINY Scanner.

SLE: Finite Automata. **9 Hours**

UNIT 2

CONTEXT-FREE GRAMMARS AND PARSING: The Parsing Process, ParseTrees and Abstract Syntax Trees, Extended Notations: EBNF and Syntax Diagrams, Syntax of the TINY language.

SLE: context free grammar**,** Ambiguity. **8 Hours**

UNIT 3

TOP-DOWN PARSING: Top-Down Parsing by Recursive-Descent , LL(1) Parsing , First and Follow Sets, A Recursive-Descent Parser for the TINY Language.

SLE: Implementation of Recursive-Descent Parser for the TINY Language. **9 Hours**

UNIT 4

SEMANTIC ANALYSIS: Attributes and Attribute Grammars , The Symbol Table , Data Types and Type Checking , A Semantic Analyzer for the TINY Language .

SLE: Algorithms for Attribute Computation **9 Hours**

UNIT 5

RUNTIME ENVIRONMENTS: Memory Organization during Program Execution, Types of Runtime Environments: Fully Static, Stack based, Dynamic Memory (Overview of all three types), Stack-Based Runtime Environments without local procedures (in detail), Parameter Passing Mechanisms, Runtime Environment for the TINY Language

SLE: Dynamic Memory Runtime Environment **8 Hours**

UNIT 6

CODE GENERATION: Intermediate Code and Data Structures for Code Generation: Three-Address code and P-code, Code Generation of Data Structure References, Code Generation of Control Statements and Logical Expressions, TM: A simple Target Machine, A Code generator for the TINY Language

SLE: Basic Code Generation Techniques. **9 Hours**

Note: Refer to appendix B, “Tiny compiler listing“ of the text book for implementation details

TEXT BOOK

1. Compiler construction, Principles and Practice by Kenneth C Louden, Thomson Publications.

REFERENCE BOOK

1. **Compilers; Principles, Techniques and Tools** by Aho, Monica S Lam , J D Ullman, Pearson Publications.
2. **Compiler Construction by Niklaus Wirth.** An Ebook in PDF, available for free Download.

WEB TECHNOLOGIES AND APPLICATIONS (4:0:0)

Sub code	**: CS0450**	**CIE**	**: 50 %**
Hrs / week	**: 04**	**SEE**	**: 50 %**
SEE Hrs	**: 03 Hours**	**Max. Marks**	**: 100**

Prerequisite: Object Oriented Programming Concepts

Course outcome

On successful completion of the course the students will be able to

1. Interpret the basics of java language
2. Implement advance features of java – inheritance, multiple inheritance, packages, interface, multithreading and exception handling
3. Illustrate the usage of I/O streams, string handling, and networking in java
4. Prepare dynamic web pages using XHTML, CSS and XML
5. Create dynamic web pages using CGI and MYSQL
6. Demonstrate the creation of dynamic web pages using XHTML, PHP, MYSQL

UNIT 1

The Java Language – 1: The Genesis of Java: Java's Lineage, The creation of Java, Why Java is important to the Internet? Java's Magic, Java features; An overview of Java Programming: Object oriented programming, simple java program, Lexical issues; Data types, Variables and Arrays: Simple types, Literals, Variables, Arrays, Operators, Control Statements, Introduction to Java Classes: Classes, Object, Methods, Constructors, The this keyword, Garbage collection, The Finalize ( ) Method, A Stack Class.

SLE: Type conversions and Casting **9 Hours**

UNIT 2

The Java Language – 2: Methods and Classes; Inheritance; Inheritance Basic, Using Super, Creating Multilevel hierarchy, When Constructors are Called, Method Overriding, Dynamic Method Dispatch, Using Abstract Classes, Using Final, the Object Class; Java Packages and Interfaces; Exception Handling; Multithreading Programming.

SLE: Creation of User defined package **9 Hours**

UNIT 3

Java I/O Streams & String Handling: I/O Basics, Reading Consol Input, Writing Consol Output, The PrintWriter Class, Reading and Writing files; String Handling: String Constructors, String Length, String Operations, Character Extraction, String Comparison, Searching String, Modifying a String, valueOf(). Networking: Networking Basics.

SLE: StringBuffer Class. **9 Hours**

UNIT 4

XHTML, XML and CSS: XHTML: Basic syntax; Standard XHTML document structure; Basic text markup, Images; Hypertext Links; Lists; Tables; Forms; Frames; CSS: Introduction; Levels of style sheets; Style specification formats; Selector forms; Property value forms; Font properties; List properties; Color; Alignment of text; The Box model; Background images; The and tags; Conflict resolution. XML: Introduction; Syntax; Document structure; Document Type definitions; Namespaces; XML schemas; Displaying raw XML documents; Displaying XML documents with CSS.

SLE: Creation of Web Pages **8 Hours**

UNIT 5

CGI and MYSQL: Introduction to Apache Web Server- Introduction, Starting, stopping and Restarting Apache, Apache Log Files, MYSQL: Introduction, Tutorial, DBI, Table Joins, CGI - Introduction, , A Simple CGI Program, what can go wrong in the program? CGI.pm: Introduction, CGI.pm HTML Shortcuts, Information received by the CGI program, Form Widget Methods, Security consideration, A note on die().

SLE: Loading and Dumping a Database, Apache Configuration **9 Hours**

UNIT 6

PHP and MYSQL: PHP Introduction, Embedding PHP into HTML, Configuration, Quick examples, Language Syntax, Built-IN PHP Functions, PHP and MySQL.

SLE: Connecting PHP to Mysql **8 Hours**

TEXT BOOKS

1. **The Complete Reference Java 2,** Herbert Schildt, 5th Edition, Tata-McGraw-Hill, 2008
2. **Programming the World Wide Web**, Robert W. Sebesta, 4th Edition, Pearson Education, 2008.
3. **Open Source Web Development with Lamp**, James Lee and Brent Ware, Pearson Education, 2009

REFERENCE BOOKS

1. **Internet and World Wide Web: How to Program** -Harvey M. Deitel, Paul J. Deitel, 4thedition, Pearson , 2009.
2. **The Web Programming Building Internet Applications**- Chris Bates, 3rd Edition, Wiley India, 2006.
3. **The Java Handbook-** 1st edition, Patrick Naughton, Tata McGraw - Hill Education (1996)

WEB TECHNOLOGIES AND APPLICATIONS LABORATORY (0:0:3)

Sub code: CS0112 **Hrs/week: 03**

Course Outcome:

At the end of this course the student will be able to

1. Implement programs on Arrays, Stack, Class and Methods using java
2. Demonstrate usage of Interface, Packages, Multithreading and Exception handling in java
3. Explore working of I/O operations, String class in java
4. Prepare web pages using HTML/XHTML and CSS.
5. Create dynamic web pages using XHTML,CGI script and MYSQL
6. Construct dynamic web pages using XHTML/HTML, PHP and MYSQL

COMPUTER NETWORKING LABORATORY (0:0:3)

Sub code: CS0109 **Hrs/week: 03**

Course Outcomes:

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

1. Understand and illustrate cabling techniques and networking devices.
2. Configure and demonstrate working of Switch, Router and Wireless Devices.
3. Understand and Illustrate ACLs and NAT.
4. Configure and demonstrate DHCP Server, Static Routing and Dynamic Routing

ELECTIVES

REAL TIME SYSTEMS (3:0:0)

Sub code	**: CS0317**	**CIE**	**: 50% Marks**
Hrs/week	**: 03**	**SEE**	**: 50% Marks**
SEE Hrs	**: 03 Hours**	**Max. Marks: 100**	

Course Outcomes

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

1. Comparing Hard and Soft Real Time Systems.
2. Identifying temporal parameters of real time work load.
3. Analyze the fundamental problems of Real Time Systems.
4. Analyze the performances of the real time scheduling.
5. Distinguish between Fixed priority versus Dynamic priority algorithms.
6. Analyze the performances of various real time protocols.

UNIT 1

Hard Versus Soft Real-Time Systems: Jobs and Processors, Release Times, Deadline and Timing Constraints, Hard and Soft timing Constraints, Hard Real-Time Systems, Soft Real-Time Systems.

SLE: Application of RTS. **7 Hours**

UNIT 2

A Reference model of Real-Time systems: Processors and Resources, Temporal Parameters of Real-Time Work load, Periodic task model, Precedence Constraints and Data dependency, other types dependencies.

SLE: Scheduling hierarchy, Functional parameters of resources. **6 Hours**

UNIT 3

Approaches to Real-Time Scheduling: Clock-Driven approach, Weighted Round-Robin approach. Priority driven approach. Dynamic Versus Static Systems, Effective Release times and deadlines, optimality of the EDF and LST algorithms.

SLE: off-Line versus on-line scheduling, Non-Optimality of the EDF and LST algorithms.

7 Hours

UNIT 4

Clock-driven Scheduling: Notations and assumptions, static, Timer-Driven Scheduler, General Structure Cyclic Schedulers Cyclic executives, Improving the average response time of a periodic jobs.

SLE: Scheduling Sporadic Jobs. **6 Hours**

UNIT 5

Priority-Driven Scheduling of Periodic Tasks: Static assumption, Fixed Priority Versus Dynamic Priority algorithms, Maximum Scheduling utilization, Optimality of the RM and DM algorithms,

SLE: A schedulability test for fixed-Priority tasks with arbitrary response times. **6 Hours**

UNIT 6

Resources and Resources Access Control: Assumptions on resources and their usage, Effects of resources contention and resources access control Non preemptive critical section, Basic Priority – Ceiling Protocol, Stack-Based priority – Ceiling Protocol, Use of priority-ceiling protocol in Dynamic-Priority Systems, Preemption-Ceiling Protocol.

SLE: Real time protocol, Priority-Based Service Disciplines for switched Networks. **7 Hours**

TEXT BOOK

1. **Real Time Systems** – Jane W.S. Liu Pearson Education Asia, First Indian Reprint-2001.

REFERENCE BOOK

1. **Real Time Systems Design and Analysis:** An Engineer's Hand book Second Edition, Lapante.

STORAGE AREA NETWORKS (3:0:0)

Sub code :CS0326 **CIE : 50%**

Hrs/ Week : 03 **SEE : 50%**

SEE Hrs : 3 Hours **Max Marks : 100**

Course Outcome:

On successful completion of the course the students will be able to

1. Explain basic concepts of storage networks, such as I/O techniques, disk subsystems
2. Compare various RAID levels in storage virtualization
3. Explain I/O technologies and Network Attached Storage.
4. Summarize Network File systems and file servers, Storage virtualization and virtualization at various levels and use storage networks for data sharing, data protection, and digital archiving.
5. Classify types of Storage virtualization in the network, SAN Architecture and Hardware devices.
6. Explain Software Components of SAN and Configuration options for SAN.

UNIT 1

Introduction: Server Centric IT Architecture and its Limitations; Storage – Centric IT Architecture and its advantages.

Intelligent Disk Subsystems -1: Architecture of Intelligent Disk Subsystems; Hard disks and Internal I/O Channels.

SLE: Case study: Replacing a server with Storage Networks **6 Hours**

UNIT 2

Intelligent Disk Subsystems -2, I/O Technologies -1: Storage virtualization using RAID and different RAID levels; Caching: Acceleration of Hard Disk Access.

SLE: Availability of disk subsystems **6 Hours**

UNIT 3

I/O Technologies- 2: SCSI.
Network Attached Storage: Fibre Channel Protocol Stack;

SLE: The Physical I/O path from the CPU to the Storage System **6 Hours**

UNIT 4

File System And NAS: Local File Systems; Network file Systems and file servers.
Storage Virtualization-1: Definition of Storage virtualization; Implementation Considerations; Storage virtualization on Block or file level.

SLE: Case Studies: Direct Access File System. **7 Hours**

UNIT 5
Storage Virtualization-2: Symmetric and Asymmetric storage virtualization in the Network.

SAN Architecture and Hardware devices: Overview, creating a Network for storage; SAN Hardware devices, The fibre channel switch, Host Bus adaptors.

SLE: Hardware devices: - Putting the storage in SAN **7 Hours**

UNIT6

Software Components of SAN: The switch's Operating system, Device Drivers, The Supporting the switch's components.

SLE: Configuration options for SANs -.The Evolving Network Connections **7 Hours**

TEXT BOOKS:

1. **Storage Networks Explained,** UlfTroppens, Rainer Erkens and Wolfgang Muller, John Wiley & Sons, 2003.
2. **Storage Networks:The Complete Reference,** Robert Spalding, Tata McGraw Hill, 2003.

