ANNAMALAI UNIVERSITY
M.Sc (INFORMATION TECHNOLOGY)

Programme Structure and Scheme of Examination (under CBCS)
(Applicable to the candidates admitted from
the academic year 2022 -2023 onwards)

Semester	Course Code	Course Title	Hours	Credit	Maximum Marks		
					CIA	ESE	Total
		SEMESTER-I					
I	22PINTC11	Core Theory - I : Data Structures and Algorithm	5	4	25	75	100
	22PINTC12	Core Theory - II: Advanced Database Management System	5	4	25	75	100
	22PINTC13	Core Theory - III: Advanced Java Programming	5	4	25	75	100
	22PINTP14	Core Practical - I : Data Structures and Algorithm using JAVA	4	2	40	60	100
	22PINTP15	Core Practical - II: Advanced RDBMS LAB	4	2	40	60	100
	22PINTE16	Core Elective- I	4	4	25	75	100
	22PINTO17	Open Elective-I	3	3	25	75	100
		Total	**30**	**23**			**700**
		SEMESTER-II					
II	22PINTC21	Core Theory - IV: Advanced Operating System	5	4	25	75	100
	22PINTC22	Core Theory - V: Advanced Web Technology	5	4	25	75	100
	22PINTC23	Core Theory - VI: Visual Programming	5	4	25	75	100
	22PINTP24	Core Practical - III: Advanced Web Technology LAB	4	2	40	60	100
	22PINTP25	Core Practical - IV: Visual Programming LAB	4	2	40	60	100
	22PINTE26	Core Elective- II	5	4	25	75	100
	22PHUMR27	Compulsory Course: Human Rights	2	2	25	75	100
		Total	**30**	**22**			**700**

List Of Core Electives (Choose 1 out3 in each Semester)

I	22PINTE16-1	Computer Communication	4	4	25	75	100
	22PINTE16-2	Software Project Management	4	4	25	75	100
	22PINTE16-3	Computer Organization and Architecture	4	4	25	75	100
II	22PINTE26-1	Web services	5	4	25	75	100
	22PINTE26-2	Internet of Things concepts and practices	5	4	25	75	100
	22PINTE26-3	Business Intelligence	5	4	25	75	100

List Open Electives (Choose 1 out 3 in each Semester)

I	22PINTO17-1	Fundamentals of Computer Applications	3	3	25	75	100
	22PINTO17-2	E-Commerce	3	3	25	75	100
	22PINTO17-3	Internet ant its Applications	3	3	25	75	100

SEMESTER - I	22PINTC11: DATA STRUCTURES AND ALGORITHMS	CREDITS: 4 HOURS: 75

COURSE OBJECTIVES (CO)

1. To impart the basic concepts of data structures and algorithms.
2. To understand the concepts of about stacks, queues, lists trees and graphs.
3. To gain knowledge on hashing/symbol tables and study various sorting algorithms
4. To Study various sorting algorithms
5. To develop applications using data structures

Unit I

Introduction of algorithms, analyzing algorithms, Arrays: Representation of Arrays, Implementation of Stacks and queues, Application of Stack: Evaluation of Expression - Infix to postfix Conversion - Multiple stacks and Queues, Sparse Matrices.

Unit II

Linked list: Singly Linked list - Linked stacks and queues – polynomial addition - More on linked Lists - Doubly linked List and Dynamic Storage Management - Garbage collection and compaction.

Unit III

Trees: Basic Terminology - Binary Trees - Binary Tree representations - Binary trees – Traversal - More on Binary Trees - Threaded Binary trees - counting Binary trees. Graphs: Terminology and Representations - Traversals, connected components and spanning Trees, Single SourceShortest path problem.

Unit IV

Symbol Tables: Static Tree Tables - Dynamic Tree Tables - Hash Tables: Hashing Functions - overflow Handling. External sorting: Storage Devices - sorting with Disks: K-way merging - sorting with tapes.

Unit V

Internal sorting: Insertion sort - Quick sort - 2 way Merge sort - Heap sort - shell sort - sorting on keys. Files: Files, Queries and sequential organizations - Index Techniques - File organization.

Text Book

1. Ellis Horowitz, Sartaj Shani, Data Structures, Galgotia publication.

Supplementary Readings

1. Tenenbaum M, Yedidyah Langsam, Moshe J. Augenstein, Data structures Using C AaronKindersley (India) Pvt. Ltd.,
2. Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman, Data structure and Algorithms, PearsonEducation Pvt. Ltd.
3. Algorithms and Data Structures :
4. https://www.syncfusion.com/ebooks/datastructurespart1/algorithms-and-data-structures
5. https://www.programiz.com/dsa
6. https://www.tutorialspoint.com/data_structures_algorithms/index.htm

COURSE OUTCOMES (COs)

After completing the Course successfully, the student will be able to

1. Analyse suitable data structures for various applications.
2. Learn sorting techniques.
3. Understand the different file organizations.
4. Familiarize with the usage of symbol tables.
5. Analyse suitable data structures for various applications.

OUTCOME MAPPING

COs/ POs	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	2	3
CO2	3	2	3	2	1
CO3	3	1	3	2	3
CO4	3	2	2	3	2
CO5	2	2	3	2	3

1-LOW 2- MEDIUM 3- HIGH

SEMESTER - I	22PINTC12: ADVANCED DATABASE MANAGEMENT SYSTEM	CREDITS: 4 HOURS: 75

COURSE OBJECTIVES (CO)

1. To understand the basic concepts and terminology related to DBMS and Relational Database Design.
2. To the design and implement Distributed Databases.
3. To apply normalization techniques to improve database design.
4. To understand advanced DBMS techniques to construct tables and write effective queries, forms, and reports.
5. Analyze a T/O based techniques for designing the database.

Unit I

Formal review of relational database and FDs Implication, Closure, its correctness

Unit II

3NF and BCNF, Decomposition and synthesis approaches, Review of SQL99, Basics of query processing, external sorting, file scans

Unit III

Processing of joins, materialized vs. pipelined processing, query transformation rules, DB transactions, ACID properties, interleaved executions, schedules, serialisability

Unit IV

Correctness of interleaved execution, Locking and management of locks, 2PL, deadlocks, multiple level granularity, CC on B+ trees, Optimistic CC

Unit V

T/O based techniques, Multiversion approaches, Comparison of CC methods, dynamic databases, Failure classification, recovery algorithm, XML and relational databases.

