B. Tech. Degree

IN

COMPUTER SCIENCE AND ENGINEERING

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

SYLLABUS
FOR
CREDIT BASED CURRICULUM

NATIONAL INSTITUTE OF TECHNOLOGY PUDUCHERRY
KARAIKAL – 609609
INDIA

THIRD SEMESTER

CODE	COURSE TITLE	L	T	P	C
MA203	Discrete Mathematics	3	0	0	3
CS201	Data Structures	3	0	0	3
CS203	Computer Organization and Architecture	3	0	0	3
CS205	Object Oriented Programming	3	0	0	3
CS207	Digital Computer Fundamentals	3	0	0	3
CS209	Data Communication& Networks	3	0	0	3
CS211	Data Structures Laboratory	0	0	3	2
CS213	Object Oriented Programming Laboratory	0	0	3	2
TOTAL CREDITS					**22**

FOURTH SEMESTER

CODE	COURSE TITLE	L	T	P	C
MA204	Probability Theory	3	0	0	3
CS202	Software Engineering	3	0	0	3
CS204	Automata and Formal Languages	3	0	0	3
CS206	Design and Analysis of Algorithms	3	0	0	3
CS208	Microprocessor and Microcontrollers	3	0	0	3
CS210	Computer Networks Laboratory	0	0	3	2
CS212	Algorithms Laboratory	0	0	3	2
CS214	Microprocessor and MicrocontrollersLaboratory	0	0	3	2
TOTAL CREDITS					**21**

FIFTH SEMESTER

CODE	COURSE TITLE	L	T	P	C
CS301	Database Management System	3	0	0	3
CS303	Operating Systems	3	0	0	3
CS305	Web Technology	3	0	0	3
CS5XX	Elective 1	3	0	0	3
CS5XX	Elective 2	3	0	0	3
CS10XX	Global Elective 1	3	0	0	3
CS307	Database Management System Laboratory	0	0	3	2
CS309	Operating Systems Laboratory	0	0	3	2
TOTAL CREDITS					**22**

SIXTH SEMESTER

CODE	COURSE TITLE	L	T	P	C
CS302	Principles of Compiler Design	3	0	0	3
CS304	UNIX System Programming	3	0	0	3
CS5XX	Elective 3	3	0	0	3
CS5XX	Elective 4	3	0	0	3
CS10XX	Global Elective 2	3	0	0	3
HM302	Professional Ethics and Human Values	2	0	0	2
CS306	Compiler Design Laboratory	0	0	3	2
CS308	UNIX System Programming Laboratory	0	0	3	2
TOTAL CREDITS					**21**

SEVENTH SEMESTER

CODE	COURSE TITLE	L	T	P	C
HM401	Industrial Economics & Management	3	0	0	3
CS5XX	Elective 5	3	0	0	3
CS5XX	Elective 6	3	0	0	3
CS5XX	Elective 7	3	0	0	3
CS10XX	Global Elective 3	3	0	0	3
CS497	Project Work Phase – I	0	0	0	2
TOTAL CREDITS					**17**

EIGTH SEMESTER

CODE	COURSE TITLE	L	T	P	C
CS5XX	Elective 8	3	0	0	3
CS5XX	Elective 9	3	0	0	3
CS5XX	Elective 10	3	0	0	3
CS5XX	Elective 11	3	0	0	3
CS498	Project Work Phase–II	0	0	0	4
TOTAL CREDITS					**16**

Summary

Semester	III	IV	V	VI	VII	VIII	Total
Credits	22	21	22	21	17	16	119

LIST OF DEPARTMENT ELECTIVES

LIST OF ELECTIVE FOR FIFTH SEMESTER (TWO)

1. CS501 Graph Theory
2. CS503 Wireless Adhoc Networks
3. CS505 Programming with C++
4. CS507 Artificial Intelligence
5. CS509 Computer Graphics and Vision

LIST OF ELECTIVE FOR SIXTH SEMESTER (TWO)

1. CS502 Object Oriented Analysis and Design
2. CS504 Software Testing
3. CS506 Advanced Computer Architecture
4. CS508 Mobile Computing
5. CS510 Distributed Systems

LIST OF ELECTIVE FOR SEVENTH SEMESTER (THREE)

1. CS511 Internet of Things
2. CS513 Mobile Application Development
3. CS515 Network Programming
4. CS517Python Programming
5. CS519 Design and Analysis of Parallel Algorithms
6. CS521 Functional Programming Languages
7. CS523 Computer and Network Security
8. CS525Knowledge Engineering
9. CS527 Data Warehousing and Data Mining

LIST OF ELECTIVE FOR EIGTH SEMESTER (FOUR)

1. CS512Advanced Database Management Systems
2. CS514Machine Learning and Soft Computing
3. CS516Big Data Analytics
4. CS518R Programming
5. CS520Cross Platform Application Development
6. CS522 Management Information Systems
7. CS524 Real Time Systems
8. CS526 Enterprise Resource Planning
9. CS528 Natural Language Processing
10. CS530Cloud Computing

LIST OF GLOBAL ELECTIVES (Offered for students other than CSE)

1. CS1001 Cloud Computing
2. CS1002 Mobile Communication
3. CS1003 Information Security
4. CS1004 Introduction to Data Structures
5. CS1005 Operating System Concepts
6. CS1006 Object Oriented Programming with C++
7. CS1007 Web of Things
8. CS1008 Computer Networks

SEMESTER III

CS201 - DATA STRUCTURES

Credits: 3

Objectives

- To introduce basic data structures and their applications.
- To introduce the concepts of algorithmic paradigms.
- To analyze the complexity of algorithms.

Unit - I Stacks & Queues

Development of Algorithms - Notations and analysis - Storage structures for arrays - Sparse matrices - Stacks and Queues: Representations and applications.

Unit - II Linked Lists

Linked Lists - Linked stacks and queues - Operations on polynomials - Doubly linked lists - Circularly linked lists - Dynamic storage management - Garbage collection and compaction.

Unit – IIISorting & Searching

Sorting Techniques - Selection, Bubble, Insertion, Merge, Heap, Quick, Radix sort and Address calculation. Linear search - Binary search - Hash table methods.

Unit – IVGraphs

Graphs - Representation of graphs - BFS, DFS - Topological sort - Shortest path problems. String representation and manipulations - Pattern matching.

Unit – VTrees

Binary Trees - Binary search trees - Tree traversal - Expression manipulation - Symbol table construction - Height balanced trees - Red-black trees - Minimum spanning trees.

Outcomes

- Apply sorting and searching algorithms to the small and large data sets.
- Ability to design and implement abstract data types such as linked list, stack, queue, graphs and trees using static or dynamic implementations.
- Analyze the complexity of different algorithms.

Teaching and Evaluation Guidelines

- 40 % on analysis (Medium/ High Level Thinking) and 60% on conceptual understanding (Low Level Thinking).

Text Book

1. Jean Paul Tremblay and Paul G. Sorenson, "An Introduction to Data Structures with Applications", Second Edition, Tata McGraw Hill,26th Reprint 2004.

Reference Books

1. Alfred V. Aho, John E. Hopcroft, Jeffrey D.Ullman, "Data Structure and Algorithms", Second Edition, Pearson Education, 2009.
2. Sara Baase and Allen Van Gelder, "Computer Algorithms - Introduction to Design and Analysis", Third Edition, Pearson Education, 2008.

CS203 - COMPUTER ORGANIZATION AND ARCHITECTURE

Credits: 3

Objectives

- To understand the basic components and its interaction in a computer system.
- To understand fundamental in building a basic computer.

Unit-I Basic structure of Computers

Operational concepts - Bus structures - Arithmetic operations - Memory operations - Addressing modes - Basic I/O operations – Performance-RISC – CISC.

Unit-II Arithmetic Unit

Addition & subtraction of signed numbers – Binary Multiplication: Booth's algorithm - Bit pair recoding - Carry save addition- Unsigned Integer multiplication & division algorithm- Floating point operations.

Unit-III Processing unit

Control unit – Pipelining - Multiple bus organization - Hardwired control - Micro programmed control - Hazards - Data path - Embedded systems.

Unit-IV Memory System

Basic concepts - Semiconductor RAM memory - Cache memory - Performance considerations - Virtual memory - Secondary storage.

Unit-V I/O Organization and Logic Circuits

Accessing I/O devices - Interrupts - DMA -Buses - Interface circuits - Serial communication links – Logic Circuits – Practical Implementation of Logic Gates.

Outcomes

- Ability to understand digital computers and their fundamental architecture.
- Ability to understand functionalities and organization of processor units and their types.

