

**COURSE OBJECTIVE(S):**

1. To know the basics of algorithmic problem solving
2. To read and write simple Python programs.
3. To develop Python programs with conditionals and loops.
4. To define Python functions and call them.
5. To use Python data structures — lists, tuples, dictionaries.
6. To do input/output with files in Python.

**Prerequisite: Nil****UNIT I ALGORITHMIC PROBLEM SOLVING****9**

Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion). Illustrative problems: find minimum in a list, insert a card in a list of sorted cards, guess an integer number in a range, Towers of Hanoi.

**UNIT II DATA, EXPRESSIONS, STATEMENTS****9**

Python interpreter and interactive mode; values and types: int, float, boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; modules and functions, function definition and use, flow of execution, parameters and arguments; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.

**UNIT III CONTROL FLOW, FUNCTIONS****9**

Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Arrays. Illustrative programs: square root, gcd, exponentiation, sum an array of numbers, linear search, binary search.

**UNIT IV LISTS, TUPLES, DICTIONARIES****9**

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension; Illustrative programs: selection sort, insertion sort, merge sort, histogram.

**UNIT V FILES, MODULES, PACKAGES****9**

Files and exception: text files, reading and writing files, format operator; command line arguments, date and time, errors and exceptions, handling exceptions, debugging, modules, packages; Illustrative programs: word count, copy file.

**TOTAL: 45 hrs.**

  
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**COURSE OUTCOMES:**

Upon completion of the course, students will be able to

1. Develop algorithmic solutions to simple computational problems
2. Read, write, execute by hand simple Python programs.
3. Structure simple Python programs for solving problems.
4. Decompose a Python program into functions.
5. Represent compound data using Python lists, tuples, dictionaries.
6. Read and write data from/to files in Python Programs.


**TEXT BOOKS:**

1. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2nd edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016  
(<http://greenteapress.com/wp/think-python/>)
2. Guido van Rossum and Fred L. Drake Jr, —An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.

**REFERENCES:**

1. John V Guttag, —Introduction to Computation and Programming Using Python", Revised and expanded Edition, MIT Press, 2013
2. Robert Sedgewick, Kevin Wayne, Robert Dondero, —Introduction to Programming in Python: An Inter-Disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.
3. Timothy A. Budd, —Exploring Python , Mc-Graw Hill Education (India) Private Ltd., 2015.
4. Kenneth A. Lambert, —Fundamentals of Python: First Programs , CENGAGE Learning, 2012.
5. Charles Dierbach, —Introduction to Computer Science using Python: A Computational Problem-Solving Focus, Wiley India Edition, 2013.
6. Paul Gries, Jennifer Campbell and Jason Montojo, —Practical Programming: An Introduction to Computer Science using Python 3 , Second edition, Pragmatic Programmers, LLC, 2013.

Course Outcomes		PSO1	PSO2	PSO3	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Develop algorithmic solutions to simple computational problems	3			3	3										
CO2	Read, write, execute by hand simple Python programs	3		1		3		3			3					
CO3	Structure simple Python programs for solving problems	3		1					2		3					
CO4	Decompose a Python program into functions.	3	2		3			2	2		1					
CO5	Represent compound data using Python lists, tuples, dictionaries.	3			3	1			2							

  
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**COURSE OBJECTIVE(S):**

1. To write, test, and debug simple Python programs.
2. To implement Python programs with conditionals and loops.
3. Use functions for structuring Python programs.
4. Represent compound data using Python lists, tuples, dictionaries.
5. Read and write data from/to files in Python.

**LIST OF PROGRAMS:**

1. To Implement python scripts using Variables and operators
2. To Demonstrate Operator precedence to evaluate an expression
3. Display grade of a student using elif statement
4. Implement Floyd triangle using for loop
5. Checks the given number is prime or not using while loop
6. Compute the GCD of Numbers using functions
7. Finding factorial of a given number using recursive function.
8. Takes a list of words and returns the length of longest one using strings
9. To perform linear and binary search using strings
10. To implement list as arrays (multiply 2 matrices)
11. To demonstrate use of list & related functions
12. To demonstrate use of tuple, set& related functions
13. To demonstrate use of Dictionary& related functions
14. Finding most frequent words in a text read from a file
15. Programs that take command line arguments (word count)


**PLATFORM NEEDED**

Python 3 interpreter for Windows/Linux

**COURSE OUTCOMES:**

Upon completion of the course, students will be able to:

1. Write, test, and debug simple Python programs.
2. Implement Python programs with conditionals and loops.

  
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Course Outcomes		PSO1	PSO2	PSO3	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Identify the different components of a web page that can be used for mining	3			3	3										
CO2	Apply machine learning concepts to web content mining	3		1		3		3			3					
CO3	Design a system to collect information available on the web to build Recommendersystems	3		1					2		3					
CO4	Analyze social media data using appropriate data/web mining techniques	3	2		3			2	2		1					
CO5	Build a simple search engine using available open source tools	3			3	1			2							



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**COURSE OBJECTIVE(S):**

*At the end of the course, the students should be able to:*

- Introduce basic postulates of Boolean algebra and shows the correlation between Boolean expressions
- Outline the formal procedures for the analysis and design of combinational circuits and sequential circuits
- Discuss the concept of memories and programmable logic devices.
- Illustrate the concept of synchronous and asynchronous sequential circuits.
- Interpolate the concept of Programming in VHDL.

**Prerequisites:** Nil

**UNIT – I    BOOLEAN ALGEBRA AND LOGIC GATES** 9

Review of binary number systems - Binary arithmetic – Binary codes – Boolean algebra and theorems - Boolean functions – Simplifications of Boolean functions using Karnaugh map and tabulation methods – Logic gates.

**UNIT – II        COMBINATIONAL LOGIC** 9

Combinational circuits – Analysis and design procedures - Circuits for arithmetic operations – Code conversion - Decoders and encoders - Multiplexers and demultiplexers – Comparator.

**UNIT – III       SYNCHRONOUS AND ASYNCHRONOUS SEQUENTIAL LOGIC** 9

Sequential circuits – Flip flops – Analysis and design procedures - State reduction and state assignment - Shift registers – Counters Analysis and design of asynchronous sequential circuits - Reduction of state and flow tables – Hazards-Hazard free realizations.

**UNIT – IV       PROGRAMMABLE LOGIC DEVICES, MEMORY AND LOGIC FAMILIES** 9

Memories: ROM, PROM, EPROM, PLA, PLD, FPGA, Introduction to Flash Memory. Digital Logic Families: TTL, ECL, CMOS.


**UNIT – V        PROGRAMMING WITH VHDL** 9

VHDL program structure-operators-Data flow modeling-Design of combinational and sequential circuits-examples: Adders, subtractors, multiplexers/Demultiplexers, Encoder/Decoder, FF's, Counters).

**COURSE OUTCOMES:**

*Upon Completion of this course, students will be able to :*

- Co1: Solve the Postulates of Boolean algebra using different techniques  
 Co2: Design the Combinational and sequential circuits  
 Co3: Apply the concept of synchronous and asynchronous circuit  
 Co4: Summarize the concept of memories and programmable logic devices. Knowledge in VHDL for VLSI Design

  
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**TEXT BOOK(S) :**

M.Morris Mano, "Digital Design", 3<sup>rd</sup> edition, Pearson Education, 2007.

**REFERENCE(S) :**

1. Charles H.Roth, Jr. "Fundamentals of Logic Design", 4<sup>th</sup> Edition, Jaico Publishing House, Latest Edition.
2. Donald D.Givone, "Digital Principles and Design", Tata McGraw-Hill, 2007
3. Charles H.Roth,Lizy Kurian John,"Digital System Design using VHDL"2<sup>nd</sup> edition PWS PublishingCompany,2008

Course Outcomes		PSO1	PSO2	PSO3	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Solve the Postulates of Boolean algebra using different techniques	3		1	3	2	3	1	1		1				1	
CO2	Design the Combinational and sequential circuits	3			3	2	3	1	1		1				1	
CO3	Apply the concept of synchronous and asynchronous circuit	3		1	3	2	3	1	1		1				1	
CO4	Summarize the concept of memories and programmable logic devices.Knowledge in VHDL for VLSI Design	3	2		3	2	3	1	1		1				1	

  
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**OBJECTIVE(S):**

- Learn the fundamentals of data models and conceptualize and depict a database system using ER diagram.
- Make a study of SQL and relational database design.
- Know the fundamental concepts of transaction processing, concurrency control techniques and recovery procedure.
- To know the internal storage structures, indexing and advanced database concepts.

Prerequisites: Nil

<b>UNIT-I</b>	<b>INTRODUCTION</b>	<b>7</b>
Purpose of Database System – Views of data - Database Languages – Data Models – Database System Architecture – Database users and Administrator – Entity Relationship model (E-R Model) – E-R Diagrams.		
<b>UNIT-II</b>	<b>RELATIONAL MODEL</b>	<b>9</b>
The relational Model – The catalog - Types of Keys - Relational Algebra – Domain Relational Calculus – Tuple Relational Calculus - SQL fundamentals – Additional Basic Operations – <b>Set Operations – Join Operations - Aggregate Functions – Nested Sub Queries</b> - Integrity – Triggers - Security & Authorization – Embedded SQL– Dynamic SQL - Views.		
<b>UNIT-III</b>	<b>DATABASE DESIGN</b>	<b>9</b>
Functional Dependencies – Non-loss Decomposition– First, Second, Third Normal Forms & Dependency Preservation – Boyce / Codd Normal Form - Multi-valued Dependencies and Fourth Normal Form – Join Dependencies and Fifth Normal Form.		
<b>UNIT-IV</b>	<b>TRANSACTION MANAGEMENT</b>	<b>9</b>
Transaction Concepts - Transaction Recovery – ACID Properties – System Recovery – Two Phase Commit – Save Points – Concurrency Control – Locking Based Protocols – Deadlock Handling – <b>Timestamp Based Protocols</b> - Serializability – <b>Transaction as SQL statements.</b>		
<b>UNIT-V</b>	<b>STORAGE STRUCTURES</b>	<b>11</b>
Overview of Physical Storage Media – Tertiary storage – RAID - File Organization – Organization of Records in Files – Indexing and Hashing – Ordered Indices – B tree - B+ tree Index Files – Static Hashing – Dynamic Hashing – Query Processing Overview – Measures of query cost – Database Tuning - OODB & XML Databases – <b>Introduction to Distributed Databases.</b>		

**TOTAL HOURS: 45 PERIODS**


**COURSE OUTCOMES:**

**At the end of the course student should be able to**

**CO1:** Gain and design extensive knowledge on various data models and ER diagram.

**CO2:** Recognize and develop sophisticated queries and authorization techniques to extract information from database

**CO3:** Analyze and eliminate all kind of dependency in a database schema via normalization techniques.

  
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**CO4:** Apply concurrency control and recovery mechanism.

**CO5:** Understand the internal storage structures using different file and indexing techniques & advanced database concepts


**TEXT BOOKS:**

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database System Concepts", 7<sup>th</sup> Edition, Tata McGraw Hill, 2019.
2. C.J.Date, A.Kannan, S.Swamynathan, "An Introduction to Database Systems", 8<sup>th</sup> Edition, Pearson Education, 2012.

**REFERENCE BOOKS:**

1. Ramez Elmasri, Shamkant B. Navathe, "Database Systems", 6<sup>th</sup> Edition, Pearson, 2014.
2. Raghu Ramakrishnan, J.Gehrke, "Database Management Systems", 3<sup>rd</sup> Edition, McGraw Hill, 2014.
3. Shio Kumar Singh, "Database Systems Concepts, Design and Applications", 2<sup>nd</sup> Edition, Pearson, 2011.

Course Outcomes		PSO1	PSO2	PSO3	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Gain and design extensive knowledge on various data models and ER diagram.	3				2		3	3							
CO2	Recognize and develop sophisticated queries and authorization techniques to extract information from database	3		1		2		3	2							
CO3	Analyze and eliminate all kind of dependency in a database schema via normalization techniques.	3				3		3	2							3
CO4	Apply concurrency control and recovery mechanism.	3	2			3		2	3							2
CO5	Understand the internal storage structures using different file and indexing techniques & advanced database concepts	3				2		3	2							

  
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**OBJECTIVES:**

- Demonstrate a thorough understanding of the object-oriented programming paradigms.
- Build C++ classes using appropriate encapsulation and design principles.
- Learn to use several oops concepts to create, debug and run simple C++ programs.
- To impart hands on experience to solve different problems using C++.

**PREREQUISITE:** Programming in C

**UNIT-I INTRODUCTION**

9

Object-Oriented Paradigm - Merits and Demerits of OO Methodology – Object-Oriented Programming Concepts: Classes – Objects – Data abstraction and encapsulation – Inheritance – Polymorphism – Dynamic binding – Message Passing – C++ Fundamentals: Tokens – Expressions – Control Structures - Functions.

**UNIT-II CLASSES AND OBJECTS**

9

Classes and Objects – Passing objects as arguments – returning objects – Friend functions – Inline function – Static data and member functions - Constructors - Parameterized constructor – Copy constructor – Destructor - Array of Objects – pointer to object members.

**UNIT-III POLYMORPHISM AND INHERITANCE**

9

Polymorphism – Function overloading – Unary operator overloading – binary operator overloading – Data Conversion - Overloading with Friend Functions. Inheritance – Constructor in Derived class – Abstract Classes - Types of Inheritance.

**UNIT-IV VIRTUAL FUNCTIONS, TEMPLATES AND STANDARD TEMPLATE LIBRARY**

9

Virtual functions – Need - Pure Virtual Functions – Virtual Destructors. Template – Class template, Function Template. STL: Introduction algorithms – Sequence Containers – Iterators – Specialized Iterators – Associative Containers – Strong user-defined object – Function objects.

**UNIT-V FILES AND EXCEPTION HANDLING**

9

C++ streams – console streams – console stream classes - formatted and unformatted console I/O operations – Manipulators. File streams classes - File modes - File pointers and Manipulations - File I/O – Exception handling - Exception handling Model – List of Exceptions – catch all Exception – uncaughtExceptions – User Defined Exceptions.

**TOTAL : 45 Hours**

**COURSE OUTCOMES:**

**At the end of the course student should be able to**

- CO1:** Describe the important concepts of Object Oriented Programming.
- CO2:** Identify the relationship between the classes and link them using appropriate concepts.
- CO3:** Develop solutions for given problems using Polymorphism and Inheritance concepts to solve real world problems.
- CO4:** Devise generic classes capable of manipulating primitive and user defined data types.
- CO5:** Develop and implement File I/O operations and Exception handling mechanisms.

**TEXT BOOK:**

1. Robert Lafore, "Object Oriented programming in C++", 4<sup>th</sup> Edition, Techmedia Publication, 2013.

**REFERENCE BOOKS:**

1. Bjarne Stroustrup, "The C++ programming language", Addison Wesley, fourth edition, 2013.
2. K R Venugopal, Rajkumar Buyya, "Mastering C++", 2<sup>nd</sup> Edition, McGraw Hill Education (India) Pvt. Ltd., 2013.
3. Herbert Schildt, "The Complete Reference, C++" 4<sup>th</sup> Edition, 2011.
4. Paul J Deitel, Harvey M Deitel: "C++ for Programmers", Pearson Education, 2009.
5. Stanley B. Lippmann, Josee Lajoie: "C++ Primer", 4<sup>th</sup> Edition, Addison Wesley, 2012.

Course Outcomes	PSO1	PSO2	PSO3	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1 Describe the important concepts of Object Oriented Programming	3				3		2	2							
CO2 Identify the relationship between the classes and link them using appropriate concepts	3		1		3		2	2							
CO3 Develop solutions for given problems using Polymorphism and Inheritance concepts to solve real world problems.	3				3		2	2							3
CO4 Devise generic classes capable of manipulating primitive and user defined data types.	3	2			3		2	2							
CO5 Develop and implement File I/O operations and Exception handling mechanisms.	3		1		3		2	2							2



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DATA STRUCTURES

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**OBJECTIVES**

- Understand the need and fundamental concepts of List ADT.
- Acquire knowledge in Stack and Queue data structures.
- Explore Comprehensive knowledge of Trees and their implementations.
- Learn graph data structure to solve problems.
- Familiar with Sorting, Searching and Hashing algorithms.

**PREREQUISITES:** Programming in C

**UNIT I                  LINEAR DATA STRUCTURES – LIST                                  6**

Abstract Data Types - The List ADT - Array based Implementation - Linked list Implementation - Doubly Linked List - Circular Linked List - Applications of Linked List - Polynomial Operations

**UNIT II                  LINEAR DATA STRUCTURES – STACKS AND QUEUES                                  9**

The Stack ADT - Array Implementation - Linked List Implementation - Applications of Stack - Balancing Symbols - Postfix Expressions - Infix to Postfix Conversion - The Queue ADT - Array Implementation - Linked List Implementation - Circular Queue - Application of Queues.

**UNIT III                  NON LINEAR DATA STRUCTURES – TREES                                  10**

Preliminaries - Binary Trees - Array Implementation - Linked List Implementation - Tree Traversals - Expression Trees - Binary Search Tree - Operations on Binary Search Tree – AVL Trees - Heaps - Binary Heaps - Operations of Heaps - Binomial Queues - B-Tree -B+ Trees.

**UNIT IV                  NON LINEAR DATA STRUCTURES -GRAPHS                                  10**

Representation of Graphs –BreadthFirst Traversal- Depth First Traversal - **Bi-connectivity – Cut vertex – Euler circuits**– Topological Sorting– Application of Graphs - Shortest Path Algorithm: Floyd Warshall - Bellman Ford - Dijkstra’sAlgorithm -Minimum Spanning Trees: Prim’s Algorithm - Kruskal’s Algorithm.

**UNITV                  SEARCHING, SORTING AND HASH TECHNIQUES                                  10**


**Searching:** Linear Search - Binary Search. **Sorting** : Insertion Sort - Selection Sort - Shell Sort - Bubble Sort - Quick Sort - Merge Sort - Radix Sort. **Hashing:** Hash Functions - Separate Chaining -Open Addressing - Rehashing - Extendible Hashing.

**Total Hours: 45**

**COURSE OUTCOMES:**

At the end of the course the students will be able to

- CO1: Implement List ADT to solve real time problems.
- CO2: Develop applications using Stack and Queues data structures.
- CO3: Design and Implement applications on trees.
- CO4: Implement graph data structure for solving problems.
- CO5: Develop various Sorting, Searching and Hashing algorithms to small and large data sets.

  
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**TEXT BOOKS:**

1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", Fourth Edition, Pearson Education, 2016.
2. Debasis Samanta, "CLASSIC DATA STRUCTURES", Second Edition, PHI Learning Private Limited Publishers, 2011

**REFERENCES:**

1. Michael T. Goodrich, Roberto Tamassia, David Mount, "Data Structures and Algorithms in C++", Second Edition, 2016.
2. Wisnu Anggoro, "C++ Data Structures and Algorithms: Learn how to write efficient code to build scalable and robust applications in C++", 2018
3. Ellis Horowitz, Sartaj Sahani, Dinesh Mehta, "Fundamentals of Data Structures in C++", Second Edition, 2008

Course Outcomes	PSo1	PSO2	PSO3	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1 Implement List ADT to solve real time problems.	3				3	3		2							3
CO2 Develop applications using Stack and Queues data structures	3				3	3		2							3
CO3 Design and Implement applications on trees	3		1		3	3	1	2							3
CO4 Implement graph data structure for solving problems.	3				3	2	2	1							3
CO5 Develop various Sorting, Searching and Hashing algorithms to small and large data sets.	3	2			3	2	2	1							3

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**OBJECTIVES:**

- To have insight into the basic structure of computers.
- To understand the design and implementation of ALU.
- To comprehend the importance of the memory and I/O communication.
- To familiarize basic concepts of Parallelism.

**PREREQUISITES: NIL****UNIT-I BASIC STRUCTURE OF COMPUTER SYSTEM 9**

Functional units – Basic operational concepts – Bus structures – Memory Locations and Addresses – Instructions and instruction sequencing - Addressing modes –RISC and CISC - Basic I / O Operations.

**UNIT-II COMPUTER ARITHMETIC AND CONTROL UNIT 9**

**Number Representation and Arithmetic Operations** - Addition and Subtraction of Signed Numbers – Multiplication of Positive Numbers – Signed Operand Multiplication– Integer Division - Floating point Numbers and operations - Control Units - Fundamental concepts – Instruction Execution– Hardwired control – Micro programmed control.

**UNIT-III PIPELINING 9**


Basic concepts – Data hazards – Instruction hazards - Unconditional branches – Conditional branches –Branch Prediction – Influence on instruction sets – Data path and control considerations - Super scalar operations – Performance considerations.

**UNIT-IV MEMORY & I/O ORGANIZATION 9**

Basic concepts – Semiconductor RAM – ROM – Speed – Size and cost – Cache memories – **Performance Considerations of Cache memory - Virtual memory** - Accessing I/O devices – Interrupts – Direct Memory Access – Interface circuits – Standard I/O Interfaces: USB, **Firewire**.

