Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal

Branch- Common to All Discipline

ES301	**Energy & Environmental Engineering**	**3L-1T-0P**	**4 Credits**

The objective of this Course is to provide *an introduction to energy systems and renewable energy resources, with a scientific examination of the energy field and an emphasis on alternative energy sources and their technology and application.*

Module 1: Introduction to Energy Science:

Introduction to energy systems and resources; Introduction to Energy, sustainability & the environment; Overview of energy systems, sources, transformations, efficiency, and storage; Fossil fuels (coal, oil, oil-bearing shale and sands, coal gasification) - past, present & future, Remedies & alternatives for fossil fuels - biomass, wind, solar, nuclear, wave, tidal and hydrogen; Sustainability and environmental trade-offs of different energy systems; possibilities for energy storage or regeneration (Ex. Pumped storage hydro power projects, superconductor-based energy storages, high efficiency batteries)

***Module2*: Ecosystems**

- Concept of an ecosystem; Structure and function of an ecosystem; Producers, consumers and decomposers; Energy flow in the ecosystem; Ecological succession; Food chains, food webs and ecological pyramids; Introduction, types, characteristic features, structure and function of the following ecosystem (a.)Forest ecosystem (b) Grassland ecosystem (c) Desert ecosystem (d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

***Module 3*: Biodiversity and its conservation**

- Introduction – Definition: genetic, species and ecosystem diversity; Bio-geographical classification of India; Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values; Biodiversity at global, National and local levels; India as a mega-diversity nation; Hot-sports of biodiversity; Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; Endangered and endemic species of India; Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

***Module 4:* Environmental Pollution**

- Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards; Solid waste Management: Causes, effects and control measures of urban and industrial wastes; Role of an individual in prevention of pollution; Pollution case studies; Disaster management: floods, earthquake, cyclone and landslides.

Module 5: **Social Issues and the Environment**

- From Unsustainable to Sustainable development; Urban problems related to energy; Water conservation, rain water harvesting, watershed management; Resettlement and rehabilitation of people; its problems and concerns. Case Studies
  Environmental ethics: Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies Wasteland reclamation; Consumerism and waste products; Environment Protection Act; Air (Prevention and Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act; Issues involved in enforcement of environmental legislation; Public awareness.

Module 6: Field work

- Visit to a local area to document environmental assets-river/forest/grassland/hill/mountain
- Visit to a local polluted site-Urban/Rural/Industrial/Agricultural
- Study of common plants, insects, birds.
- Study of simple ecosystems-pond, river, hill slopes, etc.

REFERENCE

1. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc.
2. Clark R.S., Marine Pollution, Clanderson Press Oxford (TB).
3. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumabai,
4. De A.K., Environmental Chemistry, Wiley Eastern Ltd.
5. Trivedi R.K., Handbook of Environmental Laws, Rules Guidelines, Compliances and Standards', Vol I and II, Enviro Media (R)
6. Boyle, Godfrey, Bob Everett, and Janet Ramage (Eds.) (2004), Energy Systems and Sustainability: Power for a Sustainable Future. Oxford University Press.
7. Schaeffer, John (2007), Real Goods Solar Living Sourcebook: The Complete Guide to Renewable Energy Technologies and Sustainable Living, Gaiam

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Information Technology, III-Semester

IT302 Discrete Structure

Course objectives

The main objectives of this course are:

1. To introduce students with sets, relations, functions, graph, and probability.
2. To enable students to perform set operation and solve logical reasoning and verify the correctness of logical statement.
3. To apply the properties of relations and find partially ordered set and lattices.

Unit I-Set Theory, Relation, Function, Theorem Proving Techniques : Set Theory: Definition of sets, countable and uncountable sets, Venn Diagrams, proofs of some general identities on sets Relation: Definition, types of relation, composition of relations, Pictorial representation of relation, Equivalence relation, Partial ordering relation, Job Scheduling problem
Function: Definition, type of functions, one to one, into and onto function, inverse function, composition of functions, recursively defined functions, pigeonhole principle. Theorem proving Techniques: Mathematical induction, Proof by contradiction.

Unit II- Algebraic Structures: Definition, Properties, types: Semi Groups, Monoid, Groups, Abelian group, properties of groups, Subgroup, cyclic groups, Normal subgroup, Homomorphism and isomorphism of Groups, example and standard results, Rings and Fields: definition and standard
results.

Unit III- Propositional Logic: Proposition, First order logic, Basic logical operation, truth tables, tautologies, Contradictions, Algebra of Proposition, logical implications, logical equivalence, predicates, Normal Forms, Universal and existential quantifiers. Introduction to finite state machine Finite state machines as models of physical system equivalence machines, Finite state machines as language recognizers

Unit IV- Graph Theory: Introduction and basic terminology of graphs, Planer graphs, Multigraphs and weighted graphs, Isomorphic graphs, Paths, Cycles and connectivity, Shortest path in weighted graph, Introduction to Eulerian paths and circuits, Hamiltonian paths and circuits, Graph coloring, chromatic number, Isomorphism and Homomorphism of graphs.

Unit V- Posets, Hasse Diagram and Lattices: Introduction, ordered set, Hasse diagram of partially, ordered set, isomorphic ordered set, well ordered set, properties of Lattices, bounded and complemented lattices. Combinatorics: Introduction, Permutation and combination, Binomial Theorem, Recurrence Relation and Generating Function: Introduction to Recurrence Relation and Recursive algorithms , Linear recurrence relations with constant coefficients, Homogeneous solutions, Particular solutions, Total solutions , Generating functions , Solution by method of generating functions.

Course Outcomes

On completion of the course;

1. Students will be able to understand the notion of mathematical thinking, and algorithmic thinking and be able to apply them in problem solving such as formal specification, verification, and basic concepts of set theory.
2. Students understand the basic principle of Boolean algebra, logic and set theory.
3. Be able to construct simple mathematical proof and possess the ability to verify them.

Reference Books:

1. C.L.Liu" Elements of Discrere Mathematics" TMH.
2. Lipschutz, "Discrete mathematics (Schaum)",TMH.
3. U.S Gupta " Discrete Mathematical Structures" Pearson.
4. S. Santha," Discrete Mathematics with Combinatorics and graph theory", Cengage Learning.
5. Dr.Sukhendu. Dey " Graph Theory With Applications" Shroff Publishers

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New Scheme Based On AICTE Flexible Curricula

Information Technology, III-Semester

IT303 Data Structure

Course objectives

The main objectives of this course are:

1. To introduce the concepts of linear, non-linear data structures , the operations performed on them and the applications of various data structures.
2. To introduce various algorithms of searching and sorting.
3. To understand the basic concepts of stacks, queues, linked lists, trees and graphs
4. To enable students to write algorithms for solving various problems using data structures.

Unit 1: Introduction Data, data type, data object. Types of data structure – primitive &n non-primitive , linear & non-linear. Operations on data structures – traversing, searching , inserting , deleting. Complexity analysis – worst case, best case, average case. Time – space trade off , algorithm efficiency, asymptotic notations – big oh , omega , theta.

Unit 2: Arrays & Structure Introduction , declaration of arrays , operations on arrays – inserting , deleting , merging of two arrays , 1 dimensional & 2 dimensional arrays, row & column major representation , address calculation in array , storing values in arrays , evaluation of polynomial – addition & representation. Searching & sorting – Introduction , sequential search, binary search , Fibonacci search , indexed sequential search, hashed search. Types of sorting with general concepts – bubble , heap , insertion , selection , quick , heap , shell , bucket , radix and merge sort.

Unit 3: Stacks & Queues Basic concept of stacks & queues, array representation of stacks, operation on stacks – push , pop , create , getTop , empty , linked representation of stack , multiple stack. Application of stack – Conversion: infix , prefix , postfix and evaluation of arithmetic expression. Linked representation of queue, operations on queue – insertion & deletion. Types of queue with functions – circular , deque , priority queue. Applications of queues – job scheduling , Josephus problem.

Unit 4: Linked List Introduction – basic terminology , memory allocation & deallocation for linked list. Linked list variants – head pointer , head node , types linked list – linear & circular linked list. Doubly linked list , creation of doubly list, deletion of node from doubly linked list, insertion of a node from doubly linked list, traversal of doubly linked list. Circular linked list – singly circular linked list , circular linked list with header node , doubly circular linked list. Applications of linked list – polynomial representation & garbage collection.

Unit 5: Trees Basic terminology – general tree , representation of general tree, types of trees, binary tree- realization and properties , traversal in binary trees – inorder , preorder , postorder , applications of trees. Graph- Basic Terminologies and representations, Graph search and traversal algorithms.

Course Outcomes

On completion of the course:

1. For a given search problem (linear search and binary search) student will be able to implement it.
2. For a given problem of stacks, queues and link lists, students will be able to implement it and analyze the same to determine the time and computation complexity
3. Students will be able to write an algorithm for selection sort, insertion sort, quick sort, merge sort, heap sort, bubble sort and compare their performance
4. Students will be able to implement tree, graph search and traversal algorithms

References :

1.Varsha H. Patil "Data Structure Using C++" Oxford.
2. Rajesh K. Shukla "Data Structures Using C & C++" Wiley India.
3. Reema Thareja " Data Structure Using C " Oxford.
4. D. S Malik "Data Structure Using C++ " Second Edition Cengage.
5. Kushwaha and Mishra "Data Structure: A programming Approach with C", PHI Learning.
6. A. K Sharma "Data Structure Using C" Pearson.
7. Ellis Horowitz, Sartaj Sahni, "Fundamentals of Data Structures", Computer Science Press

List of Experiments

1. Write a program to search an element in the array using Linear and Binary Search.
2. Write a program to perform the following operation in Matrix:
    1. Addition 2. Subtraction 3. Multiplication 4. Transpose
3. Write a program to perform the following operation on strings using string functions:
    1. Addition 2. Copying 3. Reverse 4. Length of String
4. Write program for implementing the following sorting methods to arrange a list of integers in ascending order:
    a) Quick sort b) Selection sort c) Insertion sort d) Merge sort
5. Write a program that uses stack operations to convert a given infix expression into its postfix equivalent.
6. Write a program to merge two sorted array into one sorted array.
7. Write a program to implement stack using array and linked list.
8. Write a program to implement queue and circular queue using array.
9. Write a program to insert an element in the beginning and end of singly linked list.
10. Write a program to insert an element at any position in singly and doubly linked list.
11. Insert and delete a node at any position in doubly linked list.
12. Write a program of Tower of Hanoi.
13. Write a program that uses functions to perform the following:
    a) Create a binary search tree of integers.
    b) Traverse the above Binary search tree non recursively in in order.

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Information Technology, III-Semester

IT304 Object Oriented Programming & Methodology

Course Objectives

1. The objective of this course is to understand the advantage of object oriented programming over procedure oriented programming.
2. To help students to understand the key features of Object Oriented Programming and Methodology like objects, methods, instance, message passing, encapsulation, polymorphism, data hiding, abstract data and inheritance.
3. To develop understanding of pointers and memory management.
4. To be able to develop understanding of file input/output and templates

Unit I- Introduction: Object oriented programming, Introduction, Application, characteristics, difference between object oriented and procedure programming, Comparison of C and C++, Cout, Cin, Data Type, Type Conversion, Control Statement, Loops, Arrays and string arrays fundamentals, Function, Returning values from functions, Reference arguments, Overloaded function, Inline function, Default arguments, Returning by reference.

Unit II- Object and Classes: Implementation of class and object in C++, access modifiers, object as data
type, constructor, destructor, Object as function arguments, default copy constructor, parameterized constructor, returning object from function, Structures and classes, Classes objects and memory, static class data, Arrays of object, Arrays as class Member Data, The standard C++ String class, Run time and Compile time polymorphism.

Unit III- Operator overloading and Inheritance: Overloading unary operators, Overloading binary operators, data conversion, pitfalls of operators overloading, Concept of inheritance, Derived class and base class, access modifiers, types of inheritance, Derived class constructors, member function, public and private inheritance.

Unit IV- Pointer and Virtual Function: Addresses and pointers, the address-of operator & pointer and arrays, Pointer and Function pointer, Memory management: New and Delete, pointers to objects, debugging pointers, Virtual Function, friend function, Static function, friend class, Assignment and copy initialization, this pointer, dynamic type information.

Unit V-Streams and Files: Streams classes, Stream Errors, Disk File I/O with streams, file pointers, error handling in file I/O with member function, overloading the extraction and insertion operators, memory as a stream object, command line arguments, printer output, Function templates, Class templates Exceptions, Containers, exception handling.

Course Outcomes

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

1. Recognize attributes and methods for given objects.
2. Define data types and also deal with operations applied for data structures.
3. Implement algorithms and complex problems.

Reference Books:

1. E. Balaguruswami, ”Object Oriented Programming in C++”, TMH.
2. Robert Lafore, “Object Oriented Programming in C++”, Pearson.
3. M.T. Somashekare, D.S. Guru, “ Object-Oriented Programming with C++”, PHI.
4. Herbert Shildt, “The Complete Reference C++”, Tata McGraw Hill publication.

List of Experiments:

1. Write a program to find out the largest number using function.
2. Write a program to find the area of circle, rectangle and triangle using function overloading.
3. Write a program to implement complex numbers using operator overloading and type conversion.
4. Write a program using class and object to print bio-data of the students.
5. Write a program which defines a class with constructor and destructor which will count number of object created and destroyed.
6. Write a program to implement single and multiple inheritances taking student as the sample base class.
7. Write a program to add two private data members using friend function.
8. Write a program using dynamic memory allocation to perform 2x2 matrix addition and subtraction.
9. Write a program to create a stack using virtual function.
10. Write a program that store five student records in a file.
11. Write a program to get IP address of the system.
12. Write a program to shutdown the system on windows operating system.

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Information Technology, III-Semester

IT305 Digital Circuits and Systems

Course Objectives

1 Understand working of logic gates.
2 To design and implement combinational and sequential logic circuits
3 Understand the process of analog to digital and digital to analog conversion
4 To understand various logic families

Unit I- Number systems and logic gates: Decimal, Binary, Octal, Hexadecimal number systems and radix conversion. Codes- BCD, excess 3, gray, ASCII. Boolean algebra- Theorems and properties, Boolean functions, canonical and standard forms, De Morgans theorem, digital logic gates, Karnaugh maps.

Unit II- Combinational circuits: Introduction to combinational circuits, multilevel NAND, NOR implementation. Designing binary Adders and Subtractors. Decoder, Encoder, Multiplexer, Demultiplexer circuits.

Unit III- Sequential circuits: Introduction to Sequential circuits, flip-flops, RS, D, T, JK, M/S JK-flipflops, truth tables, excitation tables and characteristic equations, clocked and edge triggered flipflops, Registers- Definition, serial, parallel, shift left/right registers, Johnson counter, asynchronous and synchronous counters.

Unit IV- Digital logic families: Bipolar and unipolar logic families, Digital IC specifications, RTL, DTL, All types of TTL circuits, ECL, IIL, PMOS, NMOS & CMOS Logic.

Unit V- Clocks and timing circuits: Bistable, Monostable & Astable multivibrator, Schmitt trigger circuit, Introduction of Analog to Digital & Digital to Analog converters, Display devices, 7 and 16 segment LED display, LCD.

Course Outcomes

On the completion of this course

1 Students will be able to perform number base conversions, use Boolean logic to create digital circuits.
2. Student can understand use of encoders, decoders, multiplexers and demultiplexers in communication systems.
3 By learning design of combinational and sequential circuits student can understand its use in digital systems such as computers, communication systems and other modern technologies.
4 Study of ADC and DAC along with display devices will enable students to understand signal conversion and its display and their applications in digital devices.

Reference Books:

1. M. Morris Mono, “Digital logic design”, Pearson Education Pvt. Ltd.
2. A Anand Kumar, “Fundamentals of digital circuits“, PHI Learning Pvt Ltd.
3. A K Maini, “Digital Electronics Principles and Integrated Circuits, Wiley India Pvt Ltd.
4. R P Jain, “Modern Digital Electronics”, Tata McGraw-Hill publishing company Ltd.
5. D P Kothari and J S Dhillon, "Digital Circuits and Design", Pearson Education Pvt. Ltd.

List of Experiments:

1. Study and verify the operation of AND, OR, NOT, NOR and NAND logic gates.
2. Design all basic logic gates using NOR universal gate.
3. Design all basic logic gates using NAND universal gate.
4. Verification of Demorgan’s theorem.
5. Construction and verification of half adder andfull adder circuits.
6. Construction and verification of half subtractor and full subtractor circuits.
7. Design of Binary to Grey & Grey to Binary code Converters .
8. Design of BCD to excess-3 code converter.
9. Design and verification of Multiplexer circuit
10. Design and verification of De-multiplexer circuit.

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Information Technology, III-Semester

IT306 (Java Programming Lab)

Course Objectives:

1. Understand fundamentals of programming such as variables, conditional and iterative execution, methods, etc.
2. Understand fundamentals of object-oriented programming in Java and be familiar of the important concepts like class, inheritance and multithreading, AWT and JDBC.
3. Students will able to use the Java SDK environment to create, debug and run simple Java programs.

Unit I-Overview of Java, Installation, First Simple Program, Compilation process , Java Keywords , Identifiers , Literals, Comments, Data Types, Variables, Dynamic initialization, type conversion and casting, Operators, Control Statements.

Unit II-Declaring Objects, Introducing Methods, Constructors, this Keyword, Garbage Collection, finalize Method, Overloading Methods, Overloading Constructors, Using Objects as Parameters, Inheritance, Creating a Multilevel Hierarchy, Packages and Interfaces, Exception Handling, Multithreaded

Unit III-The Applet Class: Applet Basics, The Applet Class, Applet Architecture, Applet Initialization and Termination , Simple Applet Display Methods, Simple Banner Applet, Using the Status Window, The HTML APPLET Tag, Passing Parameters to Applets, Improving the Banner Applet.

Unit IV-Introducing the AWT: Working with Windows, Graphics, and Text, AWT Classes, Window Fundamentals, Component, Container, Panel, Frame, Working with Frame Windows, Handling Events in a Frame Window, AWT Controls, Layout Managers, and Menus, Adding and Removing Controls, Grid Layout, Border Layout, introduction to swing and servlet.

Unit V-Event Handling, Two Event Handling Mechanisms, The Delegation Event Model, Events, Event Sources, Event Listeners, Event Classes, The Mouse Event Class and others, JDBC: JDBCODBC bridge, the connectivity model, the driver manager, navigating the result set object contents, the JDBC exceptional classes, connecting to remote database.

Course Outcomes:

On the completion of this course students will be able to understand:

1. The concepts of Java programming
2. The basic terminology used in computer programming and write, compile and debug programs in JAVA language.
3. The different data types, decision structures, loops, functions to design Java programs.
4. Develop program using the java collection API as well as the java standard class library.
5. Develop Java applets

Reference Books:

1. E. Balagurusamy, “Programming with java A Primer”, McGrawHill.
2. Sharanam Shah, “ Core Java 8 for Beginners”, Shroff Publisher.
3. Naughton & Schildt, “The Complete Reference Java 2”, Tata McGraw Hill.
4. Horstmann & Cornell, “Core Java 2” (Vol I & II), Pearson.