Teaching and Evaluation guidelines

- 30% on Problem Solving (Higher Order Thinking), and 40% on Structural design (Medium Order Thinking), and 30% on Basic design (Lower Order Thinking).

Text Books

1. C.HAMACHER, Z.VRANESIC, S.ZAKY, "Computer Organization", Fifth Edition, McGraw Hill, 2011
2. W.STALLINGS, "Computer Organization and Architecture", Ninth Edition, Pearson education, 2013.

Reference Books

1. David A. Patterson and John L. Hennessy, "Computer Organization and Design: The Hardware/Software Interface", Fourth edition, Elsevier 2011.

CS205 - OBJECT ORIENTED PROGRAMMING

Credits: 3

OBJECTIVES

- Implementing program for user interface and application development using core java principles.
- Comprehension of java programming constructs, control structures in java.
- Implementing object oriented constructs such as various class hierarchies, interfaces and exception handling.
- Understanding of thread concepts and I/O in java.
- Being able to build dynamic user interfaces using applets and event handling in java.

Unit -I INTRODUCTION TO OOPS

Introduction - need of object oriented programming - principles of object oriented languages - procedural languages Vs. OOPs - applications of OOPs - history of JAVA - java virtual machine - java features - program structures - installation of JDK1.6

Unit -II PROGRAMMING CONSTRUCTS

Variables - primitive data types – identifiers - naming conventions – keywords – literals – operators – binary - unary and ternary – expression - precedence rules and associativity - primitive type conversion and casting - flow of control – arrays- command line arguments.

Unit- III INTERFACE AND EXCEPTIONS

Types of inheritance – interface - interface vs abstract classes - packages-creating packages - access protection -java.lang package - exception handling techniques - user defined exception - exception encapsulation – enrichment – assertions

Unit- IV MULTITHREADING

The main thread - creation of new threads - thread priority – multithreading - using is Alive () and join () – Synchronization - suspending and resuming threads - communication between threads - reading and writing data.

Unit -V APPLETS AND EVENT HANDLING

Applet class- applet structure - an example applet program - applet life cycle - paint() - update() - repaint() – introduction- event delegation model - java.awt.event - sources of events - event listeners - adapter classes - inner classes

Outcomes

- Ability to design the application using java
- Ability to implement object oriented constructs
- Ability to design and deploy the GUI based application

Teaching and evaluation guidelines

- 40% on Design, 40% on Implementation , 20% on Techniques and Definitions

Text Book

1. Y.Daniel Liang “Introduction to Java programming”, Sixth edition , Pearson,2014
2. E.Balaguruswamy “Programming with JAVA”, Fifth edition, TMH,2014.

Reference Book

1. Herbert schildt ,”The complete reference java” , Ninth Edition,TMH,2014

CS207 - DIGITAL COMPUTER FUNDAMENTALS

Credits: 3

Objectives

- To acquire the basic knowledge of digital logic levels and application of knowledge to understand digital electronics circuits.
- To prepare students to perform the analysis and design of various digital electronic circuits.

Unit I Data and Information

Features of Digital Systems, Number Systems Decimal, Binary, Octal, Hexadecimal and their inter conversions, Representation of Data: Signed Magnitude, one's complement and two's complement, Binary Arithmetic, Fixed point representation and Floating point representation of numbers.

Codes: BCD, XS-3, Gray code, hamming code, alphanumeric codes (ASCII, EBCDIC, UNICODE), Error detecting and error correcting codes.

Unit II Boolean algebra

Basic gates (AND, OR, NOT gates), Universal gates (NAND and NOR gates), other gates (XOR, XNOR gates). Boolean identities, De-Morgan Laws.Karnaugh maps: SOP and POS forms, QuineMcClusky method.

Unit III Combinational Circuits

Half adder, full adder, code converters, combinational circuit design, Multiplexers and de-multiplexers, encoders, decoders, Combinational design using mux and demux.

Unit IV Sequential Circuit Design

Flip flops (RS, Clocked RS, D, JK, JK Master Slave, T, Counters, Shift registers and their types, Counters: Synchronous and Asynchronous counters.

Unit V Registers and Memory units

Basic Organization, Memory: ROM, RAM, PROM, EPROM, EEPROM, Secondary Memory: Hard Disk and optical Disk, Cache Memory, I/O devices

Outcomes

- The ability to understand, analyze and design various combinational and sequential circuits.
- The ability to identify and prevent various hazards and timing problems in a digital design.

Teaching and Evaluation guidelines

- 20% on An Application (Higher Order Thinking), 50% on diagrams and practice (Medium Order Thinking), and 40% on Definition and fundamentals (Lower Order Thinking)

Textbooks

1. R. P. Jain “Modern Digital Electronics”, Third Edition, McGraw Hill Education, 2003.
2. M.Morris Mano and Michael D.Ciletti, “Digital Design: International Editions”, Fifth Edition, Pearson Education, 2012.

References:

1. Malvino and Leach, “Digital Principles and Applications”, Seventh Edition, McGrawHill, 2011.
2. Peter Norton, “Introduction to Computers”, Sixth Edition, McGraw Hill, 2008.

CS209 - DATA COMMUNICATION AND NETWORKS

Credits: 3

Objectives

- To understand the fundamental concepts of computer networking
- To familiarize with the basic taxonomy and terminology of the computer networking area
- To gain expertise in design and maintenance of individual networks

Unit – I Basics of Data communication

Introduction-concepts of data communication -computer network-ISO OSI Layered architecture- TCP/Ip protocol stack-comparison of OSI and TCP/IP architectures-UTP- STP-Coaxial and Fiber optic cable – simplex- half-duplex -full-duplex communication- network topologies: Bus-Star- Ring-Token ring network-Hub/Repeaters-bridges-routers-switches.

Unit-II Medium Access Control (MAC) Layer

Medium access: Carrier Sense Multiple Access (CSMA) - Ethernet – Token ring (IEEE 802.5) – Fiber Distributed Data Interface (FDDI) – Wireless Local Area Network (WLAN) – Bridges and Switches.

Unit-III Network Layer

Circuit switching vs. Packet switching/ Packet switched networks. Protocols: Internet Protocol (IP) – Address Resolution Protocol (ARP) – Reverse Address Resolution Protocol (RARP) – Dynamic Host Configuration Protocol (DHCP) – Internet Control Message Protocol (ICMP). Routing algorithms: Routing Information Protocol (RIP) – Open Shortest Path First (OSPF). Subnet creation – Inter-domain routing: BGP – IPv6 – Multicasting.

Unit-IVTransport and Application Layer

UDP– TCP – Adaptive Flow Control – Adaptive Retransmission - Congestion control – Congestion avoidance – Quality of Service (QoS) - Hyper Text Transfer Protocol (HTTP) – Domain Name System (DNS) – (Simple Network Management Protocol (SNMP) – File Transfer Protocol (FTP). E-mail related protocols: Simple Mail Transfer Protocol (SMTP), Multipurpose Internet Mail Extensions (MIME), Post Office Protocol (POP3).

Unit – IV Multiplexing

Multiplexing Techniques: FDM-TDM- STDM- Transmission Media: Classification and Selection of Media- Switching Networks: Packet- Circuit- Massage- Telephone Networks: Packet and Circuit Switching in telephone network.

Outcomes

- Ability to identify the different types of network topologies and protocols
- Ability to design and develop layers of the OSI model and TCP/IP
- Ability to identify different types of network devices and their function

Teaching and Evaluation guidelines

- 30% on Analysis and synthesis (Higher Order Thinking), 30 % on Application (Medium Order Thinking) and 40% on knowledge and comprehension (Lower Order Thinking).

Text Book

1. Behrouz A. Forouzan, Sophia Chung Fegan, "Data Communications and Networking", Fifth Edition, Science Engineering & Math Publications, 2012.

