

COURSE OBJECTIVES

To enable the students to

- develop their knowledge in basic civil engineering practices such as plumbing, carpentry and its tool usages.
- practice some of mechanical basics such as welding, basic machining, sheet metal work, fitting.
- experience with basic electrical wiring circuits
- know about the electronic components, color coding signal generation, soldering practice..

GROUP A (CIVIL AND MECHANICAL)**I CIVIL ENGINEERING PRACTICE****BUILDINGS**

- Study of plumbing and carpentry components of residential and industrial buildings. Safety aspects.

PLUMBING WORKS

- Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows inhousehold fittings.
- Study of pipe connections requirements for pumps and turbines.
- Preparation of plumbing line sketches for water supply and sewage works.
- Hands-on-exercise:
- Basic pipe connections – Mixed pipe material connection – Pipe connections with different joiningcomponents. (e) Demonstration of plumbing requirements of high-rise buildings.

CARPENTRY USING POWER TOOLS ONLY

- a) Study of the joints in roofs, doors, windows and furniture.
- b) Hands-on-exercise:
Wood work, joints by sawing, planing and cutting.

II MECHANICAL ENGINEERING PRACTICE**WELDING**

- Preparation of arc welding of butt joints, lap joints and tee joints.
- Gas welding practice

BASIC MACHINING

- Simple Turning, Facing, Thread cutting and Taper turning
- Drilling Practice

SHEET METAL WORK

- Model making – Trays, funnels, etc.
- Different type of joints.

FITTING

- Square fitting
- Vee – fitting models

DEMONSTRATION ON

- (a) Smithy operations, upsetting, swaging, setting down and bending. Example –
Exercise –Production of hexagonal headed bolt.
- (b) Foundry operations like mould preparation for gear and step cone pulley.

TOTAL: 30 PERIODS

GROUP B (ELECTRICAL AND ELECTRONICS)

III ELECTRICAL ENGINEERING PRACTICE

1. Study of electrical tools and safety measures
2. Basic wiring practices - Stair-case wiring, Fluorescent lamp wiring and Residential house wiring
3. Measurement of electrical parameters such as voltage, current, power & power factor in RLC circuit.
4. Measurement of energy using single phase energy meter.
5. Earthing Practices & Measurement of earth resistance using megger.
6. Study of electrical equipments such as iron box, induction heater.

IV ELECTRONICS ENGINEERING PRACTICE

1. Study of Electronic components and equipments – Resistor, color coding measurement of AC signalparameter (Peak-Peak, RMS, Period, and Frequency) using CRO.
2. Study of logic gates AND, OR, Ex-OR and NOT.
3. Generation of Clock Signal.
4. Soldering practice – Components Devices and Circuits – Using general purpose PCB.
5. Measurement of ripple factor of HWR.
6. Construction and verification of half adder circuit.
7. Construction and verification of half subtractor circuit.
8. Study of Telephone, F.M Radio and Cell Phone.

TOTAL: 30 PERIODS

COURSE OUTCOMES

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

- use the tools for plumbing and carpentry works
- prepare models by -welding, machining, sheet metal and fitting
- construct electrical wiring circuit and demonstrate practically
- analyse the signal generation, solder the electronic components based on the circuits

CO - PO Mapping

Mapping of Course Outcomes with Programme Outcomes (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	Programme Outcomes(POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	2	2	-	-	-	1	-	-	1	2	3
CO2	2	2	2	2	2	-	-	-	1	-	-	1	2	3
CO3	2	2	2	2	2	-	-	-	1	-	-	1	2	3
CO4	2	2	2	2	2	-	-	-	1	-	-	1	2	3



(COMMON TO ALL BRANCHES)

OBJECTIVES

To enable the students to

- ❖ discuss a wide range of basic mathematical methods for solving different types of problems arising in the fields of Science, Mathematics and Engineering
- ❖ acquire sound knowledge of techniques in solving ordinary differential equations that model engineering problems
- ❖ understand the concepts of vector calculus, which is applied in all engineering disciplines
- ❖ know the standard techniques of complex variable
- ❖ learn the purpose of using transforms to create a new domain

UNIT I VECTOR CALCULUS 12

Gradient, Divergence and Curl - Directional derivative - Irrotational and solenoidal vector fields - Vector integration - Green's, Gauss divergence and Stokes' theorem - Statement, Verification and Simple applications.

UNIT II ANALYTIC FUNCTIONS 12

Functions of a complex variable - Analytic functions - Statement of Cauchy - Riemann equations - Harmonic functions and orthogonal properties - Harmonic conjugate - Construction of analytic functions - Conformal mapping : $w = z + c$, cz , $1/z$ and Bilinear transformation.

UNIT III COMPLEX INTEGRATION 12

Complex integration - Statement and applications of Cauchy's integral theorem and Cauchy's integral formula - Taylor and Laurent expansions - Singular points - Residues - Residue theorem - Contour integration - evaluation of circular and semicircular Contour.

UNIT IV ORDINARY DIFFERENTIAL EQUATIONS 12

Higher order linear differential equations with constant coefficients - Method of variation of parameters - Cauchy's and Legendre's linear equations - Simultaneous first order linear equations with constant coefficients.

UNIT V LAPLACE TRANSFORM 12

Laplace transform - Transform of elementary functions - Properties - Transform of periodic functions. Definition of Inverse Laplace transforms - Statement and applications of Convolution theorem - Initial and Final value theorems - Solution of linear ODE of second order with constant coefficients by Laplace transforms.

TOTAL PERIODS: 60

OUTCOMES

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

- ❖ study the basics of vector calculus comprising of gradient, divergence and curl and line, surface and volume integrals and the classical theorems.
- ❖ know the concept of analytic functions and its properties and apply it in conformal mapping.
- ❖ gain knowledge in the basics of complex integration and the concept of contour integration which is an important tool for evaluation of certain real integrals.
- ❖ solve differential equations.
- ❖ gain sufficient exposure to find solution of certain linear differential equations by Laplace transform.

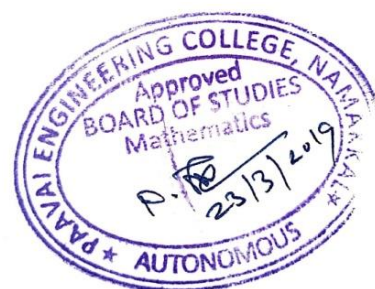
TEXT BOOKS

1. Grewal. B.S, “Higher Engineering Mathematics”, 41st Edition, Khanna Publications, Delhi,(2011).
2. Dr.P.Jayakumar, and Dr.B.Kishokkumar, “Differential Equations and Complex Analysis”, GlobalPublishers, Chennai.,(2015).
3. Erwin Kreyszig., “Advanced Engineering Mathematics” 10th Edition, Wiley Publications.

REFERENCE BOOKS

1. Dass, H.K., and Er. Rajnish Verma, “Higher Engineering Mathematics”, S. Chand Private Ltd.,(2011).
2. T. Veerarajan., “Engineering Mathematics”, 3rd Edition, Tata McGraw Hill, 2011.
3. Peter V. O’Neil, “Advanced Engineering Mathematics”, 7th Edition, Cengage learning, (2012).
4. Ramana B.V, “Higher Engineering Mathematics”, Tata McGraw Hill Publishing Company, New Delhi, (2008).

Mapping of Course Outcomes with Programme Outcomes (1/2/3 indicates strength of correlation) 3-strong, 2-Medium, 1-Weak														
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CO5	3	3	2	3	-	-	-	-	-	-	-	3	3	3



(COMMON TO CSE / IT)**COURSE OBJECTIVES**

The Students will be able to

- understand the basic concept of linked list ADT.
- understand the behavior of data structures such as stacks, queues.
- learn the concept of trees, search trees in C to solve problems.
- understand and analyze various hashing techniques and set ADT.
- apply various graph structures using C.

UNIT I LINKED LIST**6**

Abstract Data Types (ADT) - List ADT – Array based implementation - Linked list implementation - Cursor based linked list - Doubly linked list - Circularly linked list - Applications of list - Polynomial Manipulation.

UNIT II STACK AND QUEUE**6**

Stack ADT – Definition - Array and linked implementations – Applications - Infix to postfix conversion, Postfix expression evaluation - Recursion implementation - Queue ADT – Definition - Array and linked Implementations - Circular queue - Insertion and deletion operations.

UNIT III TREES**6**

Tree ADT- Tree traversals - Left child right sibling data structures for general trees - Binary Tree ADT – Expression trees - Applications of trees - Binary search tree ADT - AVL trees - binary heaps.

UNIT IV HASHING AND SETS**6**

Hashing - Separate Chaining - Open Addressing – Rehashing - Extendible Hashing - Disjoint Set ADT - Dynamic equivalence problem - Smart union algorithms - Path compression - Applications of Sets.

UNIT V GRAPHS**6**

Definition - Topological sort - Breadth-first traversal - Shortest-path algorithms - Weighted and Unweighted graph - Minimum spanning tree - Prim's and Kruskal's algorithms - Depth-first traversal - bi connectivity - Euler circuits - Applications of graphs.

TOTAL PERIODS 30**LIST OF EXPERIMENTS**

1. Implement singly linked list with its operations.
2. Implement doubly linked list with its operations.
3. Represent a polynomial as a linked list and write functions for polynomial addition.
4. Implement stack and use it to convert infix to postfix expression.
5. Implement array-based circular queue and use it to simulate a producer-consumer problem.
6. Implement an expression tree. Produce its pre-order, in-order, and post-order traversals.
7. Implement binary search tree.
8. Implementation AVL tree.

9. Implement priority queue using heaps.
10. Implement hashing technique.

TOTAL PERIODS: 30

COURSE OUTCOMES

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

- implement list ADT for linear data structures.
- design programs using a variety of data structures such as stacks, queues.
- analyze and implement various tree structures.
- review various hashing and collision resolution techniques.
- analyze and implement graph traversal methods.

TEXT BOOKS

1. M. A. Weiss, “Data Structures and Algorithm Analysis in C”, Fourth Edition, Pearson Education, 2013.
2. V. Aho, J. E. Hopcroft, and J. D. Ullman, ‘Data Structures and Algorithms’, Pearson Education, 2009.

REFERENCES

1. Reema Theraja, “Data Structures Using C”, Second Edition, Oxford University Press, 2011.
2. R. F. Gilberg, B. A. Forouzan, ‘Data Structures’, Second Edition, Thomson India Edition, 2008.
3. M. Tenenbaum, Y. Langsam, and M. J. Augenstein, ‘Data Structures using C’, Pearson Education, 2007.

Mapping of Course Outcomes with Programming Outcomes (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
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CO3	2	3	1	-	1	-	1	-	-	-	-	2	3	3
CO4	3	3	3	3	-	-	-	-	-	-	-	2	1	3
CO5	3	3	3	-	-	2	-	-	-	-	-	3	3	2



COURSE OBJECTIVES

- To understand the basic structure and operation of digital computer.
- To familiarize the students with arithmetic and logic unit and implementation of fixed point and floating-point arithmetic operations.
- To acquire knowledge about the concept of pipelining.
- To understand the concept of virtual and cache memory.
- To apply knowledge about different ways of communicating with I/O devices and standard I/O interfaces.

UNIT I BASIC STRUCTURE OF COMPUTERS**9**

Functional units – Basic operational concepts – **Bus structures** – Performance and metrics – Instructions and instruction sequencing – Hardware – Software Interface – **Instruction set architecture** – Addressing modes – RISC – CISC.

UNIT II BASIC PROCESSING UNIT & ALU OPERATIONS**9**

Fundamental concepts – Execution of a complete instruction – **Multiple bus organization** – Hardwired control – Micro programmed control – ALU-Addition and subtraction – **Multiplication–Division.**

UNIT III PIPELINING & PARALLELISM**9**

Basic concepts – Data hazards – **Instruction hazards** – Structural Hazards-Influence on instruction sets –Data path and control considerations – Performance considerations – **Exception handling-Instruction-level-parallelism** – Parallel processing challenges – Flynn's classification – **Hardware multithreading** - Hardware support for exposing parallelism

UNIT IV MEMORY SYSTEM**9**

Basic concepts – Semiconductor RAM – ROM – Speed – Size and cost – **Cache memories** – Improving cache Performance – Virtual memory – **Memory management requirements** – Associative memories – Secondary storage devices.

UNIT V I/O ORGANIZATION**9**

Accessing I/O devices – Programmed Input/ Output -Interrupts – **Direct Memory Access**– Buses – Interface circuits – **Standard I/O Interfaces (PCI, SCSI, and USB), I/O devices and processors.**

TOTAL HOURS 45**COURSE OUTCOMES**

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

- understand instruction and addressing modes.
- design arithmetic and logic unit.
- design and analyses pipelined control units.
- evaluate performance of memory systems.
- understand parallel processing architectures.

TEXT BOOKS

1. David A. Patterson and John L. Hennessey, "Computer organization and design", Morgan Kauffman / Elsevier, Fifth edition, 2014.
2. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, "Computer Organization", Fifth Edition, Tata McGraw Hill, 2002.

REFERENCES

1. V. Carl Hamacher, Zvonko G. Vranesic and Safat G. Zaky, "Computer Organisation", VI edition, McGraw-Hill Inc, 2012.
2. William Stallings "Computer Organization and Architecture", Seventh Edition, Pearson Education, 2006.
3. Vincent P. Heuring, Harry F. Jordan, "Computer System Architecture", Second Edition, Pearson Education, 2005.
4. William Stallings, "Computer Organization and Architecture – Designing for Performance", Sixth Edition, Pearson Education, 2003.
5. John P. Hayes, "Computer Architecture and Organization", Third Edition, Tata McGraw Hill, 1998.

WEB LINKS

1. https://www.tutorialspoint.com/computer_organization/index.asp
2. <http://nptel.ac.in/courses/106103068/1>
3. <http://web.cs.iastate.edu/~prabhu/Tutorial/title.html>

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CO4	2	2	2	2	2	-	-	-	2	2	2	1	2	2
CO5	2	2	2	2	2	-	-	-	2	2	2	1	2	2



COURSE OBJECTIVES

- To get a clear understanding of object-oriented concepts.
- To understand object oriented programming through C++.
- To develop the problem solving skills by applying object-oriented concepts inheritance and virtual classes.
- To create programs using streams and file handling
- To learn templates and exception handling in C++

UNIT I PRINCIPLES OF OOP**9**

Programming Paradigms- Basic concepts and benefits of OOP- Structure of C++ program - Applications of C++- Tokens- Keywords- Identifiers-constants- variables - Data types - Basic, User defined ,Derived - Dynamic initialization -Reference variables- Scope resolution operator- Function Prototyping- Inline function- Default arguments – Function overloading.

UNIT II CLASSES, OBJECTS AND CONSTRUCTORS**9**

Class specification- Static data members and member functions - Array of objects- Objects as function arguments- Friend functions- Returning objects- Local classes - Constructors -Parameterized constructors- MultipleConstructors- Constructors with default arguments-Copy constructors- Destructors - Operator Overloading-Overloading unary and binary operator.

UNIT III INHERITANCE AND VIRTUAL CLASS**9**

Introduction – types- Single Inheritance- Multiple Inheritance- Multi level inheritance- Hierarchical Inheritance- Hybrid Inheritance. Virtual base class – Abstract class – this pointer-Dynamic binding- virtual function – pure virtual function.

UNIT IV STREAMS AND FILE HANDLING**9**

Stream classes- Formatted and unformatted I/O operations- Manipulators- File handling - File open and close- File pointers and their manipulators- Sequential and random access-Error Handling.

UNIT V TEMPLATES AND EXCEPTION HANDLING**9**

Class templates-Function templates- overloading of template functions- Exception Handling: Exception handling mechanism-throwing mechanism- catching mechanism- rethrowing an exception. Standard Template Library.

TOTAL PERIODS 45**COURSE OUTCOMES**

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

- explain the object-oriented concepts
- understand object oriented programming through C++.
- create programs using inheritance and virtual classes.
- develop programs using streams and file handling.
- know function and class template and way of handling exception.

TEXT BOOKS

1. E.Balagurusamy, “Object Oriented Programming with C++”, Tata McGraw Hill, Sixth Edition, 2013

REFERENCES

1. B.Trivedi, “Programming with ANSI C++”, Oxford University Press, 2007.
2. K.R.Venugopal, Rajkumar, T.Ravishankar, “Mastering C++”, Tata McGraw Hill, 2007.
3. Robert Lafore, “Object Oriented Programming in Turbo C++”, Galgotia Publications, 2006
4. Bjarne Stroustrup, “The C++ Programming Language”, Pearson Education, Fourth Edition, 2013.
5. K.S. Easwarakumar, “Object Oriented Data Structures Using C++”, Vikas Publication House Pvt Ltd, First Edition, 2000.

WEB LINKS

1. <http://www.desy.de/gna/html/cc/Tutorial/tutorial.html>
2. http://thatchna.weebly.com/uploads/4/1/9/3/4193382/std_c_notes_03.pdf
3. <https://www.youtube.com/watch?v=CzWZYwOvrCE>

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CO4	2	2	2	2	2	-	-	-	-	-	2	1	2	2
CO5	2	2	2	2	2	-	-	-	-	-	2	1	2	2



COURSE OBJECTIVES

- To study the principles of algorithm design.
- To know the importance of computational complexity of the algorithm.
- To become familiar with dynamic programming, divide and conquer, branch and bound and backtracking techniques.
- To understand the limitations of algorithm power.
- To study about notions of P, NP, NPC, and NP-hard.

UNIT I INTRODUCTION**9**

Notion of an Algorithm – Fundamentals of Algorithmic Problem Solving – Important Problem Types – Fundamentals of the Analysis of Algorithm Efficiency – Analysis Framework – Asymptotic Notations and its properties – Mathematical analysis for Recursive and Non-recursive algorithms

UNIT II BRUTE FORCE AND DIVIDE-AND-CONQUER**9**

Brute Force - Closest-Pair and Convex-Hull Problems-Exhaustive Search - Traveling Salesman Problem- Knapsack Problem - Assignment problem. Divide and conquer methodology – Merge sort – Quick sort – Binary search – Multiplication of Large Integers – Strassen's Matrix Multiplication-Closest-Pair and Convex-Hull Problems.

UNIT III DYNAMIC PROGRAMMING AND GREEDY TECHNIQUE**9**

Computing a Binomial Coefficient – Warshall's and Floyd's algorithm – Optimal Binary Search Trees-Knapsack Problem and Memory functions. Greedy Technique– Prim's algorithm- Kruskal's Algorithm-Dijkstra's Algorithm- Huffman Trees.

UNIT IV ITERATIVE IMPROVEMENT**9**

The Simplex Method-The Maximum-Flow Problem – Maxim Matching in Bipartite Graphs- The Stable marriage Problem.

UNIT V LIMITATIONS OF ALGORITHM POWER**9**

Limitations of Algorithm Power-Lower-Bound Arguments-Decision Trees-P, NP and NP-Complete Problems-- Coping with the Limitations – Backtracking - n-Queens problem – Hamiltonian Circuit Problem – Subset Sum Problem-Branch and Bound - Assignment problem – Knapsack Problem –Traveling Salesman Problem.

TOTAL PERIODS 45**COURSE OUTCOMES**

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

- understand the significance of algorithms in problem solving process.
- analyze asymptotic runtime complexity of algorithms.
- describe and apply dynamic programming and divide and conquer algorithms.
- design efficient algorithms for new situations, using as building blocks the techniques learned.
- apply algorithm design techniques to solve certain np-complete problems.

TEXT BOOK

1. AnanyLevitin, “Introduction to the Design and Analysis of Algorithms”, Third Edition, Pearson Education, 2012.

REFERENCES

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. Donald E. Knuth, “The Art of Computer Programming”, Volumes 1& 3 Pearson Education, 2009.
4. Steven S. Skiena, “The Algorithm Design Manual”, Second Edition, Springer, 2008.

WEBLINKS

1. <http://www.personal.kent.edu/~rmuhamma/Algorithms/algorithm.html>
2. https://www.tutorialspoint.com/design_and_analysis_of_algorithms/index.htm

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CO5	2	2	2	-	2	-	-	-	-	-	2	1	2	2



COURSE OBJECTIVES

- To learn the basic concepts of boolean algebra and logic gates.
- To know about the analysis and design procedure for combinational circuits
- To familiarize the students with memory devices.
- To know about the analysis and design procedure for synchronous sequential circuits.
- To acquire knowledge about the analysis and design procedure of asynchronous sequential circuits.

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

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

UNIT II COMBINATIONAL LOGIC**9**

Combinational circuits - Analysis and design procedures - Circuits for arithmetic operations and Code conversion- Encoder - decoder – Multiplexer- Introduction to Hardware Description Language (HDL). HDL for combinational circuits.

UNIT III MEMORY AND PROGRAMMABLE LOGIC**9**

Classification of memory-ROM-DRAM organization-RAM-Static and Dynamic RAM-Memory decoding and expansion-Programmable logic devices-PLA,PAL.

UNIT IV SYNCHRONOUS SEQUENTIAL LOGIC**9**

Sequential circuits – Flip flops – Analysis and design procedures - State reduction and state assignment - Shift registers – Counters – HDL for Sequential Circuits.

UNIT V ASYNCHRONOUS SEQUENTIAL LOGIC**9**

Analysis and design of asynchronous sequential circuits - Reduction of state and flow tables - Race-free state assignment – Hazards

TOTAL PERIODS 45**COURSE OUTCOMES**

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

- understand the basic concept of Boolean algebra and logic gates.
- design combinational logic circuits.
- evaluate the memory and programmable logic devices.
- analyze and design the synchronous sequential logic circuits.
- analyze and design the asynchronous sequential logic circuits.

TEXT BOOK

1. M.Morris Mano, “Digital Design”, 3rd edition, Pearson Education, 2007.

REFERENCES

1. Charles H.Roth, Jr. "Fundamentals of Logic Design", 4th Edition, Jaico Publishing House, Cengage Earning, 5th ed, 2005.
2. Donald D.Givone, "Digital Principles and Design", Tata McGraw-Hill, 2007.

WEB LINKS

1. <http://nptel.ac.in/video.php?subjectid=117106086>
2. http://www.electronics-tutorials.ws/combinational/comb_1.html

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CO5	2	2	1	2	2	-	-	-	-	-	2	1	2	2



COURSE OBJECTIVES

- To understand the concept of boolean theorems.
- To study the concept of combinational circuits using digital logic gates
- To learn the concept of combinational circuits using MSI devices.
- To simulate combinational and sequential logic circuits using VHDL/verilog.

