Master of Science in Information Technology (M.Sc-IT)

Detailed Syllabi:

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<th>IS 2101</th>
<th>FUNDAMENTALS OF IT AND PROGRAMMING (4 Credits)</th>
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<td>Questions to be answered:</td>
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UNIT I


Computer Memory: Memory System, Memory Cells, Memory Arrays, Random Access Memory (RAM), Read Only Memory (ROM), External Memory (Secondary Memory), Floppy Disk Drives, Compact Disk Read Only Memory, Magnetic Storage Drives, Physical Devices Used to construct Memories.

Introduction to computer software: Computer Software, Overview of operating systems, Overview of application software, Overview of proprietary software, Overview of open source technology.

UNIT II


REFERENCES:
IS 2102 DATA AND FILE STRUCTURES (4 Credits)

Questions to be set: Eight (Four from each unit)
Questions to be answered: Any Five selecting at least Two from each unit

UNIT I


Algorithm – Complexity Notations: Mathematical Notation and Functions, Algorithm Notation, Control Structures, Complexity of Algorithm, Rate of Growth- Asymptotic Notation.

Linked List: Linked List and its representation in memory, Traversing a Linked List, Searching a Linked List, Memory Allocation and Garbage Collection, Insertion into Linked list, Deletion from a Linked list, Types of Linked List.

Stacks and Queues: Stack, Applications of Stack, Queue.

Trees and Binary Trees: Tree: Definition and Concepts, 3 Binary Tree: Definition and Concepts, Types of Binary Tree, Traversal on Binary Tree, Representation of Binary Tree.

Binary Search Tree: Conversion of General Tree to Binary Tree, Sequential and Other Representations of Binary Tree, Concept of Binary Search Tree (BST), Operations on BST.

Balanced Trees: Definition and Structure of AVL Tree, Operations on AVL Tree, Definition and Structure of B-Tree, Operations on B-Tree, Applications of B-Tree.

UNIT II


Applications of Graphs: Topological Sorting, Weighted Shortest Path – Dijkstra’s Algorithm, Minimum Spanning Tree (MST), Introduction to NP-Completeness.

Searching and Sorting Techniques: Sorting- Notations and concepts, Bubble sort, Merge sort, Selection sort, Heap sort; Searching- Sequential searching, Binary searching.

File Structures: External Storage Devices, Introduction to File Organization, Sequential Files, Indexed Sequential Files, Direct Files.

External Sorting Techniques: External Sorting- Run lists, Tape sorting; Sorting on Disks, Generating Extended Initial Runs.

External Searching Techniques: External Searching, Introduction to Static Hashing, Dynamic Hashing Techniques.

REFERENCES:
Questions to be set: Eight (Four from each unit)
Questions to be answered: Any Five selecting at least Two from each unit

UNIT I

Introduction to Java: Introduction, history of Java, Features of Java, Java Development Kit (JDK), Security in Java.

Java Basics: Keywords, Working of Java, Including Comments, Data Types in Java, Variables in Java, Using Classes in Java, Declaring Methods in Java, Code to Display Test Value, The main() Method, Invoking a Method in Java, Saving, Compiling and Executing Java Programs.

Operators and Control Statements: Operators, Control Flow Statements.

Arrays and Strings: Arrays, String Handling, Special String Operations, Character Extraction, String Comparison, Searching Strings, String Modification, StringBuffer.

Inheritance, Package and Interface: Inheritance, Packages Defining a Package, Understanding CLASSPATH; Interface- Defining an Interface, Some Uses of Interfaces, Interfaces versus Abstract Classes.

Exception Handling: Definition of an Exception, Exception Classes, Common Exceptions, Exception Handling Techniques.


UNIT II


Swing: Concepts of Swing, Java Foundation Class (JFC), Swing Packages and Classes, Working with Swing – An Example, Swing Components.

Java Data Base Connectivity: Java Data Base Connectivity, Database Management, Mechanism for connecting to a back end database, Loading the ODBC driver.

RMI, CORBA and Java Beans: Remote Method Invocation (RMI), Common Object Request Broker Architecture (CORBA), Java Beans.

Networking in Java: Networking in Java, URL Objects.


REFERENCES:
IS 2104 SOFTWARE ENGINEERING (4 Credits)

Questions to be set: Eight (Four from each unit)
Questions to be answered: Any Five selecting at least Two from each unit

UNIT I


Software Reliability: Introduction to Software Reliability, Software reliability metrics, Programming for Reliability- Fault avoidance, Fault tolerance; Software Reuse.


Object Oriented Design :Introduction to Object Oriented Design, Object Oriented Design- Objects, Object Classes & Inheritance, Object identification, An object-oriented design example, Object aggregation; Service Usage, Object Interface Design- Design evolution, Function oriented design, Data –flow design; Structural Decomposition- Detailed design.

UNIT II


Software Testing Assurance: Verification and Validation- Validation Testing, Validation Test Criteria; Test Plan- Test Documentation; Test Strategies- Top-Down Testing, Bottom-Up Testing, Thread testing, Stress testing, Back-to-back testing; Principles of Testing, Testing methods and tools- Testing through reviews, Black-box testing (Functional testing), White box testing (glass-box testing), Testing software changes; Additional requirements in testing OO Systems, System Testing, Acceptance Testing, Regression testing, Metrics Collection, Computation, and Evaluation, Test and QA plan, Managing Testing Functions.

Software Testing Strategies: Introduction to Software Testing Strategies, Organizing for software testing, Software Testing Strategy, Unit Testing- Unit Test Considerations; Top-down Integration, Bottom-up Integration.

Case Study: System Requirements, Architectural Alternatives.