Reference Book

1. William Stallings, "Data and Computer Communications", Eighth Edition, Pearson Education India, 2007.

CS211 - DATA STRUCTURES LABORATORY

Credits: 2

Objectives

- To develop skills to design and analyze simple linear and nonlinear data structures
- To gain knowledge in practical applications of data structures

Exercises:

1. Operations on stacks, queues and linked lists
2. Doubly Linked List and Circular Linked List Implementation
3. Implementation of priority queue
4. Implementation of Sorting
    a. Bubble Sort
    b. Selection Sort
    c. Insertion Sort
    d. Quick Sort
    e. Merge Sort
    f. Heap Sort
5. Implementation of Searching
    a. Linear Search
    b. Binary Search
6. Implementation of Tower of Hanoi
7. Implementation of Binary Trees - Height and Depth of a Binary Tree
8. Implementation of Binary Search Tree
9. Conversion of infix expressions to postfix and evaluation of postfix expressions
10. Polynomial Evaluation
11. Tree Traversal: Pre-Order, Post-Order, In-Order, and Level Order Traversals
12. Graph Representation
    a. Breadth First Search
    b. Depth First Search

Outcomes

- To implement data structures such as stacks, queues, linked lists, trees and graphs
- To have practical knowledge on the application of data structures

CS213 -OBJECT ORIENTED PROGRAMMING LABORATORY

Credits: 2

Objectives:

- To understand the advanced concepts in java programming
- To impact to express computational solutions in Java
- To understand and use the Java SDK environment to create, debug and run simple Java programs.

Exercises:

1. Command line arguments
2. Arrays
3. Classes and objects
4. Functions
5. Method Overloading and Overriding
6. Inheritance
7. Use of interfaces
8. Applets
9. String Handling
10. Exception handling
11. Input-Output File handling
12. Use of JDBC Connectivity

Outcomes:

- Ability to write program in java language
- Ability to test and debug the programs for critical errors
- Ability to analyze and optimize programs.

SEMESTER IV

CS202 - SOFTWARE ENGINEERING

Credits: 3

Objectives

- To understand the importance of software engineering lifecycle models in the development of software
- To understand the various design principles in modeling a software
- To develop a software which adheres to the standard benchmarks
- To undergo the technical knowledge in the process of software testing

Unit-I Software Life Cycle Models

Software Process Introduction – S/W Engineering Paradigm – life cycle models: waterfall, incremental, spiral, winwin spiral, evolutionary, prototyping – Object Oriented life cycle models-system engineering – computer based system – life cycle process – development process.

Unit-II Requirements

Software Requirements: Functional & non-functional – user-system requirement engineering process – feasibility studies – elicitation – validation & management – software prototyping – S/W documentation – Analysis and modeling – Case Tools.

Unit-III Design

Design Concepts and Principles Modular design – design heuristic – Software architecture – data design – architectural design – transform & transaction mapping –Introduction to SCM process – Software Configuration Items.

Unit-IV Testing

Software Testing Taxonomy of Software testing – levels - black box testing – testing boundary conditions – structural testing — regression testing– Software testing strategies – unit testing – integration testing – validation testing – system testing and debugging.

Unit-V Software Project Management

Software cost estimation - Function point models – COCOMO model –Project Scheduling-Delphi method – Software challenges – Software maintenance-Reliability – Reliability and availability models.

Outcomes

- Ability to show the enhance the Software Project Management skills
- Ability to develop functioning s/w which benchmarks to the international standards

Teaching and Evaluation guidelines

- 30 % on Application (Higher Order Thinking), 50% on Methods and Techniques (Medium Order Thinking), and 20% on Tool functions (Lower Order Thinking).

Text Books

1. R.S.Pressman, "Software Engineering - A practitioners approach", Third Edition, McGraw Hill International editions, 1992.
2. Stephen R. Schach, "Object oriented and classical software Engineering", Fourth Edition, McGraw Hill, 2002.

Reference Books

1. Ian Somerville “Software Engineering”, Ninth Edition, Pearson Education, 2010.
2. Hans van Vliet, “Software Engineering: Principles and Practice”, Third edition, John Wiley & Sons, 2008.

CS204 - AUTOMATA AND FORMAL LANGUAGES

Credits: 3

Objectives

- To understand the significance of automata theory in computer science and use the conceptual outcomes and theorems for better algorithms and implementation.

Unit-I Finite Automata (FA)

Deterministic, non-deterministic and equivalence - Equivalence of regular expressions and FA – Conversion from FA to regular expression- Moore and Mealy machines.

Unit-II Regular Languages

Pumping lemma of regular sets - MyhillNerode theorem - Minimization of finite automata - Chomsky hierarchy of languages.

Unit-III Context-Free Language (CFL)

Context-free grammar - Derivation trees - Ambiguity simplification - Normal forms –Pumping lemma for Context Free Language - Applications.

Unit-IV Pushdown Automata (PDA)

Definitions - Context free languages - Construction of PDA for simple CFLs - Linear bounded automata.

Unit-V Turing Machines

Universal Turing Machines - Types of Turing Machines - Techniques - Halting problem - Stack automata - Definitions.

Outcomes

- To be able to understand the limitations of algorithm and design optimally.

Teaching and Evaluation Guidelines

- 40% on Analysis and Application (Higher Order Thinking), and 60% on Conceptual understanding and Definitions (Lower Order Thinking).

Text Books

1. J.E.Hopcroft And J.D.Ullman, "Introduction to Automata Theory", Languages and Computation, Pearson Education, 2001
2. Peter Linz, "An Introduction to Formal Language and Automata", Narosa Publication House, Reprint 2000.

References

1. Harry R.Lewis and Christos H.Papadimitriou, “Elements of the Theory of Computation”, Pearson Education, Canada, 1981.
2. Dexter C.Kozen, “Automata and Computability” Springer Science, 1977.

CS206 - DESIGN AND ANALYSIS OF ALGORITHMS

Credits: 3

Objectives

- Learn the algorithm analysis techniques.
- Become familiar with the different algorithm design techniques and the limitations of Algorithm power.

Unit-I Introduction

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

Unit-II Divide-and-Conquer and Greedy Algorithms

Divide and Conquer: General Method – Binary Search – Finding Maximum and Minimum – Merge Sort – Greedy Algorithms: General Method – Container Loading – Knapsack Problem.

Unit-III Dynamic Programming and Backtracking

Dynamic Programming: General Method– Warshall's and Floyd algorithm – Dijikstra's Algorithm- Optimal Binary Search Trees – Travelling Salesman Problem. Backtracking: General Method – 8 Queens Problem – sum of subsets – graph coloring – Hamiltonian problem – knapsack problem.

Unit-IV Graph Algorithms

Introduction-Representation of Graphs-Graph Traversals-Connected components-Bi-connected components-Articulation point-Spanning trees-Prim's Algorithm, Kruskal's Algorithm

Unit-V Branch and Bound

Branch and Bound: General Methods (FIFO & LC) – 0/1 Knapsack problem – Introduction to NP-Hard and NP-Completeness -Decision Trees-P, NP and NP-Complete Problems– Assignment problem– Traveling Salesman Problem- Approximation Algorithms for NP Hard Problems – Cook's theorem.

Outcomes

- Design algorithms for various computing problems and analyze the time and space complexity of algorithms.
- Critically analyze the different algorithm design techniques for a given problem.
- Modify existing algorithms to improve efficiency.

Teaching and Evaluation Guidelines

- 60% on Analysis and Application (Higher Order Thinking), and 40% on Conceptual understanding and Definitions (Lower Order Thinking).

Text book

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

References

1. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", Third Edition, PHI Learning Private Limited, 2012.
2. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson Education, Reprint 2006.
3. Donald E. Knuth, "The Art of Computer Programming", Volumes 1& 3 Pearson Education, 2009.
4. Steven S. Skiena, "The Algorithm Design Manual", Second Edition, Springer, 2008.

CS208 - MICROPROCESSOR AND MICROCONTROLLERS

Credits 3

Objectives

- To understand the concepts of Architecture of 8085, 8086 microprocessor
- To understand the design aspects of I/O and Memory Interfacing circuits
- To understand the architecture and programming of ARM processor

Unit-I - 8085 Microprocessor

Introduction to 8085 – Microprocessor architecture – Registers - Addressing modes - Instruction set and assembler directives – Assembly language programming – Modular Programming - Linking and Relocation - Stacks – Interrupts and interrupt service routines.

Unit-II - 8086 Microprocessor

8086 Architecture – Basic configurations – Registers –Instruction Set – Addressing Modes – Introduction to Multiprogramming – System Bus Structure – Multiprocessor configurations – Coprocessor.

Unit-III Microcontroller

Architecture of 8051 – Special Function Registers(SFRs) - I/O Pins Ports and Circuits – Instruction set - Addressing modes - Programming 8051 Timers – Interfacing Microcontroller - Serial Port Programming - Interrupts Programming –- External Memory Interface- Stepper Motor.

Unit-IV Introduction to Embedded Systems

Complex systems and microprocessors– Embedded system design process – Instruction sets preliminaries - ARM Processor – CPU: programming input and output supervisor mode, exceptions and traps – Memory system mechanisms – CPU performance.