LIST OF EXPERIMENTS

1. Verification of Boolean laws and theorems using logic gates
2. Design and verification of adders and sub tractors using basic gates.
3. Design and implementation of code converter: Binary to Gray code and Gray code to Binary code.
4. Design and implementation of 4-bit binary adder / subtractor using IC7483
5. Design and implementation of encoder and decoder using basic gates.
6. Design and implementation of multiplexers and Demultiplexers using basic gates.
7. Design and implementation of Shift registers.
8. Design and implementation of Synchronous and Asynchronous counters.
9. Simulation of Combinational circuits using Verilog HDL

TOTAL PERIODS 60**COURSE OUTCOMES**

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

- evaluate the basic laws.
- analyse the combinational logic circuits using logic gates.
- analyse the combinational logic circuits using MSI devices.
- explain the working of sequential logic circuits.

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CO4	2	2	2	2	2	-	-	-	-	-	2	1	2	2



COURSE OBJECTIVES

- To acquire knowledge about the features of object oriented programming such as classes, objects, data abstraction.
- To explain the various concepts of overloading such as function overloading and operator overloading
- To introduce the levels of inheritance & ambiguity problems in them
- To familiarize the students with polymorphism & their implementation in C++.

LIST OF EXPERIMENTS

- Simple C++ programs.
- Programs using Functions and classes.
- Friend Functions.
- Function Overloading.
- Operator Overloading.
- Simple and Multiple Inheritances.
- Multilevel & Hybrid Inheritance.
- Virtual Functions.
- Constructors and Destructors
- File Handling.
- Templates.
- Exception Handling.

**TOTAL PERIODS 60****COURSE OUTCOMES**

At the of this course, students will be able to

- explain procedure as well as object oriented programming concepts and their differences.
- familiar with how to make programs using function overloading and operator overloading.
- get the capability to implement the different types of inheritance and done problems related to them.
- implement various types of polymorphism and the use of pointers for virtual functions.

Mapping of Course Outcomes with Programming Outcomes (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	Programme Outcomes(POs)												Programme Specific Outcomes (PSOs)	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO 2
CO1	1	1	1	1	1	-	-	-	-	-	1	1	1	1
CO2	2	2	2	2	2	-	-	-	-	-	1	1	2	2
CO3	3	3	2	2	2	-	-	-	-	-	2	2	3	3
CO4	2	2	2	2	2	-	-	-	-	-	2	1	2	2

COURSE OBJECTIVES

- To understand the phases in a software project
- To understand fundamental concepts of requirements engineering and analysis modeling.
- To understand the major considerations for enterprise integration and deployment.
- To learn various testing and maintenance measures
- To understand fundamental concepts of requirements engineering and analysis modeling.

UNIT I SOFTWARE PROCESS 9

The Evolving role of Software – Software – **The changing Nature of Software** – Legacy Software – A generic view of process – A layered Technology – A Process Framework – **The Capability Maturity Model Integration(CMMI)** – Process Assessment – Personal and Team Process Models, Product and Process, Process Models The Waterfall Model – **Incremental Process Models** – Incremental Model – The RAD Model – Evolutionary Process Models – Prototyping – The Spiral Model – **The Concurrent Development Model** – Specialized Process Models – the Unified Process - **Agile Development.**

UNIT II SOFTWARE REQUIREMENTS 9

Software Engineering Practice – **communication Practice** – Planning practice modeling practice – Construction Practice – Deployment Requirements Engineering – **Requirements Engineering tasks** – Initiating the requirements Engineering Process – Eliciting Requirements – Developing Use cases – **Building the Analysis Models** – Elements of the Analysis Model – Analysis pattern – Negotiating Requirements – **Validating Requirements.**

UNIT III REQUIREMENTS ANALYSIS 9

Requirements Analysis – **Analysis Modeling approaches** – data modeling concepts – Object oriented Analysis – Scenario based modeling – Flow oriented Modeling – **Class based modeling** – creating a behavior model.

UNIT IV TESTING TECHNIQUES 9

A **strategic Approach for Software testing** – Test Strategies for conventional software – **Validation Testing – System Testing** – The Art of Debugging, Testing Conventional Applications: Software testing Fundamentals – Internal and External Views Testing – **White Box Testing** – Basis Path Testing – Control Structure Testing – Black Box Testing – Model Based testing – Testing for Specialized Environments – **Architectures and Applications** – Patterns for Software Testing.

UNIT V SOFTWARE PROJECT MANAGEMENT 9

Software Cost Estimation – productivity – **Estimation Techniques** – Algorithmic Cost Modeling – Project Duration and Staffing – Process and Product Quality – Quality Assurance and Standards – Planning – Control – Software Measurement and Metrics – Process Improvement – **Process Classification** – Measurement – Analysis and Modeling – Change – The CMMI process improvement Framework – **Configuration Management.** – Planning Change Management – Version and Release Management – System Building – **CASE tools for configuration management.**

COURSE OUTCOMES

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

- identify the key activities in managing a software project.
- compare different process models.
- understand the Concepts of requirements engineering and Analysis Modeling.
- compare and contrast the various testing and maintenance.
- understand the concept of Software Project Management

TEXT BOOKS

1. Roger S. Pressman Software Engineering: A Practitioner's Approach, McGraw Hill International edition, Eighth edition, 2015.
2. Ian Sommerville, Software Engineering, 9th Edition, Pearson Education, 2011.
3. Watts S. Humphrey, "A Discipline for Software Engineering", Pearson Education, 2007.

REFERENCES

1. Rajib Mall, "Fundamentals of Software Engineering", Third Edition, PHI Learning Private Limited, 2009.
2. Pankaj Jalote, "Software Engineering, A Precise Approach", Wiley India, 2010.
3. Kelkar S.A., "Software Engineering", Prentice Hall of India Pvt Ltd, 2007.
4. Stephen R. Schach, "Software Engineering", Tata McGraw-Hill Publishing Company Limited, 2007.
5. James F. Peters and Witold Pedrycz, "Software Engineering, An Engineering Approach", Wiley-India, 2007.

Mapping of Course Outcomes with Programming Outcomes (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
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CO4	2	2	2	2	2	-	-	-	-	-	2	1	2	2
CO5	2	2	2	2	2	-	-	-	-	-	2	1	2	2



COURSE OBJECTIVES

- To explore the fundamentals of database management systems.
- To make the students understand the relational model.
- To familiarize database design.
- To familiarize with the different types of transaction concepts.
- To make the students understand the implementation and security issues in databases.

UNIT 1 INTRODUCTION**9**

Purpose of Database System – Views of data – Data Models – Database Languages – Database System Architecture – Database users and Administrator – Entity–Relationship model (E-R model) – E-RDiagrams -- Introduction to relational databases.

UNIT II RELATIONAL MODEL**9**

The relational Model – The catalog- Types– Keys - Relational Algebra – Domain Relational Calculus –Tuple Relational Calculus - Fundamental operations – Additional I/O operations- SQL fundamentals -Integrity –Triggers - Security – Advanced SQL features –Embedded SQL– Dynamic SQL- Missing Information– Views– Introduction to Distributed Databases and Client/Server Databases.

UNIT III DATABASE DESIGN**9**

Functional Dependencies – Non-loss Decomposition – Functional Dependencies – First, Second, Third Normal Forms, Dependency Preservation – Boyce/ Code Normal Form-Multi-valued Dependencies and Fourth Normal Form – Join Dependencies and Fifth Normal Form.

UNIT IV TRANSACTIONS**9**

Transaction Concepts - Transaction Recovery – ACID Properties– System Recovery –Media Recovery –Two Phase Commit - Save Points – SQL Facilities for recovery –Concurrency – Need for Concurrency –Locking Protocols – Two Phase Locking –Intent Locking – Deadlock- Serializability – Recovery solution Levels –ISQL Facilities for Concurrency.

UNIT V IMPLEMENTATION TECHNIQUES**9**

Overview of Physical Storage Media – Magnetic Disks – RAID – Tertiary storage – File Organization – Organization of Records in Files – Indexing and Hashing –Ordered Indices – B+ tree Index Files -B tree-Index Files – Static Hashing – Dynamic Hashing –Query Processing Overview – Catalog Information for Cost Estimation- Selection Operation – Sorting – Join Operation – Database Tuning.

TOTAL PERIODS 45**COURSE OUTCOMES**

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

- use the relational model, ER diagrams.
- write queries in structural query language.
- design the database using various normal forms.
- understand the transaction concepts and locking protocols.

- implement database concepts with security.

TEXT BOOKS

1. Silberschatz, H.Korth and Sudarshan S., “Database System Concepts”, 6th Edition, McGraw-Hill International, 2010.

REFERENCES

1. Elmasri R. and Shamkant B. Navathe, “Fundamentals of Database Systems”, 6th Edition, AddisonWesley, 2011.
2. AtulKahate, “Introduction to Database Management Systems”, Pearson Education, New Delhi, 2006.
3. Raghu Ramakrishnan, “Database Management Systems”, Fourth Edition, Tata McGraw Hill, 2010.
4. G.K.Gupta, “Database Management Systems”, Tata McGraw Hill, 2011.
5. C.J.Date, A.Kannan, S.Swamynathan, “An Introduction to Database Systems”, Eighth Edition, Pearson Education, 2006.

WEB LINKS

1. <http://www.nptelvideos.in/2012/11/database-management-system.html>
2. <https://www.youtube.com/watch?v=1057YmExS-I>
3. <http://freevidelectures.com/Course/2668/Database-Management-System>

Mapping of Course Outcomes with Programming Outcomes (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
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CO3	3	3	2	2	2	-	-	-	-	-	2	2	3	3
CO4	2	2	2	2	2	-	-	-	-	-	2	1	2	2
CO5	2	2	2	2	2	-	-	-	-	-	2	1	2	2



COURSE OBJECTIVES

- To understand the relationship between system software and machine architecture
- To know the design and implementation of assemblers.
- To understand the major concept of loader and linker.
- To have an understanding of macro processors.
- To understand the major concept of interactive debugging systems and software tools.

UNIT I INTRODUCTION 8

System software and machine architecture – The Simplified Instructional Computer (SIC) - Machine architecture- Data and instruction formats - addressing modes -instruction sets - I/O and programming.

UNIT II ASSEMBLERS 10

Basic assembler functions - A simple SIC assembler – Assembler algorithm and data structures - Machine dependent assembler features- Instruction formats and addressing modes – Program relocation - Machine independent assembler features - Literals-Symbol-defining statements – Expressions - One pass assemblers and Multi pass assemblers - Implementation example - MASM assembler.

UNIT III LOADERS AND LINKERS 9

Basic loader functions - Design of an Absolute Loader – A Simple Bootstrap Loader -Machine dependent loader features - Relocation – Program Linking – Algorithm and Data Structures for Linking Loader -Machine- independent loader features –Automatic Library Search – Loader Options - Loader design options - Linkage Editors – Dynamic Linking – Bootstrap Loaders - Implementation example - MSDOS linker.

UNIT IV MACRO PROCESSORS 9

Basic macro processor functions - Macro Definition and Expansion – Macro Processor Algorithm and data structures - Machine-independent macro processor features -Concatenation of Macro Parameters – Generation of Unique Labels – Conditional Macro Expansion – Keyword Macro Parameters-Macro within Macro- Implementation example -MASM Macro Processor – ANSI C Macro language.

UNIT V SYSTEM SOFTWARE TOOLS 9

Text editors - Overview of the Editing Process - User Interface – Editor Structure. -Interactive debugging systems - Debugging functions and capabilities – Relationship with other parts of the system – User-Interface Criteria.

TOTAL PERIODS 45**COURSE OUTCOMES**

At the end if this course, students will be able to

- identify the approach of different machine architecture.
- study of machine dependent and independent assembler algorithms and program relocation.
- design of various linker loader and program linking.
- study of machine independent macro processors.
- understand the text editors and debugging systems.

TEXT BOOKS

1. Leland L. Beck, “System Software – An Introduction to Systems Programming”, 3rd Edition, Pearson Education Asia, 2006.

REFERENCES

1. D. M. Dhamdhare, “Systems Programming and Operating Systems”, Second Revised Edition, Tata McGraw-Hill 2000.
2. John J. Donovan “Systems Programming”, Tata McGraw-Hill Edition, 2000.
3. John R. Levine, Linkers & Loaders – Harcourt India Pvt. Ltd., Morgan Kaufmann Publishers, 2000
company, 1994

WEB LINKS

1. [.http://study.com/academy/topic/systems-software.html](http://study.com/academy/topic/systems-software.html)
2. https://www.youtube.com/watch?v=VG9VopzV_T0
3. https://www.youtube.com/watch?v=6ipFf3vLifU&list=PLRjiB7KcljoS22wmROkUKZ8zD4_Fj8U2R

Mapping of Course Outcomes with Programming Outcomes (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
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CO3	3	3	2	2	2	-	-	-	-	-	2	2	3	3
CO4	2	2	2	2	2	-	-	-	-	-	2	1	2	2
CO5	2	2	2	2	2	-	-	-	-	-	2	1	2	2



COURSE OBJECTIVES

- To understand the concepts of data communications
- To be familiar with the Transmission media and Tools
- To study the functions of OSI layers
- To learn about IEEE standards in computer networking
- To get familiarized with different protocols and network components.

UNIT I FUNDAMENTALS AND LINK LAYER 9

Building a network – Requirements – Layering and protocols – Internet Architecture – Network software – Performance ; Link layer Services – Framing – Error Detection – Flow control

UNIT II MEDIA ACCESS AND INTERNET WORKING 9

Media access control – Ethernet (802.3) – Wireless LAN' s – 802.11 – Bluetooth – Switching and bridging – Basic Internetworking (IP, CIDR, ARP, DHCP, ICMP)

UNIT III ROUTING 9

Routing (RIP, OSPF, metrics) – Switch basics – Global Internet (Areas, BGP, IPv6), Multicast – addresses – multicast routing (DVMRP, PIM, MSDB, MPLS) – Routing among Mobile Devices.

UNIT IV TRANSPORT LAYER 9

Overview of Transport layer – UDP – Reliable byte stream (TCP) – Connection management – Flow control – Retransmission – TCP Congestion control – Congestion avoidance (DECbit, RED) – QoS – Application requirements

UNIT V APPLICATION LAYER 9

Traditional applications -Electronic Mail (SMTP, POP3, IMAP, MIME) – HTTP – Web Services – DNS –SNMP – Overlay networks.

TOTAL PERIODS 45

COURSE OUTCOMES

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

- identify the components required to build different types of networks.
- choose the required functionality at each layer for given application.
- identify solution for each functionality at each layer.
- trace the flow of information from one node to another node in the network.
- understanding the Applications of Networks and data communications.

TEXT BOOKS

1. Behrouz A. Forouzan, “Data communication and Networking”, Fourth Edition, Tata McGraw – Hill, 2011
2. Larry L. Peterson, Bruce S. Davie, “Computer Networks: A Systems Approach”, Fifth Edition, Morgan Kaufmann Publishers, 2011.

REFERENCES

1. Andrew S. Tanenbaum, Computer Networks, Pearson Education, 2008
2. James F. Kurose, Keith W. Ross, "Computer Networking – A Top-Down Approach Featuring the Internet", Fifth Edition, Pearson Education, 2009.
3. Nader. F. Mir, "Computer and Communication Networks", Pearson Prentice Hall Publishers, 2010.
4. Ying-Dar Lin, Ren-Hung Hwang, Fred Baker, "Computer Networks: An Open Source Approach", McGraw Hill Publisher, 2011.
5. William Stallings, "Data and Computer Communication", Sixth Edition, Pearson Education, 2000

WEB LINKS

1. <https://www.youtube.com/watch?v=3DZLIItfbqtQ&list=PL1EC310A0BF4B2CA7>
2. <https://www.youtube.com/watch?v=zzXs0EnCin0>
3. <https://www.youtube.com/watch?v=aNqiTCZ-nko>

Mapping of Course Outcomes with Programming Outcomes (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
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CO3	3	3	2	2	2	-	-	-	-	-	2	2	3	3
CO4	2	2	2	2	2	-	-	-	-	-	2	1	2	2
CO5	2	2	2	2	2	-	-	-	-	-	2	1	2	2



COURSE OBJECTIVES

- To study the architecture of 8086 microprocessor.
- To learn the design aspects of I/O and memory interfacing circuits.
- To have a knowledge about programming of 8086 microprocessor
- To study the architecture of 8051 microcontroller.
- To study the keyboard interfacing.

UNIT I THE 8086 MICROPROCESSOR 9

Introduction to Microprocessor, Bus– Address bus, Data bus and control bus, Connecting Microprocessor to I/O devices, Introduction to 8086 – Microprocessor architecture, **8086 signals**.

UNIT II 16 BIT MICROPROCESSOR INSTRUCTION SET AND ASSEMBLY LANGUAGE PROGRAMMING 9

Addressing modes –Basic configuration and Interrupts – **Instruction set and assembler directives** – Assembly language programming.

UNIT III I/O INTERFACING 9

Memory Interfacing and I/O interfacing - **Parallel communication interface** – **Serial communication interface** – D/A and A/D Interface - Timer – Keyboard /display controller – Interrupt controller – **DMA controller**

UNIT IV MICROCONTROLLER 9

Architecture of 8051 – Signals – Special Function Registers (SFRs) - I/O Ports – Memory –Interrupts – Instruction set – Addressing Modes – **Assembly language programming**.

UNIT V SYSTEM DESIGN USING MICROCONTROLLER 9

Case studies – Traffic light control, washing machine control, DC Motor – Stepper Motor – **Keyboard Interfacing** – ADC, DAC – External Memory Interface.

TOTAL PERIODS 45**COURSE OUTCOMES**

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

- design and implement programs on 8086 microprocessor.
- design i/o circuits.
- design memory interfacing circuits.
- design and implement 8051 microcontroller based systems.
- design and implement ADC and DAC

TEXT BOOKS

1. Krishna Kant, “Microprocessors and Microcontrollers Architecture, programming and system design using 8085, 8086, 8051 and 8096”. PHI 2007.
2. KennethJ.Ayala, “The 8051 Microcontroller Architecture, Programming and applications”, Second edition, Penram International.

REFERENCES

1. DouglasV.Hall, “Microprocessors and Interfacing, Programming and Hardware”,TMH,2012

2. A.K.Ray& K.M Bhurchandi, “Advanced Microprocessor and Peripherals – Architecture, Programming and Interfacing”, Tata McGraw Hill , 2006.

WEB LINKS

1. <http://nptel.ac.in/courses/108107029>
2. <https://www.youtube.com/watch?v=liRPtvj7Bfu>
3. http://nptel.ac.in/courses/Webcourse-contents/IIT-KANPUR/microcontrollers/micro/ui/Course_home2_5.htm
4. <http://nptel.ac.in/courses/117104072/>
5. <https://www.smartworld.com/notes/microprocessors-and-microcontrollers-mpmc/>

Mapping of Course Outcomes with Programming Outcomes (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	Programme Outcomes(POs)												Programme Specific Outcomes (PSOs)	
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CO5	2	2	2	2	2	-	-	-	-	-	2	1	2	2



COURSE OBJECTIVES

- To create and use a database
- To have hands on experience on DDL Commands
- To have a good understanding of DML Commands and DCL commands
- To be familiarize with a query language

LIST OF EXPERIMENTS

1. Data Definition, Table Creation, Constraints.
2. Insert, Select Commands, Update & Delete Commands.
3. Nested Queries & Join Queries
4. Views
5. High level programming language extensions (Control structures, Procedures and Functions).
6. Front end tools
7. Forms
8. Triggers
9. Menu Design
10. Reports.
11. Database Design and implementation (Mini Project).
 - a. Personal Information System.
 - b. Web Based User Identification System.
 - c. Timetable Management System.
 - d. Hotel Management System

**TOTAL PERIODS 60****COURSE OUTCOMES**

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

- design and implement a database schema for a given problem-domain
- populate and query a database
- create and maintain tables using PL/SQL
- prepare reports

Mapping of Course Outcomes with Programming Outcomes
(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

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CO4	2	2	2	2	2	-	-	-	-	-	2	1	2	2

COURSE OBJECTIVES

- To learn socket programming.
- To be familiar with simulation tools.
- performance of the protocols in different layers
- To have hands on experience on various networking protocols.

LIST OF EXPERIMENTS

1. Implementation of Stop and Wait Protocol and Sliding Window Protocol.
2. Study of Socket Programming and Client – Server model
3. Write a code simulating ARP /RARP protocols.
4. Perform a case study about the different routing algorithms to select the network path with its optimum and economical during data transfer.
 - Link State routing
 - Distance vector
5. Applications using TCP Sockets like
 - Echo client and echo server
 - File transfer
 - Remote command execution
 - 5.4 Chat
6. Applications using TCP and UDP Sockets like
 - DNS
7. Applications using Raw Sockets like
 - Ping
 - 7.2. Trace route
8. Write a program to implement RPC (Remote Procedure Call)
9. Study of Network simulator (NS).and Simulation of Congestion Control Algorithms using NS
10. Study of TCP/UDP performance

TOTAL PERIODS 60**COURSE OUTCOMES**

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

- use simulation tools
- implement the various protocols.
- analyze the performance of the protocols in different layers.
- analyze various routing algorithms

REFERENCE: Spoken-tutorial.org.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS**SOFTWARE**

- C / C++ / Java / Equivalent Compiler 30
- Network simulator like NS2/Glomosim/OPNET/ Equivalent

HARDWARE: Standalone desktops

Mapping of Course Outcomes with Programming Outcomes
(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

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CO4	2	2	2	2	2	-	-	-	-	-	2	1	2	2



COURSE OBJECTIVES

- To implement the assembly language programming of 8086 and 8051.
- To experiment the interface concepts of various peripheral device with the processor.
- To understand the basic idea about the data transfer schemes and its applications.
- To develop skill in simple program writing for 8051 & 8086 and applications

Assembly Language programming using 8086 and MASM

1. Basic arithmetic and Logical operations.

2. Move a data block without overlap.

3. String manipulations

4. Sorting and searching

Interfacing with 8086 microprocessor

5. Stepper motor control.

6. Key board and

Display.7.Serial

interface 8.Parallel

interface

Programming using 8051 microcontroller

9. Basic arithmetic and Logical

operations.10.ADC and DAC

INTERFACE

TOTAL PERIODS 60

COURSE OUTCOMES

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

- write assembly language programmes for various applications.
- interface different peripherals with microprocessor.
- execute programs in 8051.
- develop strong competencies in physics and its applications in a technology-rich, interactive.