REFERENCE BOOKS:

1. **Information storage and management**, EMC Education services, Wiley India 2009, G Somasundaram, Alok, Srivatsava
2. **Storage Area Network Essentials: A Complete Guide to understanding and Implementing SANs,** Richard Barker and Paul Massiglia, John Wiley India, 2002.
3. **Storage Networking Fundamentals** Marc Farley, Cisco Press, 2005.

LINUX INTERNALS (3:0:0)

Sub code : CS0318 **CIE : 50 %**

Hrs / week : 03 **SEE : 50 %**

SEE Hrs : 3 Hours **Max. Marks : 100**

Course Outcome

On successful completion of the course the students will be able to

1. Explain Linux Operating System basics, Kernel., booting process
2. Analyze memory management in Linux
3. Describe Inter process Communication and compare File Systems in Linux
4. Experiment with Device Drivers in Linux.
5. Illustrate Network Implementation and Debugging.
6. Make Use Kernel related commands.

UNIT 1

Linux-The Operating System: Main Characteristics, Linux Distributions: Compiling the kernel, Where is everything?, Compiling , Additional Configuration facilities

Introduction to kernel: important data structures, main algorithms, implementation of system Calls **The Booting process:** Carrying out the booting processes,

SLE: LILO-the Linux Loader, GRUB, Etc., **7 Hours**

UNIT 2

Memory Management: The Architecture-independent Memory model, The Virtual address space of a process, Block device caching, Paging under Linux

SLE: Paging under linux **6 Hours**

UNIT 3

Interprocess communication: Synchronization in the kernel, Communication via files, Pipes, System V IPC

File System: Basic principles, The representation of file system in kernel, The ext2,

SLE: Debugging using ptrace, proc file system, ext3 **6 Hours**

UNIT 4

Device Drivers Under Linux: Character and Block devices, Hardware, Polling, interrupts, and waiting queues.

SLE: Implementing a driver, Dynamic and static drivers **7 Hours**

UNIT 5

Network Implementation: Introduction and overview, Important structures, Network Devices under Linux **Modules and Debugging:** what are modules?, Implementation in the kernel, the meaning of object sections for modules, and kernels, parameter transfer and examples, What can be implemented as a module?, the kernel daemon, Simple data swapping between modules,.

SLE: Configuring the network interface, An example module, Debugging. **7 Hours**

UNIT 6

Kernel-Related Commands: Overview of the system's memory, ps-output of processes statistics, top-the CPU charts, init-primus inter pares, shutdown the system, strace monitoring a process, trace-route Ariadne's paths in the internet,.

SLE: Configuring a serial interface, configuring the parallel interface, Building a directory tree

6 Hours

TEXT BOOKS:

1. **Linux Kernel Programming**, M. Beck, et.al., III edition, Pearson Education 2002
2. **Linux Kernel Development**, Robert Love, Pearson Education 2004
3. **Understanding the Linux Kernel**, Daniel Bovet, Marco Cesati., III Edition, O'rielly Publications, 2005

DESIGN OF THE UNIX OPERATING SYSTEM (3:0:0)

Sub code	**: CS0320**	**CIE**	**: 50 %Marks**
Hrs / week	**: 03**	**SEE**	**: 50 %Marks**
SEE Hrs	**: 03 Hours**	**Max. Marks**	**: 100**

Course outcome:

On successful completion of the course the students will be able to

1. Understand the Unix system concepts
2. Understand the design of Unix Kernel and buffer cache
3. Demonstrate a clear view of the File System
4. Understand the structure of processes in UNIX OS
5. Understand the concept of Process Control and Management
6. explain the concept of memory management and I/O subsystems

UNIT 1

Overview of the UNIX System

System structure, user perspective, Operating System services, assumption about H/W. Architecture of UNIX operating system, introduction to system concepts, kernel data structure

SLE: System Administration **6 Hours**

UNIT 2

The Buffer Cache

Buffer headers, structure of the buffer pool, scenarios for retrieval of a buffer, reading and writing disk blocks

SLE: Advantages and Disadvantages of Cache **6 Hours**

UNIT 3

Internal Representation of Files

Inodes, structure of the regular file, directories, conversion of a pathname to inode, super block, inode assignment to a new file, allocation of disk blocks, other file types System Calls for the File System and change Root, Pipes, Mounting and Unmounting File Systems

SLE: Super Block **8 Hours**

UNIT 4

The Structure of process

Process stages and transitions, layout of system memory, the context of a process, saving Context of a process, manipulation of the process address space

SLE: Sleep. **6 Hours**

UNIT 5

Process Control & Scheduling
Process creation, signals, process termination, awaiting process termination, invoking other programs, the user id of a process, the shell, system Boot and the Init process. Process Scheduling, system call for time, clock
SLE: Real Time processing **7 Hours**

UNIT 6

Memory Management and I/O Subsystem
Swapping, Demand paging, Driver Interfaces, Disk Drivers, Streams
SLE: A Hybrid system with swapping and demand paging

6 Hours

TEXT BOOK:

The Design of The UNIX Operating System: Maurice J. Bach, Prentice-Hall.

REFERENCE BOOKS:

1. **UNIX Internals:** Steve D. Pate, Addison-Wesley.
2. **UNIX Operating System Source Code Level Six:** J. Lions, Department of Computer Science, The University of New South Wales.
3. **A commentary on the sixth edition UNIX Operating System:** J. Lions, Department of Computer Science, The University of New South Wales.
4. **Operating Systems – A Practical Approach:** Robert Switzer, Prentice-Hall (1993).
5. **A Practical Approach to Operating Systems:** Malcolm G. Lane, James D. Mooney, Boyd and Fraser Pub. co. (1998).
6. **Operating System Design: The XINU Approach:** Douglas Comer, Prentice Hall, 1st edition (1983).

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PROTOCOL ENGINEERING (3:0:0)

Sub code	**: CS0327**	**CIE**	**: 50 %Marks**
Hrs / week	**: 03**	**SEE**	**: 50 %Marks**
SEE Hrs	**: 03 Hours**	**Max. Marks**	**: 100**

Course Outcome

On successful completion of the course the students will be able to

1. Familiarize with the concept of protocols and their representation and discuss the phases of protocol engineering
2. Identify the components of protocol to be specified and to create formal specification of protocol using finite state machine
3. Design and develop SDL based specification of protocols
4. Apply different types of protocol verification and validation techniques
5. Compare different types of test sequence generation techniques and explain performance parameters
6. Discuss methods for interactive building of correct protocol specification and its implementation issues

UNIT 1

Introduction: Communication model, Communication Software, Communication Subsystems, Communication Protocol Definition/Representation, Formal and Informal Protocol Development Methods, Protocol Engineering Phases

Network Reference Model: Layered Architecture, Network Services and Interfaces, Protocol Functions: Encapsulation, Segmentation, Reassembly, Multiplexing, Addressing, OSI Model Layer Functions, TCP/IP Protocol Suite, Application Protocols.

SLE: Informal representation of TCP protocol 6 **Hours**

UNIT 2

Protocol Specification: Components of specification, Service specification, Communication Service Specification Protocol entity specification: Sender, Receiver and Channel specification, Interface specifications, Interactions, Multimedia specifications, Alternating Bit Protocol Specification..

SLE: RSVP specification **6 Hours**

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UNIT 3

Protocol Specification Language (SDL): Salient Features. Communication System Description using SDL, Structure of SDL Data types and communication paths. Examples of SDL based Protocol Specifications: Question and answer protocol, X-on-X-off protocol, Alternating bit protocol, Sliding window protocol specification, TCP protocol specification, SDL based platform for network, OSPF, Multi Protocol Label Switching.

SLE:BGP 7 **Hours**

UNIT 4

Protocol Verification / Validation: Protocol Verification using FSM, ABP Verification, protocol validation, Protocol Design Errors: Deadlocks, Unspecified Reception, Non-executable Interactions, State Ambiguities, Protocol Validation Approaches: Perturbation Technique, Reachability Analysis, Fair Reachability Graphs, SDL Based Protocol Verification: ABP Verification, SDL Based Protocol Validation: ABP Validation.

SLE: Process Algebra based Validation,Reachability Tree of a protocol **6 Hours**

UNIT 5

Protocol Conformance and Performance Testing: Conformance Testing Methodology and Framework, Local and Distributed Conformance Test Architectures, Test Sequence Generation

Methods: T, U, D and W methods, Distributed Architecture by Local Methods, Synchronizable Test Sequence, Conformance Testing of RIP, Testing Multimedia Systems, quality of service test architecture (QOS).

SLE: Conformance testing with Tree and Tabular Combined Notation (TTCN) **7 Hours**

UNIT 6

Protocol performance testing: Performance Test methods, SDL Based Performance Testing of TCP, Interoperability testing, Scalability testing protocol.

Protocol Synthesis and Implementation: Synthesis methods, Interactive Synthesis Algorithm, Automatic Synthesis Algorithm, Automatic Synthesis of SDL from MSC, Protocol Re-synthesis, Requirements of Protocol Implementation, Objects Based Approach to Protocol Implementation, Protocol Compilers.

SLE: SDL based performance testing of OSPF **7 Hours**

TEXT BOOK:

1. PallapaVenkataram and Sunilkumar S. Manvi: Communication Protocol Engineering, PHI, 2004.

REFERENCE BOOK:

1. Mohammed G. Gouda: Elements of Protocol Design, Wiley Student Edition, 2004.

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COMPUTER GRAPHICS AND VISUALIZATION (3:0:0)

Sub code	**: CS0307**	**CIE**	**: 50 %Marks**
Hrs / week	**: 03**	**SEE**	**: 50 %Marks**
SEE Hrs	**: 03 Hours**	**Max. Marks**	**: 100**

Course outcome

On successful completion of the course the students will be able to

1. Explain the basic components in computer graphic system.
2. Identify and Illustrate the OpenGL APIs with examples.
3. Identify and illustrate Interactive Programs and Animating Interactive Programs. Design of Interactive Programs.
4. Explain and identify basics of Geometric Objects and Transformations
5. Explain, identify and illustrate Geometric Objects and Transformations in Homogeneous Coordinates using OpenGL.
6. Analyze and compare Classical and computer viewing.

UNIT 1

Introduction: Applications of computer graphics; A graphics system; Images: Physical and synthetic; Imaging Systems; The synthetic camera model; The programmer's interface; Graphics architectures; Graphics Programming: The Sierpinski gasket.

SLE: Programming Two Dimensional Applications. **6 Hours**

UNIT 2

The OpenGL: The OpenGL API; Primitives and attributes; Color; Viewing; Control functions; The Gasket program; Polygons and recursion;

Input: Interaction; Input devices; Clients and Servers; Display Lists, Display Lists and Modeling;

SLE: The three-dimensional gasket; **7 Hours**

UNIT 3

Interaction: Programming Event Driven Input; Menus; Picking; Building Interactive Models;

Animating Interactive Programs; Design of Interactive Programs.

SLE: Logic Operations **6 Hours**

UNIT 4

Geometric Objects and Transformations-I: Scalars, Points, and Vectors; Three-dimensional Primitives; Coordinate Systems and Frames; Modeling a Colored Cube; Affine Transformations; Rotation.

SLE: Translation and Scaling; **6 Hours**

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UNIT 5

Geometric Objects and Transformations-II: Geometric Objects and Transformations; Transformation in Homogeneous Coordinates; Concatenation of Transformations; OpenGL Transformation Matrices.

SLE: Interfaces to three-dimensional applications; **7 Hours**

UNIT 6

Viewing: Classical and computer viewing; Viewing with a Computer; Positioning of the camera; Simple projections; Projections in OpenGL; Hidden-surface removal; Interactive Mesh Displays; Parallel-projection matrices; Perspective-projection matrices.

SLE: Projections and Shadows. **7 Hours**

TEXT BOOKS:

1. Edward Angel: **Interactive Computer Graphics A Top-Down Approach with OpenGL**, 5th Edition, Pearson Education, 2008. (Chapters 1 to 5)

REFERENCE BOOKS:

1. Donald Hearn and Pauline Baker: Computer Graphics- OpenGL Version, 3rd Edition, Pearson Education, 2004.
2. F.S. Hill Jr.: Computer Graphics Using OpenGL, 2nd Edition, Pearson education, 2001.
3. James D Foley, Andries Van Dam, Steven K Feiner, John F Hughes, Computer Graphics, Addison-Wesley 1997.