List of Experiments:

1. Write a program that accepts two numbers from the user and print their sum.
2. Write a program to calculate addition of two number using prototyping of methods.
3. Program to demonstrate function overloading for calculation of average.
4. Program to demonstrating overloaded constructor for calculating box volume.
5. Program to show the detail of students using concept of inheritance.
6. Program to demonstrate package concept.
7. Program to demonstrate implementation of an interface which contains two methods declaration square and cube.
8. Program to demonstrate exception handling in case of division by zero error.
9. Program to demonstrate multithreading.
10. Program to demonstrate JDBC concept using create a GUI based application for student information.
11. Program to display “Hello World” in web browser using applet.
12. Program to add user controls to applets.
13. Write a program to create an application using concept of swing.
14. Program to demonstrate student registration functionality using servlets with session management.

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Branch- Common to All Discipline

New Scheme Based On AICTE Flexible Curricula

BT401	**Mathematics-III**	**3L-1T-0P**	**4 Credits**

OBJECTIVES: The objective of this course is to fulfill the needs of engineers to understand applications of Numerical Analysis, Transform Calculus and Statistical techniques in order to acquire mathematical knowledge and to solving wide range of practical problems appearing in different sections of science and engineering. More precisely, the objectives are:

- To introduce effective mathematical tools for the Numerical Solutions algebraic and transcendental equations.
- To enable young technocrats to acquire mathematical knowledge to understand Laplace transformation, Inverse Laplace transformation and Fourier Transform which are used in various branches of engineering.
- To acquaint the student with mathematical tools available in Statistics needed in various field of science and engineering.

Module 1: Numerical Methods – 1: (8 hours): Solution of polynomial and transcendental equations – Bisection method, Newton-Raphson method and Regula-Falsi method. Finite differences, Relation between operators, Interpolation using Newton's forward and backward difference formulae. Interpolation with unequal intervals: Newton's divided difference and Lagrange's formulae.

Module 2: Numerical Methods – 2: (6 hours): Numerical Differentiation, Numerical integration: Trapezoidal rule and Simpson's 1/3rd and 3/8 rules. Solution of Simultaneous Linear Algebraic Equations by Gauss's Elimination, Gauss's Jordan, Crout's methods, Jacobi's, Gauss-Seidal, and Relaxation method.,

Module 3: Numerical Methods – 3: (10 hours): Ordinary differential equations: Taylor's series, Euler and modified Euler's methods. RungeKutta method of fourth order for solving first and second order equations. Milne's and Adam's predicator-corrector methods. Partial differential equations: Finite difference solution two dimensional Laplace equation and Poission equation, Implicit and explicit methods for one dimensional heat equation (Bender-Schmidt and Crank-Nicholson methods), Finite difference explicit method for wave equation.

Module 4: Transform Calculus: (8 hours): Laplace Transform, Properties of Laplace Transform, Laplace transform of periodic functions. Finding inverse Laplace transform by different methods, convolution theorem. Evaluation of integrals by Laplace transform, solving ODEs by Laplace Transform method, Fourier transforms.

Module 5: Concept of Probability: (8 hours): Probability Mass function, Probability Density Function, Discrete Distribution: Binomial, Poisson's, Continuous Distribution: Normal Distribution, Exponential Distribution.

Textbooks/References:

1. P. Kandasamy, K. Thilagavathy, K. Gunavathi, Numerical Methods, S. Chand & Company, 2nd Edition, Reprint 2012.
2. S.S. Sastry, Introductory methods of numerical analysis, PHI, 4th Edition, 2005.
3. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
4. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2010.
5. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
6. Veerarajan T., Engineering Mathematics, Tata McGraw-Hill, New Delhi, 2008.
7. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall, 2003 (Reprint).
8. S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.
9. W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3rd Ed., Wiley, 1968. Statistics

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New Scheme Based On AICTE Flexible Curricula

Information Technology, IV-Semester

IT402 - Computer Architecture

Course Objectives

The objective of course is to understand the basic structure and operation of computer system. Students will be able to know the operation of the arithmetic unit including the algorithms & implementation of fixed-point and floating-point addition, subtraction, multiplication & division. To study the different ways of communicating with I/O devices and standard I/O interfaces, hierarchical memory system including cache memories and virtual memory, concept of pipeline.

Unit-I Computer architecture and organization, computer generations, von Neumann model, CPU organization, CPU organization, Register organization, Various CPU register, Register Transfer, Bus and Memory Transfers, Arithmetic, Logic and Shift micro-operations, Arithmetic logic shift unit.

Unit–II The arithmetic and logic unit, Fixed-Point representation: integer representation, sign-magnitude, 1's and 2's complement and range, Integer arithmetic: negation, addition and subtraction, multiplication, division, Floating-Point representation, Floating-Point arithmetic, Hardwired micro-programmed control unit, Control memory, Micro-program sequence.

Unit–III Central Progressing Unit (CPU), Stack Organization, Memory Stack, Reverse Polish Notation. Instruction Formats, Zero, One, Two, Three- Address Instructions, RISC Instructions and CISC Characteristics, Addressing Modes, Modes of Transfer, Priority Interrupt, Daisy Chaining, DMA, Input-Output Processor (IOP).

Unit–IV Computer memory system, Memory hierarchy, main memory: RAM, ROM chip, auxiliary and associative memory, Cache memory: associative mapping, direct mapping, set-associative mapping, write policy, cache performance, Virtual memory: address space, memory space, address mapping, paging and segmentation, TLB, page fault, effective access time, replacement algorithm.

Unit–V Parallel Processing, Pipelining General Consideration, Arithmetic Pipeline, and Instruction Pipeline, Vector Operations, Matrix Multiplication, and Memory Interleaving, Multiprocessors, Characteristics of Multiprocessors.

Course Outcomes

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

1. Understand basic structure of computer system, arithmetic operations,
2. Understand the arithmetic operations, Study of hardwired and micro-programmed control units.
3. Develop the concepts of memory management, interleaving and mapping.
4. Analyze the arithmetic and instructional pipelines.

Reference Books:-

1. M. Morris Mano, “Computer System Architecture”, Pearson.
2. Dr. M. Usha, T.S. Srikanth, “Computer System Architecture and Organization”, Wiley India.
3. William Stallings, ”Computer Organization and Architecture”, Pearson.
4. V. Rajaraman, T. Radhakrishnan, “Computer Organization and Architecture”, PHI.

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New Scheme Based On AICTE Flexible Curricula

Information Technology, IV-Semester

IT403 - Analysis and Design of Algorithm

Course Objectives

Data structure includes analyzing various algorithms along with time and space complexities. It also helps students to design new algorithms through mathematical analysis and programming.

Unit-I Algorithms, Designing algorithms, analyzing algorithms, asymptotic notations, heap and heap sort. Introduction to divide and conquer technique, analysis, design and comparison of various algorithms based on this technique, example binary search, merge sort, quick sort, strassen's matrix multiplication.

Unit-II Study of Greedy strategy, examples of greedy method like optimal merge patterns, Huffman coding, minimum spanning trees, knapsack problem, job sequencing with deadlines, single source shortest path algorithm, etc.

Unit-III Concept of dynamic programming, problems based on this approach such as 0/1 knapsack, multistage graph, reliability design, Floyd-Warshall algorithm, etc.

Unit-IV Backtracking concept and its examples like 8 queen's problem, Hamiltonian cycle, Graph coloring problem etc. Introduction to branch & bound method, examples of branch and bound method like traveling salesman problem etc. Meaning of lower bound theory and its use in solving algebraic problem, introduction to parallel algorithms.

Unit-V Binary search trees, height balanced trees, 2-3 trees, B-trees, basic search and traversal techniques for trees and graphs (In order, preorder, postorder, DFS, BFS), NP-completeness.

Course Outcomes:

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

1. Implement sorting and searching algorithm
2. Experiment with techniques for obtaining maximum output with minnium efforts
3. Make use of dynamic programming for finding
4. Solve 8 queen's problem and others of the kind for application in real world scenarios .
5. Distinguish between NP hard and NP complete problems and develop their solutions

Reference Books:-

1. Coremen Thomas, Leiserson CE, Rivest RL; Introduction to Algorithms; PHI.
2. Horowitz & Sahani; Analysis & Design of Algorithm
3. Dasgupta; algorithms; TMH
4. Ullmann; Analysis & Design of Algorithm;
5. Michael T Goodrich, Robarto Tamassia, Algorithm Design, Wiely India

List of Experiments(expandable):

1. Write a program for Iterative and Recursive Binary Search.
2. Write a program for Merge Sort.
3. Write a program for Quick Sort.
4. Write a program for Strassen's Matrix Multiplication.
5. Write a program for optimal merge patterns.
6. Write a program for Huffman coding.
7. Write a program for minimum spanning trees using Kruskal's algorithm.
8. Write a program for minimum spanning trees using Prim's algorithm.
9. Write a program for single sources shortest path algorithm.
10. Write a program for Floye-Warshal algorithm.
11. Write a program for traveling salesman problem.
12. Write a program for Hamiltonian cycle problem.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Information Technology, IV-Semester

IT404 - Analog & Digital Comm.

Course Objectives

The study of communication systems starts with the concept of analog communication. In this course time and frequency representation of information is given. The objective of this course is to be familiar with the basic building blocks of communication systems such as modulator and demodulator. Different types of analog modulation techniques are given in this course.

Unit-I Signals and Systems: Block diagram of a communication system, signal-definition, types of signals continuous, discrete, deterministic, non-deterministic, periodic, non-periodic, energy, power, analog and digital signals. Electromagnetic Spectra, Standard signals- DC, sinusoidal, unit step, ramp, signum, rectangular pulse, impulse(delta) signal. System definition, classification of systems, linear, nonlinear, time variant, time invariant, causal, non causal, stable and unstable systems. Fourier transforms: Time domain and frequency domain representation of signal, Fourier Transform and its properties, conditions for existence, Transform of Gate, unit step, constant, impulse, sine and cosine wave. Shifting property of delta function, convolution, time and frequency convolution theorems.

Unit-II Amplitude modulation: Modulation, need of modulation, types of modulation techniques, amplitude modulation (DSB-FC), modulation index, frequency spectrum of AM wave, linear and over modulation, power relation in AM, transmission efficiency, modulation by a complex signal, bandwidth of AM, AM modulators, square law and switching modulator, advantages and disadvantages of AM. Demodulation of AM: Suppressed carrier amplitude modulation systems, DSB-SC, SSB-SC, VSB-SC systems, comparison of various amplitude modulation systems. Demodulation of AM, square law and envelope detector, synchronous detection of AM, Low and high power AM transmitters, AM receivers, TRF and superheterodyne receivers, sensitivity, selectivity and fidelity of receivers.

Unit-III Angle modulation: Introduction and types of angle modulation, frequency modulation, frequency deviation, modulation index, deviation ratio, bandwidth requirement of FM wave, types of FM. Phase modulation, difference between FM and PM, Direct and indirect method of FM generation, FM demodulators- slope detector, Foster seeley discriminator, ratio detector. Introduction to pulse modulation systems.

Unit-IV Sampling of signal, sampling theorem for low pass and Band pass signal, Pulse amplitude modulation (PAM), Time division, multiplexing (TDM). Channel Bandwidth for PAM-TDM signal Type of sampling instantaneous, Natural and flat top, Aperture effect, Introduction to pulse position and pulse duration modulations, Digital signal, Quantization, Quantization error, Pulse code modulation, signal to noise ratio, Companding, Data rate and Baud rate, Bit rate, multiplexed PCM signal, Differential PCM (DPCM), Delta Modulation (DM) and Adaptive Delta Modulation (ADM), comparison of various systems.

Unit-V Digital modulations techniques, Generation, detection, equation and Bandwidth of amplitude shift keying (ASK) Binary Phase Shift keying (BPSK), Differential phase shift keying (DPSK), offset and non offset quadrature phase shift keying (QPSK), M-Ary PSK, Binary frequency Shift Keying (BFSK), M-Ary FSK Quadrature Amplitude modulation (QAM).

Course Outcomes:
At the end of the course student will be able to :

1. Differentiate Analog and Digital Signal and types of signals.
2. Understand the communication of information over the communication channel.
3. Understand how information signal of low frequency can be transmitted with the help of modulation techniques over a long distance.
4. Differentiate different modulation techniques such as AM, SSB, DSB and FM.
5. Explain using block diagrams, modulation and demodulation techniques for digital signal and determine bandwidth requirement.

Reference Books:

1. Singh & Sapre, “Communication Systems”, TMH.
2. Taub Schilling, “Principles of Communication Systems”, TMH.
3. W. Tomasi “Electronic Communications Systems”, Pearson Education Pvt. Ltd.
4. Taub & shilling, “Communication Systems”, TMH.
5. Abhay Gandhi, “Analog and Digital Communication”, CENGAGE Learning.

List of Experiments:

1. AM Modulation and Demodulation (Envelope Detector)
2. Frequency modulation using reactance modulator.
3. Frequency modulation using varactor modulator.
4. Pulse Amplitude Modulation and Demodulation
5. Pre-emphasis and De-emphasis
6. Analog Multiplexing.
7. Amplitude Modulation using Pspice
8. Receiver characteristics (selectivity, sensitivity, fidelity).
9. Operation of foster-seeley loop detector.
10. Operation of ratio detector.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Information Technology, IV-Semester

IT405 - Data Base Management System

Course Objectives:

The main objectives of the course are

1. To understand fundamental knowledge of file system, database concepts and use of relational database.
2. To study of different data model and conceptual design using ER diagram.
3. Students can use SQL operations to manipulate the database and learn how to design and create a good database using functionaldependencies and normalization.
4. The course provides an overview of transaction management, concurrency control, distributed database and Big Data.

Basic Concepts: Introduction to DBMS, File system vs DBMS, Advantages of database systems, Database System architecture, Data models, Schemas and instances, Data independence, Functions of DBA and designer, Entities and attributes, Entity types, Key attributes, Relationships, Defining the E-R diagram of database.

Relational Model: Structure of relational databases, Domains, Relations, Relational algebra – fundamental operators and syntax, relational algebra queries, Entity-Relationship model :Basic concepts, Design process, constraints, Keys, Design issues, E-R diagrams, weak entity sets, extended E-R features –generalization, specialization and aggregation

SQL: Data definition in SQL, update statements and views in SQL: Data storage and definitions, Data retrieval queries and update statements, Query Processing & Query Optimization: Overview, measures of query cost, selection operation, sorting, join, evaluation of expressions, transformation of relational expressions, estimating statistics of expression results, evaluation plans. Case Study of ORACLE and DB2.

Relational Database design: Functional Dependency –definition, trivial and non-trivial FD, closure of FD set, closure of attributes, irreducible set of FD, Normalization –1NF, 2NF, 3NF, Decomposition using FD-dependency preservation, lossless join, BCNF, Multi-valued dependency, 4NF, Join dependency and 5NF

Introduction of transaction, transaction processing and recovery, Concurrency control: Lock management, specialized locking techniques, concurrency control without locking, Protection and Security Introduction to: Distributed databases, Basic concepts of object oriented data base system.

Course Outcomes:

After successful completion of this course, the students would be able to:

1. Compare file system and DBMS and explain how DBMS is better than traditional File Processing Systems.
2. Analyze the physical and logical database designs, database modeling, relational, hierarchical, and network models

3. Analyze and renovate an information model into a relational database schema and to use a DDL, DML and DCL utilities to implement the schema using a DBMS.
4. Formulate data retrieval queries in SQL and Relational Algebra.
5. Demonstrate an understanding of functional dependencies, normalization theory and apply such knowledge to the design of a database.
6. Demonstrate and explain terms like Transaction Processing, Concurrency Control, distributed database and big data.

Reference Books:

1. Korth, Silbertz, Sudarshan, "Database Concepts", McGraw Hill.
2. Elmasri, Navathe, "Fundamentals of Database Systems", Pearson.
3. Ivan Bayross, "SQL, PL/SQL the Programming Language of Oracle", BPB publications.
4. S. Sharma, J. Agrawal, S. Agrawal, "Advanced Database Management System", Dreamtech Press.
5. Leon & Leon, "Fundamental of Data Base Management System", TMH

List of Experiments:

1. To perform various SQL Commands of DDL, DML, DCL.
2. Write SQL Commands such as Insertion, deletion and updation for any schema.
3. To execute Nested Queries, Join Queries, order-by, having clause and string operation.
4. To perform set operators like Union, Intersect, Minus on a set of tables.
5. To execute various commands for GROUP functions (avg, count, max, min, Sum).
6. Write a PL/SQL block for transaction application using Triggers.
7. Write a DBMS program to prepare report for an application using function.
8. Designing of various Input screens/Forms.
9. Create reports using database connectivity of Front end with back end.
10. Create database Design with normalization and implementing in any application.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Information Technology, IV-Semester

IT406 - Introduction to MATLAB/SciLab/Web Design

Course Objective:
To familiarize students with open source academic software like Scilab or licensed software like Matlab to carryout experiments in various fields in due course like computer graphics and multimedia, soft-computing, image processing, data mining etc.
Experimental works in web design will enable students to design web pages and develop web based projects.

Introduction to MATLAB/SciLab
Installing MATLAB/SciLab Under windows/linux, Basics of MATLAB programming, Data Types, Creating variables, comments, multiline comments, Array operations in MATLAB/Scilab, Loops and execution control statements, inbuilt mathematical functions, Working with files: Scripts and Functions, Plotting and program output, overview of various toolboxes, introduction to Matlab simulink.

Introduction to Web Design
Introduction, Elements, Tags, Attributes, Paragraph, Headings, Line Breaks, Horizontal Rule, Lists, Formatting, Color Codes, Font, Text Links, Email, Images, Image Link, Forms, Table, Frames, Comments, Music Codes, Video Codes, Div, DHTML: Cascading Style Sheet Introduction, Types of CSS, Selectors (Tags), Class and Id with the Selectors, CSS Background & Color, CSS Text, CSS Font, CSS Border, CSS Padding.

Reference Books:

1. Fausett L.V. (2007) Applied Numerical Analysis Using MATLAB, 2nd Ed., Pearson Education
2. Chapra S.C. and Canale R.P. (2006) Numerical Methods for Engineers, 5th Ed., McGraw Hill
3. N.P. Gopalan, “Web Technology”, PHI.
4. Ivan Bayross, “HTML, JavaScript, DHTML and PHP”, BPB Publication.

Suggested List of Experiments/ program (Expandable):

1. Write your first Matlab/Scilab program.
2. Extract an individual element of an array
3. Write Matlab/Scilab program to illustrate loops and control statements.
4. Create a simple plot.
5. Name the title, axes title of the plot.
6. Create a webpage with HTML describing your department on following points: Use paragraph and list tags. Apply various colors to suitably distinguish key words. Also apply font styling like italics, underline and two other fonts to words you find appropriate. Also use header tags.
7. Create a web page using HTML for following: Create a table to show your class time-table. Use tables to provide layout to your HTML page describing your university infrastructure.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Information Technology, IV-Semester

IT 407 Open Source Software Lab (Linux and R)

Course Objectives:
To develop an understanding of Linux commands and shell programming and enable students to use the Linux distributions to create, debug and run applications. Learn basic R data types, R functions, objects and class, graphs and charts.