REFERENCES:

IS 2161 OBJECT-ORIENTED PROGRAMMING – PRACTICAL (CREDITS 1.5)
A sample list of exercises is given below. The list is not exhaustive.

Exercise 1: “Hello World” Program
Exercise 2: Arithmetic Operations
Exercise 3: Largest of ’n’ Numbers
Exercise 4: Matrix Multiplication
Exercise 5: Reversing a Given String
Exercise 6: Using Recursion
Exercise 7: Implementation of Inheritance
Exercise 8: Exception Handling
Exercise 9: File Handling
Exercise 10: Applet Programming
MSc.IT - Second Semester

IS 2201 OPERATING SYSTEMS (4 CREDITS)

Questions to be set: Eight (Four from each unit)
Questions to be answered: Any Five selecting at least Two from each unit

UNIT I


CPU Scheduling Algorithms: Basic Concepts of Scheduling: CPU-I/O Burst Cycle. CPU Scheduler, Pre-emptive / non pre-emptive scheduling, Dispatcher, Scheduling Criteria; Scheduling Algorithms, First come First Served Scheduling, Shortest-Job-First Scheduling, Priority Scheduling. Round-Robin Scheduling, Multilevel Queue Scheduling, Multilevel Feedback Queue Scheduling, Multiple-Processor Scheduling, Real-Time Scheduling; Evaluation of CPU Scheduling Algorithms-Deterministic Modelling, Queuing Models, Simulations, Implementation.

Process Synchronization: Inter process Communication; Basic Structure, Naming: Direct Communication; Indirect Communication, Buffering; The Critical-section problem: Two Process Solution; Multiple Process Solutions; Semaphores; Monitors; Hardware Assistance.

Deadlocks: System Model, Deadlock Characterization, Deadlock Handling; Deadlock Prevention, Deadlock Avoidance-Safe State, Resource-Allocation Graph Algorithm, Banker’s Algorithm; Deadlock Detection-Single Instance of a Resource, Multiple Instances of a Resource, Recovery from Deadlock.
**Memory Management:** Logical versus Physical Address Space Swapping; Contiguous Allocation-Single partition Allocation, Multiple Partition Allocation, Fragmentation; Paging-Concept of paging, Page Table Implementation; Segmentation-Concept of Segmentation, Segmentation Hardware, External Fragmentation.

**UNIT II**

**Virtual Memory:** Need for Virtual Memory Technique; Demand Paging; Page Replacement; Page Replacement Algorithms-FIFO Page Replacement Algorithm, Optimal Algorithm; LRU page Replacement Algorithm; Thrashing-Causes for Thrashing, Working Set Model, Page Fault Frequency.

**File System Interface and Implementation:** Concept of a File- Attributes of a File, Operations on Files, Types of Files; Structure of File; File Access Methods-Sequential Access, Direct Access, Indexed Sequential Access; Directory Structure: Single Level Directory, Two Level Directory; Tree Structured Directories; Allocation Methods- Contiguous allocation, Linked allocation, Indexed allocation, Performance comparison; Free Space Management, Directory Implementation.

**Input-Output Architecture:** I/O Structure, I/O Control Strategies-Program controlled I/O, Interrupt-controlled I/O, Direct memory access; The I/O Address Space.

**Operating Systems in Distributed Processing:** Centralized and Distributed Processing, Network Operating System (NOS) Architecture, Functions of NOS, Global Operating System (GOS), Remote Procedure Call (RPC), Distributed File Management.


**Multiprocessor Systems:** Multiprocessors, Multiprocessor Classification, Multiprocessor Interconnections, Types of Multiprocessor Operating Systems (MOS), MOS Functions and Requirements, Operating System Design and Implementation Issues.


**REFERENCES:**


IS 2202 DATA BASE MANAGEMENT SYSTEMS (4 Credits)

Questions to be set: Eight (Four from each unit)
Questions to be answered: Any Five selecting at least Two from each unit

UNIT I

Database Management System Concepts: Significance of Database, Database System Applications, Data Independence; Data Modelling for a Database-Entities and their attributes; Relationships and types; Advantages and Disadvantages of Database Management System, DBMS Vs RDBMS.

Database System Architecture: Three Level Architecture: External Level, Conceptual Level, Internal Level; Mapping; MySQL Architecture; SQL Server 2000 Architecture; Oracle Architecture, Database Management System Facilities, Database Management System Structure, Distributed Processing.

Database Models and Implementation: Data Models and types of data Models- Relational Data Model, Hierarchical Model, Network Data Model, Object-Relational Model, Object-Oriented Model; Entity-Relationship Model-Modelling using E-R Diagrams; Notations used in E-R Model, Relationships and Relationship Types; Associative Database Model.


An Introduction to RDBMS: An informal look at the relational model; Relational Database Management System, RDBMS Properties; Overview of Relational Query Optimization; System Catalog in a Relational DBMS-Information Stored in the System Catalog, How Catalogs are Stored.

SQL – 1: Introduction to SQL, Categories of SQL Commands, Data Definition, Data Manipulation Statements-SELECT - The Basic Form, Sub queries, Functions, GROUP BY Feature, Updating the Database; Data Definition Facilities.
SQL – 2: Views; Embedded SQL *- Declaring Variables and Exceptions, Embedding SQL Statements; Transaction Processing- Consistency and Isolation, Atomicity and Durability.
UNIT II

Relational Algebra: Basic Operations; Union; Difference (\(\cdot\)); Intersection (\(\cap\)); Cartesian Product (\(\times\)); Additional Relational Algebraic Operations-Projection (\(\pi\)), Selection (\(\sigma\)), JOIN (\(\Join\)); Division (\(\div\)).

