ME16102   **BASIC CIVIL AND MECHANICAL ENGINEERING**   **3 0 03**

(COMMON TO CSE / EEE / CHEMICAL)

COURSE OBJECTIVES

- To impart basic knowledge of surveying and various civil engineering materials.
- To understand the basic components involved in buildings, dams and bridges
- To gain knowledge of different power plants and their working principles
- To understand the basic working principles of IC engines and boilers
- To distinguish between different types of Refrigeration and Air conditioning systems

A CIVIL ENGINEERING

UNITI   SURVEYING AND CIVIL ENGINEERING MATERIALS   9

Surveying: Objects – types – classification – principles – measurements of distances – angles – leveling – determination of areas – illustrative examples. Civil Engineering Materials: Bricks –stones – sand – cement – concrete – steel sections.

UNITII   BUILDING COMPONENTS AND STRUCTURES   9

Foundations: Types, Bearing capacity – Requirement of good foundations. Superstructure: Brick masonry – stone masonry – beams – columns – lintels – roofing – flooring – plastering – Mechanics – Internal and external forces – stress – strain – elasticity – Types of Bridges and Dams – Basics of Interior Design and Landscaping.

B MECHANICAL ENGINEERING

UNITIII   POWER PLANT ENGINEERING   9

Introduction, Classification of Power Plants – Working principle of steam, Gas, Diesel, Hydro-electric, Solar and Nuclear Power plants – Merits and Demerits – Pumps and turbines – working principle of Reciprocating pumps (single acting and double acting) – Centrifugal Pump.

UNITIV   IC ENGINES   9

Internal combustion engines as automobile power plant – Working principle of Petrol and Diesel Engines – Four stroke and two stroke cycles – Comparison of four stroke and two stroke engines – Boiler as a power plant.

UNITV   REFRIGERATION AND AIR CONDITIONING SYSTEM   9

Terminology of Refrigeration and Air Conditioning. Principle of vapour compression and absorption system – Layout of typical domestic refrigerator – Window and Split type room Air conditioner.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

- analyze different surveying methods and understanding of various Civil EngineeringMaterials

- interpret the significance of various components of buildings, dams and bridges
- identify the components used in various power plant cycles.
- distinguish between petrol, diesel, 2-Stroke and 4-StrokeEngines
- explain the components of refrigeration and Air conditioning cycle.

TEXT BOOKS

1. Shanmugam G and Palanichamy M S, "Basic Civil and Mechanical Engineering", Tata McGraw Hill Publishing Co., New Delhi,1996.
2. Venugopal K and Prabu Raja V, "Basic Mechanical Engineering", Anuradha Publishers, kumbakonam2000.

REFERENCES

1. C.-J. Winter, Rudolf L. Sizmann, Lorin L. Vant-Hull, Solar Power Plants: Fundamentals, Technology, Systems, Economics, Springer Science & Business Media,06-Dec-2012.
2. Seetharaman S. "Basic Civil Engineering", Anuradha Agencies,2005.
3. Shantha Kumar S R J., "Basic Mechanical Engineering", Hi-tech Publications, Mayiladuthurai2000.
4. Ramamrutham. S, "Basic Civil Engineering", DhanpatRai Publishing Co. (P)Ltd.1999.
5. V. Rameshbabu, "Basic Civil and Mechanical Engineering", VRB Publishers (P) Ltd., Chennai, 2009

WEBLINKS

1. http://www.aboutcivil.org/
2. http://www.nptel.ac.in/courses/105107122/
3. http://nptel.ac.in/courses/112105128/

CO - PO Mapping

COs	Mapping of Course Outcomes with Programme Outcomes (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak													
	Programme Outcomes(POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	1	-	-	-	-	-	-	-	1	2	1
CO2	2	2	2	1	-	-	-	-	-	-	-	1	2	1
CO3	2	2	2	1	-	-	-	-	-	-	-	1	2	1
CO4	1	2	2	-	2	-	2	-	-	-	-	1	2	1
CO5	2	2	2	-	2	-	-	-	-	-	-	1	2	1

CS16203   **DATA STRUCTURES AND ALGORITHMS**   **3 0 0 3**

(COMMON TO CSE / IT)

COURSE OBJECTIVES

- To understand the fundamental data structures and algorithms.
- To analyze theoretical analysis, and application of data structure.
- To learn linear data structures such as list, stack, and queue.
- To understand the methods of sorting, searching, hashing of algorithms
- To analyze the algorithms and their complexity

UNIT I   LINEAR STRUCTURES   9

Abstract Data Types (ADT) - List ADT -array-based implementation -linked list implementation - cursor- based linked lists -doubly linked lists -applications of lists - Stack ADT - Queue ADT -circular queueimplementation -Applications of stacks and queues

UNIT II   TREE STRUCTURES   9

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 III   HASHING AND SETS   9

Hashing –Separate Chaining – Open Addressing – Rehashing – Extendible Hashing – - Disjoint Set ADT - dynamic equivalence problem -smart union algorithms - path compression –applications of Sets.

UNIT IV   GRAPHS   9

Definitions - Topological sort - breadth-first traversal - shortest-path algorithms - minimum spanning tree - Prim's and Kruskal's algorithms -Depth-first traversal – bi connectivity -Euler circuits -applications of graphs

UNIT V   ALGORITHM DESIGN AND ANALYSIS   9

Introduction to algorithm design techniques: Greedy algorithms, Divide and conquer, Dynamic programming, backtracking, branch and bound, Randomized algorithms – Introduction to algorithm analysis: asymptotic notations, recurrences – Introduction to NP-complete problems

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

- gain knowledge in the various data structure concepts.
- implement abstract data types for linear data structures.
- apply the different linear data structures and find appropriate solutions for the problem.
- review various implementations and operation of priority queue.
- implement the concept of depth first search and bi-connectivity

TEXT BOOK

1. M. A. Weiss, "Data Structures and Algorithm Analysis in C", Fourth Edition, Pearson Education, 2013.

REFERENCES

1. V. Aho, J. E. Hopcroft, and J. D. Ullman, 'Data Structures and Algorithms´, PearsonEducation, 2009.

2. R. F. Gilberg, B. A. Forouzan, 'Data Structures´, Second Edition, Thomson IndiaEdition, 2008.

3. M. Tenenbaum, Y. Langsam, and M. J. Augenstein, 'Data Structures using C´,Pearson Education, 2007.

4. K.S. Easwarakumar, Object Oriented Data Structures using C++, Vikas Publishing House pvt.Ltd., 2010.

5. Sara Baase and A. Van Gelder, 'Computer Algorithms´, Third Edition, Pearson Ed.,2011

WEB LINKS

1. http://www.nptel.ac.in/
2. http://freevideolectures.com/Course/2279/Data-Structures-And-Algorithms
3. https://www.youtube.com/watch?v=RpRRUQFbePU

<table>
<tr><td colspan="15">Mapping of Course Outcomes with Programming Outcomes
(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak</td></tr>
<tr><td rowspan="2">COs</td><td colspan="12">Programme Outcomes(POs)</td><td colspan="2">Programme Specific Outcomes (PSOs)</td></tr>
<tr><td>PO1</td><td>PO2</td><td>PO3</td><td>PO4</td><td>PO5</td><td>PO6</td><td>PO7</td><td>PO8</td><td>PO9</td><td>PO10</td><td>PO11</td><td>PO12</td><td>PSO1</td><td>PSO2</td></tr>
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<tr><td>CO2</td><td>3</td><td>2</td><td>3</td><td>3</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>2</td><td>3</td><td>3</td></tr>
<tr><td>CO3</td><td>2</td><td>3</td><td>1</td><td>-</td><td>-</td><td>-</td><td>1</td><td>-</td><td>-</td><td>-</td><td>-</td><td>2</td><td>3</td><td>3</td></tr>
<tr><td>CO4</td><td>3</td><td>3</td><td>3</td><td>3</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>2</td><td>1</td><td>3</td></tr>
<tr><td>CO5</td><td>3</td><td>3</td><td>3</td><td>-</td><td>-</td><td>2</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>3</td><td>3</td><td>2</td></tr>
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CS16204   **DATA STRUCTURE AND ALGORITHMS LAB**   **0 0 2 1**

(COMMON TO CSE / IT)

COURSE OBJECTIVES

- To be familiar with c programming
- To implement abstract data types
- To implement singly and doubly linked lists.
- To implement sorting and searching algorithms.

LIST OF EXPERIMENTS

1. Implement singly and doubly linked lists.
2. Represent a polynomial as a linked list and write functions for polynomial addition.
3. Implement stack and use it to convert infix to postfix expression
4. Implement array-based circular queue and use it to simulate a producer-consumer problem.
5. Implement an expression tree. Produce its pre-order, in-order, and post-order traversals.
6. Implement binary search tree.
7. Implement priority queue using heaps
8. Implement hashing techniques.
9. Implement Dijkstra's algorithm using priority queues
10. Implement Greedy algorithm using C.
11. Implement Branch and bound, Divide and Conquer algorithm using C.

TOTAL PERIODS: 30

COURSE OUTCOMES

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

- design and execute C programs for stacks, queues, and linked lists.
- apply the different data structures concepts and find solutions to practical problems.
- gain in depth knowledge in searching and sorting programs.
- demonstrate array implementation of list ADT.

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

CS16302   **OBJECT ORIENTED PROGRAMMING WITH C++**   **3   0   0   3**

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.

NIT 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. BjarneStroustrup, "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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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

CS16303   **DESIGN AND ANALYSIS OF ALGORITHMS**   **3   0   0   3**

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-CompleteProblems--Coping with the Limitations – Backtracking - n-Queens problem – Hamiltonian CircuitProblem –Subset SumProblem-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

COs	\multicolumn{12}{c}{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	1	2	2	-	-	-	-	-	2	2	3	3
CO4	2	2	2	-	2	-	-	-	-	-	2	1	2	2
CO5	2	2	2	-	2	-	-	-	-	-	2	1	2	2

EC16309   **DIGITAL LABORATORY**   **0   0   4   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.

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

CS16304　　　　**OBJECT ORIENTED PROGRAMMING LABORATORY**　　　**0　0　4　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

1. Simple C++ programs.
2. Programs using Functions and classes.
3. Friend Functions.
4. Function Overloading.
5. Operator Overloading.
6. Simple and Multiple Inheritances.
7. Multilevel & Hybrid Inheritance.
8. Virtual Functions.
9. Constructors and Destructors
10. File Handling.
11. Templates.
12. 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**
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CO3	3	3	2	2	2	-	-	-	-	-	2	2	3	3
CO4	2	2	2	2	2	-	-	-	-	-	2	1	2	2

CS16401   **SOFTWARE ENGINEERING**   **3   0   0   3**

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 – EvolutionaryProcess 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   TESTINGTECHNIQUES   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.

TOTAL PERIODS   45

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. RogerS.Pressman Software Engineering: A Practitioner's Approach, McGraw Hill International edition, Eighth edition, 2015.

2. Ian Sommerville, Software Engineering, 9 th 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. PankajJalote, "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 WitoldPedrycz,"Software Engineering, An Engineering Approach", Wiley-India, 2007.