**UNIT-V PARALLELISM 9**

ILP – Concepts & Challenges – Compiler Techniques – Reducing branch costs – Dynamic scheduling - Parallel Processing and Performance- Hardware Multithreading – Flynn’s Classification (SISD, MIMD, SIMD, SPMD) - Vector (SIMD) Processing - Shared-Memory Multiprocessors -Cache Coherence - Message-Passing Multi computers - Parallel Programming for Multiprocessors - Performance Modeling. **Total Hours: 45**

  
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## COURSE OUTCOMES:

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

**CO1:** Understand basic operational concepts of computers, ALU and Instructions.

**CO2:** Know the computer arithmetic and control unit operations.

**CO3:** Comprehend and analyze the Pipelined Execution.

**CO4:** Know the various Memory Systems and I/O Organization.

**CO5:** Understand Parallelism and Multiprocessor architectures.

## TEXT BOOKS:

1. Carl Hamacher, Zvonko Vranesic and Safwat Zaky & Naraig Manjikian - "Computer Organization and Embedded Systems", Sixth Edition, Tata McGraw Hill, 2012.
2. John L. Hennessy and David A. Patterson, - "Computer Architecture – A Quantitative Approach", Morgan Kaufmann / Elsevier Publishers, Sixth Edition, 2017.

## REFERENCE BOOKS:

1. David A. Patterson and John L. Hennessy, - "Computer Organization and Design: The Hardware / Software interface", Fourth Edition, Elsevier, 2012.
2. William Stallings, - "Computer Organization and Architecture – Designing for Performance", Tenth Edition, Pearson Education, 2016.

Course Outcomes	PSo1	PSO2	PSO3	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1 Understand basic operational concepts of computers, ALU and Instructions	3				2	3		2							2
CO2 Know the computer arithmetic and control unit operations.	3				2	3		2							2
CO3 Comprehend and analyze the Pipelined Execution.	3		1		2	3		2							2
CO4 Know the various Memory Systems and I/O Organization.	3				2	3		2							2
CO5 Understand Parallelism and Multiprocessor architectures	3	2			2	3		2							2

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**Course Objective(s):**

*At the end of the course ,the students should be able to:*

- Identify the various functions of digital IC's.
- Demonstrate the various combinational circuits using logic gates.
- Design and Implement various sequential circuits using logic gates
- Develop VHDL code for various combinational
- Generate VHDL code for various sequential circuits.

**LIST OF EXPERIMENTS**

1. Verification of Boolean theorems using digital logic gates
2. Design and implementation of Adder/Subtractor, Encoders/Decoders,Code Converters usingbasic gates.
3. Design and implementation of 4-bit binary adder / subtractor using MSI Circuits.
4. Design and implementation of paritygenerator / checker using basic gates and MSI Circuits
5. Design and implementation of Magnitude Comparator
6. Design and implementation of Multiplexers/Demultiplexers
7. Design and implementation of Shift registers
8. Design and implementation of Synchronous and Asynchronous counters


**VHDL PROGRAMMING**

9. Simulation of Adder/Subtractor.
10. Simulation of Encoders/Decoders.
11. Simulation of Shift Registers.
12. Simulation of Counters.

**Course Outcomes**

*Upon Completion of this course, students will be able to :*

- Apply Digital ICs for various applications.
- Analyze the various combinational circuits using logic gates.
- Implement various sequential circuits using logic gates
- Write VHDL code for various combinational circuits
- Write VHDL code for various sequential circuits

  
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Course Outcomes	PS01	PS02	PS03	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1 Apply Digital ICs for various applications.	3			3	2	3	1	1		1				1	
CO2 Analyze the various combinational circuits using logic gate	3			3	2	3	1	1		1				1	
CO3 Implement various sequential circuits using logic gates	3		1	3	2	3	1	1		1				1	
CO4 Write VHDL code for various combinational circuits	3			3	2	3	1	1		1				1	
CO5 Understand the internal storage structures using different file and indexing techniques & advanced database concepts	3	2		3	2	3	1	1		1				1	



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**OBJECTIVE(S):**


- Create database with different types of integrity constraints and use the SQL commands such as DDL, DML & DCL to access data from database.
- Learn to implement SQL join operations & functions, Views
- To know the fundamental concepts of procedures & reports
- To design a database using different tools

**Pre requisites: NIL**

**LIST OF EXPERIMENTS:**

1. Create table for any schema & perform following operations
  - A. Add new fields, modify table & fields, remove any record & empty using DDL  
Commands
  - B. Add new record, remove old record & update fields using DML Commands
  - C. Apply following constraints: Check, Default, Null, Primary & Foreign key
2. Create tables for any schema & perform Undo, Redo operations, User permission using DCL  
Commands
3. Create anytwo tables & convert into normalized form using
  - A. Nested Queries
  - B. Join queries
  - C. Set Operations
4. Implement SQL functions such as Date, Character, general, Aggregate & number functions,etc...
5. Create trigger for update & modify database.
6. Implement PL/SQL Programs with Embedded SQL form
  - A. Control structures using Loop, if-else, While & for loop
  - B. Procedures to update & reflect in related tables
  - C. Using Functions
7. Create Horizontal view, Vertical view & perform following operations add, remove, join, check view updates
8. Design any simple program using VB / VC++.
9. Develop menu design for anyschema using VB.
10. Display database details with oracle reports using manual & design wizard option.
11. Design & develop any schema with front-end tools using VB/VC++ with Database connection.
12. Study on Mongo DB.

**Total Hours: 30**

  
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**COURSE OUTCOMES:****At the end of the course student should be able to**

- CO 1: Design and implement database schema for a given problem domain.  
 CO 2: Populate and query a database using SQL operations.  
 CO 3: Prepare reports.  
 CO 4: Design & develop an application using advanced databases.

**LAB REQUIREMENTS:****HARDWARE AND SOFTWARE REQUIRED FOR A BATCH OF 30 STUDENTS:****Hardware:**

30 Personal Computers

**Software:**

Front end : VB / VC ++

Back end : MySQL, Oracle 11g, MongoDB Platform

: Windows 2000 Professional/XP or higher

Oracle server could be loaded and can be connected from individual PCs

Course Outcomes	PSo1	PSO2	PSO3	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1 Design and implement database schema for a given problem domain.	3				3	1	3	2							3
CO2 Populate and query a database using SQL operations.	3				3	2	2	2							2
CO3 Prepare reports.	3		1		3	2	2	2							2
CO4 Apply concurrency control and recovery mechanism.	3				3		3	2							3
CO5 Design & develop an application using advanced databases	3	2													



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**OBJECTIVES:**

- To learn object oriented programming concepts using C++ to solve problem.
- To implement various concepts of OOP using C++.
- Efficiently implement the different Linear Data Structures using C++
- Build knowledge on Application of Trees and Graphs
- Learn to implement Searching, Sorting and hashing Algorithms.

**PREREQUISITES : Nil LIST OF****EXPERIMENTS:**

Implement the following concept using C++

14 Hours

1. Simple C++ programs using control structures, arrays, class and objects.
2. Constructors, Destructors.
3. Method and Operator Overloading
4. Inheritance, Data conversions.
5. Virtual function and virtual base class.
6. Templates(Function and Class) and STL
7. File operations and Exception handling

Implement the following Data Structure Programs using C++`

16 Hours

8. Linked List Implementation of Singly and Doubly Linked list.
9. Linked List Implementation of Stack and Queue
10. Tree Traversal.
11. Operation of Binary Search Tree.
12. Graph Traversal.
13. Applications of Graph (Dijkstras, Prims, Kruskal)
14. Searching and Sorting Algorithms
15. Hashing Techniques

Total Hours : 30

**COURSE OUTCOMES:**

At the end of the course student should be able to

- CO1: Implement object oriented programming concepts.  
 CO2: Implement various file concepts, exception handling in object oriented Programming  
 CO3: Implement programs for manipulating List, Stack and Queue ADT with its Applications  
 CO4: Ability to apply and implement Tree and Graph Data Structures for Real Time Applications.  
 CO5: Implement various Searching Sorting and Hashing Algorithms


**LAB REQUIREMENTS:****HARDWARE AND SOFTWARE FOR A BATCH OF 30 STUDENTS****Hardware:**

LAN System with 30 Nodes (OR) Stand-alone PCs -30 No's. Printer  
- 3 No's.

**Software:**

OS: Windows / Linux Turbo  
C / C++.

Course Outcomes		PSO1	PSO2	PSO3	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Implement object oriented programming concepts.	3				3		2	2							
CO2	Implement various file concepts, exception handling in object oriented Programming	3				3		2	2							
CO3	Implement programs for manipulating List, Stack and Queue ADT with its Applications	3		1		3	3		2							3
CO4	Ability to apply and implement Tree and Graph Data Structures for Real Time Applications.	3	2			3	3	2	2							3
CO5	Implement various Searching Sorting and Hashing Algorithms	3				3	2	2	1							3

  
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**Course Objectives:**

- To master combinatorics which deals with the counting principles.
- To identify the basic properties of graph and model simple applications.
- To understand the concept of logic and hence to construct valid mathematical arguments.
- To expose the basic properties and concepts of algebraic structures.
- To introduce the concept of Lattices and Boolean algebra.

**UNIT I COMBINATORICS**

9+3

Mathematical Induction – The basics of Counting Principle - The Pigeonhole principle - Permutations and Combinations – Recurrence relations- Solving linear recurrence relations - Generating functions – Inclusion and exclusion principle.

**UNIT II GRAPHS**

9+3

Graphs – preliminaries - Types of graphs – properties – walks, trails and paths – Isomorphism of graphs – Matrix representations of graphs - Connectivity of a graph – Bipartite graphs - Euler and Hamilton graphs - Colouring of graphs - Chromatic number of a graph.

**UNIT III LOGICS AND PROOFS**

9+3

Propositional Logic – Propositional equivalences - Predicates and quantifiers – Nested Quantifiers  
Rules of inference - introduction to proofs – proof methods and strategy.

**UNIT IV ALGEBRAIC STRUCTURES**

9+3

Algebraic systems – Semigroups and monoids – Groups-Subgroups and homomorphisms – Cosets and Lagrange's theorem – Rings & Fields.

**UNIT V LATTICES AND BOOLEAN ALGEBRA**


9+3

Partial ordering – Posets – Lattices as Posets – Properties of lattices-Lattices as algebraic systems  
– Sub lattices – direct product and Homomorphism – Some special lattices – Boolean algebra.

**TOTAL = 45+15=60 PERIODS****Course Outcomes**

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

- CO 1: understand and demonstrate the applications of basic concepts of an algorithm and counting principles in combinatorial mathematics.
- CO 2: acquaint the graph theory concepts which serves as the base for the real time applications in network analysis.
- CO 3: expertise the knowledge of logics helps to verify the correctness of computer programs and to draw conclusions from scientific experiments.
- CO 4: internalize the abstract algebraic structures which provides the ability to deal the theory of sequential machines, formal languages and syntactic analysis.
- CO 5: Imbibe the concept of Lattices and Boolean algebra.

  
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**TEXT BOOKS:**

1. T.Veerarajan, "Discrete Mathematics with Graph Theory and Combinatorics", Tata McGraw-Hill Pub. Co. Ltd, New Delhi.

**REFERENCES:**

1. Kenneth H.Rosen, "Discrete Mathematics and its Applications", Seventh edition, Special Indian edition, Tata McGraw – Hill Pub. Co. Ltd., New Delhi, 2011.
2. Trembly J.P. and Manohar R, "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw-Hill Pub. Co. Ltd, New Delhi, thirtieth re-print 2007.
3. Ralph. P. Grimaldi, "Discrete and Combinatorial Mathematics: An Applied Introduction", Fourth Edition, Pearson Education Asia, Delhi, 2007.
4. Thomas Koshy, "Discrete Mathematics with Applications", Elsevier Publications, 2006.

Course Outcomes		PSo1	PSO2	PSO3	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	understand and demonstrate the applications of basic concepts of an algorithm and counting principles in combinatorial mathematics	3			3	3										1
CO2	acquaint the graph theory concepts which serves as the base for the real time applications in network analysis	3		1	3	3	2									1
CO3	Expertise the knowledge of logics helps to verify the correctness of computer Programs and to draw conclusions from scientific experiments.	3			3	3										1
CO4	Internalize the abstract algebraic structures which provides the ability to deal the theory of sequential machines, formal languages and syntactic analysis.	3	2	1	3	3	1									1
CO5	Imbibe the concept of Lattices and Boolean algebra.	3			3	3										1



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**OBJECTIVE(S):**

- Learn about Asymptotic Notations to solve Recurrence Equations.
- Understand various Algorithm Design Techniques like Divide and Conquer, Greedy Method, Dynamic Programming, Backtracking, Branch and Bound.
- Critically analyze the Efficiency of alternative Algorithm Solutions for Real World Problems.
- Learn about NP Class of Problems and their Variations.

Pre-requisites: Data Structures and Algorithms

**UNIT-I INTRODUCTION TO ALGORITHM ANALYSIS**

9

Algorithm - Fundamentals of Algorithmic Problem Solving: Algorithm Design and Analysis Process  
 - Algorithm Design Techniques - Methods of Specifying an Algorithm - Algorithm Analysis - Important Problem Types - Asymptotic Notations - Properties of Big-Oh Notation - Recurrence Equations - Solving Recurrence Equations: Substitution Method, Iteration Method - Master's Method.

**UNIT-II DIVIDE AND CONQUER AND GREEDY ALGORITHMS**

10

Divide and Conquer: General Method - Binary Search - Finding Maximum and Minimum - Merge Sort - **Quick Sort** - Greedy Algorithms: General Method - Single Source Shortest Path Problem - Container Loading - Knapsack Problem - Huffman Codes.

**UNIT-III DYNAMIC PROGRAMMING AND ITERATIVE IMPROVEMENT**

10

Dynamic Programming: General Method - Multistage Graphs - All Pair Shortest Paths - Optimal Binary Search Trees - 0/1 Knapsack - Travelling Sales Person Problem. Iterative Improvement: The Maximum Flow Problem - Maximum Matching in Bipartite Graphs - The Stable Marriage Problem.

**UNIT-IV BACKTRACKING AND BRANCH AND BOUND**

9


Backtracking: General Method - 8 Queens Problem - Sum of Subsets - Graph Coloring - Hamiltonian Circuit Problem - Knapsack Problem. Branch and Bound: Least Cost Search - The 15 Puzzle Problems - FIBO Branch and Bound - LC Branch and Bound - 0/1 Knapsack Problem - **Assignment Problem**.

**UNIT-V NP-HARD AND NP-COMPLETE PROBLEMS**

8

Basic Concepts: The Class NP-Hard and NP-Complete - NP Hard Graph Problems - Clique Decision Problem - Node Cover Decision Problem - Chromatic Number Decision Problem - NP Hard Scheduling Problem - Flow Shop Scheduling - Job Shop Scheduling.

**TOTAL: 45 Hours**

  
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**COURSE OUTCOMES:****At the end of the course the students are able to:**

- CO1:** Design Algorithms for various Computing Problems.  
**CO2:** Design and analyze algorithm using Divide and Conquer, Greedy Techniques  
**CO3:** Solve and analyze problems using Dynamic programming and iterative improvement  
**CO4:** Analyze back tracking and Branch and Bound algorithm  
**CO5:** Identify any Problem as belonging to the Class of P and NP.

**TEXT BOOKS:**

1. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, Computer Algorithms /C++, Second Edition, Universities Press, 2007.
2. Anany Levitin, "Introduction to the Design and Analysis of Algorithms", Third Edition, Pearson Education, 2012.

**REFERENCE BOOKS:**

1. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", Third Edition, PHI Learning Private Limited, 2012.
2. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson Education, Reprint 2006.
3. Harsh Bhasin, "Algorithms: Design and Analysis", Oxford University Press, 2015.

Course Outcomes		PS01	PS02	PS03	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Design Algorithms for various Computing Problems	3				2	2		1	2			1		1	
CO2	Design and analyze algorithm using Divide and Conquer, Greedy Techniques	3		1			2	2		1	2				2	
CO3	Solve and analyze problems using Dynamic programming and iterative improvement	3				2		2	2		2		2		1	
CO4	Analyze back tracking and Branch and Bound algorithm	3		1			1			1	2		2			
CO5	Identify any Problem as belonging to the Class of P and NP.	3	2			2		1	2	1	2				1	



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**OBJECTIVE(S):**

- Get familiarized with socket programming
- Understand the basic networking commands
- Analyze the performance of protocols in different layers using simulation tools.

Prerequisite: Programming in C, Object Oriented Programming

**LIST OF EXPERIMENTS:**

1. Basic network command line utilities such as ping, netstat, tracer, nslookup, port scan, ARP, ipconfig.

Implement the following experiments in C/C++/Java:

2. Generate Hamming code for error detection and correction
3. Implement Error Detection code using CRC
4. Implementation of stop and wait protocol
5. Implementation of sliding window protocol
6. Implementation of UDP
7. Implementation of TCP

Implement the following experiments using simulator:

8. Study of Basic concepts of Network Simulator (NS2), its installation and working environment.
9. Using NS2 Network Simulation,
  - i) Initialize & Network simulator object.
  - ii) Group of Nodes to form a LAN
  - iii) Delay of Link
  - iv) Bandwidth of Link.

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10. Simulate a four Duplex network and apply TCP agent between two nodes and UDP agents between other two nodes and by changing the parameters, determine the number of packets sent and dropped by TCP/UDP.

11. Simulate a wired network and measure the following performance metrics

i) Throughput

ii) Delay

iii) PacketLoss

12. Implement Link State routing and Distance Vector routing measure the following performance metrics

i) Throughput

ii) Delay

iii) PacketLoss

13. Experiment on packet capture and network traffic using wire sharktool.

**TOTAL: 30 Hours**

**COURSE OUTCOMES:**


**At the end of the course student should be able to**

**CO1:** Gain knowledge on the basic concepts of open source network simulator.

**CO2:** Analyze and implement various routing algorithms. **CO3:** Simulate networks and analyze traffic using various tools.

**CO4:** Analyze the performance of protocols in different layers.

Course Outcomes	PSo1	PSO2	PSO3	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1 Gain knowledge on the basic concepts of open source network simulator	3			2			2						1		1
CO2 Analyze and implement various routing algorithms.	3		1	1			2						1		2
CO3 : Simulate networks and analyze traffic using various tools.	3	2		1			2	2					2		
CO4 Analyze the performance of protocols in different layers.	3			1			2	1					1		2

  
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**Course Objectives**

- To impart the knowledge of basic probabilistic theory.
- To learn one dimensional discrete and continuous probability distributions occurring in natural phenomena.
- To extend the probability theory to two dimensional random variable and to study the statistical measures.
- To study the classification and analysis of few random process.
- To acquire the skills to analyze queueing models.


<b>UNIT I</b>	<b>PROBABILITY AND RANDOM VARIABLE</b>	<b>9+3</b>
Axioms of probability - Conditional probability - Total probability – Baye’s theorem- Random variable - Probability mass function - Probability density function - Properties - Moments - Moment generating functions and their properties, Applications of mgf.		
<b>UNIT II</b>	<b>PROBABILITY DISTRIBUTIONS</b>	<b>9+3</b>
Binomial, Poisson, Geometric, Uniform, Exponential, and Normal distributions and their properties - Functions of a random variable-simple applications.		
<b>UNIT III</b>	<b>TWO-DIMENSIONAL RANDOM VARIABLES</b>	<b>9+3</b>
Joint distributions – Marginal and Conditional distributions –Covariance–Correlation and Linear regression – Central limit theorem (Statement and applications only for independent and identically distributed random variables).		
<b>UNIT IV</b>	<b>RANDOM PROCESSES</b>	<b>9+3</b>
Classification – Stationary process – Poisson process - Markov process – Discrete parameter Markov chain – Chapman Kolmogorov equations-Application problems for each process.		
<b>UNIT V</b>	<b>QUEUEING THEORY</b>	<b>9 + 3</b>
Markovian queues – Little’s formula –Models: (M/M/1): (∞/FIFO), (M/M/s): (∞/FIFO), (M/M/1): (k/FIFO), (M/M/s): (k/FIFO) – Non-Markovian Queues: Pollaczek-Khinchin formula(statement and applications only) - (M/G/1): (∞/GD).		

**TOTAL: 45 + 15 = 60 PERIODS**

**Course Outcomes**

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

- CO 1:** Imbibe the knowledge of basic probability.
- CO 2:** Improve the quality of interpretation and decision making in real time problems of probability distributions.
- CO 3:** Learn the concept of two dimensional random variables which helps to understand and analyse the statistical measures which describes the outcome of a random experiment.
- CO 4:** Understand and characterize the random variable phenomenon which evolve with respect to time in a probabilistic approach.
- CO 5:** Construct and solve queueing models that are suitable for practical problems encountered in daily life.

  
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**TEXT BOOKS**

1. Ibe, O.C. "Fundamentals of Applied Probability and Random Processes", Elsevier, U.P., 1<sup>st</sup> Indian Reprint, 2007.
2. Gross, D., Shortle, J.F., Thompson, J.M. and Harris, C.M., Fundamentals of Queuing Theory, 4<sup>th</sup> Edition, John Wiley and Sons, New York, 2016.

**REFERENCES**

1. HweiHsu, "Schaum's Outline of Theory and Problems of Probability, Random Variables and Random Processes", Tata McGraw Hill, New Delhi, 9<sup>th</sup> Reprint, 2010.
2. Veerarajan.T., "Probability, Statistics and Random Processes", Tata McGraw-Hill publishing company Limited, New Delhi, 2014.
3. Kandasamy.P, Thilagavathy, K., & Gunavathi.K., "Probability, Statistics and Queueing Theory"., S.Chand & Company Ltd., New Delhi, 2014.
4. Gupta.S.C., & Kapoor, V.K., "Fundamentals of mathematical statistics", 10<sup>th</sup> edition (Reprint), Sultan Chand & Sons publishers, New Delhi, 2002.