Relational Calculus: Tuple Relational Calculus-Semantics of TRC Queries, Examples of TRC Queries; Domain Relational Calculus; Relational Algebra Vs Relational Calculus.

Normalization: Functional Dependency, Anomalies in a Database, Properties of Normalized Relations, First Normal Form, Second Normal Form, Third Normal Form, Boyce-Codd Normal Form (BCNF), Fourth and Fifth Normal Forms.

Query Processing and Optimization: Query interpretation; Equivalence of expressions; Algorithm for executing query operations; Heuristics of Query Optimization, Semantic Query Optimization, Converting Query Tree to Query Evaluation Plan, Cost Estimates in Query Optimization, Join Strategies for Parallel Processing.

Distributed Databases: Structure of Distributed Database; Tradeoffs in Distributing the Database-Advantages of Data Distribution, Disadvantages of Data Distribution; Design of Distributed Databases; Data Replication, Data Fragmentation.


REFERENCES:
IS 2203 ANALYSIS AND DESIGN OF ALGORITHMS (4 Credits)
Questions to be set: Eight (Four from each unit)
Questions to be answered: Any Five selecting at least Two from each unit

UNIT I


Mathematical aspects and Analysis of Algorithms: Asymptotic Notations and Basic Efficiency Classes, Mathematical Analysis of Non recursive Algorithms.


Divide and Conquer: Introduction, Merge sort, Quick sort, Binary Search, Binary tree traversals and related properties, Stressen’s Matrix Multiplication.


UNIT II

Transform and Conquer: Presorting, Gaussian Elimination, Balanced Search Trees, Heaps and Heap sort, Problem Reduction.


Dynamic programming-1: Overview of Dynamic Programming, Fibonacci numbers, Binomial coefficient, Warshall’s and Floyd’s Algorithms.

Greedy Technique: Introduction to Greedy Technique, Prim’s Algorithm, Kruskal’s Algorithm, Dijkstra’s Algorithm, Huffman Trees.

Limitations of Algorithm Power: Lower-Bound Arguments, Decision Trees, P, NP and NP-Complete Problems.

Coping with the Limitations of Algorithm Power: Backtracking, Branch and Bound, Approximation Algorithms for NP-Hard Problems.

REFERENCES:
IS 2204 DATA COMMUNICATION AND NETWORKING (4 Credits)

Questions to be set: Eight (Four from each unit)
Questions to be answered: Any Five selecting at least Two from each unit

UNIT I


Data communication: Data Communication, Transmission Impairments, Transmission Medium.

Data Encoding: Line Encoding, Types of Line Coding, Analog-to-Digital Conversion- Pulse code modulation (PCM), Delta modulation (DM); Transmission Modes.

Data Link Layer: Error Detection and Correction- One and two dimensional parity checks, Hamming code, Cyclic redundancy check (CRC); Framing- Character stuffing, Bit stuffing; Flow and Error Control


Data Link Control protocols: High- level Data Link Control Protocol (HDLC), Point-to-Point Protocol (PPP). MAC and LLC Sub-layers-Channel Allocation Problem, Pure ALOHA and Slotted ALOHA, Persistent and non-persistent CSMA.


UNIT II


Broadcast and Multicast Routing: Broadcast Routing, Multicast Routing, Routing in Ad Hoc Networks.

Network Layer: IP Addressing Scheme, Subnet Addressing, Subnet Masks, IPV4 Addressing, IPV6 Addressing, Address Resolution Protocol (ARP), Reverse Address Resolution Protocol (RARP).


Internet and WWW: Internet basics, Hypertext Transfer Protocol (HTTP), World Wide Web (WWW), Security in Internet, E-mail Security.

REFERENCES:
5. Stalling William. *Data communication and computer networks*.

IS 2271 -Mini Project (9-Credits)

A project work of minimum 16 weeks duration has to be carried out in the area relevant to the curriculum. The project work may be carried out in groups of students comprising of 2-3 students.
UNIT I

Overview of Object Oriented Systems Development: Two Orthogonal Views of the Software, Concept of Object Oriented Software, Importance of Object Oriented Software, Object Oriented Future, Object Oriented Systems Development Methodology, Overview of Unified Approach.


Object Oriented Methodologies: Introduction, Types of Object Oriented, Methodologies, Patterns, Unified Approach.


Object Analysis: Classification: Object Analysis, Classification Theory, Approaches for Identifying Classes, Class Responsibility Collaboration.

UNIT II

Object Oriented Analysis – Identifying Relationships, Attributes, and Methods: Introduction, Associations, Inheritance Relationships, A Part of Relationship-Aggregation,

**Object Oriented Design Process and Design Axioms:** Design Process, Design Axioms, Corollaries, Design Patterns.

**Designing Classes:** The Object Oriented Design Principles, UML Object Constraint Language (OCL), Strategies for Designing Classes, Class Visibility: Designing Public Private and Protected Protocols, Designing Classes: Refining Attributes, Designing Methods and Protocols, Packages and Managing Classes.


**View Layer:** User Interface Design as a Creative Process, Designing View Layer Classes, Purpose of a View Layer Interface, Prototyping the User Interface.


**System Usability and Measuring User Satisfaction:** Usability Testing, User Satisfaction Test, Analyzing User Satisfaction by Satisfaction Test Template, Developing Usability Test Plans and Test Cases.

**REFERENCES:**

IS 2302 Web Technologies (4 Credits)

Questions to be set: Eight (Four from each unit)
Questions to be answered: Any Five selecting at least Two from each unit

UNIT I


UNIT II

XMLHttpRequest: XMLHttpRequest, The XMLHttpRequest Object, Events for the XMLHttpRequest Object, Request Object for XMLHttpRequest, Response Object for XMLHttpRequest.