Mapping of Course Outcomes with Programming Outcomes
(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

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CO4	2	2	2	2	2	-	-	-	-	-	2	1	2	2



SEMESTER V

CS16501

THEORY OF COMPUTATION

3 2 0 4

COURSE OBJECTIVES

To enable the students to

- Introduce the mathematical foundations of computation using automata theory.
- Prove properties of regular languages and construct FA for regular expressions.
- Understand context free grammar and determine whether a given language is context - free language or not.
- Build CFG for pushdown automata.
- Design Turing machine for simple problems.

PRE - REQUISITE: Nil

UNIT I FINITE AUTOMATA 12

Introduction to automata theory - **Formal definition of Finite automata** - Deterministic Finite Automata (DFA) - Non - deterministic Finite Automata (NFA) - **Finite Automata with Epsilon transitions** - NFA to DFA conversions - DFA minimization.

UNIT II REGULAR EXPRESSIONS AND LANGUAGES 12

Regular Expression - **regular sets** - construction of Finite automata from regular expressions - pumping lemma for regular languages - Applications of pumping lemma - **Proving languages not to be regular** - Closure properties of regular languages.

UNIT III CONTEXT FREE GRAMMARS AND LANGUAGES 12

Introduction to grammars - **Language generated by grammars** - Chomsky classification of grammar - Context free grammars and languages - Derivations - leftmost and rightmost derivations - Parse Tree - Ambiguity in grammars and Languages - Simplification of CFG - Elimination of useless symbols - **Unit productions** - Null productions Normal forms - **Chomsky Normal form** - Greibach normal form - **pumping lemma for context free grammar.**

UNIT IV PUSHDOWN AUTOMATA 12

Introduction - **Pushdown automata** - Basic structure of PDA - Instantaneous description of pushdown automata - Acceptance by empty stack and final state - **Equivalence of CFG and PDA.**

UNIT V TURING MACHINE AND LANGUAGE DECIDABILITY 12

Turing machine introduction - definition - **Programming Techniques for TM** - Storage in finite Control - (Multiple Tracks, Subroutines, Checking off symbols) Designing a Turing machine for simple problems - **Multitape Turing machine** and **multitrack Turing machine** - Language decidability - Undecidable languages - Turing machine halting Problem - Rice theorem - Post correspondence problem.

TOTAL PERIODS: 60

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

- ## TEXT BOOKS

- ## REFERENCES

- ## WEB LINKS

1. www.freetechbooks.com/theory-of-computation-f50.html.
2. www.nptel.ac.in/courses/106106049.
3. www.freecomputerbooks.com/compscComputationBooks.html.
4. www.tutorialspoint.com/automata_theory.
5. <http://freevideolectures.com/Course/3045/Theory-of-Computation-I>.



Mapping of Course Outcomes with Programme Outcomes (1/2/3 indicates strength of correlation) 3-strong, 2-Medium, 1-Weak														
COs	Programme Outcomes(POs)													
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CO1	3	3	2	3	-	-	-	-	-	-	-	2	3	3
CO2	3	2	3	2	-	-	-	-	-	-	-	3	3	3
CO3	3	3	3	2	-	-	-	-	-	-	-	2	3	3
CO4	3	2	3	3	-	-	-	-	-	-	-	3	3	3
CO5	3	3	2	3	-	-	-	-	-	-	-	3	3	3

COURSE OBJECTIVES

To enable the students to

- Understand 2D graphics techniques and algorithms.
- Implement various 3D graphics techniques.
- Implement the graphics programming concepts.
- Understand the basic concepts of Multimedia.
- Gain the knowledge of the various file formats in multimedia.

PRE - REQUISITE: Nil

UNIT I 2D PRIMITIVES 9

Introduction - Output primitives: Line (DDA, Bresenham's), Circle (Bresenham's, Midpoint) drawing algorithms - Filled Area primitives - **Attributes of output primitives** - Two dimensional geometric transformations: **Translation - rotation** - scaling - reflection and shearing - Two dimensional viewing - **Clipping algorithm: Line (Cohen Sutherland, Liang Bar - sky - Clipping), Polygon (Sutherland Hodgeman Clipping), Curve - Point and Text clipping algorithms.**

UNIT II 3D REPRESENTATION 9

3D transformations - Translation - rotation - scaling - reflection and shearing - 3D Viewing - Parallel and Perspective projections - Visible surface identification.

UNIT III GRAPHICS PROGRAMMING 9

Color Models - RGB - YIQ - CMY - HSV - Animations - General computer Animation - Raster - Key frame - Graphics programming using OpenGL - Basic graphics primitives - Drawing three dimensional objects - Drawing three dimensional scenes.

UNIT IV MULTIMEDIA 9

Introduction - Applications - Multimedia system Architecture - Multimedia data interface standards - Multimedia Databases - Compression and decompression: Types of Compression - Video image compression (JPEG, MPEG) - Audio compression.

UNIT V MULTIMEDIA FILE FORMAT AND INPUT/OUTPUT TECHNOLOGIES 9

Data File Format standards: TIFF file format - RIFF file format - **MIDI file format** - JPEG DIB File format - **Multimedia input and output technologies**(Video and Image display systems, Video image and Animation).

TOTAL PERIODS 45

COURSE OUTCOMES

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

- Understand the basic concepts of computer graphics 2D modeling.
- Understand the 3D modeling techniques.
- Develop a program using computer graphics.

- Understand multimedia concepts.
- Understand multimedia file format.

TEXT BOOKS

1. Donald Hearn and Pauline Baker, Computer Graphics C version, Pearson Education, 2008.
2. Andleigh, Prabat K, and ThakrarKiran., “Multimedia Systems and Design”, Prentice Hall of India, New Delhi, 2004.

REFERENCES

1. Ashok Banerji, AnandaGhosh, “Multimedia Technologies”, Tata McGraw - Hill, New Delhi, 2009.
2. Halshall, Fred., “Multimedia Communications”, Pearson Education (India), New Delhi, 2008.
3. Foley, Vandam, Feiner and Huges, “Computer Graphics: Principles and Practice”, 2nd Edition, Pearson Education, 2003.
4. Steinmetz, Ralf and Nahrstedt, Klara., “Multimedia: Computing, Communications and Applications” Pearson Education, New Delhi, 2001.
5. Tay Vaughan, Multimedia: Making It Work, Tata McGraw Hill, 2008.

Mapping of Course Outcomes with Programming Outcomes (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
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CO2	3	2	3	3	-	-	-	-	-	-	-	2	3	3
CO3	2	3	1	-	-	-	1	-	-	-	-	2	3	3
CO4	3	3	3	3	-	-	-	-	-	-	-	2	1	3
CO5	3	3	3	-	-	2	-	-	-	-	-	3	3	2



CS16503

COURSE OBJECTIVES

To enable the students to

- Understand the concepts of Java fundamentals.
- Understand the importance of Multi thread Programming and IO.
- Develop an application using Applet and JDBC.
- Gain the knowledge about the client side scripting.
- Gain the knowledge about the server side scripting and web development application.

PRE - REQUISITE: Object Oriented Programming

UNIT I JAVA FUNDAMENTALS 9

Review of OOP - Objects and classes in Java - **Defining classes** - Methods - Access Specifiers - **Static members** - Constructors - Finalize method - Arrays - Strings - Packages - **Inheritance**.

UNIT II CONCURRENT PROGRAMMING 9

MULTI-THREADED PROGRAMMING: interrupting threads - thread states - thread properties - thread Synchronization. I/O AND EXPLORING JAVA.IO: Basics - **Reading Console Input** - Writing Console output - Native Methods - I/ O Classes and Interfaces - File - The Byte Streams - **The Character Streams - Serialization**.

UNIT III APPLETS, EVENT HANDLING AND AWT 9

Applet Basics - Applet Architecture - **Applet Display Methods** - Parameter Passing - Event Handling Mechanisms - Event Classes - Event Listener - Working with Windows - **Graphics** - Colors and Fonts - AWT Controls - **Layout Managers and Menus**.

UNIT IV CLIENT - SIDE PROGRAMMING 9

Scripting for content structuring - design - client side validation - dynamic page generation - adding interactivity - **styles using HTML - DHTML - XHTML - CSS - Java Script**.

UNIT V SERVER - SIDE PROGRAMMING 9

Types of servers - **Handling form data** - validation - **querying databases** - information retrieval - **Response generation** - Session management - using Servlets and JSP.

TOTAL PERIODS 45

COURSE OUTCOMES

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

- Construct java program using concept of OOPs and packages in java.
- Construct java program using concept of I/O exploring java.io and multithreading.
- Develop the application of Applets, Event Handling and AWT.
- Create the UI in client - side programming.
- Acquire knowledge to configure the Servers.

TEXT BOOKS

1. Herbert Schildt, "Java The Complete Reference", 8th Edition, McGraw - Hill Osborne Media, 2011.
2. Paul Deitel, "Internet & World Wide Web: How to Program", Prentice Hall, 4th Edition, 2007.

REFERENCES

1. CayS. Horstmann and GaryCornell, "Core Java™, Vol I - Fundamentals" 8Th Edition, Prentice Hall, 2007.
2. Robert W. Sebesta, "Programming the World Wide Web", Addison - Wesley, Sixth Edition, 2010.
3. UttamK.Roy, "Web Technologies", Oxford University Press, 1st Edition, 2010.
4. B. Chapman, G. Jost, and Ruud van der Pas, "Using OpenMP", MIT Press, 2008.

WEB LINKS

1. [www.javatpoint.com/java - oops - concepts](http://www.javatpoint.com/java-oops-concepts).
2. www.w3resource.com.

Mapping of Course Outcomes with Programming Outcomes (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	Programme Outcomes(POs)												Programme Specific Outcomes (PSOs)	
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CO2	3	2	3	3	-	1	-	-	-	-	-	2	3	3
CO3	2	3	1	-	-	-	1	-	-	-	-	2	3	3
CO4	1	3	3	3	-	-	-	-	-	-	-	2	1	3
CO5	3	3	3	-	-	2	-	-	-	-	-	3	3	2



COURSE OBJECTIVES

To enable the students to

- Study the basic concepts and functions of operating systems.
- Learn the Process Management with scheduling algorithms and deadlock handling methods.
- Understand Memory management techniques.
- Learn file system interfaces and implementation process.
- Study I/O Streams and Mass storage management techniques.

PRE - REQUISITE: Nil

UNIT I	INTRODUCTION	9
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Introduction: Computer system organization - **Introduction to operating systems** - operating system structures - Services - system calls - system programs. Processes: Process concept - **Process scheduling** - Operations on Processes - Cooperating processes - Inter process communication - **Communication in client** - server systems. Threads: Multi - threading models - Threading issues.

UNIT II	PROCESS MANAGEMENT AND DEADLOCK	9
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CPU Scheduling: Scheduling criteria - **Scheduling algorithms** - Multiple - processor scheduling - Real time Scheduling - Algorithm Evaluation. Process Synchronization: The critical - **section problem** - Synchronization Hardware - Semaphores - Classic problems of synchronization - Monitors. Deadlock: System model - **Deadlock characterization** - Methods for handling deadlocks - **Deadlock prevention** - Deadlock avoidance - Deadlock Detection - Recovery from deadlock.

UNIT III	MEMORY MANAGEMENT	9
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Main Memory: Background - Swapping - **Contiguous memory allocation** - Paging - Segmentation - Segmentation with paging. Virtual Memory: Background - Demand paging - **Page replacement** - Allocation of frames - Thrashing.

UNIT IV	FILE SYSTEMS	9
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File - System Interface: File concept - **Access methods** - Directory structure - File system mounting - File sharing - Protection. File - System **Implementation: Directory implementation** - Allocation methods - Free - space management Efficiency and performance - recovery - Network file systems.

UNIT V	I/O SYSTEMS AND MASS STORAGE MANAGEMENT	9
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I/O Systems - I/O Hardware - Application I/O interface - **kernel I/O subsystem** - streams - performance. Mass - Storage Structure: Disk attachment - Disk scheduling - **Disk management** - Swap - space management - RAID - Stable storage.

TOTAL PERIODS	45
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COURSE OUTCOMES

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

- Study the basic concepts and functions of operating systems.
- Learn the Process Management with scheduling algorithms and deadlock handling methods.
- Understand Memory management techniques.
- Learn file system interfaces and implementation process.
- Study I/O Streams and Mass storage management techniques.

TEXT BOOKS

1. Silberschatz, Galvin, and Gagne, "Operating System Concepts", Ninth Edition, Wiley India Pvt Ltd, 2013.
2. Andrew S. Tanenbaum, "Modern Operating Systems", Fourth Edition, Pearson Education, 2014.

REFERENCES

1. William Stallings, "Operating Systems - internals and design principles", Prentice Hall, 7th Edition, 2011.
2. Harvey M. Deital, "Operating Systems", Third Edition, Pearson Education, 2007.
3. Andrew S. Tannenbaum & Albert S. Woodhull, "Operating System Design and Implementation", Prentice Hall, 3rd Edition, 2006.

WEB LINKS

1. <http://www.youtube.com/watch?v=MzVGL44eq9w>.
2. <https://www.youtube.com/watch?v=5p3bAC - AX84>.
3. <http://www.youtube.com/watch?v=AjC2KZuRObQ>.

Mapping of Course Outcomes with Programming Outcomes
(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes(POs)												Programme Specific Outcomes (PSOs)	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	2	3	3	3	-	-	-	-	-	-	-	3	3	3
CO2	3	2	3	3	-	-	-	-	-	-	-	2	3	3
CO3	2	3	1	-	-	-	1	-	-	-	-	2	3	3
CO4	3	3	3	3	-	-	-	-	-	-	-	2	1	3
CO5	3	3	3	-	-	2	-	-	-	-	-	3	3	2



COURSE OBJECTIVES

To enable the students to

- Understand the need of developing graphics applications.
- Learn the hardware involved in building graphics applications.
- Learn algorithmic development of graphics primitives like: line, circle, ellipse, polygon etc.
- Learn the representation and transformation of graphical images and pictures.

LIST OF EXPERIMENTS

1. Implementation of Line Drawing Algorithms a) DDA b) Bresenham.
2. Implementation of Bresenham's Circle and Ellipse Generation Algorithm.
3. Implementation of Two Dimensional Transformations.
4. Composite 2D Transformations.
5. Implementation of Cohen - Sutherland Line Clipping Algorithm.
6. Implementation of 3D Transformations.
7. Composite 3D Transformations.
8. Animation using Image Effects Generator.
9. Game development using Flash.
10. Video Editing.

TOTAL PERIODS 60

COURSE OUTCOMES

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

- draw basic shapes such as lines, circle and ellipse.
- perform processing of basic shapes by various processing algorithms /techniques.
- apply the transformations to the basic shapes.
- apply the transformations to the basic shapes.

RECOMMENDED SYSTEM/SOFTWARE REQUIREMENTS

SOFTWARE: Adobe Flash Player, Dreamweaver, Photoshop 7.0.

HARDWARE: Flavor of any WINDOWS and UNIX. Standalone desktops 30 Nos.

Mapping of Course Outcomes with Programming Outcomes (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	Programme Outcomes(POs)												Programme Specific Outcomes (PSOs)	
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CO1	2	3	3	3	-	-	-	-	-	-	-	3	3	3
CO2	3	2	3	3	-	-	-	-	-	-	-	2	3	3
CO3	2	3	1	-	-	-	1	-	-	-	-	2	3	3
CO4	3	3	3	3	-	-	-	-	-	-	-	2	1	3



COURSE OBJECTIVES

To enable the students to

- Implement various of OOP using Java.
- Implement multithreading, Applet and event handling in solving real time problem.
- Develop the skill in usability of web page.
- Develop the skill in handling the web page using servlet or JSP.

LIST OF EXPERIMENTS:

1. Write a simple program in java using class, object, array of object and methods.
2. Write a program to implement method overloading and method overriding.
3. Program to implement inheritance, interface and abstract class in Java.
4. Program to implement Multithreading concept in Java.
5. Program to implement the concept of Synchronization and Serialization.
6. Design a simple Login Window Using AWT Controls (Button, Label, Text field) of Java.
7. Develop an Applet program in Java.
8. Create a web site using web development tool.
9. Create a web page with all types of Cascading style sheets.
10. Client Side Scripts for Validating Web Form Controls using JavaScript.
11. Client side scripting for roll over image and random image display using JavaScript.
12. By using servlet or JSP programming language handle the data, Validate the data and retrieve the information.

TOTAL PERIODS**60****COURSE OUTCOMES**

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

- Demonstrate object, class, inheritance, interface concept in java.
- Develop java program using the concept of multithreading, Applet and AWT.
- Develop an attitude to learn and implement the web technology concepts.
- Acquire knowledge in java web services.

**RECOMMENDED SYSTEM/SOFTWARE REQUIREMENTS**

SOFTWARE: Java, Dream Weaver or Equivalent, MySQL or Equivalent, Apache Server Turbo C, C++.

HARDWARE: Flavor of any WINDOWS or LINUX and Standalone desktops 30 Nos.

CO/PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	Programme Outcomes(POs)												Programme Specific Outcomes (PSOs)	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	1	1	-	1	-	-	-	-	-	-	-	3	3
CO2	2	1	2	1	2	-	1	-	-	-	-	-	1	3
CO3	3	2	-	-	3	-	-	-	-	-	-	-	-	3
CO4	3	1	-	-	-	2	-	-	-	-	-	-	1	3

COURSE OBJECTIVES

To enable the students to

- Work with file related System calls.
- Implement various CPU scheduling algorithms.
- Implement file allocation algorithms.
- Work with page replacement algorithms.

LIST OF EXPERIMENTS

1. Implementation of basic UNIX system commands.
2. Shell Programming.
3. Implementation of the following CPU scheduling algorithms
a) Round Robin b) SJF c) FCFS d) Priority.
4. Implementation of file allocation strategies
a) Sequential b) Indexed c) Linked.
5. Solving Producer - Consumer Problem using Semaphores.
6. Implementation of Bankers Algorithm for Dead Lock Avoidance.
7. Implementation of an Algorithm for Dead Lock Detection.
8. Implementation of page replacement algorithms
a) FIFO b) LRU c) LFU.
9. Implementation of Paging Technique for memory management.
10. Performing Shared memory and Inter Process Communication.

TOTAL PERIODS 60

COURSE OUTCOMES

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

- work with various file related System calls.
- Implement all the CPU scheduling algorithms.
- implement sequential, Indexed and linked file allocation algorithms.
- work with different page replacement algorithms.

**RECOMMENDED SYSTEM/SOFTWARE REQUIREMENTS**

SOFTWARE: Standalone desktops with C / C++ / Java / Equivalent compiler 30 Nos.

HARDWARE: Flavor of any WINDOWS or LINUX and Standalone desktops 30 Nos.

CO/PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	Programme Outcomes(POs)												Programme Specific Outcomes (PSOs)	
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CO3	3	2	-	-	3	-	-	-	-	-	-	-	-	3
CO4	3	1	-	-	-	2	-	-	-	-	-	-	1	3

COURSE OBJECTIVES

To enable the students to

- Understand the basic concepts of OOAD.
- Make utilization of software objects to build robust systems.
- To learn the UML design diagrams.
- Familiarize the object - oriented analysis and design concepts for developing object oriented Projects.
- Understand the quality issues in implementations.

PRE - REQUISITE: Nil

UNIT I	INTRODUCTION	9
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Introduction to OOAD - UML - **Unified process(UP) phases** - Case study - the Next Gen POS system - Inception Use case Modeling - Relating Use cases - include - **extend and Generalization**.

UNIT II	MODEL	9
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Elaboration - Domain Models - **Finding conceptual classes and description classes** - Associations - Attributes - Domain model refinement - Finding conceptual class hierarchies - **Aggregation and Composition** - UML activity diagrams and modeling.

UNIT III	UML	9
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System sequence diagrams - Relationship between sequence diagrams and use cases Logical architecture and UML package diagram - **Logical architecture refinement** - UML class diagrams - UML interaction diagrams UML state diagrams and modeling - Operation contracts - **Mapping design to code** - UML deployment and component diagrams.

UNIT IV	APPLICATIONS	9
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GRASP: Designing objects with responsibilities - Creator - Information expert - Low Coupling - Controller - High Cohesion - Designing for visibility - **Applying code sign patterns** - adapter - singleton - factory and observer Patterns.

UNIT V	IMPLEMENTATIONS	9
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View layer - Designing Interface Objects - **User interface design as a creative process** - Designing View layer classes - Macro level process - Micro level process - **Purpose of view layer interface** - Software Quality Assurance - System Usability.

TOTAL PERIODS	45
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COURSE OUTCOMES

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

- Perform a comprehensive object - oriented analysis and design of larger object - oriented software using the Unified Process (UP).
- Recognize the concepts and notations used for finding objects and classes.
- Demonstrate the functional behavior of UML diagrams.

- Depict the utility of object oriented methodologies.
- Determine the quality factors of object oriented design process.

TEXT BOOKS

1. Ali Bahrami, Object Oriented Systems Development, Tata McGraw - Hill, 2010.
2. John Deacon, "Object Oriented Analysis and Design", Pearson Education, First Edition, 2009.

REFERENCES

1. Craig Larman, "Applying UML and Patterns: An Introduction to object - oriented Analysis and Design and iterative development", Third Edition, Pearson Education, 2005.
2. Mike O'Docherty, "Object - Oriented Analysis & Design: Understanding System Development with UML 2.0", John Wiley & Sons, 2005.
3. James Rumbaugh, Ivar Jacobson and Grady Booch, The Unified Modeling Language Reference Manual, Addison Wesley, 2006.
4. Micheal Blaha, James Rumbaugh, "Object - Oriented Modeling and Design with UML", Second Edition, Prentice Hall of India Private Limited, 2007.

WEB LINKS

1. https://onlinecourses.nptel.ac.in/noc16_cs19.
2. <http://nptel.iitg.ernet.in/>.
3. www.tutorialspoint.com/object_oriented_analysis_design/.