Text Books

1. R. Ramakrishnan, J. Gehrke, Database Management Systems, McGraw Hill, 2004
2. A. Silberschatz, H. Korth, S. Sudarshan, Database system concepts, 5/e, McGraw Hill, 2008.

Supplementary Readings

1. K. V. Iyer, Lecture notes available as PDF file for classroom use.

COURSE OUTCOMES (COS)

After completing the Course successfully, the student will be able to

1. Exposure for students to write complex queries including full outer joins, self-join, sub queries, and set theoretic queries.
2. Know how of the file organization, Query Optimization, Transaction management, and database administration techniques.
3. Elaborate the concept of Concurrency control and Failure Recovery.
4. Illustrate concept of CC on B++ tree, Optimistic CC
5. Use Modern database such as XML and relational databases.

OUTCOME MAPPING

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	2	2	2	2	3
CO2	2	3	2	2	2
CO3	3	2	2	2	2
CO4	2	3	3	2	2
CO5	3	2	2	3	2

1-LOW 2- MEDIUM 3- HIGH

SEMESTER - I	22PINTC13: ADVANCED JAVA PROGRAMMING	CREDITS: 4 HOURS: 75

COURSE OBJECTIVES (CO)

1. To get familiar with the concept of packages, interface
2. Able to understand Inheritance and Exception handling in java.
3. To learn the concept of Graphical User Interface (GUI)
4. Analyse Network Programming, and database manipulation
5. Student will be able to develop web application using Java Servlet and Java Server Pages technology

Unit I

Data Types, Variables and Arrays: Primitive Types-Literals-Variables-Type Conversion and Casting- Arrays. Operators: Arithmetic- Bitwise-Relational-Boolean-Logical – Assignment-Conditional. Control Statements: Selection statements- Iteration Statements- Jump Statements. Classes and Methods: Fundamentals- Declaring objects- Methods- Constructors-Overloading Methods-Recursion – Nested and Inner Classes-Command Line Arguments.

Unit II

Inheritance: Basics-Super Class- Method Overriding- Abstract Classes. Packages and Interfaces: Packages- Access Protection – Importing Packages-Interfaces. Exception Handling: Fundamentals – Types – Try and Catch – Throw – throws- Finally – Built in Exceptions.

Unit III

The Applet Class: Basics – Architecture – Applet Skeleton – Display Methods – Status Window- Passing Parameters. Event Handling: Event Model – Classes – KeyEventClass- Event Listner Interfaces. AWT: Window Fundamentals – Working with frame windows- Graphics- Working with color- working with fonts. AWT controls – Labels- Buttons- Check Box- Choice Controls – Lists- Scroll Bars – TextField- Text Area.

Unit IV

Servlet Fundamentals: Servlet overview and Architecture- Servlet Basics-Servlets and HTML- servlet Sessions- Servlets, JDBC, and Inter Servlet Communications. JSP Fundamentals: JSP Overview and Architecture – JSP Implicit Objects – JSP Standard Actions- Handling JSP Errors – Custom JSP Tag Libraries.

Unit V

Using Relational Databases: Introduction – JDBC Drivers for RDBM Systems- Using java.sql API, Using javax.sql API – connection pooling. Network Programming: Introduction – Working with URLs – Working with Sockets – Remote Method Invocation.

Text Books

1. Herbert Schildt, "Java the Complete Reference", Oracle Press, TMH Company Ltd, New Delhi, 9th Edition, 2014.
2. James goodwill, " Developing Java Servlets: Web applications with servlets and JSP", 2nd Edition, SAMS Publishers, USA
3. Joe Wiggles worth and Paula McMillan, "Java Programming Advanced Topics", 3rd Edition, TMH, 2009.

Supplementary Readings

1. Alan Grid, "Java Programming", Via Etenea Limited, 2020.
2. John Dean, Raymond Dean, "Introduction to Programming with JAVA- A Problem Solving Approach", Tata McGraw Hill, 2012.
3. Ralph Bravaco, Shai Simonson, "Java Programming: From the Ground Up", Tata McGraw Hill, 2012.
4. Herbert Schildt, Dale Skrien, "Java Fundamentals – A Comprehensive Introduction", Tata McGraw Hill, 2013.

Course Outcomes (COs)

After completing the Course successfully, the student will be able to

1. Identify classes, objects, members of a class and the relationships among them needed for a finding the solution to specific problem.
2. Use the Java language for writing well-organized, complex computer programs with both command line and graphical user interfaces
3. Identify and describe common abstract user interface components to design GUI in Java using Applet & AWT along with response to events
4. Apply Servlets and JSP for creating Web based applications using JDBC
5. Design and Develop various application by Integrating any of Servlets, JSPs, Swing and Applet using Database

OUTCOME MAPPING

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	3	3	2	2	2
CO2	3	3	2	2	2
CO3	2	3	3	2	2
CO4	1	3	3	2	1
CO5	2	3	3	3	2

1-LOW 2- MEDIUM 3- HIGH

SEMESTER - I	22PINTP14 – Core Practical – I: DATA STRUCTURES AND ALGORITHM LAB USING JAVA	CREDITS: 2 HOURS: 60

COURSE OBJECTIVES (LO)

To develop skills to design and analyse simple linear and non-linear data structures.

It enables them to gain knowledge in practical application of data structures.

To Understand concepts about searching and sorting techniques

To understand basic concepts about Stacks, Queues, List, Tree and Graphs.

To understanding about writing algorithm and step by step approach in solving with the help of fundamental data structures.

List of Experiments:

1. Write a Java program to create two array lists of integers. Sort and store the elements ofboth of them in third list.
2. Write a Java program to multiply two matrices A and B and store the resultant matrix in Cusing arrays.
3. Write a Java program to experiment the operation of STACK using array.
4. Write a Java program to create menu driven options to implement QUEUE to perform thefollowing
   (i) Insertion
   (ii) Deletion
   (iii) Modification
   (iv) Listing of elements
5. Write a Java program to create Linked list representations of employee records and do thefollowing operations using pointers.
   - To add a new record.
   - To delete an existing record.
   - To print the details about an employee.
   - To find the number of employees in the structure.
6. Write a Java Program to count the total nodes of the linked list.
7. Write a Java program to insert an element at the end of the linked list.
8. Write a Java program to insert an element at the beginning of a doubly linked list.
9. Write a Java program to display the hash table, using the mid square method.
10. Write a Java program to demonstrate Binary Search.