AJAX Introduction: AJAX Introduction, AJAX Components, Handling Dynamic HTML with Ajax, CSS to Define Look and Feel, Understand the XML: Markup, XMLHttpRequest.

AJAX Using XML and XMLHttpRequest: Ajax Using XML and XMLHttpRequest, Accessing, Creating and Modifying XML Nodes, Loading XML Data into an HTML Page, Receiving XML Responses, Handling Response XML.
**PHP Introduction:** PHP Introduction, Structure of PHP, PHP Functions, AJAX with PHP, PHP Code and the Complete AJAX Example.

**AJAX with Database:** AJAX Database, Working of AJAX with PHP, Ajax PHP Database Form, AJAX PHP MySQL Select Query.

**Active Server Page:** Introduction of ASP, ASP – Variables, ASP Control Structure, ASP Objects’ Properties and Methods.

**ASP Database Connectivity:** Introduction, ASP Components, ASP Database Connection, ASP Scripting Components.

**REFERENCES:**
IS 2331  **High Speed Networks (4 Credits)**

Questions to be set: Eight (Four from each unit)
Questions to be answered: Any Five selecting at least Two from each unit

**UNIT I**

**Frame Relay Network:** Introduction, Packet-Switching Networks, Frame Relay Networks.

**Asynchronous transfer mode:** ATM Protocol Architecture and Logical Connection, ATM Cells, ATM Service Categories, ATM Adaption Layer.

**High Speed LANs:** Fast Ethernet LAN, Gigabit Ethernet, ATM LAN, Network Attached Storage (NAS), Wireless LAN and Wi-Fi, LAN Interoperability.


**Congestion Management Part-1:** Congestion – An Overview, Effects of Congestion, Congestion Control, Traffic Management.

**Congestion Management Part-2:** Frame Relay Congestion Control, Flow Control Techniques, Error Control Techniques.

**TCP Traffic and Congestion Control:** TCP Flow control, TCP Congestion Control, Performance of TCP over ATM.

**UNIT II**


**Integrated Services:** Integrated Service (IntServ) Model, Flow and Service Description, Queuing Discipline, Integrated Services in IP-ATM Networks.

**Differentiated Services:** Differentiated Service Architecture, Scalability of DiffServ, DiffServ Functional Elements, Per-Hop Behavior (PHB), Models of DiffServ.

**Protocols for Quality of Service (QoS) Support – Part I:** Multicasting, Multicast Transport Protocol (MTP), Resource Reservation Protocol (RSVP), Real-Time Transport Protocol (RTP).
Protocols for Quality of Service (QoS) Support – Part II: Multiprotocol Label Switching (MPLS), Subnet Bandwidth Management (SBM), QoS Architectures, QoS Support for Multicast.

Internet Routing Basics and Design – 1: Basics of Graph Theory, Internet Routing Principles, Analysis of Shortest Route.


REFERENCES:
IS 2332  Distributed Operating System (4 Credits)
Questions to be set: Eight (Four from each unit)
Questions to be answered: Any Five selecting at least Two from each unit

UNIT I


**Distributed Shared Memory:** Distributed Shared Memory Systems (DSM), DSM – Design and Implementation Issues, Granularity – Block Size, Structure of Shared Memory Space in a DSM System, Memory Coherence (Consistency) Models, Memory Consistency models, Implementing Sequential Consistency, Centralized – Server Algorithm, Fixed Distributed – Server Algorithm, Dynamic Distributed Server Algorithm, Implementing under RNMBs Strategy, Thrashing.

**Synchronization:** Introduction, Clock Synchronization, Clock Synchronization Algorithms, Distributed Algorithms, Event Ordering, Mutual Exclusion, Deadlock, Election Algorithms.

UNIT II


**Process Management:** Introduction, Process Migration, Threads.

**Distributed File Systems:** The Key Challenges of Distributed Systems, Client’s Perspective: File Services, File Access Semantics, Server’s Perspective Implementation, Stateful Versus Stateless Servers, Replication, Caching, Ceph.
**Naming:** Desirable Features of a Good Naming system, Fundamental Terminologies and Concepts, System Oriented Names, Object – Locating Mechanisms, Human – Oriented Names, Name Caches, Naming and Security.

**Security in Distributed Systems:** Potential attacks to Computer Systems, Cryptography, Authentication, Access Control, Digital Signatures, Design Principles.

**REFERENCES:**
IS 2333  **Software Architecture (4 Credits)**

Questions to be set:  Eight (Four from each unit)
Questions to be answered:  Any Five selecting at least Two from each unit

**UNIT I**


**Architectural Styles:** Architectural Styles, Other Familiar Architectures.

**Software Architecture – Case Studies:** Key Word in Context, Instrumentation Software, Mobile Robotics, Cruise Control, Three Vignettes in Mixed Style, Real Time Applications and Distributed Applications.

**Architectural Quality Attributes:** Functionality and Architecture, Architecture and Quality Attributes, System Quality Attributes, Quality Attributes Scenario in Practice, Other System Quality Attributes.

**Achieving Quality:** Introduction, Tactics, Relationship of Tactics to Architectural Patterns.

**Architectural Patterns –1:** Architectural Pattern, From Mud to Structure- Layers, Pipes and filters, Blackboard.

**Architectural Patterns – 2:** Distributed Systems- Broker architecture,Interactive Systems- Model-View-Controller (MVC), Presentation-Abstraction-Control (PAC).

**UNIT II**

**Architectural Patterns – 3:** Adaptable Systems- Microkernel, Reflection.

**Important Design Patterns:** Design Patterns, Structural Decomposition, Organization of Work, Access Control.

**Formal Models and Specifications:** Z-Notation, Formalizing an Architectural Style, Formalizing an Architectural Design Space.