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CO4	3	3	3	3	-	-	-	-	-	-	-	2	1	3
CO5	3	3	3	-	-	2	-	-	-	-	-	3	3	2



COURSE OBJECTIVES

To enable the students to

- Learn the methods of different problem solving and searching.
- Know the concepts of knowledge representation.
- Understand about inferring the knowledge.
- Know the concepts of planning and learning.
- Understand about the expert system.

PRE - REQUISITE: Data Structures and algorithm , Calculus

UNIT I INTRODUCTION

9

Introduction to AI - **Problem formulation** - Problem Definition - Production systems - Control strategies Search strategies. Problem characteristics - Production system characteristics - **Specialized productions system** - Problem solving methods - Problem graphs - Matching - Indexing and Heuristic functions - **Hill Climbing** - Depth first and Breath first – Constraints satisfaction - Related algorithms - **Measure of performance and analysis of search algorithms.**

UNIT II REPRESENTATION OF KNOWLEDGE

9

Game playing - Knowledge representation - **Knowledge representation using Predicate logic** - Introduction to predicate calculus – Resolution - Use of predicate calculus - **Knowledge representation using other logic** - Structured representation of knowledge.

UNIT III KNOWLEDGE INFERENCE

9

Knowledge representation - **Production based system** - Frame based system. Inference - **Backward logic chaining** - Forward chaining - **Rule value approach** - Fuzzy reasoning.

UNIT IV PLANNING AND MACHINE LEARNING

9

Basic plan generation systems - Strips - **Advanced plan generation systems** - K strips - **Strategic explanations** - Learning - Machine learning - adaptive Learning.

UNIT V EXPERT SYSTEMS

9

Expert systems - Architecture of expert systems - **Roles of expert systems** - Knowledge Acquisition - Meta knowledge - Heuristics - Typical expert systems - MYCIN - DART - XOON - **Expert systems shells.**

TOTAL PERIODS 45

COURSE OUTCOMES

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

- Demonstrate awareness of intelligent agents and problem solving using uninformed, informed and local search methods.
- Develop knowledge about usage of propositional logic and first order logic for making inferences.
- Use the knowledge and the process of inference to derive new facts.
- Describe the use of planning and explain about various learning methods.
- To gain knowledge about expert system concepts.

TEXT BOOKS

1. Kevin Night and Elaine Rich, Nair B, “Artificial Intelligence (SIE)”, McGraw Hill - 2008.
(Units - I, II, IV& V).
2. Dan W. Patterson, “Introduction to AI and ES”, Pearson Education, 2007. (Unit - III).

REFERENCES

1. Peter Jackson, “Introduction to Expert Systems”, 3rd Edition, Pearson Education, 2007.
2. Stuart Russel and Peter Norvig “AI - A Modern Approach”, 2nd Edition, Pearson Education 2007.
3. DeepakKhemani “Artificial Intelligence”, Tata McGraw Hill Education 2013.

WEB LINKS

1. <http://nptel.ac.in/courses/106105078/>.
2. <http://nptel.ac.in/courses/106106126/>.
3. <https://www.youtube.com/watch?v=kWmX3pd1f10>.

Mapping of Course Outcomes with Programming Outcomes (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
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CO3	2	3	1	-	-	-	1	-	-	-	-	2	3	3
CO4	3	3	3	3	-	-	-	-	-	-	-	2	1	3
CO5	3	3	3	-	-	2	-	-	-	-	-	3	3	2



COURSE OBJECTIVES

To enable the students to

- Know the number theory for the understanding of encryption algorithms.
- Learn the techniques used for message authentication and confidentiality maintenance.
- Understand the concepts of network security tools and applications.
- Learn the network security practices.
- Understand the concepts of system security.

PRE - REQUISITE: Computer Networks

UNIT I	INTRODUCTION AND NUMBER THEORY	9
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Security trends - Attacks and services - Classical crypto systems - Different types of ciphers LFSR sequences -
 Basic Number theory-Congruences-ChineseRemainder theorem-Modular exponentiation -
 Fermat and Euler's theorem - Legendre and Jacobi symbols - Finite fields - continued fractions.

UNIT II	SYMMETRIC CIPHERS	9
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Block Ciphers and the Data Encryption Standard - Introduction to Finite Fields - Advanced Encryption Standard -
 More on Symmetric Ciphers - Confidentiality using Symmetric Encryption.

UNIT III	PUBLIC - KEY ENCRYPTION AND HASH FUNCTION	9
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Public - KeyCryptography and RSA - Key Management - Diffie - Hellman Key Exchange - Elliptic Curve
 Cryptography - Message Authentication and Hash Functions - Hash and MAC Algorithms – Digital Signatures
 and Authentication Protocols.

UNIT IV	NETWORK SECURITY PRACTICE	9
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Authentication Applications - Kerberos - X.509 Authentication Service - Electronic mail Security - Pretty Good
 privacy - S/MIME - IP Security - Web Security.

UNIT V	SYSTEM SECURITY	9
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Intruders - Intrusion Detection - Password Management - Malicious Software - Viruses and Related Threats – Virus
 Countermeasures - Distributed Denial of Service Attacks - Firewalls - Firewall Design Principles - SET for E -
 Commerce Transactions - Trusted Systems.

TOTAL PERIODS	45
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COURSE OUTCOMES

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

- Demonstrate the fundamental representation of Network Security.
- Analyze and implement the cryptographic algorithms and protocols.
- Demonstrate the concepts of public key cryptosystems.
- Analyze the algorithms for Internet security.
- Demonstrate an ability to use techniques, skills, and modern computing tools to implement and organize.

TEXT BOOKS

1. William Stallings, Cryptography and Network Security, 6th Edition, Pearson Education, March 2013. (I,II,III,V)
2. Charlie Kaufman, Radia Perlman and Mike Speciner, "Network Security", Prentice Hall of India, 2002. (UNIT IV)

REFERENCES

1. Behrouz A. Ferouzan, "Cryptography & Network Security", Tata McGraw Hill, 2007.
2. AtulKahate, "Cryptography and Network Security", Tata McGraw Hill, 2003.
3. Bruce Schneider, "Applied Cryptography", John Wiley & Sons Inc, 2001.
4. W. Mao, Modern Cryptography - Theory and Practice, Pearson Education, 2007.
5. Stewart S. Miller, "Wi - Fi Security", McGraw - Hill 2003.
6. Charles B. Fleeter, Shari Lawrence Fleeter, "Securityin Computing", Fourth Edition, Pearson Education, 2007.

WEB LINKS

1. <http://www.securitydocs.com/>
2. <http://www.linuxsecurity.com/>
3. <http://www.itprc.com/security.htm>

Mapping of Course Outcomes with Programming Outcomes (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	Programme Outcomes(POs)												Programme Specific Outcomes (PSOs)	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO12	PSO 1	PSO 2
CO1	2	3	3	3	-	-	-	-	-	-	-	3	3	3
CO2	3	2	3	3	-	-	-	-	-	-	-	2	3	3
CO3	2	3	1	-	-	-	1	-	-	-	-	2	3	3
CO4	3	3	3	3	-	-	-	-	-	-	-	2	1	3
CO5	3	3	3	-	-	2	-	-	-	-	-	3	3	2



COURSE OBJECTIVES

To enable the students to

- Understand the design principles of a compiler.
- Learn the LEX, and various conversion techniques.
- Familiarize with different types of parsing techniques.
- Know how to perform type conversion and storage allocation.
- Learn how to effectively generate machine codes.

PRE - REQUISITE: Theory of Computation**UNIT 1 INTRODUCTION TO COMPILERS**

9

Translators - Compilation and Interpretation - **Language processors** - The Phases of Compiler - Errors Encountered in Different Phases - The Grouping of Phases - Compiler Construction Tools – **Programming Language basics.**

UNIT II LEXICAL ANALYSIS

12

Need and Role of Lexical Analyzer - **Lexical Errors** - Expressing Tokens by Regular Expressions - Converting Regular Expression to DFA - Minimization of DFA - **Language for Specifying Lexical Analyzers** - LEX - Design of Lexical Analyzer for a sample Language.

UNIT III SYNTAX ANALYSIS

15

Need and Role of the Parser - Context Free Grammars - **Top Down Parsing** - General Strategies - Recursive Descent Parser Predictive Parser - LL(1) Parser - Shift Reduce Parser - LR Parser - LR (0)Item - **Construction of SLR Parsing Table** - Introduction to LALR Parser - Error Handling and Recovery in Syntax Analyzer - YACC - Design of syntax Analyzer for a Sample Language.

UNIT IV SYNTAX DIRECTED TRANSLATION AND RUN TIME ENVIRONMENT

12

Syntax directed Definitions - **Construction of Syntax Tree** - Bottom-up Evaluation of S -Attribute Issues - Definitions Design of predictive translator - Type Systems - **Specification of a simple type checker** - Equivalence of Type Expressions - Type Conversions. RUN - **TIME ENVIRONMENT: Source Language Storage Organization.** Storage Allocation - Parameter Passing - Symbol Tables - **Dynamic Storage Allocation** - Storage Allocation in FORTAN.

UNIT V CODE OPTIMIZATION AND CODE GENERATION

12

Principal Sources of Optimization - DAG - **Optimization of Basic Blocks** - Global Data Flow Analysis - Efficient Data Flow Algorithms - Issues in Design of a Code Generator - **A Simple Code Generator Algorithm.**

TOTAL PERIODS 60**COURSE OUTCOMES**

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

- Design and implement a prototype compiler.
- Use the knowledge of patterns, tokens and regular expressions for solving a problem.

- Apply the various optimization techniques.
- Describe the runtime structures used to represent constructs in typical programming languages.
- Use the different compiler construction tools.

TEXT BOOKS

1. Alfred V Aho, Monica S. Lam, Ravi Sethi and Jeffrey D Ullman, “Compilers - Principles, Techniques and Tools”, 2nd Edition, Pearson Education, 2007.
2. Randy Allen, Ken Kennedy, “Optimizing Compilers for Modern Architectures: A Dependence - based Approach”, Morgan Kaufmann Publishers, 2002.

REFERENCES

1. Steven S. Muchnick, “Advanced Compiler Design and Implementation”, “Morgan Kaufmann Publishers - Elsevier Science, India, Indian Reprint 2003.
2. Keith D Cooper and Linda Torczon, “Engineering a Compiler”, Morgan Kaufmann Publishers Elsevier Science, 2004.
3. Charles N. Fischer, Richard. J. LeBlanc, “Crafting a Compiler with C”, Pearson Education, 2008.

WEB LINKS

1. nptel.ac.in/courses/106108052/12.
2. https://www.tutorialspoint.com/compiler_design/compiler_design_pdf_version.htm
3. <http://nptel.ac.in/downloads/106108113/>

Mapping of Course Outcomes with Programming Outcomes (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
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CO2	3	2	3	3	-	-	-	-	-	-	-	2	3	3
CO3	2	3	1	-	-	-	1	-	-	-	-	2	3	3
CO4	3	3	3	3	-	-	-	-	-	-	-	2	1	3
CO5	3	3	3	-	-	2	-	-	-	-	-	3	3	2



COURSE OBJECTIVES

To enable the students to

- Learn how to identify objects, relationships, services and attributes through UML.
- Get familiarized on object oriented design process.
- Build a conceptual model during analysis and design.
- Be familiar with various testing techniques.

LIST OF EXPERIMENTS

1. **Passport automation system.**
2. Exam Registration.
3. **Stock maintenance system.**
4. Online course reservation system.
5. E - ticketing.
6. **Software personnel management system.**
7. Credit card processing.
8. E - book management system.
9. Recruitment system.
10. **BPO Management System.**

TOTAL PERIODS 60

COURSE OUTCOMES

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

- Demonstrate the functional behavior of UML diagrams.
- Recognize the concepts and notations used for finding objects and classes.
- Depict the utility of object oriented methodologies.
- Compare and contrast various testing techniques.

RECOMMENDED SYSTEM/SOFTWARE REQUIREMENTS

SOFTWARE:Rational Suite (or) Argo UML (or) equivalent, Eclipse IDE and Junit.

HARDWARE: Flavor of any WINDOWS and Standalone desktops 30 Nos.



Mapping of Course Outcomes with Programming Outcomes (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
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CO1	2	3	3	3	-	-	-	-	-	-	-	3	3	3
CO2	3	2	3	3	-	-	-	-	-	-	-	2	3	3
CO3	2	3	1	-	-	-	1	-	-	-	-	2	3	3
CO4	3	3	3	3	-	-	-	-	-	-	-	2	1	3

COURSE OBJECTIVES

To enable the students to

- Provide a strong foundation of fundamental concepts in artificial intelligence.
- Enable the students to apply AI techniques in applications which involve perception, reasoning and learning.
- Empowering humans to perform collaborative activities in complex and dynamic settings.
- Exploiting and integrating information coming from different (and possibly heterogeneous) information sources.

LIST OF EXPERIMENTS USING C/C++, PERFORM THE FOLLOWING EXPERIMENTS

1. Depth first search.
2. Breadth first search.
3. Best first search.
4. Travelling sales man problem.
5. Water jug problem.
6. Tower of Hanoi problem.
7. Eight puzzle problem.
8. A* search.
9. AO* search.
10. Design Expert System.

TOTAL PERIODS 60

COURSE OUTCOMES

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

- Demonstrate the use of different search techniques for problem solving.
- Develop solutions for some AI problems.
- Demonstrate the use of “Prolog” for predicate logic applications.
- Design an expert system.

Mapping of Course Outcomes with Programming Outcomes (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	Programme Outcomes(POs)												Programme Specific Outcomes (PSOs)	
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CO1	2	3	3	3	-	-	-	-	-	-	-	3	3	3
CO2	3	2	3	3	-	-	-	-	-	-	-	2	3	3
CO3	2	3	1	-	-	-	1	-	-	-	-	2	3	3
CO4	3	3	3	3	-	-	-	-	-	-	-	2	1	3



COURSE OBJECTIVES

To enable students to

- learn the various basic linux commands
- gain the knowledge on MySQL server administration
- study different MySQL queries on functions and operator.
- get the knowledge on basic Concepts in PHP.
- work with files and databases using PHP.

UNIT I LINUX**9**

Introduction to Open sources – **Need and Advantages of Open Sources**. LINUX: Linux Distributions - History of Linux. The Shell: The Command Line – Filename Expansion – Pipes – Jobs - Ending Processes. The Linux Files, Directories and Archives: The File Structure – Listing, **Displaying and Printing Files** – Managing Directories – File and Directory Operations – **Archiving and Compressing Files**.

UNIT II INTRODUCTION TO MySQL**9**

Relational Database Management : Comparing SQL Implementations – **MySQL Versions and Features** – Standards and Compatibility – MySQL Specific Properties. Starting MySQL: MySQL Server Administration and Security – **Frequently Used MySQL Database Functions**. Security: MySQL Authentication and Privileges – **MySQL User Management, Debugging and Repairing Databases** : Performing Database Backups – Troubleshooting and Repairing Table Problems - Restoring a MySQL Database.

UNIT III MYSQL FUNCTIONS**9**

MySQL Commands: Record Selection Technology – **Sorting Query Results** - Using sequences – MySQL Operators (Comparison, Flow Control, Logical, Statement and String Operators) – **MySQL Functions(Binary, Date, Decimal, System and String Functions)**

UNIT IV INTRODUCTION TO PHP**9**

Introducing PHP : Unique Features – **Creating PHP Script**. Using Variables and Operators : Storing Data in Variables - Data Types – Constants. Controlling Programming Flow : **Conditional Statements** – Looping Statements – **Functions - Working with String and Numeric Functions – Arrays**

UNIT V FILE HANDLING USING PHP**9**

Working with Files and Directories: Reading Files – **Writing Files** – File and Directory Operations. Working with Databases and SQL: Introducing Databases and SQL – **Adding and Modifying Data** – Handling Errors.

TOTAL PERIODS 45

COURSE OUTCOMES

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

- understand the basic operations in Linux
- execute various commands in MySQL
- develop the ability to understand the MySQL operator and functions
- articulate the basic function in PHP
- analyze and implement file handling programs in PHP

TEXT BOOKS

1. Richard Petersen, "The complete Reference Linux", Tata McGraw Hill Edition, Sixth edition 2010
2. Steve Suchring, MySQL Bible, John Wiley, 2002.
3. Steven Holzner, "PHP: The Complete Reference", 2nd Edition, Tata McGraw - Hill Publishing Company Limited, Indian Reprint 2009.

REFERENCES

1. Mark G. Sobell. "Practical Guide to Fedora and Red HatEnterpriseLinux", 6 th Edition, Prentice Hall, 2011.
2. RasmusLerdorf and Levin Tatroe, "Programming PHP", O'Reilly 3rd Edition, 2011.
3. Remy Card, Eric Dumas and Frank Mevel, "The Linux Kernel Book", Wiley Publications, 2007.

Mapping of Course Outcomes with Programme Outcomes (1/2/3 indicates strength of correlation) 3-strong, 2-Medium, 1-Weak														
COs	Programme Outcomes POs												Programme Specific Outcomes PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	-	-	-	-	-	-	-	1	2	3
CO2	3	3	2	3	-	-	-	-	-	-	-	1	2	3
CO3	3	2	2	3	-	-	-	-	-	-	-	1	2	3
CO4	3	2	3	1	-	-	-	-	-	-	-	1	2	3
CO5	3	2	2	2	-	-	-	-	-	-	-	1	2	3



COURSE OBJECTIVES

To enable students to

- understand the design and implementation of a data store
- acquire knowledge on data and various preprocessing techniques
- analyze the various correlation based frequent patterns mining in large data sets
- learn various classifiers in data mining
- understand the data mining techniques and methods to be applied on large data sets.

UNIT I DATA WAREHOUSING**9**

Data warehouse: Basic Concepts – Modeling – Design and usage – Implementation : Data cube Computation Methods- Data Generalization by Attribute – Oriented Induction approach.

UNIT II DATA MINING**9**

Introduction: Kinds of Data and Patterns – Major Issues in Data Mining – Statistical Description of Data – Measuring Data Similarity and Dissimilarity. Data preprocessing : Data Cleaning – Data Integration –Data Transformation Data Reduction – Data Discretization: Concept Hierarchy Generation.

UNIT III ASSOCIATION RULE MINING**9**

Basic concepts – Frequent Itemset Mining Methods : Apriori algorithm, A Pattern Growth Approach for Mining Frequent Itemsets - Mining Various Kinds of Association Rules - Correlation Analysis - Constraint Based Association Mining.

UNIT IV CLASSIFICATION**9**

Basic Concepts – Decision Tree Induction – Bayes Classification Methods – Rule Based Classification - Classification by Back propagation - Support vector machines - Associative Classification - Lazy Learners - Other Classification Methods - Prediction.

UNIT V CLUSTERING AND DATA MINING APPLICATIONS**9**

Cluster analysis – Partitioning Methods – Hierarchical Methods – Density Based Methods – Grid Based Methods- Model Based Clustering Methods – Clustering High Dimensional Data – Constraint Based Clustering Analysis – Outlier Analysis – Data Mining Applications: Financial Data Analysis, Science and Engineering, Intrusion Detection and Prevention.

TOTAL PERIODS 45

COURSE OUTCOMES

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

- understand the design of a data warehouse
- apply preprocessing techniques
- mine frequent patterns in large data sets.
- compare and contrast the various classifiers
- apply clustering techniques and methods to large data sets

TEXT BOOKS

1. Jiawei Han and Micheline Kamber, “Data Mining Concepts and Techniques”, 3rd Edition, Elsevier, 2012.

REFERENCES

1. G. K. Gupta, “Introduction to Data Mining with Case Studies”, Eastern Economy Edition, Prentice Hall of India, 2006.
2. Charu C. Aggarwal, “Data Mining: The Textbook”, Kindle Edition, Springer, 2015.
3. Margaret H. Dunham, “Data Mining : Introductory and Advanced Topics”, 17th Edition, Pearson Education, 2013

Mapping of Course Outcomes with Programme Outcomes (1/2/3 indicates strength of correlation) 3-strong, 2-Medium, 1-Weak														
COs	Programme Outcomes POs												Programme Specific Outcomes PSOs	
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CO2	3	2	2	2	-	-	-	-	-	-	-	1	2	2
CO3	3	3	2	3	-	-	-	-	-	-	-	1	3	3
CO4	3	2	2	1	-	-	-	-	-	-	-	1	2	3
CO5	3	2	3	2	-	-	-	-	-	-	-	1	2	3



COURSE OBJECTIVES

To enable students to

- understand the concept of cloud computing.
- appreciate the evolution of cloud from the existing technologies.
- have knowledge on the various issues in cloud computing
- be familiar with the lead players in cloud
- appreciate the emergence of cloud as the next generation computing paradigm

UNIT I INTRODUCTION**9**

Introduction to Cloud Computing – Definition of Cloud – Characteristics and Benefits of Cloud Computing – Historical Developments - Building Cloud Computing Environments- Computing Platforms and Technologies - Principles of Parallel and Distributed Computing.

UNIT II CLOUD ENABLING TECHNOLOGIES**9**

Basics of Virtualization – Characteristics of Virtualized Environments - Taxonomy of Virtualization Techniques - Virtualization and Cloud Computing - Pros and Cons of Virtualization - Technology Examples: Para virtualization, Full Virtualization.

UNIT III CLOUD ARCHITECTURE, SERVICES AND STORAGE**9**

Cloud Reference Model : Infrastructure / Hardware as a Service, Platform as a Service, Software as a Service- Types of Clouds : Public Clouds, Private Clouds, Hybrid Clouds, Community Clouds- Economics of the Cloud- Open Challenges.

UNIT IV RESOURCE MANAGEMENT AND SECURITY IN CLOUD**9**

Inter Cloud Resource Management – Resource Provisioning and Resource Provisioning Methods – Global Exchange of Cloud Resources – Security Overview – Cloud Security Challenges – Software-as-a-Service Security – Security Governance – Virtual Machine Security – IAM – Security Standards.

UNIT V CLOUD TECHNOLOGIES AND ADVANCEMENTS**9**

Hadoop – MapReduce – Virtual Box – Google App Engine – Programming Environment for Google App Engine – Open Stack – Federation in the Cloud – Four Levels of Federation – Federated Services and Applications – Future of Federation

TOTAL PERIODS 45

COURSE OUTCOMES

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

- articulate the main concepts, key technologies, strengths and limitations of cloud computing.
- learn the key and enabling technologies that help in the development of cloud.
- develop the ability to understand the architecture of compute and storage cloud, service and delivery models.
- learn the core issues of cloud computing such as resource management and security.
- evaluate and choose the appropriate technologies, and approaches for implementation and use of cloud

TEXT BOOKS

1. Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, Mastering Cloud Computing, Tata Mcgraw Hill, 2013.
2. Rittinghouse, John W., and James F. Ransome, —Cloud Computing: Implementation, Management and Security, CRC Press, 2017.