11. Write a Java program to insert nodes into a Binary tree and to traverse in pre order.
12. Write a Java program to traverse the given binary tree using all traversal methods.
13. Write a Java program to arrange a set of numbers in ascending order using QUICK SORT.

COURSE OUTCOMES (COS)

After completing the Course successfully, the student will be able to

1. Learn and develop the mathematical logic and algorithm.
2. Describe the dynamic memory concepts.
3. Analyse the problem and should have the implementation of the non-lineardata structures like Tree and Graph.
4. Implement the various Searching and Sorting Techniques with Timecomplexity.
5. Understand and implement the appropriate data structures with optimizedmemory and computational time complexity.

OUTCOME MAPPING

COs/ POs	PO1	PO2	PO3	PO4	PO5
CO1	3	2	2	2	3
CO2	3	3	2	3	2
CO3	3	3	3	1	2
CO4	3	3	2	2	3
CO5	3	2	3	3	3

1-LOW 2- MEDIUM 3- HIGH

SEMESTER - I	22PINTP15 – Core Practical –II: ADVANCED RDBMS LAB	CREDITS: 2 HOURS: 60

COURSE OBJECTIVES (LO)

1. To explore the features of a Database Management Systems.
2. To interface a database with front end tools.
3. To understand the internals of a database system
4. To use of different Evaluation Plans
5. To interface of Concurrency &Transcations& Big Date Analysis Using Hadoop.

Experiments

1. Basic SQL
2. Intermediate SQL
3. Advanced SQL
4. ERModeling
5. Database Design and Normalization
6. Accessing Databases from Programs using JDBC
7. Building Web Applications using PHP & MySQL
8. Indexing and Query Processing
9. Query Evaluation Plans
10. Concurrency and Transactions
11. Big Data Analytics using Hadoop

COURSE OUTCOMES (COs)

After completing the Course successfully, the student will be able to

1. Ability to use databases for building web applications.
2. Gaining knowledge about the internals of a database system.
3. To use of ER Modeling, Database Design & Normalization
4. Implement the plan using Web Applications Using PHP & My SQL
5. Analysis various Query Evaluation plans, Big Data Analysis

OUTCOME MAPPING

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	3	3	2	2	3
CO2	3	3	2	3	2
CO3	2	3	3	2	2
CO4	2	2	3	2	3
CO5	3	3	2	3	2

1-LOW 2- MEDIUM 3- HIGH

SEMESTER - I	22PINTE16-1: Core Elective 1(A) – COMPUTER COMMUNICATION	CREDITS: 4 HOURS: 75

Learning Objectives (LO)

1) To understand the basics of data communication and networking.
2) To understand the functions and services of all Seven layers of OSI model.
3) To get a complete knowledge of the network layer routing protocols.
4) To know the protocols used in OSI Upper layers
5) To get an idea of latest network technologies.

UNIT – I: DATA COMMUNICATION & NETWORKING BASICS

Data transfer modes - Telephone system - Protocols & standards – Multiplexing-Circuit switching - Message & packet switching - Introduction to LAN, MAN & WAN - IEEE standards for LAN – Network topologies.

UNIT - II : OSI LOWER LAYERS

Network models – OSI layer architecture – Issues in data traffic over network – Physical layer standards – Data link control & protocol – ARQ schemes – HDLC protocol.

UNIT – III: NETWORK LAYERS

Need for Internetworking – Addressing – Routing Algorithms - Routing Issues – Internet protocol (IPV4/V6) – Congestion & flow control mechanism – TCP/IP model.

UNIT – IV: OSI HIGHER LAYERS

Transport layer – TCP & UDP – Session layer issues – Presentation layer – Application layer.

UNIT – V: APPLICATION & INTRODUCTION TO ISDN

Application layer: Email – FTP – HTTP–Compression Techniques. Introduction to ISDN – Broadband ISDN Features – ATM Concept.

Text books

1. Behrouz A.Fehrouzan, “Data communication & Networking” Mc-Graw Hill, 3rd Edition, 2004.
2. Andrew S.Tanenbaum, “Computer Networks”, 4th edition, Pearson education, 1999.

Supplementary Readings

1. Frank H. P. Fitzek, Patrick Seeling, Fabrizio Granelli, "Computing in Communication Networks", Elsevier Science, 2020.
2. W.Stallings, "Data & Computer communication", 3rd Edition, NY Pearson, 2014.
3. Rarnier Handel, N.Huber, Schroder, "ATM Networks Concepts, Protocols Applications" , Addison Welsey, 1999.

COURSE OUTCOMES (COs)

After completing the Course successfully, the student will be able to

1. *Understand* and *Contrast* the concept of Signals, OSI & TCP/IP reference models and *discuss* the functionalities of each layer in these models.
2. Understand how information can be sent via communication interfaces and links.
3. *Analyze* and *apply* various routing algorithms to find shortest paths for packet delivery.
4. Explain the details of Transport Layer Protocols (UDP, TCP) and suggest appropriate protocol in reliable/unreliable communication.
5. Analyze the features and operations of various application layer protocols such as HTTP, DNS and SMTP.

OUTCOME MAPPING

COs / POs	PO1	PO2	PO3	PO4	PO5
CO1	3	1	2	2	2
CO2	3	3	2	2	1
CO3	3	3	3	1	2
CO4	3	2	1	3	3
CO5	3	2	2	2	3

1-LOW 2- MEDIUM 3- HIGH

SEMESTER - I	22PINTE16-2: Core Elective 1(B) – SOFTWARE PROJECT MANAGEMENT	CREDITS: 4 HOURS: 75

Learning Objective (LO)

LO1 1. To provide sound knowledge in Project Management.
LO2 2. To understand the importance of requirement gathering
LO3 3. To explore different models in Software Development
LO4 4. To know the workflow of a Project
LO5 5. To identify various actors in the activity

UNIT I: INTRODUCTION TO SOFTWARE PROJECT MANAGEMENT

Introduction: Project – Software Projects vs other types of Project – Activities Covered by SPM – Some Ways of Categorizing Software Projects – Stakeholders, Setting Objectives – The Business Case - Project Success and Failure - Management and Management Control. Project Evaluation:A Business Case – Project Portfolio Management – Evaluation of Individual Projects – Cost Benefit Evaluation – Risk Evaluation.