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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

CS16402   **DATABASE MANAGEMENT SYSTEMS**   **3   0   0   3**

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 l/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 solation 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 Shamakant B. Navathe, "Fundamentals of Database Systems", 6th Edition, AddisionWesley ,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://freevideolectures.com/Course/2668/Database-Management-System

<table>
<tr><td colspan="15">Mapping of Course Outcomes with Programming Outcomes
(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak</td></tr>
<tr><td rowspan="2">COs</td><td colspan="12">Programme Outcomes(POs)</td><td colspan="2">Programme Specific Outcomes (PSOs)</td></tr>
<tr><td>PO1</td><td>PO2</td><td>PO3</td><td>PO4</td><td>PO5</td><td>PO6</td><td>PO7</td><td>PO8</td><td>PO9</td><td>PO10</td><td>PO11</td><td>PO12</td><td>PSO1</td><td>PSO 2</td></tr>
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<tr><td>CO2</td><td>2</td><td>2</td><td>2</td><td>2</td><td>2</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>1</td><td>1</td><td>2</td><td>2</td></tr>
<tr><td>CO3</td><td>3</td><td>3</td><td>2</td><td>2</td><td>2</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>2</td><td>2</td><td>3</td><td>3</td></tr>
<tr><td>CO4</td><td>2</td><td>2</td><td>2</td><td>2</td><td>2</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>2</td><td>1</td><td>2</td><td>2</td></tr>
<tr><td>CO5</td><td>2</td><td>2</td><td>2</td><td>2</td><td>2</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>2</td><td>1</td><td>2</td><td>2</td></tr>
</table>

CS16403   **SYSTEM SOFTWARE**   **3   0   0   3**

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. Dhamdhere, "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, 2000shing company,1994

WEB LINKS

1. .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

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

CS16404   **COMPUTER NETWORKS**   **3   0   0   3**

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. AndrewS.Tanenbaum, Computer Networks, PearsonEducation, 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=3DZLItfbqtQ&list=PL1EC310A0BF4B2CA7
2. https://www.youtube.com/watch?v=zzXs0EnCin0
3. https://www.youtube.com/watch?v=aNqiTCZ-nko

COs	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

EC16409   **MICROPROCESSOR AND MICROCONTROLLER LABORATORY**   **0   0   4   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.

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

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

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

COURSE OUTCOMES

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

- Analyze and design finite automata and minimize finite automata.
- Understand the properties of regular expressions, convert regular expression to finite automata.
- Understand CFG and simplification of grammar, normal forms.
- Understand PDA and equivalence of PDA and CFG.
- Understand the concept of Turing Machine and Language Decidability.

TEXT BOOKS

1. John E.Hopcroft, Rajeev Motwani and Jeffrey.D Ullman, Introduction to Automata Theory, Languages and Computations, Pearson Education, Third Edition, 2009.
2. John C.Martin, Introduction to Languages and the Theory of Computation, TMH, 2007.

REFERENCES

1. H.R. Lewis and C.H. Papadimitriou, "Elements of the theory of Computation", Second Edition, Pearson Education, 2003.
2. S.N.Sivanandam,"Theory of computation" ,I.K.International Publishing Pvt Limited,2009.
3. Thomas A. Sudkamp," An Introduction to the Theory of Computer Science, Languages and Machines", Third Edition, Pearson Education, 2007.
4. Raymond Greenlaw an H.James Hoover, "Fundamentals of Theory of Computation, Principles and Practice", Morgan Kaufmann Publishers, 1998.
5. MichealSipser, "Introduction of the Theory and Computation", Thomson Brokecole, 1997.

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**														
	Programme Outcomes(POs)													
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
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CO4	3	2	3	3	-	-	-	-	-	-	-	3	3	3
CO5	3	3	2	3	-	-	-	-	-	-	-	3	3	3

| CS16502 | GRAPHICS AND MULTIMEDIA | 3 | 0 | 0 | 3 |

COURSE OBJECTIVES

To enable the students to

- Understand 2D graphics techniques and algorithms.
- Implement various3D 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.

COs	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

JAVA AND INTERNET PROGRAMMING　　　　　　**3　0　0　3**

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. Cay S. Horstmann and Gary Cornell, "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. Uttam K.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.

2. www.w3resource.com.

COs	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	1	3	3	3	-	-	-	-	-	-	-	2	1	3
CO5	3	3	3	-	-	2	-	-	-	-	-	3	3	2

CS16504   **OPERATING SYSTEMS**   **3   0   0   3**

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

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

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

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

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

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

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, 7thEdition, 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.

COs	Mapping of Course Outcomes with Programming Outcomes (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak													
	Programme Outcomes(POs)												Programme Specific Outcomes (PSOs)	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	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

CS16505   **GRAPHICS AND MULTIMEDIA LABOROTARY**   0   0   4   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)**	
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
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

CS16506   **JAVA AND INTERNET PROGRAMMING LABORATORY**   **0   0   4   2**

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

CS16507   **OPERATING SYSTEMS LABORATORY**   **0   0   4   2**

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 complier 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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CO2	2	1	2	-	2	-	1	-	-	-	-	-	1	3
CO3	3	2	-	-	3	-	-	-	-	-	-	-	-	3
CO4	3	1	-	-	-	2	-	-	-	-	-	-	1	3

CS16601   **OBJECT ORIENTED ANALYSIS AND DESIGN**   **3   0   0   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

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

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

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

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

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

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. MichealBlaha, James Rambaugh, "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/.

| COs | 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

CS16602   **ARTIFICIAL INTELLIGENCE**   **3   0   0   3**

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=kWmX3pd1fl0.

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

CS16603   **CRYPTOGRAPHY AND NETWORK SECURITY**   **3   0   0   3**

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

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

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

Public -   Key Cryptography 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

Authentication Applications - Kerberos - X.509 Authentication Service - Electronic mail Security   - Pretty Good privacy - S/MIME - IP Security - Web Security.

UNIT V   SYSTEM SECURITY   9

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

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

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

- 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														
COs	**Programme Outcomes(POs)**												**Programme Specific Outcomes (PSOs)**	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	3	3	-	-	-	-	-	-	-	3	3	3
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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

CS16605   **OBJECT ORIENTED ANALYSIS AND DESIGN LABORATORY**   **0 0 4 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.

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

CS16606   **COMPILER DESIGN LABORATORY**   **3 0 0 3**

COURSE OBJECTIVES

To enable the students to

- Be exposed to compiler writing tools.
- Learn to implement the different phases of compiler.
- Be familiar with control flow and data flow analysis.
- Learn simple optimization techniques.

LIST OF EXPERIMENTS:

1. Study of LEX and YACC.
2. Lexical Analysis using LEX.
3. Syntax Analysis using YACC.
4. Construction of NFA from a given regular expression.
5. Construction of minimized DFA from a given regular expression.
6. Implementation of Symbol Table.
7. Implementation of Shift Reduce Parsing Algorithm.
8. Construction of LR Parsing Table.
9. Generation of Code for a given Intermediate Code.
10. Implementation of Code Optimization techniques.

                                                                    TOTAL PERIODS   60

COURSE OUTCOMES

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

- Implement the different phases of compiler using tools.
- Analyze the control flow and data flow of a typical program.
- Optimize a given program.
- Generate an assembly language program equivalent to a source language program.

RECOMMENDED SYSTEM/SOFTWARE REQUIREMENTS

SOFTWARE: Turbo C, LEX and YACC,UNIX.

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

| COs | 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

CS16607   **ARTIFICIAL INTELLIGENCE LABORATORY**   **0 0 4 2**

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.

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

CS15701   **OPEN SOURCE SOFTWARE**   **3 0 0 3**

COURSE OBJECTIVES

- To understand the basics of open source software.
- To gain the knowledge MySQL open source database.
- To be able to familiar with Server - side programming language PHP.
- To be able to implement and design the advanced Concepts in PHP.
- To expose the students with the concept of R programming.

PRE - REQUISITE: Nil

UNIT I   INTRODUCTION   9

Introduction to open sources - Need of open sources - Advantages of open sources - Open source operating systems. LINUX: Introduction - General overview - The Linux shell and File Structure: The shell - The shellscripts and programming - Shell Configuration.

UNIT II   MYSQL   9

MySQL: Introduction - Setting up account - Starting - Terminating and Writing SQL programs - Record Selection Technology - Working with strings - Date and Time - Sorting query results - Generating Summary - Working with metadata - Using sequences - MySQL and Web.

UNIT III   INTRODUCTION TO PHP   9

PHP : Features - Working with variables - storing data in variables - Operator and flow control   - String and arrays - Creating Functions - Arrays.

UNIT IV   ADVANCED PHP   9

Object oriented Programming - File handling and data storage - Working with database - Sessions - cookies and FTP.

UNIT V   R PROGRAMMING   9

Preview of some important data structure - Vectors - Matrices and arrays - Lists - Data Frames - R programming Structure: Control Structure - Function and scoping issues - Recursive. String Manipulation.

                                        TOTAL PERIODS   45

COURSE OUTCOMES

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

- configure the shell commands and programming.
- demonstrate the working with MYSQL.
- demonstrate the simple application in PHP.
- create strong application in PHP.
- develop a simple problem - solving application in R programming.

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.
4. Norman Matloff ," The Art of R Programming: A Tour of Statistical Software Design", 1st Edition, 2011.

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.
4. B.Mahendran, Understanding FOSS, GNU Developers, 2009.
5. VikramVaswani, "MYSQL: The Complete Reference", 2nd Edition, Tata McGraw - Hill Publishing Company Limited, Indian Reprint 2009.

WEB LINKS

1. http://www.gnu.org/doc/using.html.
2. https://www.tutorialspoint.com/php/php_and_mysql.html.
3. https://www.udemy.com/r - basics/.

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

CS15702   **MOBILE COMPUTING**   **3 0 0 3**

COURSE OBJECTIVES

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

PRE - REQUISITE: Computer Networks.

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 & Requirements   - Commercial Mobile Operating Systems - Software Development Kit: iOS - Android   - BlackBerry - Windows Phone -   M - Commerce - Structure   - Pros &Cons   - Mobile Payment System -   Security Issues.

TOTAL PERIODS   45

COURSE OUTCOMES

Upon the completion of the course, 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 PrakashAgarval, 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.

WEB LINKS

1. https://onlinecourses.nptel.ac.in/noc16_cs13.

2. www.nptelvideos.in/2012/12/wireless - communication.html.

3. http://nptel.ac.in/courses/106106147/.

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

CS15703   **DATA WAREHOUSING AND DATA MINING**   **3 0 0 3**

COURSE OBJECTIVES

- To understand the fundamentals of Data Warehousing with its architecture.
- To understand the Data Warehousing Business Analysis concepts.
- To understand the Data Mining concepts and pre - processing methods.
- To understand the Association rule mining and various Classification techniques in Data Mining.
- To understand the various Clustering methods in Data Mining.

PRE - REQUISITE: Data Base Management System

UNIT I   DATA WAREHOUSING   9

Data warehousing components - Building a data warehouse - Mapping the data warehouse to a multiprocessor Architecture - DBMS schemas for decision support - Data extraction - Cleanup and transformation tools - Metadata.

UNIT II   BUSINESS ANALYSIS   9

Reporting and query tools and applications - Tool categories - The need for applications - Cognos impromptu - Online Analytical Processing - Need - Multidimensional data model - OLAP guidelines - Multidimensional versus multi relational OLAP - Categorization of OLAP tools - OLAP tools and the Internet.

UNIT III   DATA MINING   9

Introduction - Data - Types of data - Data mining functionalities - Interestingness of patterns - Classification of data Mining systems - Data mining task primitives - Integration of a data mining system with a data warehouse - Data Preprocessing - Cleaning - Integration - Transformation - Reduction - Discretization - Concept Hierarchy Generation.

UNIT IV   ASSOCIATION RULE MINING AND CLASSIFICATION   9

Mining frequent patterns - Associations and correlations - Mining methods - Mining various kinds of association Rules - Correlation analysis - Constraint based association mining - Classification and prediction - Basic concepts - Decision tree Induction - Bayesian classification - Rule - based classification - Classification by back Propagation - Support vector machines - Associative classification - Lazy learners - Other classification methods - Prediction.

UNIT V   CLUSTERING, TRENDS IN DATA MINING AND APPLICATIONS   9

Cluster analysis - types of data - Categorization of major clustering methods - K - means - Partitioning methods - Hierarchical methods - Density - based methods - Grid - based methods - Model - based clustering methods - Clustering high - dimensional data - Constraint - Based cluster analysis - Outlier analysis - Data mining Applications.

TOTAL PERIODS   45

COURSE OUTCOMES

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

- understand the fundamentals of Data Warehousing with its architecture.
- learn Data Warehousing Business Analysis concepts.
- learn Data Mining concepts and Pre - processing methods.
- know the Association rule mining and various classification techniques in Data Mining.
- Be familiar with various Clustering methods in Data Mining.

TEXT BOOKS

1. Alex Berson and Stephen J. Smith, " Data Warehousing, Data Mining & OLAP", Tata McGraw Hill, 2007.
2. Jiawei Han and Miche line Kamber, "Data Mining Concepts and Techniques", 2nd Edition, Elsevier, 2011.