REFERENCES

1. Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, “Distributed and Cloud Computing, From Parallel Processing to the Internet of Things”, Morgan Kaufmann Publishers, 2012.
2. Toby Velte, Anthony Velte, Robert Elsenpeter, “Cloud Computing – A Practical Approach, Tata Mcgraw Hill, 2009.
3. George Reese, “Cloud Application Architectures: Building Applications and Infrastructure in the Cloud: Transactional Systems for EC2 and Beyond (Theory in Practice), O’Reilly, 2009

Mapping of Course Outcomes with Programme Outcomes (1/2/3 indicates strength of correlation) 3-strong, 2-Medium, 1-Weak														
COs	Programme Outcomes POs												Programme Specific Outcomes PSOs	
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CO3	2	3	2	1	-	-	-	-	-	-	-	1	2	3
CO4	3	2	2	2	-	-	-	-	-	-	-	1	3	3
CO5	3	2	2	2	-	-	-	-	-	-	-	1	2	3



COURSE OBJECTIVES

To enable students to

- gain the knowledge MySQL open source database.
- be familiar with Server - side programming language like PHP.
- implement and design the advanced PHP Concept.
- exposing the students to the concepts of R programming.

LIST OF EXPERIMENTS

1. **Developing Dynamic Internet Applications using PHP.**
2. Client - Side Scripting and Server - Side Scripting using PHP.
3. PHP's Database APIs.
4. **Simple SQL Queries via PHP.**
5. Retrieving Data from Forms using PHP
6. **Using HTTP and FTP Protocols to Pass Data using PHP.**
7. You want to use PHP to protect parts of your web site with passwords. Instead of storing the passwords in an external file and letting the web server handle the authentication , write the PHP program for password verification logic
8. When users sign up for your web site, it's helpful to know that they've provided you with a correct email address. To validate the email address they provide, send an email to the address they supply when they sign up. If they don't visit a special URL included in the email after a fewdays, deactivate their account
 - a. Create and Manage Database and tables in MySQL Connecting to and Disconnecting from the Server.
 - b. Entering Queries.
 - c. Creating and Using a Database.
 - d. Creating and Selecting a Database.
 - e. Creating a Table.
 - f. Loading Data into a Table.
 - g. Retrieving Information from a Table.
 - h. Getting Information about Databases and Tables.
9. Write an R program to implement the simple calculator using functions.
10. **Write an R program to implement the Data frames.**
11. Write an R program to implement the vectors and matrices.
12. **Write an R program to implement the list.**

TOTAL PERIODS 60

COURSE OUTCOMES

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

- demonstrate the working with MYSQL
- implement the simple application in PHP
- ability to create strong application in PHP.
- develop a simple problem - solving application in R programming.

Mapping of Course Outcomes with Programme Outcomes (1/2/3 indicates strength of correlation) 3-strong, 2-Medium, 1-Weak														
COs	Programme Outcomes POs												Programme Specific Outcomes PSOs	
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CO3	3	2	2	3	-	-	-	-	-	-	-	1	2	3
CO4	3	3	3	2	-	-	-	-	-	-	-	1	3	3



COURSE OBJECTIVES

To enable students to

- recognize the significance of proper scope and the problems
- understand the strategic plans, project prioritization methods and projects
- understand the importance of scheduling / allocating resources to a project
- understand the importance of project management as it effects strategy and business success

GUIDELINES

1. The students are expected to get formed into a team of convenient groups of not more than 3 members on a project.
2. Every project team shall have a guide who is the member of the faculty of the institution. Identification of student group and their faculty guide has to be completed within the first two weeks from the day of beginning of 7th semester
3. The group has to identify and select the problem to be addressed as their project work. make through literature survey and finalize a comprehensive aim and scope of their work to be done.
4. A project report has to be submitted by each student group for their project work.
5. Three reviews have to be conducted by a team of faculty (minimum of 3 and maximum of 5) along with their faculty guide as a member of faculty team (for monitoring the progress of project planning and implementation).

COURSE OUTCOMES

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

- formulate a real world problem, identify the requirement and develop the design solutions.
- identify technical ideas, strategies and methodologies.
- utilize the new tools, algorithms, techniques that contribute to obtain the solution of the project.
- test and validate through conformance of the developed prototype and analysis the cost effectiveness.

TOTAL PERIODS 60

Mapping of Course Outcomes with Programme Outcomes
(1/2/3 indicates strength of correlation) 3-strong, 2-Medium, 1-Weak

COs	Programme Outcomes POs												Programme Specific Outcomes PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
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CO2	2	3	2	3	-	-	-	-	-	-	-	1	3	3
CO3	3	3	1	3	-	-	-	-	-	-	-	1	2	3
CO4	3	2	3	2	-	-	-	-	-	-	-	1	2	2



SEMESTER VIII

CS16801

SOFTWARE PROJECT MANAGEMENT

3 0 0 3

COURSE OBJECTIVES

To enable students to

- understand the importance of project planning and project evaluation techniques.
- acquire knowledge in software effort estimation and calculating the project duration.
- analyze the risk and allocate the resources.
- gain knowledge about the monitoring and controlling the software projects and its quality.
- learn the fundamental concept of managing people and contracts.

UNIT I INTRODUCTION TO PROJECT PLANNING AND EVALUATION

9

Project Definition – Importance of Software Project Management – Software Projects Vs Other Projects – Activities Covered by SPM – Setting Objectives – Stepwise Project Planning – Cost Benefit Evaluation Techniques.

UNIT II SOFTWARE EFFORT ESTIMATION AND ACTIVITY PLANNING

9

Software Effort Estimation : Agile Methods – Extreme Programming – Scrum - Problems with over and under estimates – Software effort estimation techniques – Bottom-up estimating – Top down estimating – Estimating by analogy – Albrecht function point analysis.

Activity Planning : Objectives of Activity planning - Project Schedules – Project and Activities – Sequencing and Scheduling – Activity on Arrow Networks – Forward Pass – Backward Pass – Identifying Critical Path -Activity Float – Shortening Project Duration.

UNIT III RISK MANAGEMENT AND RESOURCE ALLOCATION

9

Risk Management : Categories of Risk – A Framework for dealing Risk – Risk Identification – Risk Assessment – Risk Planning - Risk Management – Risk Evaluation -Applying the PERT technique. Resource Allocation : The nature of resources - Identifying Resource Requirements – Scheduling Resources-Creating critical paths – counting the cost - Publishing the resource schedule – The Scheduling Sequence.

UNIT IV MONITORING AND CONTROLLING OF PROJECTS AND ITS QUALITY

9

Monitoring and Controlling of Software Projects : Collecting the data – Visualizing Progress - Cost monitoring - Earned value analysis – Prioritizing monitoring. Software Quality : The importance of Software Quality – Software Quality Definition– ISO9126 – Product Vs Process Quality Management – Process Capability Models – Techniques to help enhance software quality

Mapping of Course Outcomes with Programme Outcomes (1/2/3 indicates strength of correlation) 3-strong, 2-Medium, 1-Weak														
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CO3	3	2	2	1	-	-	-	-	-	-	-	1	2	3
CO4	3	2	3	3	-	-	-	-	-	-	-	1	2	3
CO5	3	3	2	2	-	-	-	-	-	-	-	1	2	3

COURSE OBJECTIVES

To enable students to

- recognize the significance of proper scope and the problems
- understand the strategic plans, project prioritization methods and projects
- understand the importance of scheduling / allocating resources to a project
- develop strategies for developing and reinforcing high performance teams

GUIDELINES

1. The students are expected to get formed into a team of convenient groups of not more than 3 members on a project.
2. Every project team shall have a guide who is the member of the faculty of the institution. Identification of student group and their faculty guide has to be completed within the first two weeks from the day of beginning of 7th semester
3. The group has to identify and select the problem to be addressed as their project work. make through literature survey and finalize a comprehensive aim and scope of their work to be done.
4. A project report has to be submitted by each student group for their project work.
5. Three reviews have to be conducted by a team of faculty (minimum of 3 and maximum of 5) along with their faculty guide as a member of faculty team (for monitoring the progress of project planning and implementation).

COURSE OUTCOMES

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

- Prepare a literature survey in a specific domain as a team / individual to motivate lifelong learning.
- Identify the problem by applying acquired knowledge
- Choose efficient tools for designing project modules
- Design engineering solutions to complex problems utilizing a systems approach and combine all the modules for efficient testing.

TOTAL PERIODS 180

Mapping of Course Outcomes with Programme Outcomes (1/2/3 indicates strength of correlation) 3-strong, 2-Medium, 1-Weak														
COs	Programme Outcomes POs												Programme Specific Outcomes PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
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CO2	3	2	2	3	-	-	-	-	-	-	-	1	2	3
CO3	3	2	2	1	-	-	-	-	-	-	-	1	1	2
CO4	3	2	3	2	-	-	-	-	-	-	-	1	2	3



COURSE OBJECTIVES

enable the students to

- Introduce students to ideas and techniques from discrete mathematics that are widely used in science and engineering.
- Make the students to think logically and mathematically and apply these techniques in solving problems.
- Provide the foundation for imbedding logical reasoning in computer science.
- Develop recursive algorithms based on mathematical induction.
- Know basic properties of relations.

UNIT I PROPOSITIONAL CALCULUS

9

Propositions - Logical connectives - **Compound propositions** - Conditional and conditional propositions - Truth tables - Tautologies and contradictions - Contrapositive - **Logical equivalences and implications** - DeMorgan's Laws - **Normal forms** - Principal conjunctive and disjunctive normal forms - Rules of inference - Arguments - **Validity of arguments.**

UNIT II PREDICATE CALCULUS

9

Predicates - Statement function - Variables - **Free and bound variables** - Quantifiers - Universe of discourse - Logical equivalences and implications for quantified statements - Theory of inference - **The rules of universal specification and generalization** - Validity of arguments.

UNIT-III SET THEORY

9

Basic concepts - Notations - Subset - **Algebra of sets** - The power set - Ordered pairs and Cartesian product - Relations on sets - **Types of relations and their properties** - Relational matrix and the graph of relation - **Partitions Equivalence relations.**

UNIT IV FUNCTIONS

9

Definitions of functions - **Classification of functions** - Type of functions - Examples - Composition of functions - **Inverse functions** - Binary and n - ary operations - Characteristic function of a set - Hashing functions - **Recursive functions** - Permutation functions.

UNIT-V LATTICE THEORY

9

Partial ordering - Posets - Lattices as Posets - **Properties of lattices** - Lattices as Algebraic systems - Sub lattices - Direct product and Homomorphism - **Some Special lattices.**

TOTAL PERIODS 45**COURSE OUTCOMES**

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

- Construct mathematical arguments using logical connectives and quantifiers.
- Verify the correctness of an argument using propositional and predicate logic and truth tables.
- Demonstrate the ability to solve problems using counting techniques and combinatorics Construct proofs using direct proof, proof by contraposition, proof by contradiction, and proof by cases.
- Perform operations on discrete structures such as sets, functions, relations, and sequences.
- Understand the concepts of Boolean algebra.

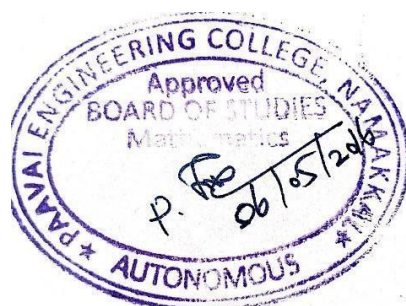
TEXT BOOKS

1. Kenneth H.Rosen, "Discrete Mathematics and its Applications (with Combinatorics and Graph Theory)", 6th Edition, Tata McGraw - Hill, 5th Reprint 2008.
2. Trembly J.P and Manohar.R, "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw - Hill, 35th Reprint 2008.

REFERENCES

1. Ralph.P.Grimaldi, "Discrete and Combinatorial Mathematics: An Applied Introduction", 4th Edition, Pearson Education, 2002.
2. A.Tamilarasi, A.M.Natarajan, "Discrete Mathematics and its Applications", 3rd Edition, Khanna Publishers, 2008.
3. T.Veerarajan, "Discrete Mathematics with Graph Theory and Combinatorics", Tata McGraw - Hill, 2007.

Mapping of Course Outcomes with Programme Outcomes (1/2/3 indicates strength of correlation) 3-strong, 2-Medium, 1-Weak														
COs	Programme Outcomes(POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
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CO3	2	3	3	-	-	-	-	-	-	-	-	3	3	3
CO4	2	2	3	3	-	-	-	-	-	-	-	2	3	3
CO5	3	3	3	-	-	-	-	-	-	-	-	3	3	3



3COURSE OBJECTIVES

To enable the students to

- Provide an overview on role of web services in commercial applications and the principles of web service Provision.
- Understand Internet Service Provision, the Web Service concepts and XML Technology.
- Understand and explore design and implementation of distributed services.
- Classify different forms and protocols of Web services.
- Describe the challenges of Securing Web Services. PRE - REQUIREMENT: Nil

UNIT I INTRODUCTION

9

Introduction to Internet and WWW - Introduction to HTML - XML - CSS - Creating Markup with XML - benefits Advantages of XML over HTML - EDL - XML Standards - Document Type Definition (DTD) - Attribute Types - Conditional Sections - Whitespace Characters.

UNIT II XML TECHNOLOGY

9

XML Schemas - DOM - DOM Components - Simple API for XML (SAX) - XML Path Language - Presentation Technologies - XSL - XFORMS - XHTML - Transformation - Extensible Style sheet Language Transformations (XSLT) - X link - X query - X Pointer - X Include and X Base.

UNIT III WEB SERVICES

9

Evolution of Distributed Computing - CORBA - Java RMI - Microsoft DCOM - Message Oriented Middleware - Introduction to Web Services - Core Web Services Standards - Building Web Services Architecture - Web Services Communication Models - Implementation view - Web services technology stack - Logical view - Composition of web services - Deployment view - From application server to peer to peer - Process view - Life in the runtime.

UNIT IV WEB SERVICES BUILDING BLOCKS

9

Transport protocols for web services - Messaging with web services - Protocols - SOAP - Describing web services - Anatomy of a SOAP message - SOAP Encoding - SOAP Message Exchange Model - SOAP Communication - SOAP Security. WSDL - Anatomy of WSDL - Manipulating WSDL - UDDI - Anatomy of UDDI.

UNIT V WEB SERVICES SECURITY

9

Challenges of Securing Web Services - XML Security Standards - Web Services Security implementation in WCF - Rapid fire Cryptography - XML Encryption - XML Signature - Types of XML Signature - Canonicalization - Implementations of XML Signature - XML key management specification.

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

- Upon the completion of the course, students will be able to
- Develop web based applications.

- Demonstrate the basics of web services.
- Understand the different forms and protocols of Web services.
- Describe the web service building blocks.

TEXT BOOKS

1. Deitel H M, Deitel P J, Nirto T R, Lin T M, XML How to Program, Pearson Edition, 2011.
2. Frank. P. Coyle, XML, Web Services And The Data Revolution, Pearson Education, 2002.
3. Eric Newcomer, Understanding Web Services: XML, WSDL, SOAP and UDDI, Addison Wesley, 2002.

REFERENCES

1. Ramesh Nagappan , Robert Skoczylas and Rima Patel Sriganesh, Developing Java WebServices, Wiley Publishin Inc., 2007.
2. Steve Graham and Doug Davis, Building Web services with Java, Pearson education 2000.
3. Charles F. Goldfarb and Paul Prescod, The XML Handbook, Pearson education asia, 2001.
4. Etbankarami, Web services Essential, O., Reilly, 2006.

WEB LINKS

1. <https://msdn.microsoft.com/en-us/library/ms996507.aspx>.
2. <http://www.tutorialspoint.com/webservices>.

Mapping of Course Outcomes with Programming Outcomes (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	Programme Outcomes(POs)												Programme Specific Outcomes (PSOs)	
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CO2	3	2	3	3	-	-	-	-	-	-	-	2	3	3
CO3	2	3	1	-	-	-	1	-	-	-	-	2	3	3
CO4	3	3	3	3	-	-	-	-	-	-	-	2	1	3
CO5	3	3	3	-	-	2	-	-	-	-	-	3	3	2



COURSE OBJECTIVES

To enable the students to

- Understand the Big Data and Hadoop.
- Acquire knowledge of HDFS and YARN.
- Provide Map reduce concepts and Interfacing.
- Gain knowledge about Eco system.
- Learn the fundamental concept of Data Analytics with R.

UNIT I INTRODUCTION TO BIG DATA AND HADOOP

8

Types of Digital Data, - **Introduction to Big Data** - Big Data Analytics - Big data Technology landscape - History of Apache Hadoop - Analyzing - **Data with Unix tools** - analyzing Data with Hadoop - Hadoop Streaming – IBM Big Data Strategy - **Introduction to Infosphere Big Insights and Big Sheets.**

UNIT II HDFS (Hadoop Distributed File System)

10

HDFS Architecture - Daemons Related to HDFS - **Working with HDFS Command** - Special Features of Hadoop Processing Data with Hadoop - **Managing Resources and Applications with YARN** - Introduction - Limitation of Hadoop1.0 - Hadoop 2: HDFS - Hadoop 2: YARN.

UNIT III MAP REDUCE

9

Introduction - **How Map Reduce Works** - Types - Formats - Map Reduce Example - Word Count Example - Anatomy of a Map Reduce Job - Run, Failures - Job Scheduling - **Shuffle and Sort** - Task Execution - Map Reduce Using Java - Map Reduce Features.

UNIT IV HADOOP ECO SYSTEM

9

Pig: Introduction to PIG - **Execution Modes of Pig** - Comparison of Pig with Databases - Grunt - Pig Latin - User Defined Functions - Data Processing operators. Mango DB: Recap of NoSQL databases - Mongo DB - CRUD - MongoDB - Arrays - Java Scripts - Cursors - **Map Reduce Programming** - Aggregations. Hive : Hive Shell - Hive Services - Hive Metastore - Comparison with Traditional Databases - Hive QL - Tables - Querying Data and User **Defined Functions.** Hbase: **HBasics - Concepts - Clients - Example** - Hbase Versus RDBMS .Cassandra: Cassandra - CQLSH - CRUD - Counter - List - Set - Map – Tracing .Big SQL : Introduction.

UNIT V DATA ANALYTICS WITH R

9

Machine Learning: Introduction - **Supervised Learning** - Unsupervised Learning - Collaborative Filtering. Big Data **Analytics with Big R.**

TOTAL PERIODS 45

COURSE OUTCOMES

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

- Identify Big Data, Hadoop and its Business Implications.
- List the components of Hadoop Distributed File System.
- Manage Map Reduce in Hadoop Environment.
- Develop Big Data Solutions using Hadoop Eco System.
- Able to gain knowledge about Machine Learning Techniques using R

TEXT BOOKS

1. Tom White “Hadoop: The Definitive Guide” Third Edit on, O’reily Media, 2012.
2. SeemaAcharya, SubhasiniChellappan, "Big Data Analytics" Wiley 2015.

REFERENCES

1. Michael Berthold, David J. Hand, "Intelligent Data Analysis”, Springer, 2007.
2. JayLiebowitz, “Big Data and Business Analytics” Auer Bach Publications, CRC press (2013).
3. Tom Plunkett, Mark Hornick, “Using R to Unlock the Value of Big Data: Big Data Analytics with Oracle R Enterprise and Oracle R Connector for Hadoop”, McGraw - Hill/Osborne Media (2013), Oracle press.

WEB LINKS

1. https://www.tutorialspoint.com/big_data_analytics/index.htm.
2. <https://www.youtube.com/watch?v=3SK9iJNYehg>.
3. <https://www.youtube.com/watch?v=zez2Tv-bcXY>.

Mapping of Course Outcomes with Programming Outcomes (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
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CO3	2	3	1	-	-	-	1	-	-	-	-	2	3	3
CO4	3	3	3	3	-	-	-	-	-	-	-	2	1	3
CO5	3	3	3	-	-	2	-	-	-	-	-	3	3	2



COURSE OBJECTIVES

To enable the students to

- Learn the basics of parallel computing and programming.
- Learn the system development like architecture and memory.
- Gain the knowledge of network topologies in parallel computing.
- Understand the different parallel programming models.
- Know the various message passing interface models.

PRE - REQUISITE: Computer Architecture, Computer Networks, Operating System

UNIT I	INTRODUCTION TO PARALLEL COMPUTING	9
Introduction to parallel computing - Parallel Programming Paradigm - Architecture - Design Dimensions of Scalability - Parallel Programming Models - Basic Concepts Of Clustering - Scalable Principles - Parallel Programming Overview - Processes , Tasks and Threads - Parallelism Issues - Interaction/ Communication Issues - Semantic Issues In Parallel Programs.		
UNIT II	ENABLING TECHNOLOGIES	9
System Development Trends - Principles of Processor Design - Microprocessor Architecture Families - Hierarchical Memory Technology - Cache Coherence Protocols - Shared Memory Consistency - Distributed Cache Memory Architecture - Latency Tolerance Techniques - Multithreaded Latency Hiding.		
UNIT III	SYSTEMS INTERCONNECTS	9
Basics of Interconnection Networks - Network Topologies and Properties - Buses, Crossbar and Multistage Switches, Software Multithreading - Synchronization Mechanisms .		
UNIT IV	PARALLEL PROGRAMMING	9
Fundamental concepts - Designing for threads Threading and parallel programming constructs - Synchronization - Critical sections - Deadlock. Threading APIs .		
UNIT V	MESSAGE PASSING	9
Message Passing Paradigm - Message Passing Interface - MPI Model - data decomposition –communicators and topologies - point -to - point communication - MPI Library Parallel Virtual Machine .		
TOTAL PERIODS		45

COURSE OUTCOMES

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

- Understand the parallel programming models and issues in parallelism.
- Understand the programming Systems and memory.
- Correlate the network concepts with parallel programming.
- Design the threads in parallel programming.
- Understand the interfaces in message passing and virtual machine

TEXT BOOKS

1. Peter S. Pacheco, “An Introduction to Parallel Programming”, Morgan Kaufmann, 2011.
2. Michael J Quinn, “Parallel programming in C with MPI and Open MP”, Tata McGraw Hill, 2003.