Course Outcomes		PSo1	PSO2	PSO3	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Imbibe the knowledge of basic probability.	3			3	3										1
CO2	Improve the quality of interpretation and decision making in real time problems of probability distributions.	3			3	3	2									1
CO3	Learn the concept of two dimensional random variables which helps to understand and analyse the statistical measures which describes the outcome of a random experiment.	3		1	3	3	1									1
CO4	Understand and characterize the random variable phenomenon which evolve with respect to time in a probabilistic approach	3			3	3	2									1
CO5	Construct and solve queuing models that are suitable for practical problems encountered in daily life	3	2		3	3	2									1



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**Course Objectives:**

- Summarize the architecture and assembly language programming of microprocessors
- Defend the architecture and assembly language programming of microcontrollers
- Demonstrate the concept of interrupts and interfacing with various peripherals.
- Integrate the features of a microcontroller and its timer applications.
- Justify the architectural features of 801XX with 8086 processor.

**UNIT I****8086 MICROPROCESSOR**

9

Intel 8086 microprocessor – Architecture - Minimum and Maximum mode Configuration – Signals (Pin Configuration)- Instruction Set-Addressing Modes-Assembly Language Programming-Assembler Directives- Interrupts And Interrupt Service Routines.

**UNIT II****MEMORY AND I/O INTERFACING**

9

Memory interfacing and I/O interfacing with (8086) – parallel communication interface – serial communication interface – timer-keyboard/display controller – interrupt controller – DMA controller (8257).

**UNIT III****8051 MICROCONTROLLERS**

9

Architecture of 8051 Microcontroller (Pin Configuration) – I/O ports – memory – counters and timers-serial data I/O – interrupts

**UNIT IV****INTERFACING WITH 8051**

9

Interfacing with keyboards, LEDs, 7 segment LEDs, LCDs, Interfacing with ADCs. Interfacing with DACs- Stepper Motor.

**UNIT V****MICROPROCESSOR TECHNOLOGY**


9

Architecture of Intel 80286, 80386, 80486 – Features of Pentium I and II processors

**TOTAL: 45 Hours****Course Outcomes:**

*Upon Completion of this course, students will be able to :*

- CO 1: Recognize the basic Microprocessor architecture and its concepts.
- CO 2: Outline the concepts of peripheral interfacing mechanisms.
- CO 3: Design various assembly language programming using microprocessors and microcontroller.
- CO 4: Extend the real world interfacing with microcontroller
- CO 5: Extrapolate the architectural features of 801XX with 8086 processor.

  
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### Text Books

- 1 Yn-cheng Liu, Glenn A. Gibson, "Microcomputer systems: The 8086 / 8088 Family architecture, Programming and Design", second edition, Prentice Hall of India , 2006
- 2 Kenneth J. Ayala, 'The 8051 microcontroller Architecture, Programming and applications' second edition , Penram international.
- 3 Mohamed Ali Mazidi, Janice Gillispie Mazidi, " The 8051 microcontroller and embedded systems using Assembly and C", second edition, Pearson education /Prentice hall of India , 2007.
- 4 The Intel Microprocessor Architecture, Programming and Interfacing, Barry B. Brey ,6th edition, Pearson education, 2002.

### Reference Books

- 1 Douglas V. Hall, "Microprocessors and Interfacing: Programming and Hardware", second edition, Tata Mc Graw Hill, 2006.
- 2 A.K. Ray & K.M Bhurchandi, "Advanced Microprocessor and Peripherals – Architecture, Programming and Interfacing", Tata Mc Graw Hill, 2006.
- 3 Peter Abel, "IBM PC Assembly language and programming", fifth edition, Pearson education / Prentice Hall of India Pvt.Ltd, 2007.

Course Outcomes	PSo1	PSO2	PSO3	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1 Recognize the basic Microprocessor architecture and its concepts.	3			3	2	3	1	3						1	
CO2 Recognize and develop sophisticated queries and authorization techniques to extract information from database	3		1	3	2	3	1	3						1	
CO3 Design various assembly language programming using microprocessors and microcontroller	3			3	2	3	1	3						1	
CO4 Extend the real world interfacing with microcontroller.	3			3	2	3	1	3						1	
CO5 Extrapolate the architectural features of 801XX with 8086 processor	3	2		3	2	3	1	3						1	

  
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**OBJECTIVE(S):**

- ☐ To understand and differentiate Unified Process from other approaches
- ☐ To study the concepts of modeling in object oriented concepts
- ☐ To learn about Unified Modeling Language
- ☐ To design with the UML static, dynamic and implementation diagrams
- ☐ To learn design techniques and methodologies.

**Prerequisite: Software Engineering and Object Oriented Programming**

<b>UNIT- I</b>	<b>INTRODUCTION</b>	<b>10</b>
An Overview of Object Oriented Systems Development - Object Basics – Objects and Classes- Abstraction- Encapsulation- Inheritance- Polymorphism Object Oriented Systems Development Life Cycle <b>OOAD Methodologies</b> - Rumbaugh Methodology - Booch Methodology – Jacobson Methodology - Patterns – Frameworks – Unified Approach		
<b>UNIT- II</b>	<b>SYSTEM MODELLING</b>	<b>11</b>
Introduction to Unified Modeling Language – Usage of UML - Types of UML Diagrams <b>USE CASE MODELING</b> - Understanding Use cases-Identifying Use cases-Association between use cases (uses and Extends)-Describing use cases-Dividing Use cases into packages- Naming a Use case - Use case Diagram <b>OBJECT MODELING:</b> Class diagrams, associations, generalization, composition, object diagrams, associations, aggregation and composition <b>DYNAMIC MODELING:</b> Interaction diagrams, sequence diagrams, collaboration diagrams, state diagrams, activity diagrams. <b>IMPLEMENTATION MODELING:</b> Package diagrams, deployment diagrams, componentdiagrams, combining component and deployment diagrams.		
<b>UNIT- III</b>	<b>OBJECT ORIENTED ANALYSIS</b>	<b>8</b>
Object Analysis - Classification – Identifying Object relationships - Attributes and Methods		
<b>UNIT- IV</b>	<b>OBJECT ORIENTED DESIGN</b>	<b>8</b>
Design axioms - Designing Classes – Access Layer - Object Storage - Object Interoperability.		
<b>UNIT-V</b>	<b>USER INTERFACE DESIGN</b>	<b>8</b>
Designing Interface Objects – Designing View layer classes – Macro-Level Process - Micro- Level Process – Purpose of a View Layer Interface – Prototyping the User Interface - Case study:Designing user Interface for the Vianet Bank ATM.		

**TOTAL: 45 Hours**

  
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 Adhiyamaan College of Engineering (Autonomous)  
 Hosur - 562 103  
 Krishnagiri (Dt), Tamil Nadu.

## COURSE OUTCOMES:

At the end of the course student should be able to

**CO1:** Apply Object Oriented Methodologies and Unified Modeling Approach to develop a system model.

**CO2:** Analyze, identify object relationship, attributes and methods to build a class.

**CO3:** Use the UML analysis and design diagrams.

**CO4:** Create UML for requirements, designs and component interfaces

**CO5:** Design classes, user interface and to have wide knowledge on object storage and interoperability to develop an effective model.


## TEXT BOOK:

1. Ali Bahrami, "Object Oriented Systems Development", Tata Mc Graw-Hill, New Delhi, 1<sup>st</sup> Edition, 2008.

## REFERENCE BOOKS:

1. James Rumbaugh, Ivar Jacobson, Grady Booch, "The Unified Modeling Language User Guide", Pearson Education, 3<sup>rd</sup> Edition, 2012.
2. Hans-Erik Eriksson, Magnus Penker, Brain Lyons, David Fado, "UML 2 Toolkit", OMG Press Wiley Publishing Inc., New Delhi, 2011.
3. Craig Larman, "Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development", Pearson Education, 3<sup>rd</sup> Edition, 2012.
4. Mahesh P Matha, "Object Oriented Analysis and Design using UML", PHI Learning, New Delhi, 2008.
5. Martin Fowler, "UML Distilled", 3<sup>rd</sup> Edition, PHI Learning, New Delhi, 2015.

Course Outcomes	PSO1	PSO2	PSO3	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1 Apply Object Oriented Methodologies and Unified Modeling Approach to develop a system model	3		1		3	3		2	2	1					2
CO2 Analyze, identify object relationship, attributes and methods to build a class.	3				3	3		2	2	1					2
CO3 Use the UML analysis and design diagrams	3				3	3		2	2	1					2
CO4 Create UML for requirements, designs and component interfaces	3	2			3	3		2	2	1					2
CO5 Design classes, user interface and to have wide knowledge on object storage and interoperability to develop an effective model.	3				3	3		2	2	1					2

  
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**COURSE OBJECTIVES**

- Understand the Properties of formal languages and formal grammars.
- Introduce deterministic and non-deterministic finite automata.
- Learn Pushdown Automata and Context free language.
- Understand Turing machines and computing with Turing machines.
- Acquaint with the fundamentals of decidability and Reducibility.

**UNIT-I INTRODUCTION TO AUTOMATA****9**

Sets – functions – relations – Languages– Basic Machines - Finite Automata – Basic definitions– Deterministic Finite Automata (DFA), Non-Deterministic Finite Automata (NFA) – Finite automata with Epsilon transitions –Equivalence of DFA`s and NFA`s - Applications of finite state automata.

**UNIT-II REGULAR EXPRESSIONS AND LANGUAGES****9**

Regular languages - Regular Expressions – Finite automata and regular expressions – Properties of regular sets –Properties of Regular Language: Proving languages not to be Regular – Pumping Lemma for Regular Language, Closure properties of Regular Language, Equivalence and Minimization of Automata.

**UNIT- III CONTEXT FREE LANGUAGES AND PUSH DOWN AUTOMATA****9**

Context Free Grammar (CFG) – Derivation trees – Ambiguity-Normal Forms, Chomsky Normal Form (CNF) and Griebach Normal Form (GNF)– Introduction to Push Down Automata (PDA) – PDA definition – Equivalence of PDA and context free language –Deterministic pushdown automata – Properties of context free languages.


**UNIT-IV TURING MACHINES****9**

Church-Turing thesis: Turing machines - Language of a TM, TM as accepters and deciders. Programming techniques for TM -Storage in state, multiple tracks, and subroutines. Variants of Turing Machines-Universal Turing machine.

**UNIT-V DECIDABILITY AND REDUCIBILITY****9**

Decidability: Decidable languages Halting problem: Diagonalization Method-Halting Problem is Undecidable- Reducibility: Undecidable problems from Language theory - A simple Undecidable problem: Rice Theorem - Post's Correspondence Problem (PCP) -Definition, Undecidability of PCP.

**Total hours :45**

  
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**COURSE OUTCOMES:**

**At the end of the course student should be able to**


- CO1:** Construct automata, regular expression for any pattern.
- CO2:** Design grammars and Automata (recognizers) for different language classes.
- CO3:** Write Context free grammar for any construct
- CO4:** Design Turing machines for any language and propose computation solutions using Turing Machines
- CO5:** Derive whether a problem is decidable or not

**TEXT BOOKS:**

1. John E. Hopcroft and Rajeev Motwani and Jeffrey D. Ullman, "Introduction to Automata Theory, Languages and Computation", third edition, Pearson Education, New Delhi, 2014.
2. John C. Martin, "Introduction to Languages and the Theory of Computation", Fourth Edition, Tata McGraw-Hill Education Pvt. Ltd., New Delhi, 2011.
3. Rajendra Kumar, "Theory of Automata Languages and Computation", first edition Tata McGraw-Hill Education Pvt. Ltd., New Delhi, 2010.

**REFERENCE BOOKS:**

1. S.N.Sivanadam , M.Janaki Meena, " Theory of Computation" , I.K.International Publishing House Pvt. Ltd, ISBN: 9789380026206, 2009.
2. Michael Sipser , "Introduction to the Theory of Computation", third edition, PWS Publications, Boston, 2013.
3. Harry R. Lewis, Chris H Papadimitriou, "Elements of the Theory of Computation", Second Edition, PHI / Pearson Education, New Delhi, 1997.
4. Peter Linz, "An Introduction to Formal Language and Automata", fifth edition, Narosa Publishers, New Delhi, 2011.

  
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**Course Objectives:**

*At the end of the course, the students should be able to:*

- Develop the code in assembly language programming.
  - Test the developed code using 8086 processors and 8051 controllers.
  - Demonstrate the interface peripherals with microprocessor and microcontroller
  - Integrate the peripherals for real world applications.
- Design the various ALU for analysis of microprocessor and microcontroller

**LIST OF EXPERIMENTS****I. 8086 based Experiments**

1. 16 bit arithmetic operation using 8086.
2. Generate a Fibonacci series using 8086.
3. Searching Largest Number and Smallest Number in an array using 8086.
4. To generate factorial of number using 8086.
5. String manipulation using 8086.

**II. 8051 based experiments**

6. 8-bit arithmetic operations using 8051 microcontroller
7. Design of simple ALU using 8051 microcontroller.
8. Searching Largest Number and smallest number in an array using 8051.
9. 9. Solve the logic equations using 8051 microcontroller.

**III. Interfacing Experiments with 8086/8051**


10. Traffic light controller
11. Stepper motor interfacing
12. 12.8279 keyboard/display controller
13. 13.ADC and DAC interfacing

**Course Outcomes:**

*Upon Completion of this course, students will be able to :*

- CO1 : Generate the code for arithmetic operations in assembly language
- CO2 : Generalize the developed code using 8086 processors and 8051 controllers.
- CO3 : Reorganize the Interfacing peripherals with microprocessor and microcontroller
- CO 4 : Interpolate the peripherals for real world applications.
- CO 5 : Propose the various ALU for analysis of microprocessor and microcontroller

Course Outcomes		PSo1	PSO2	PSO3	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Generate the code for arithmetic operations in assembly language	3			3	2	3	1	3						1	
CO2	Generalize the developed code using 8086 processors and 8051 controllers	3		1	3	2	3	1	3						1	
CO3	Reorganize the Interfacing peripherals with microprocessor and microcontroller	3			3	2	3	1	3						1	
CO4	Interpolate the peripherals for real world applications.	3	2		3	2	3	1	3						1	
CO5	Propose the various ALU for analysis of microprocessor and microcontroller	3			3	2	3	1	3						1	

  
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**OBJECTIVE(S):**

The student should be made to:

- Learn the basics of OO analysis and design skills.
- Get exposed to the UML design diagrams.
- Learn to map design to code.
- Be familiar with the various testing techniques.

**Prerequisite:** Fundamentals of Computing & C Programming, Object Oriented Programming

**LIST OF EXPERIMENTS:**

Prepare the following documents for two or three of the experiments listed below and develop the software engineering methodology.

1. **Project Analysis** - Prepare Project Plan by Thorough study of the problem – Identifying project scope, Objectives, Infrastructure.
2. **Software requirement Analysis** - Describe the individual Phases / Modules of the project, Identify deliverables.
3. **System Modeling** - Preparing Class Diagram, Object Diagram, Interaction diagrams, sequence diagrams, collaboration diagrams, state diagrams, activity diagrams, Package diagrams, deployment diagrams, component diagrams.
4. **Data Modeling** - E-R Diagrams and Data dictionary
5. **Software Development and Debugging**
6. **Software Testing** - Prepare test plan test cases and perform validation testing.

**SUGGESTED LIST OF APPLICATIONS**

1. Payroll System
2. Library Management System
3. Feedback System
4. Internal Marks System

  
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5. Quiz System
6. Online Ticket Reservation System
7. Course Registration System
8. Dashboard System
9. ATM Systems
10. Stock Maintenance
11. Real-Time Scheduler
12. Deposit Monitoring System

**TOTAL: 45 HOURS**

**COURSE OUTCOMES:**

**At the end of the course student should be able to**

**CO1:** Prepare a project plan by analyzing project scope and objectives by using OO concepts.

**CO2:** Design & develop UML diagrams.

**CO3:** Get knowledge on Argo UML tool for developing UML diagrams.

**CO4:** Compare test cases, test plan for an application project

**LIST OF EQUIPMENTS AND SOFTWARE FOR A BATCH OF 36 STUDENTS**

- PC : 36 Nos.
- OS : Windows 2000/ Windows XP/ NT (or) Higher
- Software : ArgoUML (freeware) – to be installed in all PC's.

Course Outcomes		PS01	PS02	PS03	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Prepare a project plan by analyzing project scope and objectives by using OO concepts.	3				3	3		2	2	1					2
CO2	Design & develop UML diagrams.	3		1		3	3		2	2	1					2
CO3	Get knowledge on Argo UML tool for developing UML diagrams.	3				3	3		2	2	1					2
CO4	Compare test cases, test plan for an application project	3	2			3	3		2	2	1					2

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**Course Objectives:**

- To equip students of engineering and technology with effective speaking and listening skills in English.
- To help them enrich their soft skills and interpersonal skills, which will make the transition from college to workplace smoother and help them excel in their career.
- To enhance the performance of the students in the recruitment processes, self enhancement and launching start ups.

**Unit I: Listening**

7

Listening Audios and answering MCQs - Watching video clips on famous speeches, motivational videos, documentaries and answering MCQs - Listening Comprehension and TED talks.

**Unit II: Speaking**

10

Prepared talk - Extempore - story knitting - Picture Talk - Brainstorming - Debate - Group Discussion - Elevator Speech - Mock HR Interviews - Story Narration - Miming - Short Skits.

**Unit III: Reading**

12

Reading Comprehension - Verbal Analogy - Classification - Alphabet Test - Logical Sequence of Words - Statement & Conclusions - Statement & Courses of Action - Situation Reaction Test - Theme Detection - Deriving Conclusions from Passages.

**Unit IV: Writing**

7

Business Letters - Email Writing - Essay Writing - Paragraph Writing - Paraphrasing.

**Unit V: Career Skills**

9

Vocabulary Test (GRE, TOEFL, TOEIC & CAT Exam words) - Confused Pair of words - Contronyms - One Word Substitution - Sequencing of Sentences - Sentence correction.

**TOTAL : 45 PERIODS****Lab Requirements:**

1. Teacher console and systems for students.
2. English Language Lab Software
3. Career Lab Software



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### Course Outcomes:

On completion of the course, the students shall have the ability to:

**CO1:** Comprehend the various strategies of listening and its significance.

**CO2:** Articulate their views clearly and concisely with self-confidence and persuasiveness.

**CO3:** Understand the prevailing practices of testing in the recruitment process by the corporates and the institutional selection processes.

**CO4:** Communicate the corporate and social requirements in an impressive written mode.

**CO5:** Enhance their verbal skills in the screening tests competently both for recruitment and pursuing higher studies as well.

### Text Books:

1. Agarwal R. S., A Modern Approach to Verbal and Non-verbal Reasoning, Chand & Co., New Delhi, 2012.
2. Ashraf Rizvi M. Effective Technical Communication. TATA McGraw Hill, New Delhi: 2007.

### References:

1. Lingua: Essays for TOEFL/IELTS, Dreamtech Press, New Delhi, 2016.
2. Lily Mangalam, Global English Comprehension, Allied Publishers Pvt. Ltd., New Delhi, 2014.
3. Sharon Weiner Green and Ira K. Wolf, Barron's GRE, Glagotia Publications Pvt. Ltd., 18<sup>th</sup> Edition, New Delhi, 2011.
4. Mohamed Elias, R. Gupta's IELTS/TOEFL Essays, Ramesh Publishing House, 6<sup>th</sup> Edition, New Delhi, 2016.

Course Outcomes		PSo1	PSO2	PSO3	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Comprehend the various strategies of listening and its significance.	3		1			3			2	1					
CO2	Articulate their views clearly and concisely with self-confidence and persuasiveness.	3					2			1	1					
CO3	Understand the prevailing practices of testing in the recruitment process by the corporates and the institutional selection processes.	3								2	1					
CO4	Communicate the corporate and social requirements in an impressive written mode.	3	2							1	1					
CO5	Enhance their verbal skills in the screening tests competently both for recruitment and pursuing higher studies as well.	3									1					

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**OBJECTIVE(S):**

- To understand the fundamentals of .NET Programming
- To develop real time applications using C#
- To update and enhance skills in writing Windows applications, ADO.NET and ASP.NET.

Prerequisite: Object Oriented Programming.

**UNIT-I C# LANGUAGE FUNDAMENTALS**

9

The Building Block of the .NET Platform (CLR,CTS, and CLS) – Overview of Assemblies  
 - The Anatomy of a Simple C# Program - Defining Classes and Creating Objects - The System Console Class-Establishing Member Visibility - Default Values of Class Member Variables- Member Variable Initialization Syntax- Static Keyword - Method Parameter Modifiers - Iteration Constructs - Decision Constructs and the Relational / Equality Operators - Understanding Value Types and Reference Types- Boxing and Unboxing - Working with .NET Enumerations - Overriding Some Default Behaviors of System. Object - The System Data Types - String Data Type - .NET Array Types - Custom Namespaces.

**UNIT-II OBJECT ORIENTED PROGRAMMING WITH C#**

9

Understanding the C# Class Type - Reviewing the Pillars of OOP - The First Pillars: C#'s Encapsulation Services, The Second Pillar: C#'s Inheritance Support - Programming for Containment/Delegation - The Third Pillar: C#'s Polymorphic Support-C# Casting Rules - Understanding Object Lifetime - Basics of Object Lifetime - Role of Application Roots - Garbage Collection - Building Finalizable and Disposable Types. Exception Handling - Throwing a Generic Exception - Catching Exceptions.