**Linguistic Issues:** Architectural Description Language, First Class Connectors, Adding Implicit Invocation to Traditional Programming Languages.


**Designing and Documenting Software Architecture:** Forming a Team Structure, Creating a Skeleton System, Uses of Architectural Documentation, Rules for Documentation, Views, Documenting a View.

**REFERENCES:**
UNIT I


Licensing: Licensing, Intellectual Proprietary Right, Commercial License vs. Open source license.

Open Source Licensing, Contract and Copyright Law: Basic principles of copyright law, contract and copyright, open source software licensing, issues with copyrights and patents, warranties.

The MIT, BSD, Apache Licenses: The MIT (or X) license, the BSD license, The apache license.

Academic free Licenses: Overview of Academic Free Licenses, Provisions under Academic Free License (v2.0) Applications of AFL, Philosophy of Open Source License.

The GPL, LGPL, and Mozilla Licenses: GNU general public license, The GNU Library General Public License, The Mozilla Public License, Applications and Comparisons of GPL, LGPL and MPL.

QT, Artistic, and Creative Commons Licenses: QT- Overview, The Q public License, Artistic license (Perl), creative commons licenses.

UNIT II

Non- Open Source Licenses: Overview of Non-Open Source Licenses, Classic Proprietary License, Sun Community Source License, Microsoft Shared Source Initiative.

Open Source Development- 1: Infrastructure needed for an open- source project, Software Development Life Cycle, Building a Community.

Legal Impacts of Open Source and Free Software Licensing- 1: Entering contracts, statutory developments related to software contracts, self-enforcing nature of open source and free software licenses.

Legal Impacts of Open Source and Free Software Licensing- 2: The global scope of open source and free software licensing, the negative effects of open source and free software licensing.


Software Development Using Open Source and Free Software Licenses: Models of open source and free software development, Forking, Choosing an open source or free software license, drafting open source licenses.

REFERENCES:
IS 2335 **Embedded Systems (4 Credits)**
Questions to be set: Eight (Four from each unit)
Questions to be answered: Any Five selecting at least Two from each unit

**UNIT I**


**Embedded System Design:** Embedded System Design Process, Formalism for System Design.

**Embedded Processors, Hardware Units and Devices:** Processor in the system, Other Hardware Units and Devices in a System, Linking and Interfacing Buses and Units,

**The 8051 Architecture:** 8051 microcontroller, I/O Ports and Circuits, Timers / Counters, Serial Interface, Interrupts.

**8051 Assembly Language Programming:** Registers in the 8051, 8051 Assembly Language Programming, Assembling and Running an 8051 Program, The 8051 program Counter and ROM Space, 8051 Data types and Directives, 8051 Flag Bits and PSW Register, 8051 Register Banks and Stack.

**8051 Instruction Set:** Addressing modes in 8051, Types of instructions in 8051, Descriptions of 8051 Common Instructions.

**Interfacings with 8051:** Interfacing with Keyboard, Interfacing with D/A and A/D Converter, Interfacing with LCD Display, Interfacing with Stepper Motor.

**UNIT II**

**Introduction to Real Time Operating Systems:** A Brief History of Operating Systems, Meaning and Types of operating system, Definition of RTOS, The Scheduler, Objects and Services, Key Characteristics of an RTOS.

**Tasks and Tasks States:** Definition of a Task, Task States and Scheduling, Task Operations, Task Structure, Synchronization and Communication.

**Semaphores:** Definition of Semaphore- Binary Semaphores, Counting Semaphores, Mutual Exclusion (Mutex) Semaphores; Typical Semaphore Operations, Typical Semaphore Use.
Message Queues, Mailboxes and Pipes: Message Queues, Mailboxes, Pipes, Event Registers, Signals, Condition Variables.

Memory Management and Interrupt Routines in an RTOS Environment: Memory Management, Timer Functions, Device I/O Management, Interrupt routines in an RTOS Environment, Basic design using an RTOS, Encapsulating Semaphores and Queues, Important Real Time operating Systems (RTOSs).


REFERENCES:
8. General RTOS Concepts. Renesas Electronics Corporation
IS 2336 **Graphics & Multimedia Systems (4 Credits)**

Questions to be set: Eight (Four from each unit)
Questions to be answered: Any Five selecting at least Two from each unit

**UNIT I**

**Introduction to computer graphics & graphics systems:** Overview of computer graphics, Advantages of Interactive Graphics, Image Processing as Picture Analysis, Visualization, RGB color model, Direct Table, Lookup Table.

**Devices:** Over View of Graphic System, Active and Passive Graphic Devices, Computer Graphics Software.

**Scan conversion:** Points & lines, Line drawing algorithms.

**Scan conversion -2:** Circle generation algorithm; Ellipse generating algorithm, Scan Line Fill Algorithm, Boundary fill algorithm, flood fill algorithm.

**2D Transformation:** Basic transformations, Matrix representation & homogeneous coordinates, transformations between coordinate systems, Other Transformation in 2D, Composite Transformations in 2D.

**2D Viewing:** 2D Viewing pipeline, Window to viewport Co-ordinate transformation, clipping operations, polygon Clipping.

**3D transformation & Viewing:** 3D transformations, other transformations, Rotation about an arbitrary axis in space, reflection through an arbitrary plane, Projections, 3D Viewing.

**UNIT II**

**Curves:** Introduction to Spline Curves, Explicit Curves, Parametric Spline Curves, Bezier Curves, B-Spline Curves, Non Uniform Rational B-Spline Curves, Introduction to Surfaces.