REFERENCES

1. John L. Hennessey and David A. Patterson, “Computer Architecture - A quantitative approach”, Morgan Kaufmann / Elsevier Publishers, 5th. Edition, 2012.
2. B. Lewis and D. J. Berg, “Multithreaded programming with Pthreads”, Sun Microsystems Press, 1998.
3. Rob Farber, “CUDA application design and development”, Morgan Kaufmann, 2011.
4. B. Chapman, G. Jost, and Ruud van der Pas, “Using Open MP”, MIT Press, 2008.
5. W. Gropp, E. Lusk, and R. Thakur, “Using MPI - 2: Advanced features of the message passing interface”, MIT Press, 1999.

WEB LINKS

1. <http://nptel.ac.in/courses/106102114/>
2. <http://nptel.ac.in/courses/106104024/>

Mapping of Course Outcomes with Programming Outcomes (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	Programme Outcomes(POs)												Programme Specific Outcomes (PSOs)	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO12	PSO 1	PSO 2
CO1	2	3	3	3	-	-	-	-	-	-	-	3	3	3
CO2	3	2	3	3	-	-	-	-	-	-	-	2	3	3
CO3	2	3	1	-	-	-	1	-	-	-	-	2	3	3
CO4	3	3	3	3	-	-	-	-	-	-	-	2	1	3
CO5	3	3	3	-	-	2	-	-	-	-	-	3	3	2



COURSE OBJECTIVES

To enable the students to

- Understand the basics of R Programming.
- Gain the knowledge in R Programming structures and function.
- Be familiar with Object - Oriented Programming concepts in R Programming.
- Provide the concept and an understanding of basic concepts in python programming.
- Analyze the manipulating directories and other functions PRE - REQUISITE: Nil

UNIT I	INTRODUCTION TO R PROGRAMMING	9
Statistical Work in R Programming - Getting Started - Vector - Matrices - Lists - Data Frames - Factors and Tables.		
UNIT II	R PROGRAMMING STRUCTURES AND FUNCTION	9
Control Statements - Arithmetic and Boolean Operators and Values - Type Conversions. R Function: Functions Are Objects - Return Values - Functions Have No Side Effects.		
UNIT III	OBJECT - ORIENTED PROGRAMMING IN R PROGRAMMING	9
Managing Your Objects - Generic Functions - Writing Classes - Extended Example: a Procedure for Polynomial Regression.		
UNIT IV	INTRODUCTION TO PYTHON PROGRAMMING	9
History - Features - The Basic elements of python - Conditional operators - Branching Programs - Control Structures - Strings and Input - Iteration - Opening and closing - files - various types of file modes - reading and Writing to files - manipulating - directories - Iterables - Iterators, Problem - solving applications.		
UNIT V	FUNCTIONS, SCOPING AND ABSTRACTION	9
Functions and scoping - Specifications - Recursion - Global variables - Modules - System functions and Parameters - Structured types - Mutability - Higher - Order Functions - Strings, Tuples - Lists and Dictionaries - Lists and Mutability - Functions as objects.		
TOTAL PERIODS		45

COURSE OUTCOMES

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

- understand and gain knowledge in R Programming.
- understand the working with R Structure and Function.
- implement the simple application in OOPS Concept in R Programming.
- develop proficiency in creating based applications using the python Programming Language.
- understand the various functions, abstractions, tuples and Scope available in python programming language and apply them in solving computational problems.

TEXT BOOKS

1. Norman Matloff ,” The Art of R Programming: A Tour of Statistical Software Design”, 1st Edition, 2011 .
2. John V Guttag. “Introduction to Computation and Programming Using Python”, Prentice Hall of India, 2nd Edition, 2016.

REFERENCES

1. R. Nageswara Rao, “Core Python Programming”, dreamtech, 2nd Edition, 2017.
2. O'Reilly Media,” R Cookbook”, Paul Teetor, March 2011.

WEB LINKS

1. <https://www.udemy.com/r - basics/>
2. <https://www.python.org>
3. <https://pythonprogramming.net>

Mapping of Course Outcomes with Programming Outcomes (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	Programme Outcomes(POs)												Programme Specific Outcomes (PSOs)	
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CO4	3	3	3	3	-	-	-	-	-	-	-	2	1	3
CO5	3	3	3	-	-	2	-	-	-	-	-	3	3	2



COURSE OBJECTIVES

To enable the students to

- Differentiate database systems from file systems by enumerating the features provided by database systems and describe each in both function and benefit.
- Demonstrate an understanding of the relational data model.
- Gain experience with SQL.
- Formulate solutions to a broad range of query and data update problems using using SQL.
- Demonstrate an understanding of normalization theory and apply such knowledge to the normalization of a database.

PRE - REQUISITE: Nil

UNIT I INTRODUCTION**9**

Database System Architecture: Purpose of Database Systems - Views of Data - Database Languages - Data Storage and Querying - Transaction Management – Database Architecture - Database Users and Administrators. Relational Databases: Structure of Relational Databases - Database Schema - Keys - Schema Diagram.

UNIT II QUERY LANGUAGES AND E - R MODEL**9**

Formal Relational Query Languages: Relational Algebra - Tuple and Domain Relational Calculus, Database Design and E - R Model: Overview - Entity Relationship Model - Constraints - Removing Redundant Attributes in Entity Sets - E - R Diagrams.

UNIT III STRUCTURED QUERY LANGUAGE (SQL)**9**

Introduction to SQL: Overview of SQL Query Languages - SQL Data Definition - Basic Structure Of SQL Queries - Additional Basic Operations - Set Operations - Aggregate Functions - Nested Sub Queries - Join Expressions - Views - Transactions - Integrity Constraints - SQL Data Types and Schemes - Authorization.

UNIT IV ADVANCED SQL**9**

Accessing SQL from a Programming Languages - Functions and Procedures - Triggers.

UNIT V RELATIONAL DATABASE DESIGN**9**

Features of Good Relational Database Design - Informal Guide Lines For Relational Schemas - Decomposition Using Functional Dependencies - Functional Dependency Theory - First, Second, Third and Boyce Codd Normal Forms.

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

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

- Define the fundamental elements of a database management system.
- Explain the basic concepts of relational data model, entity - relationship model.
- Outline relational algebra and database query language (SQL).
- Explain relational database design.
- Construct a database for a given problem using E - R model, normalization and SQL.

REFERENCES

1. Abraham Silberschatz, Henry Korth, and S. Sudarshan, "Database System Concepts", Sixth Edition, McGraw - Hill, 2011.
2. Elmasri and S. Navathe, "Fundamentals of Database Systems", Pearson Education, Sixth Edition, 2011.
3. Thomas M. Connolly and Carolyn E. Begg, "Database Systems - A Practical Approach to Design, Implementation, and Management", Pearson Education, Fifth edition, 2010.
4. C.J.Date, A.Kannan and S.Swamynathan, "An Introduction to Database Systems", Pearson Education, Eighth Edition, 2006.

WEB LINKS

1. <http://ocw.mit.edu/courses>
2. <http://docs.mongodb.org/manual/>

Mapping of Course Outcomes with Programming Outcomes (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
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CO4	3	3	3	3	-	-	-	-	-	-	-	2	1	3
CO5	3	3	3	-	-	2	-	-	-	-	-	3	3	2



COURSE OBJECTIVES

To enable the students to

- Gain knowledge about E-Commerce and its business models.
- Understand the infrastructure of E-Commerce.
- Acquire the knowledge about web server software and tools.
- Identify the major security issues associated with Internet.
- Look toward a next generation approach to security engineering by Research

PRE - REQUISITE: Nil

UNIT I INTRODUCTION	9
History of E - Commerce - Overview of E - Commerce framework - E - Business models - Network infrastructure - Role of Internet - E - commerce and World wide Web.	
UNIT II INFRASTRUCTURE FOR E COMMERCE	9
Packet switched networks - TCP/IP protocol script - Internet utility programmes - SGML, HTML and XML - web client and Servers - Web client/server architecture - intranet and extranets.	
UNIT III WEB BASED TOOLS FOR E COMMERCE	9
Web server - performance evaluation - web server software feature sets - web server software and tools - web protocol - search engines - intelligent agents - EC software - web hosting - cost analysis.	
UNIT IV SECURITY	9
Internet security standards - secure electronic payment protocols - cryptography and authentication - security issues - encryption techniques - e commerce payment mechanisms - SET protocol - electronic check - electronic cash - E - Commerce Ethics - regulations and social responsibility.	
UNIT V INTELLIGENT AGENTS	9
Definition and capabilities - limitation of agents - security - web based marketing - search engines and Directory registration - online advertisements - Portables and info mechanics - website design issues - e-shopping - online Money transaction.	
TOTAL PERIODS	45

COURSE OUTCOMES

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

- Understand the various aspects of E - Commerce.
- Analyze the technical backbone of internet behind in E - Commerce.
- Develop a website for e - commerce.
- Identify the major security issues associated with Internet.
- Explore the issues in electronic money transactions.

TEXT BOOKS:

1. Ravi Kalakota and Andrew B Whinston, “ Frontiers of Electronic Commerce“, Pearson Education Asia 1999.
2. Marilyn Greenstein and Todd M Feinman , ”Electronic commerce: Security, Risk Management and Control” Tata McGraw - Hill , 2000.
3. KameshK.Bajaj and Debjani Nag,E - Commerce the Cutting Edge of Business, Tata McGraw Hill, 2005.

REFERENCES

1. EfraimTurvanJ.Lee, David kug and chung, “Electronic commerce” Pearson Education Asia2001.2.
Brenda commerce Business Prentice Hall, 2000.
2. Judy Strauss and Raymond Frost , “E Marketing“, PHI, 2002.
3. Brenda Kienan, “Managing e Commerce Business”, PHI, 2001.
4. Vivek Sharma and Rajiv Sharma, “Developing e Commerce Sites - an integrated approach“, Pearson Education Asia, 2000.

WEB LINKS

1. <http://www.tech tutorials.info/ecommerce.html>
2. <http://www.iseca.org/mirrors/sans.org/4 - 37.pdf>
3. <http://www.cs.berkeley.edu/~russell/aimale/chapter02.pdf>

Mapping of Course Outcomes with Programming Outcomes (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
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CO3	2	3	1	-	-	-	1	-	-	-	-	2	3	3
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CO5	3	3	3	-	-	2	-	-	-	-	-	3	3	2



PROGRAMME ELECTIVE II

CS16251

SEMANTIC WEB

3 0 0 3

COURSE OBJECTIVES

To enable students to

- understand the fundamentals of Semantic Web.
- know the languages used in Semantic Web and ontologies.
- learn the algorithms of Semantic Web.
- understand tools used in the Semantic Web technologies.
- know the overall applications of Semantic Web.

UNIT I INTRODUCTION

9

Fundamentals: Defining the Semantic Web - Semantic Web Roadblocks Components, Types, Major Avoiding the Programming Components, Impacts - Establishing a Web Data, Centric Perspective, Expressing Semantic Data -Road blocks - Ontological Commitments, Categories – Knowledge Representation Ontologies - Top Level -Linguistic - Domain - Semantic Web, Foundation, Layers, Architecture.

UNIT II LANGUAGES FOR SEMANTIC WEB AND ONTOLOGIES

9

Web Documents in XML – Resource Description Framework (RDF), Schema, Web Resource Description using RDF, Properties, Maps and RDF – Overview, Syntax Structure, Semantics - Pragmatics -Traditional Ontology Languages LOOM , OKBC, OCML - Flogic Ontology Markup Languages - SHOE , OIL , DAML OIL, OWL .

UNIT III ONTOLOGY LEARNING FOR SEMANTIC WEB

9

Taxonomy for Ontology Learning - Layered Approach - Phases of Ontology Learning - Importing and - Processing Ontologies and Documents - Ontology Learning Algorithms - Evaluating ontological and non-ontological resources.

UNIT IV ONTOLOGY MANAGEMENT AND TOOLS

9

Overview - Need for management - Development process – Target ontology – Ontology mapping – Skills Management system – Ontological class – Constraints, Issues, Evolution – Development of tool suits, Ontology Merge tools, Ontology based annotation tools.

UNIT V APPLICATIONS

9

WSMO – OWL – Semantic Web Service – Case study for specific domain security issues.

TOTAL PERIODS 45

COURSE OUTCOMES

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

- understand the basics of semantic web and XML.
- know the significance of RDF
- construct an ontology for semantic web.
- identify the ontology management and tools.
- explain the applications of semantic web technologies..

TEXT BOOKS

1. Allemang, D & Hendler, J, “Semantic Web for the working oncologist”. 2nd Edition, Morgan & Kaufmann Publisher, 2011.
2. Asuncion Gomez - Perez, OscarCorcho, Mariano Fernandez - Lopez, “Ontological Engineering: with examples from the areas of Knowledge Management, e-Commerce and the Semantic Web” Springer,

REFERENCES

1. Heath, T., & Bizer, C, “ Linked Data: Evolving the Web into a Global Data Space”, Morgan & Claypool Publisher, 2011.
2. Daconts, M.C, Orbst, L.J, & Smith. K, “The Semantic Web: A Guide to the Future of XML, Web Services and Knowledge Management”, New York: Wiley. [ISBN: 0 - 471 - 43257 - 1], 2003.

Mapping of Course Outcomes with Programme Outcomes (1/2/3 indicates strength of correlation) 3-strong, 2-Medium, 1-Weak														
COs	Programme Outcomes POs												Programme Specific Outcomes PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	-	-	-	-	-	-	-	1	2	3
CO2	3	3	2	3	-	-	-	-	-	-	-	1	3	3
CO3	3	3	2	3	-	-	-	-	-	-	-	1	2	3
CO4	3	2	3	1	-	-	-	-	-	-	-	1	3	3
CO5	3	2	3	2	-	-	-	-	-	-	-	1	2	3



COURSE OBJECTIVES

To enable students to

- impart the fundamentals of WSN and its advantages.
- learn about the MAC Layer and Routing Process.
- know about the Routing Protocols.
- get an idea about the Sensor Network databases.
- gain knowledge about applications of Wireless Sensor Networks.

UNIT I INTRODUCTION TO WIRELESS SENSOR NETWORKS**9**

Over view of sensor networks - Constraints and challenges - Applications – Contention Collaborative processing - Key definitions in sensor networks - Tracking scenario - Problem formulation Distributed representation and interference of states - Tracking multiple Objects - Sensor Models Performance Comparison and metrics.

UNIT II MAC LAYER**9**

Medium Access Control Protocols: Fundamentals of MAC protocols - Low duty cycle protocols and wakeup concepts - Contention - based protocols - Schedule - based protocols - SMAC - BMAC
- Traffic - adaptive medium access protocol (TRAMA) - The IEEE 802.15.4 MAC protocol and Zig Bee
- General Issues - Geographic, Energy- Aware Routing - Attribute Based Routing.

UNIT III ROUTING PROTOCOLS**9**

Medium Access Control Protocols: Fundamentals of MAC protocols - Low duty cycle protocols and wakeup concepts - Contention - based protocols - Schedule - based protocols - SMAC - BMAC
- Traffic - adaptive medium access protocol (TRAMA) - The IEEE 802.15.4 MAC protocol and Zig Bee
- General Issues - Geographic, Energy- Aware Routing - Attribute Based Routing.

UNIT IV SENSOR NETWORK DATABASE AND TOOLS**9**

Sensor Database Challenges - Querying the Physical Environment - Interfaces - IN- network Node level Aggregation - Data Centric Storage - Data indices and Range Queries - Distributed Hierarchical Aggregation
- Temporal data - Sensor Node Hardware - Sensor Network Programming Challenges Software Platforms
- Operating System TinyOS - Node Level Simulators - State Centric Programming
- Applications and Future Directions.

9

TOTAL PERIODS 45

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

- understand the concepts of wireless sensor networks.
- identify the mac layer functions.
- analyses the mechanisms of routing protocols.
- design the network database and their tools.
- apply the concepts of wireless sensor networks in real-time applications.

1. Feng Zhao & Leonidas J. Guibas, “Wireless Sensor Networks - An Information process Approach, First Edition ,2004.
2. KazemSohraby, Daniel Minoli and TaiebZnati, “Wireless Sensor Networks Technology Protocols, and Applications“, John Wiley & Sons, 2007

1. Holger Karl and Andreas Willig, "Protocols and Architectures for Wireless Sensor Networks", John Wiley & Sons, Ltd, 2005.
2. WaltenegusDargie, Christian Poellabauer "Fundamentals of Wireless Sensor Networks: Theory and Practice", Wiley, 2010.
3. Anna Hac, "Wireless Sensor Network Designs", John Wiley, 2003.



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CO2	2	3	2	2	-	-	-	-	-	-	-	1	2	3
CO3	3	2	2	3	-	-	-	-	-	-	-	1	3	3
CO4	3	3	3	1	-	-	-	-	-	-	-	1	2	3
CO5	3	2	2	2	-	-	-	-	-	-	-	1	2	3

COURSE OBJECTIVES

To enable students to

- know the basic concepts of data science tool kit.
- be aware of how data is collected, managed and stored for data science.
- understand statistics and machine learning concepts that are vital for data science.
- critically evaluate data visualizations based on their design.
- analyze various data visualizations techniques.

UNIT I INTRODUCTION**9**

Introduction to core concepts and technologies: Introduction-Terminology- data science process- data science toolkit-Types of data-Example applications.

UNIT II DATA COLLECTION AND MANAGEMENT**9**

Data collection and management: Introduction-Sources of data- Data collection and APIs- Exploring and fixing data-Data storage and management- Using multiple data sources.

UNIT III DATA ANALYSIS**9**

Data Analysis: Introduction-Terminology and concepts- Introduction to statistics- Central tendencies and distributions-Variance- Distribution properties and arithmetic- Samples/CLT- Basic machine learning algorithms-Linear regression, SVM, Naive Bayes.

UNIT IV DATA VISUALIZATION**9**

Data visualization: Introduction-Types of data visualization- Data for visualization: Data types-Data encodings- Retinal variables- Mapping variables to encodings- Visual encodings.

UNIT V APPLICATIONS OF DATA SCIENCE**9**

Applications of Data Science- Technologies for visualization- Recent trends in various data collection and analysis techniques-various visualization techniques- application development methods of used in data science.

TOTAL PERIODS 45

COURSE OUTCOMES

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

- understand the basic concepts of data science.
- articulate the key concepts in data science, including their real-world applications and the toolkit used by data scientists.
- implement machine learning algorithm
- execute data visualization based on their design
- analyze various technologies for visualization techniques.

TEXT BOOKS

1. V.K Jain, second edition “Data Science and Analytics”, Khanna Publication, 2018.

REFERENCES

1. Cathy O’Neil and Rachel Schutt. Doing Data Science, Straight Talk fromThe Frontline. O’Reilly,2014.
2. Jure Leskovek, AnandRajaraman and Jeffrey Ullman, Mining of Massive Datasets. second edition, 2016.

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CO3	3	3	2	3	-	-	-	-	-	-	-	1	2	3
CO4	3	2	3	3	-	-	-	-	-	-	-	1	2	3
CO5	3	2	3	2	-	-	-	-	-	-	-	1	1	3



COURSE OBJECTIVES

To enable students to

- understand the overview of Internet of Things with various design levels and templates.
- describe the generic design methodology for internet of things with python programming.
- analyze the characteristics and applications of domain specific IoTs for real life scenarios.
- know about raspberry pi device and use of cloud platforms and frameworks for developing IoT applications.
- evaluate the approaches for collecting and analyzing data generated by IoT systems in the cloud.

PRE - REQUISITE: Wireless Sensor Networks**UNIT I INTRODUCTION TO IoT 9**

Introduction – Definition and Characteristics of IoT – Physical Design of IoT – Logical Design of IoT - IoT Enabling Technologies – IoT Levels and Deployment Templates.

UNIT II DEVELOPING INTERNET OF THINGS 9

Motivation for using Python – Logical Design using Python – Python Data Types and Data Structures – Control Flow Functions – Modules – Packages – File Handling – Date / Time Operations - Classes - Python Packages of Interest for IoT.

UNIT III DOMAIN SPECIFIC IoTs 9

Home Automation – Cities – Environment – Energy – Retail – Logistics – Agriculture – Industry – Health and Lifestyle – IoT and M2M – IoT Protocols – MQTT, CoAP, AMQP.

UNIT IV IOT PHYSICAL DEVICES, ENDPOINTS, PHYSICAL SERVERS AND CLOUD OFFERINGS 9

IoT Device - Raspberry Pi-Raspberry Pi Interfaces - Programming Raspberry Pi with Python - Other IoT Devices -Cloud Storage Models and Communication APIs - WAMP - Xively Cloud for IoT - Django - Amazon Web Services for IoT - Sky Net IoT Messaging Platform - Case Study on Smart Parking and Air Pollution Monitoring.

UNIT V DATA ANALYTICS FOR IoT 9

Introduction - Apache Hadoop - Using Hadoop Map Reduce for Batch Data Analysis - Apache Oozie - Apache Spark - Apache Storm - Using Apache Storm for Real-Time Data Analysis - Case Study on Weather Monitoring.

TOTAL PERIODS 45

COURSE OUTCOMES

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

- understand the basic concepts and technologies used in internet of things.
- apply the generic design methodology for internet of things with python programming to design the model.
- obtain the knowledge of the different types of domain specific iots for real life applications.
- gain the knowledge of raspberry pi device and its use in cloud platforms and other frameworks for developing iot applications.
- understand the processes of collecting and analyzing data generated by iot systems in the cloud.

TEXT BOOKS

1. ArshdeepBahga, Vijay Madiseti, "Internet of Things - A hands - on approach", Universities Press, 2015.

REFERENCES

1. CharalamposDoukas, "Building Internet of Things With the Arduino", Volume 1, published by Createspace, 2012.
2. Andrian McEwen, Hakim Cassimally, "Designing the Internet of Things", 1st edition, John Wiley & Sons Ltd, 2014.
3. Honbo Zhou, "The Internet of Things in the Cloud: A Middleware Perspective", 1st edition, CRC Press, 2013.