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MULTIMEDIA COMPUTING (3:0:0)

Sub code	**: CS0308**	**CIE :**	**50 %Marks**
Hrs / week	**: 03**	**SEE :**	**50 %Marks**
SEE Hrs	**: 03 Hours**	**Max. Marks:**	**100**

Course outcome

On successful completion of the course the students will be able to

1. Discuss types of multimedia networks and multimedia applications
2. Compare the different types of document formats
3. Design the different types of text compression techniques
4. Apply different types of compression techniques on audio and images
5. Analyze the different types of video compression techniques
6. Compare the different standards for the multimedia communications

UNIT 1

Multimedia communications

Introduction; Multimedia information representation; Multimedia networks: Telephone networks, Data networks, Broadcast television networks, Integrated services digital networks, Broadband multiservice networks; Multimedia applications : Interpersonal communications, Interactive applications over the Internet, Entertainment applications; Application and networking terminology : Media types, Communication modes, Network types, Multipoint conferencing,.

SLE: Applications of Multimedia Communications. Network QoS, Application QoS **7 Hours**

UNIT 2

Multimedia information representation

Introduction; Digitization principles: Analog signals, Encoder design, Decoder design; Text: Unformatted text, Formatted text, Hypertext; Images: Graphics, Digitized documents, Digitized pictures; Audio: PCM speech, CD-quality audio, synthesized audio; Video: Broadcast television, Digital video, PC video, Video content.

SLE: Audio and Video Representation in Multimedia **7 Hours**

UNIT 3

Compression Techniques(Text, Image, Audio and Video):

Introduction; Compression principles: Source encoders and destination decoders, Lossless and lossy compression, Entropy encoding, Source encoding;

Text compression: static Huffman coding, Dynamic Huffman coding, Arithmetic coding

SLE: Lempel-Ziv coding, Lempel-Ziv-Welsh coding **6 Hours**

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UNIT4

Image compression: Graphics interchange format, Tagged image file format, Digitized documents, Digitized pictures, JPEG.

Audio compression: Introduction; Differential pulse code modulation, Adaptive differential PCM, Adaptive predictive coding, Linear predictive coding, Code-excited LPC, perceptual coding, MPEG audio coders.

SLE: Audio Compression, Dolby audio coders **7 Hours**

UNIT 5

Video compression: Video compression principles, H.261, H.263, MPEG, MPEG-1, MPEG-2, MPEG-4.

SLE: MPEG-4, H.261, H.263 **6 Hours**

UNIT 6

Standards for multimedia communications

Introduction; Reference models: TCP/IP reference model, protocol basics; Standards relating to interpersonal communications: Circuit-mode networks, packet-switched networks, Electronic mail; Standards relating to interactive applications over the Internet: Information browsing, Electronic commerce, Intermediate systems, java and JavaScript; Standards for entertainment applications: Movie/video-on-demand, Interactive television.

SLE: Standards for Multimedia Communications, Video on Demand **6 Hours**

TEXT BOOK

1. **Multimedia Communications – Applications, Networks, Protocols and Standards** – Fred Halsall, Pearson Education, 2009.

REFERENCE BOOKS:

1. Multimedia computing, communications and Applications - Ralf Steinmetz, Klara Narstedt, 2nd Edition, Pearson Education, 2001.
2. Multimedia System Design- Prabhat K. Andleigh, Kiran Thakrar, PHI, 2003.
3. Multimedia Communication Systems: Techniques, Standards and Networks–K.R. Rao, Zoran S. Bojkovic and Dragorad A. Milovanovic, Pearson Education 2002.
4. Multimedia Information Networking- Nalin K. Sharad, PHI, 2002

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INTRODUCTION TO C# PROGRAMMING AND .NET CONCEPTS (3:0:0)

Sub code : CS0312	**CIE : 50%Marks**
Hrs/week : 03	**SEE : 50%Marks**
SEE Hrs :03 Hours	**Max. Marks :100**

Course Outcome

On successful completion of the course the students will be able to

1. Explain the basics of .Net platform and the role of base class libraries, role of common intermediate language and namespaces.
2. Discuss the fundamentals of c# and to build the basic c# program using different constructs.
3. Review the basic pillars of object oriented programming concepts.
4. Apply the exception handling technique to handle different types of errors.
5. Provide the knowledge about basics of object lifetime and to define the use of interfaces and collections.
6. Explain the callback interfaces, delegates, events and its implementation.

UNIT 1

THE PHILOSOPHY OF .NET: Understanding the Previous State of Affairs, The .NETSolution, The Building Block of the .NET Platform (CLR,CTS, and CLS), The Role of the .NET Base Class Libraries, What C# Brings to the Table, An Overview of .NET Binaries (aka Assemblies), the Role of the Common Intermediate Language , The Role of .NET Type Metadata, The Role of the Assembly Manifast, Compiling CIL to Platform –Specific Instructions, Understanding the Common Type System, Intrinsic CTS Data Types, Understanding the Common Languages Specification, Understanding the Common Language Run-time A tour of the .NET Namespaces.

SLE: Increasing Your Namespace Nomenclature **7 Hours**

UNIT 2

C# LANGUAGE FUNDAMENTALS: The Anatomy of a Basic C# Class, Creating objects:Constructor Basics, The Composition of a C# Application, Default Assignment and Variable Scope, The C# Member Initialization Syntax, Basic Input and Output with the Console Class, Understanding Value Types and Reference Types, The Master Node System.Object, The System Data Types (and C# Aliases), Converting Between Value Types and Reference Types Boxing and Unboxing, Defining Program Constants, C# Iteration Constructs, C# Controls Flow Constructs, The Complete Set of C# Operators, Defining Custom Class Methods, Understating Static Methods, Methods Parameter Modifies, Array Manipulation in C #, String Manipulation in C#, C# Enumerations, Defining Structures in C#, Defining Custom Namespaces.

SLE: Programming using basic constructs of c# **7 Hours**

UNIT 3

OBJECT- ORIENTED PROGRAMMING WITH C#: Forms Defining of the C# Class, Definition the "Default Public Interface" of a Type, Recapping the Pillars of OOP, The First Pillars: C#'s Encapsulation Services, Pseudo- Encapsulation: Creating Read-Only Fields, The Second Pillar: C#'s Inheritance Supports, keeping Family Secrets: The "Protected" Keyword, Nested Type Definitions, The Third Pillar: C #'s Polymorphic Support, Casting Between.

SLE: Object oriented programming using VS.NET **6 Hours**

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UNIT 4

EXCEPTIONS : Ode to Errors, Bugs, and Exceptions, The Role of .NET Exception Handing,the System. Exception Base Class, Throwing a Generic Exception, Catching Exception, CLR System – Level Exception (System.System Exception), Custom Application-Level Exception (System. System Exception), Handling Multiple Exception, The Family Block, the Last Chance Exception Dynamically Identifying Application – and System Level Exception Debugging System.

SLE: Exception Using VS.NET **6 Hours**

UNIT 5

OBJECT LIFETIME: Understanding Object Lifetime, the CIT of "new', The Basics ofGarbage Collection,, Finalization a Type, The Finalization Process, Building an Ad Hoc Destruction Method, Garbage Collection Optimizations, The System. GC Type.

INTERFACES AND COLLECTIONS: Defining Interfaces Using C# Invoking InterfaceMembers at the object Level, Exercising the Shapes Hierarchy, Understanding Explicit Interface Implementation, Interfaces As Polymorphic Agents, Building Interface Hierarchies,

SLE: Building custom Interfaces and collections using VS.NET **7 Hours**

UNIT 6

CALLBACK INTERFACES, DELEGATES, AND EVENTS, ADVANCED TECHNIQUES: Understanding Callback Interfaces, Understanding the .NET Delegate Type,Members of System. Multicast Delegate, The Simplest Possible Delegate Example, Building More a Elaborate Delegate Example, Understanding Asynchronous Delegates, Understanding (andUsing)Events.

.**SLE :**Building callback interfaces ,delegates and events using VS.NET **6 Hours**

TEXT BOOK

1. **C# and the .NET platform** - Andrew Troelsen, Special Edition, Dream Tech Press, India, 2003.

REFERENCE BOOK:

1. Inside C# - Tom Archer, WP Publishers, 2001.

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EMBEDDED SYSTEMS (3:0:0)

Sub code	**: CS0331**	**CIE**	**: 50 %Marks**
Hrs / week	**: 03**	**SEE**	**: 50 %Marks**
SEE Hrs	**: 03 Hours**	**Max. Marks :**	**100**

Course Outcome

On successful completion of the course the students will be able to

1. Describe the fundamentals of Embedded Systems.

2. Develop necessary skills to understand and design an embedded system application.

3. Identify the challenges of Concurrent Process and its solutions.

4. Compare the advantages of the software Architectures and design an embedded system application using an RTOS.

5. Describe the inter task communication primitives like, semaphores and message queues. and design the hardware along with the choice of the RTOS for the application at hand.

6. Describe the Embedded Software Development Tools and Model the requirements of an application as a set of tasks.

UNIT 1

Custom single-purpose processor design; **RT-level custom single-purpose processor design**; **Optimizing custom single-purpose processors**: optimizing the FSMD, Optimizing the data-path, optimizing the FSM.

SLE : Optimizing the Original Program. **7 Hours**

UNIT 2

Timers, counters, and watchdog timers.

State machine models: Introduction; finite-state machines (FSM); Finite-state machines with data path model (FSMD); Using state machines: Describing a system as a state machine, Comparing state machine and sequential program models, Capturing a state machine model in a sequential programming language; Hierarchical/Concurrent state machine model (HCFSM) and the State charts language; Program state machine model (PSM);

SLE : An introductory example,A basic state machine model. **7 Hours**

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UNIT 3

Concurrent process models: Concurrent processes: Process create and terminate, Process suspend and resume, Process join; Communication among processes: Shared memory, Message passing; Synchronization among processes: Condition variables, Monitors.

Interrupts: The Shared Data Problem.

SLE : Interrupt Basics. **7 Hours**

UNIT 4

Survey of Software Architecture: Round Robin with Interrupts, Function Queue Scheduling Architecture; Real Time Operating System Architecture, Selecting architecture.

Introduction to RTOS: Tasks and Task States, Tasks and Data, Semaphores and shared data.

SLE: Round Robin. 7 **Hours**

UNIT 5

Basic Design Using an RTOS: Overview, Principles, An Example, Encapsulating semaphores and Queues, Hard Real-Time Scheduling Considerations.

SLE:Saving Power. 6 **Hours**

UNIT 6

Embedded Software Development Tools: Host and Target Machines, Linker/Locator for Embedded Software, getting embedded software into the Target System

SLE: Environment in which the program operates. 5 **Hours**

TEXT BOOKS

1. **Embedded System Design: A Unified Hardware/ Software Introduction** - Frank Vahid, Tony Givargis, John Wiley & Sons, Inc.2002

2. **An Embedded Software Primer** - David E. Simon: Pearson Education, 1999.

REFERENCE BOOKS

1. **Embedded C:** Michael J. Pont, Pearson Education (2002).

2. **Real-Time Systems and Programming Languages:** Alan Burns and Andy Wellings,

3. **Embedded Systems Building Blocks, Second Edition - Complete and Ready-to-Use Modules in C:** Jean J. Labrosse, CMP; 2nd edition (1999)

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GAME THEORY (3:0:0)

Sub Code	**: CS0310**	**CIE**	**: 50% Marks**
Hrs/Week	**: 03**	**SEE**	**: 50% Marks**
SEE Hrs	**: 03**	**Max Marks**	**: 100**

Course Outcome

On successful completion of the course the students will be able to

1. Familiarize with basics of game theory, examine and evaluate different situations using game theoretic approach.
2. Compare applications of deterministic outcome and probabilistic outcome (mixed strategy)
3. Construct sub-games under extensive game with perfect information and illustrates to find sub game perfect equilibrium.
4. Compute Nash equilibrium for situations which can be modeled as Bayesian games.
5. Test the theory of Nash equilibrium in strictly competitive games and analyze rationalizability of a game.
6. Acquire knowledge on monomorphic and polymorphic evolutionary games and analyze repeated games.

UNIT 1

INTRODUCTION; STRATEGIC GAMES: What is game theory? The theory of rational choice, interacting decision makers. Strategic games; Example: The prisoner's dilemma; Nash equilibrium; Examples of Nash equilibrium; Best-response functions; Dominated actions; Equilibrium in a single population: symmetric games and symmetric equilibria.

SLE: Find Nash equilibrium for BOS and Stag -Hunt game **7 Hours**

UNIT 2

MIXED STRATEGY EQUILIBRIUM: Introduction; Strategic games in which players may randomize; Mixed strategy Nash equilibrium; Dominated actions; Pure equilibria when randomization is allowed, illustration; Equilibrium in a single population, illustration; The formation of players' beliefs; Extensions; Representing preferences by expected payoffs.