**Hidden surfaces:** Hidden Surface Determination, Visible-Surface Detection Methods, z-buffer algorithm, Back Face Detection, BSP tree Method, Depth-Sort Algorithm, Scan Line Method, Fractal Geometry, Wire Frame Methods.

**Color & shading models:** Color model, Basic Lighting and Reflection, Shading, Texture Mapping.

Audio: digital audio, Music- MIDI basic concepts, MIDI devices, MIDI messages; Processing and sampling sound, Compression.

Video: MPEG compression standard, compression through redundancy, Frame compression.

Animation: Types and Techniques of Animation, key frame animation, morphing, Virtual Reality concepts.

REFERENCES:

IS 2361- Web Technologies Lab (1.5 credits)

Exercises

Following topics are to be covered through standard practical experiments:

Exercise 1 - XML
Exercise 2 – AJAX
Exercise 3 - AJAX with Database
Exercise 4- Active Server Page
Exercise 5 - ASP Database Connectivity
Exercise 6- SOAP
Exercise 7 – J2ME
IS 2401 Data Warehousing and Data Mining (4 Credits)

Questions to be set: Eight (Four from each unit)
Questions to be answered: Any Five selecting at least Two from each unit

UNIT I


Planning and Requirements: Key Issues in Planning a Data Warehouse, Planning and Project Management in Data Warehouse Construction, Data Warehouse Project.

Data Warehouse Architecture: Components of Data Warehouse Architecture, Technical Architectures, Tool Selection, Federated Data Warehouse Architecture.


Extract, Transform and Load: ETL Overview, ETL Requirements and Steps, Data Transformation, Data Loading, ETL Tools.

Data Warehouse & OLAP: What is OLAP? Multidimensional Data, OLAP Architectures, Data Warehouse and OLAP, Hypercubes & Multicubes.


UNIT II

Introduction to Data Mining: Meaning and Working of Data Mining, Data, Information and Knowledge, Relation between Data Warehousing and Data Mining, Data Mining and Knowledge Discovery Process, Data Mining and Online Analytical Processing (OLAP), Data Mining and Statistics, Data Mining Technologies, Data Mining Software.
Business Intelligence: Business Intelligence (BI), Business Intelligence Tools, Business Intelligence Infrastructure, Business Intelligence Applications, BI versus Data, Warehouse, BI versus Data Mining, Future of BI.

Data Preprocessing: Introduction, Data Preprocessing Overview, Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization and Concept Hierarchy Generation.

Data Mining Techniques – An Overview: Data mining: Various Definitions, Data Mining Versus Database Management System (DBMS), Data Mining Techniques.

Clustering: Clustering, Cluster Analysis, Clustering Methods, Clustering and Segmentation Software, Evaluating Clusters.

Web Mining: Introduction, Terminologies, Categories of Web Mining, Applications of Web Mining, Agent Based and Database Approaches, Web Mining Software.

Applications of Data Mining: Business Applications Using Data Mining, Scientific Applications Using Data Mining, Other Applications.

REFERENCES:
1. PONNAIAH PAULRAJ. Data Warehousing Fundamentals –WILEY STUDENT EDITION, John Wiley.
3. PUJARI K. ARUN. Data Mining Technique. University Press
6. Dunham M.H. Data Mining Introductory and Advanced Topics. Pearson Education.
7. ANAHORY SAM & MURRAY DENNIS. Data Warehousing in the Real World.. Pearson Edn Asia.
IS 2431  **C# and .Net (4 Credits)**

Questions to be set: Eight (Four from each unit)

Questions to be answered: Any Five selecting at least Two from each unit

**UNIT I**


**An Overview of C#**: Object Oriented Concepts, C# Program – Execution, Sample Programs, Command Line Arguments, Programming Examples, Multiple Main Methods.

**Literals, Variables and Data Types**: Keywords, Identifiers, Literals, Variables, Data Types, Boxing and Unboxing.


**Arrays and Strings**: Single Dimensional Arrays, Multidimensional Arrays, Jagged Arrays, System. Array Class, ArrayList Class, Strings, Regular Expressions.

**Methods in C#**: Declaring Methods, Main Method, Invoking Methods, Nesting of Methods, Method Parameters.

**UNIT II**

**Structures and Enumerations**: Structures- Defining a Structure, Assigning Values to Members, Copying Structures, Structures with Methods, Nested Structures, Classes Vs Structures, Guidelines to use Structures; Enumerations- Enumerator Initialization, Enumerator Type Conversion.

**Classes and Objects**: Classes, Constructors & Destructors, Member Initialization, ‘this’ Reference Variable, Nesting of Classes, Members, Properties.
Inheritance and Polymorphism: Classical Inheritance, Containment Inheritance, Defining a Subclass, Visibility Control, Subclass Constructor, Method Overriding, Hiding Methods, Abstract Classes, Abstract Methods, Sealed Classes, Sealed Methods, Polymorphism.


Interfaces, Delegates and Events: Defining Interfaces, Extending Interfaces, Implementing Interfaces, Explicit Interface Implementation, Abstract Classes and Interfaces, Delegates, Multicast Delegates, Events.

Managing Console I/O Operations: The Console Class, Console Input and Output, Formatted Output, Custom Numeric Format.


REFERENCES:
IS 2432 **Network Security (4 Credits)**

Questions to be set: Eight (Four from each unit)

Questions to be answered: Any Five selecting at least Two from each unit

**UNIT I**


**Basics of Cryptography:** Terminologies used in Cryptography, Substitution Techniques, Transposition Techniques.

**Encryption and Decryption:** Characteristics of Good Encryption Technique, Properties of Trustworthy Encryption Systems, Types of Encryption Systems, Confusion and Diffusion, Cryptanalysis.