REFERENCES

1. Pang - Ning Tan, Michael Steinbach and Vipin Kumar, "Introduction To Data Mining", Person Education, 2007.
2. G. K. Gupta, "Introduction to Data Mining with Case Studies", Easter Economy Edition, Prentice Hall of India, 2006.
3. Daniel T.Larose, "Data Mining Methods and Models", Wile - Inter science, 2006.
4. S. K. Mourya, Shalu Gupta, Data Mining and Data Warehousing, Alpha Science International Limited, 2013.
5. G. K. Gupta, Introduction to Data Mining With Case Studies, Eastern Economy, Third Edition 2013.

WEB LINKS

1. http://www.tutorialspoint.com/data_mining/dm_applications_trends.htm
2. http://home.deib.polimi.it/matteucc/Clustering/tutorial_html/
3. http://www.youtube.com/watch?v=zqKFH7WNmf

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

CS15704   **CLOUD COMPUTING**   **3 0 0 3**

COURSE OBJECTIVES

- To introduce the broad perceptive of cloud architecture and model.
- To understand the concept of Virtualization.
- To understand the features of cloud infrastructure.
- To apply different cloud programming model as per need.
- To learn to design the trusted cloud Computing system.

PRE - REQUISITE: Nil

UNIT I   INTRODUCTION   9

Introduction   -   Cloud Computing at a Glance   - Historical Developments -   Building Cloud Computing Environments   -   Computing Platforms and Technologies. Principles of Parallel and Distributed Computing - Eras of Computing   - Elements of Parallel Computing and Distributed Computing   - Technologies for Distributed Computing.

UNIT II   VIRTUALIZATION   9

Introduction - Characteristics of Virtualized Environments - Taxonomy of Virtualization Techniques - Virtualization and Cloud Computing - Pros and Cons of Virtualization - Technology Examples. Cloud Computing Architecture - Cloud Reference Model - Types of Clouds - Economics of the Cloud - Open Challenges.

UNIT III   CLOUD INFRASTRUCTURE   9

Architectural Design of Compute and Storage Clouds - Layered Cloud Architecture Development - Design Challenges - Inter Cloud Resource Management - Resource Provisioning and Platform Deployment - Global Exchange of Cloud Resources.

UNIT IV   PROGRAMMING MODEL   9

Introduction to Hadoop Framework - Map reduce - Design of Hadoop file system - HDFS concepts. Cloud Software Environments - Eucalyptus - Open Nebula - OpenStack - Aneka - CloudSim.

UNIT V   SECURITY IN THE CLOUD   9

Security Overview - Cloud Security Challenges and Risks - Software - as - a - Service Security - Security Governance - Risk Management - Security Monitoring - Security Architecture Design - Data Security - Application Security - Virtual Machine Security - Identity Management and Access Control - Autonomic Security.

                                                            TOTAL PERIODS   45

COURSE OUTCOMES

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

- compare the strengths and weakness of cloud computing.

- identify the architecture, infrastructure and delivery models of cloud computing.

- apply suitable virtualization concept.

- choose the appropriate Programming Models and approach.

- address the core issues of cloud computing such as security, privacy and interoperability.

TEXT BOOKS

1. Rajkumar Buyya, Christian Vecchiola, S.Tamarai Selvi, „Mastering Cloud Computing", TMGH, 2013.

2. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.

REFERENCES

1. John W.Rittinghouse and James F.Ransome, "Cloud Computing: Implementation, Management, and Security", CRC Press, 2010.

2. Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing, A Practical Approach", TMH, 2009.

3. Kumar Saurabh, "Cloud computing - insights into New - Era Infrastructure", Wiley India, 2011.

4. Ronald L. Krutz, Russell Dean Vines, "Cloud Security - A comprehensive Guide to Secure Cloud Computing", Wiley - India, 2010.

5. John W.Rittinghouse and James F.Ransome, "Cloud Computing: Implementation, Management, and Security", CRC Press, 2010.

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

CS15705   **OPEN SOURCE SOFTWARE LABORATORY**   **0   0   4   2**

COURSE OBJECTIVES

- To gain the knowledge MySQL open source database.
- To be familiar with Server - side programming language like PHP.
- To implement and design the advanced PHP Concept.
- To 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 & 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 few days, deactivate their account.

    a. Create & 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, 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.

<table>
<tr><td colspan="16">Mapping of Course Outcomes with Programme Outcomes
(1/2/3 indicates strength of correlation) 3-strong, 2-Medium, 1-
Weak</td></tr>
<tr><td rowspan="2">COs</td><td colspan="12">Programme Outcomes POs</td><td colspan="2">Programme Specific Outcomes PSOs</td></tr>
<tr><td>PO1</td><td>PO2</td><td>PO3</td><td>PO4</td><td>PO5</td><td>PO6</td><td>PO7</td><td>PO8</td><td>PO9</td><td>PO10</td><td>PO11</td><td>PO12</td><td>PSO1</td><td>PSO2</td></tr>
<tr><td>CO1</td><td>3</td><td>2</td><td>2</td><td>3</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>2</td><td>2</td><td>2</td></tr>
<tr><td>CO2</td><td>3</td><td>3</td><td>2</td><td>3</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>1</td><td>2</td><td>3</td></tr>
<tr><td>CO3</td><td>3</td><td>3</td><td>2</td><td>3</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>2</td><td>3</td><td>2</td></tr>
<tr><td>CO4</td><td>2</td><td>2</td><td>3</td><td>2</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>1</td><td>2</td><td>3</td></tr>
</table>

CS15706   **MINI PROJECT**   **0 0 4 2**

COURSE OUTCOMES

Upon the completion of the course, 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.

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

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

CS15801   **SOFTWARE PROJECT MANAGEMENT**   **3   0   0   3**

COURSE OBJECTIVES

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

PRE - REQUISITE: Software Engineering

UNIT I   INTRODUCTION TO PROJECT PLANNING AND EVALUATION   8

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   10

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 ArrowNetworks - Forward Pass - Backward Pass   - Identifying Critical Path   - Activity Float   - Shortening Project Duration.

UNIT IIIRISK 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 - Monte Carlo Simulation. 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 CONTROLING 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.

UNIT V   MANAGING PEOPLE AND CONTRACTS   9

Managing people: Selection Process - instruction in the best methods - Motivational theories: Maslows Hierarchy of Needs - The Oldham - Hackman Job characteristic model - Becoming a Team - Decision Making. Managing Contracts: Types of Contract - Stages in contract placement - Typical terms of a Contract.

TOTAL PERIODS   45

COURSE OUTCOMES

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

- select the project by applying various evaluation techniques.
- find the project duration by scheduling the activities.
- evaluate the risk and allocate the resources accordingly.
- monitor the progress of project and find the quality of project.
- motivate people and establishing a contract.

TEXT BOOKS

1. Bob Hughes,Mikecotterell, "software project management", Fifth edition, TataMcgrawHill, 2004.
2. Wattshumphrey, "Managing the Software Process", PearsoneducationInc.2006.

REFERENCES

1. Nina.sgodbole, "software quality assurance: principles and practices", Alpha science international ltd, 2004.
2. Gordon g schulmeyer," handbook of software quality assurance", 3rd edition, attach house publishers, 2007.
3. Ramesh, gopalaswamy, "managing global projects", TataMcgrawHill,2001.

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

CS15802   **PROJECT WORK**   **0 0 12 6**

COURSE OUTCOMES

Upon the completion of the course, 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.

GUIDELINES

1. The students are expected to get formed into a team of convenient groups of not more than 3 memberson 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. ☐ Demonstrate the knowledge, skills and attitudes of a professional engineer.

TOTAL PERIODS 180

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

CS16151   **XML AND WEB SERVICES**   **3 0 0**

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 - REQUISITE: 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 PublishinInc., 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. Etbancarami, Web services Essential, O„Reilly, 2006.

WEB LINKS

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

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	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
CO5	3	3	3	-	-	2	-	-	-	-	-	3	3	2

CS16152 **BIG DATA AND ANALYTICS** **3 0 0 3**

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.
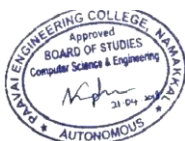2. SeemaAcharya, SubhasiniChellappan, "Big Data Analytics" Wiley 2015.

REFERENCES

1. Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007.
2. Jay Liebowitz, "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.

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	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**
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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

CS16153   **PARALLEL COMPUTING**   **3 0 0 3**

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 Haufmann, 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/

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

COs	\multicolumn{12}{c	}{Programme Outcomes(POs)}	\multicolumn{2}{c	}{Programme Specific Outcomes (PSOs)}
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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

CS16901   **R AND PYTHON PROGRAMMING**   **3 0 0 3**

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   INTRODUCTIO 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

COs	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

CS16902   **FUNDAMENTALS OF DATABASE MANAGEMENT SYSTEMS**   3   0   0   3

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 IIQUERY 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.
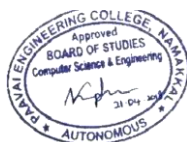
REFERENCES

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/

COs	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

CS16903   **E - COMMERCE**   **3 0 0 3**

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

COs	\multicolumn{12}{c}{Mapping of Course Outcomes with Programming Outcomes (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak}		
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CO5	3	3	3	-	-	2	-	-	-	-	-	3	3	2

CS15352   **WIRELESS SENSOR NETWORKS**   **3 0 0 3**

COURSE OBJECTIVES

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

PRE - REQUISITE: Computer Networks

UNIT I   INTRODUCTION TO WIRELESS SENSOR NETWORKS   9

Over view of sensor networks - Constraints and challenges   - Advantages of Sensor networks - Applications. 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

Routing Challenges and Design Issues in Wireless Sensor Networks, Flooding and - Gossiping - Data centric Routing - SPIN - Directed Diffusion - Energy aware routing - Gradient - based routing - Rumor Routing - COUGAR - ACQUIRE - Hierarchical Routing - LEACH - PEGASIS - Location Based Routing GF - GAF - GEAR - GPSR - Real Time routing Protocols - TEEN - APTEEN - SPEED - RAP.

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.

UNIT V   APPLICATTIONS OF WSN   9

WSN Applications - Home Control   - Building Automation - Industrial Automation - MedicalApplications - Reconfigurable Sensor Networks - Highway Monitoring - Military Applications - Civil and Environmental Engineering Applications - Wildfire Instrumentation - Habitat Monitoring - Nano scopic Sensor.

TOTAL PERIODS   45

COURSE OUTCOMES

Upon the completion of the course, 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.

TEXT BOOKS

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

REFERENCES

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.
4. Yan Zhang; Laurence T. Yang ., "RFID and Sensor Networks: Architectures, Protocols, Security, and
5. Integrations", CRC Press , Francis Xavier University, Antigonish NS, Canada, 2009.

WEB LINKS

1. www.sensor - networks.org.
2. www.nptel.ac.in.
3. www.slideshare.net.

COs	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	3
CO5	3	2	2	2	-	-	-	-	-	-	-	1	2	3

CS15353 **ADVANCED COMPUTER ARCHITECTURE** **3 0 0 3**

COURSE OBJECTIVES

- To introduce the concept of Instruction level parallelism.
- To understand the basic concept of thread level parallelism under shared memory architectures.
- To gain knowledge about VLIW and EPIC.
- To provide a thorough understanding about various memory technologies.
- To know about the various multi core architecture.

PRE - REQUISITE: Computer Architecture

UNIT I INSTRUCTION LEVEL PARALLELISM 9

ILP - concepts and challenges - Pipelining overview - Compiler Techniques for Exposing ILP - Dynamic Branch Prediction - Dynamic Scheduling - Multiple instruction Issue - Hardware Based Speculation - Static scheduling - Multi - threading - Limitations of ILP.

UNIT II THREAD LEVEL PARALLELISM 9

Introduction; Symmetric shared - memory architectures; Performance of symmetric shared - memory multiprocessors Distributed shared memory and directory - based coherence - Basics of synchronization - Models of Memory Consistency.

UNIT III HARDWARE AND SOFTWARE FOR VLIW AND EPIC 9

Introduction: VLIW and EPIC - Detecting and Enhancing Loop - Level Parallelism - Scheduling and Structuring Code for Parallelism - Hardware Support for Exposing Parallelism - Predicated Instructions - Hardware Support for Compiler Speculation - The Intel IA - 64 Architecture and Itanium Processor.