UNIT II: PROJECT PLANNING AND SELECTION OF PROJECT APPROACH

Project Planning - Introduction to Step Wise Project Planning – Step 0 to Step 10. Selection of an Appropriate Project Approach -Introduction – Build or Buy – Choosing Methodologies and Technologies – Software Processes and Process Models – Choice of Process Models – The Waterfall Model– Prototyping – other ways of categorizing prototype- Agile Methods – Extreme Programming - Selecting the Most Appropriate Process Model.

UNIT III: EFFORT ESTIMATION AND ACTIVITY PLANNING

Effort Estimation – Introduction –Estimates – Problems with Over and Under-estimate – Basis for Software Estimating – Effort Estimation Techniques – Bottom-up Estimating – Top-down Approach and Parametric Models – Expert Judgment - Estimating by Analogy – Albrecht Function Point Analysis – Function Mark II – COCOMO & COCOMO II – Cost Estimation – Staffing Pattern. Activity Planning – Introduction – Objectives of Activity Planning – When to plan – Project Schedules – Project and Activities – Sequencing and Scheduling Activities – Networking Planning Models – Formulating a Network Model– Activity on Arrow Networks.

UNIT IV: RISK MANAGEMENT, RESOURCE ALLOCATION AND MONITORING

Risk Management –Risk – Categories of Risk – A Framework for Dealing with Risk – Risk Identification – Risk Assessment – Risk Planning – Risk Management. Resource Allocation –Introduction – The Nature of Resources – Identifying Resource Requirements – Scheduling Resources. Monitoring –Creating the Framework – Collecting the Data – Review and Project Termination Review – Visualizing Progress – Cost Monitoring and Earned Value Analysis – Getting the Project Back to Target – Change Control – SCM.

UNIT V: MANAGING PEOPLE AND WORKING IN TEAMS

Managing People –Understanding Behavior – Organizational Behavior – Selecting the Right Person for the Job – Instruction in the Best Methods – Motivation – The Oldham-Hackman Job Characteristics Model – Stress – Health and Safety. Working in Teams –Introduction – Becoming a Team – Decision Making – Organization and Team Structures – Coordination Dependencies – Dispersed and Virtual Teams – Communication Genres – Communication Plans – Leadership.

Text Book:

1. BOB Hugues, Mike Cotterell, Rajib Mall "Software Project Management", McGraw Hill, Fifth Edition,2011.

Supplementary Readings

1. Futrell, "Quality software Project management", Pearson Education India.
2. Royce, "Software Project Management", Pearson Education India.

Web References

1. https://www.lynda.com/Project-Management-training-tutorials/39-0.html
2. www.rspa.com/spi/project-mgmt.html

Course Outcomes (CO)

After completing the Course successfully, the student will be able to

1. Students are able to understand the activities during the project scheduling of any software application.
2. Students are able to learn the risk management activities and the resource allocation for the projects
3. Students are able to apply the software estimation and recent quality standards for evaluation of the software Projects.
4. Students are able to acquire knowledge and skills needed for the construction of highly reliable software project.
5. Students are able to able to create reliable, replicable cost estimation that links to the requirements of project planning and managing.

OUTCOME MAPPING

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	3	2	2	2	2
CO2	2	3	2	3	2
CO3	3	2	2	3	3
CO4	3	2	3	2	3
CO5	3	2	3	3	2

1-LOW 2- MEDIUM 3- HIGH

SEMESTER - I	22PINTE16-3: Core Elective 1(C) – Computer Organization and Architecture	CREDITS: 4 HOURS: 75

Learning Objectives (LO)

1. To understand the Architecture and Organization of the Computer System.
2. To understand what a process is going on the Address modes and
3. Programs.
4. To understand different approaches to Memory management Systems.
5. Students should be able to how to process going on Input and Output
6. Organizations.
7. Students should understand the Computer Instruction, Arithmetic Instruction and Logical Instruction

Unit I

Basic of Computer, Von Neumann Architecture, Generation of Computer, Classification of Computers, Instruction Execution. Register Transfer and Micro operations: Register Transfer, Bus and Memory Transfers, Three-StateBusBuffers,MemoryTransfer,Micro-Operations,Register Transfer Micro-Operations, Arithmetic Micro-Operations, Logic Micro-Operations, ShiftMicro-Operations.

Unit II

Stack Organization, Register Stack, Memory Stack, Reverse Polish Notation. Instruction Formats, Three- Address Instructions, Two — Address Instructions, One - Address Instructions, Zero - Address Instructions, RISC Instructions, Addressing Modes. RISC & CISC and their characteristics.

Unit III

Addition And Subtraction With Signed-Magnitude, Multiplication Algorithm, Booth Multiplication Algorithm, Array Multiplier, Division Algorithm, Hardware Algorithm, Divide Overflow, Floating-Point Arithmetic Operations, Decimal Arithmetic Operations, BCD Adder, BCD Subtraction.

Unit IV

Modes Of Transfer, Priority Interrupt, DMA, Input-Output Processor (IOP), CPU-IOP Communication. Memory Organization: Memory Hierarchy, Main Memory, Auxiliary Memory, Cache Memory, Virtual Memory, Associative Memory.

Unit V

Control memory – Address sequencing – Design of Control unit. Pipelining: Parallel Processing, Pipelining- Arithmetic Pipeline, Instruction Pipeline. Multiprocessors: Characteristics of Multiprocessors, Interconnection Structure: Time-Shared Common Bus, Multi-Port Memory, Cross bar Switch, Multistage Switching Network, Hyper cube Interconnection.

Text Books

1. Morris M Mano. "Computer System Architecture", By Pearson paperback, (2017) ThirdEdition
2. John.P. Hayes"Computer System Architecture",.McGrawHill(1988)
3. Hamacher C.,Vranesic Z.,Zaky S.," Computer Organization, McGraw Hill(2009), Fifth Edition.
4. HwangK. Briggs,"Computer Architecture and parallel Processing", Paperback (1984).