**UNIT-III INTERFACES, COLLECTIONS, DELEGATES, EVENTS AND LAMDAEXPRESSION**

9

Defining Interfaces in C#-Implementing an Interface in C# - Contrasting Interfaces to Abstract Base Classes-Building Interface Hierarchies - Building Enumerable Types (IEnumerable and IEnumerator) Building Cloneable Objects (ICloneable) -Building Comparable Objects (IComparable) -The Interfaces of the System - Collections Namespace - Defining a Delegate in C# -Simplest Possible Delegate Example-Enabling Multicasting -C# Events - LamdasExpression.

**UNIT-IV DEVELOPING WINDOW APPLICATION FORMS**

9

Windows Forms Types - Application Class- Functionality of the Control Class - Functionality of the Form Class- Building Windows Applications - Working with StatusStrips - Working with ToolStrips - Building an MDI Application - Basic Controls.

**UNIT-V ADO.NET AND ASP.NET**

9

ADO.NET Overview – Using Database Connections, Commands, The Data Reader, The DataSet Class, ASP.NET Introduction – Web Forms – ADO.NET and Data Binding-ASP.NET Features – User and Custom Controls – Master Pages- Site Navigation – Security.

**TOTAL: 45 HOURS**

**COURSE OUTCOMES:**

At the end of the course students should be able to:

**CO1:** Understand anatomy of C# Programming

**CO2:** Develop Console application using object oriented concepts, advanced features in C#.

**CO3:** Develop Window form application with Database connectivity.

**CO4:** Build Applications using ADO.NET AND ASP.NET.

**TEXT BOOKS:**

1. Andrew Troelsen, "Pro C# 5.0 and the .NET 4.5 Framework" Apress, Sixth Edition, 2012 ISBN: 978-1-4302-4233-8
2. Christian Nagel et al. "Professional C# 2012 with .NET 4.5", Wiley India, 2012.

**REFERENCE BOOKS:**

1. Herbert Schildt, "The Complete Reference: C# 4.0", Tata McGraw Hill, 2012.
2. E. Balagurusamy, "Programming in C#", Tata McGraw-Hill, 2004.
3. O'Reilly "Programming C# 5.0", O'Reilly Media ISBN: 978-1-4493-2041-6 | ISBN 10:1-4493-2041-4, October 2012.
4. Michael Schmalz "C# Database Basics" O'Reilly Media ISBN:978-1-4493-0998-5, 2012

Course Outcomes		PSO1	PSO2	PSO3	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Understand anatomy of C# Programming	3				3		1								2
CO2	Develop Console application using object oriented concepts, advanced features in C#.	3		1		3	2	2	3							1
CO3	Develop Window form application with Database connectivity.	3				2	2	1	2							1
CO4	Build Applications using ADO.NET AND ASP.NET.	3	2			2	2	1	2							2

  
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**PREREQUISITE:** Fundamentals of Computing and C Programming, Object oriented programming

**OBJECTIVES:**

- Demonstrates an in depth understanding of tools and scripting languages necessary for design and development of applications.
- Explores the nature of scripting and provides skills in scripting language design.
- Learn to write simple scripts to automate system using appropriate languages.
- Conceive basics of text processing, client and server level scripting and GUI programming.

**UNIT I INTRODUCTION TO SCRIPTING AND PERL** 9

Scripts and Programs - Origin of Scripting - Characteristics of Scripting Languages - Uses of Scripting Languages - Web Scripting. Perl background- Perl overview - Perl parsing rules - Variables and Data - Statements and Control structures –Subroutines - Packages - Modules - Working with Files - Data Manipulation.

**UNIT II Introduction to PHP** 9

Introduction - Programming in web environment - variables – constants - data types - operators - Statements - Functions - Arrays – OOP: Classes and Objects-Constructor- Inheritance- Overloading and overriding - String Manipulation and regular expressions - File handling and data storage.

**UNIT III PHP and MySQL** 9

Setting up webpages to communicate with PHP – Handling Form Controls -PHP and MySQL database - PHP Connectivity - Sending and receiving E-mails - Debugging and error handling - PHP Frameworks: Codeignter – Laravel.

**UNIT IV OOC AND DB INTEGRATION IN PYTHON** 9

Python Basics - Introduction to OOC – Classes and Instances – Static and Class Methods – Composition – Inheritance – Built-in Functions – Integrated Web Applications in Python - Python and MySQL Database Integration: Connect Database – Create and Insert Operations – Parameter Passing – Retrieving data from Database. Case Study on SciPy, Django, Open CV.

**UNIT V Introduction to Ruby** 9

Introduction to Ruby - Core Programming Elements – Conditional Structures – Loop Structures – Arrays – Using Objects - Defining Classes and Creating Objects - Object Inheritance – File Input/Output.

**TOTAL HOURS: 45 HOURS**

**COURSE OUTCOMES:**

At the end of the course the students should be able to

- CO1:** Apply Perl scripts in application development and data analysis  
**CO2:** Develop Web based application using PHP and MySQL  
**CO3:** Design and implement short and efficient Python scripts for longer constructs.  
**CO4:** Illustrate Ruby scripts in application development

### TEXT BOOKS

1. Martin C. Brown, "Perl: The Complete Reference", 2nd Edition, Tata McGraw-Hill Publishing Company Limited, Indian Reprint 2012.
2. Steve Suehring, "PHP6& MySQL Bible", John Wiley Publishing Inc., Reprint 2010.
3. Wesley J. Chun, "Core Python Programming", Prentice Hall, 2010.
4. Ophir Frieder, Gideon Frieder and David Grossman, "Computer Science Programming Basics with Ruby", First Edition, O'Reilly, 2013.


### REFERENCES

1. Rasmus Lerdorf and Levin Tatroe, "Programming PHP", O'Reilly, 2012.
2. Tom Christiansen, Jon Orwant, Larry Wall, Brian Foy, "Programming Perl", 4<sup>th</sup> Edition, O'Reilly Media, 2012.
3. Steven Holzner, "PHP: The Complete Reference", 2nd Edition, Tata McGraw-Hill Publishing Company Limited, Indian Reprint 2010.
4. Paul Barry, "Head First Python", O'Reilly Media, 2010.
5. Garrett Golemund, "Hands-On Programming with R", Paperback Edition, O'Reilly Media, 2016.
6. Colin Gillespie and Robin Lovelace, "Efficient R Programming", First Release, O'Reilly, 2016.

### ONLINE REFERENCES

1. <https://www.perl.org/>
2. <http://php.net/manual/en/>
3. <http://www.learnpython.org/>
4. <http://www.pythontutor.com/>
5. <http://www.diveintopython3.net/>

Course Outcomes		PS01	PS02	PS03	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Apply Perl scripts in application development and data analysis.	3		1		3	2		2							2
CO2	Develop Web based application using PHP and MySQL	3				3	3		2							2
CO3	Design and implement short and efficient Python scripts for longer constructs.	3	2			2	3		2							2
CO4	Illustrate Ruby scripts in application development	3				3	2		2							2

  
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**Prerequisites:** Java Programming

**OBJECTIVE(S):**

- To learn the characteristics of mobile applications.
- To learn about the intricacies of UI required by mobile applications.
- To study about the design aspects of mobile application.
- To learn development of mobile applications.

**UNIT –I GETTING STARTED WITH MOBILITY** 9  
 Mobility landscape, Mobile platforms – Apple iPhone Platform- Google Android Platform – Eclipse Simulator, Mobile apps development, setting up the mobile app development environment along with an emulator - Case Study on Mobile App development.

**UNIT-II BUILDING BLOCKS OF MOBILE APPS – I** 9  
 App user interface designing – mobile UI resources (Layout, UI elements, Drawable Menu), Activity- states and life cycle, interaction amongst activities. App functionality beyond user interface - Threads, A Sync task, Services – states and lifecycle, Notifications.

**UNIT-III BUILDING BLOCKS OF MOBILE APPS – II** 9  
 Broadcast receivers, Telephony and SMS APIs , Native data handling – on-device file I/O, shared preferences, mobile databases such as SQLite, and enterprise data access (via Internet/Intranet)

**UNIT-IV SPRUCING UP MOBILE APPS** 9  
 Graphics and animation – custom views, canvas, animation APIs, multimedia – Audio/video playback and record, location awareness, and native hardware access (sensors such as accelerometer and gyroscope)


**UNIT-V TESTING MOBILE APPS AND TAKING APPS TO MARKET** 9  
 Debugging mobile apps, White box testing, Black box testing, and test automation of mobile apps,JUnit for Android, Robotium, MonkeyTalk, Versioning, signing and packaging mobile apps, distributing apps on mobile market place.

**TOTAL: 45**

**COURSE OUTCOMES:**

**At the end of the course students should be able to**

- CO1:** Familiarize with Mobile apps development aspects.  
**CO2:** Design and implement the user interfaces for mobile applications  
**CO3:** Develop useful mobile applications using Google Android and Eclipse simulator.  
**CO4:** Develop mobile applications using graphics and animation  
**CO5:** Perform testing, signing, packaging and distribution of mobile apps

  
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**TEXT BOOK:**

1. Anubhav Pradhan, Anil V Deshpande, "Mobile Apps Development", First Edition, Wiley India, (2013)

**REFERENCE BOOKS:**

1. Barry Burd , "Android Application Development All in one for Dummies", First Edition , Wiley India ,(2011)
2. Lauren Darcey , Shane Conder, "Teach Yourself Android Application Development In 24 Hours", Second Edition, Wiley India , (2012)

Course Outcomes		PSo1	PSO2	PSO3	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Familiarize with Mobile apps development aspects .	3			3	1	3	2	3	2						
CO2	Design and implement the user interfaces for mobile applications	3		1		1		2		2						
CO3	Develop useful mobile applications using Google Android and Eclipse simulator	3	2		3	1	2	2	1							
CO4	Develop mobile applications using graphics and animation	3			2	1	3	2								
CO5	Perform testing, signing, packaging and distribution of mobile apps	3				1				1						

  
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**PREREQUISITES:** Object Oriented Programming, Theory of Computation.

### OBJECTIVES

- Understand the phases of compiler.
- Learn the role of a parser and different ways of recognizing and parsing of tokens.
- Perceive the various storage allocation techniques.
- Acquaint how to generate and optimize the code.

### UNIT I INTRODUCTION TO COMPILER

9

Compilers - Structure of a Compiler - Role of lexical analyzer - Input Buffering - Specification of Tokens - Recognition of Tokens – Lexical-Analyzer Generator-Finite Automata-Regular Expression to FA-Optimization of DFA.

### UNIT II SYNTAX ANALYSIS AND SYNTAX DIRECTED TRANSLATION

11

Role of the parser - Top Down parsing - Recursive Descent Parser - Predictive Parser - LL(1) Parser - Shift Reduce Parser - LR Parser – Operator Precedence - Construction of SLR Parsing table - LALR Parser – Syntax Directed Definitions – Construction of Syntax Trees – S-Attributed Definitions – L-Attributed Definitions

### UNIT III INTERMEDIATE CODE GENERATION

9

Intermediate Languages - Variants of syntax Tree-Generation of Three Address Code – Types and Declarations -Assignment Statements - Arrays - Boolean Expressions - Back patching - Case Statements - Procedure Calls.

### UNIT IV RUN-TIME ENVIRONMENT AND CODE GENERATION

8

Storage Organization - Storage Allocation - Access to Non-Local Names –Heap Management -Issues in design of a code generator – The target machine – Instruction costs – Basic Blocks and Flow Graphs - A simple code generator

### UNIT V CODE OPTIMIZATION

8

Introduction to optimization – Peephole Optimization-Principal Sources of Optimization – Optimization of Basic Blocks – Global Data Flow analysis-Constant Propagation-Partial Redundancy Elimination-loops in Flow Graphs

**TOTAL HOURS: 45**

## COURSE OUTCOMES

At the end of the course, the student should be able to:

- CO 1:** Understand the phases of compiler and recognize tokens from language specifications. **CO2:** Create framework for syntax directed translation schemes, and parse the generated tokens.  
**CO3:** Construct the intermediate code representation and generation  
**CO4:** Develop a simple compiler by using different compiler construction tools **CO5:** Apply the optimization technique to generate optimized code


## TEXT BOOK

1. Alfred V. Aho, Monica S.Lam, Ravi Sethi, Jeffrey D.Ullman, —Compilers: Principles, Techniques and Tools, Second Edition, Pearson Education, 2014(reprint).

## REFERENCES

1. Dhamdhare D M, "Compiler Construction Principles and Practice" second edition, Macmillan India Ltd., New Delhi, 2005.
2. Jean Paul Tremblay, Paul G Serenson, "The Theory and Practice of Compiler Writing", McGraw Hill, New Delhi, 2007.
3. Dick Grone, Henri E Bal, Cerial J H Jacobs and Keen Gangendoen, Modern Compiler Design", John Wiley, New Delhi, 2009.
4. Steven S. Muchnick, "Advanced Compiler Design Implementation", First Edition Elsevier Science India, Morgan Kaufmann Publishers, 2008

Course Outcomes	PS01	PS02	PS03	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1 Understand the phases of compiler and recognize tokens from language specifications	3			1	3										
CO2 Create framework for syntax directed translation schemes, and parse the generated tokens.	3		1	1		2				3					
CO3 Construct the intermediate code representation and generation	3			1		2		3		2					
CO4 Develop a simple compiler by using different compiler construction tools	3	2	1	1	3	2		2		2					
CO5 Apply the optimization technique to generate optimized code	3			1	3	2									

  
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**PREREQUISITES:** Object Oriented Programming, Java Programming,

**OBJECTIVES**

- To provide an overview of working principles of internet, web related functionalities.
- To understand and practice embedded dynamic scripting on client side Internet Programming.
- To understand and apply the fundamentals core java, packages, database connectivity for computing.
- To acquire the knowledge on server side programming.
- To develop web services using AJAX.

**UNIT I INTRODUCTION**

9

Internet Standards – Introduction to WWW – WWW Architecture - Overview of HTTP, HTTP request – response – Generation of dynamic web pages. Web 2.0: Basics, Rich Internet Applications, Collaboration tools. UI DESIGN: Markup Language (HTML): Introduction to HTML and HTML5 - Formatting and Fonts –Commenting Code – Anchors – Backgrounds – Images – Hyperlinks – Lists – Tables – Frames -HTML Forms. Cascading Style Sheet (CSS): The need for CSS, Introduction to CSS – Basic syntax and structure - Inline Styles – Embedding Style Sheets - Linking External Style Sheets – Backgrounds – Manipulating text - Margins and Padding - Positioning using CSS

**UNIT II JAVASCRIPT, JQUERY**

9

Introduction to JavaScript - Syntax - Variables and data types - JavaScript Control Statements - Operators - Literals - Functions - Objects - Arrays - Built in objects - Event handling - Fundamentals of JQuery - JQuery selectors - JQuery methods to access HTML attributes - Traversing - Manipulators  
- Events – Effects.

**UNIT III DOM,XML**

9

Introduction to the Document Object Model - DOM History and Levels - Intrinsic Event Handling - Modifying Element Style - The Document Tree - Properties of window - DOM Collections - Using Timer and Dynamic Styles to Create Animated Effects.XML – Introduction-Form Navigation-XML Documents- XSL – XSLT.

**UNIT-IV SERVER SIDE PROGRAMMING**

9

Servlets: Java Servlet Architecture- Servlet Life Cycle- Form GET and POST actions- Session Handling- Understanding Cookies- Multi- tire application Installing and Configuring Apache Tomcat Web Server  
DATABASE CONNECTIVITY: JDBC perspectives, JDBC program example - JSP: Understanding Java Server Pages-JSP Standard Tag Library(JSTL)-Creating HTML forms by embedding JSP code.

**UNIT V INTRODUCTION TO AJAX AND WEB SERVICES**

9

AJAX: Client Server Architecture-XML Http Request Object-Call Back Methods. Introduction to Web Services: UDDI, SOAP, WSDL, Service Provider, Service Consumer, Web Service Architecture,Case Study: Developing and deploying web services.

**TOTAL HOURS: 45**

## COURSE OUTCOMES

At the end of the course, the student should be able to:

- CO1: Acquire knowledge about functionalities of World Wide Web.  
 CO2: Explore markup languages features and create interactive web pages using them.  
 CO3: Design Client side validation using scripting languages.  
 CO4: Design web page and connect to the databases.  
 CO5: Create, describe, publish and consume the Web Services.


## TEXT BOOKS

1. Harvey M. Deitel and Paul J. Deitel, Internet & World Wide Web How to Program, Pearson Education, 2018.
2. Jeffrey C. Jackson, "Web Technologies - A Computer Science Perspective", Pearson Education, 2008.

## REFERENCE BOOKS

1. Robert. W. Sebesta, "Programming the World Wide Web", Pearson Education, Fourth Edition, 2007.
2. Kogent Learning Solutions Inc., "Html5 Black Book: Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP and jQuery", Dreamtech Press, 2011.
3. Joe Fawcett, Danny Ayers, Liam R. E. Quin, "Beginning XML", John Wiley & Sons Publisher, Fifth Edition, 2012
4. Achyut S Godbole and Atul Kahate, "Web Technologies", Second Edition, Tata McGraw Hill, 2012.
5. Bates, "Developing Web Applications", Wiley, 2006.

Course Outcomes	PSO1	PSO2	PSO3	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1 Acquire knowledge about functionalities of World Wide Web.	3		1	2	2	3									
CO2 Explore markup languages features and create interactive web pages using them.	3				2	2				3					
CO3 Design Client side validation using scripting languages.	3		1		1					2		3			
CO4 Design web page and connect to the databases.	3	2		2	2	1						2			
CO5 Create, describe, publish and consume the Web Services.	3			2	2										

  
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PREREQUISITES: NIL

**OBJECTIVE(S):**

- Understand the Characteristics of Intelligent Agents
- Solve problems using various Search Strategies & Knowledge Representation Scheme
- Realize the various applications of AI

**UNIT– I INTRODUCTION 8**

Introduction – Definition - Future of Artificial Intelligence – Characteristics of Intelligent Agents – Typical Intelligent Agents – Problem Solving Approach to Typical AI problems

**UNIT– II PROBLEM SOLVING METHODS 10**

Problem solving Methods - Search Strategies: Uninformed - Informed - Heuristics- Local Search Algorithms and Optimization Problems - Searching with Partial Observations - Constraint Satisfaction Problems – Constraint Propagation -Backtracking Search - Game Playing -Optimal Decisions in Games - Alpha–Beta Pruning -Stochastic Games

**UNIT– III KNOWLEDGE REPRESENTATION 10**

Propositional Logic - First Order Logic: Syntax and Semantics – Extensions & Notational variations –Using First Order Logic – Logical agents of Wumpus world - Knowledge Engineering – General ontology Inference in First order Logic: Inference Rules involving quantifiers – Forward and Backward Chaining Resolution – Completeness of Resolution.

**UNIT– IV PLANNING & LEARNING 9**

Planning: A simple Planning Agent – Basic Representations for Planning – Partial Order planning Example – Partial Order Planning Algorithm. Learning: Inductive Learning – Learning Decision Trees – Learning in Neural and Belief Networks: Neural networks – Perceptrons – Multilayer Feed-Forward networks.

**UNIT– V AI APPLICATIONS 8**

AI Applications – Language models – Information Retrieval – Information Extraction – Natural Language Processing – Machine Translation – Robot – Hardware Perception – Planning – Moving. **CASE STUDY: Speech Recognition.**

**TOTAL: 45 HOURS**

  
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**COURSE OUTCOMES:**

At the end of the course student should be able to

**CO1:** Understand various problem solving approaches for AI problems.

**CO2:** Apply different search strategies and heuristics in problem solving.

**CO3:** Utilize various Knowledge Representation Techniques in solving complex real-life problems.

**CO4:** Understand the concepts of Planning and Learning Techniques.

**CO5:** Build new applications for real-world scenarios.

**TEXT BOOKS:**

1. Stuart J Russell and Peter Norvig, "Artificial Intelligence - A Modern Approach", Third Edition, Prentice Hall of India/ Pearson Education, New Delhi, 2015.

**REFERENCE BOOKS:**

1. M. Tim Jones, "Artificial Intelligence: A Systems Approach (Computer Science)", Jones and Barlett Publishers, Inc., First Edition 2008.
2. Nils J. Nilsson, "The Quest for Artificial Intelligence", Cambridge University Press, 2009.
3. William F. Clocksin and Christopher S. Mellish, "Programming in Prolog: Using the ISO Standard", Fifth edition, Springer, 2003.
4. Elaine Rich, Kevin Knight, Shivashankar B. Nair, "Artificial Intelligence", Third Edition, Tata McGraw-Hill Education, 2008.

Course Outcomes	PSO1	PSO2	PSO3	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1 Understand various problem solving approaches for AI problems.	3			1	2	3	2								
CO2 Apply different search strategies and heuristics in problem solving.	3		1	1											
CO3 Utilize various Knowledge Representation Techniques in solving complex real-life problems.	3	2		1						3					
CO4 Understand the concepts of Planning and Learning Techniques.	3			1	2		2			2					
CO5 Build new applications for real-world scenarios.	3			1	2	2	2			2					

  
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**OBJECTIVE(S):**

The student should be made to:

- Know the components and structure of mobile application development frameworks for Android and windows OS based mobiles.
- Understand how to work with various mobile application development frameworks.
- Can able to draw basic graphical primitive on the mobile application and GPS location tracking information.