Unit-V Embedded Computing Platform Design and Optimization

The CPU Bus-Memory devices and systems–Designing with computing platforms – platform level performance analysis - Components for embedded programs-Models of programs Assembly, linking and loading – compilation techniques- Program level performance analysis – Software performance optimization.

Outcomes

- Ability to design and implement programs on 8085 and 8086 microprocessor
- Ability to design I/O circuits and Memory Interfacing circuits
- Ability to design and develop components of ARM processor

Teaching and Evaluation guidelines

- 30% on An Application (Higher Order Thinking), and 50% on Methods and Techniques for interfacing (Medium Order Thinking), and 20% on Assembly level of programming (Lower Order Thinking).

Text Books

1. Yu-Cheng Liu, Glenn A.Gibson, "Microcomputer Systems: The 8086 / 8088 Family - Architecture, Programming and Design", Second Edition, Prentice Hall of India, 2007.
2. Ramesh S. Gaonkar, "Microprocessor – Architecture, Programming and Applications with the 8085", Fifth Edition, Prentice Hall, 2002.
3. Mohamed Ali Mazidi, Janice GillispieMazidi, RolinMcKinlay, "The 8051 Microcontroller and Embedded Systems: Using Assembly and C", 2nd Edition, Pearson Education, 2011.
4. Marilyn Wolf, "Computers as Components - Principles of Embedded Computing System Design", 3rd Edition "Morgan Kaufmann Publisher (An imprint from Elsevier), 2012.

References Books

1. Doughlas V. Hall, "Microprocessors and Interfacing, Programming and Hardware", Tata McGraw-Hill, 2012
2. Jonathan W. Valvano, "Embedded Microcomputer Systems Real Time Interfacing", 3rd Edition, Cengage Learning, 2012
3. David. E. Simon, "An Embedded Software Primer", 1st Edition, Fifth Impression, Addison-Wesley Professional, 2007

CS210 - COMPUTER NETWORKS LABORATORY

Credits: 2

Objectives

- To understand the network topologies
- To understand the socket communication and routing protocols
- To study the behavior of TCP and UDP

EXPERIMENTS

1. Study of different types of Network cables and Practically implement the cross-wired cable and straight through cable using clamping tool
2. Study of basic Network commands and Network configuration commands
3. Client Server Program using TCP sockets
    - — Date and Time Server
    - — Chat application
4. Simulation of Sliding Window Protocol
5. Implementation of routing protocols
    - — OSPF, BGP
6. Programs using raw sockets
    - — Packet capturing and packet filtering
7. Client Server Program using UDP
    - — DNS Implementation
    - — Chat application

Outcomes

- To implement client server based communication using TCP and UDP
- To implement the routing protocols

CS212 - ALGORITHM LABORATORY

Credits: 2

Objectives

- Describe and use major algorithmic techniques divide-and-conquer, dynamic programming, greedy paradigm and graph algorithms.

EXPERIMENTS

1. Implementation of Sorting Algorithms using Divide Conquer Technique
    i) Quick Sort
    ii) Merge Sort
    iii) Heap Sort
2. Implementation of Binary Search Tree Algorithm using Divide Conquer Technique.
3. Implementation of Minimum Spanning Tree using Prim's Algorithm.
4. Implementation of Knapsack Problem using Greedy method.
5. Implementation of 8 Queen's Problem using Backtracking Algorithm.
6. Implementation of All Pair Shortest Path Algorithm using Floyd's Algorithm.
7. Implementation of Travelling Salesman Problem using Dynamic Programming.
8. Implementation of Multistage Graphs using Dynamic Programming.

Outcomes

- Identify the problem given and design the algorithm using various algorithm design techniques.
- Implement various algorithms in a high level language.
- Analyze the performance of various algorithms.

CS214 - MICROPROCESSORS AND MICROCONTROLLERS LABORATORY

Credits: 2

Objectives

- To understand and learn the assembly language programming of various microprocessor architectures.
- To obtain the practical training of interfacing the peripheral devices with the processor.
- To control the components of a microprocessor based system through the use of interrupts.
- To impart a practical knowledge on assembling PC hardware, installation and troubleshooting the Microprocessor and Microcontrollers.

Experiments

Experiment Using 8085 Microprocessor

- Study of 8085 Microprocessor Trainer Kit
- 8 bit Arithmetic Operations (Addition, Subtraction, Multiplication)
- Multiplication of two 8 bit numbers by bit rotation method
- Code Conversions
- 16 bit Arithmetic Operations (Addition, Subtraction. Multiplication)

Experiments Using 8051 Microcontroller

- Arithmetic operations in 8051
- ADC & DAC Interfacing
- Stepper Motor and DC Motor Interface

Outcomes

- Ability to obtain knowledge to do programs in assembly language programming using the
- trainer kits
- Ability to utilize development kits effectively for the real time applications of various
- peripheral devices with the processor
- Ability to design interfacing devices with the microprocessor

SEMESTER V

CS301 - DATABASE MANAGEMENT SYSTEMS

Credits: 3

Objectives

- To understand the different database models and language queries to access databases
- To understand the normalization forms in building an effective database tables
- To protect the data and the database from unauthorized access and manipulation

Unit-I Databases

Need - Concepts - Architecture - Data independence - Data modeling: Entity-relationship model - Weak entity sets - Mapping ER model to Relational model.

Unit-II Concepts

Integrity constraints - Relational algebra - Relational calculus - Tuple relational calculus – Domain relational calculus - Overview of QBE.

Unit-III SQL Queries

Nested queries - Aggregate operators - Null values - Embedded SQL - Database security - Views- Queries on views.

Unit-IV Schema Refinement

Functional dependencies - Normalization - Decomposition - Armstrong's axioms - 3NF- BCNF- 4NF - Multi-valued dependencies.

Unit-V Object-oriented data model

Object identity and pointers - Object definition and manipulation language - Object-oriented databases - Object relational databases - ER Diagramming model for OO relationships – Recent trends.

Outcomes

- Ability to define, manipulate, and control a relational database management system
- Ability to design SQL based Client-Server applications
- Ability to build a database management system that satisfies relational theory

Teaching and Evaluation guidelines

- 50% on Application (Higher Order Thinking), and 30% on Methods and Techniques (Medium Order Thinking), and 20% on Tool functions (Lower Order Thinking).

Text Books

1. A.Silberchatz, F.Korth, S.Sudarshan, "Database System Concepts", Sixth Edition, McGraw Hill, 2010.
2. R.Elmasri, S.B.Navathe, "Fundamentals of Database Systems", Sixth Edition, Pearson Education, 2011.

Reference Book

1. Raghu Ramakrishnan, Johannes Gehrke," Database Management Systems", Third Edition, McGraw-Hill, 2002.

CS303 – OPERATING SYSTEMS

Credits: 3

Objectives

- To know the basics such as process and CPU scheduling algorithms
- To understand the critical regions and dead lock problem
- To understand virtual memory concept, thrashing problem and page replacement algorithms
- To understand the file tables, access algorithms, and spoofing

Unit-I Basic OS Concepts

Overview of Operating Systems, functionalities and characteristics of OS, hardware concepts related to OS, CPU states, I/O channels, Memory hierarchy, microprogramming, process, PCB.

Unit-II Synchronization

Signals, forks and pipes, interrupt processing, Peterson's solution - Bakery algorithm - Hardware-based solutions - Semaphores - Critical regions - Problems of synchronization - Deadlock prevention and recovery - Banker's algorithms.

Unit-III Memory Management

Swapping – Contiguous Memory Allocation – Paging – Segmentation – Segmentation with Paging – Virtual Memory – Demand Paging – Process Creation – Page Replacement – Allocation of Frames – Thrashing.

Unit-IV File Systems

File Concept – Access Methods – Directory Structure – File System Mounting – File Sharing – Protection – File System Structure – File System Implementation – Directory Implementation – Allocation Methods – Free Space Management.

Unit-V I/O Systems

Kernel I/O Subsystem – Disk Structure – Disk Scheduling – Disk Management – Swap Space Management – RAID Structure – Case study on Linux System – Case study on Windows XP.

Outcomes

- Ability to implement CPU scheduling algorithms and resolve problems related to critical regions
- Ability to implement page replacement algorithms like FCFS, LRU, etc.
- Ability to change UNIX access controls to protect the files

Teaching and Evaluation guidelines

20% on an Application (Higher Order Thinking), and 50% on Methods and Algorithms (Medium Order Thinking), and 30% on Definition (Lower Order Thinking).