Unit I Introduction to LINUX Operating System: Overview of popular Linux distributions, Hardware requirements for Linux, Installation of LINUX distributions
Internal And External Commands, Command Structure, general-purpose utilities: cal, date, echo, printf, bc, script, passwd, PATH, who, uname, tty, stty, pwd, cd, mkdir, rmdir

Unit II Handling files: The File System, cat, cp, rm, mv, more, file, ls, wc, pg, cmp, comm, diff, gzip, tar, zip, df, du, mount, umount, chmod, VI editor, security by file permissions commands: chmod, find, locate, Compiling C/C++ files, File processing: awk, sed, Commands: gcc, sh.

Networking commands: ping, telnet, ftp, arp, rlogin, other commands: make, apt-get, Accessing remote servers and files, Editing and manipulating files, System Administration: Configuration of Linux, Connecting to remote machines-ftp, telnet, Adding and removing users.

Unit III Programming in Linux: Bash shell scripting, Interactive scripts, shell variables, assigning values to variables, positional parameters, command line arguments, arithmetic in shell script, exit, status of a command, sleep and wait, script termination, Decision taking, -if else, nested if, file tests, string tests, case control structure, Loop control, break, continue, logical operators and executing Script, Debugging a script, executing multiple scripts, other shell script examples.

Unit IV R Introduction: Installation of R, R reserved words, Variables and Constants, R Operators, R Control Structures, R Programming: for loop, R while loop, R break & next, R repeat loop
R Functions: R Programming Function, Function Return Value, R Environment and Scope, R recursive function, R switch function

Unit V R Data Structure: R Vectors, R Matrix, R List, R Data Frame
R Object and Class: Object and Class, R S3 Class, R S4 Class, R Reference Class, R Inheritance
R Graphs and Charts: Bar plot, Histogram, Pie Chart, Box plot, Strip chart

References:

1. Forouzan, “Unix & Shell Programming”, Cengage Learning.
2. Sumitab Das,”Unix Concept & Application”,TMH.
3. Richard Peterson,”Linux Complete Reference”,TMH.
4. Michael J. Crawley, “The R Book”, Wiley
5. Roger D. Peng, “R Programming for Data Science” Lean Publishing
6. Tilman M. Davies, “The Book of R”, No Starch Press

Course Outcomes:

After the completion of this course, the students will be able to:

1. Understand the basic commands used in Linux operating system
2. Learn the important Linux/UNIX library functions and system calls
3. Write, compile and debug shell script in Linux environment
4. Learn how to program in R and write R functions
5. Read data into R, access R packages

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Information Technology, IV-Semester

BT408- 90 hrs Internship based on using various software's –Internship -II

To be completed anytime during fourth semester. Its evaluation/credit to be added in fifth semester.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Information Technology, IV-Semester

BT409 Cyber Security

Unit I

Introduction- Introduction of Cyber Crime, Categorizing Cybercrime, Cybercrime Theory, Criminology perception of cyber criminals: hackers, computer intrusions and Attacks, Privacy, surveillance and protection, hiding crimes in cyberspace, cryptography, hacking vs cracking, privacy and security at risk in the global information society.

Unit II

Application Security- Data Security, Security Technology-Firewall and VPNs, Intrusion Detection, Access Control. Security Threats -Viruses, Worms, Trojan Horse, Bombs, Trapdoors, Spoofs, E-mail Viruses, Macro Viruses, Malicious Software, Network and Denial of Services Attack, Security Threats to E-Commerce- Electronic Payment System, e- Cash, Credit/Debit Cards.

Unit III

Cryptrography concepts and Techniques

Plain text , cipher text, types – substitution ,transposition ,encryption, decryption , symmetric and asymmetric key cryptography algorithms, steganography .

Unit IV

Security Policies- Development of Policies, WWW Policies, Email Security Policies, Policy Review Process-Corporate Policies-Sample Security Policies, Publishing and Notification Requirement of the Policies.

Unit V

Information Security Standards-ISO, IT Act, Copyright Act, Patent Law, IPR. Cyber Laws in India; IT Act 2000 Provisions, Intellectual Property Law: Copy Right Law, Software License, Semiconductor Law and Patent Law.

Case Study – Corporate Security , Cyber cases

References:

- Nina Godbole " Cyber Security: Wiley.
- Michael E.Whitman and Herbert J Mattord "Principle of Information Security" Cengage
- William stallings "Cryptography and Network Security" PEARSON
- Charles P. Pfleeger, Shari Lawerance Pfleeger, "Analysing Computer Security", Pearson Education India.
- Vinod V. Sople, "Managing Intellectual Property" PHI Learning Private Limited
- IT Act 2000 Details www.mit.gov.in
- Atul Khate, "Cryptrography and Network Security" ,TMH
- V.K.Pachghare, "Cryptography and information Security", PHI Learning Private Limited, Delhi India.
- CHANDER, HARISH," Cyber Laws And It Protection " , PHI Learning Private Limited ,Delhi

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Information Technology, V-Semester

IT501 - Operating System

Course Objectives

- Learn concepts of operating systems
- Learn the mechanisms of OS to handle processes
- Study of various mechanisms involved in memory management techniques
- Gaining knowledge of deadlocks prevention and detection techniques
- Analyzing disk management functions and techniques

Unit I

Introduction to Operating Systems, Evaluation of OS, Types of operating Systems, system protection, Operating system services, Operating System structure, System Calls and System Boots, Operating System design and implementation, Spooling and Buffering.

Unit II

Basic concepts of CPU scheduling, Scheduling criteria, Scheduling algorithms, algorithm evaluation, multiple processor scheduling. Process concept, operations on processes, threads, inter process communication, precedence graphs, critical section problem, semaphores, classical problems of synchronization,

Unit III

Deadlock problem, deadlock characterization, deadlock prevention, deadlock avoidance, deadlock detection, recovery from deadlock, Methods for deadlock handling. Concepts of memory management, logical and physical address space, swapping, Fixed and Dynamic Partitions, Best-Fit, First-Fit and Worst Fit Allocation, paging, segmentation, and paging combined with segmentation.

Unit IV

Concepts of virtual memory, Cache Memory Organization, demand paging, page replacement algorithms, allocation of frames, thrashing, demand segmentation, Role of Operating System in Security, Security Breaches, System Protection, and Password Managment.

Unit V

Disk scheduling, file concepts, File manager, File organization, access methods, allocation methods, free space managements, directory systems, file protection, file organization & access mechanism, file sharing implement issue, File Management in Linux, introduction to distributed systems.

References:

1. Silberschatz ,"Operating system", Willey Pub

2. Tanenbaum “ Modern Operating System” PHI Learning.
3. Dhamdhere, ”System Programming and Operating System”,TMH.
4. Stuart,”Operating System Principles, Design &Applications”,Cengage Learning
5. Operating System : Principle and Design by Pabitra Pal Choudhury, PHI Learning

Suggested List of Experiments

1. Program to implement FCFS CPU scheduling algorithm.
2. Program to implement SJF CPU scheduling algorithm.
3. Program to implement Priority CPU Scheduling algorithm.
4. Program to implement Round Robin CPU scheduling algorithm.
5. Program to implement classical inter process communication problem(producer consumer).
6. Program to implement classical inter process communication problem(Reader Writers).
7. Program to implement classical inter process communication problem(Dining Philosophers).
8. Program to implement FIFO page replacement algorithm.
9. Program to implement LRU page replacement algorithm

Course Outcomes

Upon successful completion of this course the students will:

- Gain knowledge of history of operating systems
- Understand designissuesassociatedwithoperatingsystems
- Gain knowledge ofvariousprocessmanagementconceptsincludingscheduling,synchronization,deadlocks
- Understand conceptsofmemorymanagementincludingvirtualmemory
- Understand issuesrelatedtofilesysteminterfaceandimplementation,diskmanagement
- Befamiliarwithprotectionandsecuritymechanisms
- BefamiliarwithvarioustypesofoperatingsystemsincludingUnix

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Information Technology, V-Semester

IT502 - Computer Networks

Course Objectives

- To provide students with an overview of the concepts and fundamentals of computer networks
- To familiarize with the basic taxonomy and terminology of computer networking area.
- Describe how computer networks are organized with the concept of layered approach
- To experience the designing and managing of communication protocols while getting a good exposure to the TCP/IP protocol suite

Unit I

Importance of computer networks, broadcast and point to point networks, Local area networks and Wide area networks , ISO-OSI reference model, TCP/IP model , interfaces and services, Protocol data unit, connection oriented and connectionless services, service primitives, Binding Protocol Address- ARP & RARP, packet format, Encapsulation.

Unit II

Data-Link layer: - Data link layer design issues, framing , flow & error control , physical addressing, Stop & Wait protocol ,Go back N ARQ ,selective repeat ARQ ,piggybacking and pipelining ,HDLC LAN Protocol stack-Logical link control and Media Access Control sublayer, IEEE 802.2 LLC Frame format; MAC layer Protocols- static and dynamic allocation, Pure and slotted ALOHA, Carrier sense multiple access, Persistent and non persistent CSMA, IEEE standard 802.3, 802.4, 802.5, FDDI,

Unit III

The Network layer- logical addressing, classful & classless addressing, packet delivery & forwarding. unicast routing protocols , multicast routing protocols, Routing algorithm- Least Cost, Dijkstra's, Bellman-ford, Introduction to Internet protocol, IPv4 header, IPv4 Datagrams, Encapsulation, Fragmentation and Reassembly, IP routing, Subnet addressing, Subnet mask, Super netting- special case of IP addresses, Ipv6-Motivation, frame format and addressing. ICMP: Introduction, ICMP Header, ICMP message types.

Unit IV

Transport layer- TCP: Introduction ,Transport services , Process to process delivery, TCP ,congestion control algorithms, quality of service, headers, connection establishment and termination, timeout of connection establishment, maximum segment size, port no. and socket addresses, TCP timers, UDP: Introduction, UDP header, UDP checksum, UDP operations, encapsulation & decapsulation, queuing, SCTP-Services, transmission sequence number, stream identifier, stream sequence number, packet format.

Unit V

Application layer - BOOTP:-operation, packet format, DHCP:-Address allocation, configuration & packet Format, DNS: Distribution of name spaces, DNS in the internet, FTP:-Connection, Communication, command processing, TFTP, E-Mail: SMTP, POP, IMAP, SNMP. study of internetworking devices and their configuration– switches, hubs, Bridges, routers and Gateways.

References

1. ."Computer Networks" - Tanenbaum ,PHI Learning
2. "Data Communication & Networks " , Fourouzan TMH
3. "TCP/IP-Protocol suite", Forouzan, TMH 3rd edition
4. "Computer Networks and Internets", D.E.Comer, Pearson
5. "TCP/IP Illustrated" W. Richard Stevens, Volume I, Addison Wesley,
6. "Internetworking with TCP/IP Vol. I, II & III", Comer , PHI Learning.

Course Outcomes

Upon successful completion of this course the students will:

- Have agood understanding of the OSI Reference Model and its Layers
- Identify core networking and infrastructure components and the roles they serve; and given requirements and constraints, design an IT infrastructure including devices, topologies, protocols, systems software, management and security;
- Analyze the requirements for a given organizational structure and select the most appropriate networking architecture and technologies
- Specify and identify deficiencies in existing protocols, and then go onto formulate new and better protocols

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Information Technology, V-Semester

Departmental Elective IT- 503 (A) Theory of Computation

Course Objectives

- Student learns some fundamental concepts in automata theory and designing of Finite Automata, conversion NFA to DFA. Application of Finite Automata in computer science and real world.
- Obtain minimized DFA and Application of regular expression and conversion from RE to Finite Automata and Finite Automata to Regular Expression and Proving language are not regular.
- Designing of CFG's , Construction of parse trees, finding and removing ambiguity in grammars, simplification of CFG, Conversion of grammar to Chomsky Normal Form ,Greibach normal form.
- Designing problems on Pushdown Automata and conversion of grammar to PDA, PDA to Grammar.
- Designing Turing machines, understanding the working of various types of Turing machines and study P and NP type problem.

UNIT I

Introduction of the theory of computation, Finite state automata – description of finite automata, properties of transition functions, Transition graph, designing finite automata, FSM, DFA, NFA, 2-way finite automata, equivalence of NFA and DFA, Mealy and Moore machines.

UNIT II

Regular grammars, regular expressions, regular sets, closure properties of regular grammars, Arden's theorem, Myhill-Nerode theorem, pumping lemma for regular languages, Application of pumping lemma, applications of finite automata, minimization of FSA.

UNIT III

Introduction of Context-Free Grammar - derivation trees, ambiguity, simplification of CFGs, normal forms of CFGs- Chomsky Normal Form and Greibach Normal forms, pumping lemma for CFLs, decision algorithms for CFGs, designing CFGs, Closure properties of CFL's.

UNIT IV

Introduction of PDA, formal definition, closure property of PDA, examples of PDA, Deterministic Pushdown Automata, NPDA, conversion PDA to CFG, conversion CFG to PDA.

UNIT V

Turing machines - basics and formal definition, language acceptability by TM, examples of TM, variants of TMs – multitape TM, NDTM, Universal Turing Machine, offline TMs, equivalence of single tape and multitape TMs. Recursive and recursively enumerable languages, decidable and undecidable problems – examples, halting problem, reducibility. Introduction of P, NP, NP complete, NP hard problems and Examples of these problems.

Reference Books:

1. Daniel I.A. Cohen,"Introduction to Computer Theory",Wiley India.
2. John E Hopcroft, Jeffrey D. Ullman and Rajeev Motwani, "Introduction to Automata Theory, Languages and Computation", Pearson Education.
3. K.L.P Mishra & N.Chandrasekaran,"Theory of Computer Science", PHI Learning.
4. Peter Linz, "Introduction to Automata Theory and Formal Languages", Narosa Publishing.
5. John C Martin, "Introduction to languages and the theory of computation", TATA McGraw Hill.

Course Outcomes

At the completion of the course, students will be able to...

- Convertbetween finite automata, regular grammars, and regular expression representations of regular languages
- Apply the pumping lemma for regular languages to determine if a language is regular
- Convertbetweengrammars and push-down automata for context-free languages
- Determine if a language is regular or context-free
- Demonstrate that a grammar is ambiguous
- Translate a context-free grammar from one form to another
- Produce simple programs for a Turing Machine
- Explain the concept of undecidability
- List examples of undecidable problems

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New Scheme Based On AICTE Flexible Curricula

Information Technology, V-Semester

Departmental Elective IT- 503 (B) Microprocessor and Interfacing

Course Objectives:

- To introduce basic concepts of microprocessor
- Tointroduceserialandparallelbusstandards.
- To introduce programming in assembly language.
- To introduce basic concepts of interfacing memory and peripheral devices to a microprocessor.

UNIT –I:
Evolution of microprocessor, single chip micro computers, Micro processor Application, Microprocessor and its architecture, addressing modes, instruction, Instruction sets, Arithmetic and Logic Instruction, Program control instruction, Introduction –8086 family, procedure and macros, connection , Timing and Troubleshooting interrupt, 80286, 80836 and 80486 micro processor system concept.

UNIT –II:
Microprocessor Cycle, AIU, Timing and control Unit, Register data, Address bus, Pin Configuration, Intel 8086 instruction, Opcode and operands, limitation word size. Programming the microprocessor Assembly language, The Pentium and Pentium Pro Micro Processorwith features, Pentium II, Pentium III and Pentium –IV Microprocessor with software changes. Instruction set for Intel 8086, Introduction Intimation and data formats, Addressing modes, Status flags, Symbols and abbreviations, programming of microprocessors, Assembly language, high level language, areas of application of various languages, Stacks, Sub routines system, software, commands in assembly language, software Development, Debugging program, Modular programming, Structured programming, Top-down, Bottom-up design , MACRO microprogramming.

UNIT-III:
Assembly language programming with Examples like Addition of 8/16-bit Binary number, subtraction of 8/16 bit binary number, Address partitioning, addressing mode, type of addressing mode, memory and I/o interfacing, Data transfer schemes, Interfacing device and I/o devices I/o ports, Basic I/o Interfacing MDS, Micro controllers, I/o processor and co-processors ,Microcomputer Development system, Single chip micro computers, intel 8748 intel 8051, inter 8096, intel 8049intel 2920/2921, I/o processor UPI-425,UPI-41,42, Co-processor, math processor math co-processor –8087, 80287, 80387DX 803875x

UNIT –IV:
Bus Interface I/o port Addressing, decoding 8279, Programmable key board/display interface, 8254 Internal Timer, 16550 programmable communication interface A/D, 8259A Programmable Interrupt Controller, 8237 DMA Controller, Shared bus operation, disk Memory system Video display. ISA Bus, Extended ISA (EISA) and VESA Local Buses, Peripheral Component Inter Connect (Pc I) Bus, Parallel Printer interface (LPT) Universal serial Bus (USB) Accelerated graphics port (AGP),Programmable Communication interfere 8251 VSART CRT Controller 8275, 6854, Floppy disk Controller 8272, I/o processor 8089.

UNIT –V:
Memory Unit, RAM,SRAM, DRAM,ROM, PROM EPROM, EEPROM Nonvolatile RAM semiconductor Technology for memory, Shift register, Magnetic Memory, Tap, disc, main memory and secondary memory

cache memory, program memory and Data Memory, Real and virtual memory Buses, memory Addressing capacity of CPU, processing speed of computer

Reference Books:

1. Douglas V Hall, “Microprocessors and interfacing –Programming & Hardware” TMH
2. Barry B. Brey, “The intel Microprocessor –8086”, Pearson Education
3. Kenneth J.Ayala,”The 8086 Microproccessor: Programming & Interfacing The PC”,CengageLearning
4. Krishna Kant,”Microprocessors and Microcontrollers”, PHI Learning
5. A.K.Ray KM Bhurchandi, “Advanced Microprocessor and peripherals” McGraw Hill
6. R.S. Gaonkar ,”Microprocessors and interfacing”, TMH

Course Outcomes:

At the completion of the course, students will be able to...

- Explainthemicroprocessor’sandMicrocontroller’sinternalarchitecture
- Applyknowledgeanddemonstrateprogrammingproficiencyusingthevariousaddressingmodesanddatatransferinstructionsofthetargetmicroprocessorandmicrocontroller.
- CompareacceptedstandardsandguidelinestoselectappropriateMicroprocessor(8085&8086)andMicrocontrollertomeetspecifiedperformancerequirements.
- Analyzeassemblylanguageprograms
- DesignelectricalcircuitrytotheMicroprocessorI/Oportsinordertointerfacetheprocessortoexternaldevices.
- Evaluateassemblylanguageprograms

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Information Technology, V-Semester

Departmental Elective IT- 503 (C) Object Oriented Analysis and Design

Course Objectives:
The prime objective of this course is to teach the students to analyze, design and implement object-oriented software systems

UNIT I Introduction: Overview of object oriented concepts, Object Orientation, OO Software Development life cycle, Object oriented methodology, OO Themes, Modeling Concepts, Role of Analysis and Design in software development, Overview of various OOAD methodologies, OO approach vs conventional approach, Unified process of Software development, UML, Goals of UML, Overview of different models.

UNIT II Static Modeling using Class Diagrams: Object and Class concepts, Link and association, Multiplicity, Ternary Association, Recursive association, Association class, Generalization and Inheritance, Multiple inheritance, Aggregation and composition, Abstract Class, Packages.