**LIST OF EXPERIMENTS:**

1. Develop an application that uses GUI components, Font and Colours
2. Develop an application that uses Layout Managers and event listeners.
3. Develop a native calculator application.
4. Write an application that draws basic graphical primitives on the screen.
5. Develop an application that makes use of database.
6. Develop an application that makes use of RSS Feed.
7. Implement an application that implements Multithreading
8. Develop a native application that uses GPS location information.
9. Implement an application that creates an alert upon receiving a message.
10. Write a mobile application that creates alarm clock

**TOTAL: 45 HOURS**

**COURSE OUTCOMES:**

At the end of the course, the student should be able to:

**CO1:** Design and Implement various mobile applications using emulators.

**CO2:** Deploy applications to hand-held devices

**CO3:** Develop an application using basic graphical primitives and databases.

**CO4:** Construct an application using multi threading and RSS feed and Make use of location identification using GPS in an application.

**LIST OF EQUIPMENTS:**

- Standalone desktops with Windows or Android or iOS or Equivalent Mobile Application Development
- Tools with appropriate emulators and debuggers.



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Course Outcomes		PSo1	PSO2	PSO3	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Design and Implement various mobile applications using emulators	3		1	3	1	3	2	3	2						
CO2	Deploy applications to hand-held devices	3				1		2	2	2						
CO3	Develop an application using basic graphical primitives and databases.	3	2		3	1	2	2	1							
CO4	Construct an application using multi threading and RSS feed and Make use of location identification using GPS in an application.	3			2	1	3	2		1						



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**OBJECTIVES:**

1. Learn how to build a data warehouse and query it.
2. Understand the data sets and data pre-processing.
3. Demonstrate the working of algorithms for data mining tasks such association rule mining, Classification, clustering and regression.
4. To obtain Practical experience with all real data sets.

**LIST OF EXPERIMENTS:**

1. Build Data Warehouse and Explore WEKA
2. Implement preprocessing on dataset student.arff
3. Implement association rule mining on data sets
4. Implement Association rule process on dataset test.arff using apriori algorithm
5. Implement classification rule process on dataset employee.arff using naïve Bayes algorithm
6. Implement clustering rule process on dataset student.arff using simple k-means
7. Implement classification on data sets
8. Implement clustering on data sets
9. Implement Regression on data sets
10. Credit Risk Assessment using German Credit Data
11. Implementation of ERP.

**COURSE OUTCOMES:**

At the end of the course students can able to;

CO1: Understand and create data

CO2: Implement the association rule, classification and clustering in large data sets.

CO3: Add mining algorithms as a component to the exiting tools.

CO4: Apply mining techniques for realistic data.

CO5: Apply data mining techniques in real world data analysis.

**LAB REQUIREMENTS:**

SOFTWARE : WEKA, Python Libraries

HARDWARE : Standalone desktops

Course Outcomes	PS01	PS02	PS03	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1 : Understand and create data	3			1	3	1		2		1					
CO2 Implement the association rule, classification and clustering in large data sets.	3		1	1	1	1				1					
CO3 Add mining algorithms as a component to the exiting tools.	3	2		1	2					1					
CO4 Apply mining techniques for realistic data..	3			1	2			3		1					
CO5 Apply data mining techniques in real world data analysis.	3			1	2	3				1					



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**COURSE OBJECTIVES**

- Be familiar with Web page design using HTML / DHTML and style sheets
- Use JavaScript to access and use web services for dynamic content
- Learn to create dynamic web pages using server side scripting.

**LIST OF EXPERIMENTS**

1. a) Design a web pages for your college containing a description of the courses, departments, faculties, library, etc (use href, list, frame tags)  
b) Create your class timetable using table tag.
2. Design a web page of your home town with an attractive background color, textcolor, animage, font.(use External, Internal, and Inline CSS to format)
3. Create a Student registration form for job application and validate the form fields using JavaScript.
4. Create a Quiz program with adaptive questions using JavaScript.
5. Create an online Event Registration form and validate using JQuery.
6. With the help of JDBC Connectivity to get details of bank customers transactions (credits and debits).Write a JSP to calculate the current balance, cumulative total of credits and debits of the individual customer.
7. Create an Extensible mark up language to represent the students mark information of a class. Create a webpage to display all the students consolidated mark statement with pass (green color)or fail (red color)using XSLT
8. Develop a web service for an airline management and implement the following scenariously using database
  - (a) Check ticket availability.
  - (b) Check air services through travel agent.
  - (c) Search a passenger whether he / she travelled in a particular date or not.
9. Create a program to change the content of the web page using AJAX.

**TOTAL HOURS: 45**

  
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## COURSE OUTCOMES

At the end of the course, the student should be able to:

**CO1:** Design Web pages using HTML/DHTML and style sheets

**CO2:** Create dynamic web pages using server side scripting.

**CO3:** Design and Implement database applications.

**CO4:** Develop the simple GUI interfaces to interact with users and real time applications.

## SOFTWARE REQUIREMENTS

Operating System: Linux / Windows

Programming Language & IDE: HTML 5, JDK 1.7, Coffee Cup Editor, PHP, Notepad++.Server:

Apache Tomcat Server / XAMP / LAMP

Backend: MYSQL / SQLite

Course Outcomes		PSo1	PSO2	PSO3	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Design Web pages using HTML/DHTML and style sheets	3		1	3	1	3	2	3	2						
CO2	Create dynamic web pages using server side scripting.	3	2			1		2	2	2						
CO3	Design and Implement database applications.	3		1	3	1	2	2	1							
CO4	Develop the simple GUI interfaces to interact with users and real time applications	3			2	1	3	2		1						

  
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**PREREQUISITES: Computer Architecture**

**OBJECTIVES**

- To understand the recent trends in the field of Computer Architecture and identify performance related parameters
- To appreciate the need for parallel processing
- To expose the students to the problems related to multiprocessing
- To understand the different types of multicore architectures
- To expose the students to warehouse-scale and embedded architectures

**UNIT I FUNDAMENTALS OF QUANTITATIVE DESIGN AND ANALYSIS 9**

Classes of Computers – Trends in Technology, Power, Energy and Cost – Dependability – Measuring, Reporting and Summarizing Performance – Quantitative Principles of Computer Design – Classes of Parallelism - ILP, DLP, TLP and RLP - Multithreading - SMT and CMP Architectures – Limitations of Single Core Processors - The Multicore era – Case Studies of Multicore Architectures.

**UNIT II DLP IN VECTOR, SIMD AND GPU ARCHITECTURES 9**

Vector Architecture - SIMD Instruction Set Extensions for Multimedia – Graphics Processing Units - Detecting and Enhancing Loop Level Parallelism - Case Studies.

**UNIT III TLP AND MULTIPROCESSORS 9**

Symmetric and Distributed Shared Memory Architectures – Cache Coherence Issues - Performance Issues – Synchronization Issues – Models of Memory Consistency – Interconnection Networks – Buses, Crossbar and Multi-stage Interconnection Networks.

**UNIT IV RLP AND DLP IN WAREHOUSE-SCALE ARCHITECTURES 9**

Programming Models and Workloads for Warehouse-Scale Computers – Architectures for Warehouse-Scale Computing – Physical Infrastructure and Costs – Cloud Computing – Case Studies.

**UNIT V ARCHITECTURES FOR EMBEDDED SYSTEMS 9**

Features and Requirements of Embedded Systems – Signal Processing and Embedded Applications – The Digital Signal Processor – Embedded Multiprocessors - Case Studies.

**TOTAL HOURS: 45 HOURS**

**COURSE OUTCOMES**

**At the end of the course the students should be able to**

- CO1:** Identify the limitations of ILP and the need for multicore architectures  
**CO2:** Discuss the issues related to multiprocessing and suggest solutions  
**CO3:** Understand the salient features of different multicore architectures and how they exploit parallelism  
**CO4:** Critically analyze the different types of inter connection networks  
**CO5:** Understand the architecture of GPUs, warehouse-scale computers and embedded processors

**TEXT BOOK**

1. John L. Hennessey and David A. Patterson, "Computer Architecture – A Quantitative Approach", Morgan Kaufmann / Elsevier, 5th edition, 2012.

**REFERENCES**

1. Kai Hwang, "Advanced Computer Architecture", Tata McGraw-Hill Education, 2003
2. Richard Y. Kain, "Advanced Computer Architecture a Systems Design Approach", PrenticeHall, 2011.
3. David E. Culler, Jaswinder Pal Singh, "Parallel Computing Architecture : A Hardware/ SoftwareApproach" , Morgan Kaufmann / Elsevier, 1997.

Course Outcomes		PSo1	PSO2	PSO3	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Identify the limitations of ILP and the need for multicore architectures	3			3	3										
CO2	Discuss the issues related to multiprocessing and suggest solutions	3		1	3	2					3					
CO3	Understand the salient features of different multicore architectures and how they exploit parallelism	3			2			3	1		3					
CO4	Critically analyze the different types of inter connection networks	3	2					2	3		2					
CO5	Understand the architecture of GPUs, warehouse-scale computers and embedded processors	3		1		3			2							

  
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**PREREQUISITES:** Design and Analysis of Algorithm, Computer Networks, Operating System, Computer Organization and Architecture

### OBJECTIVES

- To understand the need and fundamentals of parallel and distributed computing paradigms.
- To learn about the scheduling, decomposition techniques and its mapping.
- To build application using remote procedure call
- To utilize and manage the resources in a distributed computing environment
- To explore knowledge in distributed file systems.

**UNIT I INTRODUCTION TO PARALLEL COMPUTING** 9  
 Parallel Processing Terminology - Scope of Parallel Computing-Parallel Computer Memory Architectures -The PRAM model of Parallel Computation - PRAM Algorithms - Parallel reduction - Prefix Sum - List Ranking - Preorder Tree Traversal - Merging Two Sorted List - Graph Coloring- Nvidia CUDA programming model

**UNIT II DESIGNING PARALLEL PROGRAMS AND MAPPING** 9  
 Decomposition Techniques - Characteristics of Tasks and Interactions- Mapping Techniques for Load Balancing-collective communication-synchronization- OpenMP: a Standard for Directive Based Parallel Programming- Sorting Networks - Bubble Sort Variations – Discrete Optimization Problems:Parallel Depth First Search

**UNIT III DISTRIBUTED COMPUTING PARADIGM** 9  
 Introduction to Distributed Computing System - Distributed Computing System Models - Distributed Operating System - Issues in Designing a Distributed Operating System - Introduction to Distributed Computing Environment(DCE) - Network Types - Communication Protocols – Internetworking- Election Algorithms: The Bully Algorithm- The Ring Algorithm-Case Study:RAY- Distributed Computing Framework

**UNIT IV MESSAGE PASSING AND RESOURCE MANAGEMENT** 9  
 Issues in IPC by message passing - Multi Datagram Messages - Encoding and Decoding of Message Data - Group Communication - The RPC Model - Transparency of RPC - Implementing RPC mechanism - Stub Generation - RPC Messages - Communication Protocols for RPCs - Client-Server Binding –Resource Management:Features of a good scheduling algorithm-Task assignment approach-Load balancing-load sharing approach- Case study:MPI Remote Method Invocation And Object

**UNIT V DISTRIBUTED FILE SYSTEM** 9  
 Distributed File Systems-Desirable Features of a Good Distributed File System -File Models -File Replication -Fault Tolerance -Transactions - Nested Transactions - Locks - Optimistic Concurrency Control - Timestamp Ordering - Comparison - Flat and Nested Distributed Transactions - Atomic Commit protocols - Concurrency Control in Distributed Transactions-- Case Study:Open Source Distributed File Systems

**TOTAL HOURS: 45 HOURS**

## COURSE OUTCOMES

Upon completion of the course, the students will be able to

- CO1: Apply parallel programming algorithms for real world problems.
- CO2: Acquire knowledge on different scheduling, decomposition techniques and its mapping.
- CO3: Develop applications by incorporating distributed computing architectures.
- CO4: Build remote procedure calls and manage resources
- CO5: Implement and deploy the application using distributed file systems


## TEXT BOOK

1. Michael Quinn, "Parallel Computing - Theory and Practice", Second Edition, Tata McGraw Hill, 2012.
2. Distributed Operating System: Concepts and Design, Pradeep K. Sinha, PHI, 2012.

## REFERENCES

1. Ananth Grama, Anshul Gupta, George Karypis and Vipin Kumar, "Introduction to Parallel Computing", Second Edition, Pearson Education, 2009.
2. George Coulouris, Jean Dollimore and Tim Kindberg, Distributed Systems, Concepts and Design, Pearson Education, 3<sup>rd</sup> Edition 2011.
3. Haggit Attiya and Jennifer Welch, "Distributed Computing - Fundamentals, Simulations and Advanced Topics", Second Edition, Wiley, 2012.
4. Norman Matloff, "Parallel Computing for Data Science -With Examples in R, C++ and CUDA", Chapman and Hall/CRC, 2015.
5. Wan Fokkink, "Distributed Algorithms: An Intuitive Approach", MIT Press, 2013.
6. M.L. Liu, "Distributed Computing -Principles and Applications", First Edition, Pearson Education, 2011.

Course Outcomes	PSO1	PSO2	PSO3	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1 Apply parallel programming algorithms for real world problems..	3			3	3										
CO2 Acquire knowledge on different scheduling, decomposition techniques and its mapping.	3	2		3	2		3								
CO3 Develop applications by incorporating distributed computing architectures	3		1	3			1				3				
CO4 Build remote procedure calls and manage resources	3			3			2	3			3				
CO5 Implement and deploy the application using distributed file systems	3			3	3			2							

  
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### Course Objectives

- To learn the basic concepts of statistics.
- To introduce the notion of sampling distributions and acquire the knowledge of statistical techniques useful in decision making.
- To expose the statistical methods for analysis of variance and control limits.
- To solve equations using direct and iterative methods.
- To introduce interpolation techniques and to study the principles of numerical differentiation and numerical integration.

### UNIT I DESCRIPTIVE STATISTICS

9 + 3

Measures of Central tendency - Arithmetic Mean, Median, Mode - Measures of dispersion- Standard deviation and Variance – Graphical representation of data- Pie chart, Bar graph, Histogram and Ogives. Curve fitting by the Principle of least squares.

### UNIT II TESTING OF HYPOTHESIS

9 + 3

Sampling distributions – Testing of hypothesis for large samples by Z-test and small samples by Student's t-test for single Mean, Proportion, equality of means and equality of proportions – F-test for single variance and equality of variances – Chi-square test for Goodness of fit and Independence of attributes.

### UNIT III DESIGN OF EXPERIMENTS

9 + 3

ANOVA (Analysis of variance) – Completely Randomized Design (CRD-one way classification) – Randomised Block Design (RBD-two way classification) - Latin Square Design (LSD-Three way classification)- Control charts for measurements -  $\bar{x}$  chart, R-chart

### UNIT IV NUMERICAL SOLUTION OF EQUATIONS

9 + 3

Solution of algebraic and transcendental equations : Fixed point iteration - Newton-Raphson method- Solution of system of equations - Direct Methods: Gauss Elimination method, Gauss-Jordan method, LU decomposition method and Cholesky decomposition method – Iterative methods: Gauss- Jacobi method and Gauss-Seidel method.


### UNIT V INTERPOLATION, NUMERICAL DIFFERENTIATION AND INTEGRATION

9 + 3

Interpolation: Newton's forward and backward differences interpolation - Lagrange's and Newton's divided difference interpolation - Numerical differentiation using Newton's forward and backward difference interpolation - Numerical integration using Trapezoidal and Simpson's  $1/3^{\text{rd}}$  and  $3/8^{\text{th}}$  rules.

**Total no. of periods: 45 + 15 = 60**

*Note: Use of approved statistical table is permitted in the examination.*

  
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### Course Outcomes

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

- CO 1: Apply the basic Statistical measures of Central Tendency and Dispersion and represent statistical data graphically for analysis.
- CO 2: Draw conclusions through hypothesis testing.
- CO 3: Acquaint with the knowledge of analysis of variance for decision making and analyse the control limits of a sample.
- CO 4: Apply numerical methods for solving algebraic, transcendental equations and system of equations by direct and iterative methods.
- CO 5: Appreciate numerical techniques such as interpolation applied to find derivatives and numerical integration.

### TEXT BOOKS

1. Gupta.S.C., & Kapoor,V.K., "Fundamentals of mathematical statistics", 11<sup>th</sup> edition, SultanChand & Sons publishers, New Delhi, 2013.
2. Grewal, B.S. and Grewal,J.S., " Numerical methods in Engineering and Science", 6th Edition, Khanna Publishers, New Delhi, 2004.

### REFERENCES

1. Veerarajan.T., "Probability, Statistics and Random Processes", Tata McGraw-Hill publishing company Limited, New Delhi, 2014.
2. R.E. Walpole, R.H. Myers, S.L. Myers, and K Ye, "Probability and Statistics for Engineers and Scientists", Pearson Education, Asia , 8th edition, 2007.
3. Miller and Freund., "Probability and Statistics for Engineers", Pearson Education, Asia, 7th edition, 2012.
4. Kandasamy.P, Thilagavathy,K. & Gunavathi.K., "Numerical Methods"., S.Chand & Company Ltd., New Delhi, 2014.
5. S.S.Sastry, "Introductory Methods of Numerical Analysis", 5th Edition, Prentice Hall of India Private Ltd., New Delhi, 2012.

Course Outcomes	PSo1	PSO2	PSO3	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1 Apply the basic Statistical measures of Central Tendency and Dispersion and represent statistical data graphically for analysis.	3			3	3										1
CO2 Draw conclusions through hypothesis testing.	3			3	3	2	3								2
CO3 Acquaint with the knowledge of analysis of variance for decision making and analyse the control limits of a sample.	3		1	3	3	2	3								2
CO4 Apply numerical methods for solving algebraic, transcendental equations and system of equations by direct and iterative methods.	3			3	3	2	2								2
CO5 Appreciate numerical techniques such as interpolation applied to find derivatives and numerical integration.	3	2		3	3	2	2								

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**NETWORK DESIGN AND MANAGEMENT**

618CSE04

Prerequisite: Computer Networks

OBJECTIVE(S):

- To understand the concepts and terminology associated with SNMP and TMN
- To learn to the concepts and architecture behind standards based network management
- To understand the need for interoperable network management
- To understand network management as a typical distributed application
- To study the current trends in network management technologies

**UNIT I - PHYSICAL NETWORK DESIGN**  
9  
LAN cabling topologies – Ethernet switches – High speed and Gigabit and 10Gbps – Building cabling topologies and Campus cabling topologies – Routers, Firewalls and L3 switches – Remote Access Technologies and Devices – Modems and DSL – SLIP and PPP – WAN Design and Enterprise Networks – Core networks, distribution networks and access networks

**UNIT II - OSI NETWORK MANAGEMENT**  
9  
Network Management: Goals, Organization, and Functions, Network and System Management, Network Management System Platform, Current Status and future of Network, OSI Network management model - Organizational model - Information model, communication model. Abstract Syntax Notation - Encoding structure, Macros Functional model CMIP/CMIS

**UNIT III - INTERNET MANAGEMENT(SNMP)**  
9  
SNMP (V1 and V2) - Organizational model - System Overview, The information model, communication model - Functional model, SNMP proxy server, Management information, protocol remote monitoring - RMON SMI and MIB, RMON1, RMON2 - A Case Study of Internet Traffic Using RMON.

**UNIT IV - BROADBAND NETWORK MANAGEMENT**  
9  
Broadband networks and services, ATM Technology - VP, VC, ATM Packet, Integrated service, ATM LAN emulation, Virtual LAN, ATM Network Management - ATM Network reference model, integrated local management interface. ATM Management Information base, Role of SNMP and LLMI in ATM Management, M1, M2, M3, M4 Interface. ATM Digital Exchange Interface Management - TMN conceptual Model - TMN Architecture, TMN Management Service Architecture

**UNIT V - NETWORK MANAGEMENT APPLICATIONS**  
9  
Configuration management, performance management, fault management, Event Correlation Techniques security Management, Accounting management, Report Management, Policy Based Management Service Level Management - Network Management Tools, Network Statistics Measurement Systems – Web Based Management, XML Based Network Management - : Future Directions.

TOTAL: 45 HOURS



**COURSE OUTCOMES:**

At the end of the course, the student should be able to: CO1:

Apply the networking principles to design a network

CO2: Formulate possible approaches for managing OSI network model.

CO3: Use on SNMP for managing the network & RMON for monitoring the behavior of the

Network

CO4: Explore the possibilities of improving the speed of the network and managing them

CO5: Identify the various components of network and formulate the scheme for themanaging them

**TEXT BOOKS:**

1. Mani Subramanian, "Network Management Principles and practice ", Pearson Education, New Delhi, 2010.

2. STALLINGS, WILLIAM, "SNMP, SNMPV2, SNMPV3, and RMON 1 and 2," Pearson Education, 2012

**REFERENCE BOOKS:**

1. Salah Alidarous, Thomas Plevayk, "Telecommunications Network Management Technologies and Implementations ", eastern Economy Edition IEEE press, New Delhi, 1998.

2. Lakshmi G. Raman, "Fundamentals of Telecommunication Network Management", Eastern Economy Edition IEEE Press, New Delhi, 1999.