**Symmetric Key Encryption:** Data Encryption Standard (DES) Algorithm, Double and Triple DES, Security of the DES, Advanced Encryption Standard (AES) Algorithm, DES and AES Comparison.

**Public Key Encryption:** Characteristics of Public Key System, RSA Technique, Key Exchange, Diffie-Hellman Scheme, Cryptographic Hash Functions, Digital Signature, Certificates, Certificate Authorities.

**Protection of Computing Resources:** Secure Programs, Non-malicious Program Errors, Viruses and Other Malicious Code, Targeted Malicious Code, Methods of Control.

**Security Features in Operating System:** Objects to be Protected, Protection Methods of Operating Systems, Memory Protection, File Protection, User Authentication.

**UNIT II**

**Designing Trusted Operating Systems:** Types of Security Policies, Models of Security, Design of OS.

**Network Security:** Network Concepts, Threats in Networks, Network Security Controls.


**Electronic Mail Security:** Threats to E-Mail, Requirements and Solutions, Encryption for Secure E-Mail, Secure E-Mail System.

**Firewalls:** Firewalls – Types, Comparison of Firewall Types, Firewall Configurations.


**REFERENCES:**
IS 2433 **Real Time Operating System (RTOS) (4 Credits)**

Questions to be set: Eight (Four from each unit)
Questions to be answered: Any Five selecting at least Two from each unit

**UNIT I**


**Modeling Real-Time Systems:** Purpose of the Model, Structural Elements, Interfaces, Event-Triggered versus Time-Triggered, Interrupts.

**Real Time Languages:** Overview of Real Time Languages, Few Real Time Languages, Modula 2 as Real Time Language, Ada as Real Time Language.

**Real Time Operating Systems – 1:** RTOS Overview, RTOS Components, Task Management & Memory Management, Scheduling Strategies, Commercial Real-time Operating Systems.

**Real Time Operating Systems – 2:** Intertask Communication and Synchronization, Real Time Kernels, Practical Real Time Operating Systems.


**UNIT II**

**Multi Processing Systems:** Parallel Processing, Vector Computers, Multiple Tasks, Dispatcher.

**Development Methodologies:** Yourdon Systems Method (YSM), The Ward and Mellor Essential Model, The Hatley and Pirbhai Requirements Model.

**Design Analysis – 1:** Petri Nets, Petri Nets and the Modeling of Systems, Properties of Petri Nets, Scheduler Characteristics, Real Time vs. General Purpose Database.
Design Analysis – 2: Transactions and Serializability, Scheduling RTDB Transactions, Disk Scheduling.


REFERENCES:
IS 2434 Customer Relationship Management (4 Credits)

Questions to be set: Eight (Four from each unit)
Questions to be answered: Any Five selecting at least Two from each unit

UNIT I

Introduction to CRM: CRM – Definition, Origin and Evolution of CRM, Importance of CRM, Types of CRM.

CRM Architecture: CRM Architecture – Overview, CRM Technology Components, Customer Lifestyle, Customer Interaction,

Sales Force Automation (SFA): Definition and Need of SFA, SFA – Features, SFA Functionality, Barriers to Successful SFA.

Technological Aspects of SFA: Data Synchronization, Flexibility and Performance, Reporting Tools.

Enterprise Marketing Automation: Enterprise Marketing Automation, Components of Enterprise Marketing Automation, Managing the Marketing Campaign, Business Analytics Tool.

Enterprise Marketing Management: Integrate Marketing into the Enterprise, Response Management.

Customer Interaction Centers: Evolution of Customer Interaction Centers (CICs), Planning a Successful CIC, Technological Implementation.

UNIT II

Computer Telephony Integration: Computer Telephone Integration – Overview, Computer Telephony Integration – Benefits, Computer Telephony Integration – Functionality, Web Enabling the Call Center, Automated Intelligent Call Routing and Monitoring.

Implementing CRM–I: Kick off Meeting, Requirements Gathering, Scoping and Prioritizing Projects, Designing the Project, Pre-implementation.

Introduction to eCRM: Overview of eCRM, The Six ‘E’s of eCRM, Features of eCRM, Differences Between CRM and eCRM, eCRM Architecture.

Introduction to Application Service Provider (ASP): Overview of ASP, Application Server Provider (ASP) – Features, ASP – Value Chain Participants, Specialized CRM ASPs, Advantages and Disadvantages of Implementing ASP.


Internet and Social CRM: Traffic Building, Providing Quality, Transaction, Retention and Measuring Result, Social CRM, CRM Tools.

REFERENCES:
1. Paul, Greenberg. CRM at the speed of light. TMH.
2. Kristin Anderson & Carol Kerr. Customer Relations Management. TMH.
IS 2435 **Advanced Software Engineering (4 Credits)**

Questions to be set: Eight (Four from each unit)
Questions to be answered: Any Five selecting at least Two from each unit

**UNIT I**


**Software Engineering Methodologies:** Components of Software Engineering, Software Development Models.

**Predictive vs. Adaptive Approaches to SDLC:** Traditional Predictive Approaches to SDLC, Adaptive Approaches to SDLC, Separation of Design and Construction, Unpredictability of Requirements.


**Extreme Programming:** XP Equation, XP Values, Assuming Sufficiency.


**XP Events:** Iteration Planning, Iteration, Releasing.

**UNIT II**

Extreme Programming Artifacts: Story Cards, Task Cards, Bullpens.