UNIT III Dynamic Modeling using State Diagrams: Events, States, Transitions and conditions, Types of state diagrams, Continuous life cycle state diagrams, one-shot life cycle state diagrams, Sub states, Nested state diagrams, Signal generalization, Concurrency, Junction state, Synch state, Relation of class and state models.

UNIT IV Interaction Modeling: Use case Models, Actors and use cases, Use Case relationships, Use of Use cases for validation and verification, Sequence diagrams, Procedural sequence models, activity models, swim lanes, Dynamic concurrency, decomposing an activity, Communication Diagrams, Architectural Modeling: Component and Deployment Diagrams.

UNIT V System design and class design, Implementation modeling, Implementing structure and implementing functionality, Frameworks, Design Patterns, Object-Oriented Languages and their comparison, Object-Oriented Databases, ObjectOriented Programming Style, CORBA, COM, DCOM.

Reference Books:
1. Michael Blaha, Object-Oriented modeling and Design with UML, PHI
2. Mahesh P. Matha, Object-Oriented Analysis and Design Using UML, PHI
3. D Jeya Mala and S. Geetha, Object-Oriented Analysis and Design Using UML, McGraw Hill
4. Andrew Haigh, Object-Orientd Analysis and Design, TMH
5. O' Docherty, Object-Oriented Analysis and Design Understanding, System Development with UML 2.0, Wiley India

Course Outcomes:
At the end of the course student will be able to:

1. Explain OOAD concepts
2. Perform object oriented analysis and develop static model of system after identifying classes and their relationships
3. Develop dynamic model of system by identifying states and events
4. Develop interaction model of system by drawing use case, sequence and activity diagrams
5. Select an appropriate design patternand effectively construct object-oriented programs

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Information Technology, V-Semester

Open Elective IT- 504 (A) Artificial Intelligence

Course Objectives

- To present an overview of artificial intelligence (AI) principles and approaches
- Develop a basic understanding of the building blocks of AI

Unit I:

Meaning and definition of artificial intelligence, Production systems, Characteristics of production systems, Study and comparison of breadth first search and depth first search techniques, other Search Techniques like hill Climbing, Best first Search. A* algorithm, AO* algorithms etc, and various types of control strategies.

Unit II:

Knowledge Representation, Problems in representing knowledge, knowledge representation using propositional and predicate logic, comparison of propositional and predicate logic, Resolution, refutation, deduction, theorem proving, inferencing, monotonic and non-monotonic reasoning.

Unit III:

Probabilistic reasoning, Baye's theorem, semantic networks, scripts, schemas, frames, conceptual dependency, fuzzy logic, forward and backward reasoning.

Unit IV:

Game playing techniques like minimax procedure, alpha-beta cut-offs etc, planning, Study of the block world problem in robotics, Introduction to understanding, natural language processing.

Unit V:

Introduction to learning, Various techniques used in learning, Introduction to neural networks, applications of neural networks, common sense, reasoning, some example of expert systems.

References:-

1 Rich E and Knight K, “Artificial Intelligence”, TMH, New Delhi.

2 Nelsson N.J., “Principles of Artificial Intelligence”, Springer Verlag, Berlin.

Course Outcomes:
Upon successful completion of this course the students will:

- Be familiar with terminology used in this area

- Explain what constitutes "Artificial" Intelligence and how to identify systems with Artificial Intelligence.
- Know how to build simple knowledge-based systems
- Have ability to apply knowledge representation, reasoning, and machine learning techniques to real-world problems

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Information Technology, V-Semester

Open Elective IT- 504 (B) E Commerce & Governance

Course Objectives

- Discuss fundamentals of e-commerce, types and applications.
- Evaluate the role of the major types of information systems in a business environment and their relationship to each other
- Assess the impact of the Internet and Internet technology on business electronic commerce and electronic business
- Identify the major e management challenges for building and using information systems and learn how to find appropriate solutions to those challenges.
- Learn strategies for e-commerce, e government, Wireless Application Protocol, WAP technology and electronic payment system.

Unit I: Introduction
Definition of Electronic Commerce, Brief history of Ecommerce, e, E-Commerce: technology and prospects, incentives for engaging in electronic commerce, needs of E-Commerce, advantages and disadvantages, , Inter Organizational E-Commerce Intra Organizational E-Commerce, and Consumer to Business Electronic Commerce, Architectural framework ,Impact of E-commerce on business, E-Commerce Models.

Unit II: Network Infrastructure for E- Commerce
Internet and Intranet based E-commerce- Issues, problems and prospects, Network Infrastructure, Network Access Equipments, Broadband telecommunication (ATM, ISDN, FRAME RELAY). Mobile Commerce: Introduction, Wireless Application Protocol, WAP technology, Mobile Information device. Emerging Client Server Security Threats, firewalls & Network Security.

Unit III: E-Marketplaces, e Procurement and e Payment Systems
Define e-Marketplace and Describe their Functions, Explain e-Marketplace types and their features, Describe the various types of auctions and list their characteristics, Discuss the benefits, limitations and impacts of auctions, E-Commerce in the wireless environment, Competition in the DE and impact on industry, Integration and e-Business suits, ERP, eSCM, CRM, e-Procurement definition, processes, methods and benefits , e-Payment, Discuss the categories and users of smart cards, Describe payment methods in B2B EC

Unit IV: Electronic Payment System
Electronic Payments Overview of Electronics payments, Overview, The SET protocol, Payment Gateway, Digital Token based Electronics payment System, magnetic strip card, E-Checks, Smart Cards, Credit Card, Debit Card based EPS, Emerging financial Instruments, Home Banking, Online Banking.

Unit V: e-Government
Definition of e-Governments, theoretical background of e-governance, issues in e-governance applications, evolution of e-governance, Implementation, E-Government Services, Challenges and Opportunities, E-Government Benefits, e-governance models- broadcasting, critical flow, comparative analysis, mobilization and lobbying, interactive services / G2C2G.

Reference Books

1. Ravi Kalakota, Andrew Winston, “Frontiers of Electronic Commerce”, Addison Wesley.
2. Pete Lohsin , John Vacca “Electronic Commerce”, New Age International
3. Goel, Ritendra “E-commerce”, New Age International
4. Laudon, “E-Commerce: Business, Technology, Society”, Pearson Education
5. Bajaj and Nag, “E-Commerce the cutting edge of Business”, TMH
6. Turban, “Electronic Commerce 2004: A Managerial Perspective”, Pearson Education
7. Denieal Amor, “ The E-Business Revolution”, Addision Wesley
8. Diwan, Sharma, “E-Commerce” Excel
9. J. Satyanarayan, “E-government: The science of the possible”, PHI Learning Private Limited
10. C.S.R. Prabhu, “E-governence: concept and case study”, PHI Learning Private Limited

Course Outcomes

Upon successful completion of this course the student will be able to:

- understand the e-business concepts.
- understand the e-business models and infrastructure.
- learn how e-business concepts are applied to different fields, such as: education, banking, tourism and so on.
- willcome up with online business ideas and will be motivated to apply what they learned.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Information Technology, V-Semester

Open Elective IT- 504 (C) Java Programming

Course Objective:

- To learn the basic concepts and techniques which form the object oriented programming paradigm
- To identify Java language components and how they work together in applications.
- To design and program stand-alone Java applications.
- To learn how to use exception handling in Java applications.
- To learn Java Event Handling

UNIT-I

The Java Environment: Java Development Kit (JDK) , Java virtual machine, Java programming environment(compiler, interpreter, applet viewer, debugger), Java Applications Programming Interface(API),Basic idea of application and applet. Java as an object oriented language: objects, classes, encapsulation, inheritance and software reuse, polymorphism, abstract classes and abstract methods,: defining an interface, implementing & applying interfaces, variables in interfaces, extending interfaces, Packages,scopeandlifetime;Accessspecifies;Constructors;Copyconstructor;this pointer; finalize() method; arrays; Memory allocation and garbage collection

UNIT- II

AWT: Containers and components, AWT classes, window fundamentals: Component, Container, Panel, Window, Frame, Canvas, AWT Controls, Layout Managers and Menus: adding and removing control, Labels, Button, Check Box, Radio Button, Choice, menu, Text area, Scroll list, Scrollbar; Frame; Layout managers-flow layout, Grid layout, Border layout, Card layout. Java Event Handling Model: Java's event delegation model –Ignoring the event, Self-contained events, Delegating events; The event class hierarchy; There lationship between interface, methods called, parameters and event source; Adapter classes; Event classes action Event, Adjustment Event, Container Event, Focus Event, Item Event, Eye Event, Mouse Event, Text Event,Window Event. Applets: Applet security restrictions; the class hierarchy for applets; Life cycle of applet; HTMLTags for applet Introduction to Swing: swing library, Building application susing Swings

UNIT-III

Multithreading and Exception Handling: Overview of simple threads, Basic idea of multi threaded programming, Thread synchronization: Locks, synchronized methods, synchronized block,Thread scheduling,Producer-consumerrelationship,Daemon thread,Basicidea ofexception handling,stack basedexecutionandexceptionpropagation,Exception types: Exception Handling:Try,Catch,Finally,Throw statement,Assertions

UNIT-IV

Input/Output:ExploringJavaI/O.,Directories,streamclassesTheBytestream:Inputstream,outputstream,file input stream, file output stream, print stream, Randomaccess file, the character streams, Buffered reader, buffered writer, print writer, serialization. JDBC: JDBC-ODBCbridge; The connectivity model; The driver manager; Navigating there sult set object contents; java.sql Package; The JDBCexception classes; Connecting to Remote database.

UNIT-V

Java Networking: exploring java. Net package Networking Basics: Socket, Client server, reservedsockets,servers,Internetaddressing,TCPsockets,UDPsockets. RMI: Client/Server architecture, RMI registry services; Step sofcreating RMI Application and an example

References:

1. Naughton&Schildt"TheCompleteReferenceJava
2. TataMcGraw Hill.2.Deitel "Java-How toProgram:"PearsonEducation,Asia.
3. Horstmann&Cornell "CoreJava2" (Vol I&II) ,SunMicrosystems.
4. LvanBayross"Java2.0":BPBpublications.
5. Ivor Horton's"BeginningJava2,JDK5Ed.,WileyIndia.
6. JavaProgrammingfor theabsolutebeginnersByRussell,PHILearning

Course Outcomes

Upon successful completion of this course the student will:

- Have the knowledge of the structure and model of the Java programming language
- use the Java programming language for various programming tasks
- develop software in the Java programming language
- evaluate user requirements for software functionality required to decide whether the Java programming language can meet user requirements
- propose the use of certain technologies by implementing them in the Java programming language to solve the given problem

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Information Technology, V-Semester

Departmental Lab IT-505 Advanced Java Lab

Course Objective:

• To learn Designing and developing Web applications
•Designing Enterprise based applications by encapsulating an application's business logic.
•Designing applications using pre-built frameworks.

Unit I

Java Database Connectivity(JDBC): JDBC Product, Types of Drivers, Two-Tier Client/Server Model, Three-Tier Client/Server Model, Basic Steps of JDBC, Creating and Executing SQL Statement, The Result Set Object, Working with Database MetaData Interface

Unit II

Java Servlets:Servlet Interaction & Advanced Servlets, Life cycle of Servlet, Java Servlet Development Kit, Javax.servletpackage, Reading Servlet Parameters, Reading Initialization Parameters, The javax.servlet.http Package, Handling HTTP.

Unit III

JavaServer Pages(JSP): JSP Technologies, Understanding the Client-Server Model, Understanding Web server software, Configuring the JSP Server, Handling JSP Errors, JSP Translation Time Errors, JSP Request Time Errors, Creating a JSP Error Page

Remote Method Invocation (RMI): RMI Architecture, Designing RMI application, Executing RMI application

Unit IV

Enterprise Java Beans (EJB): Types of EnterpriseJava beans, Session Bean & Entity Bean, Features of Session Bean, Life-cycle of Stateful Session Bean, Features of Entity Bean, Life-cycle of Entity Bean, Container-managed Transactions & Bean-managed Transactions, Implementing a container-managed Entity Bean

Unit V

Struts: Introduction to the Apache Struts, MVC Architecture, Struts Architecture, How Struts Works? Introduction to the Struts Controller, Introduction to the Struts Action Class, Using Struts ActionFrom Class, Using Struts HTML Tags, Introduction to Struts Validator Framework, Client Side Address Validation in Struts, Custom Validators Example, Developing Application with Struts Tiles

References

1.Java the Complete Reference, ninth edition by Herbert Schild, Publisher: McGraw Hills
2.Head First EJB 3.0 by Kathy Sierra, Bert Bates, Publisher: O'Reilly Media 3.Head First Servlets and JSP by Bryan Basham, Kathy Sierra & Bert Bates, Publisher: O'Reilly Media
4.Just Hibernate, A Lightweight Introduction to the Hibernate Framework by Madhusudhan Konda, Publisher: O'Reilly Media
5.Programming Jakarta Struts, 2nd Edition by Chuck Cavaness, Publisher: O'Reilly Medi

Course Outcomes:

Upon successful completion of this course students will be able to-

- learn to access database through Java programs, using Java Data Base Connectivity (JDBC)
- create dynamic web pages, using Servlets and JSP.
- make a resusable software component, using Java Bean.
- invoke the remote methods in an application using Remote Method Invocation (RMI)
- understand the multi-tier architecture of web-based enterprise applications using Enterprise JavaBeans (EJB).
- developStateful, Stateless and Entity Beans.
- use Struts frameworks, which gives the opportunity to reuse the codes for quick development.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Information Technology, VI- semester

IT 601 Computer Graphics & Multimedia

Course Objectives:

1. To introduce the principles of computer graphics and the components of a graphics system
2. To introduce basic algorithms for drawing line, circle and curves.
3. To develop understanding of the basic principles of 2D and 3D computer graphics and how to transform the shapes to fit them as per the picture definition.
4. To introduce multimedia architecture and hardware
5. To introduce multimedia file formats

Unit I

Introduction to Raster scan displays, Storage tube displays, refreshing, flickering, interlacing, colour monitors, display processors resolution, working principle of dot matrix, inkjet laser printers, working principles of keyboard, mouse scanner, digitizing camera, track ball, tablets and joysticks, graphical input techniques, positioning techniques, rubber band techniques, dragging etc.

Unit II

Scan conversion techniques, image representation, line drawing, simple DDA, Bresenham's Algorithm, Circle drawing, general method, symmetric DDA, Bresenham's Algorithm, curves, parametric function, Beizier Method, B-spline Method.

Unit III

2D & 3D Co-ordinate system, Translation, Rotation, Scaling, Reflection Inverse transformation, Composite transformation, world coordinate system, screen coordinate system, parallel and perspective projection, Representation of 3D object on 2D screen, Point Clipping, Line Clipping Algorithms, Polygon Clipping algorithms, Introduction to Hidden Surface elimination, Basic illumination model, diffuse reflection, specular reflection, phong shading, Gourand shading ray tracing, color models like RGB, YIQ, CMY, HSV.

Unit IV

Introduction to multimedia components applications, Multimedia System Architecture, Evolving technologies for Multimedia, Defining objects for Multimedia systems, Multimedia Data interface standards, Multimedia Databases, Multimedia Hardware, SCSI, IDE, MCI, Multimedia Tools, presentation tools, Authoring tools.

Unit V

Compression & Decompression, Multimedia Data & File Format standards, TIFF, MIDI, JPEG, DIB, MPEG, RTF, Multimedia I/O technologies, Digital voice and audio, Video image and animation, Full motion video, Storage and retrieval technologies.

References:-

1. Donald Hearn and M.Pauline Baker, Computer Graphics C Version, Pearson Education, 2003.
2. Prabat K Andleigh and Kiran Thakrar, Multimedia Systems and Design, PHI Learning,
3. Tay Vaughan, Multimedia making it work, Tata McGraw Hill edition.
4. Amarendra N Sinha & Arun D Udai, Computer Graphics, McGraw Hill publication.
5. Mukherjee, Fundamental of Computer Graphics and Multimedia, PHI Learning.

List of Practicals:

1.Write a program to implement DDA line drawing algorithm
2.Write a program to implement Bresenham's line drawing algorithm.
3.Write a program to implement Bresenham's circle drawing algorithm.
4.Write a program to draw an ellipse using Bresenham's algorithm.
5.Write a program to perform various transformations on line , square & rectangle.
6.Write a program to implement Cohen Sutherland line clipping algorithm.
7.Write a program to implement Liang-Bersky line clipping algorithm.
8.Write a program to implement Cohen-Sutheland polygon clipping algorithm to clip a polygon with a Pattern.
9.Write a program to convert a color given in RGB space to it's equivalent CMY color space.
10.Study of various Multimedia file formats:-RTF,MIDI,GIF,JPEG,MPEG,TIFF etc.
11.Write a program to implement JPEG compression scheme for still images.
12.Write a program to perform Packbits compression & decompression.
13.Write a short program to create a TIFF file using bitmap segments and text files as the TIFF File components.
14. Write a program to convert a BMP file into either JPEG or GIF file.
15.Study of various Multimedia Authoring Tools.

Course Outcomes:

Upon completion of this course, students will be able to-

1. Understand the core concepts of computer graphics.
2. Implement various shapes drawing algorithms.
3. Apply geometric transformations on graphic objects and also implement clipping, shading and colour models.
4. Understand multimedia systems architecture, multimedia components and use various multimedia tools.
5. Perform activities involved in design, development and testing of modeling, rendering, shading and animation.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Information Technology, VI-Semester

IT 602 Wireless and Mobile Computing

Course Objectives:

1. To provide an overview of Wireless Communication networks area and its applications in communication engineering.
2. To introduce various standards of mobile communication.
3. To explain the various terminology, principles, devices, schemes, concepts used in Wireless Communication Networks.
4. To introduce the concepts of Adhoc networks and Sensor networks and their issues
5. To introduce various security threats in wireless networks and the techniques for the prevention and detection of threats

Unit I:

Antenna , radiation pattern, antenna types, antenna gain, propagation modes, types of fading. Model for wireless digital communication, multiple access technique-SDMA, TDMA, FDMA, CDMA, DAMA, PRMA, MAC/CA, Cellular network organization, operations of cellular system, mobile radio propagation effects, handoff, power control, sectorization, traffic engineering, Infinite sources, lost calls cleared, grade of service, poison arrival process

Unit II:

GSM- Services, system architecture, radio interface, logical channels, protocols, localization and calling, handover, security, HSCSD, GPRS-architecture, Interfaces, Channels, mobility management DECT, TETRA, UMTS.

Unit III:

IEEE 802.11: LAN-architecture, 802.11 a, b and g, protocol architecture, physical layer, MAC layer , MAC management, HIPERLAN-protocol architecture, physical layer, access control sub layer, MAC sub layer. Bluetooth-user scenarios- physical layer, MAC layer.

Unit IV:

Mobile IP, DHCP, Ad hoc networks: Characteristics, performance issue, routing in mobile host. Wireless sensor network, Mobile transport layer: Indirect TCP, Snooping TCP, Mobile TCP, Time out freezing, Selective retransmission, transaction oriented TCP. Introduction to WAP.

Unit V:

Intruders, Intrusion detection, password management, viruses and related threads, worms, trojan horse defense, difference biometrics and authentication system, firewall design principle.