Course Outcomes											
CO1	CO2	CO3	CO4	CO5							
Apply the networking principles to design a network	Formulate possible approaches for managing OSI network model.	Use on SNMP for managing the network & RMON for monitoring the behavior of the Network	Explore the possibilities of improving the speed of the network and managing them	Identify the various components of network and formulate the scheme for themanaging them							
3	3	3	3	3	3	3	3	3	3	3	3
PS01	PS02	PS03	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
PO10	PO11	PO12									

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**OBJECTIVES:**

- To understand the basic concepts and techniques of Machine Learning.
- To have a thorough understanding of the widely used Machine learning algorithms
- To be familiar with different dimensionality reduction methods.
- To recognize various tree, deterministic, evolutionary and graphical models of machine learning algorithms

**UNIT I INTRODUCTION**

9

Learning – Types of Machine Learning – Supervised Learning – The Brain and the Neuron – Design a Learning System – Perspectives and Issues in Machine Learning – Concept Learning Task – Concept Learning as Search – Finding a Maximally Specific Hypothesis – Version Spaces and the Candidate Elimination Algorithm – Linear Discriminants – Perceptron – Linear Separability – Linear Regression.

**UNIT II LINEAR MODELS**

9

Multi-layer Perceptron – Going Forwards – Going Backwards: Back Propagation Error – Multi-layer Perceptron in Practice – Examples of using the MLP – Overview – Deriving Back- Propagation – Radial Basis Functions and Splines – Concepts – RBF Network – Curse of Dimensionality – Interpolations and Basis Functions – Support Vector Machines

**UNIT III TREE AND PROBABILISTIC MODELS**

9

Learning with Trees – Decision Trees – Constructing Decision Trees – Classification and Regression Trees – Ensemble Learning – Boosting – Bagging – Different ways to Combine Classifiers – Probability and Learning – Data into Probabilities – Basic Statistics – Gaussian Mixture Models – Nearest Neighbor Methods – Unsupervised Learning – K means Algorithms – Vector Quantization – Self Organizing Feature Map.

**UNIT IV DIMENSIONALITY REDUCTION AND EVOLUTIONARY MODELS**

9

Dimensionality Reduction – Linear Discriminant Analysis – Principal Component Analysis – Factor Analysis – Independent Component Analysis – Locally Linear Embedding – Isomap – Least Squares Optimization – Evolutionary Learning – Genetic algorithms – Genetic Offspring: - Genetic Operators – Using Genetic Algorithms – Reinforcement Learning – Overview – Getting Lost Example – Markov Decision Process

**UNIT V GRAPHICAL MODELS**

9

Markov Chain Monte Carlo Methods – Sampling – Proposal Distribution – Markov Chain Monte Carlo – Graphical Models – Bayesian Networks – Markov Random Fields – Hidden Markov Models – Tracking Methods

**TOTAL: 45 PERIODS****COURSE OUTCOMES**

**At the end of the course the students are able to**

- CO1:** Distinguish between, supervised, unsupervised and semi-supervised learning  
**CO2:** Apply the suitable machine learning strategy to real-world applications.  
**CO3:** Suggest supervised, unsupervised or semi-supervised learning algorithms for any given problem  
**CO4:** Modify existing machine learning algorithms to improve classification efficiency  
**CO5:** Design systems that uses the appropriate graph models of machine learning

**TEXT BOOK:**

1. Stephen Marsland, —Machine Learning – An Algorithmic Perspective, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.
2. Tom M Mitchell, —Machine Learning, First Edition, McGraw Hill Education, 2013.

**REFERENCE BOOKS:**

1. Peter Flach, —Machine Learning: The Art and Science of Algorithms that Make Sense of Data, First Edition, Cambridge University Press, 2012.
2. Jason Bell, —Machine learning – Hands on for Developers and Technical Professionals, First Edition, Wiley, 2014
3. Ethem Alpaydin, —Introduction to Machine Learning 3e (Adaptive Computation and Machine Learning Series), Third Edition, MIT Press, 2014.

Course Outcomes		PSo1	PSO2	PSO3	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Distinguish between, supervised, unsupervised and semi-supervised learning	3							2					1		
CO2	Apply the suitable machine learning strategy to real-world applications.	3		1			2	2								
CO3	Suggest supervised, unsupervised or semi-supervised learning algorithms for any given problem	3		1			1		3					3		
CO4	Modify existing machine learning algorithms to improve classification efficiency	3	2					2						1		
CO5	Design systems that uses the appropriate graph models of machine learning	3					3	3	3							



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**OBJECTIVES:**

- To understand the basic concepts of mobile computing.
- To learn the basics of mobile telecommunication system.
- To be familiar with the network layer protocols and Ad-Hoc networks.
- To know the basis of transport and application layer protocols.
- To gain knowledge advances in mobile computing and application

<b>UNIT I</b>	<b>INTRODUCTION</b>	<b>9</b>
Introduction to Mobile Computing – Applications of Mobile Computing- Generations of Mobile Communication Technologies- Multiplexing – Spread spectrum -MAC Protocols – SDMA- TDMA- FDMA- CDMA		
<b>UNIT II</b>	<b>MOBILE TELECOMMUNICATION SYSTEM</b>	<b>9</b>
Introduction to Cellular Systems - GSM – Services & Architecture – Protocols – Connection Establishment – Frequency Allocation – Routing – Mobility Management – Security – GPRS-UMTS- Architecture – Handover - Security		
<b>UNIT III</b>	<b>MOBILE NETWORK LAYER</b>	<b>9</b>
Mobile IP – DHCP – AdHoc– Proactive protocol-DSDV, Reactive Routing Protocols – DSR,AODV , Hybrid routing –ZRP, Multicast Routing- ODMRP, Vehicular Ad Hoc networks( VANET) –MANET Vs VANET – Security.		
<b>UNIT IV</b>	<b>MOBILE TRANSPORT AND APPLICATION LAYER</b>	<b>9</b>
Mobile TCP– WAP – Architecture – WDP – WTLS – WTP –WSP – WAE – WTAArchitecture– WML		
<b>UNIT V</b>	<b>ADVANCES IN MOBILE COMPUTING AND APPLICATIONS</b>	<b>9</b>
4G Networks: Introduction, features and challenges, network architecture, 5G Networks: Introduction. Comparison of 3G/4G/5G Networks. Mobile Device Operating Systems – Special Constraints & Requirements – MCommerce –Structure– Pros & Cons– Mobile Payment System – Security Issues		

**TOTAL :45 PERIODS**

**COURSE OUTCOMES:**

**At the end of the course, the students should be able to:**

- Explain the basics of mobile telecommunication systems
- Illustrate the generations of telecommunication systems in wireless networks
- Determine the functionality of MAC, network layer and Identify a routing protocol for a given Ad hoc network
- Explain the functionality of Transport and Application layers
- Acquire knowledge on advances in Mobile Computing and its applications

**TEXT BOOKS:**

1. Jochen Schiller, — Mobile Communications , PHI, Second Edition, 2003.
2. Prasant Kumar Pattnaik, Rajib Mall, — Fundamentals of Mobile Computing , PHI Learning Pvt.Ltd, New Delhi – 2012

## REFERENCES

1. Dharma Prakash Agarwal, Qing and An Zeng, "Introduction to Wireless and Mobile systems", Thomson Asia Pvt Ltd, 2005.
2. Uwe Hansmann, Lothar Merk, Martin S. Nicklons and Thomas Stober, — Principles of Mobile Computing , Springer, 2003.
3. William.C.Y.Lee,—Mobile Cellular Telecommunications-Analog and Digital Systems ,Second Edition,TataMcGraw Hill Edition ,2006.
4. C.K.Toth, —AdHoc Mobile Wireless Networks , First Edition, Pearson Education, 2002.

Course Outcomes		PSo1	PSO2	PSO3	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Explain the basics of mobile telecommunication systems.	3			3	1										1
CO2	Illustrate the generations of telecommunication systems in wireless networks	3		1	2				1							1
CO3	Determine the functionality of MAC, network layer and Identify a routing protocol for a given Ad hoc network	3		1	3	2										2
CO4	Explain the functionality of Transport and Application layers	3	2		1	1			2							2
CO5	Acquire knowledge on advances in Mobile Computing and its applications	3			2	1			2							

  
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**OBJECTIVE(S):**

- Make use of Data sets in implementing the machine learning algorithms
- Identify and Implement the machine learning concepts and algorithms for various applications
- Design learning model for appropriate application
- Explore supervised and unsupervised learning algorithms for real world problems

**SUGGESTED LIST OF EXPERIMENTS (ANY 5) :**

The suggested list Experiments can be implemented using Java / Python

1. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.
2. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.
3. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
4. Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets.
5. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
6. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set (You can use Java/Python ML library classes/API).
7. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering (You can add Java/Python ML library classes/API in the program).
8. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.

**TOTAL: 45 Hours****COURSE OUTCOMES:**

Upon completion of the course, students will be able to:

- CO1:** Understand the implementation procedures for the machine learning algorithms.
- CO2:** Design Java/Python programs for various Learning algorithms.
- CO3:** Apply appropriate data sets to the Machine Learning algorithms.
- CO4:** Identify and apply Machine Learning algorithms to solve real world problems.
- CO5:** Apply effectively the Neural Networks concept for appropriate problems.

Course Outcomes		PSO1	PSO2	PSO3	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Understand the implementation procedures for the machine learning algorithms.	3			3	3										
CO2	Design Java/Python programs for various Learning algorithms	3			3	3		2		1						
CO3	Apply appropriate data sets to the Machine Learning algorithms.	3		1	3	3				2						
CO4	Identify and apply Machine Learning algorithms to solve real world problems.	3		1	3	2		3								
CO5	Apply effectively the Neural Networks concept for appropriate problems	3	2		3	2		1		3						

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**OBJECTIVE(S):**

- Create practical exposure to virtualization concepts by creating virtual machines
- Learn Application and back end web service development
- Expose to database hosting and accessing in virtual environment
- Demonstrate the use of map and reduce
- Familiar with installation and configuration in cloud platforms


**LIST OF EXPERIMENTS:**

1. Design and create virtual machine configuration for the given problem. Justify the use of CPU, Memory, GPU and storage. Create the Virtual machine.
2. Create key based authentication and login virtual machine from the host machines. Install required software by connecting with SSH or Putty.
3. Install Web server in the virtual machine and create sample web application (HTML, JS) and host. Run from the browser.
4. Create simple backend logic and communication with front end app using AJAX.
5. Create SQL DB and design schema for user session details. Retrieve the details from front end application.
6. Create user name, store the password in the SQL. Login using user name/password and validate.
7. Create and mount one node Hadoop cluster.
8. Access the Hadoop using API's from the application and show the data.
9. Demonstrate the use of map and reduce using simple program.
10. Install and Configure Google App Engine
11. Design an assignment to retrieve, verify and store user credentials using firebase authentication, the Google App engine standard environment, & Google cloud datastore.
12. Case Study of Microsoft Azure.

**TOTAL: 45 Hours****COURSE OUTCOMES:****Upon completion of the course, students will be able to:**

- CO1:** Design and develop highly scalable cloud-based applications by creating and configuring virtual machines on the cloud
- CO2:** Create a sample web application
- CO3:** Store and retrieve the data in cloud databases.
- CO4:** Compare, contrast, and evaluate the key trade-offs between multiple approaches to map reduce in cloud system design.
- CO5:** Develop and deploy cloud application using popular cloud platforms

**LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:****Software:** Eucalyptus or Open Nebula or equivalent, Virtual box, Ubuntu.**Hardware:** Standalone desktops 30 Nos

  
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Course Outcomes		PSO1	PSO2	PSO3	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Design and develop highly scalable cloud-based applications by creating and configuring virtual machines on the cloud	3					2		3		2					
CO2	Create a sample web application	3					2		3		2					
CO3	Store and retrieve the data in cloud databases	3		1	2		3		2		2					
CO4	Compare, contrast, and evaluate the key trade-offs between multiple approaches to map reduce in cloud system design	3		1	3		2		2		2					
CO5	Develop and deploy cloud application using popular cloud platforms	3	2		1		1									

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**OBJECTIVE(S):**

- To understand the fundamentals of Internet of Things
- To learn about the basics of IOT protocols
- To build a small low cost embedded system using Raspberry Pi.
- To apply the concept of Internet of Things in the real world scenario.

**Prerequisites: Nil****UNIT-I INTRODUCTION****9**

Introduction to Internet of Things Definition & Characteristics of IoT, Evolution of IoT, Physical Design of IoT-Things in IoT, IoT Protocols, Logical Design of IoT, IoT Functional Blocks, IoT Communication Models, IoT Communication APIs, IoT Enabling Technologies, Wireless Sensor Networks. Cloud Computing Big Data Analytics, Communication Protocols, Embedded Systems IoT Levels & Deployment Templates, IoT Level-1, IoT Level-2, IoT Level-3, IoT Level-4, IoT Level-5, IoT Level-6 .

**UNIT-II IoT, M2M AND PLATFORM DESIGN METHODOLOGY****9**

IoT and M2M: Introduction, M2M, Difference between IoT and M2M, SDN and NFV for IoT, Software Defined Networking, Network Function Virtualization, NETCONF, YANG, IoT System Management with NETCONF-YANG, IoT Platforms Design Methodology : IoT Design Methodology , Purpose & Requirements Specification , Process Specification, Domain Model Specification, Information Model Specification, Service Specifications, IoT Level Specification, Functional View Specification, Operational View Specification, Device & Component Integration, Application Development.

**UNIT-III PYTHON PACKAGES AND IOT PHYSICAL DEVICES****8**

Python Packages of Interest for IoT-JSON, XML, HTTPLib & URLLib, SMTPLib, Raspberry Pi, About the Board, Linux on Raspberry Pi, Raspberry Pi Interfaces, Serial, SPI, I2C Programming Raspberry Pi with Python-Controlling LED with Raspberry Pi, Interfacing an LED and Switch with Raspberry Pi, Interfacing a Light Sensor (LDR) with Raspberry Pi, Other IoT Devices-pcDuino, Beagle Bone Black, Cubie board.

**UNIT-IV IoT PHYSICAL SERVERS & CLOUD OFFERINGS****9**

IoT Physical Servers & Cloud Offerings, WAMP - AutoBahn for IoT, Xively Cloud for IoT, Python Web Application Framework – Django, Django Architecture , Starting Development with Django , Designing a RESTful Web API, Amazon Web Services for IoT , Amazon EC2, Amazon AutoScaling , Amazon S3, Amazon RDS Amazon DynamoDB, Amazon Kinesis, Amazon SQS, Amazon EMR, SkyNet IoT Messaging Platform.

**UNIT-V DATA ANALYTICS FOR IoT & CASE STUDIES****10**

Data Analytics for IoT-Apache Oozie, setting up Oozie, Oozie Workflows for IoT Data Analysis, Apache Spark, Apache Storm, Setting up a Storm Cluster, Using Apache Storm for Real-time Data Analysis, REST-based approach, Web Socket-based approach. Case Studies Illustrating IoT Design-Smart Lighting, Smart Parking, Weather Monitoring System-Weather Reporting Bot, Smart Irrigation, IoT Printer, Tools for IoT-Chef, Puppet.

**TOTAL: 45 Hours**

  
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**COURSE OUTCOMES:**

At the end of the course, the student should be able to:

- CO1:** Compare and analyze different design issues and domains of IoT. **CO2:** Identify different design methodologies and end point devices of IoT. **CO3:** Prepare different cloud based and embedded solution for IoT.
- CO4:** Formulate different case studies related to IoT framework.
- CO5:** Solve data analytical and real-time application problems on IoT.

**TEXT BOOKS:**

1. Arshdeep Bagha, Vijay Madiseti, Internet of Things (A Hands-on-Approach), University Press, 2015.

**REFERENCE BOOKS:**

1. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), - Architecting the Internet of Things, Springer, 2011.
2. Honbo Zhou, - The Internet of Things in the Cloud: A Middleware Perspective, CRC Press, 2012.
3. Jan Ho" ller, Vlasios Tsiatsis, Catherine Mulligan, Stamatis, Karnouskos, Stefan Avesand. David Boyle, "From Machine-to-Machine to the Internet of Things - Introduction to a New Age of Intelligence", Elsevier, 2014.
4. Olivier Hersent, David Boswarthick, Omar Elloumi, -The Internet of Things – Key applications and Protocols, Wiley, 2012
5. The Evolution of Internet of Things-Texas Instruments.  
(<http://www.ti.com/lit/ml/swrb028/swrb028.pdf>)

Course Outcomes	PSO1	PSO2	PSO3	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1 Compare and analyze different design issues and domains of IoT.	3					3									
CO2 Identify different design methodologies and end point devices of IoT.	3		1		3	3									
CO3 Prepare different cloud based and embedded solution for IoT.	3		1			2									
CO4 Formulate different case studies related to IoT framework.	3	2			2		2					3			
CO5 Solve data analytical and real-time application problems on IoT	3				1		3					2			

  
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**OBJECTIVE(S):**

- Building and design of the foundational enterprise IT architecture
- To evolving technology, continued improvements in enterprise applications and establishing baseline metrics is important to the sustenance of key infrastructure elements of software enterprise applications
- A Unified meta-model of elements can lead to effective business analysis from an idea that originated in order to bring rigid engineering concepts to building enterprise IT systems, Enterprise Architecture (EA) is evolving into a business-driven
- To formally capture and implement the dynamic and static elements of an enterprise to manage enterprise change

**UNIT I INTRODUCTION**

8

Introduction to Enterprise Applications and their Types, Software Engineering Methodologies, Life Cycle of Raising an Enterprise Application, Introduction to Skills Required to Build an Enterprise Application, Key Determinants of Successful Enterprise Applications, and Measuring the Success of Enterprise Applications.

**UNIT II INCEPTING ENTERPRISE APPLICATIONS**

9

Inception of Enterprise Applications, Enterprise Analysis, Business Modeling, Requirements Elicitation, Use Case Modeling, Prototyping, Non Functional Requirements, Requirements Validation, Planning and Estimation.

**UNIT III ARCHITECTING AND DESIGNING ENTERPRISE APPLICATIONS**

10

Concept of Architecture, Views and Viewpoints, Enterprise Architecture, Logical Architecture, Technical Architecture - Design, Different Technical Layers, Best Practices, Data Architecture and Design – Relational, XML, and Other Structured Data Representations, Infrastructure Architecture and Design Elements - Networking, Internetworking, and Communication Protocols, IT Hardware and Software, Middleware, Policies for Infrastructure Management, Deployment Strategy, Documentation of Application Architecture and Design.

**UNIT IV CONSTRUCTING ENTERPRISE APPLICATIONS**

9

Construction Readiness of Enterprise Applications - Defining a Construction Plan, Defining a Package Structure, Setting up a Configuration Management Plan, Setting up a Development Environment, Introduction to the Concept of Software Construction Maps, Construction of Technical Solutions Layers, Methodologies of Code Review, Static Code Analysis, Build and Testing, Dynamic Code Analysis – Code Profiling and Code Coverage.

**UNIT V TESTING AND ROLLING OUT ENTERPRISE APPLICATIONS**

9

Types and Methods of Testing an Enterprise Application, Testing Levels and Approaches, Testing Environments, Integration Testing, Performance Testing, Penetration Testing, Usability Testing, Globalization Testing and Interface Testing, User Acceptance Testing, Rolling out an Enterprise Application.

Total :45 Hrs



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## COURSE OUTCOMES:

At the end of the course, the student should be able to:

**CO1:** Understand the fundamental of Enterprise applications and key determinants to measure the success.

**CO2:** Demonstrate an understanding of different modelling techniques used to design Enterprise applications.

**CO3:** Develop knowledge in designing Enterprise Applications. **CO4:**

Construct Enterprise applications by understanding the design.

**CO5:** Test and roll out the enterprise applications in real environment.


## TEXT BOOK

1. Raising Enterprise Applications: A Software Engineering Perspective, Anubhav Pradhan Satheesha B. Nanjappa Senthil K. Nallasamy Veerakumar Esakimuthu, 1st Edition, Wiley India Pvt Ltd, 2010, ISBN:9788126519460.

## REFERENCE BOOKS

1. Raffaele Garofalo, "Building Enterprise Applications with Windows Presentation Foundation and the Model View ViewModel Pattern", 1st Edition, Microsoft Press, 2011
2. Dominic Duggan, "Enterprise Software Architecture and Design Entities, Services, and Resources", 1st Edition, Wiley India Pvt Ltd, 2012
3. Martin Fowler, "Patterns of Enterprise Application Architecture", 1st Edition, Pearson/Goels Computer Hut Publisher,

Course Outcomes	PSO1	PSO2	PSO3	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1 Solve data analytical and real-time application problems on IoT	3			3											
CO2 Demonstrate an understanding of different modelling techniques used to design Enterprise applications.	3			2	2		2								
CO3 Develop knowledge in designing Enterprise Applications.	3		1	3	1	3					3				
CO4 Construct Enterprise applications by understanding the design.	3		1	1	3	2	2				2				
CO5 Test and roll out the enterprise applications in real environment.	3	2		3			3								

  
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**OBJECTIVES**

- To understand the characteristics and significances of Pervasive Computing and the solutions those are in use.
- To realize the sensing technologies of pervasive environment.
- To design and implement pervasive applications in collaboration with different technologies.