UNIT IV MEMORY AND I/O 9

Introduction - Cache performance - Cache Optimizations - Virtual memory - Advanced optimizations of Cache performance - Memory technology and optimizations - Protection: Virtual memory and virtual machines. Types of storage devices - Buses - RAID - Reliability - availability and dependability - I/O performance measures - Designing an I/O system.

UNIT V MULTICORE ARCHITECTURES 9

Software and Hardware multithreading - SMT and CMP architectures - Design issues - Case studies - Intel Multi - core architecture - SUN CMP architecture - heterogeneous multi - core processors - case study: IBM Cell Processor.

TOTAL PERIODS 45

COURSE OUTCOMES

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

- analyze the performance of different ILP Techniques.
- evaluate the performance of different parallelism with respect to various parameters.
- understand the concept of parallelism.
- identify cache and memory related issues in multi processors.
- know different types of multi core architectures.

TEXT BOOKS

1. John L Hennessey and David A Patterson, "Computer Architecture A Quantitative Approach", Morgan Kaufmann/ Elsevier, Fifth Edition, 2012.

REFERENCES

1. Kai Hwang and Zhi.WeiXu, "Scalable Parallel Computing",Tata McGraw Hill, New Delhi, 2003.

2. Sima D, Fountain T and Kacsuk P,"Advanced Computer Architectures: A Design Space Approach", Addison Wesley, 2000.

3. Kai Hwang and Faye Briggs, "Computer Architecture and Parallel Processing", McGraw - Hill International Edition, 2000.

WEB LINKS

1. http://nptel.ac.in/courses/106105033.

2. https://www.tutorialspoint.com/parallel_computer_architecture/index.htm.

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</table>

CS15354   **INTERNET OF THINGS**   **3 0 0 3**

COURSE OBJECTIVES

- To understand the overview of Internet of Things with various design levels and templates.

- To describe the generic design methodology for internet of things with python programming.

- To describe the characteristics and applications of domain specific IoTs for real life scenarios .

- To provide an introduction to raspberry pi device and use of cloud platforms and frameworks for developing IoT applications.

- To describe 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**

IoT design methodology - Motivation for using Python - Data   Logical Design using Python -   Data Types & Structures - Control Flow - Functions - Modules Operations -   - Packages - File Handling   - Date/Time 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   **9**
                OFFERINGS

IoT Device - Raspberry Pi - Raspberry 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, 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.

REFERENCES

1. ArshdeepBahga, Vijay Madisetti, ―Internet of Things - A hands - on approach‖, Universities Press, 2015.

2. CharalamposDoukas ,‖ Building Internet of Things With the Arduino: Volume 1 ―,published by Createspace,2012

3. Andrian McEwen, Hakim Cassimally, " Designing the Internet of Things", 1st edition, John Wiley & Sons Ltd, 2014.

4. Honbo Zhou, "The Internet of Things in the Cloud: A Middleware Perspective", 1st edition, CRC Press, 2013

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

BA15351   **ENGINEERING ECONOMICS AND FINANCIAL ACCOUNTING**   **3   0   0   3**

COURSE OBJECTIVES

- To know the fundamentals of Managerial Economics.
- To be familiar with Demand and Supply analysis.
- To understand the Production and cost analysis.
- To describe the various financial accounting techniques.
- To understand the significance of Capital Budgeting.

PRE - REQUISITE: Nil

UNIT I   INTRODUCTION   **9**

Managerial Economics   -   Relationship with other disciplines   -   Firms: Types -   objectives and goals - Managerial Decisions   -   Decision analysis.

UNIT II   DEMAND AND SUPPLY ANALYSIS   **9**

Demand -   Types of demand   -   Determinants of demand   - Demand function   - Demand elasticity   - Demand Forecasting -   Supply   - Determinants of supply -   Supply function.

UNIT III   PRODUCTION AND COST ANALYSIS   **9**

Production function   - Returns to scale   - Production optimization   -   Least cost input   -   Isoquant – Managerial uses of production function. Cost Concepts   - Cost function   - Determinants of cost   - Short run and Long run cost curves   - Cost Output Decision -   Estimation of Cost.

UNIT IV   FINANCIAL ACCOUNTING   **9**

Final Accounts - Trading Accounts -   Profit and Loss Accounts   - Balance sheet - Cash flow analysis   - Funds flow analysis.

UNIT V   CAPITAL BUDGETING   **9**

Investments   - Risks and return evaluation of investment decision   - Average rate of return – Payback Period   - Net Present Value -   Internal rate of return.

                                                                                          TOTAL PERIODS   45

COURSE OUTCOMES

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

- acquire knowledge in the basic concepts of Managerial Economics.
- identify the role demand and supply analysis.
- understand the Production and cost analysis.
- know the applications of financial accounting.
- be familiar with the scope capital budgeting.

REFERENCES

1. Samuelson. Paul A and Nordhaus W.D., 'Economics', Tata Mcgraw Hill Publishing Company Limited, New Delhi, 2004.

2. G S Gupta, Samuel Paul, V. L. Mote, "Managerial Economics - Concepts and Cases" McGraw Hill Education, New Delhi, 2004.

3. Prasanna Chandra. 'Fundamentals of Financial Management', Tata Mcgraw Hill PublishingLtd., 4th edition, 2005.

WEB LINKS

1. www.managementstudyguide.com.

2. www.economicsconcepts.com.

3. www.economist.com.

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CS15451   **ADVANCED DATABASE TECHNOLOGY**   **3 0 0 3**

COURSE OBJECTIVES

- To familiarize the basic data base concepts, data models and to conceptualize a database system using ER diagrams.
- To know the concepts of parallel and distributed databases.
- To familiarize the object oriented concepts in databases.
- To learn the active database concepts to enhance the data models.
- To learn the emerging technologies related to the advanced database system.

PRE - REQUISITE: Database Management System

UNIT 1   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.

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   OBJECT AND OBJECT RELATIONAL DATABASES   9

Concepts for object databases: Object identity - Object structure - Type constructors - - OQL - Encapsulation of operations - Methods - Persistence - Type and class hierarchies - Inheritance Complex objects - Object database standards - languages and design: ODMG model - ODL - Object relational and extended - Relational systems: Object relational features in SQL / Oracle.

UNIT IV   ENHANCED DATA MODELS   9

Active database concepts and triggers - Temporal databases - Spatial databases - Multimedia databases - Deductive databases - XML databases: XML data model - DTD - XML schema - XML querying – Geographic information systems.

UNIT V   EMERGING TECHNOLOGIES   9

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

                                                                      TOTAL PERIODS 45

COURSE OUTCOMES

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

- understand the basic database system concepts.
- design parallel and distributed databases for application development.

- apply the object oriented concepts in databases.

- design Active 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

1. Thomas Connolly and Carlolyn Begg, "Database Systems, A Practical Approach to Design, Implementation

2. M T Ozsu, Patrick Valduriez, Principles of Distributed Database Systems, Prentice Hall, 1999.

REFERENCES

1. R. Elmasri, S.B. Navathe, "Fundamentals of Database Systems", Fifth Edition, Pearson Education, 2006.

2. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database System Concepts", Fifth Edition, Tata McGraw Hill, 2006.

3. C.S.R.Prabhu, "Object oriented data base system approaches and architectures" PHI, India, 2004.

4. S. Ceri and G. Pelaggati, Distributed Database System Principles and Systems, MGH, 1985.

5. Rob cornell " Data Base System And Implementation" cengage learning 2011.

WEB LINKS

1. https://www.w3schools.in/sql/database - concepts/

2. http://web.cs.wpi.edu/~cs561/s12/Lectures/4 - 5/ParallelDBs.pdf

3. http://nptel.ac.in/courses/106106093/

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CS15452   **AD-HOC NETWORKS**   **3 0 0 3**

COURSE OBJECTIVES

- To understand the fundamental and design issues in ad hoc.
- To learn the different types of MAC protocols.
- To be familiar with different types of ad hoc routing protocols.
- To be exposing to the Multicast Routing and Transport Layer issues in ad hoc networks.
- To be familiar with Security Protocols and QOS in Ad Hoc Wireless Networks

PRE - REQUISITE: Computer Networks

UNIT I   INTRODUCTION   9

Fundamentals of Wireless Communication Technology - The Electromagnetic Spectrum - Radio propagation Mechanisms - Characteristics of the Wireless Channel - Fundamentals of WLANs - Mobile ad hoc networks (MANETs) - ad hoc wireless network - 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 Mechanisms   - Contention based MAC protocols with Scheduling Mechanisms -   Multi channel MAC - IEEE 802.11.

UNIT III   ROUTING PROTOCOLS FOR AD HOC WIRELESS NETWORKS   9

Issues in designing a routing protocol for Ad hoc wireless networks -   Classifications of Routing Protocols - Table Driven Routing Protocols   - On Demand Routing Protocols - Hybrid Routing Protocols -   Routing Protocols with Efficient Flooding Mechanisms - Hierarchical Routing Protocols.

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

Issues in Designing a Multicast Routing Protocol - Classification of Multicast Routing Protocols - Application Dependent Multicast Routing -   Issues & 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   - Issues and Challenges of QOS - Classifications of QOS - MAC & Network Layer Solutions - QOS Frameworks.

**   TOTAL PERIODS   45**

COURSE OUTCOMES

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

- explain the concepts, network architectures and applications of ad hoc Networks.
- analyze the protocol design issues of ad hoc Wireless Networks.
- design routing protocols for ad hoc wireless networks with respect to some protocol design issues.
- explain 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.Toh, "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.

WEB LINKS

1. http://www.cs.jhu.edu/~cs647/intro_adhoc.pdf

2. http://www.ericsson.com/ericsson/corpinfo/publications/review/2000_04/files/2000046.pdf

3. http://textofvideo.nptel.iitm.ac.in/117102062/lec2.pdf.

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</table>

CS15453   **GRAPH THEORY AND APPLICATIONS**   **3 0 0 3**

COURSE OBJECTIVES

- To understand the basic concepts of graph and tree.
- To gain knowledge in concept of network flow, spanning tree and planar graph.
- To gain knowledge in colorings the graph and understand the directed graph.
- To implement the arrangement and grouping concepts mathematically.
- To gain 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, students will be able to

- learn the basic concepts of graph and tree.
- understand and able to design the spanning tree, network flow and planar graph.
- able to design and implement the graph coloring.
- implement the permutations & 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, 1994.

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. Liu C.L., "Elements of Discrete Mathematics", McGraw Hill, 1985.

WEB LINKS

1. http://www.mathworks.in/help/dsp/ref/matrixviewer.html

2. http://www.imatest.com/docs/colormatrix/

3. https://www.jstor.org/stable/24344961

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

CS15454   **USER INTERFACE DESIGN**   **3 0 0 3**

COURSE OBJECTIVES

- To learn about graphical system.
- To study about design standards.
- To learn about the controls used in windows.
- To study about the multimedia.
- To perform various test in windows layout.

PRE - REQUISITE: Graphics and Multimedia

UNIT I   INTRODUCTION   9

Human - Computer Interface - Characteristics of Graphics Interface - Direct Manipulation Graphical System Web User Interface - Popularity - Characteristic & Principles.

UNIT II   HUMAN COMPUTER INTERACTION   9

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

UNIT III   WINDOWS   9

Characteristics - Components - Presentation Styles - Types - Management - Organizations - Operations - Web Systems - Device - Based Controls Characteristics - Screen - Based Controls - Operate Control - Text Boxes - Selection Control   - Combination Control - Custom Control - Presentation Control.

UNIT IV   MULTIMEDIA   9

Text For Web Pages - Effective Feedback - Guidance & Assistance – Internationalization - Accessibility - Icons - Image - Multimedia - Coloring.

UNIT V   WINDOWS LAYOUT - TEST   9

Prototypes - Kinds of Tests - Retest - Information Search - Visualization - Hypermedia - WWW - Software Tools.

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of the course, the student should 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 BOOK

1. Wilbent. O. Galitz ,"The Essential Guide To User Interface Design", John Wiley&Sons, 2016.

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.