References:-

1 J. Schiller, “Mobile Communication”, Addision , Wiley
2 William Stalling, “Wireless Communication and Network”, Pearson Education
3 Upena Dalal,” Wireless Communication”, Oxford Higher Education
4 Dr. Kamilo Feher, “Wireless Digital communication”, PHI
5 William C.Y Lee, “Mobile Communication Design Fundamental” , John Wiley.

Suggested List of Practicals:

To implement mobile network using open source softwares like NS2 etc.
Implement Code Division Multiple Access (CDMA).
To write a programme to implement concept of frequency reuse when given size of geographical area and the set of available frequencies.
Study of OPNET tool for modeling and simulation of different cellular standards.
Study and Analysis of wired network.
Study and Analysis of wireless network.
Study and Analysis of Bluetooth.
Study of Mobile IP.
Write programs using WML (Wireless Markup Language) Rajiv Gandhi Proudyogiki Vishwavid

Course Outcomes:

Upon completion of this course, students will be able to-

1. Explain the basic concepts of wireless network and wireless generations.
2. Demonstrate the different wireless technologies such as CDMA, GSM, GPRS etc
3. Explain the design considerations for deploying the wireless network infrastructure.
4. Appraise the importance of Adhoc networks such as MANET and Wireless Sensor networks
5. Differentiate and support the security measures, standards. Services and layer wise security considerations

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Information Technology, VI-Semester

Departmental Elective IT 603(A) Compiler Design

Course Objectives:

1. To teach the students the basic concepts of Compiler, programming languages and develop an understanding of the compilation phases
2. To make students understand what is syntax analysis and various types of parsers
3. To introduce syntax trees and dependency graphs
4. To introduce intermediate code generation, memory management and the role of symbol table and its organization
5. To introduce Code generation and code optimization

UNIT-I:
Introduction to Compiler, analysis of source program, phases and passes, Bootstrapping, lexical analyzers, data structures in compilation – LEX: lexical analyzer generator, Input buffering, Specification and Recognition of tokens, YACC, The syntactic specification of programming languages: Context free grammars, derivation and parse trees, capabilities of CFG.

UNIT-II:
Syntax Analysis: working of Parser, Top down parsing, Bottom-up parsing, Operator precedence parsing, predictive parsers, LR parsers (SLR, Canonical LR, LALR), constructing SLR parsing tables, constructing Canonical LR parsing tables, Constructing LALR parsing tables, using ambiguous grammars, an automatic parser generator.

UNIT-III:
Syntax Directed Translation: Definitions, Inherited Attributes, L-attributed definitions, S-attributed definitions, Dependency graph, Construction of syntax trees, Top down translation, postfix notation, bottom up evaluation.

UNIT-IV:
Intermediate Code Generation: Three address code, quadruple & triples, translation of assignment statements, Boolean expression and control structures, Backpatching, Run Time Memory Management: Static and Dynamic storage allocation, stack based memory allocation schemes, Symbol Table management.

UNIT-V:
Code Optimization and Generation: organization of code optimizer, basic blocks and flow graphs, DAG representation of basic blocks, loops in flow graph, peephole optimization, Basic of block optimization.

References:-

1. A. V. Aho, R. Sethi & J. D. Ullman, Compilers: Principles, Techniques and Tools, Pearson Ed.
2. Alfred V. Aho, Jeffrey D. Ullman, Principles of Compiler Design, Narosa Publishing House.
3. Ronald Mak, Writing Compilers and Interpreters, Wiley IndiacEdition.
4. Louden, Compiler Construction, Cengage learning.

Course Outcomes:

Upon completion of this course, students will be able to-

1. Demonstrate an understanding of the compilation phases.
2. Specify and analyze the lexical, syntactic and semantic structures of advanced language features.
3. Write a scanner, parser, and semantic analyser without the aid of automatic generators.
4. Describe techniques for intermediate code and machine code optimization.
5. Design the structures and support required for compiling advanced language features.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Information Technology, VI-

Semester

Departmental Elective IT 603(B) Data Mining

Course Objectives:

1. To introduce data warehouse and its components
2. To introduce knowledge discovery process, data mining and its functionalities
3. To develop understanding of various algorithms for association rule mining and their differences
4. To introduce various classification techniques
5. To introduce various clustering algorithms.

Unit I:

Data Warehousing**:** Need for data warehousing , Basic elements of data warehousing, Data Mart, Data Warehouse Architecture, extract and load Process, Clean and Transform data, Star ,Snowflake and Galaxy Schemas for Multidimensional databases, Fact and dimension data, Partitioning Strategy-Horizontal and Vertical Partitioning, Data Warehouse and OLAP technology, Multidimensional data models and different OLAP Operations, OLAPServer: ROLAP, MOLAP, Data Warehouse implementation, Efficient Computation of Data Cubes, Processing of OLAP queries, Indexing data.

Unit II:

Data Mining**:** Data Preprocessing, Data Integration and Transformation, Data Reduction, Discretizaion and Concept Hierarchy Generation, Basics of data mining, Data mining techniques, KDP (Knowledge Discovery Process), Application and Challenges of Data Mining

Unit III:

Mining Association Rules in Large Databases**:** Association Rule Mining, Single-Dimensional Boolean Association Rules, Multi-Level Association Rule, Apriori Algorithm, Fp- Growth Algorithm, Time series mining association rules, latest trends in association rules mining.

Unit IV:

Classification and Clustering: Distance Measures, Types of Clustering Algorithms, K-Means Algorithm, Decision Tree, Bayesian Classification, Other Classification Methods, Prediction, Classifier Accuracy, Categorization of methods, Outlier Analysis.

Unit V:

Introduction of Web Mining and its types, Spatial Mining, Temporal Mining, Text Mining, Security Issue, Privacy Issue, Ethical Issue.

References:-

1. Arun k Pujari “Data Mining Technique” University Press
2. Han,Kamber, “Data Mining Concepts & Techniques”,
3. M.Kaufman., P.Ponnian, “Data Warehousing Fundamentals”, John Wiley.
4, M.H.Dunham, “Data Mining Introductory & Advanced Topics”, Pearson Education.
5. Ralph Kimball, “The Data Warehouse Lifecycle Tool Kit”, John Wiley.
6. E.G. Mallach , “The Decision Support & Data Warehouse Systems”, TMH

Course Outcomes:

Upon completion of this course, students will be able to-

1. Demonstrate an understanding of the importance of data warehousing and OLAP technology
2. Organize and Prepare the data needed for data mining using pre preprocessing techniques
3. Implement the appropriate data mining methods like classification, clustering or Frequent Pattern mining on various data sets.
4. Define and apply metrics to measure the performance of various data mining algorithms.
5. Demonstrate an understanding of data mining on various types of data like web data and spatial data

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New Scheme Based On AICTE Flexible Curricula

Information Technology, VI-Semester

Departmental Elective IT 603(C) Embedded Systems

Course Objectives:

1. To introduce students with knowledge about the basic functions and applications of embedded systems
2. To introduce the architecture of embedded systems
3. To introduce the various communication protocols
4. To enable students to have knowledge of the memory types and supporting technologies of embedded systems.
5. To enable students to have knowledge about the development of embedded software

UNIT-I Introduction to Embedded Systems: Definition of embedded system, embedded systems vs. general computing systems, history of embedded systems, classification, major application areas, purpose of embedded systems, characteristics and quality attributes of embedded systems, common design metrics, and processor technology: general purpose processor, application specific processor, single purpose processor.

UNIT-II Embedded System Architecture: Von Neumann v/s Harvard architecture, instruction set architecture, CISC and RISC instructions set architecture, basic embedded processor, microcontroller architecture, CISC & RISC examples: 8051, ARM, DSP processors.

UNIT-III Input Output and Peripheral Devices Timers and counters, watchdog timers, interrupt controllers, PWM, keyboard controller, analog to digital converters, real time clock. Introduction to communication protocols: basic terminologies, concepts, serial protocol: I2C, CAN, firewire, USB. Parallel protocols: PCI bus, IrDA, bluetooth, IEEE 802.11, wireless protocols.

UNIT-IV Memory System Architecture Caches, virtual memory, MMU, address translation, memory and interfacing, memory write ability and storage performance. Memory types, composing memory – advance RAM interfacing, microprocessor interfacing I/O addressing, interrupts, direct memory access, arbitration multilevel bus architecture.

UNIT-V Embedded System Supporting Technologies Difference between normal OS and RTOS, scheduling algorithms. Case study: Tiny OS, VxWorks, QNX. Overview of VLSI technology, introduction to device drivers. Case studies: washing machine, air-conditioning, auto focus camera.

References:

1. F Vahid, T Giogarvis, Embedded systems: A unified hardware/software approach, Wiley, 1999.

2. Raj Kamal, Embedded Systems Introduction, 2nd Ed., TMH publication, 2015.

3.David E Simons, An Embedded Software Primer, Pearson, 1999.

Course Outcomes:

Upon completion of this course, students will be able to-

1. Explain the embedded system concepts and architecture of embedded systems
2. Describe the architecture of 8051 microcontroller and write embedded program for 8051 microcontroller
3. Select elements for an embedded systems tool.
4. Understand the memory types used in embedded systems
5. Design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability

New Scheme Based On AICTE Flexible Curricula

Information Technology, VI-Semester

Open Elective IT 604(A) Intellectual Property Rights

Course Objectives:

1. To enable Students to understand Primary forms of IPR
2. To enable Students to understand what is infringement of copyright and its consequences
3. To introduce criteria and procedure for obtaining patents
4. To enable Students to understand the registration procedures related to IPR.
5. To expose Students to contemporary issues and enforcement policies in IPR.

UNIT I Introduction

Introduction and Justifications of IPR, Nature of IP, Major forms of IP- Copyright, Patent, Trade Marks Designs, Geographic indication, layout design of Semi conductors, Plant varieties, Concept & Meaning of Intellectual Property. Major international documents relating to the protection of IP - Berne Convention, Paris Convention, TRIPS. The World Intellectual Property Organization (WIPO).

UNIT II Copyright

Meaning and historical development of copyright , Subject matter , Ownership of copyright, Term of copyright, Rights of owner, Economic Rights, Moral Rights. Assignment and licence of rights, Infringement of copyright, Exceptions of infringement, Remedies, Civil, Criminal, Administrative, Registration Procedure.

UNIT III Patents

Meaning and historical development,. Criteria for obtaining patents, Non patentable inventions, Procedure for registration, Term of patent, Rights of patentee, Compulsory licence, Revocation, Infringement of patents, Exceptions to infringement, Remedies, Patent office and Appellate Board.

UNIT IV – Trade Marks, Designs & GI

Trade Marks: Functions of marks, Procedure for registration, Rights of holder, Assignment and licensing of marks, Infringement, Trade Marks Registry and Appellate Board.

Designs: Meaning and evolution of design protection, Registration, Term of protection, Rights of holder, unregistered designs.

Geographical Indication: Meaning and evolution of GI, Difference between GI and Trade Marks, Registration, Rights, Authorised user.

UNIT V Contemporary Issues & Enforcement of IPR

IPR & sustainable development, The Impact of Internet on IPR. IPR Issues in biotechnology, E-Commerce and IPR issues, Licensing and enforcing IPR, Case studies in IPR

References:

1. P. Narayanan, Intellectual Property Law, Eastern Law House
2. . Neeraj Pandey and Khushdeep[Dharni, Intellectual Property Rights, PHI, 2014
3. N.S Gopalakrishnan and T.G. Agitha, Principles of Intellectual Property, Eastern Book Co. Lucknow, 2009.
4. Anand Padmanabhan, Enforcement of Intellectual Property, Lexis Nexis Butterworths, Nagpur, 2012.
5. Managing Intellectual Property The Strategic Imperative, Vinod V. Sople, PHI.
6. Prabuddha Ganguli, " Intellectual Property Rights" Mcgraw Hill Education, 2016.

Course Outcome:

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

1. Understand Primary forms of IPR
2. Assess and critique some basic theoretical justification for major forms of IP Protection
3. Compare and contrast the different forms of IPR in terms of key differences and similarities.
4. Uderstand the registration procedures related to IPR.
5. Have exposure to contemporary issues and enforcement policies in IPR.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Information Technology, VI- semester

Open Elective IT 604(B) Software Engineering

Course Objectives:

1. To introduce software development life cycle and various software process models
2. To introduce measures and metrics for software quality, reliability and software estimation techniques
3. To develop an understanding of software analysis and design phases
4. To introduce coding standards, guidelines and various software testing techniques
5. To introduce various activities for software maintenance and quality assurance

Unit I

Introduction, Software- problem and prospects Software development process: System Development Life Cycle, Waterfall Model, Spiral Model and other models, Unified process Agile development-Agile Process- Extreme Programming- Other agile Process models.

Unit II

Measures, Metrics and Indicators, Metrics in the Process and Project Domains, Software Measurement, Metrics of Software Quality, S/W reliability, Software estimation techniques, LOC and FP estimation. Empirical models like COCOMO, project tracking and scheduling, reverse engineering.

Unit III

Software requirements and specification: feasibility study, Informal/formal specifications, pre/post conditions, algebraic specification and requirement analysis models, Specification design tools. Software design and implementation: Software design objectives and techniques, User interface design, Modularity, Functional decomposition, DFD, Data Dictionary, Object oriented design, Design patterns implementation strategies like top- down, bottom-up.

Unit IV

Coding standard and guidelines, programming style, code sharing, code review, rapid prototyping, specialization, construction, class extensions, intelligent software agents, reuse performance improvement, debugging. Software Testing Strategies: Verification and Validation, Strategic Issues, test plan, white box, black-box testing, unit and integration testing, system testing test case design and acceptance testing, maintenance activities.

Unit V

Software Maintenance: Software Supportability, Reengineering, Business Process Reengineering, Reverse Engineering, Restructuring, Forward Engineering, Economics of Reengineering, project scheduling and tracking plan, project management plan, SQA and quality planning, SCM activities

and plan, CMM, Software project management standards, Introduction to component based software engineering.

References:

1 P.S. Pressman, Software Engineering. A Practitioner's Approach, TMH.
2 Rajib Mall, Fundamental of Software Engineering, PHI.
3 Hans Van Vliet, Software Engineering, Wiley India Edition.
4 James S. Peters, Software Engineering, Wiley India Edition.
5 Pankaj Jalote, Software Engineering: A Precise Approach, Wiley India.
6 Kelkar, Software Project Management, PHI Learning

Course Outcomes:

Upon completion of this course, students will be able to-

1. Define various software application domains and remember different process model used in software development.
2. Understand various measures of software and Generate project schedule.
3. Describe functional and non-functional requirements of software and develop design models of software.
4. Investigate the reason for bugs and apply the software testing techniques in commercial environment.
5. Understand various activities to be performed for improving software quality and software maintenance.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Information Technology, VI-Semester

Open Elective IT 604(C) Wireless Sensor Networks

Course Objectives:

1. To Understand the basic WSN technology and supporting protocols
2. Understand the medium access control protocols and address physical layer issues
3. Learn localization concepts for sensor networks
4. Learn energy efficiency and power control in sensor networks
5. Understand the security challenges in sensor networks.

Unit I

Overview of Wireless Sensor Networks: Network Characteristics, Network Applications, Network Design Objectives, Network Design Challenges, Technological Background : MEMS Technology , Wireless Communication Technology , Hardware and Software Platforms, Wireless Sensor Network Standards, Introduction, Network Architectures for Wireless Sensor Networks, Classifications of Wireless Sensor Networks, Protocol Stack for Wireless Sensor Networks.

Unit II

Fundamental MAC Protocols, MAC Design for Wireless Sensor Networks, MAC Protocols for Wireless Sensor Networks: Contention-Based Protocols, Contention-Free Protocols, Hybrid Protocols. Introduction, Fundamentals and Challenges, Taxonomy of Routing and Data Dissemination Protocols, Overview of Routing and Data Dissemination Protocols: Location-Aided Protocols, Layered and In-Network Processing-Based Protocols, Data-Centric Protocols, Multipath-Based Protocols, Mobility-Based Protocols, QoS Based Protocols, Heterogeneity-Based Protocols.

Unit III

Introduction, Query Processing in Wireless Sensor Networks, Data Aggregation in Wireless Sensor Networks, Node Localization: Concepts and Challenges of Node Localization Technologies, Ranging Techniques for Wireless Sensor Networks, Wireless Localization Algorithms, Wireless Sensor Node Localization.

Unit IV

Need for Energy Efficiency and Power Control in Wireless Sensor Networks, Passive Power Conservation Mechanisms: Physical-Layer Power Conservation Mechanisms, MAC Layer Power Conservation Mechanisms, Higher Layer Power Conservation Mechanisms, Active

Power Conservation Mechanisms: MAC Layer Mechanisms, Network Layer Mechanisms, Transport Layer Mechanisms.

Unit V

Fundamentals of Network Security, Challenges of Security in Wireless Sensor Networks, Security Attacks in Sensor Networks, Protocols and Mechanisms for Security, IEEE 802.15.4 and ZigBee Security .

References:

1. Wireless Sensor Networks A Networking Perspective, Jun Zheng & Abbas Jamalipour, a john Wiley & sons, Inc., publication .
2. Wireless sensor networks Technology, Protocols, and Applications , kazem sohraby, daniel minoli, taieb znati , a john Wiley & sons, Inc., publication .
3. Fundamentals of wireless sensor networks theory and practice, Waltenegus Dargie, Christian Poellabauer, A John Wiley and Sons, Ltd., Publication.

Course Outcomes:

Upon completion of this course, students will be able to-

1. Have knowledge of some existing applications of wireless sensor actuator networks
2. Learn the various hardware, software platforms that exist for sensor networks
3. Have knowledge of the various protocols for sensor networks
4. Analyze modeling and simulation of sensor networks
5. Understand what research problems sensor networks pose in disciplines such as signal processing, wireless communications and even control systems

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Information Technology, VI-

Semester

IT 605 Programming in Python

Python –Overview
Introduction, History, Features

Python –Environment Setup
Local Environment Setup, Getting Python, Installation of Python, Use of IDE

Python –Basic Syntax
Python Identifiers, Reserved Words, Lines & Indentation, Multiline Statements, Quotation in Python, Comments & other useful constructs

Python –Variables
Assigning Values to Variables, Multiple Assignment, Standard Data Types

Python Numbers
Python Strings, Python Lists, Python Tuples, Dictionary, DataType Conversion

Python –Basic Operators
Types of Operators, Arithmetic Operators, Comparison Operators, Assignment Operators, Bitwise Operators, Logical Operators, Operator Precedence.

Python –Decision Making & Loops
Flowchart, If statement Syntax

Python-Functions
Syntax for defining a function, Calling a Function, Function Arguments, Anonymous Functions
Python-Applications & Further Extensions

References:

1. Python Crash Course: A Hands-On, Project-Based Introduction to Programming, by Eric Matthes, No Starch Press
2. Learn Python the Hard Way' by Zed A. Shaw (3rd Edition), Addison Wesley
3. Head-First Python, by Paul Barry, O'Reilly
4. 'Python Programming' by John Zelle, Franklin, Beedle & Associates Inc;

Course Outcomes:
Upon completion of this course, students will be able to-

1. Install Python and have knowledge of syntax of Python
2. Describe the Numbers, Math functions, Strings, List, Tuples and Dictionaries in Python
3. Express different Decision Making statements and Functions
4. Develop code in Python using functions, loops etc.
5. Design GUI Applications in Python and evaluate different database operations

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New Scheme Based On AICTE Flexible Curricula

Information Technology, VI-Semester

IT 606 Android Programming

Introduction to Android:
A little Background about mobile technologies, Overview of Android, An Open Platform for Mobile development, Open Handset Alliance, What does Android run On – Android Internals, Why to use Android for mobile development,

Developing for Android:
My First Android Application, How to setup Android Development Environment, Android development Framework - Android-SDK, Eclipse, Emulators – What is an Emulator / Android AVD, Creating & setting up custom Android emulator, Android Project Framework, My First Android Application.