**UNIT I INTRODUCTION TO PERVASIVE COMPUTING 9**

Pervasive Computing and its significances – Research trends in pervasive computing and networking. Mobile Agent Technology - Mobile Agent Security - Mobile Agent Platforms - Sensor Networks - Sensor Network Applications Elements of a Context-Aware Pervasive System – Sensing, Thinking, Acting.

**UNIT II ELEMENTS OF PERVASIVE COMPUTING 9**

Adhoc and Sensor Network – Properties of an Adhoc networks – Unique features of Sensor Network – Constraint Resources – Mobility - Mobile Sensor Cooperation: Mobility to Enhance Functionality, Mobility to Enhance Dependability, - Cooperation across Mobile Entities: Cooperative Path Planning, Data-Based Agreement for Coordination.

**UNIT III AUTONOMIC AND PROTOCOLS 9**

Pervasive Networks Architecture - Protocols – Auto configuration: Neighborhood discovery, Topology discovery, MAC Schedule Construction. Energy Efficient Communication: Multi-hop routing, Communication scheduling, Sleep Scheduling, Clustering.

**UNIT IV PERVASIVE APPROACHES AND SOLUTIONS 9**

Approaches and Solutions – Deployment and Configuration, Routing, Fault Tolerant and Reliability. Mobile and wireless security issues: Detectability, Resource depletion, physical intercept problem, Theft of service.

**UNIT V PERVASIVE LEARNING TOOLS AND TECHNOLOGIES 9**

Pervasive Learning Tools and Technologies - Emerging Technologies and Systems for Pervasive Learning - Integration of Real-World Practice and Experience with Pervasive Learning - Smart Devices, Systems and Intelligent Environments: Smart Home, Smart Car, Smart Laboratory.

**TOTAL: 45 PERIODS****COURSE OUTCOMES:**

**At the end of the course the students are able to**

CO1: Outline the basic significances and performance requirements of pervasive computing.

CO2: Understand the basic pervasive computing elements and autonomic behavior of sensors.

CO3: Examine and analyze various pervasive approaches and possible solutions.

CO4: Design and develop diversified smart applications using pervasive computing techniques.


**TEXT BOOKS:**

1. Mohammad S., Obaidat, Mieso Denko, Isaac Woungang, Pervasive Computing and Networking, John Wiley & Sons, First Edition, 2011.
2. Frank Adelstein, Sandeep Gupta, Golden Richard III, Loren Schwiebert, Fundamentals of Mobile and Pervasive Computing, Tata McGraw Hill, New Delhi, 2005.

**REFERENCE:**

1. Rahul Banerjee, "Lecture Notes in Pervasive Computing", Outline Notes, BITS - Pilani, 2012.
2. Genco, S. Sorce, "Pervasive Systems and Ubiquitous Computing", WIT Press, 2012
3. StefenPoslad, "Ubiquitous Computing: Smart Devices, Environments and Interactions", Wiley, Second Edition, 2010

Course Outcomes		PSo1	PSO2	PSO3	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Outline the basic significances and performance requirements of pervasive computing	3			3	3										
CO2	Understand the basic pervasive computing elements and autonomic behavior of sensors.	3		1	3	3										
CO3	Examine and analyze various pervasive approaches and possible solutions.	3		1	2	2	3		3							
CO4	Design and develop diversified smart applications using pervasive computing techniques	3	2		1	1	2		1							

  
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**OBJECTIVE(S):**

- Understand logical and physical components of a storage infrastructure
- To study different types of storage area networks
- To gain knowledge in different backup and recovery topologies and their role in providing disaster recovery and business continuity capabilities
- To gain knowledge in information security and identify different storage virtualization technologies

**Pre requisites:** Computer Networks, Database Systems

**UNIT I INTRODUCTION TO STORAGE TECHNOLOGY 9**

Review data creation and the amount of data being created and understand the value of data to a business, challenges in data storage and data management, Solutions available for data storage, Core elements of a data center infrastructure, role of each element in supporting business activities.

**UNIT II STORAGE SYSTEMS ARCHITECTURE 9**

Hardware and software components of the host environment, Key protocols and concepts used by each component, Physical and logical components of a connectivity environment, Major physical components of a disk drive and their function, logical constructs of a physical disk, access characteristics, and performance Implications, RAID, RAID levels, Compare and contrast integrated and modular storage systems, High-level architecture and working of an intelligent storage system

**UNIT III INTRODUCTION TO NETWORKED STORAGE 9**

Evolution of networked storage, Architecture, components, and topologies of FC-SAN, NAS, and IP-SAN, FCoE, iSCSI Benefits of the different networked storage options, understand the need for long-term archiving solutions and describe how CAS full fill the need, understand the appropriateness of the different networked storage options for different application environments.

**UNIT IV INFORMATION AVAILABILITY, MONITORING & MANAGING DATACENTER 9**

Business Continuity- Information Availability, RTO and RPO, Identify single points of failure in a storage infrastructure and list solutions to mitigate these failures, Architecture of backup/recovery and the different backup/ recovery topologies, Data Deduplication, Local and Remote replication technologies. Monitoring the storage infrastructure, Information Life Cycle Management.

**UNIT V SECURING STORAGE AND STORAGE VIRTUALIZATION 9**

Information security, Critical security attributes for information systems, Storage security domains, List and analyzes the common threats in each domain, Virtualization technologies, block-level and file-level virtualization technologies and processes.

**TOTAL: 45Hours**



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**COURSE OUTCOMES:**

At the end of the course student should be able to

- CO1:** Ability to identify the key requirements of data center.  
**CO2:** Analyze the different storage systems architecture.  
**CO3:** Analyze different storage networking technologies.  
**CO4:** Ability to identify key challenges in managing information and also describe the different role in providing disaster recovery and business continuity capabilities.  
**CO5:** Ability to identify and analyzes the common threats in different domains.

**REFERENCE BOOKS:**

1. EMC Corporation, Information Storage and Management, Wiley, India, 2<sup>nd</sup> Edition, 2012.
2. Robert Spalding, "Storage Networks: The Complete Reference", Tata McGraw Hill, Osborne, 2003.
3. Marc Farley, "Building Storage Networks", Tata McGraw Hill, Osborne, 2001.

Course Outcomes		PSo1	PSO2	PSO3	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Ability to identify the key requirements of data center .	3			3	3										
CO2	Analyze the different storage systems architecture.	3			2	3		3	3				3			
CO3	Analyze different storage networking technologies.	3		1	1				1				2			
CO4	Ability to identify key challenges in managing information and also describe the different role in providing disaster recovery and business continuity capabilities.	3		1		2		2								
CO5	Ability to identify and analyzes the common threats in different domains.	3	2		3	1			2							



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**OBJECTIVES:**

- To provide students with a theoretical as well as practical understanding of agile software development practices and how small teams can apply them to create high-quality software.
- To provide a good understanding of software design and a set of software technologies and APIs.
- To do a detailed examination and demonstration of Agile development and testing techniques.
- To understand the benefits and pitfalls of working in an Agile team.
- To understand Agile development and testing.

**UNIT I AGILE METHODOLOGY**

9

Theories for Agile Management – Agile Software Development – Traditional Model vs. Agile Model – Classification of Agile Methods – Agile Manifesto and Principles – Agile Project Management – Agile Team Interactions – Ethics in Agile Teams – Agility in Design, Testing – Agile Documentations – Agile Drivers, Capabilities and Values.

**UNIT II AGILE PROCESSES**

9

Lean Production – SCRUM, Crystal, Feature Driven Development- Adaptive Software Development – Extreme Programming: Method Overview – Lifecycle – Work Products, Roles and Practices.

**UNIT III AGILITY AND KNOWLEDGE MANAGEMENT**

9

Agile Information Systems – Agile Decision Making – Earl's Schools of KM – Institutional Knowledge Evolution Cycle – Development, Acquisition, Refinement, Distribution, Deployment, Leveraging – KM in Software Engineering – Managing Software Knowledge – Challenges of Migrating to Agile Methodologies – Agile Knowledge Sharing – Role of Story- Cards – Story-Card Maturity Model (SMM).

**UNIT IV AGILITY AND REQUIREMENT ENGINEERING**

9

Impact of Agile Processes in RE–Current Agile Practices – Variance – Overview of RE Using Agile – Managing Unstable Requirements – Requirements Elicitation – Agile Requirements Abstraction Model – Requirements Management in Agile Environment, Agile Requirements Prioritization – Agile Requirements Modeling and Generation – Concurrency in Agile Requirements Generation.

**UNIT V AGILITY AND QUALITY ASSURANCE**


9

Agile Product Development – Agile Metrics – Feature Driven Development (FDD) – Financial and Production Metrics in FDD – Agile Approach to Quality Assurance – Test Driven Development – Agile Approach in Global Software Development.

**TOTAL: 45 PERIODS****COURSE OUTCOMES:**

**Upon completion of the course, the students will be able to:**

- CO1:** Realize the importance of interacting with business stakeholders in determining the requirements for a software system
- CO2:** Perform iterative software development processes: how to plan them, how to execute them.
- CO3:** Point out the impact of social aspects on software development success. **CO4:** Develop techniques and tools for improving team collaboration and software quality.
- CO5:** Perform Software process improvement as an ongoing task for development teams.

  
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**TEXT BOOKS:**

1. David J. Anderson and Eli Schragenheim, —Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results, Prentice Hall, 2003.
2. Hazza and Dubinsky, —Agile Software Engineering, Series: Undergraduate Topics in Computer Science, Springer, 2009.

**REFERENCES:**

1. Craig Larman, —Agile and Iterative Development: A Managers Guide, Addison-Wesley, 2004.
2. Kevin C. Desouza, —Agile Information Systems: Conceptualization, Construction, and Management, Butterworth-Heinemann, 2007.

Course Outcomes		PS01	PSO2	PSO3	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Realize the importance of interacting with business stakeholders in determining their requirements for a software system	3			3	3										
CO2	Perform iterative software development processes: how to plan them, how to execute them.	3			3											
CO3	Point out the impact of social aspects on software development success.	3		1	2	2	3		3				3			
CO4	Perform Software process improvement as an ongoing task for development teams.	3		1	1	2	2		1				1			
CO5	Understand the internal storage structures using different file and indexing techniques & advanced database concepts	3	2		1				2				1			

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PREREQUISITES: NIL

OBJECTIVES:

Upon Completion of this course, the students will be familiar with

- Cybercrime and Cyber offence
- Cybercrime using mobile devices
- Tools and methods used in cybercrime
- Fundamental of Computer Forencics

**UNIT I INTRODUCTION TO CYBERCRIME AND CYBER OFFENCE 9**

Cybercrime and Information Security, Classifications of Cybercrimes, Cybercrime: The Legal Perspectives, Cybercrimes: Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes, Cybercrime Era: Survival Mantra for the Netizens. Cyber offenses: How Criminals Plan Them: How Criminals Plan the Attacks, Social Cyber stalking Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector, Cloud Computing.

**UNIT II CYBERCRIME: MOBILE AND WIRELESS DEVICES 9**

Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication Service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops.

**UNIT III TOOLS AND METHODS USED IN CYBERCRIME 9**

Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Key loggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks. **Phishing and Identity Theft:** Introduction, Phishing, Identity Theft (ID Theft).



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Introduction, Historical Background of Cyber forensics, Digital Forensics Science, The Need for Computer Cyber forensics and Digital Evidence, Forensics Analysis of E-Mail, Digital Forensics Life Cycle, Chain of Custody Concept, Network Forensics, Approaching a Computer Forensics Investigation, Setting up a Computer Forensics Laboratory: Understanding the Requirements, ComputerForensics and Steganography, Relevance of the OSI 7 Layer Model to Computer Forensics, Forensics and Social Networking Sites: The Security/Privacy Threats, Computer Forensics from Compliance Perspective, Challenges in Computer Forensics, Special Tools and Techniques, Forensics Auditing, Anti forensics.

#### UNIT V LEGAL PERSPECTIVES ON CYBERCRIMES AND CYBER SECURITY 9

The legal landscape around the world. Need of Cyber laws in the Indian context. The Indian IT Act. Digital signatures and The Indian IT Act. Amendments to The Indian IT Act. Cybercrime and Punishment.

**TOTAL: 45 PERIODS**

#### OUTCOMES:

**On completion of the course, the student will be able to,**

- CO1: Discriminate and analyze problems involved in cybercrime
- CO2: Synthesis cybercrime issues on wireless and mobile devices
- CO3: Use and apply modern cyber forensics tools
- CO4: Analyze the computer forensic problems for a feasible solution
- CO5: Apply cyber law for a given type of cyber issues

#### TEXT BOOKS:

1. SunitBelapure and Nina Godbole, "Cyber Security: Understanding Cyber Crimes, Computer Forensics And Legal Perspectives", Wiley India Pvt Ltd, ISBN: 978-81-265-21791, Publish Date 2013
2. Dr. Surya Prakash Tripathi, RitendraGoyal, Praveen Kumar Shukla, KLSI. "Introduction to information security and cyber laws". Dreamtech Pre ss. ISBN: 9789351194736, 2015

  
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**REFERENCE BOOKS:**

1. Thomas J. Mowbray, "Cybersecurity: Managing Systems , Conducting Testing, and Investigating Intrusions", Copyright © 2014 by John Wiley & Sons, Inc, ISBN: 91-118 - 84965 -1
2. James Graham, Ryan Olson, Rick Howard, "Cyber Security Essentials", CRC Press, 15-Dec-2010

Course Outcomes		PSo1	PSO2	PSO3	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Discriminate and analyze problems involved in cybercrime	3			3	3			1							
CO2	Synthesis cybercrime issues on wireless and mobile devices	3		1		3			1							
CO3	Use and apply modern cyber forensics tools	3		1		1		3	1		2	1				
CO4	Analyze the computer forensic problems for a feasible solution	3	2			1		2			3	2				
CO5	Apply cyber law for a given type of cyber issues	3			3				2		1	2				



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**PREREQUISITES:** Computer Networks

**OBJECTIVE(S):**

- To learn about the issues and challenges in the design of wireless ad hoc networks.
- To understand the working of MAC and Routing Protocols for ad hoc and sensor networks
- To learn about the Transport Layer protocols and their QoS for ad hoc and sensor networks.
- To understand various security issues in ad hoc and sensor networks and the corresponding solutions.

**UNIT I            MAC & ROUTING IN AD HOC NETWORKS**

9

Introduction – Issues and challenges in ad hoc networks – MAC Layer Protocols for wireless ad hoc networks – Contention-Based MAC protocols – MAC Protocols Using Directional Antennas – Multiple-Channel MAC Protocols – Power-Aware MAC Protocols – Routing in Adhoc Networks – Design Issues – Proactive, Reactive and Hybrid Routing Protocols.

**UNIT II            TRANSPORT & QOS IN AD HOC NETWORKS**

9

TCP's challenges and Design Issues in Ad Hoc Networks – Transport protocols for adhoc networks – Issues and Challenges in providing QoS – MAC Layer QoS solutions – Network Layer QoS solutions – QoS Model.

**UNIT III            MAC & ROUTING IN WIRELESS SENSOR NETWORKS**

9

Introduction – Applications – Challenges – Sensor network architecture – MAC Protocols for wireless sensor networks – Low duty cycle protocols and wakeup concepts – Contention- Based protocols – Schedule-Based protocols – IEEE 802.15.4 Zigbee – Topology Control – Routing Protocols.

**UNIT IV            TRANSPORT & QOS IN WIRELESS SENSOR NETWORKS**

9


Data-Centric and Contention-Based Networking – Transport Layer and QoS in Wireless Sensor Networks – Congestion Control in network processing – Operating systems for wireless sensor networks – Examples.

**UNIT V            SECURITY IN AD HOC AND SENSOR NETWORKS**

9

Security Attacks – Key Distribution and Management – Intrusion Detection – Software based Anti-tamper techniques – Water marking techniques – Defense against routing attacks – Secure Ad hoc routing protocols – Broadcast authentication WSN protocols – TESLA – Biba – Sensor Network Security Protocols – SPINS.

**TOTAL: 45 Hrs**

  
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## COURSE OUTCOMES:

At the end of the course, the student should be able to:

- CO1: Identify different issues in wireless ad hoc and sensor networks.
- CO2: Analyze the MAC protocol design concepts in Ad Hoc networks.
- CO3: Identify different MAC protocols and evaluate the QOS related performance measurement of Sensor Networks.
- CO4: Recognize various routing protocols and its issues in WSN.
- CO5: To identify and understand security issues in ad hoc and sensor networks

## TEXT BOOKS:

- 1) C. Siva Ram Murthy and B.S. manoj, "Ad Hoc Wireless Networks – Architectures and Protocols", Pearson Education, 2012.
- 2) Carlos de Morais Cordeiro, Dharma Prakash Agrwal, Ad Hoc and Sensor Network: Theory and Applications, 2<sup>nd</sup> Edition, World Scientific Publishing Co, 2011.
- 3) Holger Karl, Andreas Willing, —Protocols and Architectures for Wireless Sensor Networks, John Wiley & Sons, Inc., 2005.

## REFERENCES:

1. Subir Kumar Sarkar, T G Basavaraju, C Puttamadappa, —Ad Hoc Mobile Wireless Networks, Auerbach Publications, 2008.
2. Carlos De Morais Cordeiro, Dharma Prakash Agrawal, —Ad Hoc and Sensor Networks: Theory and Applications (2nd Edition), World Scientific Publishing, 2011.
3. Walteneus Dargie, Christian Poellabauer, —Fundamentals of Wireless Sensor Networks Theory and Practice, John Wiley and Sons, 2010.
4. Xiang-Yang Li, "Wireless Ad Hoc and Sensor Networks: Theory and Applications, 1227 th edition, Cambridge university Press, 2008.

Course Outcomes		PSo1	PSO2	PSO3	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Identify different issues in wireless ad hoc and sensor networks.	3				3										
CO2	Analyze the MAC protocol design concepts in Ad Hoc networks.	3		1		2		3			1					
CO3	Identify different MAC protocols and evaluate the QOS related performance measurement of Sensor Networks	3		1	3					3	2					
CO4	Recognize various routing protocols and its issues in WSN.	3	2		3	1		2		2	1					
CO5	To identify and understand security issues in ad hoc and sensor networks	3			3	2				1	1					

  
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**OBJECTIVE(S):**

- To understand Blockchain's fundamental components, and examine decentralization using blockchain.
- To explain how crypto currency works, from when a transaction is created to when it is considered part of the Blockchain.
- To explain the components of Ethereum and Programming Languages for Ethereum.
- To study the basics of Hyperledger and Web3.
- To learning of solidity and de-centralized apps on Ethereum.

**UNIT I INTRODUCTION TO BLOCKCHAIN 9**

History of Blockchain – Types of Blockchain – Consensus – Decentralization using Blockchain –Blockchain and Full Ecosystem Decentralization – Platforms for Decentralization. **Applications:Internet of Things, Medical Record Management System, Domain Name Service.**

**UNIT II INTRODUCTION TO CRYPTOCURRENCY 9**

Bitcoin – Digital Keys and Addresses – Transactions – Mining – Bitcoin Networks and Payments – Wallets – Alternative Coins – Theoretical Limitations – Bitcoin limitations – Name coin – Prime coin – Zcash – Smart Contracts – Ricardian Contracts.

**UNIT III ETHEREUM 9**

The Ethereum Network – Components of Ethereum Ecosystem – Ethereum Programming Languages:Runtime Byte Code, Blocks and Blockchain, Fee Schedule – Supporting Protocols – Solidity Language.

**UNIT IV WEB3 AND HYPERLEDGER 9**


Introduction to Web3 – Contract Deployment – POST Requests – Development Frameworks– Hyperledger as a Protocol – The Reference Architecture – Hyperledger Fabric –Distributed Ledger – Corda.

**UNIT V SOLIDITY PROGRAMMING 9**

Solidity - Language of Smart Contracts, Installing Solidity & Ethereum Wallet, Basics of Solidity, General Value Types-Global Variables and Functions-Expressions and Control Structures-Writing Smart Contracts.

**TOTAL: 45 Hrs****COURSE OUTCOMES:****At the end of the course student should be able to**

- CO1:** Understand the technology components of Blockchain and how it works behind the scenes
- CO2:** Identify different approaches to developing decentralized applications.
- CO3:** Understand Bitcoin and its limitations by comparing with other alternative coins.
- CO4:** Devise solution using the Ethereum model.
- CO5:** Understand and use Hyperledger and its development framework.



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**TEXT BOOKS:**

1. Imran Bashir, "Mastering Blockchain: Distributed Ledger Technology, Decentralization and Smart Contracts Explained", Second Edition, Packt Publishing,
2. Ritesh Modi, "Solidity Programming Essentials: A beginner's guide to build smartcontracts for Ethereum and blockchain", First Edition, Packt Publishing,

**REFERENCE BOOKS:**

1. Arshdeep Bahga, Vijay Madiseti, "Blockchain Applications: A Hands On Approach", VPT, 2017.
2. Andreas Antonopoulos, Satoshi Nakamoto, "Mastering Bitcoin", O'Reilly, 2014.
3. Roger Wattenhofer, "The Science of the Blockchain" CreateSpace Independent Publishing, 2016.
4. A. Narayanan, J. Bonneau, E. Felten, A. Miller, S. Goldfeder, "Bitcoin and Crypto currency Technologies: A Comprehensive Introduction", Princeton University Press, 2016.
5. Alex Levering ton, "Ethereum Programming" Packt Publishing, 2017

Course Outcomes		PSo1	PSO2	PSO3	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Understand the technology components of Blockchain and how it works behind the scenes	3				3										
CO2	Identify different approaches to developing decentralized applications.	3				2			2							
CO3	Understand Bitcoin and its limitations by comparing with other alternative coins.	3		1		1	3		2	3		2				
CO4	Devise solution using the Ethereum model.	3		1		1	2		2	2		3				
CO5	Understand and use Hyperledger and its development framework.	3	2			1						3				

  
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**PREREQUISITES:** Networks and web services

**OBJECTIVE(S):**

- To learn fundamentals of XML
- To provide an overview of Service Oriented Architecture and Web services and their importance
- To learn web services standards and technologies
- To learn service oriented analysis and design for developing SOA based applications

**UNIT I XML**

9

XML document structure – Well-formed and valid documents – DTD – XML Schema – Parsing XML using DOM, SAX – XPath - XML Transformation and XSL – Xquery.