**Roles of Extreme Programming:** Customer’s Roles, Developer’s Roles, Supplementary Roles.

**Coding XP Style:** Balance Functionality with Simplicity, Implement Only the Needed Features, Eliminate Repetition.

**Adopting XP:** Before Commencing XP, Eliminating Fear and Working Together, Starting Feedback, Including Managers and Customers.
**Agile Modeling with XP:** Agile Modeling – Principles, Comparing XP and Agile Modeling, Scrum Methodology.

**Dynamic Systems Development Methodology (DSDM):** Overview of DSDM, The Principles of DSDM, Phases of DSDM, Core Techniques Used in DSDM.

**XP Tools:** Java and XP, Tools and Philosophies, Open Source Toolkit.

**REFERENCES:**
IS 2436 **Cloud Computing (4 Credits)**

**Questions to be set:** Eight (Four from each unit)

**Questions to be answered:** Any Five selecting at least Two from each unit

**UNIT I**

**Introduction to Cloud Computing:** From Collaborative to Cloud- A Short History, Functioning of Cloud Computing, Cloud Architecture, Cloud Storage and Cloud Services, Industrial Applications.

**Business Values:** Service Modeling, Infrastructure as a Service, Platform as a Service, Software as a Service, Massively Scaled Software as a Service.


**Cloud Service Administration:** Service Level Agreements and Monitoring, Support Services, Accounting Services, Resource Management, Service Management, Untangling Software Dependencies.

**Cloud Computing Technology:** Clients, Security, Network, Services.

**Accessing the Cloud:** Platforms, Web Applications, API in Cloud Computing, Browsers for Cloud Computing,

**Cloud Data Management:** Data Security, Data Location, Data Control, Securing Data for Transport, Scalability and Cloud Services, Storage as A Service.

**UNIT II**

**Information Storage in Cloud Computing:** Storage as a Service, Storage Providers, Storage Security, Merits and Demerits of Cloud Storage.

**Discovery of Private and Hybrid Clouds:** Need for Privacy, Comparing Public, Private and Hybrid, Examining the Economics of the Private Cloud, The Up Key Vendors.

**Cloud Computing Standards:** Best Practices and Standards, Practical Issues, Standards Organizations and Groups.
Desktop and Device Management: Desktop Virtualisation, Desktop Placement in the Cloud, Desktop Management.

Cloud Governance: IT Governance, Deciding the Governor, Risk Assessment of Running the Cloud, Working of Governance.

Migrating to the Cloud: Cloud Services for Individual, Cloud Services Aimed at the Mid-Market, Enterprise-Class Cloud Offerings, Migration.


REFERENCES:
IS 2437 Wireless and Mobile Communication (4 Credits)

Questions to be set: Eight (Four from each unit)
Questions to be answered: Any Five selecting at least Two from each unit

UNIT I


Common Cellular System Components: Cellular networks architecture, Signal strength and cell area, Common cellular netowrks components, Components Identification and call establishment.


GSM Architecture: Fundamentals of GSM Network, GSM Frequency Band, GSM PLMN, GSM Objectives, GSM Services, GSM PLMN Subsystems.

GSM Interface and Protocol Stack: GSM PLMN Interfaces , GSM Radio Interface, GSM Abis Interface, GSM A Interface , GSM Interface for Connecting Other Components, Mapping of GSM Layers onto OSI Layers, Protocols Used Across Other Interfaces of GSM.

GSM TDMA Techniques: GSM and TDMA Techniques, GSM Channels, GSM Identifiers.


UNIT II

CDMA Technology: CDMA overview, CDMA channels Concept, CDMA system operations.

**Waveform Coding and Call Flow in GSM:** Waveform Coding, GSM Vocoder, Data Encryption in GSM, Call flow in GSM.

**Wireless Modulation Techniques:** Concept of Modulation, Wireless Modulation Techniques, Air Interface, Path Loss Models, Multiple Access Techniques.

**Wireless Modulation Techniques – 2:** Orthogonal Frequency Division Multiplexing (OFDM), Ultra Wide Band Radio Techniques, Diversity Techniques, GSM Hardware.


**Wi-Fi and Wimax Technology:** Wi-Fi (802.11), WiMAX(802.16).

**REFERENCES:**
IS 2438 Enterprise Resource Planning (4 Credits)

Questions to be set: Eight (Four from each unit)
Questions to be answered: Any Five selecting at least Two from each unit

UNIT I


Reasons for the Growth of ERP: Reasons for the Growth of ERP, Scenario and Justification of ERP in India, Evaluation of ERP, Various Modules of ERP, Advantages of ERP.

Understanding ERP: Overview of Enterprise, Integrated Management Information, Business Modelling, ERP for Small Businesses, ERP for Make to Order Companies.


ERP Implementation: Precautions in ERP Implementation, ERP Post Implementation Options, Guidelines for ERP Implementation.


ERP and Related Technologies–II: Decision Support Systems (DSS), Supply Chain Management.

UNIT II

ERP Modules–I: ERP Finance Module, Plant Maintenance


**Post Implementation Phases:** Re-Engineering, Configuration, Implementation, Team Training, Testing, Going Live and End User Training, Post Implementation (Maintenance Mode).

**ERP and E-commerce:** Future Directives in ERP, ERP and Internet, Critical Factors Guiding Selection and Evaluation of ERP, Strategies for Successful ERP Implementation, Critical Success Factors in ERP Implementation, Failure Factors in ERP Implementation, Integrating ERP into Organisation.

**Using ERP Tools:** ERP Software and Tools, Case Study 1: SAPR/3 at Tata Steel, Case Study 2: Pantaloon.

**REFERENCES:**

**IS 2475 Project (20 Credits)**

A project work of minimum 16 weeks duration has to be carried out in the area relevant to the curriculum. The project work may be carried out in groups of students comprising of 2-3 students or individually under the supervision of faculty member(s).