Android Activities and UI Design
Understanding Intent, Activity, Activity Lifecycle and Manifest, Creating Application and new Activities, Expressions and Flow control, Android Manifest, Simple UI -Layouts and Layout properties, Fundamental Android UI Design, Introducing Layouts
Creating new Layouts, Drawable Resources, Resolution and density independence (px,dip,dp,sip,sp), XML Introduction to GUI objects viz., Push Button Text / Labels, EditText, ToggleButton, WeightSum, Padding, Layout Weight

Reference:
Head First Android Development, 2nd edition, OREILLY.
Android App Development for Dummies, 3rd edition, Michael Burton, John Wiley sons
Busy Coder's Guide to Android Development, Mark L. Murphy, Commonsware

Course Outcomes:
Upon completion of this course, students will be able to-

1. Experiment on Integrated Development Environment for Android Application Development.
2. Design and Implement User Interfaces and Layouts of Android App.
3. Use Intents for activity and broadcasting data in Android App.
4. Design and Implement Database Application and Content Providers.

5. Experiment with Camera and Location Based service and develop Android App with Security features.

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New Scheme Based On AICTE Flexible Curricula

Information Technology, VII- semester

IT 701 Soft Computing

Course Objective:
The objective of this course is to familiarize the students with different soft computing tools to use them to be able to solve complex problems

Unit I Introduction to Neural Network: Concept, biological neural network, comparison of ANN with biological NN, evolution of artificial neural network, Basic models, Types of learning, Linear separability, XOR problem, McCulloch-Pitts neuron model, Hebb rule.

Unit II Supervised Learning: Perceptron learning, Single layer/multilayer, Adaline, Madaline, Back propagation network, RBFN, Application of Neural network in forecasting, data compression and image compression.

Unit III Unsupervised learning: Introduction, Fixed weight competitive nets, Kohonen SOM, Counter Propagation networks, (Theory, Architecture, Flow Chart, Training Algorithm and applications). Introduction to Convolutional neural networks (CNN) and Recurrent neural networks (RNN).

Unit IV Fuzzy Set: Introduction, Basic Definition and Terminology, Properties and Set-theoretic Operations, , Fuzzy Relations , Membership Functions and their assignment, Fuzzy rules and fuzzy Reasoning, Fuzzy if-then Rules, Fuzzy Inference Systems. Application of Fuzzy logic in solving engineering problems.

Unit V Genetic Algorithm: Introduction to GA, Simple Genetic Algorithm, terminology and operators of GA (individual, gene, fitness, population, data structure, encoding, selection, crossover, mutation, convergence criteria). Reasons for working of GA and Schema theorem, GA optimization problems like TSP (Travelling salesman problem), Network design routing. Introduction to Ant Colony optimization (ACO) and Particle swarm optimization (PSO).

References-

1. S.N. Shivnandam, “Principle of soft computing”, Wiley.
2. S. Rajshekaran and G.A.V. Pai, “Neural Network , Fuzzy logic And Genetic Algorithm”, PHI.
3. Jack M. Zurada, “Introduction to Artificial Neural Network System” JAico Publication.
4. Simon Haykins, “Neural Network- A Comprehensive Foudation”
5. Timothy J.Ross, “Fuzzy logic with Engineering Applications”, McGraw-Hills 1.

Suggested List of Experiments-

1. Form a perceptron net for basic logic gates with binary input and output.
2. Using Adaline net, generate XOR function with bipolar inputs and targets.
3. Calculation of new weights for a Back propagation network, given the values of input pattern, output pattern, target output, learning rate and activation function.
4. Design fuzzy inference system for a given problem.
5. Maximize the function $y = 3x^2 + 2$ for some given values of x using Genetic algorithm.
6. Implement Travelling salesman problem using Genetic Algorithm.
7. Optimisation of problem like Job shop scheduling using Genetic algorithm

Course Outcomes:

After the completion of this course, the students will be able to:

1. Understand concept of ANN and explain the XOR problem
2. Use supervised neural networks to classify given inputs
3. Understand unsupervised neural networks for clustering data .
4. Build Fuzzy inference system using concepts of fuzzy logic.
5. Obtain an optimized solution to a given problem using genetic algorithm.

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New Scheme Based On AICTE Flexible Curricula

Information Technology, VII-Semester

Departmental Elective IT 702(A) Data Science

Course Objective:
The objective of this course is to familiarize students with the roles of a data scientist and enable them to analyze data to derive meaningful information from it.

Unit I Data Science and Big Data Overview: Types of data, Sources of data, Data collection, Data storage and management, Big Data Overview, Characterization of Big data, Drivers of Big Data, Challenges, Big Data Use Cases, Defining Big Data Analytics and examples of its use cases, Data Analytics Lifecycle: Discovery, Data Preparation, Model Planning, Model Building, Communicate Results, Operationalize.

Unit II Advanced Analytical Theory and Methods: Clustering, K-means, Additional Clustering Algorithms, Association Rules, Apriori Algorithm, Applications of Association Rules, Regression, Linear Regression, Logistic Regression, Classification, Decision Trees, Naive Bayes, Additional Classification Methods, Text Analysis, Text Analysis Steps, Determining Sentiments.

Unit III Advanced Analytics-Technology and Tools: Analytics for Unstructured Data Use Cases, MapReduce, Apache Hadoop,Traditional database vs Hadoop, Hadoop Core Components, HDFS, Design of HDFS, HDFS Components, HDFS Architecture, Hadoop 2.0 Architecture, Hadoop-2.0 Resource Management, YARN.

Unit IV The Hadoop Ecosystem: Introduction to Hive, Hbase, HiveUse Cases: Facebook, Healthcare; Hive Architecture, Hive Components. Integrating Data Sources, Dealing with Real-Time Data Streams and Complex Event Processing, Overview of Pig, Difference between Hive and Pig, Use Cases of Pig, Pig program structure, Pig Components, Pig Execution, Pig data models, Overview of Mahout, Mahout working.

Unit V Introduction to R, Basic Data Analytics Methods Using R, Communicating and Operationalizing an Analytics Project, Creating the Final Deliverables, Data Visualization Basics.

References:

1. EMC Education Services, “Data Science and Big Data Analytics”, Wiley, 2015.
2. Judith Hurwitz, Alan Nugent, Fern Halper, and Marcia Kaufman, “Big Data for Dummies”,Wiley & Sons, 2013.
3. VigneshPrajapati, “Big Data Analytics with R and Hadoop” ,Packt Publishing, 2013.
4. David Dietrich, Barry Heller, and Beibei Yang“Data Science and Big Data Analytics:Discovering, Analyzing, Visualizing and Presenting Data”, John Wiley & Sons, Inc.

Course Outcomes:
After the completion of this course, the students will be able to:

1. Demonstrate proficiency with statistical analysis of data.

2. Build and assess data-based models.
3. Execute statistical analyses with professional statistical software.
4. Demonstrate skill in data management.
5. Apply data science concepts and methods to solve problems in real-world contexts and will communicate these solutions effectively

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New Scheme Based On AICTE Flexible Curricula

Information Technology, VII-Semester

Departmental Elective IT 702(B) Cloud Computing

Course Objective:
The objective of this course is to provide students with the comprehensive and in-depth knowledge of Cloud Computing concepts, technologies, architecture and applications.

UNIT I
Introduction of Grid and Cloud computing, characteristics, components, business and IT perspective, cloud services requirements, cloud models, Security in public model, public verses private clouds, Cloud computing platforms: Amazon EC2,Platform as Service: Google App Engine, Microsoft Azure, Utility Computing, Elastic Computing.

UNIT II
Cloud services- SAAS, PAAS, IAAS, cloud design and implementation using SOA, conceptual cloud model, cloud stack, computing on demand, Information life cycle management, cloud analytics, information security, virtual desktop infrastructure, storage cloud.

UNIT III
Virtualization technology: Definition, benefits, sensor virtualization, HVM, study of hypervisor, logical partitioning- LPAR, Storage virtualization, SAN, NAS, cloud server virtualization, virtualized data center.

UNIT IV
Cloud security fundamentals, Vulnerability assessment tool for cloud, Privacy and Security in cloud, Cloud computing security architecture: Architectural Considerations- General Issues, Trusted Cloud computing, Secure Execution Environments and Communications, Micro- architectures; Identity Management and Access control-Identity management, Access control, Autonomic Security, Cloud computing security challenges: Virtualization security management- virtual threats, VM Security Recommendations, VM-Specific Security techniques, Secure Execution Environments and Communications in cloud.

UNIT V
SOA and cloud, SOA and IAAS, cloud infrastructure benchmarks, OLAP, business intelligence, e-Business, ISV, Cloud performance monitoring commands, issues in cloud computing. QOS issues in cloud, mobile cloud computing, Inter cloud issues, Sky computing, Cloud Computing Platform, Xen Cloud Platform, Eucalyptus, OpenNebula, Nimbus, TPlatform, Apache Virtual Computing Lab (VCL), Anomaly Elastic Computing Platform.

References:
1. Dr.Kumar Saurabh, “Cloud Computing”, Wiley India.
2. Ronald Krutz and Russell Dean Vines, “Cloud Security”, Wiley-India.
3. Judith Hurwitz, R.Bloor, M.Kanfman, F.Halper, “Computing for Dummies”, Wiley India Edition.
4. Anthony T.Velte Toby J.Velte, “Cloud Computing – A Practical Approach”, TMH.
5. Barrie Sosinsky, ‘Cloud Computing Bible”, Wiley India.

Course Outcomes:
After the completion of this course, the students will be able to:

1. Explain the core concepts of the cloud computing paradigm
2. Demonstrate knowledge of virtualization
3. Explain the core issues of cloud computing such as security, privacy, and interoperability.
4. Choose the appropriate technologies, algorithms, and approaches for the related issues.
5. Identify problems, and explain, analyze, and evaluate various cloud computing solutions.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Information Technology, VII-Semester

Departmental Elective IT 702(C) SIMULATION & MODELING

Course Objective:
The objective of this course is to introduce students to basic simulation methods and tools for modeling and simulation of continuous, discrete and combined systems. The objective is to impart knowledge of simulation principles. The ability to create simulation models of various types.

Unit I
Modeling & Simulation Concepts Modeling & Simulation Concepts: System Concepts, What is a Model? Type of Models, Modeling & Simulation, Continuous vs. Discrete System Simulation, Numerical Integration vs. Continuous Simulation, Analog vs. Digital Simulation, Simulation vs. Monte- Carlo Simulation, Nature of Computer Modeling and Simulation, When to Use Simulation? Limitations of Simulation

Unit II
Probability Concepts in Simulation Stochastic variables, Random numbers: Pseudo-random generators, Testing of Pseudo-random number generators, Generation of non-uniformly distributed random numbers, discrete and continuous random variables, and density and distributive functions. Study of few distributions such as Poisson, Normal, Uniform

Unit III
Simulation of Continuous Systems Introduction, Differential equations, Pure Pursuit Problem, Simulation of Chemical Reaction, Autopilot Simulation and Simulation of other Continuous systems

Unit IV
Simulation of Discrete Systems Arrival patterns and service times, Simulation of Queuing System - Elementary idea about networks of Queuing with particular emphasis to computer system environment

Unit V
Verification & Validation Design of simulation experiments and validation of simulation experiments comparing model data units and real system data
Simulation Language A brief introduction to important discrete and continuous languages such as GPSS (Study & use of the language). Use of data base & AI techniques in the area of modeling and simulation

References:

1. Deo, Narsing “System Simulation with Digital Computers”
2. Gorden G, “System Simulation”, Prentice Hall
3. Shridhar Bhai Trivedi, Kishore “Probability & Statistics with reliability Queuing, Computer Science Applications”
4. Payer, T.A., “Introduction to System Simulation”, McGraw Hill
5. Reitman, J, “Computer Simulation Application”, Wiley
6. Barnes B, “Modeling and Performance Measurement of Computer System
7. Spriet, WIA. “Computer Aided Modeling and Simulation (Academic Press).

Course Outcomes:
After the completion of this course, the students will be able to:

1. Define, describe and apply basic concepts related to modeling, identification and simulation
2. Classify various simulation models and give practical examples for each category.
3. Demonstrate the ability to apply knowledge of probability and statistics for *simulation & modeling*,
4. Generate and test random numbers and apply them to develop simulation models.
5. Construct a model for a given set of data and motivate its validity.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Information Technology, VII-Semester

Departmental Elective IT 702(D) Augmented and Virtual Reality

Course Objective:
The objective of this course is to provide students a general introduction of Virtual and Augmented Environments followed by an analysis of features, requirement and issues in real-life applications.

Unit I Introduction to Virtual Reality- Virtual Reality and Virtual Environment: Introduction, Applications of Virtual Reality, Computer graphics, Real time computer graphics, Flight Simulation, Virtual environment requirement, benefits of virtual reality, Historical development of VR, Scientific Landmark 3D Computer Graphics: Introduction, The Virtual world space, positioning the virtual observer, the perspective projection, human vision, stereo perspective projection, 3D clipping, Colour theory, Simple 3D modeling, Illumination models, Reflection models, Shading algorithms, Radiosity, Hidden Surface Removal, Realism-Stereographic image.

Unit II Geometric Modeling- Geometric Modeling: Introduction, From 2D to 3D, 3D space curves, 3D boundary representation Geometrical Transformations: Introduction, Frames of reference, Modeling transformations, Instances, Picking, Flying, Scaling the VE, Collision detection Generic VR system: Introduction, Virtual environment, Computer environment, VR technology, Model of interaction, VR Systems.

Unit III Virtual Environment -Animating the Virtual Environment: Introduction, The dynamics of numbers, Linear and Nonlinear interpolation, the animation of objects, linear and non-linear translation, shape & object in betweening, free from deformation, particle system. Physical Simulation: Introduction, Objects falling in a gravitational field, Rotating wheels, Elastic collisions, projectiles, simple pendulum, springs, Flight dynamics of an aircraft.

Unit IV VR Hardware and Software- Human factors: Introduction, the eye, the ear, the somatic senses. VR Hardware: Introduction, sensor hardware, Head-coupled displays, Acoustic hardware, Integrated VR systems. VR Software: Introduction, Modeling virtual world, Physical simulation, VR toolkits, Introduction to VRML

Unit V Augmented and Mixed Reality- Taxonomy, Technology and features of augmented reality, difference between AR and VR, Challenges with AR, AR systems and functionality, Augmented reality methods, visualization techniques for augmented reality, wireless displays in educational augmented reality applications, mobile projection interfaces, marker-less tracking for augmented reality, enhancing interactivity in AR environments, evaluating AR systems.

References:

1. John Vince, “Virtual Reality Systems “, Pearson Education Asia, 2007.
2. Anand R., “Augmented and Virtual Reality”, Khanna Publishing House, Delhi.
3. Adams, “Visualizations of Virtual Reality”, Tata McGraw Hill, 2000.
4. Grigore C. Burdea, Philippe Coiffet , “Virtual Reality Technology”, Wiley Inter Science, 2 nd Edition, 2006.
5. William R. Sherman, Alan B. Craig, “Understanding Virtual Reality: Interface, Application and Design”, Morgan Kaufmann, 2008.
6. Alan B Craig, William R Sherman and Jeffrey D Will, Developing Virtual Reality Applications: Foundations of Effective Design, Morgan Kaufmann, 2009.

7. Gerard Jounghyun Kim, Designing Virtual Systems: The Structured Approach, 2005.
8. Alan B. Craig, Understanding Augmented Reality, Concepts and Applications, Morgan Kaufmann, 2013.

Course Outcomes:

After the completion of this course, the students will be able to:

1. Demonstrate knowledge of virtual reality and its applications
2. To describe the importance of viewing and projections.
3. Understand geometric modeling and Virtual environment.
4. Explain about virtual reality hardware and software
5. Develop Virtual Reality applications.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Information Technology, VII-Semester

Open Elective IT 703 (A) Cyber Laws and Forensics

Course Objective:
The objective of this course is to emphasize the importance of cyber laws and digital forensics, and to prepare students to conduct a digital investigation in an organized and systematic way.

UNIT-I Introduction to cybercrime, definition, cyber crime and information security, classification of cybercrimes, cybercrime: the legal perspectives, an Indian perspective, cybercrime and the Indian ITA 2000, a global perspective on cybercrime, Cyber offences: How criminals plan them, Tools and methods used in cyber crime, Need of cyber law, The Indian IT act, challenges to Indian law and cybercrime scenario in India, digital signature and Indian IT act, Amendments in the Indian IT act, cybercrime and punishment

UNIT-II Law and framework for information security, law for intellectual property rights(IPR), patent law, copy right law, Indian copyright act, privacy issue and law in Hong Kong, Japan, and Australia, data protection act in Europe, health insurance portability and accountability act of 1996(HIPAA), Gramm-leach-Bliley act of 1999(GLAB),Sarbanes-Oxley(SOX), legal issue in data mining, building security into software/system development life cycle.

UNIT III Digital forensics Science, The need for computer forensics, Understanding computer forensics, computer forensics versus other related disciplines, A brief History of computer Forensics, Cyber forensics and digital evidence, Digital forensics lifecycle, chain of custody concept, Network forensics, Approaching a computer forensics investigation, setting up a computer forensics laboratory, Forensics and social networking sites, computer forensics from compliance perspective, challenges in computer forensics, forensics auditing, antiforensics

UNIT IV Current Computer Forensics Tools, Evaluating Computer Forensics Tool Needs, Types of Computer Forensics Tools, Tasks Performed by Computer Forensics Tools, Tool Comparisons, Other Considerations for Tools, Computer Forensics Software Tools, Command-Line Forensics Tools, UNIX/Linux Forensics Tools, Other GUI Forensics Tools, Computer Forensics Hardware Tools, Forensic Workstations

UNIT V Forensics of hand held devices, Investigating Network Intrusions and Cyber Crime, Network Forensics and Investigating logs, Investigating network Traffic, Investigating Web attacks ,Router Forensics. Cyber forensics tools and case studies.

References:
1) The Indian Cyber law with Cyber glossary, Suresh T. Vishwanathan, New Delhi, Bhart Law House, 2000.
2) Law of Cyber Crimes and Information Technology Law, S.V. JogaRao, 2007.
3) Cory Altheide, Harlan Carvey, Digital Forensics with Open Source Tools, Syngress imprint of Elsevier.
4) Bill Nelson, Amelia Phillips, Christopher Steuart, “Guide to Computer Forensics and Investigations”, Fourth Edition, Course Technology.
5. Angus M. Marshall, “Digital forensics: Digital evidence in criminal investigation”, John – Wiley and Sons, 2008.