**UNIT II SERVICE ORIENTED ARCHITECTURE (SOA) BASICS**

9

Characteristics of SOA, Benefits of SOA , Comparing SOA with Client-Server and Distributed architectures --- Principles of Service Orientation – Service layers.

**UNIT III WEB SERVICES (WS) AND STANDARDS**

8

Web Services Platform – Service descriptions – WSDL – Messaging with SOAP – Service discovery – UDDI – Service-Level Interaction Patterns – Orchestration and Choreography.

**UNIT IV WEB SERVICES EXTENSIONS**

8

WS-Addressing - WS-Reliable Messaging - WS-Policy – WS-Coordination – WS -Transactions - WS-Security – Examples.

**UNIT V SERVICE ORIENTED ANALYSIS AND DESIGN**

11


SOA delivery strategies – Service oriented analysis – Service Modelling – Service oriented design – Standards and composition guidelines -- Service design – Business process design – Case Study.

**TOTAL: 45 Hrs**

**COURSE OUTCOMES:**

**At the end of the course, the student should be able to:**

- CO1:** Understand XML technologies  
**CO2:** Understand service orientation, benefits of SOA  
**CO3:** Understand web services and WS standards  
**CO4:** Use web services extensions to develop solutions  
**CO5:** Understand and apply service modeling, service oriented analysis and design for application development

  
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**TEXT BOOKS:**

1. Thomas Erl, "Service Oriented Architecture: Concepts, Technology, and Design", Pearson Education, 2005
2. Sandeep Chatterjee and James Webber, "Developing Enterprise Web Services: An Architect's Guide", Prentice Hall, 2004

**REFERENCES BOOKS:**

1. James McGovern, Sameer Tyagi, Michael E Stevens, Sunil Mathew, "Java Web Services Architecture", Elsevier, 2003.
2. Ron Schmelzer et al. "XML and Web Services", Pearson Education, 2002.
3. Frank P. Coyle, "XML, Web Services and the Data Revolution", Pearson Education, 2002

Course Outcomes		PSo1	PSO2	PSO3	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Understand XML technologies	3			3	3										
CO2	Understand service orientation, benefits of SOA	3				2							3			
CO3	Understand web services and WS standards	3		1		1		3		2		3	2			
CO4	Use web services extensions to develop solutions	3		1	1	1		2		3		2	2			
CO5	Understand and apply service modeling, service oriented analysis and design for application development	3	2		3	1				1						


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**OBJECTIVE(S):**

- To provide an understanding of computer forensics fundamentals.
- To analyze various computer forensics technologies.
- To identify methods for data recovery.
- To apply the methods for preservation of digital evidence.
- To learn about the types of attacks and remedial actions in the context of systems, networks, images and videos.

<b>UNIT I</b>	<b>INCIDENT AND INCIDENT RESPONSE</b>	<b>9</b>
Introduction to Security Threats: Introduction – Computer Crimes – Computer Threats and Intrusions – Phishing – Identity Theft – Cyber Terrorism and Cyber War – Need for Security: Information Security – OS Security – Database Security – Software Development Security – Introduction to Incident – Incident Response Methodology – Steps – Activities in Initial Response Phase after Detection of an Incident.		
<b>UNIT II</b>	<b>FILE STORAGE AND DATA RECOVERY</b>	<b>9</b>
File Systems – FAT, NTFS, NTFS Encrypting File System – Forensic Analysis of File Systems – Storage Fundamentals – Initial Response & Volatile Data Collection from Windows System – Initial Response & Volatile Data Collection from UNIX system – Forensic Duplication – Tools – Discover of Electronic Evidence – Identification of Data – Reconstructing Past Events – Networks.		
<b>UNIT III</b>	<b>NETWORK AND EMAIL FORENSICS</b>	<b>9</b>
Network Evidence – Types of Network Monitoring – Setting Up a Network Monitoring System – Network Data Analysis – Email Clients – Email Tracing – Internet Fraud – Spam Investigations – Mobile Forensics – Subscriber Identity Module (SIM) Investigations – Wireless Device Investigations – PDA Investigations.		
<b>UNIT IV</b>	<b>SYSTEM FORENSICS</b>	<b>9</b>
Data Analysis: Analysis Methodology – Investigating Live Systems (Windows & Mac OS) – Hacking: Investigating Hacker Tools – Ethical Issues – Cybercrime. Forensic and Investigative tools – Forensic Equipment's for evidence collection – Post exploitation.		
<b>UNIT V</b>	<b>IMAGE AND VIDEO FORENSICS</b>	<b>9</b>
Recognizing a Graphics File – Data Compression – Locating and Recovering Graphics Files – Identifying Unknown File Formats – Copyright Issues with Graphics – Fraud using image and video – Detection of Fraud in images and video. (refbook1)		

**TOTAL: 45 Hrs**

  
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**COURSE OUTCOMES:**

At the end of the course student should be able to

**CO1:** Recognize attacks on systems.

**CO2.:** Design a counter attack incident response and incident response methodology.

**CO3:** Illustrate the methods for data recovery, evidence collection and data seizure

**CO4:** Understand network and email attacks and forensic investigation with tools.

**CO5:** Analyze various image encryption/decryption, steganography and fraud in image

**TEXT BOOKS:**

1. Kevin Mandia, Jason T. Luttgens, Matthew Pepe, "Incident Response and Computer Forensics", Tata McGraw-Hill, 2014
2. Bill Nelson, Amelia Philips, Christopher Steuart, "Guide to Computer Forensics and Investigations", Cengage Learning, 2018.

**REFERENCE BOOKS:**

1. John R. Vacca, "Computer Forensics", Firewall Media, 2009.
2. .Rafay Baloch, "Ethical Hacking and Penetration Testing Guide", Auerbach Publications, First Edition, 2014.

Course Outcomes		PSo1	PSO2	PSO3	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Recognize attacks on systems.	3			3	3										
CO2	Design a counter attack incident response and incident response methodology.	3			2							3				
CO3	Illustrate the methods for data recovery, evidence collection and data seizure	3		1	2		3		3	3		3				
CO4	Understand network and email attacks and forensic investigation with tools.	3		1	1	2	2		1	2		2				
CO5	Analyze various image encryption/decryption, steganography and fraud in image	3	2			3			2	1						

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**PREREQUISITES :**Artificial Intelligence and Machine Learning

**OBJECTIVES:**

- Understand the concept, techniques in deep learning.
- Learn Feed forward and backward network model.
- Create models using CNN and RNN.
- Learn Tensor flow to implement deep learning techniques.

**UNIT 1: Introduction to Deep Learning and Activation Functions** 9

Historical Trends in Deep Learning -Activation Functions : Sigmoid, ReLU, Hyperbolic Functions,Softmax.  
Artificial Neural Networks : Introduction, Perceptron Training Rule - XOR Gate, Gradient Descent Rule.

**UNIT 2: Deep Feed forward Networks** 9

Gradient Descent and Backpropagation: Gradient Based Learning, Stochastic Gradient Descent,Backpropagation, Some problems in ANNOptimization and Regularization :Overfitting and Capacity, Cross Validation, FeatureSelection, Regularization, Hyperparameters

**UNIT 3: Convolutional Neural Networks** 9

Introduction to Convolutional Neural Networks: Introduction to CNNs, Kernel filter,Principles behind CNNs, Multiple Filters, CNN applicationsIntroduction to Recurrent Neural Networks:, Unfolded RNNs,Bidirectional RNNs, Deep RNNs, RNN applications.

**UNIT 4: Introduction to TensorFlow** 9

Introduction to TensorFlow :Computational Graph, Key highlights, Creating a Graph,Regression example, Gradient Descent, TensorBoard, Modularity, Sharing Variables,Keras.

**UNIT 5: Applications** 9

Deep Learning applications: Large Scale Deep Learning- Image Processing, Natural Language Processing, SpeechRecognition, Video Analytics.

**Total : 45 Hrs**

**COURSE OUTCOMES**

**At the end of the course the students are able to**

- CO1: Understand the fundamentals of deep learning and activation functions.  
CO2: Apply backpropagation network model for real world problems.  
CO3: Design model using CNN and RNN.  
CO4: Develop applications using Tensorflow.  
CO5: Explore deep learning model for different applications.

**Text Book**

1. Goodfellow, I., Bengio,Y., and Courville, A., Deep Learning, MIT Press, 2016.

**REFERENCE BOOKS**

1. Adam Gibson, Deep Learning: A Practitioner's Approach, O'Reilly Media,August 2017
2. Li Deng, "Deep Learning: Methods and Applications", Microsoft Technical Report.
3. Josh Patterson and Adam Gibson, "Deep Learning: A practitioner's approach", O'Reilly, USA, 2017.
4. Francois Chollet, "Deep Learning using Python", Manning Publications, USA, 2017.
5. Yusuke Sugomori, Bostjan Kaluza, Soares and Alan M. F. Souza, "Deep Learning: Practical Neural Networks with Java", PACKT Publishing, UK, 2017.



Course Outcomes		PSo1	PSO2	PSO3	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Understand the fundamentals of deep learning and activation functions.	3														
CO2	Apply backpropagation network model for real world problems	3		1	2	2						2				
CO3	Design model using CNN and RNN.	3		1	1	3		2			3	2		2		
CO4	Develop applications using Tensorflow.	3	2		3	2		2			3	2		1		
CO5	Explore deep learning model for different applications.	3			3	2					1			2		



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**OBJECTIVES**

- To learn about different Visualization Techniques
- To study the Interaction techniques in information visualization fields
- To understand various abstraction mechanisms
- To create interactive visual interfaces

**UNIT I FOUNDATIONS FOR DATA VISUALIZATION 9**

Introduction to Visualization – Visualization stages – Experimental Semiotics based on Perception – Gibson’s Affordance theory – A Model of Perceptual Processing – Costs and Benefits of Visualization – Types of Data.

**UNIT II COMPUTER VISUALIZATION 9**

Non-Computer Visualization – Computer Visualization: Exploring Complex Information Spaces – Fisheye Views – Applications – Comprehensible Fisheye views – Fisheye views for 3D data – Non Linear Magnification – Comparing Visualization of Information Spaces – Abstraction in computer Graphics – Abstraction in user interfaces.

**UNIT III MULTIDIMENSIONAL VISUALIZATION 9**

1D, 2D, 3D – Multiple Dimensions – Trees – Web Works – Data Mapping: Document Visualization – Workspaces.

**UNIT IV TEXTUAL METHODS OF ABSTRACTION 9**

From Graphics to Pure Text – Figure Captions in Visual Interfaces – Interactive 3D illustrations with images and text – Related work – Consistency of rendered – images and their textual labels – Architecture – Zoom techniques for illustration purpose – Interactive handling of images and text

**UNIT V ABSTRACTION IN TIME AND INTERACTIVE SYSTEMS 9**

Animating non Photo realistic Computer Graphics – Interaction Facilities and High Level Support for Animation Design – Zoom Navigation in User Interfaces – Interactive Medical Illustrations – Rendering Gestural Expressions – Animating design for Simulation – Tactile Maps for Blind People – Synthetic holography – Abstraction Versus Realism – Integrating Spatial and Non Spatial Data.

**TOTAL: 45 Hrs****COURSE OUTCOMES:**

**At the end of the course student should be able to**

- CO1:** Define and characterize data science, apply basic data visualization techniques in different ways.
- CO2:** Exposure to a number of common data domains and corresponding analysis tasks, including multivariate data, networks, text and cartography.
- CO3:** Explain principles of visual perception
- CO4:** Apply visualization techniques for various data analysis tasks
- CO5:** Practical experience building and evaluating visualization systems.


## TEXT BOOK

1. Colin Ware "Information Visualization Perception for Design", 3<sup>rd</sup> edition, Morgan Kaufman 2012.
2. Stuart.K.Card, Jock.D.Mackinlay and Ben Shneiderman, "Readings in Information Visualization Using Vision to think", Morgan Kaufmann Publishers, 1999.
3. Thomas Strothotte, "Computer Visualization—Graphics Abstraction and Interactivity", Springer Verlag Berlin Heidelberg 1998.

## REFERENCE BOOKS

1. Chaomei Chan, "Information Visualization", Beyond the horizon, 2nd edition, Springer Verlag, 2004.
2. Pauline Wills, "Visualisation: A Beginner's Guide", Hodder and Stoughton, 1999.
3. Benedikt. M, "Cyberspace: First Steps", MIT Press, 1991.

Course Outcomes		PSo1	PSO2	PSO3	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Define and characterize data science, apply basic data visualization techniques in different ways.	3														
CO2	Exposure to a number of common data domains and corresponding analysis tasks, including multivariate data, networks, text and cartography	3		1	2	2						2				
CO3	Explain principles of visual perception	3		1	1	3		2			3	2				
CO4	Apply visualization techniques for various data analysis tasks	3	2		3	2		2			3	2				
CO5	Practical experience building and evaluating visualization systems.	3			3	2		2			1					

  
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**OBJECTIVE(S):**

- To give a clear picture on quality management, documentation and control for software quality.
- To provide knowledge on standards, models and tools used for quality management.
- To perform measurement and assessment of software quality.

**UNIT I INTRODUCTION TO SOFTWARE QUALITY & ARCHITECTURE 9**

Need For Software Quality – Quality Challenges – Software Quality Assurance (SQA) – Definition And Objectives – Software Quality Factors – McCall's Quality Model – SQA System and Architecture – Software Project Life Cycle Components – Management of SQA components  
– Pre-Project Software Quality Components – Contract Review – Development and Quality Plans.

**UNIT II SQA COMPONENTS AND PROJECT LIFE CYCLE 9**

Software Development Methodologies – Quality Assurance Activities in the Development Process – Verification, Validation & Qualification – Reviews: Objectives – Formal design Review – Peer Review – Quality of Software Maintenance Components – Pre-Maintenance Software Quality Components – Maintenance Software Quality Assurance Tools – Assuring the Quality of External participants contributions: Objectives, Types, Risks & Benefits, Tools – CASE Tools and Their effect on Software Quality.

**UNIT III SOFTWARE QUALITY INFRASTRUCTURE 9**

Procedures And Work Instructions – Supporting Quality devices – Templates – Checklists – Staff Training and Certification – Corrective and Preventive Actions – Configuration Management – Software Change Control – Configuration Management Audit – Documentation Control – Storage and Retrieval.


**UNIT IV SOFTWARE QUALITY MANAGEMENT, METRICS 9**

Project Process Control – Computerized Tools – Software Quality Metrics – Objectives of Quality Measurement – Process Metrics – Product Metrics – Implementation – Limitations of Software Metrics – Cost of Software Quality – Classical Quality Cost Model – Extended Model  
– Application of Cost Model.

**UNIT V STANDARDS, CERTIFICATIONS 9**

Quality Management Standards – ISO 9001 And ISO 9000-3 – Capability Maturity Models (CMM & CMMI) – Organization of Quality Assurance – Department Management Responsibilities – Project Management Responsibilities – SQA Units And Other Actors In SQA Systems.

**TOTAL: 45 Hrs**

  
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## COURSE OUTCOMES:

**At the end of the course, the student should be able to:**

**CO1:** Learn to document, control and manage software quality with the aid of tools and standards.

**CO2:** Distinguish between various software quality models.

**CO3:** Measure and assess software quality through process and product metrics.

**CO4:** Distinguish between the software quality standards.

## TEXT BOOKS:


1. Daniel Galin, "Software Quality Assurance: From Theory to Implementation", Pearson Education, 2004.

## REFERENCES BOOKS:

1. Stephen H. Kan, "Metrics and Models in Software Quality Engineering", Pearson Education, 2002.

2. Mordechai Ben-Menachem, Garry S. Marliss, "Software Quality: Producing Practical, Consistent Software", BS Publications, 2014.

Course Outcomes	PSo1	PSO2	PSO3	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1 Learn to document, control and manage software quality with the aid of tools and standards.	3			3	3										
CO2 Distinguish between various software quality models	3		1		2										
CO3 Measure and assess software quality through process and product metrics.	3		1		1		3		2			2			
CO4 Distinguish between the software quality standards	3	2		1	1		2		3			2			

  
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**PREREQUISITES :** Data Warehousing and Data Mining

**OBJECTIVES:**

- Introduce the basic concepts and techniques of Information Retrieval, Web Search, Data Mining, and Machine Learning for extracting knowledge from the web.
- To know the different categories of web mining
- To appreciate the use of web mining in web applications
- Develop skills of using recent data mining software for solving practical problems of Web Mining

**UNIT I INTRODUCTION 9**

Introduction – Web Mining – Theoretical background –Algorithms and techniques – Association rule mining – Sequential Pattern Mining -Information retrieval and Web search – Information retrieval Models Relevance Feedback- Text and Web page Pre-processing – Inverted Index – Latent Semantic Indexing – Web Search – Meta-Search – Web Spamming

**UNIT II WEB CONTENT MINING 9**

Web Content Mining – Supervised Learning – Decision tree - Naïve Bayesian Text Classification - Support Vector Machines - Ensemble of Classifiers. Unsupervised Learning - K- means Clustering - Hierarchical Clustering –Partially Supervised Learning – Markov Models - Probability-Based Clustering - Evaluating Classification and Clustering – Vector Space Model – Latent semantic Indexing – Automatic Topic Extraction - Opinion Mining and Sentiment Analysis – Document Sentiment Classification

**UNIT III WEB LINK MINING 9**

Web Link Mining – Hyperlink based Ranking – Introduction of Social Networks Analysis- Co- Citation and Bibliographic Coupling - Page Rank -Authorities and Hubs -Link-Based Similarity Search - Enhanced Techniques for Page Ranking - Community Discovery – Web Crawling -A Basic Crawler Algorithm Implementation Issues- Universal Crawlers- Focused Crawlers- TopicalCrawlers- Evaluation - Crawler Ethics and Conflicts - New Developments

**UNIT IV STRUCTURED DATA EXTRACTION 9**

Structured Data Extraction: Wrapper Generation – Preliminaries- Wrapper Induction- Instance- Based Wrapper Learning -- Automatic Wrapper Generation: Problems - String Matching and Tree Matching - Multiple Alignment - Building DOM Trees - Extraction Based on a Single List Page and Multiple pages Introduction to Schema Matching - Schema-Level Match -Domain and Instance-Level Matching – Extracting and Analyzing Web Social Networks



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Web Usage Mining - Click stream Analysis -Web Server Log Files - Data Collection and Pre- Processing - Cleaning and Filtering- Data Modeling for Web Usage Mining - The BIRCH Clustering Algorithm - Affinity Analysis and the A Priori Algorithm – Binning - Discovery and Analysis of Web Usage Patterns – Modeling user interests –Probabilistic Latent Semantic Analysis – Latent Dirichlet Allocation Model– Applications- Collaborative Filtering- Recommender Systems – Web Recommender systems based on User and Item – PLSA and LDAModels.

**TOTAL: 45 Hrs**

**Course Outcomes (COs):**

On successful completion of this course, the students should be able to

**CO1:** Identify the different components of a web page that can be used for mining

**CO2:** Apply machine learning concepts to web content mining

**CO3:** Design a system to collect information available on the web to build Recommendersystems

**CO4:** Analyze social media data using appropriate data/web mining techniques

**CO5:** Build a simple search engine using available open source tools

**TEXT BOOKS:**

1. G. Sreedhar-Web Data Mining and the Development of Knowledge-Based Decision Support Systems IGI Global; 1st edition, March 2017.
2. Mai Ayad-Introduction to web Mining,LAP Lambert Academic Publishing, January,2012
3. Bing Liu, —Web Data Mining, Exploring Hyperlinks, Contents and Usage Data, Springer, Second Edition, 2011.

**REFERENCE BOOKS:**

1. GuandongXu ,Yanchun Zhang, Lin Li, —Web Mining and Social Networking: Techniques and Applications , Springer, First Edition.2010.
2. Zdravko Markov, Daniel T. Larose, —Data Mining the Web: Uncovering Patterns inWeb Content, Structure, and Usage , John Wiley & Sons, Inc., 2007.
- 3.SoumenChakrabarti, —Mining the Web: Discovering Knowledge from Hypertext Data

Course Outcomes		PSo1	PSO2	PSO3	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Identify the different components of a web page that can be used for mining	3			3	3										
CO2	Apply machine learning concepts to web content mining	3		1		3		3			3					
CO3	Design a system to collect information available on the web to build Recommendersystems	3		1					2		3					
CO4	Analyze social media data using appropriate data/web mining techniques	3	2		3			2	2		1					
CO5	Build a simple search engine using available open source tools	3			3	1			2							