Course Outcomes (CO)

After completing the Course successfully, the student will be able to

1. Understand the Organization of Computer and Basic Architecture Components involved in Computer Designs.
2. Describe the Central Processing Units system and Address, Arithmetic and Logical Instructions.
3. Understand the Organization of Computer and Basic Architecture Components involved in Computer Designs.
4. Understand the Addressing methods and Programs of Bus Structure in Computer Systems.
5. Understand Pipeline, Parallel Processing and multiprocessor characteristics

OUTCOME MAPPING

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	2	2
CO2	2	3	2	3	2
CO3	2	2	3	3	3
CO4	3	2	1	2	3
CO5	3	2	3	2	2

1-LOW 2- MEDIUM 3- HIGH

SEMESTER - II	22PINTC21 – Core Theory –IV: ADVANCED OPERATING SYSTEM	CREDITS: 4 HOURS: 75

COURSE OBJECTIVES (CO)

1. Learn basic Concepts of Operating System
2. Enrich knowledge about Process and Processor Management
3. Acquire knowledge in Memory Management with various algorithm
4. Implementing various Job Scheduling functions and policies
5. Knowledge gaining in file Management

Unit I

Operating Systems Objectives and functions – Operating System and User /Computer Interface, Operating System as a Resource Manager: Evaluation of Operating Systems –Serial Processing, Sample Batch Systems, Time Sharing Systems.

Unit II

Process Description, Process Control Processes and Threads. Concurrency–Principles of Concurrency, Mutual Exclusion – Software support, Dekker's Algorithm –Mutual Exclusion–Hardware support, Mutual Messages–Deadlock–Deadlock prevention, Deadlock Detection, Deadlock Avoidance–An Integrated deadlock Strategy.

Unit III

Memory Management–Memory Management Requirements–Fixed Partitioning, Placement Algorithm, Relocation in a Paging System – Sample Segmentation. Virtual Memory–Paging Address Translation in a Paging System. Segmentation–Organization, Address Translation in a Segmentation System – Combined Paging and Segmentation–Virtual Memory–Operating System Software–Fetch Policy, Placement Policy and replacement Policy, Page buffering resident set Management.

Unit IV

Scheduling – Types of Scheduling, scheduling Algorithms, scheduling criteria, FIFO, Round Robin, Shortest Process next, Shortest Remaining Time, Highest response ratio and Feedback scheduling Performance comparison–Fair–Share Scheduling. I/O Management and disk scheduling–Organization of the I/O function–the Evaluation of the I/O function, Logical structure of the I/O function, I/O Buffering, Disk Cache.

Unit V

File Management Files, File Management Systems, File System Architecture, and Functions of File Management File Directories–File Sharing–Secondary Storage Management – File allocation.

Text Books

1. William Stallings, "Operating Systems", Second edition, Maxwell McMillan, International Editions, 1997.
2. Charles Crowley, "Operating Systems-A Design Oriented Approach", IRWIN Publications Chicago, 1997.

Supplementary Readings

1. Ann McIver McHoes and Ida M. Flynn , Understanding Operating Systems , Sixth Edition, Course Technology, Cengage Learning,2011
2. Ann McHoes, Ida M. Flynn**,** Understanding Operating Systems, Seventh Edition**,** Cengage Learning, 2013.
3. DeitalH.M. "An Introduction to Operating Systems", Addison Wesley Publishing
4. Silberchatz.A., Peterson.J.L., GalvanP. "Operating System Concepts", Third Edition, Addison Wesley Publishing Co., 1992.

COURSE OUTCOMES(COs)

After completing the Course successfully, the student will be able to

1. Operating System Usages and functions
2. we can understand, How to control the Processor through Operating System
3. Get better experience in Memory management in OS
4. Acquire knowledge in Job Scheduling techniques
5. File management helps to storing and sharing Data

OUTCOME MAPPING

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	3	1	2	2	2
CO2	2	3	2	3	2
CO3	3	2	2	1	3
CO4	3	2	3	2	3
CO5	3	2	1	3	2

1-LOW 2- MEDIUM 3- HIGH

SEMESTER - II	22PINTC22 –Core Theory –V ADVANCED WEB TECHNOLOGY	CREDITS: 4 HOURS: 75

COURSE OBJECTIVE (COs)

1. Explore the backbone of webpage creation by developing .NET skill.
2. Enrich knowledge about HTML control and web control classes
3. Provide depth knowledge about ADO.NET
4. Understand the need of usability, evaluation methods for web services
5. Developing Component based Programming

Unit I

OVERVIEW OF ASP.NET - The .NET framework – Learning the .NET languages Data types – Declaring variables- Scope and Accessibility- Variable operations-Object Based manipulation-Conditional Structures-Loop Structures-Functions and Subroutines. Types, Objects and Namespaces: The Basics about Classes- Value types and Reference types- Advanced class programming- Understanding namespaces and assemblies. Setting Up ASP.NET and IIS.

Unit II

Developing ASP.NET Applications - ASP.NET Applications: ASP.NET applications–Code behind-The Global.asax application file-Understanding ASP.NET Classes- ASP.NET Configuration. Web Form fundamentals: A simple page applet-Improving the currency converter-HTML control classes-The page class-Accessing HTML server controls. Web controls: Web Control Classes – Auto Post Back and Web Control events-Accessing web controls. Using Visual Studio. NET: Starting a Visual Studio. NET Project- Web form Designer- Writing code-Visual studio.NET debugging. Validation and Rich Controls: Validation-A simple Validation example-Understanding regular expressions- A validated customer form. State management- Tracing, Logging, and Error Handling.

Unit III

Working with Data-Overview of ADO.NET-ADO.NET and data management-Characteristics of ADO.NET-ADO.NET object model. ADO.NET data access: SQL basics–Select, Update, Insert, Delete statements- Accessing data- Creating a connection- Using a command with a Data Reader - Accessing Disconnected data - Selecting multiple tables – Updating Disconnected data. Data binding: Single value Data Binding- Repeated value data binding- Data binding with data bases. Data list – Data grid – Repeater – Files, Streams and Email – Using XML

Unit IV

Web Services- Web services Architecture: Internet programming then and now-WSDL–SOAP-Communicating with a web service-Web service discovery and UDDI. Creating Web services: Web service basics - The Stock Quote web service – Documenting the web service-Testing the web service- Web service Data types- ASP.NET intrinsic objects. Using web services: Consuming a web service-Using the proxy class-An example with Terra Service.