SLE: Find Mixed strategy Nash equilibrium for prisoner's dilemma **7 Hours**

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UNIT 3

EXTENSIVE GAMES: Extensive games with perfect information; Strategies and outcomes; Nash equilibrium; Subgame perfect equilibrium; Finding subgame perfect equilibria of finite horizon games.

Extensions: Allowing for simultaneous moves, illustration: entry into a monopolized industry, Discussion: subgame perfect equilibrium and backward induction.

SLE: Problems on finding subgame perfect equilibrium and backward induction **7 Hours**

UNIT 4

BAYESIAN GAMES: Motivational examples; General definitions; Two examples concerning information; Illustration: auctions; Extensive games with imperfect information; Strategies; Nash equilibrium; Beliefs and sequential equilibrium; Signaling games; Illustration: strategic information transmission.

SLE: Auctions with an arbitrary distribution of valuations **6 Hours**

UNIT 5

STRICTLY COMPETITIVE GAMES, RATIONALIZABILITY: Strictly competitive games and maximization; Maximization and Nash equilibrium; Strictly competitive games; Maximization and Nash equilibrium in strictly competitive games. Rationalizability; Iterated elimination of strictly dominated actions; Iterated elimination of weakly dominated actions; Dominance solvability.

SLE: Problems on Iterated elimination of weakly dominated actions **6 Hours**

UNIT 6

EVOLUTIONARY EQUILIBRIUM, ITERATED GAMES: Monomorphic pure strategy equilibrium; Mixed strategies and polymorphic equilibrium; Asymmetric contests; Variations on themes: Sibling behavior.. Repeated games: The main idea; Preferences; Repeated games; Finitely and infinitely repeated Prisoner's dilemma;

Repeated games: Nash equalibria of general infinitely repeated games, finitely repeated games.

SLE: Nash equilibrium of an infinitely repeated Prisoner's dilemma. **6 Hours**

TEXT BOOK

1. **An Introduction to Game Theory –** Martin Osborne, Oxford University Press, Indian Edition, 2004.

REFERENCE BOOKS

1. **Game Theory: Analysis of Conflict** – Roger B. Myerson, Harvard UniversityPress, 1997.
2. **Microeconomic Theory** – Andreu Mas-Colell, Michael D. Whinston, and JerryR. Green, Oxford University Press, New York, 1995.
3. **Game Theory and Strategy** – Philip D. Straffin, Jr., TheMathematicalAssociation of America, January 1993.

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ADHOC NETWORKS (3:0:0)

Sub code	**: CS0328**	**CIE**	**: 50 %**
Hrs / week	**: 03**	**SEE**	**: 50 %**
SEE Hrs	**: 03 Hours**	**Max. Marks**	**: 100**

Course Outcome

On successful completion of the course the students will be able to

1. Identify the unique issues in ad-hoc wireless networks. Knowledge of the current technology trends for the implementation and deployment of Ad-hoc wireless networks.

2. Identify the challenges in designing MAC protocols for Ad-hoc networks and discuss the working of MAC protocols

3. Explain the challenges in designing Routing Protocols for Ad-hoc networks and discuss the working of Table-Driven Routing protocols

4. Explain the challenges in designing Routing Protocols for Ad-hoc networks and discuss the working of On-Demand Routing protocols

5. Describe the challenges in designing Transport Protocols for Ad-hoc networks and discuss the working of Transport protocols

6. Describe the challenges in designing Security Protocols for Ad-hoc networks and discuss the working of Security protocols

UNIT 1

INTRODUCTION: Cellular and Ad Hoc Wireless networks, Applications of Ad Hoc wireless networks; Issues in Ad hoc wireless networks: Medium Access Scheme, Routing, Multicasting, Transport Layer Protocols, Pricing Scheme, Quality of service positioning, Self-organization, Security, Addressing and Service Discovery, Energy Management, Scalability, Deployment Considerations;

SLE: Ad hoc wireless Internet. **7 Hours**

UNIT 2

MAC PROTOCOLS: MAC Protocols for Ad hoc wireless Networks: Introduction, Issues in designing a MAC protocol for Ad hoc wireless Networks, Design goals of a MAC protocol for Ad-hoc wireless Networks, Classification of MAC Protocols, Contention based protocols with reservation mechanisms: D-PRMA, CATA, SRMA/PA, FPRP, HRMA

SLE: MACA/PR. **7 Hours**

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UNIT 3

ROUTING PROTOCOLS: Routing protocols for Ad-hoc Wireless Networks: Introduction, Issues in Designing a Routing Protocol for Ad-hoc Wireless Networks, Classification of Routing Protocols. TABLE DRIVEN ROUTING PROTOCOLS**:** DSDV, WRP, CGSR

SLE: STAR protocol **6 Hours**

UNIT - 4

ROUTING PROTOCOLS- II: On-Demand Routing Protocols: Dynamic source Routing Protocol (DSR), AODV, TORA, LAR, ABR, and FORP.

SLE: SSA protocol **6 Hours**

UNIT - 5

TRANSPORT LAYER: Transport Layer Protocols for Ad-hoc wireless Networks: Introduction, Issues in Designing a Transport Layer Protocol for Ad-hoc wireless Networks, Design Goals of a Transport Layer Protocol for Ad hoc wireless Networks, Classification of Transport Layer Solutions, TCP over Ad-hoc wireless Networks: Feedback-Based TCP, TCP with Explicit Failure Notification, TCP-BUS, ,Split TCP.

SLE: ATP 7 **Hours**

UNIT 6

SECURITY: Security in wireless Ad hoc wireless Networks, Network security requirements, Issues & Challenges in Security Provisioning, Network security Attacks, Key Management: Symmetric and Asymmetric key Algorithms, key Management Approaches, key management in Ad-hoc Wireless Networks: Secure routing in Ad hoc wireless Networks: Requirements, SAR protocol,

SLE: ARAN **6 Hours**

TEXT BOOK

1. **Ad hoc Wireless Networks** – C. Siva Ram Murthy & B. S. Manoj, 2nd Edition, Pearson Education, 2005.

REFERENCE BOOKS

1. **Ad hoc Wireless Networks** – Ozan K. Tonguz and Gianguigi Ferrari, John Wiley, 2006.

2. **Ad hoc Wireless Networking –** Xiuzhen Cheng, Xiao Hung, Ding-Zhu Du, Kluwer Academic Publishers, 2004.

3. **Adhoc Mobile Wireless Networks -** C.K. Toh, Protocols and Systems, Prentice-Hall, 2002.

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WIRELESS COMMUNICATION NETWORKS (3:0:0)

Sub code : CS0305 **CIE: 50%**

Hrs/ week :03 **SEE :50%**

SEE Hrs : 3 Hours **Max Marks : 100**

Course Outcomes:

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

1. Describe the evolution of wireless communication and early growth of cellular radio around the world.
2. Outline an overview of the major wireless communication systems of 21'st century.
3. Illustrates the fundamental cellular radio concepts, such as frequency reuse, handoff and interference issues.
4. Analyze different ways to model and predict the large scale effects of radio propagation in different operating environments.
5. Explains the most common analog and digital modulation techniques used in wireless communication along with its tradeoffs.
6. Evaluate the Multiple Access Techniques for Wireless Communications, so as to accommodate large number of users and impact the system capacity and infrastructure of cellular systems.

UNIT 1

Introduction to Wireless Communication Systems & Networking: Evolution of Mobile Radio Communication, examples of Wireless Communication Systems, Cordless Telephone System. Cellular Telephone Systems,

SLE: Comparison of Common Wireless Communications Systems. **6 Hours**

UNIT 2

Modern Wireless Communications Systems: Second generation (2G), Cellular Networks, evolution of 2.5G, TDMA Standards, Third Generation (3G) Wireless Networks.

SLE: Wireless Local Loop (WLL) and LMDS, Wireless Local Area Networks (WLANs), Bluetooth and Personal Area Networks (PANS). **5 Hours**

UNIT 3

The Cellular Concept: System Design Fundamentals, Introduction, Frequency reuse, channel assignment strategies, handoff strategies – prioritizing handoffs, Practical Handoff considerations. Interference and system capacity, co-channel interference and system capacity, Channel planning for wireless systems.

SLE: Adjacent channel interference power control for reducing interference. **7 Hours**

UNIT 4

Mobile Radio Propagation: Introduction to radio wave propagation, Free space propagation model, Relating power to electric field, Reflection.

SLE: diffraction and scattering **7 Hours**

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UNIT 5

Modulation Techniques for Mobile Radio: Linear Modulation techniques – Binary phases shift keying (BPSK), Differential Phase Shift Keying (DPSK), Quadrature Phase Shift Keying (QPSK), Constant envelope modulation – Binary Frequency Shift Keying, Minimum Shift Keying (MSK), Gaussian Minimum Shift Keying (GMSK).

SLE: Frequency modulation Vs amplitude modulation, Amplitude modulation, Angle modulation, Digital Modulation. **7 Hours**

UNIT 6

Multiple Access Techniques for Wireless Communications:

Introduction to Multiple access, Frequency Division Multiple Access (FDMA), Time Division Multiple Access (TDMA), Spread Spectrum, Multiple Access, Space Division Multiple Access (SDMA), Packet Radio. Protocols.

Wireless Networking.

Introduction to Wireless Networks. Differences Between Wireless and Fixed Telephone Networks. Development of Wireless Networks.

SLE: Reservation Protocols–Reservation ALOHA, Packet Reservation Multiple Access (PRMA), Capacity of cellular systems. **7 Hours**

TEXT BOOKS

1. **Wireless Communications, Principles and Practice, second edition,**, Theodore S Rappaport, Pearson Education Asia,2002.

REFERENCE BOOKS

1. **Mobile Communications Engineering Theory and Applications, Second Edition**, William C Y Lee McGraw Hill Telecommunications 1998.

2. **Wireless Communications and Networks,** William Stallings Pearson Education Asia, 2002.

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INTRODUCTION TO ANDROID PROGRAMMING (3:0:0)

Sub code	**: CS0313**	**CIE**	**: 50 %**
Hours / week	**: 03**	**SEE**	**: 50 %**
SEE Hours	**: 3 Hours**	**Max. Marks**	**: 100**

Pre-requisite: DBMS, Java Programming

Course outcomes:

On successful completion of the course the students will be able to

1. Understand the basic versions, the evolution of Android as a Mobile OS, create simple apps and apply different styles.
2. Experiment with the User Interface of Android using Activities, Fragments and Intents.
3. Manipulate the UI with different common elements.
4. Apply the knowledge to a real time Android Application in terms of Design and Visualization.
5. Apply the knowledge to a real time Internet Download Application.
6. Able to learn how to persist data using preferences.

UNIT 1

GETTING STARTED WITH ANDROID PROGRAMMING: What Is Android? Android Versions, Features of Android, Architecture of Android, Android Devices in the Market, The Android Market, The Android Developer Community, Obtaining the Required Tools, Android SDK, Installing the Android SDK Tools, Configuring the Android SDK Manager, Eclipse, Android Development Tools (ADT), Creating Android Virtual Devices (AVDs), Creating Your First Android Application, Anatomy of an Android Application.

SLE: Designing a Android Application **6 Hours**

UNIT 2

ACTIVITIES, FRAGMENTS AND INTENTS: Understanding Activities, Applying Styles and Themes to an Activity, Hiding the Activity Title, Displaying a Dialog Window, Displaying a Progress Dialog, Displaying a More Sophisticated Progress Dialog, Linking Activities Using Intents, Resolving Intent Filter, Collision, Returning Results from an Intent, Passing Data Using an Intent Object, Fragments, Adding Fragments Dynamically, Life Cycle of a Fragment, Interactions between Fragments, Calling Built-In Applications Using Intents, Understanding the Intent Object, Using Intent Filters, Adding Categories.

SLE: Displaying Notifications in Android Application **7 Hours**

UNIT 3

GETTING TO KNOW THE ANDROID USER INTERFACE: Understanding the Components of a Screen, Views and View Groups, Linear Layout, Absolute Layout, Table Layout, Relative Layout, Frame Layout, Scroll View, Adapting to Display Orientation, Anchoring Views, Resizing and Repositioning, Managing

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Changes to Screen Orientation, Persisting State Information during Changes in Configuration, Detecting Orientation Changes, Controlling the Orientation of the Activity, Utilizing the Action Bar, Adding Action Items to the Action Bar, Customizing the Action Items and Application Icon, Creating the User Interface Programmatically, Listening for UI Notifications, Overriding Methods Defined in an Activity, Registering Events for Views.