WEB LINKS

1. nptel.ac.in/courses/106105087/20
2. https://www.tutorialspoint.com/software.../software_user_interface_design.htm

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</table>

CS15455   **DISTRIBUTED SYSTEMS**   **3 0 0 3**

COURSE OBJECTIVES

- To study the communication in the distributed environment.
- To learn few operating system concepts in distributed level.
- To gain the knowledge of scheduling and file systems
- To learn the fault tolerance in distributed systems
- To learn about Distributed Object and Coordination Based Systems

PRE - REQUISITE: Operating system, Computer Networks

UNIT I   COMMUNICATION IN DISTRIBUTED ENVIRONMENT   9

Introduction - Various Paradigms in Distributed Applications - Remote Procedure Call - Remote Object Invocation Message - Oriented Communication - Unicasting, Multicasting and Broadcasting - Group Communication.

UNIT II   DISTRIBUTED OPERATING SYSTEMS   9

Issues in Distributed Operating System   -   Threads in Distributed Systems   -   Clock Exclusion   - Synchronization   - Causal Ordering -   Global States   -   Election Algorithms   -   Distributed Mutual   - Distributed Transactions - Distributed Deadlock   - Agreement Protocols.

UNIT III   DISTRIBUTED RESOURCE MANAGEMENT   9

Distributed Shared Memory   - Data - Centric Consistency Models   - Client   - Centric Consistency   - Models – Ivy Munin - Distributed Scheduling - Distributed File Systems   - Sun NFS.

UNIT IV   FAULT TOLERANCE   9

Introduction to Fault Tolerance   -   Distributed Commit Protocols   -   Byzantine Fault Tolerance – Impossibilities in Fault Tolerance.

UNIT V   DISTRIBUTED OBJECT AND COORDINATION - BASED SYSTEMS   9

Introduction to Distributed Object   - Based Systems   - CORBA - DCOM - Globe -   Distributed Coordination based System - JINI.

                                                            TOTAL PERIODS   45

COURSE OUTCOMES

Upon the completion of the course, the student should be able to

- understand the communication in distributed system.
- correlate the OS concepts with distributed system.
- understand the shared memory and scheduling.
- analyze the fault tolerance in distributed system.
- analyze and apply the distributed object systems.

TEXT BOOKS

1. George Coulouris, Jean Dollimore, Tim Kindberg, "Distributed Systems Concepts and design" , Third Edition, Pear Education Asia, 2002.

2. HagitAttiya and Jennifer Welch, "Distributed Computing: Fundamentals, Simulation and advanced topics",Wiley,2004.

REFERENCES

1. Andrew S. Tannenbaum and Maarten Van Steen, "Distributed Systems: Principles and Paradigms", Second Edition, Pearson, 2007.

2. M.L.Liu, "Distributed Computing Principles and Applications", Pearson Addison Wesley, 2004.

3. George Coulouris, Jean Dollimore, Tim Kindberg, and Gordon Blair, "Distributed Systems: Concepts and Design", Fifth Edition, Addison Wesley, 2011.

4. A.S.Tanenbaum, M.Van Steen, "Distributed Systems", Pearson Education, 2004.

5. MukeshSinghal, "Advanced Concepts In Operating Systems", McGraw Hill Series in Computer Science, 1994.

WEB LINKS

1. http://www.ejbtutorial.com/category/distributed - systems.

2. http://www.ics.uci.edu/~cs230/lectures/DistributedOSintro.pdf.

3. http://nptel.ac.in/courses/106106107/1.

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CS15551　　　　　　　　　**AGILE SOFTWARE DEVELOPMENT**　　　　　**3　0　0　3**

COURSE OBJECTIVES

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

PRE - REQUISITE: Software Engineering

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 Tests and 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 Agile Tester.

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.

UNIT V　　　INDUSTRY TRENDS　　　　　　　　　　　　　　　　　　9

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, 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 Schawber, 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.

WEB LINKS

1. www.it - ebooks.info/tag/agile

2. http://martinfowler.com/agile.html

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

CS15552   **SERVICE ORIENTED ARCHITECTURE**   **3 0 0 3**

COURSE OBJECTIVES

- To gain understanding of the basic principles of service orientation.
- To learn service oriented analysis techniques.
- To learn technology underlying the service design.
- To learn advanced concepts such as service composition, orchestration and Choreography.
- To know about various WS - * specification standards.

PRE - REQUISITE: Internet and Java Programming

UNIT I   BASICS OF SOA   **9**

Roots of SOA   -   Characteristics of SOA   - Comparing SOA to client - server and distributed internet architectures - Anatomy of SOA - How components in an SOA interrelate - Principles of service orientation. **UNIT**

II   WEB SERVICES   **9**

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

UNIT III   SERVICE DESIGN   **9**

Service oriented ana ysi -   Business - centric SOA   -   Deriving business services - service modeling - Service Orien ed De ign - WSDL basics - SOAP basics - SOA composition guidelines - Entity - centric business service design - Application service design - Task - centric business service design.

UNIT IV   SOA PLATFORM BASICS   **9**

SOA platform basics -   SOA support in J2EE - Java API for XML - based web services(JAX - WS)   - Java architecture for XML binding (JAXB) - Java API for XML Registries(JAXR) - Java API for XML based RPC (JAX - RPC) - Web Services Interoperability Technologies (WSIT) -   SOA support in .NET   - Common Language Runtime-ASP.NETweb forms-ASP.NET web services   -Web Services Enhancements (WSE).

UNIT V   BUILDING SOA - BASED APPLICATIONS   **9**

WS - BPEL basics - WS - Coordination overview - WS - Choreography, WS - Policy, WS - Security.

                                                                              TOTAL PERIODS   45

COURSE OUTCOMES

Upon the completion of the course, the student should be able to

- understand the basics of SOA.
- understand the service layers of web services.
- understand and discuss service and design.
- understand the basic platforms of SOA.
- understand the applications of SOA.

TEXT BOOK

1. Thomas Erl "Service - Oriented Architecture: Concepts, Technology, and Design", Pearson Education, 2005.

REFERENCES

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.

3. Sandeep Chatterjee, James Webber, "Developing Enterprise Web Services, An Architect"s Guide", Pearson Education, 2005.

4. Dan Woods and Thomas Mattern, "Enterprise SOA Designing IT for BusinessInnovation" O"REILLY, First Edition, 2006.

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

CS15553   **DIGITAL IMAGE PROCESSING**   **3   0   0   3**

COURSE OBJECTIVES

- To understand the fundamentals of image processing.
- To gain knowledge on various Image enhancement techniques.
- To know the various Image restoration techniques.
- To understand the needs of various Image compression techniques.
- To gain knowledge about various Image segmentation, representation and description methods.

PRE - REQUISITE: Digital electronics, Transforms and Partial Differential Equations

UNIT I   INTRODUCTION   9

Origin of Digital Image processing   - fundamental steps in image processing   -   Components of Image processing system   - Visual perception -   Light and EM spectrum -   Image sensing and acquisition - Image sampling and Quantization - relationship between pixels.

UNIT II   IMAGE ENHANCEMENT   9

Spatial Domain: Gray level transformation   -   Histogram processing   -   Arithmetic / Logic operations - Spatial filtering - smoothing filters - sharpening filters Frequency Domain: Fourier transform   - smoothing frequency domain filters -   sharpening filters - Homographic filtering.

UNIT III   IMAGE RESTORATION   9

Model of Image degradation/ restoration process   - Noise models - mean filters   - order statistics - adaptive filters - band reject - band pass   - notch - optimum notch filters   - Linear, position invariant degradations – establishing degradation functions - Inverse filtering - Weiner -   least Square   - Geometric mean filters.

UNIT IV   IMAGE COMPRESSION   9

Fundamentals -   Image compression models   -   error free compression: variable length coding - Lossless predictive coding   - Bit plane coding - Lossy compression - Image compression standards.

UNIT V   IMAGE SEGMENTATION, REPRESENTATION AND DESCRIPTION   9

Segmentation: Detection of discontinuities - Edge linking & Boundary detection - Threshold - region based segmentation. Representation & Description: Chain codes - Polygonal approximations - signatures, Boundary segments - Skeletons; Boundary Description, Fourier descriptors - Regional descriptors - Recognition based on matching.

                                                                                 TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of the course, the student should be able to

- Apply the digital image fundamentals for the digital image representation..
- apply image enhancement techniques and describe the underlying mathematical principles.
- apply image restoration techniques..
- analyze the constraints in image processing when dealing with larger data sets and use image compression techniques.

- describe and apply the concepts of feature detection and contour finding algorithms in the field of biomedical imaging to other engineering disciplines

TEXT BOOKS

1. Rafael C. Gonzalez, Richard E. Woods, "Digital Image Processing" , 2nd edition , Pearson Education, 2007.
2. Anil Jain K. "Fundamentals of Digital Image Processing", PHI Learning Pvt. Ltd., 2011.

REFERENCES

1. S.Annadurai, R.Shanmugalakshmi, "Fundamentals of Digital Image Processing", Pearson Education, 2007
2. Willliam K Pratt, "Digital Image Processing", John Willey, 2002.
3. Malay K. Pakhira, "Digital Image Processing and Pattern Recognition", First Edition, PHI Learning Pvt. Ltd., 2011.
4. Milan Sonka, Vaclav Hlavac, Roger Boyle Image Processing. Analysis, and Machine Vision (Second Edition,2003).
5. ChandaDuttaMagundar Digital Image Processing and Application, Prentice Hall of India, 2006.

WEB LINKS

1. http://eeweb.poly.edu/~onur/lectures/lectures.html
2. www.caen.uiowa.edu/~dip/LECTURE/lecture.html

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</table>

CS15554   **SOFT COMPUTING**   **3   0   0   3**

COURSE OBJECTIVES

- To understand the features of neural network and its applications.
- To learn the concepts of supervised learning.
- To know about the feedback neural networks and self - organizing feature maps.
- To study the fuzzy logic components.
- To gain knowledge insight onto Genetic Algorithms.

PRE - REQUISITE: Nil

UNIT I   INTRODUCTION TO ARTIFICIAL NEURAL NETWORKS   9

Characteristics - structure and working of biological neural network - models of neuron - functional units in a ANN for pattern recognition task - Soft Computing Constituents - From Conventional AI to Computational Intelligence -

UNIT II   FEEDFORWARD NEURAL NETWORKS   9

SUPERVISED LEARNING - I: Perceptron - Learning and memory - Learning algorithms - Error correction and gradient decent rules - Perceptron learning algorithms. SUPERVISED LEARNING - II: Backpropogation, Multilayered network architectures - Back propagation learning Algorithm - Applications of feed forward neural networks.

UNIT III   FEEDBACK NEURAL NETWORKS AND SELF ORGANIZING FEATURE MAP   9

Introduction - Associative learning - Hopfield network - Error performance in Hopfield networks - simulated annealing, Boltzmann machine and Boltzmann learning - state transition diagram and false minima problem - stochastic update - simulated annealing - Boltzmann machine - bidirectional associative memory - Self - organization - generalized learning laws - competitive learning - vector quantization - self - organizing feature map - applications of self - organizing feature map.

UNIT IV   FUZZY LOGIC   9

Fuzzy set theory   - crisp sets - fuzzy sets - Crisp relations - Fuzzy relations   - Fuzzification – Defuzzification - Fuzzy rules - Membership function -   Decision - making logic - Introduction to Neuro - fuzzy system - Adaptive fuzzy system, Applications of fuzzy logic control.

UNIT V   GENETIC ALGORITHMS   9

Goals of optimiz tion - Genetic algorithm and search space -   operators - generational cycle - stopping condition -   Constraints - classification - genetic programming   - multilevel optimization and applications of Genetic Algorithm.

                                              TOTAL PERIODS   45

COURSE OUTCOMES

Upon the completion of the course, the student should be able to

- describe the essentials of artificial neural network and soft computing.
- describe supervised learning and its applications.
- gain knowledge on feedback neural networks.

- define fuzzy systems and use fuzzy logic.

- understand genetic algorithm concepts and Write Genetic Algorithm to solve the optimization problem.