6. Nina Godbole and Sunit Belapure– Cyber Security, Wiley India Publication.
7. Nina Godbole, Information system security, Wiley India Publication.
8. Information Warfare: Corporate attack and defense in digital world, William

Course Outcomes:

After the completion of this course, the students will be able to:

1. Become aware of various cyber crimes and cyber laws
2. Underline the need of digital forensic and role of digital evidences
3. Understand different types of digital evidences that can be presented to support investigations
4. List the methods to generate legal evidence and supporting investigation reports
5. Use various digital forensic tools

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Information Technology, VII-Semester

Open Elective IT 703 (B) Internet of Things

Course Objective:
The objective of this course is to provide an understanding of the technologies and the standards relating to the Internet of Things and to develop skills on IoT technical planning.

Unit I IoT definition, Characteristics, IoT conceptual and architectural framework, Physical and logical design of IoT, IoT enablers, Modern day IoT applications, M2M communications, IoT vs M2M, IoT vs WoT, IoT reference architecture, IoT Network configurations, IoT LAN, IoT WAN, IoT Node, IoT Gateway, IoT Proxy, IPv4 vs IPV6

Unit II Sensor, Basic components and challenges of a sensor node, Sensor features, Sensor resolution; Sensor classes: Analog, Digital, Scalar, Vector Sensors; Sensor Types, bias, drift, Hysteresis error, quantization error; Actuator; Actuator types: Hydraulic, Pneumatic, electrical, thermal/magnetic, mechanical actuators, soft actuators

Unit III Basics of IoT Networking, IoT Components, Functional components of IoT, IoT service oriented architecture, IoT challenges, 6LowPAN, IEEE 802.15.4, ZigBee and its types, RFID Features, RFID working principle and applications, NFC (Near Field communication), Bluetooth, Wireless Sensor Networks and its Applications

Unit IV MQTT, MQTT methods and components, MQTT communication, topics and applications, SMQTT, CoAP, CoAP message types, CoAP Request-Response model, XMPP, AMQP features and components, AMQP frame types

Unit V IoT Platforms, Arduino, Raspberry Pi Board, Other IoT Platforms; Data Analytics for IoT, Cloud for IoT, Cloud storage models & communication APIs, IoT case studies

References:
1. Vijay Madisetti, Arshdeep Bahga, “Ïnternet of Things, A Hands on Approach”, University Press
2. Dr. SRN Reddy, Rachit Thukral and Manasi Mishra, “Introduction to Internet of Things: A practical Approach”, ETI Labs
3. Pethuru Raj and Anupama C. Raman, “The Internet of Things: Enabling Technologies, Platforms, and Use Cases”, CRC Press
4. Jeeva Jose, “Internet of Things”, Khanna Publishing House, Delhi
5. Adrian McEwen, “Designing the Internet of Things”, Wiley
6. Raj Kamal, “Internet of Things: Architecture and Design”, McGraw Hill
7. Cuno Pfister, “Getting Started with the Internet of Things”, O Reilly Media

Course Outcomes:
After the completion of this course, the students will be able to:
1. Understand Internet of Things and its hardware and software components

2. Interface I/O devices, sensors & communication modules
3. Analyze data from various sources in real-time and take necessary actions in an intelligent fashion
4. Remotely monitor data and control devices
5. Develop real life IoT based projects

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Information Technology, VII-Semester

Open Elective IT 703 (C) Social Networks

Course Objective:
The objective of this course is to focus on the importance of social network analysis and to enhance skills of students for analyzing social media and networking data.

UNIT I Introduction Introduction to Semantic Web: Limitations of current Web - Development of Semantic Web - Emergence of the Social Web - Social Network analysis: Development of Social Network Analysis - Key concepts and measures in network analysis - Electronic sources for network analysis: Electronic discussion networks, Blogs and online communities - Web-based networks - Applications of Social Network Analysis.

UNIT II Modelling, Aggregating and Knowledge Representation Ontology and their role in the Semantic Web: Ontology-based knowledge Representation - Ontology languages for the Semantic Web: Resource Description Framework - Web Ontology Language - Modelling and aggregating social network data: State-of-the-art in network data representation - Ontological representation of social individuals - Ontological representation of social relationships - Aggregating and reasoning with social network data - Advanced representations.

UNIT III Extraction and Mining Communities in Web Social Networks Extracting evolution of Web Community from a Series of Web Archive - Detecting communities in social networks - Definition of community - Evaluating communities - Methods for community detection and mining - Applications of community mining algorithms - Tools for detecting communities social network infrastructures and communities - Decentralized online social networks - MultiRelational characterization of dynamic social network communities.

UNIT IV Predicting Human Behaviour and Privacy Issues Understanding and predicting human behaviour for social communities - User data management - Inference and Distribution - Enabling new human experiences - Reality mining - Context - Awareness - Privacy in online social networks - Trust in online environment - Trust models based on subjective logic - Trust network analysis - Trust transitivity analysis - Combining trust and reputation - Trust derivation based on trust comparisons - Attack spectrum and countermeasures.

UNIT V Visualization and Applications of Social Networks Graph theory - Centrality - Clustering - Node-Edge Diagrams - Matrix representation - Visualizing online social networks, Visualizing social networks with matrix-based representations - Matrix and Node-Link Diagrams - Hybrid representations - Applications - Cover networks - Community welfare - Collaboration networks - Co-Citation networks.

References:

1. Ajith Abraham, Aboul Ella Hassanien, Václav Snášel, ―Computational Social Network Analysis: Trends, Tools and Research Advances‖, Springer, 2012
2. Borko Furht, ―Handbook of Social Network Technologies and Applications‖, Springer, 1st edition, 2011
3. Charu C. Aggarwal, ―Social Network Data Analytics‖, Springer; 2014
4. Giles, Mark Smith, John Yen, ―Advances in Social Network Mining and Analysis‖, Springer, 2010.

5. Guandong Xu , Yanchun Zhang and Lin Li, ―Web Mining and Social Networking – Techniques and applications‖, Springer, 1st edition, 2012
6. Peter Mika, ―Social Networks and the Semantic Web, Springer, 1st edition, 2007.
7. Przemyslaw Kazienko, Nitesh Chawla,‖Applications of Social Media and Social Network Analysis‖, Springer,2015
8. Maksim Tsvetovat and Alexander Kouznetsov , "Social Network Analysis for Startups", O'Reilly Media, 2011.
9. Charles Kadushin, "Understanding Social Networks", Oxford University Press, 2012
10. Social Network Analysis: Theory and Applications

Course Outcomes:

After the completion of this course, the students will be able to:

1. Understand the importance of social media and networks
2. Have skills for analyzing social media and networking data
3. Visualize social networks
4. Create real-life case studies using social media data
5. Plan and execute a small-scale network analysis project.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Information Technology, VII-Semester

Open Elective IT 703 (D) Digital Image Processing

Course Objective:
The objective of this course is to describe and explain basic principles of digital image processing.

Unit I Introduction and Digital Image Fundamentals: The origins of Digital Image Processing, Examples of Fields that Use Digital Image Processing, Fundamentals Steps in Image Processing, Elements of Digital Image Processing Systems, Image Sampling and Quantization, Some basic relationships like Neighbours, Connectivity, Distance Measures between pixels, Linear and Non Linear Operations.

Unit II Image Enhancement in the Spatial Domain: Some basic Gray Level Transformations, Histogram Processing, Enhancement Using Arithmetic and Logic operations, Basics of Spatial Filters, Smoothening and Sharpening Spatial Filters, Combining Spatial Enhancement Methods.

Unit III Image Enhancement in the Frequency Domain: Introduction to Fourier Transform and the frequency Domain, Smoothing and Sharpening Frequency Domain Filters, Homomorphic Filtering.
Image Restoration A model of The Image Degradation / Restoration Process, Noise Models, Restoration in the presence of Noise Only Spatial Filtering, Periodic Noise Reduction by Frequency Domain Filtering, Linear Position-Invariant Degradations, Estimation of Degradation Function, Inverse filtering, Wiener filtering, Constrained Least Square Filtering, Geometric Mean Filter, Geometric Transformations.

Unit IV Image Compression: Coding, Interpixel and Psychovisual Redundancy, Image Compression models, Elements of Information Theory, Error free comparison, Lossy compression, Image compression standards. **Image Segmentation** Detection of Discontinuities, Edge linking and boundary detection, Threshold, Region Oriented Segmentation, Motion based segmentation.

Unit V Representation and Description: Representation, Boundary Descriptors, Regional Descriptors, Use of Principal Components for Description, Introduction to Morphology, Some basic Morphological Algorithms. **Object Recognition** Patterns and Pattern Classes, Decision-Theoretic Methods, Structural Methods.

References:
1. R.C Gonzalez & Richard E Wood, “Digital Image Processing”, Addison Wesley Publishing
2. Anil K Jain, “Fundamentals of Digital image processing”. PHI.
3. Sonka, Hlavac, Boyle, “Digital image processing and computer vision”, Cengage learning, India Edition.
4. B Chanda, D. Dutta Majumder, “Digital image Processing and Analysis”, PHI.

Course Outcomes:
After the completion of this course, the students will be able to:
1. Explain basic concepts of image processing.
2. Have knowledge of techniques employed for the enhancement of images
3. Categorize image compression techniques
4. Interpret image segmentation and representation techniques.
5. Develop any image processing application

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New Scheme Based On AICTE Flexible Curricula

Information Technology, VII- semester

IT 704 Cloud Computing Lab

Course Objective:

The objective of this course is to make students understand *Cloud computing* concepts and the installation of different cloud simulation tools/ cloud setup tools.

Suggested List of Practicals:

1. Study of cloud computing concepts
2. Using Eucalyptus or Open Nebula or equivalent to set up the cloud
3. Find procedure to run the virtual machine of different configuration.
4. Check how many virtual machines can be utilized at particular time.
5. Install a C compiler in the virtual machine and execute a sample program.
6. Show the virtual machine migration based on the certain condition from one node to the other.
7. To develop web applications in cloud
8. To learn the design and development process involved in creating a cloud based application
9. To learn to implement and use parallel programming using Hadoop
10. Install Virtualbox/VMware Workstation with different flavours of linux or windows OS on top of windows 7 or 8.
11. Install a C compiler in the virtual machine created using virtual box and execute Simple Programs
12. Install Google App Engine. Create hello world app and other simple web applications using python/java.
13. Use GAE launcher to launch the web applications.
14. Simulate a cloud scenario using CloudSim.
15. Implementation of various scheduling mechanisms using open source cloud simulator.
16. Find a procedure to transfer the files from one virtual machine to another virtual machine.
17. Find a procedure to launch virtual machine using trystack (Online Openstack Demo Version)
18. Install Hadoop single node cluster and run simple applications like wordcount

Course Outcomes:

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

1. Configure various virtualization tools such as Virtual Box, VMware workstation.
2. Design and deploy a web application in a PaaS environment.
3. Learn how to simulate a cloud environment to implement new schedulers.
4. Install and use a generic cloud environment that can be used as a private cloud.
5. Manipulate large data sets in a parallel environment.

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New Scheme Based On AICTE Flexible Curricula

Information Technology, VII- semester

IT 705 IoT Lab

Course Objective:
The objective of this course is to to create a competitive industry required IoT skill in students.

Suggested List of Practicals
1. Familiarization with Arduino/Raspberry Pi and perform necessary software installation.
2. To interface LED/Buzzer with Arduino/Raspberry Pi and write a program to turn ON LED for 1 sec after every 2 seconds.
3. To interface Push button/Digital sensor (IR/LDR) with Arduino/Raspberry Pi and write a program to turn ON LED when push button is pressed or at sensor detection.
4. To interface DHT11 sensor with Arduino/Raspberry Pi and write a program to print temperature and humidity readings.
5. To interface motor using relay with Arduino/Raspberry Pi and write a program to turn ON motor when push button is pressed.
6. To interface OLED with Arduino/Raspberry Pi and write a program to print temperature and humidity readings on it.
7. To interface Bluetooth with Arduino/Raspberry Pi and write a program to send sensor data to smartphone using Bluetooth.
8. To interface Bluetooth with Arduino/Raspberry Pi and write a program to turn LED ON/OFF when '1'/'0' is received from smartphone using Bluetooth.
9. Write a program on Arduino/Raspberry Pi to upload temperature and humidity data to thingspeak cloud.
10. Write a program on Arduino/Raspberry Pi to retrieve temperature and humidity data from thingspeak cloud.
11. To install MySQL database on Raspberry Pi and perform basic SQL queries.
12. Write a program on Arduino/Raspberry Pi to publish temperature data to MQTT broker.
13. Write a program on Arduino/Raspberry Pi to subscribe to MQTT broker for temperature data and print it.
14. Write a program to create TCP server on Arduino/Raspberry Pi and respond with humidity data to TCP client when requested.
15. Write a program to create UDP server on Arduino/Raspberry Pi and respond with humidity data to UDP client when requested.

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

1. Have understanding of Arduino/Raspberry Pi
2. Apply the skills learned by designing, building, and testing a microcontroller-based embedded system
3. Publishing/Subscribing to connect, collect data, monitor and manage assets
4. Remotely monitor data and control devices
5. Perform experiments and mini projects on IoT

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Information Technology, VIII- semester

IT 801- Information Security

Course Objectives:

The objective of this course is to familiarize the students with the fundamentals of information security and the methods used in protecting both the information present in computer storage as well as information traveling over computer networks.

Unit I Introduction: Fundamental Principles of Information Security- Confidentiality, Availability, Integrity, Non Repudiation, The OSI Security Architecture, Security Attacks, Security Services, Security Mechanisms, a Model for Network Security; Classical Encryption Techniques: Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Steganography

Unit II Block Ciphers and Data Encryption Algorithm: Block Cipher Principles, The Data Encryption Standard, The Strength of DES, Differential and linear cryptanalysis, Block Cipher Design Principles; Advanced Encryption Standard: Evaluation criteria of AES, The AES Cipher, Multiple Encryption and Triple DES, Block Cipher modes of operation, Stream Ciphers, Confidentiality using Symmetric Encryption

Unit III Public Key Encryption: Principles of Public Key Cryptosystems, The RSA algorithm, Key Management, Diffie-Hellman Key Exchange, Elliptic curve cryptography; Message Authentication and Hash Functions: Authentication requirements, Authentication Functions, Message Authentication Codes, Hash Functions, Security of Hash Functions and MACs; Hash and MAC algorithms: Secure Hash Algorithm, HMAC; Digital Signatures and Authentication Protocols, Digital Signature Standard

Unit IV Authentication Applications, Kerberos, X.509 Authentication Service, Public key infrastructure; Electronic Mail Security: Pretty Good Privacy; IP Security: IP Security Overview, Architecture, Authentication header, encapsulating security payload, Key management; Web Security: Web security considerations, Secure Socket Layer and Transport layer Security, Secure Electronic Transaction

Unit V System Security: Intruders, Intrusion Detection, Password management; Malicious Software: Different type of malicious software, Viruses and related threats, Virus Countermeasures, Threats and attacks on Information Security, DoS and DDos Attacks; Security controls required for Information Security, Firewalls: Firewall design principles, Trusted Systems, Common criteria for information technology security evaluation

References:

1. William Stallings, "Cryptography and Network Security", Fourth edition, PHI
2. Atul Kahate, “Cryptography and Network Security”, McGraw Hill.
3. V.K. Pachghare, “Cryptography and Information Security”, PHI Learning

4. Nina Godbole, “Information System Security”, Wiley

Course Outcomes:

After the completion of this course, the students will be able to:

1. Understand key terms and concepts in information security and Cryptography and evaluate the cyber security needs of an organization.
2. Acquire knowledge to secure computer systems, protect personal data, and secure computer networks in an organization
3. Apply knowledge of various encryption algorithms and authentication mechanisms to secure information in computer systems and networks
4. Understand principles of web security to secure network by monitoring and analyzing the nature of attacks and design/develop security architecture for an organization.
5. Design operational and strategic information security strategies and policies.

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New Scheme Based On AICTE Flexible Curricula

Information Technology, VIII- semester

Departmental Elective IT 802 (A) Machine Learning

Course Objectives:
To familiarize students with the knowledge of machine learning and enable them to apply suitable machine learning techniques for data handling and to gain knowledge from it. Evaluate the performance of algorithms and to provide solution for various real-world applications.

Unit I Introduction:
Introduction, Examples of various Learning Paradigms, Perspectives and Issues, Concept Learning, Version Spaces, Finite and Infinite Hypothesis Spaces, PAC Learning, VC Dimension

Unit II Supervised Learning Algorithms:
Learning a Class from Examples, Linear, Non-linear, Multi-class and Multi-label classification, Decision Trees: ID3, Classification and Regression Trees (CART), Regression: Linear Regression, Multiple Linear Regression, Logistic Regression, Neural Networks: Introduction, Perceptron, Multilayer Perceptron, Support vector machines: Linear and NonLinear, Kernel Functions, K-Nearest Neighbors

Unit III Ensemble Learning:
Ensemble Learning Model Combination Schemes, Voting, Error-Correcting Output Codes, Bagging: Random Forest Trees, Boosting: Adaboost, Stacking

Unit IV Unsupervised Learning:
Introduction to clustering, Hierarchical: AGNES, DIANA, Partitional: K-means clustering, K-Mode Clustering, Self-Organizing Map, Expectation Maximization, Gaussian Mixture Models, Principal Component Analysis (PCA), Locally Linear Embedding (LLE), Factor Analysis

Unit V Probabilistic Learning:
Bayesian Learning, Bayes Optimal Classifier, Naïve Bayes Classifier, Bayesian Belief Networks, Mining Frequent Patterns

References:

1. EthemAlpaydin,"Introduction to Machine Learning", MIT Press, Prentice Hall of India, Third Edition 2014.
2. MehryarMohri, AfshinRostamizadeh, AmeetTalwalkar "Foundations of Machine Learning", MIT Press, 2012.
3. Tom Mitchell, "Machine Learning", McGraw Hill, 3rd Edition,1997.
4. Charu C. Aggarwal, "Data Classification Algorithms and Applications", CRC Press, 2014.

5. Stephen Marsland, “Machine Learning – An Algorithmic Perspective”, 2nd Edition, CRC Press, 2015.
6. Kevin P. Murphy "Machine Learning: A Probabilistic Perspective", The MIT Press, 2012
7. Jiawei Han and MichelineKambers and Jian Pei, “Data Mining –Concepts and Techniques”, 3rd Edition,Morgan Kaufman Publications, 2012.
8. Marc Peter Deisenroth, A. Aldo Faisal, Cheng Soon Ong, “Mathematics for Machine Learning”, Cambridge University Press, 2019.

Course Outcomes:

After the completion of this course, the students will be able to:

1. Recognize the characteristics of machine learning strategies.
2. Apply various supervised learning methods to appropriate problems.
3. Identify and integrate more than one technique to enhance the performance of learning.
4. Create probabilistic and unsupervised learning models for handling unknown pattern.
5. Analyze the co-occurrence of data to find interesting frequent patterns and Preprocess the data before applying to any real-world problem and can evaluate its performance

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New Scheme Based On AICTE Flexible Curricula

Information Technology, VIII- semester

Departmental Elective IT 802 (B) Natural Language Processing

Course Objectives:
To provide a broad introduction to NLP with a particular emphasis on core algorithms, data structures, and machine learning for NLP.