SLE: Designing User Interface **7 Hours**

UNIT 4

DESIGNING YOUR USER INTERFACE WITH VIEWS: Using Basic Views, TextView, View, Button, ImageButton, EditText, CheckBox, ToggleButton, RadioButton, and RadioGroup Views, ProgressBar View, AutoCompleteTextView, View Using Picker Views, TimePicker View, DatePicker View, Using List Views to Display Long List, ListView View, Using the Spinner View, Understanding Specialized Fragments, Using a ListFragment, Using a DialogFragment, Using a PreferenceFragment

DISPLAYING PICTURES AND MENUS WITH VIEWS: Using Image Views to Display Pictures, Gallery and ImageView Views, Image Switcher, Grid View, Using Menus with Views, Creating the Helper Methods, Options Menu, Context Menu, Some Additional Views, Analog Clock and Digital Clock Views, Web View.

SLE: Designing Menus in Android **7 Hours**

UNIT 5

USING INTERNET RESOURCES: Downloading and Parsing Internet Resources, Connecting to an Internet Resource, Parsing XML Using the XML Pull Parser, Creating an Earthquake Viewer, Using the Download Manager, Downloading Files, Customizing Download Manager Notifications, Specifying a Download Location, Cancelling and Removing Downloads, Querying the Download Manager, Using Internet Services, Connecting to Google App Engine, Best Practices for Downloading Data Without Draining the Battery

SLE: Using Internet Resources to develop Android Applications **6 Hours**

UNIT 6

FILES, SAVING STATE, AND PREFERENCES:

Saving Simple Application Data, Creating and Saving Shared Preferences, Retrieving Shared Preferences, Creating a Settings Activity for the Earthquake Viewer, Introducing the Preference Framework and the Preference Activity, Defining a Preference Screen Layout in XML, Native Preference Controls, Using Intents to Import System Preferences into Preference Screens, Introducing the Preference Fragment, Defining the Preference Fragment Hierarchy, Using Preference Headers, Introducing the Preference Activity, Backward Compatibility and Preference Screens, Finding and Using

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the Shared Preferences Set by Preference Screens, Introducing On Shared Preference Change Listeners, Creating a Standard Preference Activity for the Earthquake Viewer, Persisting the Application Instance State, Saving Activity State Using Shared Preferences, Saving and Restoring Activity Instance State, Using the Lifecycle Handlers, Saving and Restoring Fragment Instance State, Using the Lifecycle Handlers, Including Static Files as Resources, Working with the File System, File-Management Tools Using Application-Specific Folders to Store Files, Creating Private Application Files, Using the Application File Cache, Storing Publicly Readable File

SLE: Creating Private Application Files **6 Hours**

TEXT BOOKS

1. Wei-Meng Lee, Beginning Android 4 Application Development, Wrox, Wiley India Edition. (Chapters: 1, 2, 3, 4, 5)
2. Reto Meier, Professional Android 4 Application Development, Wrox, Wiley India Edition(Chapters: 6, 7, 8)

REFERENCE BOOKS:

1. Mark Murphy, The Busy Coder's Guide to Android Development, version 4.2.
2. Android Programming: The Big Nerd Ranch Guide (Big Nerd Ranch Guides)
3. Paul Deitel, Harvey Deitel, Abbey Deitel, and Michael Morgano, Android for Programmers: An App-Driven Approach
4. Anubhav Pradhan, Anil V Deshpande, Composing Mobile Apps: Learn / Explore / Apply using Android 1st Edition.

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BIG DATA ANALYTICS (2:0:2)

Sub code	**: CS0324**	**CIE**	**: 50 %**
Hours / week	**: 03**	**SEE**	**: 50 %**
SEE Hours	**: 3 Hours**	**Max. Marks**	**: 100**

Course Outcome

On successful completion of the course the students will be able to

1. Overview of Big Data and Related Technologies
2. Analyze Technologies for Handling Big Data and Hadoop Ecosystem
3. Acquire clear understanding of MapReduce Fundamentals and HBase
4. Acquire clear understanding of Virtualizing and Processing Data using MapReduce
5. Acquire a clear understanding of YARN and Mahout
6. Acquire a clear understanding of Hive

UNIT 1

Getting an Overview of Big Data

What is Big Data? , History of Data Management – Evolution of Big Data, Structuring Big Data, Types of Data, Elements of Big Data, Volume, Velocity, Variety ,Veracity ,Big Data Analytics ,Advantages of Big Data Analytics, Use of Big Data in Social Networking, Use of Big Data in Preventing Fraudulent Activities, Use of Big Data in Retail Industry.

SLE: Future of Big Data in Automation Industry

6 hours

UNIT 2

Introducing Technologies for Handling Big Data and Hadoop Ecosystem

Distributed and Parallel Computing for Big Data, Introducing Hadoop, How does Hadoop Function?, Cloud Computing and Big Data, Features of Cloud Computing, Cloud Deployment Models, Cloud Delivery Models, Cloud Services for Big Data, Cloud Providers in Big Data Market, In-Memory Computing Technology for Big Data, Hadoop Ecosystem, Hadoop Distributed File System, HDFS Architecture, Features of HDFS, MapReduce, Features of MapReduce, Hadoop YARN,Introducing HBase, Combining HBase and HDFS.

SLE:Sqoop, Flume **6 hours**

UNIT 3

Understanding MapReduce Fundamentals and HBase

The MapReduce Framework, Exploring the Features of MapReduce, Working of MapReduce, Exploring Map and Reduce Functions, Techniques to Optimize MapReduce Jobs, Hardware/Network Topology,Synchronization, File System, Uses of MapReduce, Role of HBase in Big Data Processing, Characteristics of HBase

SLE : Installation of HBase **7 hours**

UNIT 4

Understanding Big Data Technology Foundations and Processing your Data with MapReduce

Exploring the Big Data Stack,Virtualization and Big Data, Virtualization Approaches,Developing a Simple MapReduce Application, Points to Consider while designing MapReduce.

SLE: Managing Virtualization with Hypervisor **6 hours**

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UNIT 5

Understanding Hadoop YARN Architecture and Mahout

Background of YARN, YARN Architecture, Working of YARN, YARN Schedulers, Backward Compatibility with YARN, YARN Configurations, YARN Commands,What is Mahout?, Machine Learning, Collaborative Filtering, Clustering, Classification, Mahout Algorithms, Environment for Mahout.

SLE: YARN Containers **7 hours**

UNIT 6

Exploring Hive

Introducing Hive, Hive Services, Data Types in Hive, Built-In Functions in Hive, Hive DDL, Data Manipulation in Hive, Data Retrieval in Hive, Using Joins in Hive.

SLE: Getting Started with Hive Installation **7 hours**

TEXTBOOK:

1. **Big Data: Black Book,** DT Editorial Services, Wiley India Pvt Ltd, 2015 Edition

REFERENCE BOOKS:

1. Big Data Analytics with R and Hadoop, Vignesh Prajapati, -Packt Publishing 2013
2. Michael Minelli, Michehe Chambers, “Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today’s Business”, 1st Edition, Ambiga Dhiraj, Wiely CIO Series, 2013.
3. Bill Franks, “Taming the Big Data Tidal Wave: Finding Opportunities in HugeData Streams with Advanced Analytics”, 1st Edition, Wiley and SAS BusinessSeries, 2012.
4. Tom White, “Hadoop: The Definitive Guide”, 3rd Edition, O’reilly, 2012.
5. Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data EMC Education Services, Wiley India Pvt Ltd

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INTRODUCTION TO DATA MINING (3:0:0)

Sub code : CS0325 **CIE : 50% Marks**

Hrs/week : 03 **SEE : 50% Marks**

SEE Hrs : 03 Hours **Max. Marks : 100**

Course Outcome

On successful completion of the course the students will be able to

1. Understand Data Mining concepts and applications of Data Mining Applications.
2. Discuss Data Preprocessing Techniques.
3. Understand Data Warehouse Implementation.
4. Acquire the knowledge of Data Cube Computation and Data Generalization
5. Acquire clear understanding of Mining Frequent Patterns, Associations, and Correlations
6. Apply the knowledge of Classification and Prediction in real world applications.

UNIT 1

Introduction to Data Mining:

Motivation and importance, What is Data Mining, Relational Databases, Data Warehouses, Transactional Databases, Advanced Database Systems and Advanced Database Applications, Data Mining Functionalities, Interestingness of a pattern Classification of Data Mining Systems.

SLE: Major issues in Data Mining**.** 6 **Hours**

UNIT 2

Data Preprocessing Why Pre-process the Data? Data Cleaning, Data Integration and Transformation Data Reduction, Discretization.

SLE: Concept Hierarchy Generation **6 Hours**

UNIT 3

Data Warehouse and OLAP Technology for Data Mining What is a Data Warehouse? Multi-Dimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, Development of Data Cube Technology.

SLE: Data Warehousing to Data Mining 7 **Hours**

UNIT 4

Data Cube Computation and Data Generalization: Efficient Methods for Data Cube Computation, Further Development of Data Cube and OLAP Technology, Attribute-Oriented Induction—An Alternative Method for Data Generalization and Concept Description

SLE: Class Description: Presentation of Both Characterization and Comparison **6 Hours**

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UNIT 5

Mining Frequent Patterns, Associations, and Correlations: Basic Concepts and a Road Map, Efficient and Scalable Frequent Itemset Mining Methods, Mining Various Kinds of Association Rules, From Association Mining to Correlation Analysis

SLE: Metarule-Guided Mining of Association Rules **7 Hours**

UNIT 6

Classification and Prediction: What Is Classification? What Is Prediction? , Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification, Rule-Based Classification, Classification by Backpropagation, Support Vector Machines, Prediction, Accuracy and Error Measures, Evaluating the Accuracy of a Classifier or Predictor, Model Selection

SLE: Ensemble Methods **7 Hours**

TEXT BOOK

1. Data Mining Concepts and Techniques, Jiawei Han and Micheline Kamber, Morgan Kaufman Publications

REFERENCE BOOKS

1. Introduction to Data Mining, Adriaan, Addison Wesley Publication

2. Data Mining Techniques, A.K.Pujari, University Press

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CLIENT – SERVER PROGRAMMING (3:0:0)

Sub code : CS0321 **CIE : 50% Marks**

Hrs/Week : 03 **SEE : 50% Marks**

SEE Hrs : 03 Hours **Max.Marks : 50**

Course Outcome

On successful completion of the course the students will be able to

1. Illustrate concurrent processing in client- server software and explain two basic approaches to network communication
2. Discuss algorithms and issues in Client Software Design
3. Implement TCP and UDP client for TIME service
4. Discuss algorithms and Issues in Server Software Design
5. Demonstrate Iterative Connectionless and Connection oriented Servers
6. Implement Concurrent Connection-Oriented Servers (TCP)

UNIT-1

The Client Server Model and Software Design: Introduction, Motivation, Terminology and Concepts.

C**oncurrent Processing in Client-Server software**: Introduction, Concurrency in Networks, Concurrency in Servers, Terminology and Concepts, An example of Concurrent Process Creation, Executing New Code, Context Switching and Protocol Software Design, Concurrency and Asynchronous I/O.

Program Interface to Protocols: Introduction, Loosely Specified Protocol Software Interface, Interface Functionality, Conceptual Interface Specification, System Calls, Two Basic Approaches to Network Communication, The Basic I/O Functions available in UNIX.

SLE: Using UNIX I/O with TCP/IP 7 **hours**

UNIT-2

The Socket Interface: Introduction, Berkley Sockets, Specifying a Protocol Interface, the Socket Abstraction, Specifying an End Point Address, A Generic Address Structure, Major System Calls used with Sockets, Utility Routines for Integer Conversion, Using Socket Calls in a Program,

Algorithms and Issues in Client Software Design: Introduction, Learning Algorithms instead of Details, Client Architecture, Identifying the Location of a Server, Parsing an Address Argument, Looking up a Domain Name, Looking up a well-known Port by Name, Port Numbers and Network Byte Order, Looking up a Protocol by Name, The TCP Client Algorithm, Allocating a Socket, Choosing a Local Protocol Port Number, A fundamental Problem in choosing a Local IP Address, Connecting a TCP Socket to a Server, Communicating with the Server using TCP, Reading a response from a TCP Connection, Closing a TCP Connection, Programming a UDP Client, Connected and Unconnected UDP Socket, Using Connect with

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UDP, Communicating with a Server using UDP, Closing a Socket that uses UDP, Partial Close for UDP, A Warning about UDP Unreliability.