TEXT BOOKS

1. S.N.Sivanandam and S.N.Deepa, Principles of Soft computing, Wiley India Edition, 2nd Edition, 2013.

2. S. Rajasekaran, VijaylakshmiPai (2003), Neural networks, Fuzzy Logic and Genetic Algorithms Synthesis and Applications, Prentice Hall of India, New Delhi, India.

3. Rob Farber, "CUDA application design and development", Morgan Haufmann, 2011.

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1. Genetic Algorithms BY "David E. Goldberg" Pearson Education.

2. Timothy J. Ross, „Fuzzy Logic with Engineering Applications", Tata McGraw Hill, 1997.

3. Yegnanarayana (2006), Artificial Neural Networks, Prentice Hall of India, New Delhi, India.

4. Neural Networks and Learning Machines By "Simon Haykin"3rd Edition, Phi Publication.. B. Chapman,

5. G. Jost, and Ruud van der Pas, "Using OpenMP", MIT Press, 2008.

6. Lotfi A. Zadeh(1997), Soft computing and Fuzzy Logic, World Scientific Publishing Co., Inc. River Edge,NJ, USA.

WEB LINKS

1. sourcecodesonline.blogspot.com/.../cs1018 - soft - computing - syllabus.html

2. www2.cs.uh.edu/~ceick/6367/Soft - Computing.pdf

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

CS15651   **SOFTWARE TESTING**   **3 0 0 3**

COURSE OBJECTIVES

- To understand standard principles to check the occurrence of defects and its removal.

- To learn the various design of test cases.

- To know the behavior of the testing techniques to detect the errors in the software

- To be familiar with test management.

- To learn the functionality of automated testing tools.

PRE - REQUISITE: Software Engineering

UNIT I   INTRODUCTION   9

Testing as an Engineering Activity   -   Testing as a Process -   Basic definitions - Software Testing Principles - The Tester''s Role in a Software Development Organization - Origins of Defects - Cost of defects - Defect Classes - The Defect Repository and Test Design   - Defect Examples - Developer/Tester Support of Developing a Defect Repository.

UNIT II   TEST CASE DESIGN   9

Test case Design Strategies   - Using Black Box Approach to Test Case Design   - Random Testing - Requirements based testing - Boundary Value Analysis - Equivalence Class Partitioning - State - based testing - Cause - effect graphing - Compatibility testing - user documentation testing - domain testing - Using White Box Approach to Test design - Test Adequacy Criteria - static testing vs. structural testing - code functional testing - Coverage and Control Flow Graphs - Covering Code Logic - Paths - code complexity testing.

UNIT III   LEVELS OF TESTING   9

The Need for Levels of Testing - Unit Test - Unit Test Planning - Designing the Unit Tests. The Test Harness - Running the Unit tests and Recording results - Integration tests - Designing Integration Tests - Integration Test Planning - scenario testing - defect bash elimination - System Testing - types of system testing - Acceptance testing - performance testing -   Regression Testing - internationalization testing - ad - hoc testing - Alpha - Beta Tests - testing OO systems - usability and accessibility testing.

UNIT IV   TEST MANAGEMENT   9

People and organizational issues in testing - organization structures for testing teams - testing services - Test Planning - Test Plan Components - Test Plan Attachments - Locating Test Items - test management - test process - Reporting Test Results   - The role of three groups in Test Planning and Policy Development - Introducing the test specialist - Skills needed by a test specialist   - Building a Testing Group.

UNIT V   TEST AUTOMATION   9

Software test automation - skills needed for automation - scope of automation - design and architecture for automation - requirements for a test tool - challenges in automation - Test metrics and measurements - project, progress and productivity metrics - Criteria for Test Completion - SCM - Types of reviews - Developing a review program - Components of Review Plans - Reporting Review Results. - testing maturity model.

                                              TOTAL PERIODS   45

COURSE OUTCOMES

Upon the completion of the course, the student should be able to

- understand the role of tester in software organization.
- document test plan and test cases designed.
- identify suitable tests to be carried out.
- understand the technology tools that can reduce paper waste and carbon footprint by user.
- explore the test automation concepts and tools

TEXT BOOKS

1. Srinivasan Desikan and Gopalaswamy Ramesh, " Software Testing - Principles and Practices", Pearson education, 2006
2. AdityaP.Mathur, "Foundations of Software Testing", Pearson Education, 2008.

REFERENCES

1. Boris Beizer, "Software Testing Techniques", Second Edition, Dreamtech, 2003
2. Edward Kit ," Software Testing in the Real World - Improving the Process", Pearson Education,1995.
3. Ron Patton, "Software Testing", Second Edition, Sams Publishing, Pearson Education, 2007
4. Ilene Burnstein, "Practical Software Testing", Springer International Edition, 2003.

WEB LINKS

1. http://nptel.ac.in/courses/106101061/18
2. http://nptel.ac.in/courses/106105150/

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

CS15652   **ROBOTICS**   **3 0 0 3**

COURSE OBJECTIVES

- 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

PRE - REQUISITE: Discrete Mathematics, Numerical Methods

UNIT I   SCOPE OF ROBOTS   9

Introduction - The scope of industrial Robots - Definition of an industrial robot   - Need for industrial robots - Usage - applications.

UNIT II   ROBOT COMPONENTS WITH ROBOT MANIPULATOR   9

Fundamentals of Robot Technology - Automation and Robotics - Robot anatomy - Work volume - Precision of movement - End effectors - Sensors   - Kinematics of serial robots - Direct and inverse kinematics - Linear and angular velocity of links - Dynamics of serial and parallel manipulators.

UNIT III   MODELING AND CONTROL OF FLEXIBLE ROBOTS AND ROBOT

**   PROGRAMMING**   **9**

Models of flexible links and joints   -   Kinematic modeling of multi - link flexible robots - Dynamics and control of flexible link manipulators - Robot Programming - Methods - interlocks textual languages. Characteristics of Robot level languages, characteristic of task level languages.

UNIT IV   PERMUTATIONS AND COMBINATION   9

Introduction - Robot Cell Design and Control -   Remote Center Compilance   - Safety in Robotics.

UNIT V   FUTURE TRENDS   9

Introduction to chaos - Non - linear dynamics and chaos in robot equations   - Simulations of planar 2 DOF manipulators - Analytical criterion for unforced motion   - Gough - Stewart platform and its singularities -use of near singularity for fine motion for sensing   - design of Gough - Stewart platform based sensors. Advanced robotics - Advanced robotics in Space -   Specific features of space robotics systems - long - term technical developments - Advanced robotics in under -   water operations. Robotics Technology of the Future - Future Applications.

TOTAL PERIODS   45

COURSE OUTCOMES

Upon the completion of the course, the student should be able to

- use matrix algebra and Lie algebra for computing the kinematics of robots.
- calculate the forward kinematics and inverse kinematics of serial and parallel robots.
- calculate the Jacobian for serial and parallel robot.
- do the path planning for a robotic system.
- proficient in the use of Maple or Matlab for the simulation of robots.

TEXT BOOKS

1. Barry Leatham - Jones, "Elements of industrial Robotics" PITMAN Publishing, 1987.

2. Grimaldi R.P. "Discrete and Combinatorial Mathematics: An Applied Introduction", Addison Wesley, 1994.

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",

3. Prentice Hall of India, 1996.

4. Liu C.L., "Elements of Discrete Mathematics", McGraw Hill, 1985.

WEB LINKS

1. http://www.mathworks.in/help/dsp/ref/matrixviewer.html

2. http://www.imatest.com/docs/colormatrix/

3. https://www.jstor.org/stable/24344961

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

MA15153   **OPERATIONS RESEARCH**   **3 0 0 3**

COURSE OBJECTIVES

- To provide the concept and an understanding of basic concepts in Operations Research.
- To understand develop and solve mathematical model of Transport and assignment problems.
- To understand the techniques of optimality.
- To develop an understanding and appreciation for the field of inventory and production management.
- To provide the student with a rigorous framework with which to model and analyze queuing systems.

PRE-REQUISITE : Nil

UNIT I   LINEAR PROGRAMMING MODELS   **9**

Mathematical Formulation - Graphical Solution of linear programming models - Simplex method - Big M
- Method   - Two phase method.

UNIT II TRANSPORTATION AND ASSIGNMENT MODELS   **9**

Mathematical formulation of transportation problem - Methods for finding initial basic feasible solution - optimum
solution - degeneracy - Mathematical formulation of assignment models - Variants of the Assignment problem.

UNIT III   DYNAMIC PROGRAMMING   **9**

Dynamic programming - Principle of optimality - Forward and backward recursion - Applications of dynamic
programming - Problem of dimensionality.

UNIT IV   INVENTORY MODELS AND NETWORKING MODELS   **9**

Inventory Models - EOQ and EBQ Models (With and without shortages), Quantity Discount Models - Networking
Models - PERT & CPM.

UNIT V   QUEUEING MODELS   **9**

Characteristics of Queuing Models   - Poisson Queues   - (M / M / 1) : (FIFO / ∞ /∞), (M / M / 1) : (FIFO / N /
∞), (M / M / C) : (FIFO / ∞ / ∞), (M / M / C) : (FIFO / N / ∞) models.

                                                                TOTAL PERIODS   45

COURSE OUTCOMES

Upon the completion of the course, the student should be able to

- understand and apply linear, integer programming to solve operational problem with constraints..
- apply transportation and assignment models to find optimal solution in warehousing and Travelling.
- able to use optimization concepts in real world problems.
- logistics majors will be able to apply inventory models and techniques to create and recommend
  appropriate stocking solutions in various business settings.
- identify and analyze appropriate queuing model to reduce the waiting time in queue.

TEXT BOOKS

1. R.Panneerselvam," Operations research", Second edition, Prentice hall - USA - 2007.

2. Operations Research by Kanthiswarup, P.K. Gupta, Manmohan 9[th]Revised Edition 2001, Reprint 2002. Sultan Chand & Sons, New Delhi

REFERENCES

1. Taha H.A, "Operations Research: An Introduction ", 8th Edition, Pearson Education, 2008

2. Prem Kumar Gupta, D.S. Hira, "Operations Research", S.Chand& Company Ltd, New Delhi, Third Edition , 2008

3. John W. Chinneck, "Feasibility and Infeasibility in Optimization Algorithms and Computational Methods", Springer, 2008.

4. Ravindran, Phillips, Solberg, "Operations Research: Principles and Practice", Second Edition, John Wiley & Sons, 2007.

WEB LINKS

1. https://www.youtube.com/watch?v=M8POtpPtQZc

2. https://www.youtube.com/watch?v= - YBlR1UF - UY

3. https://www.youtube.com/watch?v=ug7O1lSZyg0

<table>
<tr><th colspan="15">Mapping of Course Outcomes with Programme Outcomes
(1/2/3 indicates strength of correlation) 3-strong, 2-Medium, 1-Weak</th></tr>
<tr><th rowspan="2">COs</th><th colspan="12">Programme Outcomes POs</th><th colspan="2">Programme Specific Outcomes PSOs</th></tr>
<tr><th>PO1</th><th>PO2</th><th>PO3</th><th>PO4</th><th>PO5</th><th>PO6</th><th>PO7</th><th>PO8</th><th>PO9</th><th>PO10</th><th>PO11</th><th>PO12</th><th>PSO1</th><th>PSO2</th></tr>
<tr><td>CO1</td><td>3</td><td>3</td><td>2</td><td>2</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>1</td><td>2</td><td>3</td></tr>
<tr><td>CO2</td><td>3</td><td>3</td><td>2</td><td>3</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>1</td><td>2</td><td>3</td></tr>
<tr><td>CO3</td><td>3</td><td>2</td><td>2</td><td>3</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>1</td><td>3</td><td>3</td></tr>
<tr><td>CO4</td><td>2</td><td>2</td><td>3</td><td>1</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>1</td><td>2</td><td>2</td></tr>
<tr><td>CO5</td><td>3</td><td>2</td><td>3</td><td>2</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>1</td><td>2</td><td>3</td></tr>
</table>

| CS15653 | GRID COMPUTING | 3 | 0 | 0 | 3 |

COURSE OBJECTIVES

- To know the basic concepts of Grid.
- To understand the infrastructure of Grid
- To acquire the Knowledge of job management in grid.
- To expertise in Grid management
- To learn the security and Resource management.