Text Books

1. A. Silberchatz, P. B. Galvin, "Operating System Concepts", Addison Wesley, Ninth Edition, 2013
2. W. Stallings, "Operating Systems", Prentice Hall, Fifth Edition, 2005

Reference Book

1. A. Tannenbaum, “Modern Operating Systems”, Third Edition, Prentice Hall, 2009.

CS305 – WEB TECHNOLOGY

Credits: 3

Objectives

- To understand the basics of Web Designing using HTML, DHTML, and CSS
- To learn the basics about Client side scripts and Server side scripts

Unit – I Basics of Markup Language

HTML- List, Tables, Images, Forms, Frames, Cascading Style sheets. XML- Document type definition, XML Schemas, Document Object model, Data Formats –XML, JSON, CBOR.

Unit – II Introduction to JavaScript

Java Script -Control statements, Functions, Arrays, Objects, Events, Dynamic HTML with Java Script, AJAX.

Unit – III Web Servers and its Applications

Web servers – IIS (XAMPP, LAMPP) and Tomcat Servers. Java Web Technologies- Servlets, JavaServer Pages, Java Server Faces, Web Technologies in Netbeans, Building a Web Application in Netbeans, JSF Components, Session Tracking, Cookies

Unit – IV Introduction to PHP

PHP- Basics, String Processing and Regular Expressions, Form Processing and Business Logic, Using Cookies, Dynamic Content, Operator Precedence Chart

Unit – V Front End to Database Connectivity

Database Connectivity with Servlets, JSP, PHP. Case Studies- Student information system, Health Management System

Outcomes

- Ability to design and develop client side and server side scripting techniques
- Ability to build and deploy web applications

Teaching and evaluation guidelines

- 40% on Design, 40% on Implementation and Connectivity, 20% on Techniques and Definitions

Text books

1. Paul J. Deitel, Harvey M. Deitel, Abbey Deitel, "Internet & World Wide Web How to Program", Fifth Edition, Deitel series, 2012.
2. Jason Gilmore, "Beginning PHP and MySQL From Novice to Professional", Fourth Edition, Apress Publications, 2010.

Reference Books

1. Robert W. Sebesta, "Programming with World Wide Web", Fourth Edition, Pearson, 2008.
2. David William Barron, "The World of Scripting Languages", Wiley Publications, 2000.

CS307 - DATABASE MANAGEMENT SYSTEM LABORATORY

Credits: 2

Objectives

- To understand basic concepts and terminology related to DB and storage management
- To program simple database applications in MySQL

EXPERIMENTS

Exercises are based on MySQL

1. Applications involving vendor development systems, storage management system, financial management etc.

2. Creation and querying of database tables

3. Design of tables by normalization and dependency analysis

4. Writing application software with host language interface

Outcomes

- Ability to write queries for design and manipulation of database tables using MySQL
- Apply normalization procedures is in the database tables

CS309 - OPERATING SYSTEMS LABORATORY

Credits: 2

Objectives

- To understand and write program in Unix environment
- To design and implement the scheduling algorithms
- To design and implement advanced file system operations

EXPERIMENTS

1. Learning applications of System Calls Using Fork(),Sleep (), Wait ()
2. Implementation of CPU Scheduling Algorithm.
    a. First Come First Serve Scheduling
    b. Shortest Job First Scheduling
    c. Priority Scheduling
    d. Round Robin Scheduling
3. Implementing of Producer-Consumer Problem Using Semaphore
5. Implementing Bakery Algorithm (Critical Section Problem)
6. Implementing Banker's Algorithm (Deadlock Avoidance)
7. Simulate Paging technique of Memory Management
8. Implementation of File Systems
    a. Basic File Operations
    b. File Operation – I
    c. File Operation – II
9. Implementing Page Replacement Algorithm
    a. First in First out (FIFO Page Replacement)
    b. Least Recently Used (LRU Page Replacement)
    c. Optimal Page Replacement

Outcomes

- Familiarize with the shell commands in Unix environment
- Ability to write programs using threads and system APIs

SEMESTER VI

CS302 - PRINCIPLES OF COMPILER DESIGN

Credits: 3

Objectives

- To understand the various stages involved in the design of a compiler
- To have a grasp on the syntactic and semantic structure in the compiler design

Unit-I Introduction

Structure of a compiler - Different phases of a compiler - Finite automata and lexical analysis.

Unit-II Syntactic Specification

Context-free grammars - Derivation and parse trees - Basic parsing techniques.

Unit-III Parsers

LR Parsers: Simple LR, Canonical LR, and LALR - Syntax-directed translation schemes - Various forms of intermediate code.

Unit-IV Symbol Tables and Translation

Array references - procedure calls – declarations - case statements - Symbol tables - Run-time storage administration - Error detection and recovery.

Unit-V Code Optimization and Generation

Loop optimization – Directed Acyclic Graph (DAG) representation of basic blocks - Code generation from DAG's - Compilers: Yet another Compiler Compiler (YACC) - Attributed parser generators.

Outcome

- To design, develop, and implement a compiler for any language.

Teaching and evaluation guidelines

- 50% on Analysis and Applications, 30% on Techniques and Methods, 20% on definitions

Text Books

1. A.V. Aho, Monica, R.Sethi, J.D.Ullman, "Compilers, Principles, Techniques and Tools", Second Edition, Pearson Education/ Addison Wesley, 2007.
2. J.P. Tremblay, P.G. Sorrenson, "The Theory and Practice of Compiler Writing", McGraw Hill, 1985.

Reference Book

1. Andrew W. Appel, “Modern Compiler Implementation in Java”, Second Edition, 2009.

CS304 – UNIX SYSTEM PROGRAMMING

Credits: 3

Objectives

- To understand the fundamental design of the UNIX operating system
- To become fluent with the Application Programing Interfaces(APIs) provided in the Unix environment
- To be able to design and build an application/service over the UNIX operating system

Unit - I Introduction

UNIX Architecture- UNIX system Overview- Unix Standardization- POSIX- BSD- Flavors of UNIX- BSD- Linux- Mac OS- Solaris ISO C Limits- POSIX Limits- Primitive System Data types.

Unit - II UNIX File APIs

General File APIs- File and Record Locking- Directory File APIs- Device File APIs- FIFO file APIs- Symbolic Kink File APIs- General File Class- regfile Class for Regular Files- dirfile Class for Directory File- FIFO file Class- Device File Class- Symbolic Link File Class- File Listing Program.

Unit - III UNIX Processes

The Environment of a UNIX Process- main function- Process termination- command-line arguments- Environment List- Memory Layout of a C Program- Shared Libraries- Memory Allocation- Environment Variables- setjmp and longjmp functions- getrlimit- setrlimit functions- UNIX Kernel Support for Processes.

Unit - IV Process Control and Signals

Process Identifiers- fork- vfork- exit- wait- waitpid- race conditions- exec functions- changing user ids- Interpreter files- systems function- Process Accounting- User Identification- Process Times. Signals: The Unix Kernel Support for Signals- Signal Mask- sigaction- the SIGCHLD signal and waitpid function- the sigsetjmp and siglongjmp functions- Kill- Alarm- Interval Timers.

Unit - V Daemon Processes and Inter Process Communication

Daemon Processes- Daemon Characteristics- Daemon Conventions- client-servier Model. Inter Process Communication- Pipes- pope- pclose- FIFOs- Message Queues- Semaphores.

Outcomes

- Ability to understand and reason out the working of UNIX Systems
- To be able to build an application/service over a UNIX system.

Teaching and Evaluation guidelines

- 20% on An Application (Higher Order Thinking), and 50% on diagrams and architecture (Medium Order Thinking), and 30% on Definition (Lower Order Thinking).

Text Books

1. W. Richard Stevens, "Advanced Programming in the UNIX Environment", Second Edition, Pearson Education/PHI, 2005.
2. Terrance Chan, "Unix System Programming Using C++", Prentice Hall India, 1999.

Reference Books

1. Marc J Rochkind, "Advanced Unix Programming", Second Edition, Pearson Education, 2005.
2. Maurice J Bach, "The design of the UNIX Operating System", First Edition, Pearson Education/PHI, 1987.