SLE: Symbolic Constants for Socket Call Parameters. **7 marks**

UNIT-3

Example Client Software: Introduction, The Importance of Small Examples, Hiding Details, An Example Procedure Library for Client Programs, Implementation of Connect TCP, Implementation of Connect UDP, A Procedure that Forms Connections, Using the Example Library, The DAYTIME Service, Implementation of a TCP Client for DAYTIME, Reading from a TCP Connection, The Time Service, Accessing the TIME Service, Accurate Times and Network Delays, A UDP Client for the TIME Service, The ECHO Service.

SLE: A TCP Client for the ECHO Service, A UDP Client for the ECHO Service. **7 hours**

UNIT-4

Algorithm and Issues in Server Software Design: Introduction, The Conceptual Server Algorithm, Concurrent Vs Iterative Servers, Connection-Oriented Vs Connectionless Access, Connection-Oriented Servers, Connectionless Servers, Failure, Reliability and Statelessness, Optimizing Stateless Servers, Four Basic Types of Servers, Request Processing Time, Iterative Server Algorithms, An Iterative Connection-Oriented Server Algorithm, Binding to a Well Known Address using INADDR_ANY, Placing the Socket in Passive Mode, Accepting Connections and using them. An Iterative Connectionless Server Algorithm, Forming a Reply , Address in a Connectionless Server, Concurrent Server Algorithms, Master and Slave Processes, A Concurrent Connectionless Server Algorithm, A concurrent Connection-Oriented Server Algorithm, Using separate Programs as Slaves, Apparent Concurrency using a Single Process, When to use each Server Types, The Important Problem of Server Deadlock

SLE: Alternative Implementations. **6 hours**

UNIT-5

Iterative Connectionless Servers (UDP): Introduction, Creating a Passive Socket, Process Structure, An Example TIME Server.

Iterative Connection-Oriented Servers (TCP): Introduction, Allocating a Passive TCP Socket, A Server for the DAYTIME Service, Process Structure, An Example DAYTIME Server, Closing Connections.

SLE: Connection Termination and Server Vulnerability **6 hours**

UNIT-6

Concurrent Connection-Oriented Servers (TCP): Introduction, Concurrent ECHO, Iterative Vs Concurrent Implementations, Process Structure, An example Concurrent ECHO Server, Cleaning up Errant processes, Brief introduction to Single process, Concurrent Servers (TCP).

SLE: Examples on DAYTIME Server (concurrent server TCP) **6 Hours**

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TEXT BOOKS:

1. Douglas E.Comer, David L. Stevens: Internetworking with TCP/IP – Vol. 3, Client-Server

2. Programming and Applications, BSD Socket Version with ANSI C, 2nd Edition, Pearson, 2001.

REFERENCE BOOKS:

1. W. Richard Stevens: Unix Network Programming, PHI, 2001.2

2. W. Richard Stevens: TCP/IP Illustrated, Volumes 1, 2, and 3, Pearson, 2000

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WEB PROGRAMMING (2:0:2)

Sub code : CS0314 **CIE : 50% Marks**

Hrs/Week : 03 **SEE : 50% Marks**

SEE Hrs : 03 Hours **Max. Marks : 50**

Course Outcome

On successful completion of the course the students will be able to

1. Prepare Web pages using HTML/XHTML
2. Illustrate the application of CSS to the web pages
3. Explain the concepts and constructs of JavaScript
4. Demonstrate events handling in JavaScript
5. Create dynamic web pages using JavaScript
6. Discuss the characteristics and syntactic structure of XML document

Unit-1

Fundamentals: Introduction To The Internet, The World Wide Web, Web Browsers, Web Servers, Uniform Resource Locators, Multipurpose Internet Mail Extensions, The Hypertext Transfer Protocol, The Web Programmer's Toolbox.

Introduction To XHTML: Origin And Evolution Of HTML And HTML, Basic Syntax, Standard XHTML Document Structure, Basic Text Markup, Images, Hypertext Links, Lists, Tables, Forms, Frames,.

SLE: Syntactic Differences between HTML And XHTML **7 hours**

UNIT-2

Cascading Style Sheets: Introduction, Levels Of Style Sheets, Style Specification Formats, Selector Forms, Property Value Forms, Font Properties, List Properties, Color, The Box Model, Background Images, The <Span> And <Div> Tags, Conflict Resolution.

SLE: Alignment of text, conflict resolution **6 hours**

Unit-3

The Basics Of JavaScript: Overview Of JavaScript, Object Orientation And JavaScript, General Syntactic Characteristics, Primitives, Operations And Expressions, Screen Output And Keyboard Input, Control Statements, Object Creation And Modification, Arrays, Functions, An Example, Constructors, Pattern Matching using Regular Expressions, Another Example.

SLE: Errors in Scripts. **6 marks**

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Unit-4

JavaScript and XHTML Documents: The JavaScript Execution Environment, the Document Object Model, Element Access in JavaScript, Events and Event handling, Handling Events from Body Elements, Handling events from Button elements, DOM 2 Event Model, The Navigator object

SLE: Handling Events from Text Box and Password Elements**,** DOM tree Traversal and Modification.

7 hours

Unit-5

Dynamic Document with Javascript: Introduction, Positioning Elements, Moving Elements, Elements, Element Visibility, Changing Colors And Fonts, Dynamic Contents, Stacking Elements, Locating The Mouse Cursors, Reacting To A Mouse Click.

SLE: Slow Movement of Elements **6 hours**

Unit-6

Introduction To XML: Introduction, The Syntax Of XML, XML Document Structure, Document Type Definitions, Namespaces, XML Schemas, Displaying Raw XML Documents, Displaying XML Documents With CSS, XSLT Style Sheets,.

SLE: Dragging and Dropping Elements, XML Processors, Web Services **7 hours**

TEXT BOOK

1. Robert W. Sebesta : Programming the World Wide Web, 4th Edition, Pearson Education

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WIRELESS AND MOBILE NETWORKS (3:0:0)

Sub code: CS0330 **CIE: 50%**
Hrs/ week: 03 **SEE : 50%**
SEE Hrs: 3 Hours **Max Marks : 100**

Course Outcome:

On successful completion of the course the students will be able to

1. Describe an advanced element of learning in the field of wireless communication.
2. Outline the basic concepts of wireless connectivity and mobile computing.
3. Analyze networking principles and fundamental challenges of wireless devices, number portability in cellular networks.
4. Have a working understanding of the characteristics and limitations of mobile hardware devices including their user-interface modalities.
5. Gain knowledge about different mobile platforms and application development
6. Understand and analyse how Internet Protocols are used for mobile devices and how they are applied differently compared to static devices.

UNIT 1

Introduction to Wireless Communication Systems &Networking: Evolution of Mobile Radio Communication, Packet switched and circuit switched systems, examples of Wireless Communication Systems, Cellular Telephone Systems, Principle of Cellular Communication, Overview and comparision of AMPS, 1G, 2G, 2.5G and 3G,3.5G and 4G technologies

SLE: Comparison of Common Wireless Communications Systems, VoLTE, usage in India and its difference with normal voice calls. **5 Hours**

UNIT 2

Mobility and Handoff management: Handoff, Mobility management, Roaming management, Strategies for handoff detection, MAHO NCHO, MCHO, channel assignment, radio link transfer, hard handoff and soft handoff

SLE: Ongoing call termination vs New call blocking – precedence during handoff and implementation issues involved. **7 Hours**

UNIT 3

Number portability, SRF and challenges: Mobile Computing fundamental challenges, Mobile Number Portability-types, architecture and implementation, fixed networks and mobile networks, Signaling relay approaches, SRF

SLE: Mobile number portability in India, VoIP service for mobile networks **7 Hours**

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UNIT 4:

GSM and GPRS: GSM architecture, Location tracking and call setup, security, GPRS Services and architecture, classes of GPRS devices, GPRS state model and radio resource and multiple access management, sharing of radio channels between voice and data, USSD

SLE: Phone theft security and its relation with GSM network **7 Hours**

UNIT 5:

Mobile OS: Mobile Devices –Special Constrains & Requirements – Commercial Mobile Operating Systems, Palm OS, Win CE(basics) and Android OS architecture, Dalvik Virtual Machine working and its differences with JVM, SDKs

SLE: Wireless local loop (WLL) **7 Hours**

UNIT 6:

Mobile IP and Short message Services: Mobile IP and IP v 6 and its application in mobile computing, Triangle routing,logicalproblems and optimization**,** SMS Architecture, Mobile Originating and Mobile Terminating SMS, SMS TPDUs, SMS encoding & decoding

SLE: WAP protocol stack **6 hours**

TEXT BOOKS:

1. Yi Bing Lin, "***Wireless and Mobile Networks Architecture***", John Wiley, Oct 2, 2008

2. Ajay R. Mishra "***Cellular Technologies for Emerging Markets: 2G, 3G and Beyond",***
Wiley; 1 edition (August 30, 2010)

REFERENCE BOOKS:

1. Nikolay Elenkov "Android Security Internals: An In-Depth Guide to Android's ***Security Architecture"*** No Starch Press; 1 edition (November 2, 2014)

2. Tomasz Imielinski et.al, "***Mobile Computing***", Kluwer Academic Press

3. Raj Kamal, "***Mobile Computing***",Oxford University Press, 2nd edition, September 2012

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PYTHON PROGRAMMING (3:0:0)

Sub Code : CS0315 **CIE : 50% Marks**
Hours/Week : 03 **SEE : 50% Marks**
SEE Hours : 03 Hours **Max. Marks : 100**

Pre-requisite: Computer Programming Concepts

Course Outcomes:

On Successful Completion of the Course, the students will be able to:

1. Explain core ideology of Python and write simple python programs using numeric types.
2. Use String, List and Dictionary types in Python for data storage and processing.
3. Use various python control statements to develop applications.
4. Demonstrate use of advanced function features in Python.
5. Apply OOP features in python.
6. Demonstrate advanced function features and exception handling.

UNIT 1:
Introduction**:** Why do people use Python? Who uses Python today? What can I do with Python? What are Python's technical strengths? Introducing Python Object Types, The Python Conceptual Hierarchy, Why Use Built-in Types? Python's Core Data Types.
Numeric Types: Numeric Type Basics, Numbers in Action, Dynamic Typing Interlude, Case of the Missing Declaration Statements.
SLE: Shared References. **7 Hours**

UNIT 2:
String Fundamentals: String Basics, String Literals, String in Action, String Methods.
Lists and Dictionaries: Lists, Lists in action, Dictionaries, Dictionaries in action.
'Tuples-Files and Everything Else': Tuples, Files.
SLE : Sets **7 Hours**

UNIT 3:
Statements and Syntax: Assignments, Expressions, and Prints: Assignment Statements-Assignment Statement Forms, Sequence Assignments. if Tests and Syntax Rules: if statements, while and for Loops: while loops,break, continue, pass, and the Loop else. For Loops.
SLE: Loop Coding Techniques **6 Hours**

UNIT 4:
Function Basics: Why Use Functions, Coding Functions, Examples: Definitions and Calls, Intersecting Sequences. Arguments: Argument-Passing Basics, Special Argument-Matching Modes: Argument Matching Basics, Argument Matching Syntax
SLE: Keyword and Default Examples. **6 Hours**

UNIT 5: Classes and OOP: Class Coding Basics: Classes Generate Multiple Instance Objects, Classes Are Customized by Inheritance, Classes Can Intercept Python Operators, The World's Simplest Python Class, Class Coding Details: The class Statement, Methods, Inheritance, Namespaces: The Conclusion.
SLE: User-Defined Exceptions, Termination Actions. **7 Hours**

UNIT 6: Advanced Function Topics: Anonymous Functions-lambda, Functional Programming Tools-map, Headers: Collecting arguments, Calls: Unpacking arguments filter, reduce.

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Exception Basics: Why Use Exceptions? Exceptions: The Short Story,Exception Coding Details: The try/except/else Statement,The raise Statement
SLE: The try/finally Statement, Unified try/except/finally. **6 Hours**

TEXT BOOK:

1. **Learning Python,** Mark Lutz, O'Reilly Media, 5th Ed.