PRE - REQUISITE: Nil

UNIT I   INTRODUCTION   9

Introduction - Evolution of grid Computing - Grid Architecture - Characteristics - Grid vs. super computer - Grid computing organizations and their role - Pros and Cons of grid - Companies in the grid Today - Types of grid - Benefits and challenges of grid computing.

UNIT II   GRID INFRASTRUCTURE   9

Open grid services architecture(OGSA) - The Globus Toolkit 3(GT3) - OGSA - DAI - WSRF - Semantic grid - Computing - Grid Security infrastructure (GSI).

UNIT III   SCHEDULING AND MANAGEMENT IN GRID   9

Grid scheduling and resource management - Sche uling paradigms - scheduling with QoS - Review of Condor - Working principles of Scheduling Sun G id Engine (SGE) - Portable batch System (PBS), Load sharing facility.

UNIT IV   GRID MONITORING   9

Grid Monitoring Architecture (GMA) - An Overview of Grid Monitoring Systems - Grid ICE Network Weather Service - R - GMA - Other Monitoring Systems - Ganglia and Grid Mon

UNIT V   GRID SECURITY AND APPLICATION MANAGEMENT   9

Grid Security - A Brief Security Primer - PKI - X509 Certificates - Grid Application Description Language - Application Partitioning - Meta - Scheduling - Mapping - Monitoring.

                                                        TOTAL PERIODS   45

COURSE OUTCOMES

Upon the completion of the course, the student should be able to

- define and explain the grid environment.
- demonstrate the access of grid for the service
- organize processes in a grid.
- define and explain the functionalities of Grid.
- explain the security and Application management in Grid.

TEXT BOOKS

1. Joshy Joseph and Craig Fellenstein, "Grid Computing", Pearson Education.2004 IBM Press.

REFERENCES

1. Fran Berman, Geoffrey Fox, Anthony J.G. Hey, "Grid Computing: Making the Global Infrastructure a Reality ", John Wiley and Sons, 2003. D Janaki Ram, "Grid Computing", TMH.
2. Ahmar Abbas, "Grid Computing: A Practical Guide to Technology and Applications", Charles River.

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

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

CS16951   AMCAT (ONLINE PLACEMENT APTITUDE CERTIFICATION)   0 0 2 1

PRE-REQUISITE: Fundamentals of Computer Science

COURSE LAYOUT

Operating System and Computer Architecture - Basics of OS and Computer Architecture, Process Management and Synchronization and Memory and I/O Management. DBMS - Data model, Relational Algebra and SQL, Normalization, Architecture and Indexing. **Computer Networks -** Basics of networking and communication, OSI, TCP/IP layers and protocols and Network Devices and Routing Algorithms.

TOTAL PERIODS 30

TEXT BOOKS

1. Silberschatz, Galvin, and Gagne, "Operating System Concepts", Ninth Edition,   Wiley India Pvt Ltd, 2013.

2. Thomas Connolly and Carolyn Begg, ―Database Systems: A Practical Approach to Design, Implementation and Management, Fifth Edition, Pearson Education, 2009.

3. William Stallings, ―Data and Computer Communications, Tenth Edition, Pearson Education, 2013.

WEB LINK

1. https://www.myamcat.com/courses

CS16952   E-LITMUS (ONLINE PLACEMENT APTITUDE CERTIFICATION)   0 0 2 1

PRE-REQUISITE: Basics of Mathematical Concept

COURSE LAYOUT

eLitmus Syllabus for Quantitative Aptitude- Number Systems - Coordinate Geometry – Logarithms - Quadratic Equations - Time, Speed & Distance – Geometry - Permutation & Combination. Logical Reasoning - Data Tabulation based Questions - Arrangement Based Problems - crypt arithmetic Problem - Bar Graphs/Pie Charts. Verbal Ability - Questions Related To Grammatical Concepts - Reading Comprehension - Paragraph Based Questions.

TOTAL PERIODS 30

TEXT BOOK

1. Crypt arithmetic Division Problems, "A Complete Guide for eLitmus Exam".

WEB LINK

1. http://www.elitmuszone.com/elitmus/cryptarithmetic-division-problems/

CS16953	NASSCOM NAC-TECH	0 0 2 1

(ONLINE PLACEMENT APTITUDE CERTIFICATION)

PRE-REQUISITE: Basics of Mathematical concepts & computer science

COURSE LAYOUT

Verbal ability - Articles, reading comprehension, prepositions, and synonyms - Analytical Ability: Data sufficiency, series & pattern completion, conceptualization, Venn diagram, puzzles Programming Fundamentals -SDLC, Algorithm, flowcharts.5.Learning Ability Test: Learning abilities. Written English Test - Introduction to Databases, Relationships, ER Diagrams, Constraints and Keys, Normalization, Indexing, Performance, Locking, Database Structures & Processes, Process Management, Deadlocks, Memory management, OS File Management, OS Security fundamentals, IO Management, Device Management, Network Technology, Network Topology, OSI Reference model, Protocols, Client Server Architecture, Linked Lists, Trees, Stacks, Queues, Dynamic Memory Allocation, Sorting and Searching Algorithms, Structures, Software Life Cycle(SDLC), Requirements Analysis, Design, Coding, Levels of Testing, Implementation, Maintenance, Development Models

TOTAL PERIODS 30

TEXT BOOK

1. "Strategic Alliance between NASSCOM and NIIT focusing on skill development", NIIT.

WEB LINK

1. http://nactech.nasscom.in/

CS16954   I-PAT (ONLINE PLACEMENT APTITUDE CERTIFICATION)   0 0 2 1

PRE-REQUISITE: Basics of Mathematical Concept

COURSE LAYOUT

Numeric Series Problem - Difference based Series - Common Rule Series - Pair Wise Series - Interleaved Series - Power based Series - Exotic Series. Math Word Problems - Ratios and Percentages - Work and Time - Ipat Geometry - Mixtures and Compounds - Interest and Probability.

TOTAL PERIODS 30

TEXT BOOK

1. IBM IPAT, "JobTestPrep".

WEB LINK

1. https://masteribmipat.com/

PRE-REQUISITE: C Programming, Java or C++ programming

COURSE LAYOUT

Introduction - Life cycle models I - Life Cycle Models II - Requirements analysis and specification - Basics of software design - Procedural design methodology - Object-oriented concepts - Introduction to UML: Class and Interaction Diagrams - Object-oriented analysis and design - Testing I - Testing II- Testing III.

TOTAL PERIODS 30

TEXT BOOK

1. Rajib Mall, Software Engineering, PHI, 2013.

WEB LINK

1. https://onlinecourses.nptel.ac.in/noc18_cs43/preview

CS16956   **NPTEL-ARTIFICIAL INTELLIGENCE SEARCH**   **0 0 2 1**

METHODS FOR PROBLEM

PRE-REQUISITE: Data Structures and Programming

COURSE LAYOUT

Introduction: Overview and Historical Perspective, Turing Test, Physical Symbol Systems and the scope of Symbolic AI, Agents - State Space Search: Depth First Search, Breadth First Search, DFID - Heuristic Search: Best First Search, Hill Climbing, Beam Search - Traveling Salesman Problem, Tabu Search, Simulated Annealing - Population Based Search: Genetic Algorithms, Ant Colony Optimization - Branch & Bound, Algorithm A*, Admissibility of A* - Monotone Condition, IDA*, RBFS, Pruning OPEN and CLOSED in A* - Problem Decomposition, Algorithm AO*, Game Playing - Game Playing: Algorithms Minimax, AlphaBeta, SSS* - Rule Based Expert Systems, Inference Engine, Rete Algorithm - Planning: Forward/Backward Search, Goal Stack Planning, Sussman's Anomaly - Plan Space Planning, Algorithm Graph plan.

TOTAL PERIODS 30

TEXT BOOK

1. Deepak Khemani, A First Course in Artificial Intelligence, McGraw Hill (India), 2013.

WEB LINK

1. https://onlinecourses.nptel.ac.in/noc18_cs51/preview

CS16957　　　　**NPTEL- COPUTER NETWORKS AND INTERNET**　　　　**0 0 2 1**
PROTOCOL

PRE-REQUISITE:　Nil

COURSE LAYOUT

Introduction to Computer Networks – History, Circuit Switching and Packet Switching - TCP/IP Protocol Stack – Basic Overview- Application Layer Services (HTTP, FTP, Email, DNS) - Transport Layer Primitives – Connection Establishment and Closure - Flow Control and Congestion Control at the Transport Layer - Transmission Control Protocol – Basic Features, TCP Congestion Control - Network Layer Primitives – IP Addressing - IP Routing – Intra Domain Routing Protocols, Inter Domain Routing Protocols (BGP) - IP Services – SNMP, ARP - Data Link Layer Service Primitives – Forwarding, Flow Control, Error Control Media Access Control - Channel Access Protocols, Framing - End to End Principles of Computer Networks.

TOTAL PERIODS 30

TEXT BOOKS

1. Computer Networking: A Top - Down Approach, by Ames Kurose, Keith Ross 2013.
2. Computer Networks: A Systems Approach Book by Bruce S. Davie and Larry L. Peterson.

WEB LINK

1. https://onlinecourses.nptel.ac.in/noc18_cs38/preview

PRE-REQUISITE: Nil

COURSE LAYOUT

Motivation for Computing - Welcome to Programming!! - Variables and Expressions : Design your own calculator - Loops and Conditionals : Hopscotch once again - Lists, Tuples and Conditionals : Lets go on a trip - Abstraction Everywhere : Apps in your phone - Counting Candies : Crowd to the rescue - Birthday Paradox : Find your twin - Google Translate : Speak in any Language - Currency Converter : Count your foreign trip expenses - Monte Hall : 3 doors and a twist - Sorting : Arrange the books - Searching : Find in seconds - Substitution Cipher : What's the secret !! - Sentiment Analysis : Analyse your Facebook data - 20 questions game : I can read your mind - Permutations : Jumbled Words - Spot the similarities : Dobble game - Count the words : Hundreds, Thousands or Millions - Rock, Paper and Scissor : Cheating not allowed !! - Lie detector : No lies, only TRUTH - Calculation of the Area : Don't measure - Six degrees of separation : Meet your favourites - Image Processing : Fun with images - Tic tac toe : Let's play - Snakes and Ladders : Down the memory lane - Recursion : Tower of Hanoi - Page Rank : How Google Works !!

                                                            TOTAL PERIODS 30

TEXT BOOK
1. John V Guttag. "Introduction to Computation and Programming Using Python", Prentice Hall of India, 2nd Edition, 2016

WEB LINK
1. https://onlinecourses.nptel.ac.in/noc18_cs35/preview

PRE-REQUISITE: Data Structure and C Programming.

COURSE LAYOUT

Programming in C++ is Fun : Build and execute a C program in C++, Write equivalent programs in C++ - C++ as Better C : Procedural Extensions of C - Overview of OOP in C++ : Classes and basic Object-Oriented features (encapsulation) - Overview of OOP in C++ : More OO features, overloading, namespace and using struct and union - Inheritance : Generalization / Specialization of Object Modeling in C++ - Polymorphism : Static and Dynamic Binding - Type Casting & Exceptions : C++ cast operators; C++ Exceptions & standard exception classes - Templates & STL – Function and Class templates and using STL like containers, algorithms

TOTAL PERIODS 30

TEXT BOOKS

1. The C++ Programming Language by Bjarne Stroustrup, 2013. Or, Programming: Principles and Practice Using C++ by Bjarne Stroustrup, 2014.
2. The C Programming Language (Ansi C Version) by Brian W. Kernighan and Dennis M. Ritchie, 1990. Or, The Programming Language by Brian W. Kernighan and Dennis M. Ritchie, 2015.