Unit–V

AdvancedASP.NET-Component Based Programming: Creating a simple component–Properties and state-Database components-Using COM components. Custom controls: User Controls-Deriving Custom controls. Caching and Performance Tuning: Designing and scalability – Profiling – Catching – Output catching-Data catching. Implementing security: Determining security requirements-The ASP.NET security model-Forms authentication-Windows authentication.

Text Book

1. Mathew MacDonald, “ASP.NET Complete Reference”, TMH 2005.

Supplementary Readings

1. Crouch Matt J, “ASP.NET and VB.NET Web Programming”, Addison Wesley 2002.
2. J. Liberty, D.Hurwitz, “Programming ASP.NET”, Third Edition, O’REILLY, 2006.

COURSE OUTCOMES (COS)

After completing the Course successfully, the student will be able to

1. Acquire knowledge on the concepts of .Net
2. Implementing various HTML controls and Visual studio projects
3. Able to develop applications using ADO .Net
4. Acquire knowledge in web services
5. Develop websites which contains adaptive web pages

OUTCOME MAPPING

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	2	3	2	2	2
CO2	2	2	2	3	3
CO3	3	3	2	3	3
CO4	3	2	3	3	3
CO5	3	1	3	3	2

1-LOW 2- MEDIUM 3- HIGH

SEMESTER - II	22PINTC23 –Core Theory –VI: VISUAL PROGRAMMING	CREDITS: 4 HOURS: 75

COURSE OBJECTIVES (COs)

1. To Introduce the basics of VB.
2. To understand the concepts MDI Applications, ADO and Active X.
3. T To improve creative thinking creating forms.
4. Creating dialogs, menus & Use windows common dialogs & Creating SDI & MDI applications.
5. Creating ActiveX Data object & Reports

Unit I

Introduction: Need of visual languages, integrated development environment (IDE), advantage of Visual Basic, characteristics and features of Visual Basic – IDE, Projects, user interface, objects oriented, visual development and event-driven programming, forms/graphic controls, data processing, sharing with windows and internet applications.

Unit II

Visual Basic programming and tools: An introduction to Visual Basic programming, simple program construction, statements, input/outputs, comments, editor, subroutines, controls flow statements, objects and variants.

Unit III

Designing user interface –Elements of user interface, understanding forms, menus and toolbars, designing menus and toolbars, building dynamic forms, drag and drop operations, working with menus, customizing the toolbars.

Unit IV

Controls – Textbox, combo box, scroll bar and slider control operations, generating timed events, drawing with Visual Basic using graphics controls, coordinate systems and graphic methods, manipulating colors and pixels with Visual Basic, working with ActiveX controls.

Unit V

Menus: Creating a menu system, Creating and accessing pop-up menu, Modifying menus at runtime, adding menu items at run-time, data access methods, creating, reading and writing text files, data controls, creating queries, Report generation.

Text Books

1. Programming with Visual Basic 6.0, Mohammed Azam, Vikas Publishing House Pvt. Ltd., Chennai.

Supplementary Readings

1. David Schneider, Introduction to Programming using Visual Basic, PHI.
2. Mohammed Azam, Programming with Visual Basic 6.0, Vikas Publications.
3. Dietel& Dietel, Visual Basic Programming, Pearson Education.
4. David I. Schneider, An Introduction To Programming Using Visual Basic .Net®, PHI.
5. C Muthu , Visual Basic.Net, Tata Mc Graw Hill Year of Publication.

Web references

1. https://www.freetutes.com/learn-vb6/

Course Outcomes (COs)

After completing the Course successfully, the student will be able to

1. Know about Need of Visual basic & its basic concepts.
2. Explain the Programming Concepts & tools.
3. Discuss about Forms and iits tools.
4. Illustrate concept of Active-X controls
5. Use of Menus and Reports.

OUTCOME MAPPING

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	2	3
CO2	3	3	3	3	3
CO3	2	2	2	2	2
CO4	3	3	3	2	2
CO5	3	3	2	3	3

1-LOW 2- MEDIUM 3- HIGH

SEMESTER - II	22PINTC22 –Core Practical –II: ADVANCED WEB TECHNOLOGIES LAB	CREDITS: 2 HOURS: 60

COURSE OBJECTIVES (COs)

1. Create simple Web service Programs
2. Develop windows application based web services
3. Accessing Database in Web services
4. To create an application that simulates sending a SOAP message
5. Develop a Web intranet/internet based Web Service Client

Experiments

1. Create a simple Web Service that converts the temperature from Fahrenheit to Celsius and vice versa.
2. Use the above Web Service on a web page and execute to fetch the results
3. Create a Web Services provider and make it available on the Internet or intranet.
4. Create a web based Consumer of an existing web service.
5. Create a Windows application based consumer of an existing web service.
6. Write an application that simulates sending a SOAP message as a request and receiving another as a response.
7. Develop a Web Service that provides images as responses.
8. Develop a web service that access table contents of a database.
9. Develop a console based Web Service Client.
10. Develop a Web intranet/internet based Web Service Client.

COURSE OUTCOMES (COs)

After completing the Course successfully, the student will be able to

1. Acquire Excellent knowledge and execute simple web service programs
2. Implementing various techniques in web services
3. Able to develop applications based web services from existing programs
4. Using SOAP techniques
5. Develop Client server based web Services

OUTCOME MAPPING

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	3	2	2	2	2
CO2	2	1	2	3	2
CO3	3	2	1	3	3
CO4	3	2	3	1	3
CO5	3	2	3	3	2

1-LOW 2- MEDIUM 3- HIGH

SEMESTER - II	22PINTP25: Core Practical –IV VISUAL PROGRAMMING LAB	CREDITS: 2 HOURS: 60

COURSE OBJECTIVES (COs)

1. To know about how to write simple program in Visual Basic
2. To create menu & MDI forms
3. T To study about display files in directory
4. Creating dialogs, common dialog boxes.
5. Creating a databases access

List of Experiments:

1. Construction of an Arithmetic Calculator (Simple).
2. Writing simple programs using loops and decision making statements.
    a. Generate Fibonacci series.
    b. Find the sum of N numbers.
    c. To display the numbers/symbols in triangle format.
3. Write a program to create a menu and MDI Forms.
4. Write a program to create a simple input screen with four basic controls to read input and write it to a file.
5. Write a program to display files in a directory using DriveListBox, DirListBox and FileListBox control and open, edit and save text file using Rich text box control.
6. Write a program to illustrate Common Dialog Control and to open, edit and save text file
7. Write a program to develop windows based installation file with Student Registration form and Login form using database access
8. Develop a program to Insert, update, delete a Record in database using ADO
9. Write a program to implement Personal Information System using MDI and Standard ADODC controls and reports.
10. Write a program to implement animation using timers.
11. Railways Reservation System (Using Tables).