REFERENCE BOOKS:

1. **Introducing Python –** Modern Computing in Simple Packages, Bill Lubanovic, O'Reilly Media, First Edition.
2. **Think Python -** How to Think Like a Computer Scientist**,** Allen Downey, Green Tea Press, 2nd Edition (2.0.17)

WEB LINKS:

1. **Official Python Documentation:** https://docs.python.org
2. **Full Stack Python:**https://www.fullstackpython.com/

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OPERATION RESEARCH (3:0:0)

Sub Code : CS0311 **CIE : 50% Marks**

Hours/Week : 03 **SEE : 50% Marks**

SEE Hours : 03 Hours **Max. Marks : 100**

Course Outcome:

1. Understand the need for Operation Research for problem solving and apply the same for linear programming model
2. Analyse and apply Simplex Method for problem solving
3. Understand the fundamental and foundation of Simplex Method.
4. Understand Duality Theory and apply the same for problem solving
5. Explore different application areas of Operation Research like Transportation and Assignment Problems
6. Use the knowledge of Operation Research in Game Theory and Decision Making

UNIT 1

Introduction: The origin, nature and impact of OR; Defining the problem and gathering data; Formulating a mathematical model; Deriving solutions from the model; Testing the model; Preparing to apply the model; Implementation. **Introduction to Linear Programming:** Prototype example; The linear programming (LP) model,

SLE: Assumptions of LP. **7 hrs**

UNIT 2

Simplex Method - I: The essence of the simplex method; Setting up the simplex method; Algebra of the simplex method; the simplex method in tabular form.

SLE: Tie breaking in the simplex method **6 hrs**

UNIT 3

Simplex Method – I: Adapting to other model forms

Simplex Method – II: Foundation of simplex method, the revised simplex method, a fundamental insight

SLE: Simplex method in Matrix form **6 hrs**

UNIT 4:

Duality Theory: The essence of duality theory; Economic interpretation of duality, Primal dual relationship; Adapting to other primal forms.

SLE: SOB Method **6 hrs**

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UNIT 5

Transportation and Assignment Problems: The transportation problem, A streamlined simplex method for the transportation problem; The assignment problem.

SLE: Travelling Salesmen Problem **7 hrs**

UNIT 6

Game Theory: The formulation of two persons, zero sum games; Solving simple games- a prototype example; Games with mixed strategies. **Decision Analysis:** A prototype example; Decision making without experimentation. Decision making with experimentation

SLE: Decision tree. **7 hrs**

TEXT BOOK:

1. Frederick S. Hiller and Gerald J. Lieberman: Introduction to Operations Research: Concepts and Cases, 9th Edition, Tata McGraw Hill, 2010

REFERENCE BOOK:

1. Wayne L. Winston: Operations Research Applications and Algorithms, 4th Edition, Cengage Learning, 2003

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ADVANCED JAVA (3:0:0)

Sub Code	**: CS0316**	**CIE : 50% Marks**
Hours/Week	**: 03**	**SEE : 50% Marks**
SEE Hours	**: 03 Hours**	**Max. Marks : 100**

Course Outcome

On successful completion of the course the students will be able to

1. Demonstrate the usage of Applet class and its interfaces.
2. Illustrate the main event classes and interfaces used by the AWT along with Creation, management of windows, fonts, output text, and utilize graphics.
3. Discuss standard AWT controls and layout managers
4. Explain the flexibility of GUI components of Swing compare to AWT
5. Discuss building complex systems from software components using Beans and how servlets dynamically extend the functionality of a web server
6. Demonstrate JDBC connectivity to Databases

Unit-1

Applet: The Applet Class,Two Types of Applets, Applet Basics , The Applet Class, Applet Architecture , An Applet Skeleton, Applet Initialization and Termination , Overriding update( ) , Contents Simple Applet Display Methods . Requesting Repainting, A Simple Banner Applet, Using the Status Window ,The HTML APPLET Tag , Passing Parameters to Applets, Improving the Banner Applet , getDocumentBase( ) and getCodeBase( ),AppletContext and showDocument( ) ,Outputting to the Console.

SLE: The AudioClip Interface, TheAppletStub Interface **6 hours**

Unit-2

Event handling in Java: Two Event Handling Mechanisms, The Delegation Event Model, Events classes, source of events, **events listener interfaces,** Using the Delegation Event Model,Adapter Classes.

Introduction to AWT: AWT classes, Windows Fundamental, Working With Frame Windows, Creating A Frame Window In An Applet, Creating A Windowed Program, Displaying Information With In A Window, Working With Graphics, Colors, Fonts, Setting The Paint Mode

SLE: Inner Classes, Managing text output using FontMetric **8 hours**

Unit-3

Using AWT Controls, Layout Manager and Menus:Control Fundamentals, Labels, Using Buttons, Checkboxes, Checkbox Group, Choice Controls Using Lists, Managing Scroll Bars, Using Text field, Text area, Understanding Layout Managers, Menu bars And Menus, Dialog Boxes.

SLE: File Dialog **6 hours**

Unit-4

Swing: Introduction To Swing, Origin Of Swing, Swing Is Built On The AWT, Two Key Swing Features, The MVC Connection, Components And Container, Swing Package, Event Handling, Create A Swing Applet, Painting.

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Exploring Swing: Jlabel&Imageicon, Jtextfield, The Swing Buttons, Jtabbedpane, Jcrollpane, Jlist, Jcombobox,.
SLE: trees, Jtable **6 hours**

Unit-5
JavaBeans: What Is JavaBeans, Advantages Of JavaBeans, Introspection, Bound And Constrained Properties, Persistence, Customizers, The API
Introducing Servlets: Background, Life cycle of Servlet, Using Tomcat, A simple Servlet program, API, javax.servlet package, handling HTTP Request and Response, using cookies
SLE: Beans example, Session Tracking **7 hours**

Unit-6
JDBC-connectivity to Database: Java Database Connectivity, Database Servers, Database Clients, JDBC (Java Database Connectivity), Working With Oracle Database, Working With MysqlDatabase, Stages in a JDBC Program, Registering The Driver, Connecting To A Database, Preparing SQL Statements, Using JDBC-ODBC , Bridge Driver to connect To Oracle Database, Retrieving Data From MysqlDatabase, retrieving Data From MS Access Database, Improving The Performance of a JDBC Program, Affectof Driver, Affectof Set fetchsize(), AffectOf Prepared statement, Stored Procedures and Callable statement, Types of Result Sets, Storing Images Into Database, Retrieving Images from Database, Storing a file into Database, Retrieving a File from the Database.
SLE: Resultsetmetadata, Databasemetadata, Types of JDBC Drivers **6 hours**

TEXT BOOKS

1. Java The Complete Reference, Herbert Schildt,9th Edition, Tata-McGraw-Hill,2014
2. Core JAVA An Integrated Approach, by Dr.R.Nageswara Rao, Dreamtech Press,2008

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ADVANCED ALGORITHMS (3:0:0)

Sub code	**: CS0323**	**CIE**	**: 50 %Marks**
Hrs / week	**: 03**	**SEE**	**: 50 %Marks**
SEE Hrs	**: 03 Hours**	**Max. Marks**	**: 100**

Prerequisite: Analysis and Design of Algorithms.

Course Outcome:

On successful completion of the course the students will be able to

1. Describe Hashing Technique and Red Black Trees
2. Design algorithm using Dynamic programming and Greedy
3. Compare different algorithms fusing Amortized Analysis
4. Describe B trees and Fibonacci heaps
5. Interpret max flow and multi-threaded algorithm
6. Interpret number-theoretic algorithms

UNIT 1

Hash tables: Direct-address tables, Hash tables, Hash functions, open addressing

Red Black Trees: Properties, Rotations

SLE: Hash Search and Deletion of Red Black Trees. **6 Hours**

UNIT 2

Dynamic Programming: Rod Cutting, Longest Common Subsequence.

Greedy Algorithms: Activity selection problem, Huffman codes

SLE: a task scheduling problem as a matroid. **6 Hours**

UNIT 3

Amortized Analysis: Aggregate analysis, The accounting method.

Single Source Shortest paths : The Bellman-Ford algorithm.

SLE: Single source shortest paths in a DAG**.** **7 Hours**

UNIT 4

B-trees: Introduction, Definition of B-trees, Basic operations of B-trees.

Fibonacci Heaps: Introduction, Structure of Fibonacci heaps,

SLE: Deleting a key from a B-tree. **7 Hours**

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UNIT 5

Maximum Flow: Introduction, Flow networks, the Ford-Fulkerson method, Maximum bipartite matching , push reliable algorithms: basic operations, push operation reliable operation, the generic algorithm.

Multi threaded algorithms :the basics of dynamic multithreading.

SLE: multi threaded matrix multiplication. **7 Hours**

UNIT 6

Number-Theoretic Algorithms : Modular arithmetic, Solving modular linear equations, The Chinese remainder theorem,, Powers of an element.

String matching algorithms : The Robin Karp algorithm.

SLE: string matching with finite automata. **6 Hours**

TEXT BOOK:

1. **Introduction to Algorithms –**Thomas H. Cormen, Charles E. Leiserson, Ronald L.Rivest, Clifford Stein PHI, 3rd Edition.

REFERENCE BOOKS:

1. **Computer Algorithms-** Ellis Horowitz, SartajSahni and SanguthevarRajasekaran, ComputerScience Press, 1998
2. **The Design and Analysis of Computer Algorithms-** Alfred V. Aho, John E. Hopcroft,Jeffrey D. Ullman, Addison Wesley, 1974.

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DECISION SUPPORT SYSTEM (3:0:0)

Sub Code **CS0304** CIE:**50% Marks**
Hrs/ Week: **3** SEE: **50% Marks**
SEE Hrs: **03** Max. Marks: **100**

Course Outcome:

On successful completion of the course the students will be able to

1. Explain the use of Computers in Decision support systems and its various applications
2. Develop decisions based on intelligence
3. Illustrate DSS and its components of DSS
4. Develop Mathematical models and set goals for the decision.
5. Develop DSS by using various tools techniques and methods.
6. Compare Enterprise decision support systems and Knowledge Management

Unit 1

DECISION-MAKING AND COMPUTERIZED SUPPORT: Management Support Systems: An Overview, Managers. and Decision-Making , Managerial Decision-Making and Information Systems, Managers and Computer Support, Computerized Decision Support and the Supporting Technologies, A Framework for Decision Support, The Concept of Decision Support Systems , Group Support Systems, Enterprise Information Systems, Knowledge Management Systems, Expert Systems, Artificial Neural Networks , Advanced Intelligent Decision Support Systems

SLE: Hybrid Support Systems , ABE Automation Makes Faster and Better Decisions with DSS **6 Hrs**

Unit - 2

Decision-Making Systems, Decision-Making: Introduction and Definitions, Systems, Models, Phases ofthe Decision-Making Process, Decision-Making: The Intelligence Phase, Decision-Making: The Design Phase, Decision-Making:The Choice Phase, Decision-Making: The Implementation Phase, How Decisions Are Supported, Personality Types, Gender, Human CognitiorI, and Decision Styles, The Decision-Makers,

SLE : Clay Process Planning at IMERYS: A Classical Caseof Decision-Making **7 Hrs**

Unit - 3

Decision Support Systems: DSS Configurations, What Is a DSS?, Characteristics and Capabilities of DSS, Components of DSS, The Data Management Subsystem, The Model Management Subsystem, The User Interface (Dialog) Subsystem, The Knowledge-Based Management Subsystem, The User, DSS Hardware, DSS Classifications.

Modeliug and Analysis: MSS Modeling, Static and Dynamic Models, Certainty, Uncertainty, and Risk, Influence Diagrams, MSS Modeling with Spreadsheets, Decision Analysis of a Few Alternatives (Decision Tables and Decision Trees)

SLE: The Advantage of Petro Vantage: Business IntelligencelDSS Creates an E-Marketplace **7 Hrs**

Unit - 4

Mathematical Modelling: The Structure of MSS Mathematical Models, athematical Programming Optimization, Multiple Goals, Sensitivity Analysis, What-If, and Goal Seeking, Problem-Solving Search Methods, Heuristic Programming, Simulation, Visual Interactive Modeling and Visual Interactive Simulation

Business Intelligence: Data Warehousing, Data Acquisition, Data Mining, BusinessAnalytics, and Visualization: The Nature and Sources of Data, Data Collection, Problems, and Quality, The Web / Internet and Commercial Database Services.

SLE: Quantitative Software Packages, Model Base Management, Database Management Systems in Decision Support Systems / Business Intelligence **7 Hrs**

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Unit - 5

Decision Support System Development:

Introduction to DSS Development, The Traditional System Development Life Cycle, Alternative Development Methodologies, Proto typing: The DSS Development Methodology, Change Management, DSS Technology Levels and Tools, DSS Development Platforms, DSS Development Tool Selection, Team-Developed DSS.