CS306 - COMPILER DESIGN LABORATORY

Credits: 2

Objectives

- To provide a deep insight into the various programmatic stages in building a Compiler

EXPERIMENTS

1. Design of lexical analyzers and parsers like recursive-descent parser for a block structured language with typical constructs
2. Exercises using LEX and YACC
3. C/C++ Program on Left Recursion elimination and Left factoring, SLR, and LALR
4. Quadruples/Triples generation using LEX and YACC for a subset of a block structured language

Outcomes

- Complete understanding of the working principles of a compiler
- Technical expertise to design, develop, and implement a compiler for any language

CS308 – UNIX SYSTEM PROGRAMMING LABORATORY

Credits: 2

Objectives

- To understand the Unix environment
- To understand APIs given in the Unix Environment
- To design and implement utilities and applications using the Unix APIs

EXPERIMENTS

1. Applications of File APIs in the Unix system.
2. Use of Regular, directory and symbolic files.
3. Programs using Unix Environment Variables, for setting and getting them.
4. Process commands such as fork and exec.
5. Use of signal and sigaction functions.
6. Creation of Deamon process.
7. Interprocess communication using pipes.
8. Interprocess communication using FIFOs.
9. Interprocess communication using Message queues.
10. Client-server implementation.

Outcomes

- Familiarize with the Unix environment
- Ability to write programs using Unix system APIs

LIST OF ELECTIVES FOR FIFTH SEMESTER

CS501 - GRAPH THEORY

Credits: 3

Objectives

- Understandthe importance of graph theory with respect to computer science applications and application of the basic corollaries and theorems learnt.

Unit-I Introduction

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

Unit-II Trees, Cut-sets, Connectivity

Spanning trees – Fundamental Circuits – Finding All Spanning Trees of a Graph – Cut Sets – Properties of Cut Set – All Cut Sets – Fundamental Circuits and Cut Sets – Connectivity and Separability.

Unit-III Planarity

Combinational and Geometric Graphs – Planar Graphs – Kuratowski's Two Graphs – Different Representation of a Planar Graph-Geometric Dual –Combinatorial Dual.

Unit-IV Matrices, Colouring and Directed graph

Incidence matrix – Circuit Matrix – Path Matrix – Adjacency Matrix – Chromatic Number – Chromatic partitioning – Chromatic polynomial – Matching – Covering – Four Color Problem – Directed Graphs – Types of Directed Graphs – Digraphs and Binary Relations – Euler Graphs – Adjacency Matrix of a Digraph.

Unit-V Graph Theoretic Algorithms

Algorithms: Connectedness and Components – Spanning tree – Set of Fundamental Circuits – Cut Vertices and Separability – Shortest Path Algorithm – Depth First Search – Planarity Testing – Isomorphism.

Outcomes

- To be able to use the concepts learnt in graph theory in designing algorithms for real world applications.

Teaching and Evaluation Guidelines

- 40% on Analysis and Application (Higher Order Thinking), and 60% on Conceptual understanding and Definitions (Lower Order Thinking).

Text Book

1. NarsinghDeo, "Graph Theory: With Application to Engineering and Computer Science", Prentice Hall of India, 2003.

Reference Book

1. R.J. Wilson, "Introduction to Graph Theory", Fourth Edition, Pearson Education, 2003.

CS503 WIRELESS AD HOC NETWORKS

Credits: 3

Objectives

- To understand the challenges of ad hoc networks
- To understand the Network Protocol design for Wireless Ad Hoc Networks
- To be able to correlate with application scenarios.

Unit-I Introduction to Wireless Networks

Evolution of Wireless Networks, Ad Hoc Networks, Heterogeneity in Mobile Devices, Wireless Sensor Networks, Traffic Profiles, Types of Ad Hoc Mobile Communication, Challenges facing Ad Hoc Mobile Networks,

Unit-II Ad Hoc Wireless Media Access Protocols

Synchronous MAC Protocols, Asynchronous MAC Protocols, Hidden Terminal Problem, receiver initiated MAC protocols, sender initiated MAC protocols, MACA, MACA-BI, PAMAS, DBTMA, MARCH.

Unit-IIIAd Hoc Wireless Routing Protocols

Table Driven approaches Destination Sequenced Distance Vector Routing(DSDV),Wireless Routing Protocol(WRP), Cluster Switch Gateway Routing(CSGR), Ad Hoc On Demand Distance Vector Routing(AODV), Dynamic Source Routing(DSR), Temporally Ordered Routing Algorithm(TORA), Location Aided Routing(LAR), Power Aware Routing(PAR), Zone Routing Protocol(ZRP), Source Tree Adaptive Routing(STAR)

Unit-IV Quality of Service in Ad Hoc Wireless Networks

Issues and challenges for providing QoS in Ad Hoc Wireless Networks, QoS models, INSIGNIA, INORA, SWAN. Need for energy management.

Unit-V Wireless Sensor Networks

Applications, Sensor Network Architecture, Data dissemination, flooding, gossiping, rumor routing, sequential assignment routing, directed diffusion, cost-field approach, data gathering direct transmission, power-efficient gathering for sensor information systems, binary scheme, chain-based three level scheme.

Outcomes

- Ability to choose protocols at different layers based upon application needs.
- Ability to visualize an application for a Wireless Ad-hoc network scenario.

Teaching and Evaluation guidelines

- 20% on An Application (Higher Order Thinking), and 50% on diagrams and architecture (Medium Order Thinking), and 30% on Definition (Lower Order Thinking).

Text Book

1. C. Siva Ram Murthy, B.S. Manoj, "Ad Hoc Wireless Networks architectures and Protocols", Pearson, 2004.

Reference Books

1. C K Toh, "Ad Hoc Mobile Wireless Networks Protocols and Systems", Pearson, 2009.
2. Ozan K. Tonguz, Gianluigi Ferrari, "Ad Hoc Wireless Networks – A Communication-Theoretic Perspective", Wiley, 2009.

CS505 PROGRAMMING WITH C++

Credits: 3

Objectives

- To understand the fundamentals of Object Oriented Programming
- To become fluent with the basic programming constructs of C++
- To be able to read and write basic C++ code.

Unit-I Introduction to C++ and Functions

Concepts of Object oriented Programming, encapsulation, data binding, inheritance, programming characteristics of object oriented programming, difference between C and C++. Keywords, constants, cout, cin, directives, data types, type conversions, arrays, strings, returning from functions, reference arguments, overloaded functions, inline functions, default arguments, returning by reference.

Unit-II Objects and Classes

Implementation of class in C++, C++ Objects as physical object, C++ object as data types constructor. Object as function arguments. The default copy constructor, returning object from functions.Structures and classes.Classes objects and memory static class data.Const and classes.

Unit-III Operator Overloading and Inheritance

Arrays as class Member Data : Arrays of object, string, The standard C++ String class. Operator overloading : Overloading unary operations. Overloading binary operators, data conversion, pitfalls of operators overloading and conversion keywords.Explicit and Mutable.Inheritance : Concept of inheritance. Derived class and based class. Derived class constructors, member function, inheritance in the English distance class, class hierarchies, inheritance and graphics shapes, public and private inheritance, aggregation : Classes within classes, inheritance and program development.

Unit-IV Pointers and Virtual Functions

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

Unit-V Streams, files and templates

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, and printer output. Templates and Exceptions: Function templates, Class templates Exceptions. The Standard Template Library: Introduction algorithms, sequence containers, iterators, specialized iterators, associative containers, strong user-defined object, function objects.

Outcomes

- Exploit the Object Oriented Programming constructs in programming.
- Ability to build an application using C++ programming constructs.

Teaching and Evaluation guidelines

- 20% on An Application (Higher Order Thinking), and 50% on diagrams and architecture (Medium Order Thinking), and 30% on Definition (Lower Order Thinking).

Text Book

1. BjarneStroustrup, "C++ Programming Language", Fourth Edition, Addison Wesley, 2013.

Reference Books

1. Stanley Lippman, "Essential C++", Addison Wesley, 1999.
2. Stanley Lippman, JoseeLajoie, Barbara E. Moo"C++ Primer", Fifth Edition, Adison Wesley, 2012.

CS507- ARTIFICIAL INTELLIGENCE

Credits: 3

Objectives

- Study the concepts of Artificial Intelligence
- Learn the methods of solving problems using Artificial Intelligence
- Introduce the concepts of Expert Systems and machine learning.

Unit I Introduction

Introduction - AI problems, foundation of AI and history of AI. Intelligent agents: Agents and Environments, the concept of rationality, the nature of environments, structure of agents, problem solving agents, problem formulation.

Unit II Search Strategies

Uniformed search strategies, Search with partial information (Heuristic/ Informed search) Greedy best first search- A* search. Local Search Algorithm – Hill climbing, Simulated Annealing search.

Unit IIIGame Search

Minimax algorithm, optimal decisions in multiplayer games, Alpha-Beta pruning. First order logic -Inference in first order logic – forward & backward chaining – Language and Tools.

Unit IV Planning

Basic Plan generation systems - STRIPS – POP - Dealing with uncertainty. Natural Language Processing: Introduction - Understanding - Perception - Machine learning.