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CO3	2	3	2	3	-	-	-	-	-	-	-	1	2	2
CO4	3	2	3	2	-	-	-	-	-	-	-	1	2	3
CO5	3	3	2	2	-	-	-	-	-	-	-	1	2	3



COURSE OBJECTIVES

To enable students to

- familiarize the data base system concepts, data models and to conceptualize a database system using ER diagrams.
- know the concepts of parallel and distributed databases
- study XML database concepts.
- learn the active, temporal and spatial database concepts to enhance the data models.
- learn the emerging mobile database technology related to the advanced database systems.

UNIT I DATABASE SYSTEM CONCEPTS 9

Database System Architecture, Data Model. Relational Model, Entity Relationship Model – Normalization - Query Processing - Query Optimization - Transaction Processing - Concurrency Control – Recovery - Database Tuning : Relational, Mapping and Entity Relationship - Normalization and Transaction- Distributed Transaction Management- Distributed Query Processor.

UNIT II PARALLEL AND DISTRIBUTED DATABASES 9

Parallel Databases: I/O parallelism - Inter and Intra query parallelism, Inter and Intra Issues - operation parallelism - Distributed Databases: Introduction to Distributed Database Systems - Distributed Database System Architecture- Top - Down Approach - Distributed Database Design Fragmentation – Allocation, Database Integration, Bottom - up approach, Schema Matching, Schema Integration, Schema Mapping.

UNIT III XML DATABASES 9

XML Databases: XML Data Model, DTD, XML Schema, XML Querying – Web Databases – JDBC – Information Retrieval – Data Warehousing – Data Mining.

UNIT IV ACTIVE, TEMPORAL AND SPATIAL DATABASE 9

Active database concepts and triggers - Temporal databases - Deductive databases - Geographic information systems.

UNIT V MOBILE DATABASE 9

Location and handoff management - Effect of mobility on data management - Location dependent data distributions - Mobile transaction models - Concurrency control -Transaction commit protocols - Information retrieval – Web databases.

TOTAL PERIODS 45

COURSE OUTCOMES

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

- understand the database system concepts.
- design parallel and distributed databases for application development.
- understand XML database concepts.
- design active and temporal database concepts for enhancing the data models and for managing the geographic information systems
- apply the emerging technologies in Mobile and Web databases.

TEXT BOOKS

2. R. Elmasri, S.B. Navathe, “Fundamentals of Database Systems”, Fifth Edition, Pearson Education, 2006.
3. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, “Database System Concepts”, Fifth Edition, Tata McGraw Hill, 2006.

REFERENCES

3. C.S.R.Prabhu, “Object oriented data base system approaches and architectures” PHI, India, 2004.
4. Rob cornell“ Data Base System And Implementation” cengage learning 2011.

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CO3	3	2	2	3	-	-	-	-	-	-	-	1	2	2
CO4	3	2	3	2	-	-	-	-	-	-	-	1	2	3
CO5	3	2	2	2	-	-	-	-	-	-	-	1	2	3



COURSE OBJECTIVES

To enable students to

- understand the fundamentals and design issues in ad hoc.
- impart knowledge in the different types of protocols.
- be familiar with the classification and mechanism of routing protocols.
- learn the procedures and classify the routing protocols.
- know the concepts of various attacks and QOS framework.

UNIT I INTRODUCTION 9

Fundamentals of Wireless Communication Technology - Electromagnetic Spectrum, Radio propagation Mechanisms, Characteristics of the Wireless Channel. Fundamentals of WLANs - ad hoc wireless network, Mobile ad hoc networks (MANETs), Applications of ad hoc wireless networks, Issues in ad hoc wireless networks.

UNIT II MAC PROTOCOLS FOR AD HOC WIRELESS NETWORKS 9

Issues in designing a MAC Protocol for ad hoc wireless networks - Classification of MAC Protocols - Contention Based protocols, Contention based protocols with Reservation Mechanism, Contention based MAC Protocols with Scheduling Mechanism – Multi channel MAC – IEEE 802.11.

UNIT III ROUTING PROTOCOLS FOR AD HOC WIRELESS NETWORKS 9

Routing Protocols for Ad-hoc Wireless Networks - Classifications of Routing Protocols, Table Driven Routing Protocols, On Demand Routing Protocols, Hybrid Routing Protocols, Routing Protocol with Efficient Flooding Mechanism , Hierarchical Routing Protocol.

UNIT IV MULTICAST ROUTING ,TRANSPORT LAYER IN AD HOC WIRELESS NETWORKS 9

Issues in Designing a Multicast Routing Protocol - Classification of Multicast Routing Protocols, Application Dependent Multicast Routing - Design Goals of a Transport Layer, Protocol for Ad Hoc Wireless Networks, Classification of Transport Layer Solutions.

UNIT V SECURITY PROTOCOLS AND QOS IN AD HOC WIRELESS NETWORKS 9

Security in Ad Hoc Wireless Networks - Issues and Challenges in Security Provisioning, Attacks, Key Management, Secure Routing in Ad Hoc Wireless Networks. QOS - Classification of QOS, MAC and Network Layer Solutions, QOS Framework.

COURSE OUTCOMES

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

- explain the concepts, network architectures and applications of ad hoc Networks.
- analyse the protocol design issues of ad hoc Wireless Networks.
- design routing protocols for ad hoc wireless networks with respect to some protocol design issues.
- examine the Multicast Routing and Transport Layer Solutions.
- evaluate the QoS related performance measurements of ad hoc wireless networks.

TEXT BOOKS

1. C. Siva Ram Murthy, and B. S. Manoj, “Ad Hoc Wireless Networks: Architectures and Protocols” Prentice Hall Professional Technical Reference, 2013.

REFERENCES

1. Charles .E. Perkins, “AdHocNetworking”, Pearson Education, 2008.
2. C.K.Toth, “Ad Hoc Mobile Wireless Networks - Protocols and Systems”, Pearson Education, 2007.
3. Marco Conti, Jon Crowcroft, Andrea Passarella, “MultihopAdHoc Networks from Theory to Reality” Nova Science Publishers, Inc, NewYork, 2007.

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CO3	3	3	2	2	-	-	-	-	-	-	-	1	3	3
CO4	2	2	3	1	-	-	-	-	-	-	-	2	2	3
CO5	3	2	2	2	-	-	-	-	-	-	-	1	2	3



COURSE OBJECTIVES

To enable students to

- understand the basic concepts of graph and tree.
- gain knowledge in concept of network flow, spanning tree and planar graph.
- understand the matrices of the graph and the directed graph concepts.
- implement the arrangement and grouping concepts mathematically.
- obtain knowledge of generating functions.

PRE - REQUISITE: Data Structure , Discrete Mathematics

UNIT I INTRODUCTION 9

Graphs - Introduction - Isomorphism - Sub Graphs - Walks - Paths - Circuits - Connectedness – Components - Euler Graphs - Hamiltonian Paths and Circuits - Trees - Properties of Trees - Distance and Centers in Tree - Rooted and binary trees.

UNIT II TREES, CONNECTIVITY AND PLANARITY 9

Spanning Trees - Fundamental Circuits - Spanning Trees in a Weighted Graph - Cut Sets - Properties of Cut Set - All Cut Sets - Fundamental Circuits and Cut Sets - Connectivity and Separability - Network Flows – 1- Isomorphism - 2 - Isomorphism - Combinational and Geometric Graphs - Planer Graphs – Representation of a Planer Graph.

UNIT III MATRICES, COLOURING AND DIRECTED GRAPH 9

Chromatic Number - Chromatic Partitioning - Chromatic Polynomial - Matching - Covering - Four Color Problem - Directed Graphs - Types of Directed Graphs - Digraphs and Binary Relations - Directed Paths and Connectedness - Euler Graphs.

UNIT IV PERMUTATIONS AND COMBINATION 9

Fundamental Principles of Counting - Permutations and Combinations - Binomial Theorem - Combinations with Repetition - Combinatorial Numbers - Principle of Inclusion and Exclusion.

UNIT V GENERATING FUNCTIONS 9

Generating Functions - Partitions of Integers - Exponential Generating Function - Summation Operator - Generating Recurrence Relations - First order and Second order - Non - Homogeneous Recurrence Relations - Method of Functions.

TOTAL PERIODS 45

COURSE OUTCOMES

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

- learn the basic concepts of graph and tree.
- understand and design the spanning tree, network flow and planar graph.
- design and implement the graph coloring.
- implement the permutations and combination concepts.
- implement and design the generating function.

TEXT BOOKS

1. Narsingh Deo, “Graph Theory: With Application to Engineering and Computer Science”, Prentice Hall of India, 2003.
2. Grimaldi R.P. “Discrete and Combinatorial Mathematics: An Applied Introduction”, Addison Wesley, 2004

REFERENCES

1. Clark J. and Holton D.A, “A First Look at Graph Theory”, Allied Publishers, 1995.
2. Mott J.L., Kandel A. and Baker T.P. “Discrete Mathematics for Computer Scientists and Mathematicians”, Prentice Hall of India, 1996.
3. Douglas B. West., “Introduction to Graph Theory”, Pearson, 2015.

Mapping of Course Outcomes with Programme Outcomes (1/2/3 indicates strength of correlation) 3-strong, 2-Medium, 1-Weak														
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CO4	3	2	3	3	-	-	-	-	-	-	-	1	2	2
CO5	3	2	2	1	-	-	-	-	-	-	-	1	2	3



COURSE OBJECTIVES

To enable students to

- gain knowledge about graphical interface system.
- study about design standards.
- understand about the controls used in windows.
- study about multimedia.
- perform various tests in windows layout.

UNIT I INTRODUCTION

7

Defining the user interface – Importance of good design - Introduction of graphical user interface- Characteristics of Graphical and web user Interface - Direct Manipulation Graphical System Web User Interface - Popularity - Characteristic and Principles.

UNIT II HUMAN COMPUTER INTERACTION

11

User Interface Design Process - Obstacles - Usability - Human Characteristics In Design - Human Interaction Speed - Business Definition - Requirement Analysis - Direct - Indirect Methods - Basic Business Functions - Design Standards System Training - Human Consideration In Screen Design - Structures Of Menus - Functions Of Menus - Contents Of Menus – Formatting of Menus - Phrasing The Menu - Selecting Menu Choices - Navigating Menus - Graphical Menus.

UNIT III WINDOWS

9

Window Characteristics - Components - Presentation Styles - Types - Management – Organizing window functions - Operations - Web Systems - Device - Based Controls Characteristics - Screen - Based Controls - Operable Control – Text Entry/Read Only Controls - Text Boxes - Selection Control -Combination Control - Custom Control - Presentation Controls.

UNIT IV MULTIMEDIA

9

Text For Web Pages - Effective Feedback - Providing the proper feedback - Guidance and Assistance - Internationalization - International considerations - Accessibility –Types of disabilities – accessibility design - Icons - Multimedia – Graphics - Images – video – Photographs/Pictures – Video – Coloring.

UNIT V WINDOWS LAYOUT - TEST

9

Organizing and Laying out Screens – Screen Examples – Purpose of usability test – importance of usability testing - Prototypes - Kinds of Tests – Developing and conducting the Test – Test plan – Test participants Test Conduct and Data Collection– Analyze, Modify and Retest.

TOTAL PERIODS 45

COURSE OUTCOMES

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

- identify and define key terms related to user interface
- explain about the design standards.
- explain the controls in the windows.
- implement the multimedia effects.
- perform various test in windows layout.

TEXT BOOKS

1. Wilbent. O. Galitz ,“The Essential Guide To User Interface Design”, John Wiley&Sons, 2007.

REFERENCES

1. Ben Sheiderman, “Design The User Interface”, Pearson Education, 2016.
2. Alan Cooper, “The Essential of User Interface Design”, Wiley - Dream Tech Ltd., 2002.

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CO3	3	2	2	3	-	-	-	-	-	-	-	1	2	3
CO4	3	2	3	1	-	-	-	-	-	-	-	1	2	3
CO5	3	2	2	2	-	-	-	-	-	-	-	1	2	3



COURSE OBJECTIVES

To enable students to

- study about the trends and resource sharing in distributed environment.
- learn the level of model and inter process communication.
- gain the knowledge of Distributed Objects.
- learn the fault tolerance in distributed systems
- learn about Distributed File Services and Domain Systems

UNIT I CHARACTERIZATION OF DISTRIBUTED SYSTEMS

7

Introduction: Examples of Distributed Systems, Trends in Distributed Systems, Focus on resource sharing and the web, Challenges.

UNIT II COMMUNICATION IN DISTRIBUTED SYSTEM

9

System Model: Physical model, Architectural Model, Fundamental Model – Inter process Communication: External data representation and Multicast communication, API for the internet protocols – Network Virtualization: Overlay Networks – Case Study: MPI

UNIT III REMOTE METHOD INVOCATION AND OBJECTS

10

Remote Invocation: Introduction, Request-reply protocols, Remote procedure call, Remote method Invocation –Design Issues.

UNIT IV SECURITY

10

Overview of security techniques – Cryptographic algorithms – Digital Signatures – Cryptography Pragmatics Case study: Kerberos.

UNIT V DISTRIBUTED FILE SYSTEM AND NAME SERVICES

9

Distributed File Systems: Introduction, File service architecture, Case study: Andrew File system - Name Services and Domain Name System – Directory Services - Case study: The X.500 Directory Service.

TOTAL PERIODS 45**COURSE OUTCOMES**

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

- layout foundations of distributed systems.
- get familiar with the idea of middleware and related issues
- understand in detail about the system level and support required for distributed system
- understand the issues involved in studying data and cryptographic algorithms
- expose to the concept of design and implementation of distributed file systems

TEXT BOOKS

1. George Coulouris, Jean Dollimore, Tim Kindberg, “Distributed Systems Concepts and design” , Fifth edition 2011-Addison Wesley.

REFERENCES

1. Andrew S. Tannenbaum and Maarten Van Steen, “Distributed Systems: Principles and Paradigms”, Second Edition, Pearson, 2007.
2. George Coulouris, Jean Dollimore, Tim Kindberg, and Gordon Blair, “Distributed Systems: Concepts and Design”, Fifth Edition, Addison Wesley, 2011.
3. M.L.Liu, “Distributed Computing Principles and Applications”, Pearson Addison Wesley, 2004.

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CO3	3	2	2	2	-	-	-	-	-	-	-	1	2	3
CO4	3	2	3	3	-	-	-	-	-	-	-	1	2	3
CO5	3	2	2	1	-	-	-	-	-	-	-	1	3	3



CS16904

**OPEN ELECTIVE II
GREEN COMPUTING**

3 0 0 3

COURSE OBJECTIVES

To enable students to

- learn the fundamentals of Green Computing.
- analyze the Green computing Grid Framework.
- learn about energy saving practices.
- understand the issues related with Green compliance.
- gain knowledge about green environment strategies.

UNIT I INTRODUCTION TO GREEN COMPUTING 9

Definition of the green computing- Green IT Fundamentals and Strategies: Drivers, Dimensions, and Goals – Environmentally Responsible Business, Policies, Practices, and Metrics regulations and industrial initiatives by government– Green computing: Approaches to green computing- Middleware Support, Compiler Optimization, Product longevity. Software induced energy consumption, its measurement and rating- carbon foot print, scope on power

UNIT II GREEN ASSETS AND MODELLING 9

Green Assets: Buildings, Data Centers, Networks, and Devices – Green Business Process Management: Modeling, Optimization, and Collaboration – Green Enterprise Architecture – Environmental Intelligence – Green Supply Chains – Green Information Systems: Design and Development Models Technical aspects of software regarding - environment awareness like Green Power,

UNIT III SUSTAINABLE FRAMEWORK 9

Virtualization of IT systems – Role of electric utilities, Telecommuting, teleconferencing and teleporting – Materials recycling – Best ways for Green PC – Green Data center – Green Grid framework Terminal servers, Power management, Operating system support, Power supply, Storage, Video card, Display, Tools for monitoring. A model for sustainable software engineering, Role of generic knowledge base in enhancing sustainability, Sustainability relevant criteria, sustainable development.

UNIT IV GREEN COMPLIANCE 9

Socio-cultural aspects of Green IT – Green Enterprise Transformation Roadmap – Green Compliance: Protocols, Standards, and Audits – Emergent Carbon Issues: Technologies and Future, Green mobile, optimizing for minimizing battery consumption, Web, Temporal and Spatial Data Mining Materials recycling, Telecommuting, metrics for green computing. Techniques to measure energy consumption of software components, requirements and usage scenarios in reducing energy consumption, modeling energy consumption.

COURSE OBJECTIVES

To enable students to

- define the Basics and principle of Web page design
- visualize the basic concept of HTML.
- recognize the elements of HTML.
- introduce basics concept of CSS.
- develop the concept of web publishing

PRE - REQUISITE: Nil

UNIT I WEB DESIGN PRINCIPLES 9

Brief History of Internet-What is World Wide Web- Why create a web site-Web Standards – Audience requirement.-Basic principles involved in developing a web site-Planning process - Five Golden rules of web designing- Designing navigation bar-Page design-Home Page Layout- Design Concept.

UNIT II INTRODUCTION TO HTML 9

What is HTML-HTML Documents-Basic structure of an HTML document-Creating an HTML document- Mark up Tags-Heading-Paragraphs-Line Breaks- HTML Tags.

UNIT III ELEMENTS OF HTML 9

Introduction to elements of HTML-Working with Text-Working with Lists, Tables and Frames- Working with Hyperlinks, Images and Multimedia-Working with Forms and controls.

UNIT IV INTRODUCTION TO CASCADING STYLE SHEETS 9

Concept of CSS- Creating Style Sheet-CSS Properties-CSS Styling(Background, Text Format, Controlling Fonts)- Working with block elements and objects-Working with Lists and Tables- CSS Id and Class -Box Model(Introduction, Border properties, Padding-Properties, Margin properties)-CSS Advanced (Grouping, Dimension, Display, Positioning, Floating, Align, Pseudo class, Navigation Bar, Image Sprites, Attribute selector)- CSS Color-Creating page Layout and Site Designs.

UNIT V INTRODUCTION TO WEB PUBLISHING OR HOSTING 9

Creating the Web Site- Saving the site-Working on the web site-Creating web site structure Creating Titles for web pages-Themes-Publishing web sites.

TOTALPERIODS 45

COURSE OUTCOMES

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

- acquire knowledge on developing webpage.
- create the webpage using HTML tags.
- enhance the webpage design using various elements in HTML such as list, table, and frames.
- apply different style sheets concepts to enrich the webpage.
- understand how to host the website.

TEXT BOOKS

1. Thomas A.Powell, The Complete reference:HTML & CSS, McGraw Hill, Jan 2010.

REFERENCES

1. Laura Lemay,Rafe Colburn,Jennifer Kyrnin “Mastering HTML, CSS and Java Script Web Publishing”, BPB Publications,June, 2016.
2. Jon Duckett, “HTML & CSS Desing and Build Websites”, John Wiley & Sons, Nov, 2011.
3. Ben Henick, “HTML & CSS : The Good Parts”, O’Reilly, Feb,2010.

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CO3	3	2	3	3	-	-	-	-	-	-	-	1	3	2
CO4	2	2	3	1	-	-	-	-	-	-	-	1	3	2
CO5	3	2	2	2	-	-	-	-	-	-	-	1	2	3



COURSE OBJECTIVES

To enable students to

- learn about the fundamentals of Agile
- study about agile scrum framework
- know about agile testing
- Know about agile software design and development.
- know the current trends of industry

UNIT I FUNDAMENTALS OF AGILE 9

The Genesis of Agile-Introduction and background -Agile Manifesto and Principles-Overview of Scrum- Extreme Programming-Feature Driven development-Lean Software Development-Agile Project Management- Design and Development Practices in Agile projects-Test Driven Development- Continuous Integration-Refactoring - Pair Programming- Simple Design-User Stories-Agile Testing-Agile Tools.

UNIT II AGILE SCRUM FRAMEWORK 9

Introduction to Scrum- Project Phases -Agile Estimation -Planning Game-Product Backlog-Sprint Backlog -Iteration planning - User Story Definition - Characteristics and Content of User Stories-Acceptance Testsand Verifying Stories-Project Velocity-Burn down chart-Sprint Planning and Retrospective- Daily Scrum- Scrum Roles -Product Owner -Scrum Master-Scrum Team-Scrum Case Study-Tools for Agile Project Management.

UNIT III AGILE TESTING 9

The Agile Lifecycle and its Impact on Testing-Test -Driven Development (TDD)-xUnit framework and tools for TDD- Testing user stories - Acceptance Tests and Scenarios- Planning and Managing Testing Cycle Exploratory Testing - Risk Based Testing- Regression Tests -Test Automation- Tools to Support the AgileTester.

UNIT IV AGILE SOFTWARE DESIGN AND DEVELOPMENT 9

Agile Design Practices - Role of Design Principles including Single Responsibility Principle -Open Closed Principle - Liskov Substitution Principle - Interface Segregation Principles - Dependency Inversion Principle in Agile Design - Need and Significance of Refactoring - Refactoring Techniques – Continuous Integration - Automated build Tools -Version control.

Market Scenario and Adoption of Agile -Agile ALM -Roles in an Agile project -Agile applicability - Agile in Distributed teams-Business benefits-Challenges in Agile -Risks and Mitigation-Agile projects on Cloud - Balancing -Agility with Discipline Agile rapid development technologies.

TOTAL PERIODS 45

COURSE OUTCOMES

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

- understand the background and driving forces for taking an Agile approach to software development.
- understand the business value of adopting Agile approaches and Agile development practices.
- drive development with unit tests using test driven development.
- apply design principles and refactoring to achieve agility.
- deploy automated build tools, version control and continuous integration and perform testing activities within an agile project.



REFERENCES

1. Ken Schwaber, Mike Beedle, “Agile Software Development with Scrum “, Pearson , 21 Mar 2008
2. By Robert C. Martin,” Agile Software Development, Principles, Patterns and Practices “, Prentice Hall ,25 Oct 2002
3. Lisa Crispin, Janet Gregory,”Agile Testing: A Practical Guide for Testers and Agile Teams” Addison Wesley, 30 Dec 2008.
4. Alistair Cockburn, “Agile Software Development: The Cooperative Game “, Addison Wesley, 19 Oct 2006.
5. Mike Cohn, “User Stories Applied: For Agile Software “, Addison Wesley, 1 Mar 2004

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CO3	3	2	2	3	-	-	-	-	-	-	-	1	2	3
CO4	2	3	2	1	-	-	-	-	-	-	-	1	2	3
CO5	3	2	2	2	-	-	-	-	-	-	-	1	2	3

COURSE OBJECTIVES

To enable students to

- understand of the basic principles of service orientation.
- acquire knowledge in web service oriented analysis.
- learn technology underlying the service design.
- apply advanced concepts such as ASP.NET web forms, ASP.NET web services.
- know about various WS specification standards.