COURSE OUTCOMES (COs)

After completing the Course successfully, the student will be able to

1. Understand the features in VB.
2. Select and apply statements for design forms.
3. Combine multiple features in interface and database.
4. Illustrate common dialog controls
5. Use of file & data base concepts

OUTCOME MAPPING

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	2	3	3	2	3
CO2	3	3	2	3	2
CO3	2	2	2	2	2
CO4	2	2	3	2	2
CO5	3	3	2	3	3

1-LOW 2- MEDIUM 3- HIGH

SEMESTER - II	22PINTE26-1: Core Elective 2(A) WEB SERVICES	CREDITS: 4 HOURS: 75

Learning Objectives

1. To Understand Web Services and implementation model for SOA
2. To Understand the SOA, its Principles and Benefits.
3. Understanding cloud computing as a web service.
4. Discuss the concept of virtualization and data in cloud.
5. Learning basic concept of cloud computing & cloud service Modes.

Unit I : Web Service and SOA fundamentals

Introduction, Concept of Software as a Service(SaaS), Web services versus Web based applications, Characteristics of Web services, Service interface and implementation, The Service Oriented Architecture(SOA), Quality of service (QoS), Web service interoperability, Web services versus components, RESTful services , Impact and shortcomings of Web services.

Unit II : Web Services Architecture.

Web services Architecture and its characteristics, core building blocks of web services, standards and technologies available for implementing web services, web services communication, basic steps of implementing web services, developing web services enabled applications.

Unit III : SOAP: Simple Object Access Protocol

Inter-application communication and wire protocols, SOAP as a messaging protocol, Structure of a SOAP message, SOAP communication model, Building SOAP Web Services, developing SOAP Web Services using Java, Error handling in SOAP, Advantages and disadvantages of SOAP.

Unit IV : Describing and Discovering Web Services

WSDL in the world of Web Services, Web Services life cycle, anatomy of WSDL definition document, WSDL bindings, WSDL Tools, limitations of WSDL, Service discovery, role of service discovery in a SOA, service discovery mechanisms, UDDI – UDDI Registries, uses of UDDI Registry, Programming with UDDI, UDDI data structures, support for categorization in UDDI Registries, Publishing API, Publishing information to a UDDI Registry, searching information in a UDDI Registry, deleting information in a UDDI Registry, limitations of UDDI.

Unit V : Emerging trends

Cloud Computing : What is Cloud Computing?, SOA meets the Cloud, Cloud Service Models, SaaS- Salesforce.com, PaaS-Google App Engine, IaaS-Amazon EC2, Cloud Deployment Models – Public, Community, Private, Hybrid. Virtualization , Virtual Machine(VM) Technology, Virtual Machine Monitor or Hypervisor - KVM, Xen, VMware hypervisors and their features, Multi-tenancy, Architecture model for Cloud Computing . Case Study: Use Cloud Services – Amazon EC2, Google App Engine, Salesforce.com

Text books

1. Web Services & SOA Principles and Technology, Second Edition, Michael P. Papazoglou.
2. Developing Java Web Services, R. Nagappan, R. Skoczylas, R.P. Sriganesh, Wiley India.
3. Developing Enterprise Web Services, S. Chatterjee, J. Webber, Pearson Education.
4. Gautam Shroff, “Enterprise Cloud Computing” ,Cambridge.

Supplementary Readings

1. Building Web Services with Java, 2nd Edition, S. Graham and others, Pearson Edn., 2008.
2. Java Web Services, D.A. Chappell & T. Jewell, O’Reilly,SPD.
3. J2EE Web Services, Richard Monson-Haefel, Pearson Education.
4. Java Web Services Programming,R.Mogha,V.V.Preetham,Wiley India Pvt.Ltd.
5. Ronald Krutz and Russell Dean Vines, “Cloud Security”, Wiley-India
6. XML, Web Services, and the Data Revolution, F.P.Coyle, Pearson Education.
7. Dr. Kumar Saurabh,”Cloud Computing”, Wiley Publication
8. BorkoFurht, “Handbook of Cloud Computing”, Springer

Course Outcomes (COs)

After completing the Course successfully, the student will be able to

1. Understand & Identify basic concept of Web Services & Web Service applications
2. Explain the Concept of Web services Architecture and its characteristics
3. Student Learn about current trends in SOAP Web Services.
4. Illustrate about UDDI Registries & Programming with UDDI.
5. Elaborate about Virtualization, Virtual Machine (VM) Technology, Virtual Machine Monitor or Hypervisor in current trends.

OUTCOME MAPPING

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	2	2	2	2	3
CO2	2	3	2	2	2
CO3	2	3	3	2	3
CO4	3	2	3	3	3
CO5	2	2	3	2	2

SEMESTER - II	22PINTE26-2: Core Elective 2(B) Internet of Things concepts and Practices	CREDITS: 4 HOURS: 75

Learning Objective (LO)

1. To provide an understanding of the technologies and the standards relating
2. to the Internet of Things.
3. To develop skills on IoT technical planning.
4. To Implement Data and Knowledge Management and use of Devices in IoT Technology.
5. To Understand State of the Art IoT Architecture.
6. To study Real World IoT Design Constraints, Industrial Automations in IoT.

Unit I

INTRODUCTION TO IoT: Internet of Things - Physical Design- Logical Design- IoT Enabling Technologies - IoT Levels & Deployment Templates - Domain Specific IoTs - IoT and M2M - IoT System Management with NETCONF-YANG- IoT Platforms Design Methodology.