Unit V Expert Systems

Expert Systems – Architecture, Roles of expert systems- Knowledge Acquisition. Typical expert Systems – MYCIN, DART, XOON.

Outcomes

- Understand various search methods
- Understand various Game Playing techniques
- Use various knowledge representation
- Technical knowledge of Expert Systems, NLP, and Machine Learning techniques
- Acquaintance with programming languages such as LISP and PROLOG

Teaching and Evaluation guidelines

- 40% on Implementation of AI (Higher order thinking), 30% on Language Tools (Medium order thinking) and 30% on Theory(Lower order thinking)**.**

Text Books

1. Stuart Russell and Norvig “AI – A Modern Approach”, Third Edition, Pearson Education 2009.
2. Dan W. Patterson, “Introduction to AI and ES”, Third Edition, Pearson Education, 2007.

Reference Books

1. G. Luger, W.A. Stubblefield, "Artificial Intelligence", Third Edition, Addison-Wesley Longman, 1998.
2. N.J. Nilsson, "Principles of Artificial Intelligence", First Edition, Narosa Publishing House, 1980.
3. Peter Jackson, “Introduction to Expert Systems”, Third Edition, Pearson Education, 2007.

CS509 COMPUTER GRAPHICS AND VISION

Credits: 3

Objectives

- To understand basic algorithms for computer graphics
- To understand various applications of graphics

Unit-I 2D Primitives
Output primitives: Line - Circle and Ellipse drawing algorithms - Attributes - Two dimensional Geometric transformations - Two dimensional viewing - Line - Polygon - Curve and Text clipping algorithms.

Unit-II 3D Concepts
Parallel and Perspective projections: Three dimensional object representation – Polygons, Curved lines, Splines, Quadric Surfaces- Visualization of data sets - 3D transformations - Viewing -Visible surface identification - Hidden surface and line elimination.

Unit-III Graphics Programming
Color Models: RGB – YIQ – CMY - HSV – Animations – General Computer Animation, Raster and Key frame - Graphics programming using OPENGL – Basic graphics primitives – Drawing three dimensional objects and scenes.

Unit-IV Rendering
Introduction to Shading models – Flat and Smooth shading – Adding texture to faces – Adding shadows of objects - Creating shaded objects – Rendering texture – Drawing Shadows- realistic image synthesis techniques, Textures and image-based rendering; Video games and Computer animations.

Unit-V Fractals
Fractals and Self similarity – Peano curves – Creating image by iterated functions – Mandelbrot sets – Julia Sets – Random Fractals – Overview of Ray Tracing – Intersecting rays with other primitives – Adding Surface texture – Reflections and Transparency – Boolean operations on Objects.

Outcomes

- Ability to create software tools for Games and Animation
- Knowledge of Computer Graphics Techniques

Teaching and Evaluation guidelines

- 40% on Application (Higher Order Thinking), and 40% on Methods and Techniques (Medium Order Thinking), and 20% on Tool functions (Lower Order Thinking).

Text Books

1. Donald Hearn, Pauline Baker, "Computer Graphics – C Version", Second edition, Pearson Education, 2004.
2. F.S. Hill," Computer Graphics using OPENGL", Second edition, Pearson Education, 2003.

Reference Book

1. James D. Foley, Andries Van Dam, Steven K. Feiner, John F. Hughes, "Computer Graphics- Principles and practice", Second Edition in C, Pearson Education, 2007.

LIST OF ELECTIVES FROM SIXTH SEMESTER

CS502 - OBJECT ORIENTED ANALYSIS AND DESIGN

Credits: 3

Objectives

- To understand basic Object Oriented analysis and design skills through an elaborate case study
- To understand the UML design diagrams
- To understand design based on requirements
- To impart of converting design to code
- To apply the appropriate design patterns

Unit- I Introduction & Modeling
OOAD Basics Introduction – Overview of object oriented system development – Object basics- The Unified Process – Modeling concepts – Modeling as a design technique – Analysis and modeling – UML diagrams – Use case Modeling – Class modeling – State modeling – Interaction Modeling.

Unit -II Requirements
Requirements & More Modeling Object Constraint Language - Inception – Evolutionary Requirements– Domain Models –System Sequence Diagrams – Operation Contracts.

Unit –III Design
Design and Principles Of Design Requirements to Design –Design Patterns – Logical Architecture – Package diagram – Design patterns: Model- View- Control pattern – Detailed design – Object design with GRASP pattern – Detailed class diagram with Visibility.

Unit -IV Patterns
More Patterns – Analysis update – Objects with responsibilities – Applying design patterns – Architectural Analysis – Logical Architecture Refinement – Package Design – Persistence framework with patterns.

Unit- V Coding and Testing
Mapping designs to code – Test Driven development and refactoring – UML Tools and UML as blueprint. Testing - Issues in Object Oriented Testing – Class Testing – Object Oriented Integration Testing – GUI Testing – Object Oriented System Testing.

Outcomes

- Ability to demonstrate a thorough knowledge of one object oriented method down to detailed design.
- Ability to implement a detailed object oriented design in an object oriented language.
- Ability to Critically evaluate issues of patterns and structure in object oriented development

Teaching and Evaluation guidelines

- 30 % on Application (Higher Order Thinking), 40% on Methods and Techniques (Medium Order Thinking), and 30% on Tool functions (Lower Order Thinking).

Text Books

1. Michael Blaha and James Rumbaugh, "Object-oriented modeling and design with UML", Second Edition, Prentice-Hall of India, 2005.
2. Craig Larman, "Applying UML and Patterns – An introduction to Object-Oriented Analysis and Design and Iterative Development", Third Edition, Pearson Education, 2008.

Reference Books

1. Ali Bahrami, "Object Oriented Systems Development", International edition, McGraw-Hill, 1999.
2. Booch, Grady, "Object Oriented Analysis and Design", Second Edition, Pearson Education 2000.
3. Martin Fowler, "UML Distilled - A Brief Guide to the Standard Object Modeling Language", Third Edition, Pearson Education, 2004.
4. Lunn, Ken, "Software development with UML", First Edition, Palgrave Macmillan, 2002.

CS504 - SOFTWARE TESTING

Credits: 3

Objectives

- To understand the software testing principles and Software Quality
- To understand various software testing methods
- To develop the Software which adheres to the standard benchmarks

Unit-I Introduction

Testing as an Engineering Activity –Role of Process in Software Quality – Testing as a Process – Basic Definitions – Software Testing Principles – The Tester's Role in a Software Development Organization – Origins of Defects – Developer/Tester Support for Developing a Defect Repository.

Unit- II Test Case Design

Test Case Design Strategies – Using Black Box Approach to Test Case Design Random Testing - Equivalence Class Partitioning state-based testing– cause effect graphing – error guessing - compatibility testing – user documentation testing – domain testing Using White–Box Approach to Test design

Unit- III Levels of Testing

The Need for Levels of Testing – Unit Test – Unit Test -The Test Harness – Integration tests — scenario testing – defect bash elimination -System Testing – types of system testing - – testing OO systems – usability and accessibility testing

Unit-IV Test Management

Test Planning – Test Plan Components – Test Plan Attachments – Locating Test Items – test management – test process - Reporting Test Results– Introducing the test specialist – Skills needed by a test specialist – Building a Testing Group.

Unit-V Controlling and Monitoring

Software test automation – requirements for a test tool – challenges in automation - Test metrics and measurements –project, progress and productivity metrics – Status Meetings – Reports and Control Issues – Criteria for Test Completion – SCM – evaluating software quality

Outcomes

- Ability to develop the test generation from the requirements
- Ability to develop the Software Testing Tools for commercial applications

Teaching and Evaluation guidelines:

- 50% on Methods and Techniques (Medium Order Thinking), 30 % on Application (Higher Order Thinking), and 20% on Tool functions (Lower Order Thinking).

Text Books:

1. Boris Beizer, "Software Testing Techniques", Second Edition, Dreamtech, 2003
2. Elfriede Dustin, "Effective Software Testing", First Edition, Pearson Education, 2003.

Reference Books:

1. AdityaP.Mathur, "Foundations of Software Testing", Second Edition, Pearson Education,2008.
2. RenuRajani, Pradeep Oak, "Software Testing – Effective Methods, Tools and Techniques", Tata McGraw Hill, 2004

CS506 – ADVANCED COMPUTER ARCHITECTURE

Credits: 3

Objectives

- To understand the fundamental knowledge in architecture design, pipelined processor design, and their impacts on performance
- To understand the fundamental knowledge in memory hierarchy
- To assess the communication and the computing possibilities of parallel system architecture

Unit-I Parallel computer models

Flynn's classification - Parallel and vector computers - System, implicit and explicit parallelism - Multi-vector and SIMD computers - PRAM and VLSI models.