UNIT I BASICS OF SOA**9**

Fundamental SOA – Evolution of SOA – SOA Timeline, Continuing evolution of SOA, ROOTS of SOA – Comparing SOA to past Architectures – SOA vs. Client server architecture, SOA vs. Distributed internet architecture, SOA vs. Hybrid web service architecture, service orientation and object orientation.

UNIT II WEB SERVICES**9**

Web services – Web services framework- Services – Service descriptions -Messaging with SOAP -Message exchange Patterns –Service Activity - Coordination - Atomic Transactions -Business activities Orchestration -Choreography - Service layer abstraction -Application Service Layer -Business Service Layer - Orchestration Service Layer

UNIT III SERVICE DESIGN**9**

Introduction to Service oriented analysis –benefits of a Business-centric SOA -Deriving business services – Service modeling – Step by Step process - Services vs. Services candidates, process description – Service Oriented Design -WSDL language basics –SOAP language basics –Steps to composing SOA - Entity-centric business service design - Application service design -Task-centric business service design

UNIT IV SOA PLATFORMS**9**

SOA platform basics –Basic Platform Building blocks, Common SOA platform Layers, Relationship between SOA layers and Technologies, Fundamental service technology architecture- SOA support in J2EE – Platform Overview Primitive SOA Support, Support for Service Orientation principles, Contemporary SOA support - SOA support in .NET Common Language Runtime -ASP.NET web forms -ASP.NET web Services

9

TOTAL PERIODS 45

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

- ## TEXT BOOKS

-

1. Thomas Erl, "SOA Principles of Service Design "(The Prentice Hall Service -Oriented Computing Series from Thomas Erl), 2005
2. Newcomer, Lomow, "Understanding SOA with Web Services", Pearson Education, 2005.

[illegible]

COURSE OBJECTIVES

To enable students to

- learn basic concepts of image processing.
- be exposed to simple image enhancement techniques.
- be familiar with image filtering techniques.
- compress the images using various coding techniques.
- learn to represent image in form of features.

UNIT I DIGITAL IMAGE FUNDAMENTALS**8**

Introduction – Origin – Steps in Digital Image Processing – Components – Elements of Visual Perception- Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels- Mathematical tools used in digital image processing.

UNIT II IMAGE ENHANCEMENT**10**

Basic intensity transformation functions- Histogram processing- Basics of Spatial Filtering- Smoothing and sharpening Spatial Filtering – Filtering in the Frequency Domain: Preliminary concepts – Discrete Fourier Transform – properties of 2-D DFT- Characteristics of Frequency domain – Image smoothing and Image Sharpening using frequency domain filters -Ideal, Butterworth and Gaussian filters.

UNIT III IMAGE RESTORATION AND SEGMENTATION**9**

Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering. Segmentation: Point, Line and Edge - Detection – Region based Segmentation - Morphological watersheds.

UNIT IV IMAGE COMPRESSION**9**

Compression: Fundamentals – Image Compression methods – Huffman coding – Golomb coding – Arithmetic coding - LZW coding – Run-Length coding – Symbol based coding.

UNIT V IMAGE REPRESENTATION AND RECOGNITION**9**

Boundary following – Chain Code – Polygonal approximation, signature, boundary segments – Boundary description – Shape number – Fourier Descriptor- Regional Descriptors – Topological feature, Texture – use of principal components for descriptions -Patterns and Pattern classes – Recognition based on decision theoretic methods – Structural methods.

TOTAL PERIODS 45

COURSE OUTCOMES

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

- remember digital image fundamentals.
- enhance the image quality.
- apply image enhancement and restoration techniques.
- use image compression and enhancement techniques.
- represents features of images.

TEXT BOOKS

1. Rafael C. Gonzales, Richard E. Woods, “Digital Image Processing”, Third Edition, Pearson Education, 2010.

REFERENCES

1. Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins, “Digital Image Processing Using MATLAB”, Third Edition Tata Mc Graw Hill Pvt. Ltd., 2011.
2. Anil Jain K. “Fundamentals of Digital Image Processing”, PHI Learning Pvt. Ltd., 2011.
3. Malay K. Pakhira, “Digital Image Processing and Pattern Recognition”, First Edition, PHI Learning Pvt. Ltd., 2011.
4. William K Pratt, “Digital Image Processing”, John Willey, 2002.

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CO4	3	2	3	1	-	-	-	-	-	-	-	1	2	3
CO5	3	3	3	2	-	-	-	-	-	-	-	1	2	3



COURSE OBJECTIVES

To enable students to

- provide knowledge on knowledge based systems
- learn the fundamentals of fuzzy logic
- acquire knowledge on artificial neural networks
- know how cooperative neuro-fuzzy systems work
- gain knowledge on the preliminaries of evolutionary computing

UNIT I INTRODUCTION TO INTELLIGENT SYSTEMS AND SOFT COMPUTING 9

Intelligent Systems - Knowledge Based Systems - Knowledge Representation and Processing – Soft Computing

UNIT II FUNDAMENTALS OF FUZZY LOGIC SYSTEMS 9

Background - Fuzzy Sets - Fuzzy Logic Operations - Implication - Some Definitions - Fuzziness and Fuzzy Resolution - Fuzzy Relations - Composition and Inference – Projection - Consideration of Fuzzy Decision Making.

UNIT III FUNDAMENTALS OF ARTIFICIAL NEURAL NETWORKS 9

Learning and Acquisition of Knowledge - Features of Artificial Neural Networks - Fundamentals of Connectionist Modeling - Major Classes of Neural Networks - Multilayer Perceptron - Radial Basis Function Networks - Kohonen's Self - Organizing Network - The Hopfield Network - Industrial and Commercial Applications of ANN.

UNIT IV NEURO-FUZY SYSTEMS 9

Background - Architectures of Neuro Fuzzy Systems - Cooperative Neuro Fuzzy Systems - Neural Network Driven Fuzzy Reasoning - Hybrid Neuro Fuzzy Systems - Construction of Neuro Fuzzy Systems – Structure Identification Phase - Parameter Learning Phase.

UNIT V EVOLUTIONARY COMPUTING 9

Overview of Evolutionary Computing - Genetic Algorithms and Optimization - The Schema Theorem – The Fundamental Theorem of Genetic Algorithms - Genetic Algorithm Operators - Integration of Genetic Algorithms with Neural Networks - Integration of Genetic Algorithms with Fuzzy Logic – Known Issues in GAs - Population-Based Incremental Learning - Evolutionary Strategies – ES Applications.

TOTAL PERIODS 45

COURSE OUTCOMES

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

- illustrate the key aspects of the knowledge based system and how knowledge is represented and processed
- Know the basic concept of fuzzy systems
- illustrate the concept of learning and acquisition of knowledge
- Identify the key concepts of Neuro Fuzzy systems
- Illustrate the concept of genetic algorithm

TEXT BOOKS

1. Fakhereddine O Karray and Clarence De Silva, “Soft Computing and Intelligent Systems Design:Theory, Tools and Applications”, Pearson, 2009.

REFERENCES

1. Madan M Gupta and Naresh K Sinha, “Soft Computing and Intelligent Systems: Theory and Applications”, Academic Press, 1999
2. S Rajasekaran and G A Vijayalakshmi Pai, “Neural Networks, Fuzzy Logic and Genetic Algorithms Synthesis and Applications”, Prentice Hall India, 2003.
3. S N Sivanandam, S Sumathi and S N Deepa, “Neural Networks using MATLAB”, Tata McGraw-Hill, 2005.

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CO3	3	3	2	3	-	-	-	-	-	-	-	1	2	3
CO4	3	2	3	1	-	-	-	-	-	-	-	1	3	3
CO5	3	2	2	2	-	-	-	-	-	-	-	1	2	3



COURSE OBJECTIVES

To enable students to

- understand standard principles to check the occurrence of defects and its removal.
- learn the various design analysis methods.
- know the behaviour of the testing techniques to detect the errors in the software.
- be familiar with the concepts of test and defect controlling.
- learn the functionality of automated testing tools.

UNIT I INTRODUCTION 9

Testing as an Engineering Activity - **Role of Process in Software Quality** - Testing as a Process- asic. Definitions: Software Testing Principles, tester's role in software development organization. Origins of defects - defect classes, defect repository and test design, **analysis of defect for a project**.

UNIT II TESTING DESIGN STRATEGIES 9

Introduction to Testing Design Strategies - **Black Box testing**, Random Testing, Equivalence Class partitioning, Boundary Value Analysis. White-Box testing, **Test Adequacy Criteria**, Coverage and Control Flow Graphs, Covering Code Logic Paths - **Case study: Additional White box testing approaches**.

UNIT III LEVELS OF TESTING 9

Need for Levels of Testing- Unit Test, designing unit tests - Integration tests, designing integration Tests - System Testing, types of system testing – **Acceptance Testing** – Performance Testing - Regression Testing. Alpha -Beta and Acceptance Test- **Usability and Accessibility test** – Website testing.

UNIT IV TEST AND DEFECT MANAGEMENT 9

Test Management- Documenting test plan and test case, **effort estimation**, configuration management, project progress management. Use of testopia for test case documentation and test management –Test Planning - **Test Plan Components, test plan attachments, locating test items reporting test results**.

UNIT V TEST AUTOMATION**9**

Introduction to automation testing, why automation, what to automate, skills needed for automation, design and architecture for automation, tools and result modules - Introduction to Selenium, Basics of Automation testing using selenium, using selenium IDE for automation testing.

TOTAL PERIODS 45**COURSE OUTCOMES**

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

- apply software testing fundamentals and testing design strategies to enhance software quality.
- implement the different analysing techniques in software design.
- impart knowledge in identifying suitable tests to be carried out.
- understand, plan and document the defect control procedures.
- explore the test automation concepts and tools.

TEXT BOOKS

1. Srinivasan Desikan and Gopalaswamy Ramesh, “Software Testing - Principles and Practices”, Pearson education, 2006.
2. Rex Black (2001), Managing the Testing Process (2nd edition), John Wiley & Sons.

REFERENCES

1. AdityaP.Mathur, “Foundations of Software Testing”, Pearson Education, 2008.
2. Ron Patton, “Software Testing”, Second Edition, Sams Publishing, Pearson Education, 2007.
3. Foundations of software testing ,Dorothy Graham, Erik van Veenendaal, Isabel Evans, Rex Black,2008.

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CO4	3	2	3	2	-	-	-	-	-	-	-	1	3	3
CO5	3	2	2	2	-	-	-	-	-	-	-	1	2	2



COURSE OBJECTIVES

To enable students to

- introduce the functional elements of Robotics
- impart knowledge on the direct and inverse kinematics
- introduce the manipulator differential motion and control
- educate on various path planning techniques
- establish the dynamics and control of manipulators

UNIT I BASIC CONCEPTS 9

Brief history-Types of Robot-Technology-Robot classifications and specifications-Design and control issues-Various manipulators – Sensors - work cell - Programming languages.

UNIT II DIRECT AND INVERSE KINEMATICS 9

Mathematical representation of Robots - Position and orientation – Homogeneous transformation. Various joints-Representation using the Denavit Hattenberg parameters -Degrees of freedom-Direct kinematics-Inverse kinematics-SCARA robots- Solvability – Solution methods-Closed form solution.

UNIT III MANIPULATOR DIFFERENTIAL MOTION AND STATICS 9

Linear and angular velocities-Manipulator Jacobian-Prismatic and rotary joints-Inverse -Wrist and arm singularity - Static analysis - Force and moment Balance.

UNIT IV PATH PLANNING 9

Definition-Joint space technique-Use of p-degree polynomial-Cubic polynomial-Cartesian space technique - Parametric descriptions - Straight line and circular paths - Position and orientation planning.

UNIT V DYNAMICS AND CONTROL 9

Lagrangian mechanics-2DOF Manipulator-Lagrange Euler formulation-Dynamic model – Manipulator control problem-Linear control schemes-PID control scheme-Force control of robotic manipulator.

TOTAL PERIODS 45

COURSE OUTCOMES

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

- analyze Instrumentation systems and their applications to various
- examine the Direct kinematics and Inverse kinematics
- study the differential motion and statics in robotics
- explore the various path planning techniques.
- know the dynamics and control in robotics industries.

TEXT BOOKS

1. John J. Craig, Introduction to Robotics Mechanics and Control, Third edition, Pearson Education, 2009
2. R.K. Mittal and I.J. Nagrath, Robotics and Control, Tata McGraw Hill, New Delhi, 4th Reprint, 2005
3. M.P. Groover, M. Weiss, R.N. Nagel and N. G. Odrej, Industrial Robotics, McGraw-Hill Singapore, 2005.

REFERENCES

1. Ashitava Ghoshal, Robotics-Fundamental Concepts and Analysis', Oxford University Press, Sixth impression, 2010.
2. S. Ghoshal, "Embedded Systems & Robotics" – Projects using the 8051 Microcontroller", Cengage Learning, 2009.
3. K. K. Appu Kuttan, Robotics, I K International, 2007

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CO4	3	2	3	1	-	-	-	-	-	-	-	1	2	3
CO5	3	2	2	2	-	-	-	-	-	-	-	1	2	3



COURSE OBJECTIVES

To enable students to

- learn the concepts of machine learning.
- understand linear and non-linear learning models
- apply distance-based clustering techniques.
- build tree and rule based models.
- know the high level services like data management.

UNIT I FOUNDATIONS OF LEARNING 9

Components of learning– **A simple learning models** - learning versus design–types of learning–supervised–unsupervised–reinforcement–other views of learning– **feasibility of learning**–error and noise– training versus testing–theory of generalization –interpreting generalization bound– **approximation- generalization trade-off.**

UNIT II LINEAR MODELS 9

Linear classification – **univariate linear regression** – multivariate linear regression – Logistic regression–predicting a probability, **Gradient descent–multilayer neural networks** – learning neural networks structures - support vector machines – Non Linear transformation–generalization and over fitting– **regularization**– validation.

UNIT III DISTANCE-BASED MODELS 9

Nearest neighbour classification–**Distance based clustering** - K-means algorithm–clustering around medoids – silhouettes– hierarchical clustering–Kernels to distances – **Probabilistic models – with hidden variables**
Compression based models – Model ensembles– bagging and random forests–boosting–meta learning.

UNIT IV TREE AND RULE MODELS 9

Decision trees – learning decision trees – **ranking and probability estimation trees** –regression treesclustering trees–Learning ordered rule lists–learning unordered rule sets–**descriptive rule learning association rule mining**–first-order rule learning.

UNIT V REINFORCEMENT LEARNING 9

Passive reinforcement learning–direct utility estimation– **adaptive dynamic programming**– temporal- difference learning – active reinforcement learning – exploration –learning an action-utility function – Generalization in reinforcement learning – policy search – application sin game playing–**applications in robot control.**

TOTAL PERIODS 45

COURSE OUTCOMES

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

- understand theory of underlying machine learning.
- construct algorithms to learn linear and non-linear models.
- implement data clustering algorithms.
- construct algorithms to learn tree and rule-based models.
- apply reinforcement learning techniques.

TEXT BOOKS

1. Y. S. Abu-Mostafa, M. Magdon-Ismail, and H.-T. Lin, “Learning from Data”, AML Book Publishers, 2012.
2. P. Flach, “Machine Learning: The art and science of algorithms that make sense of data”, Cambridge University Press, 2012.

REFERENCES

1. S.Russel and P.Norvig, “Artificial Intelligence: A Modern Approach”, Third Edition, Prentice Hall, 2009.
2. K.P.Murphy, “Machine Learning: A probabilistic perspective”, MIT Press, 2012.
3. C.M.Bishop, “Pattern Recognition and Machine Learning”, Springer, 2007.

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CO3	2	2	2	3	-	-	-	-	-	-	-	1	1	3
CO4	3	2	3	1	-	-	-	-	-	-	-	1	2	3
CO5	3	2	2	1	-	-	-	-	-	-	-	1	2	2



COURSE OBJECTIVES

To enable students to

- understand the basic concepts of mobile computing.
- be familiar with the network protocol stack.
- learn the basics of mobile telecommunication system.
- be exposed to Ad - Hoc networks.
- gain knowledge about different mobile platforms and application development.

UNIT I INTRODUCTION**9**

Mobile Computing - Mobile computing Vs. wireless Networking - Mobile Computing Applications - Characteristics of Mobile Computing - Structure of Mobile Computing Application. MAC Protocols - Wireless MAC Issues - Fixed Assignment Schemes - Random Assignment Schemes – Reservation Based Schemes

UNIT II MOBILE INTERNET PROTOCOL AND TRANSPORT LAYER**9**

Overview of Mobile IP - Features of Mobile IP - Key Mechanism in Mobile IP - Route Optimization - Overview of TCP/IP - Architecture of TCP/IP - Adaptation of TCP Window - Improvement in TCP Performance.

UNIT III MOBILE TELECOMMUNICATION SYSTEM**9**

Global System for Mobile Communication (GSM) - General Packet Radio Service (GPRS) - Universal Mobile Telecommunication System (UMTS) - Case Study: 2G - 3G - 4G - LTE.

UNIT IV MOBILE AD-HOC NETWORKS**9**

Ad-Hoc Basic Concepts - Characteristics - Applications - Design Issues - Routing - Essential of Traditional Routing Protocols - Popular Routing Protocols - Vehicular Ad Hoc networks (VANET) - MANET Vs. VANET - Security.

UNIT V MOBILE PLATFORMS AND APPLICATIONS**9**

Mobile Device Operating Systems - Special Constrains and Requirements - Commercial Mobile Operating

TOTAL PERIODS 45

COURSE OUTCOMES

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

- explain the basics of mobile telecommunication system.
- choose the required functionality at each layer for given application.
- identify solution for each functionality at each layer.
- apply simulator tools and design ad hoc networks.
- develop a mobile application.

TEXT BOOKS

1. Prasant Kumar Pattnaik, Rajib Mall, “Fundamentals of Mobile Computing”, PHI Learning Pvt. Ltd, New Delhi – 2012.

REFERENCES

1. Jochen H. Schller, “Mobile Communications”, Second Edition, Pearson education, New Delhi, 2007
2. Dharma Prakash Agarval, Qing and An Zeng, "Introduction to Wireless and Mobile systems", Thomson Asia Pvt Ltd, 2005.
3. UweHansmann, LotharMerk, Martin S. Nicklons and Thomas Stober, “Principles of Mobile Computing”, Springer, 2003.
4. William.C.Y.Lee, “Mobile Cellular Telecommunications - Analog and Digital Systems”, Second Edition, TataMcGraw Hill Edition ,2006

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CO1	3	3	2	2	-	-	-	-	-	-	-	1	2	2
CO2	3	3	2	3	-	-	-	-	-	-	-	1	2	3
CO3	3	2	2	3	-	-	-	-	-	-	-	1	2	2
CO4	3	2	3	3	-	-	-	-	-	-	-	1	2	3
CO5	3	2	3	2	-	-	-	-	-	-	-	1	2	2



COURSE OBJECTIVES

To enable students to

- introduce the fundamentals in linear programming
- learn the techniques in linear programming.
- impart knowledge and skill in game theory and networking models.
- describe the application of inventory models
- discuss about queuing theory.

UNIT I INTRODUCTION TO LINEAR PROGRAMMING (LP) 9

Introduction to applications of operations research in functional areas of management. Linear Programming – Formulation, solution by graphical and simplex methods (Primal - Penalty, Two Phase).

UNIT II LINEAR PROGRAMMING EXTENSIONS 9

Transportation models – Balanced and unbalanced problems – Initial basic feasible solution by N-W Corner Rule, Least cost and Vogel's approximation methods. Check for optimality. Solution by MODI / Stepping Stone Method. Case of degeneracy- Assignment models –Solution by Hungarian and Branch and Bound algorithms – Travelling salesman problem

UNIT III GAME THEORY AND NETWORK MODELS 9

Game theory – Two person zero sum games-Saddle point – Dominance rule – Convex linear combination (Averages) – Methods of matrices – Graphical and LP solutions– Networking Models – PERT and CPM.

UNIT IV INVENTORY MODELS 9

Inventory Models – EOQ and EBQ Models (With and without shortages) – Quantity Discount Models.

UNIT V QUEUEING THEORY AND REPLACEMENT MODELS 9

Queuing Theory – Single and multi-channel models – Infinite number of customers and infinite calling source.

TOTAL PERIODS 45

COURSE OUTCOMES

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

- understand the fundamental concepts in linear programming.
- apply the techniques in linear programming.
- exhibit their skill in applying game theory and networking models.
- acquire knowledge in application of inventory models.
- familiar with queuing theory.

TEXT BOOKS

1. Paneerselvam R., Operations Research, Prentice Hall of India, Fourth Print, 2008
2. Kalavathy S, Operations Research, Second Edition, Vikas Publishing House, 2004

REFERENCES

1. N. D Vohra, Quantitative Techniques in Management, Tata Mcgraw Hill, 2010.
2. Pradeep Prabakar Pai, Operations Research - Principles and Practice, Oxford Higher Education.
3. Hamdy A Taha, Introduction to Operations Research, Prentice Hall India, Seventh Edition, Third Indian Reprint 2004
4. G. Srinivasan, Operations Research – Principles and Applications, PHI, 2007.
5. Gupta P.K, Hira D.S, Problem in Operations Research, S.Chand and Co, 2007.
6. Frederick & Mark Hillier, Introduction to Management Science – A Modelling and case studies approach with spreadsheets, Tata Mcgraw Hill, 2005.

Mapping of Course Outcomes with Programme Outcomes (1/2/3 indicates strength of correlation) 3-strong, 2-Medium, 1-Weak														
COs	Programme Outcomes POs												Programme Specific Outcomes PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	-	-	-	-	-	-	-	1	2	3
CO2	3	3	2	3	-	-	-	-	-	-	-	1	3	3
CO3	2	2	2	3	-	-	-	-	-	-	-	1	2	3
CO4	3	3	3	1	-	-	-	-	-	-	-	1	2	3
CO5	3	2	2	2	-	-	-	-	-	-	-	1	2	3