Unit I

Introduction to various levels of natural language processing, Ambiguities and computational challenges in processing various natural languages. Introduction to Real life applications of NLP such as spell and grammar checkers, information extraction, question answering, and machine translation

Unit II

Character Encoding, Word Segmentation, Sentence Segmentation, Introduction to Corpora, Corpora Analysis

Unit III

Inflectional and Derivation Morphology, Morphological Analysis and Generation using finite state transducers

Introduction to word types, POS Tagging, Maximum Entropy Models for POS tagging, Multi-word Expressions.

Unit IV

The role of language models. Simple N-gram models. Estimating parameters and smoothing. Evaluating language models.

Introduction to phrases, clauses and sentence structure, Shallow Parsing and Chunking, Shallow Parsing with Conditional Random Fields (CRF), Lexical Semantics, Word Sense Disambiguation, WordNet, Thematic Roles, Semantic Role Labelling with CRFs.

Unit V

NL Interfaces, Text Summarization, Sentiment Analysis, Machine Translation, Question answering, Recent Trends in NLP

References:
1. J. H. Speech and Language Processing, Jurafsky, D. and Martin, Prentice Hall, 2nd Edition, 2014

2. C. D. and H. Schütze: Foundations of Statistical Natural Language Processing, Manning, The MIT Press

Course Outcomes:
After the completion of this course, the students will be able to:

1. Identify and discuss the characteristics of different NLP techniques
2. Understand the fundamental mathematical models and algorithms in the field of NLP and apply these mathematical models and algorithms in applications in software design and implementation for NLP
3. Understand the complexity of speech and the challenges facing speech engineers
4. Understand approaches to syntax and semantics in NLP
5. Understand approaches to discourse, generation, dialogue and summarization within NLP

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New Scheme Based On AICTE Flexible Curricula

Information Technology, VIII- semester

Departmental Elective IT 802 (C) Robotics

Course Objectives:
The objective of this course is to impart knowledge about industrial robots for their control and design.

Unit I Introduction to Robotics:
Types and components of a robot, Classification of robots, closed-loop and open-loop control systems;
Kinematics systems: Definition of mechanisms and manipulators, Social issues and safety

Unit II Robot Kinematics and Dynamics:
Kinematic Modelling: Translation and Rotation Representation, Coordinate transformation, DH parameters, Jacobian, Singularity, and Statics;
Dynamic Modelling: Equations of motion: Euler-Lagrange formulation

Unit III Sensors and Vision System:
Sensor: Contact and Proximity, Position, Velocity, Force, Tactile etc.
Introduction to Cameras, Camera calibration, Geometry of Image formation, Euclidean/Similarity/Affine/Projective transformations, Vision applications in robotics.

Unit IV Robot Control:
Basics of control: Transfer functions, Control laws: P, PD, PID, Non-linear and advanced controls
Robot Actuation Systems: Actuators: Electric, Hydraulic and Pneumatic; Transmission: Gears, Timing Belts and Bearings, Parameters for selection of actuators.

Unit V Control Hardware and Interfacing:
Embedded systems: Architecture and integration with sensors, actuators, components, Programming for Robot Applications

References:

1. Saha, S.K., "Introduction to Robotics, 2nd Edition, McGraw-Hill Higher Education, New Delhi, 2014.
2. Ghosal, A., "Robotics", Oxford, New Delhi, 2006.
3. Niku Saeed B., "Introduction to Robotics: Analysis, Systems, Applications", PHI, New Delhi.
4. Mittal R.K. and Nagrath I.J., "Robotics and Control", Tata McGraw Hill.
5. Mukherjee S., "Robotics and Automation", Khanna Publishing House, Delhi.
6. Craig, J.J., "Introduction to Robotics: Mechanics and Control", Pearson, New Delhi, 2009
7. Mark W. Spong, Seth Hutchinson, and M. Vidyasagar, "Robot Modelling and Control", John Wiley and Sons Inc, 2005
8. Steve Heath, "Embedded System Design", 2nd Edition, Newnes, Burlington, 2003

9. Merzouki R., Samantaray A.K., Phathak P.M. and Bouamama B. Ould, “Intelligent Mechatronic System: Modeling, Control and Diagnosis”, Springer.

Course Outcomes:

After the completion of this course, the students will be able to:

1. Understand robot mechanism
2. Perform kinematic and dynamic analyses with simulation
3. Design control laws for a robot
4. Integrate mechanical and electrical hardware for a real prototype of robotic device
5. Select a robotic system for given application

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Information Technology, VIII- semester

Departmental Elective IT 802 (D) Quantum Computing

Course Objectives:
The objective of this course is to impart necessary knowledge to the learner so that he/she can develop and implement algorithm and write programs using these algorithm

Unit I
Motivation for studying Quantum Computing , Major players in the industry (IBM, Microsoft, Rigetti, D-Wave etc.), Origin of Quantum Computing
Overview of major concepts in Quantum Computing: Qubits and multi-qubits states, Braket notation, Bloch Sphere representation, Quantum Superposition, Quantum Entanglement

Unit II
Math Foundation for Quantum Computing: Matrix Algebra: basis vectors and orthogonality, inner product and Hilbert spaces, matrices and tensors, unitary operators and projectors, Dirac notation, Eigen values and Eigen vectors

Unit III
Building Blocks for Quantum Program: Architecture of a Quantum Computing platform,
Details of q-bit system of information representation: Block Sphere, Multi-qubits States, Quantum superposition of qubits (valid and invalid superposition), Quantum Entanglement, Useful states from quantum algorithmic perceptive e.g. Bell State, Operation on qubits: Measuring and transforming using gates.
Quantum Logic gates and Circuit: Pauli, Hadamard, phase shift, controlled gates, Ising, Deutsch, swap etc.

Unit IV
Programming model for a Quantum Computing Program: Steps performed on classical computer, Steps performed on Quantum Computer, Moving data between bits and qubits.
Basic techniques exploited by quantum algorithms, Amplitude amplification, Quantum Fourier Transform, Phase Kick-back, Quantum Phase estimation, Quantum Walks

Unit V
Major Algorithms: Shor's Algorithm, Grover's Algorithm, Deutsch's Algorithm, Deutsch -Jozsa Algorithm OSS Toolkits for implementing Quantum program: IBM quantum experience, Microsoft Q, Rigetti PyQuil (QPU/QVM)

References:

1. Michael A. Nielsen, "Quantum Computation and Quantum Information", Cambridge University Press.
2. David McMahon, "Quantum Computing Explained", Wiley

Course Outcomes:

After the completion of this course, the students will be able to:

1. Understand major concepts in Quantum Computing
2. Explain the working of a Quantum Computing program, its architecture and program model
3. Develop quantum logic gate circuits
4. Develop quantum algorithm
5. Program quantum algorithm on major toolkits

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Information Technology, VIII- semester

Open Elective IT 803 (A) Blockchain Technology

Course Objectives:
The objective of this course is to provide conceptual understanding of how block chain technology can be used to innovate and improve business processes. The course covers the technological underpinning of block Chain operations in both theoretical and practical implementation of solutions using block Chain technology.

Unit I Introduction: Overview of Block chain, Public Ledgers, Bitcoin, Smart Contracts, Block in a Block chain, Transactions, Distributed Consensus, Public vs Private Block chain, Understanding Cryptocurrency to Block chain, Permissioned Model of Block chain, Overview of Security aspects of Block chain; Basic Crypto Primitives: Cryptographic Hash Function, Properties of a hash function, Hash pointer and Merkle tree, Digital Signature, Public Key Cryptography, A basic cryptocurrency

Unit II Understanding Block chain with Crypto currency: Bitcoin and Block chain: Creation of coins, Payments and double spending, Bitcoin Scripts, Bitcoin P2P Network, Transaction in Bitcoin Network, Block Mining, Block propagation and block relay.
Working with Consensus in Bitcoin**:** Distributed consensus in open environments, Consensus in a Bitcoin network, Proof of Work (PoW) – basic introduction, HashCash PoW, Bitcoin PoW, Attacks on PoW and the monopoly problem, Proof of Stake, Proof of Burn and Proof of Elapsed Time, The life of a Bitcoin Miner, Mining Difficulty, Mining Pool

Unit III Understanding Block chain for Enterprises: Permissioned Block chain: Permissioned model and use cases, Design issues for Permissioned block chains, Execute contracts, State machine replication, Overview of Consensus models for permissioned block chain- Distributed consensus in closed environment, Paxos, RAFT Consensus, Byzantine general problem, Byzantine fault tolerant system, Lamport-Shostak-Pease BFT Algorithm, BFT over Asynchronous systems.

Unit IV Enterprise application of Block chain: Cross border payments, Know Your Customer (KYC), Food Security, Mortgage over Block chain, Block chain enabled Trade, We Trade – Trade Finance Network, Supply Chain Financing, and Identity on Block chain

Unit V Block chain application development: Hyperledger Fabric- Architecture, Identities and Policies, Membership and Access Control, Channels, Transaction Validation, Writing smart contract using Hyperledger Fabric, Writing smart contract using Ethereum, Overview of Ripple and Corda

References:
1. Melanie Swan, “Block Chain: Blueprint for a New Economy”, O’Reilly, 2015
2. Josh Thompsons, “Block Chain: The Block Chain for Beginners- Guide to Block chain Technology and Leveraging Block Chain Programming”
3. Daniel Drescher, “Block Chain Basics”, Apress; 1stedition, 2017

4. Anshul Kaushik, “Block Chain and Crypto Currencies”, Khanna Publishing House, Delhi.
5.Imran Bashir, “Mastering Block Chain: Distributed Ledger Technology, Decentralization and Smart Contracts Explained”, Packt Publishing
6. Ritesh Modi, “Solidity Programming Essentials: A Beginner’s Guide to Build Smart Contracts for Ethereum and Block Chain”, Packt Publishing
7. Salman Baset, Luc Desrosiers, Nitin Gaur, Petr Novotny, Anthony O’Dowd, Venkatraman Ramakrishna, “Hands-On Block Chain with Hyperledger: Building Decentralized Applications with Hyperledger Fabric and Composer”, Import, 2018

Course Outcomes:

After the completion of this course, the students will be able to:

1. Understand block chain technology
2. Acquire knowledge of crytocurrencies
3. Develop block chain based solutions and write smart contract using Hyperledger Fabric and Ethereum frameworks
4. Build and deploy block chain application for on premise and cloud based architecture
5. Integrate ideas from various domains and implement them using block chain technology in different perspectives

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Information Technology, VIII- semester

Open Elective IT 803 (B) Human Computer Interaction

Course Objectives:
To provide the basic knowledge on the levels of interaction, design models, techniques and validations focusing on the different aspects of human-computer interface and interactions

Unit I HCI Foundations:
Input–output channels, Human memory, Thinking: reasoning and problem solving, Emotion, Individual differences, Psychology and the design of interactive systems, Text entry devices, Positioning, pointing and drawing, Display devices, Devices for virtual reality and 3D interaction, Physical controls, sensors and special devices, Paper: printing and scanning

Unit II Designing Interaction:
Overview of Interaction Design Models, Discovery - Framework, Collection - Observation, Elicitation, Interpretation - Task Analysis, Storyboarding, Use Cases, Primary Stakeholder Profiles, Project Management Document

Unit III Interaction Design Models:
Model Human Processor - Working Memory, Long-Term Memory, Processor Timing, Keyboard Level Model - Operators, Encoding Methods, Heuristics for M Operator Placement, What the Keyboard Level Model Does Not Model, Application of the Keyboard Level Model, GOMS - CMN-GOMS Analysis, Modeling Structure, State Transition Networks - Three-State Model, Glimpse Model, Physical Models, Fitts' Law

Unit IV Guidelines in HCI:
Shneideman's eight golden rules, Norman's Sever principles, Norman's model of interaction, Nielsen's ten heuristics, Heuristic evaluation, contextual evaluation, Cognitive walk-through
Collaboration and Communication:
Face-to-face Communication, Conversation, Text-based Communication, Group working, Dialog design notations, Diagrammatic notations, Textual dialog notations, Dialog semantics, Dialog analysis and design

Unit V Human Factors and Security:
Groupware, Meeting and decision support systems, Shared applications and artifacts, Frameworks for groupware Implementing synchronous groupware, Mixed, Augmented and Virtual Reality
Validation: Validations - Usability testing, Interface Testing, User Acceptance Testing

References:

1. A Dix, Janet Finlay, G D Abowd, R Beale., Human-Computer Interaction, 3rd Edition, Pearson Publishers,2008
2. Shneiderman, Plaisant, Cohen and Jacobs, Designing the User Interface: Strategies for Effective Human Computer Interaction, 5th Edition, Pearson Publishers, 2010.
3. Hans-Jorg Bullinger," Human-Computer Interaction", Lawrence Erlbaum Associates, Publishers
4. Jakob Nielsen," Advances in Human-computer Interaction",Ablex Publishing Corporation

5. Thomas S. Huang," Real-Time Vision for Human-Computer Interaction", Springer
6. Preece et al, Human-Computer Interaction, Addison-Wesley, 1994

Course Outcomes:

After the completion of this course, the students will be able to:

1. Enumerate the basic concepts of human, computer interactions
2. Create the processes of human computer interaction life cycle
3. Analyze and design the various interaction design models
4. Apply the interface design standards/guidelines for evaluating the developed interactions
5. Apply product usability evaluations and testing methods

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New Scheme Based On AICTE Flexible Curricula

Information Technology, VIII- semester

Open Elective IT 803 (C) Printing and Design

Course Objectives:
To impart knowledge and skills related to 3D printing technologies, selection of material and equipment and develop a product using this technique in Industry 4.0 environment

Unit I 3D Printing (Additive Manufacturing):
Introduction, Process, Classification, Advantages, Additive V/s Conventional Manufacturing processes, Applications.
CAD for Additive Manufacturing: CAD Data formats, Data translation, Data loss, STL format.

Unit II Additive Manufacturing Techniques:
Stereo- Lithography, LOM, FDM, SLS, SLM, Binder Jet technology.
Process, Process parameter, Process Selection for various applications.
Additive Manufacturing Application Domains: Aerospace, Electronics, Health Care, Defence, Automotive, Construction, Food Processing, Machine Tools

Unit III Materials:
Polymers, Metals, Non-Metals, Ceramics
Various forms of raw material- Liquid, Solid, Wire, Powder; Powder Preparation and their desired properties, Polymers and their properties, Support Materials.

Unit IV Additive Manufacturing Equipment:
Process Equipment- Design and process parameters, Governing Bonding Mechanism, Common faults and troubleshooting, Process Design

Unit V Post Processing:
Post Processing Requirement and Techniques. Product Quality: Inspection and testing, Defects and their causes

References:

1. Lan Gibson, David W. Rosen and Brent Stucker, "Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing", Springer, 2010.
2. Andreas Gebhardt, "Understanding Additive Manufacturing: Rapid Prototyping, Rapid Tooling, Rapid Manufacturing", Hanser Publisher, 2011.
3. Khanna Editorial, "3D Printing and Design", Khanna Publishing House, Delhi.
4. CK Chua, Kah Fai Leong, "3D Printing and Rapid Prototyping- Principles and Applications", World Scientific, 2017.
5. J.D. Majumdar and I. Manna, "Laser-Assisted Fabrication of Materials", Springer Series in Material Science, 2013.
6. L. Lu, J. Fuh and Y.S. Wong, "Laser-Induced Materials and Processes for Rapid Prototyping", Kulwer Academic Press, 2001.

7. Zhiqiang Fan And Frank Liou, “Numerical Modelling of the Additive Manufacturing (AM) Processes of Titanium Alloy”, InTech, 2012.

Course Outcomes:

After the completion of this course, the students will be able to:

1. Develop CAD models for 3D printing.
2. Import and Export CAD data and generate .stl file.
3. Select a specific material for the given application.
4. Select a 3D printing process for an application.
5. Produce a product using 3D Printing or Additive Manufacturing (AM).

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Information Technology, VIII- semester

Open Elective IT 803 (D) Parallel Computing

Course Objectives:

To develop an understanding of the fundamental principles and engineering trade-offs involved in designing modern parallel computers and to develop programming skills to effectively implement parallel architecture

Unit I Introduction: The need for parallelism, Forms of parallelism (SISD, SIMD, MISD, MIMD), Moore's Law and Multi-cores, Fundamentals of Parallel Computers, Communication architecture, Message passing architecture, Data parallel architecture, Dataflow architecture, Systolic architecture, Performance Issues

Unit II Large Cache Design: Shared vs. Private Caches, Centralized vs. Distributed Shared Caches, Snooping-based cache coherence protocol, directory-based cache coherence protocol, Uniform Cache Access, Non-Uniform Cache Access, D-NUCA, S-NUCA, Inclusion, Exclusion, Difference between transaction and transactional memory, STM, HTM

Unit III Graphics Processing Unit: GPUs as Parallel Computers, Architecture of a modern GPU, Evolution of Graphics Pipelines, GPGPUs, Scalable GPUs, Architectural characteristics of Future Systems, Implication of Technology and Architecture for users, Vector addition, Applications of GPU

Unit IV Introduction to Parallel Programming: Strategies, Mechanism, Performance theory, Parallel Programming Patterns: Nesting pattern, Parallel Control Pattern, Parallel Data Management, Map: Scaled Vector, Mandelbrot, Collative: Reduce, Fusing Map and Reduce, Scan, Fusing Map and Scan, Data Recognition: Gather, Scatter, Pack , Stencil and Recurrence, Fork-Join, Pipeline

Unit V Parallel Programming Languages: Distributed Memory Programming with MPI: trapezoidal rule in MPI, I/O handling, MPI derived datatype, Collective Communication, Shared Memory Programming with Pthreads: Conditional Variables, read-write locks, Cache handling, Shared memory programming with Open MP: Parallel for directives, scheduling loops, Thread Safety, CUDA: Parallel programming in CUDA C, Thread management, Constant memory and Event, Graphics Interoperability, Atomics, Streams

References:

1. D. E. Culler, J. P. Singh, and A. Gupta, “Parallel Computer Architecture”, MorganKaufmann, 2004
2. Rajeev Balasubramonian, Norman P. Jouppi, and Naveen Muralimanohar, “Multi-Core Cache Hierarchies”, Morgan & Claypool Publishers, 2011

3. Peter and Pach Eco, “An Introduction to Parallel Programming”, Elsevier, 2011
4. James R. Larus and Ravi Rajwar, “Transactional Memory”, Morgan & Claypool Publishers, 2007
5. David B. Kirk, Wen-mei W. Hwu, “Programming Massively Parallel Processors: A Hands-on Approach”, 2010
6. Barbara Chapman, F. Desprez, Gerhard R. Joubert, Alain Lichnewsky, Frans Peters “Parallel Computing: From Multicores and GPU's to Petascale”, 2010
7. Michael McCool, James Reinders, Arch Robison, “Structured Parallel Programming: Patterns for Efficient Computation”, 2012
8. Jason Sanders, Edward Kandrot, “CUDA by Example: An Introduction to GeneralPurpose GPU Programming”, 2011

Course Outcomes:

After the completion of this course, the students will be able to:

1. To develop an understanding of various basic concepts associated with parallel computing environments
2. Understand, appreciate and apply parallel and distributed algorithms in problem solving
3. Acquire skills to measure the performance of parallel and distributed programs
4. Design parallel programs to enhance machine performance in parallel hardware environment
5. Design and implement parallel programs in modern environments such as CUDA, OpenMP, etc