SLE: End User Developed DSS, Putting The DSS Together **6 Hrs**

Unit - 6

COLLABORATION, COMMUNICATION, ENTERPRISE DECISION SUPPORT SYSTEMS, AND KNOWLEDGE MANAGEMENT: Collaborative Computing Technologies: Group Support Systems, Group Decision-Making, Communication, and Collaboration, Communication Support, Collaboration Support: Computer-Supported Cooperative Work, Group Support Systems, Group Support Systems Technologies, Groupsystems Meetingroom and Online, The GSS Meeting Process.

SLE: Distance Learning, Creativity and Idea Generation **7 Hrs**

TEXT BOOK:

1. Decision Support Systems and Intelligent Systems - Efraim Turban. Jay E. Aronson, Ting Peng Liang:, 7th Edition, Prentice-Hall of India, 2006.

REFERENCE BOOKS

1. Frada Burstein, Clyde W. Holsapple, International Handbooks Information System, Handbook on decision support systems 1: Basic Themes, First edition, ISBN 3540487123, 9783540487128, 9783540487135, Springer-Verlag Berlin Heidelberg publisher, 2008

2. Vicki L. Sauter, Decision Support Systems for Business Intelligence, 2nd edition, ISBN 0470433744, 9780470433744, Wiley publication, 2011

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PERVASIVE COMPUTING (3:0:0)

Sub Code	**: CS0303**	**CIE : 50% Marks**
Hours/Week	**: 03**	**SEE : 50% Marks**
SEE Hours	**: 03 Hours**	**Max. Marks : 100**

Course outcomes:

On successful completion of the course the students will be able to

1. Discuss the different applications that use pervasive computing and also compare the different device technology available.

2. Assess the different device connectivity using the protocols

3. Use the voice technology in the hand held devices

4. Design and demonstrate some applications using the programming languages

5. Create the user interfaces for a given application

6. Apply the concepts to PDA and to compare the connected devices

UNIT 1

Past, present, future: The vine and fig tree dream, Pervasive computing, the pervasive computing market, m-Business Conclusions and challenges. Email access via WAP and voice.

Device technology: Hardware, Human-machine interfaces, Biometrics, Operating systems,Java for pervasive devices

SLE: Application examples: Airline check-in and booking, **7 Hours**

UNIT 2

Device connectivity: Protocols, Security, Device management. **WAP and beyond:** Introduction, Components of the WAP architecture, WAP infrastructure, WAP security issues, i-Mode SCCCC

SLE: Wireless Markup Language, WAP push, Products **7 Hours**

UNIT 3

Voice technology: Basics of speech recognition, Voice standards Speech applications, Speech and pervasive computing, Security. **Personal digital assistants:** History, Device categories,.

SLE: Personal digital assistant operating systems **6 Hours**

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UNIT 4

Server-side programming in Java: Java 2 Enterprise Edition: overview, Servlets, Enterprise Java Beans, Java Server pages, Web services, Model-view-controller pattern

SLE: Extensible Markup Language, **6 Hours**

UNIT 5

Example application: Introduction, , Architecture, Implementation **Access from PCs**: Smart-card-based authentication via the Internet. Access via WAP: WAP functionality.

SLE: User interfaces overview, implementation **7 Hours**

UNIT 6

Access from personal digital assistants: Extending the example application to personal digital assistants, Implementation for connected devices.

SLE: Comparison of PDAs, connected devices and different implementations **6 Hours**

TEXT BOOK

1. **Pervasive Computing: Technology and Architecture of Mobile Internet Applications**, *Jochen Burkhardt, Thomas Schaeck, Horst Henn, Stefan Hepper, Klaus Rindtorff, Pearson Education, April 2002.*

REFERENCE BOOK

1. **Pervasive Computing: the mobile world**, Uwe Hansmann, springer, 2nd edition, 2003

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CONCURRENT PROGRAMMING (3:0:0)

Sub code	**: CS0319**	**CIE**	**: 50 %Marks**
Hrs / week	**: 03**	**SEE**	**: 50 %Marks**
SEE Hrs	**: 03 Hours**	**Max. Marks**	**: 100**

Course Outcome

On successful completion of the course the students will be able to

1. Illustrate sequential programming paradigm and concurrent programming model with an example. Acquainted with Pascal-FC compiler.
2. Demonstrate process life cycle and process scheduling and how it is handled in Pascal-FC
3. Discuss various ways of process synchronization such as message passing model, mutual exclusion, shared variables.
4. Explain in detail message passing model and remote invocation.
5. Discuss semaphores - a synchronization primitive.
6. Point Out the advanced synchronization constructs such as critical regions and Monitors. Also analyze concurrency architecture in embedded systems.

UNIT 1

The Nature and Uses of Concurrent Programming: Introduction, Sequential Programming asa total ordering, Breaking away from the sequential paradigm, Concurrent programming as a partial ordering, The motivation for concurrent programming, An inherently concurrent problem domain, Problems in concurrent programming

SLE: Introducing Pascal-FC **6 Hours**

UNIT 2

Process Representation and Life-cycle: The concept of process, Process Structures, Process states and transitions, Process management and the run-time support system

SLE: Timing in Pascal-FC **6 Hours**

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UNIT 3

Process interaction: Active and passive entities, The Ornamental Gardens Problem, Mutualexclusion and other synchronizations, Synchronization using simple shared variables, Synchronization primitives for shared variable solutions.

SLE: The correctness of concurrent programs **7 Hours**

UNIT 4

Synchronous Message-passing: Alternative Language models, Selective waiting,Communication by channel, The select construct, Concurrency and non-determinism,

Remote Invocation: Basic model

SLE: Remote invocation and selective waiting **7 Hours**

UNIT 5

Semaphores: Definition of semaphores, Pascal-FC's Semaphores, Mutual exclusion with semaphore, Fairness and semaphores, Semaphore invariants, Condition synchronization with semaphores

SLE: Why Semaphores? Evaluation of semaphores **6 Hours**

UNIT 6

Conditional Critical Regions and Monitors: Beyond semaphores, Critical regions, Conditional critical regions, Monitors for mutual exclusion, Condition synchronization with monitors, Illustrative examples of the use of monitors

SLE: Concurrency Architectures: Introduction, Embedded systems architecture **7 Hours**

TEXT BOOK:

1. Concurrent Programming: Alan Burns, Geoffrey Davis, Addison-Wesley (1993).

REFERENCE BOOKS:

1. **Concurrent Programming – Principles and Practice:** Gregory R. Andrews, The Benjamin/Cummings Publishing Company, Inc (1991).
2. **Concurrent Programming:** (Edited by) NarainGehani, Andrew D. McGettrick,Addison Wesley (1988).
3. **Principles of Concurrent Programming:** M. Ben-Ari, Prentice-Hall (1982).
4. **Concurrent Programming:** C. R. Snow, Cambridge University Press (1992).
5. **On Concurrent Programming:** Fred B. Schneider, Springer, 1st Edition (1997)

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PARALLEL ALGORITHMS (3:0:0)

Sub code	**: CS0306**	**CIE**	**: 50 %Marks**
Hrs / week	**: 03**	**SEE**	**: 50 %Marks**
SEE Hrs	**: 03 Hours**	**Max. Marks**	**: 100**

Course Outcome:

On successful completion of the course the students will be able to

1. Compute models such as RAM, PRAM were discussed.
2. Discuss parallel algorithms for well-known problems such as prefix computation, max sum subsequence, array packing.
3. Discuss pointer jumping and divide conquer techniques for parallel programming with examples such as list ranking, merge sort.
4. Discuss parallel algorithms for geometrical problems such as convex hull, All nearest neighbour.
5. Explain graph theory classic problems such as Euler tour, finding connected components, shortest path were explained and parallel solutions.
6. Explain Number theory problems such as primarily test, GCD and numerical problems such as approximation of Taylor series.

UNIT 1
Models of Computation: RAM (Random Access Machine),PRAM (Parallel Random Access Machine),Fundamental Terminology Interconnection Networks.
SLE: Additional Terminology. **7 Hours**

UNIT 2
Parallel Prefix: Parallel Prefix, Application: Maximum Sum Subsequence, Array Packing.
SLE: Computing Overlapping Line Segments. **6 Hours**

UNIT 3
Pointer Jumping and divide and Conquer: List Ranking Linked List Parallel Prefix , Merge Sort (Revisited) Selection.
SLE: Modifications of Quick Sort for Parallel Models. **6 Hours**

UNIT 4
Computational Geometry: Convex Hull, Smallest Enclosing Box, Architecture-Independent Algorithm.
SLE: All-Nearest Neighbour Problem **7 Hours**

UNIT 5
Graph Algorithms: Fundamental PRAM Graph Techniques, List Ranking via Pointer Jumping, Euler Tour Technique, Tree Contraction.
SLE: Shortest-Path Problems RAM, PRAM and Mesh. **6 Hours**

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UNIT 6

Numerical Problems: Primality, Greatest Common Divisor, Lame's Theorem , Integral Powers, Approximation by Taylor Series.

SLE: Evaluating a Polynomial. **7 Hours**

TEXT BOOK

1. Algorithms Sequential and Parallel: A Unified Approach, Second Edition,2005, By: RussMiller; Laurence Boxer, Course Technology PTR.

REFERENCE BOOKS

1. **Introduction to Parallel Algorithms,** Joseph JaJa, University of Maryland, Addison-Wesley Professional.
2. **Parallel Algorithms (Hardcover)** by Henri Casanova , Arnaud Legrand, Yves Robert,Publisher: Taylor & Francis /b S Publication (Jul 2008)

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UNIX SYSTEM PROGRAMMING (2:0:2)

Sub code	**: CS0322**	**CIE**	**: 50 %**
Hrs / week	**: 3**	**SEE**	**: 50 %**
SEE Hrs	**: 03 Hours**	**Max. Marks**	**: 100**

Prerequisite: Computer Concepts

Course Outcome

On successful completion of the course the students will be able to

1. Describe basic features and file I/O functions of UNIX operating system.
2. Explain various aspects of files and directories in UNIX
3. Explain about process environment and process control in UNIX.
4. Illustrate concepts and uses of signals in UNIX.
5. Apply thread concepts and POSIX thread functions for multi-threaded programming in UNIX.
6. Use inter-process communication mechanisms in UNIX for achieving process interaction.

UNIT 1

UNIX System Overview: Introduction, Unix architecture, System calls and Library Functions.

File I/O Introduction, File Descriptors, open Function, creat Function, close Function, lseek Function, read Function, write Function, File Sharing, Atomic Operations, dup and dup2.

SLE: UNIX Standardization, UNIX System Implementations **7 Hours**

UNIT 2

Files and Directories Introduction, stat, Set-User-ID and Set-Group-ID, access Function, umask Function, chmodFunctions, Sticky Bit, chown Functions, File Size,File Truncation, File Systems, link, unlink, remove, and rename Functions, Symbolic Links, symlink Functions, File Times, utime Function.

SLE: File Types, File Access Permissions **7 Hours**

UNIT 3

Process Environment Introduction, main Function, Process Termination, Command-Line Arguments,Environment List, Memory Layout of a C Program, Shared Libraries, Memory Allocation, Environment Variables, setjmp and longjmp Functions

Process Control Introduction, Process Identifiers, fork Function, vfork Function, exit Functions, wait and waitpid Functions.

SLE: Race Conditions, exec Functions, Changing User IDs and Group IDs. **7 Hours**

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UNIT 4

Signals Introduction, Signal Concepts, signal Function, Reentrant Functions, Reliable Signal Terminology and Semantics, kill and raise Functions, alarm and pause Functions, sigprocmask Function, sigpending Function, sigaction Function, sigsetjmp and siglongjmp Functions, sigsuspend Function.

SLE: Unreliable signals, Interrupted System calls **6 Hours**

UNIT 5

Threads: Introduction, Thread Concepts, Thread Identification, Thread Creation, Thread Termination,Thread Synchronization.

Daemon Processes: Introduction, Daemon Characteristics, Coding Rules

SLE: Single-Instance Daemons, Daemon Conventions. **6 Hours**

UNIT 6

Interprocess Communication: Introduction, Pipes, popen and pclose Functions, Coprocesses, FIFOs, XSI IPC, Message Queues, Semaphores

Network IPC: Sockets Introduction, Socket Descriptors, Addressing, Connection Establishment.

SLE: Data Transfer, Socket Options **6 Hours**

TEXT BOOK

1. **Advanced Programming in the UNIX Environment** – W. Richard Stevens and Stephen A Rago, 2nd Edition, Pearson Education / PHI, 2005.

REFERENCE BOOK

1. **The Design of the UNIX Operating System** – Maurice J Bach, Pearson Education PHI, 1987.