WEB LINK

1   https://onlinecourses.nptel.ac.in/noc18_cs32/preview

CS16960	NPTEL- PROGRAMMING, DATA STRUCTURES AND ALGORITHMS USING PYTHON	0 0 2 1

PRE-REQUISITE: Nil

COURSE LAYOUT

Informal introduction to programming, algorithms and data structures viagcd - Downloading and installing Python - gcd in Python: variables, operations, control flow - assignments, condition-als, loops, functions - Python: types, expressions, strings, lists, tuples - Python memory model: names, mutable and immutable values - List operations: slices etc. - Binary search - Inductive function definitions: numerical and structural induction – Elementary inductive sorting: selection and insertion sort - In-place sorting - Basic algorithmic analysis: input size, asymptotic complexity, O() notation - Arrays vs lists - Merge sort – Quicksort -Stable sorting – Dictionaries - More on Python functions: optional arguments, default values Passing functions as arguments - Higher order functions on lists: map, lter, list comprehension - Exception handling - Basic input/output - Handling files String processing.

TOTAL PERIODS 30

TEXT BOOK

1. John V Guttag. "Introduction to Computation and Programming Using Python", Prentice Hall of India, 2nd Edition, 2016

WEB LINK

1   https://onlinecourses.nptel.ac.in/noc18_cs34/preview

PRE-REQUISITE: Python and Algorithm Design

COURSE LAYOUT

Introduction: Basic definitions, types of learning, hypothesis space and inductive bias, evaluation, cross-validation - Linear regression, Decision trees, over fitting - Instance based learning, Feature reduction, Collaborative filtering based recommendation - Probability and Bayes learning - Logistic Regression, Support Vector Machine, Kernel function and Kernel SVM - Neural network: Perceptron, multilayer network, back propagation, introduction to deep neural network - Computational learning theory, PAC learning model, Sample complexity, VC Dimension, Ensemble learning - Clustering: k-means, adaptive hierarchical clustering, Gaussian mixture model.

TOTAL PERIODS 30

TEXT BOOKS

1. Machine Learning. Tom Mitchell. First Edition, McGraw- Hill, 1997.
2. Introduction to Machine Learning Edition 2, by Ethem Alpaydi

WEB LINK

1. https://onlinecourses.nptel.ac.in/noc18_cs40/preview

CS16962   NPTEL-INTRODUCTION TO INTERNET OF THINGS   0 0 2 1

PRE-REQUISITE: Basic programming language

COURSE LAYOUT

Introduction to IoT: Sensing - Actuation - Basics of Networking: Machine-to-Machine Communications - Interoperability in IoT - Introduction to Arduino Programming: Integration of Sensors and Actuators with Arduino - Introduction to Python programming - Introduction to Raspberry Pi - Implementation of IoT with Raspberry Pi – SDN - SDN for IoT - Data Handling and Analytics - Cloud Computing - Sensor-Cloud - Fog Computing - Smart Cities and Smart Homes - Connected Vehicles - Smart Grid - Industrial IoT - Case Study: Agriculture – Healthcare - Activity Monitoring.

TOTAL PERIODS 30

TEXT BOOKS

1. "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", by Pethuru Raj and Anupama C. Raman (CRC Press)
2. "Internet of Things: A Hands-on Approach", by Arshdeep Bahga and Vijay Madisetti (Universities Press)

WEB LINK

1. https://onlinecourses.nptel.ac.in/noc18_cs46/preview

PRE-REQUISITE: C Programming

COURSE LAYOUT

Introduction to Computers and Programming - Introduction to C++ - Expressions and Interactivity - Making Decisions - Loops and Files – Functions – Arrays - Searching and Sorting Arrays – Pointers - Strings - Operator Overloading – Inheritance – Polymorphism – Templates - Stream I/O - Exception Handling - File Processing - String Class - Data Structures - Bit Manipulation - Standard Template Library.

                                                         TOTAL PERIODS 30

TEXT BOOKS

1. Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", Dorling Kindersley (India) Pvt. Ltd., Pearson Education in South Asia, 2011.
2. Pradip Dey, Manas Ghosh, "Fundamentals of Computing and Programming in C", First Edition, Oxford University Press, 2009.

WEB LINK

1. https://www.advance.com/c - basics/.

PRE-REQUISITE: Basics of Java programming

COURSE LAYOUT

Overview of Library Management System - Creating a Java web project - Java servlets and JSPs - Servlet Methods - Database and validation - Creating and viewing inventories - Issuing and Returning a book - Java Beans and Swing: Bean concepts - Events in bean box - Bean customization - Persistence - Application - deployment using swing - Advanced swing techniques - JAR file handling. Java Enterprise Applications: Java Servlets - Java Server Pages - JDBC - Session beans - Entity beans Deploying n-tier application - Introduction to Android 4 - Introduction to struts Framework.

TOTAL PERIODS 30

TEXT BOOK

1. Robert W. Sebesta, "Programming the World Wide Web", Addison -Wesley, Sixth Edition, 2010.

WEB LINK

1. http://www.tict.edu.in/tict-cse-spoken-tutorial-training.html?limit=5&start=5

PRE-REQUISITE: Nil

COURSE LAYOUT

 LINUX: Introduction - General overview - <mark>The Linux shell and File Structure: The shell</mark> - The shell scripts and programming - Shell Configuration. Basic Operating System Concepts – Why Ubuntu Linux – features & benefits- <mark>Ubuntu-Linux Practical Tips & Techniques –</mark> I (Understanding its Menus and managing Files & Folders in Ubuntu with Practical Session with Hands On Practice by the participants) - <mark>Firefox Web browser Tips & Techniques.</mark>

                                                              TOTAL PERIODS 30

TEXT BOOKS

   1. Richard Petersen,"The complete Reference Linux", Tata McGraw Hill Edition, Sixth edition 2010.

   2. Mark G. Sobell. "Practical Guide to Fedora and Red HatEnterpriseLinux", 6th Edition, Prentice Hall, 2011.

   3. Remy Card, Eric Dumas and Frank Mevel, "The Linux Kernel Book", Wiley Publications, 2007.

WEB LINK:

   1. https://www.udemy.com/r - basics/.

PRE-REQUISITE: Nil

COURSE LAYOUT

BOSS Linux – Install – BOSS Live – Utility – BOSS Linux components - BOSS Linux Licensing - The BOSS free and open source software guidelines – Installation steps – Beginning the installation – Language Selection – country Selection – keyboard configuration – network configuration – Disk partitioning setup – Installing the base system – Create User Account.

TOTAL PERIODS 30

TEXT BOOK

1. O"Reilly, "Linux in a Nutshell", 6th Edition.

WEB LINK

1. http://downloads.bosslinux.in/usermanual/BOSS_Anoop_Updated_Installation_Manual.pdf

PRE-REQUISITE: Nil

COURSE LAYOUT

XAMPP in Linux - Echo PHP Function, PHP Variables, If and Switch Statements - PHP Operators - Arrays in PHP - Loops in PHP - Functions in PHP - PHP Special Variables - PHP and HTML - Simple Visitor Counter - PHP String Functions - File Upload - Cookies - Sessions - MD5 Encryption - Sending Email - Display Images from a Directory - User Login. Introduction to MySQL - Data types, Constraints - Select, Orderby, Limit - Functions - Number, Date, Character, Control Flow - Joins, Group by, Having, Sub query, Indexing.

TOTAL PERIODS 30

TEXT BOOKS

1. RasmusLerdorf and Levin Tatroe, "Programming PHP", O "Reilly 3rd Edition, 2011.
2. Steve Suchring, MySQL Bible ‖, John Wiley, 2002.

WEB LINK

1. https://www.phphub.in/courses-offered/certified-phpmysql-web-developer.html?id=21

PRE-REQUISITE: Database Management Systems

COURSE LAYOUT

Retrieving Data using the SQL SELECT Statement - Restricting and Sorting Data - Using Single-Row Functions to Customize Output - Using Conversion Functions and Conditional Expressions - Reporting Aggregated Data Using the Group Functions - Displaying Data From Multiple Tables - Using Subqueries to Solve Queries - Using the SET Operators - Manipulating Data - Using DDL Statements to Create and Manage Tables - Creating Other Schema Objects.

TOTAL PERIODS 30

TEXT BOOK

1. John J.Patrick, "SQL Fundamentals", Third edition 2010.

WEB LINK:

1. http://www.oraclestudy.com/oracle-1z0-051-certification-exam-syllabus

PRE-REQUISITE: Java programming

COURSE LAYOUT

JAVA-History and philosophy of Java- Understand Java's contribution to the Internet -Understand the importance of byte code- Know the Java buzzwords-Understand the foundational principles of object-oriented programming-Use variables, Use the if and for -control statements-Create blocks of code - Know the java keywords-Understand the rules for Java identifiers- Create, compile, and run a simple Java program. **ORACLE-** Database design using SQL-Basic SQL syntax and the rules for constructing valid SQL statements -design, implement, and demonstrate a database solution for a business or organization.

TOTAL PERIODS 30

TEXT BOOKS

1. Herbert Schildt, "Java The Complete Reference", 8th Edition, McGraw - Hill Osborne Media, 2011.
2. R. Elmasri, S.B. Navathe, "Fundamentals of Database Systems", Fifth Edition, Pearson Education, 2006.

WEB LINK

1. https://education.oracle.com/pls/web_prod-plq

PRE-REQUISITE: Networking

COURSE LAYOUT

Introduction – Network works – Purpose and functions of network devices – components – TCP/IP models – Voice Over IP and Video Over IP – network and Internet Communication – LAN/WAN operation and features – Troubleshoot switch with VLANs – interswitch communication – Ethernet networks – Traffic management – Cisco switches – Ping – traceroute – telnet – SSH. Switiching Technologies- VIP, RSTP, VLAN, PVSTP. Benefits of private and public IP addressing. Basic router operation – Routing on Cisco devices – Implementation of WAN links.

TOTAL PERIODS 30

TEXT BOOK

1. Cisco 7304 Network Service Engine Installation and Configuration
2. CCNA™: Cisco® Certified Network Associate Study Guide, 5th Edition

WEB LINK

1. http://study-ccna.com/

CS16971   **SCJP / OCPJP -SUN CERTIFIED JAVA PROGRAMMER /**   **0 0 2 1**

ORACLE CERTIFIED PROFESSIONAL JAVA PROGRAMMER

PRE-REQUISITE: Java programming

COURSE LAYOUT

Java Basics - scope of variables - Working with Java Data Types - Using Operators and Decision Constructs - Creating and Using Arrays - Using Loop Constructs - Working with Methods and Encapsulation - Working with Inheritance - Handling Exceptions - Working with Selected classes from the Java API - Manipulate data using the String Builder - unchecked exceptions, and Errors - try-catch block - features and components of Java.

TOTAL PERIODS 30

TEXT BOOK

1. Kathy Sierra, Bert Bates "SCJP Sun Certified Programmer for Java 6 Study Guide Books"

WEB LINK

1. http://ocjp.in/ocjp-syllabus/

PRE-REQUISITE: Nil

COURSE LAYOUT

Android App life cycle and its main components - Create a graphical user interface (GUI) - Implement a custom application theme - Define a Recycler View item list -   Implement menu-based or drawer navigation -   Integrate code from an external support library -   Schedule a time-sensitive task using alarms - Schedule a background task using Job Scheduler - Designing and building a functional Android application -   Debugging Android applications using different tools and plugins -   Setting up and understanding your Android Development Environment - Register and publishing on Play Store.

TOTAL PERIODS 30

TEXT BOOK

1.   John Horton, "Android Programming for Beginners", Second Edition, 2011.

WEBLINK

1.   https://www.udemy.com/learn-android-application-development-y/

PRE-REQUISITE: Nil

COURSE LAYOUT

Introduction - Computer Organization - Number Systems and Codes - Memory - ALU Instruction prefetch - Interrupts - I/O Techniques - Device Controllers - Error Detection Techniques - Microprocessor - Personal Computer Concepts - Advanced System Concepts - Microcomputer Concepts - OS - Multitasking and Multiprogramming - Virtual Memory - Cache Memory - Modern PC and User. Microprocessor and Firmware - Programmable LSI's - Bus Faults - Faults Elimination process - Systematic Troubleshooting - Symptoms observation and analysis - fault diagnosis - fault rectification - Troubleshooting levels.

TOTAL PERIODS 30

TEXT BOOKS

1. B. Govindarajalu, "IBM PC Clones Hardware, Troubleshooting and Maintenance", 2/E, TMH, 2002.
2. Scott Mueller, "Repairing PC's", PHI,1992.

WEB LINK

1. http://www.learning-about-computers.com/tutorials/troubleshooting.shtml