Unit II

IoT ARCHITECTURE: M2M high-level ETSI architecture - IETF architecture for IoT - OGC architecture - IoT reference model - Domain model - information model - functional model - communication model - IoT reference architecture

Unit III

IoT PROTOCOLS: Protocol Standardization for IoT – Efforts – M2M and WSN Protocols – SCADA and RFID Protocols – Unified Data Standards – Protocols – IEEE 802.15.4 – BACNet Protocol – Modbus– Zigbee Architecture – Network layer – 6LowPAN - CoAP - Security

Unit IV

WEB OF THINGS: Web of Things versus Internet of Things — Two Pillars of the Web — Architecture Standardization for WoT– Platform Middleware for WoT – Unified Multitier WoT Architecture – WoT Portals and Business Intelligence. Cloud of Things: Grid/SOA and Cloud Computing – Cloud Middleware – Cloud Standards – Cloud Providers and Systems – Mobile Cloud Computing – The Cloud of Things Architecture.

Unit V

APPLICATIONS: The Role of the Internet of Things for Increased Autonomy and Agility in Collaborative Production Environments - Resource Management in the Internet of Things: Clustering, Synchronisation and Software Agents. Applications - Smart Grid — Electrical Vehicle Charging.

Text Books

1. Dr Kamlesh Lakhwani, Dr Hemant Kumar Gianey, *Internet of Things (IOT): Principles,Paradigms & Applications of IOT*, Bpb publications (2019).
2. Cuno Pfister, Getting Started with Internet of Things, O'Reilly (2018), 1st Edition.
3. ArshdeepBahga, Vijay Madisetti, *Internet of Things – A hands-on approach*, Universities Press(2015).
4. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), *Architecting the Internet of Things*, Springer(2011).
5. Jan Ho¨ ller, VlasiosTsiatsis , Catherine Mulligan, Stamatis , Karnouskos, Stefan Avesand. David Boyle, *From Machine-to-Machine to the Internet of Things - Introduction to a New Ageof Intelligence*, Elsevier(2014).
6. David Easley and Jon Kleinberg, *Networks, Crowds, and Markets: Reasoning About a Highly Connected World*, Cambridge University Press(2010).
7. Olivier Hersent, David Boswarthick, Omar Elloumi ,*The Internet of Things – Key applicationsand Protocols*, Wiley (2012).
8. https://www.pdfdrive.com/internet-of-things-iot-technologies-applications-challenges-and- solutions-e158467863.html (E-book)

Course Outcomes (COs)

After completing the Course successfully, the student will be able to

1. Understand the technology and standards relating to IoT.
2. Know about the critical parts of the ICT ecosystem required to mainstreamIoT.
3. Acquire skills on developing their own national and enterprise level technicalstrategies.
4. Interpret the vision of IoT from a global context.
5. Determine the Market perspectives of IoT.

OUTCOME MAPPING

COs/ Pos	PO1	PO2	PO3	PO4	PO5
CO1	3	3	2	2	3
CO2	3	3	3	2	3
CO3	3	3	3	3	1
CO4	3	2	2	3	3
CO5	3	3	3	3	2

1-LOW 2- MEDIUM 3- HIGH

SEMESTER - II	22PINTE26-3: Core Elective 2 (C) Business Intelligence	CREDITS: 4 HOURS: 75

Learning Objectives (LO)

1. Be exposed with the basic rudiments of business intelligence system.
2. Understand the modeling aspects behind Business Intelligence.
3. understand the business intelligence life cycle and the techniques used in
4. it.
5. To Link data mining with business intelligence
6. To know the future of Business Intelligence

Unit 1

Business Intelligence: Effective and timely decisions – Data, information and knowledge –Role of mathematical models – Business intelligence architectures: Cycle of a business intelligence analysis – Enabling factors in business intelligence projects – Development of a business intelligence system–Ethics and business intelligence.

Unit II

Knowledge Delivery: The business intelligence user types, Standard reports, Interactive Analysis and Adhoc Querying, Parameterized Reports and Self-Service Reporting, dimensional analysis, Alerts/Notifications, Visualization: Charts, Graphs, Widgets, Scorecards and Dashboards, Geographic Visualization, Integrated Analytics, Considerations: Optimizing the Presentation for the Right Message.

Unit III

Efficiency: Efficiency measures–The CCR model: Definition of target objectives- Peer groups -Identification of good operating practices; cross efficiency analysis– virtual inputs and outputs- Other models. Pattern matching–cluster analysis, outlier analysis

Unit IV

Business Intelligence Applications: Marketing models – Logistic and Production models –Case studies.

UnitV

Future of Business Intelligence: Future of business intelligence – Emerging Technologies, Machine Learning, Predicting the Future, BI Search & Text Analytics – Advanced Visualization –Rich Report, Future beyond Technology.

Text Book

1. Efraim Turban, Ramesh Sharda, Dursun Delen , " Decision Support and Business Intelligence Systems", 9th Edition, Pearson (2013).

Supplementary Readings

1. LarissaT.Moss, S.Atre,"Business Intelligence Road map: The Complete Project Life cycle of Decision Making", Addison Wesley,(2003).
2. CarloVercellis,"Business Intelligence:DataMining and Optimization for Decision Making", Wiley Publications, (2009).
3. David Loshin Morgan, Kaufman, "Business Intelligence: The Savvy Manager‟s Guide " , Second Edition,(2012).
4. Cindi Howson , " Successful Business Intelligence : Secrets to Making BIa Killer App", McGraw-Hill,(2007).
5. RalphKimball,Margy Ross , Warren Thornthwaite, Joy Mundy, Bob Becker, " The Data Warehouse Life cycle Toolkit " , Wiley Publication Inc.,(2007).

Course Outcomes (COs)

After completing the Course successfully, the student will be able to

1. Explain the fundamentals of business intelligence.
2. Link data mining with business intelligence.
3. Apply various modeling techniques.
4. Explain the data analysis and knowledge delivery stages.
5. Apply business intelligence methods to various situations.

OUTCOME MAPPING

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	2	2
CO2	3	3	3	1	3
CO3	3	2	3	2	2
CO4	3	2	2	3	3
CO5	3	2	2	2	3

1-LOW 2- MEDIUM 3- HIGH