Unit-II Program and network properties

Data and control dependence - Hardware and software parallelism - Partitioning and scheduling - Interconnection architectures.

Unit-III Performance laws

Metrics and measures - Amdahl's law for fixed workload - Bounded speed-up model - Scalability analysis and approaches.

Unit-IV Symbolic Processors

CISC and RISC architectures - Super scalar processors and their features - Memory hierarchy. Linear Pipeline Processors - Basic considerations - Basics of non-linear pipeline processors – Instruction pipeline design – Arithmetic pipeline design – Superscalar and Super pipeline design.

Unit-V Parallel Computing

Concepts & terminology- Parallel computer memory architecture- Parallel programming models-designing parallel programs-parallel algorithms.

Outcomes

- Ability to understand parallelism both in terms of a single processor and multiple processors
- Ability to understand parallel hardware constructs

Teaching and Evaluation guidelines

- 30% on An Application (Higher Order Thinking), and 50% on diagrams and architecture (Medium Order Thinking), and 20% on Definition (Lower Order Thinking).

Text Book

1. K. Hwang, "Advanced Computer Architecture, Parallelism, Scalability, Programmability", First Edition, McGraw Hill, New York, 2010.

Reference Book

1. D. A. Patterson and J. L. Hennessy, "Computer Architecture: A Quantitative Approach", Fourth Edition, Harcourt Asia, Morgan Kaufmann, 1999

CS508 - MOBILE COMPUTING

Credits: 3

Objectives

- To understand the networking concept of mobile networks.
- To learn the basics of wireless voice and data communication technologies.
- To study the working principles of wireless LAN and its standards
- To build skills in working with wireless application protocols to develop mobile applications.

Unit-I Mobile Networks

Cellular Wireless Networks – GSM – Architecture – Protocols – Connection Establishment – Frequency Allocation – Routing – Mobility Management – Security –GPRS.

Unit-II Wireless Networks

Wireless LANs and PANs – IEEE 802.11 Standard – Architecture – Services –Network – HyperLAN–BlueTooth-Wi-Fi–WiMAX.

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Unit-III Routing

Mobile IP – DHCP – Adhoc- Proactive and Reactive Routing Protocols – Multicast Routing.

Unit-IV Transport and Application Layers

Mobile TCP– WAP – Architecture – WWW Programming Model– WDP – WTLS – WTP – WSP – WAE – WTA Architecture – WML – WMLScripts.

Unit-V Pervasive Computing

Pervasive computing infrastructure-applications- Device Technology – Hardware- Human-machine Interfaces- Biometrics-Operating systems– Device Connectivity: Protocols- Security-Device Management- Pervasive Web Application architecture-Access from PCs andPDAs-AccessviaWAP.

Outcomes

- Apply the fundamental design paradigms and technologies to mobile computing applications.
- Develop consumer and enterprise mobile applications using representative mobile devices and platforms using modern development methodologies.
- Design effective mobile interfaces using human computer interaction principles

Teaching and Evaluation guidelines

- 50% on Application (Higher Order Thinking), and 30% on Methods and Techniques (Medium Order Thinking), and 20% on Tool functions (Lower Order Thinking).

Text Books

1. Jochen Schiller, "Mobile Communications", Second Edition, PHI, 2003.
2. JochenBurkhardt, "Pervasive Computing: Technology and Architecture of Mobile Internet Applications", Third Edition, Addison-Wesley Professional, 2007.

Reference Books

1. Frank Adelstein, Sandeep KS Gupta, Golden Richard, "Fundamentals of Mobile and Pervasive Computing", First Edition, McGraw-Hill 2005
2. DebashisSaha, "Networking Infrastructure for Pervasive Computing: Enabling Technologies", First edition, Kluwer Academic Publisher, Springer; 2002
3. Agrawal and Zeng, "Introduction to Wireless and Mobile Systems", First edition, Brooks/ Cole (Thomson Learning), 2002
4. UweHansmann, LotharMerk, Martin S. Nicklons and Thomas Stober, "Principles of Mobile Computing", Second Edition, Springer, New York, 2003.

CS510 - DISTRIBUTED SYSTEMS

Credits: 3

Objectives

- To impart advanced technologies for developing distributed systems
- To understand the development of Microkernel, Distributed algorithms, Time stamping in distributed systems
- To understand the assumptions and limitations of the underlying distributed systems

Unit-I Distributed Systems

Introduction: Goal - Advantages over centralized systems - Organization of multiprocessor systems - Hardware/software concepts - Review of layered protocols.

Unit-II Client/Server Model

Microkernel - RMI - Distributed algorithms - Time stamping - Circulating tokens - Diffusing computations.

Unit-III Mutual Exclusion Algorithm

Election algorithm - Detecting loss of tokens and regeneration - Distributed deadlock detection algorithms - Distributed termination algorithms.

Unit-IV File Replication

Semantics of file sharing - Remote access methods - Fault tolerant issues - Introduction to distributed operating systems.

Unit-V Introduction to Distributed Operating Systems

Motivations - Management systems - Levels of distribution transparency - Architecture - Introduction to concurrency control.

Outcomes

- Ability to analyze, design, build, and deploy distributed computer systems using a variety of current application technologies and architecture .
- Ability to promote the utilization of industry standard distributed computing technologies such as J2EE and .NET.

Teaching and Evaluation guidelines:

- 30% on Problems and Analysis (Higher Order Thinking), and 30% on Application (Medium Order Thinking), and 40% on Conceptual Understanding (Lower Order Thinking).

Text Books

1. George Coulouris and Jean Dollimore, and Tim Kindberg, "Distributed System Concepts and Design", Fifth Edition, Pearson Education, 2013
2. A. S. Tanenbaum, "Distributed Operating Systems", Low Price Edition, Pearson Education, 2009.

Reference Book

1. S. Ceri and G.Pelagatti, "Distributed Databases - Principles and Systems", International student edition, McGraw Hill, 1985.

LIST OF ELECTIVES FOR SEVENTH SEMESTER

CS511 – INTERNET OF THINGS

Credits: 3

Objectives

- To have a grasp on Data and Knowledge Management and use of Devices in IoT Technology
- To understand State of the Art – IoT Architecture
- To understand real world IoT Design constraints
- To study the security and privacy issues in IoT

Unit-I Introduction

Internet & Web Basics - IoT - The Vision, Applications, IoT Standardization – IoT Components – Sensors – Actuators – Intelligent Analytics – Intelligent Analysis

Unit-II IoT Architecture

Traditional TCP/IP protocol stack and IoT Protocol Stack – Data Formats – Representational State Transfer (REST) and activity streams – Business Aspects and models

Unit-III IoT Communication

Fundamentals- Devices and gateways, Local and wide area networking, Data management, Communication protocols – Constrained Application Protocol (CoAP), Web Socket, PUSH - Everything as a Service (XaaS), Knowledge Management.

Unit-IV IoT Implementation and Security

Introduction to Raspberry Pi, Arduino Boards – Operating System (Micro Python) – Python Programming language – Multiple security levels – Security and Privacy Issues in IoT – Privacy preserving algorithms in IoT – Complexity Analysis of the cryptographic algorithms in IoT.

Unit- V Case Study and implications

Real-World Design Constraints- Technical Design constraints - Data representation and visualization, Interaction and remote control. Case Studies: IoT in Disaster Management System, &IoT in Agriculture – Societal Implications.

Outcomes

- Working ability with Raspberry Pi
- Demonstration of real world IoT application
- To analyze the security constraints in IoT applications

Teaching and evaluation guidelines

- 40% on Design, 40% on Comparisons and Statements, 20% on Techniques and Definitions

Textbook

1. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, StamatisKarnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", First Edition, Academic Press, 2014.

Reference Books

1. Vijay Madisetti and ArshdeepBahga, "Internet of Things (A Hands-on-Approach)", First Edition, VPT, 2014.
2. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", First Edition, Apress Publications, 2013

CS513 MOBILE APPLICATION DEVELOPMENT

Credits: 3

Objectives

- Understand system requirements for mobile applications.
- Generate suitable design using specific mobile development frameworks.
- Generate mobile application design.
- Implement the design using specific mobile development frameworks.
- Deploy the mobile applications in marketplace for distribution.

Unit-I Introduction
Introduction to mobile applications, embedded systems, Market and business drivers for mobile applications, Publishing and delivery of mobile applications, Requirements gathering and validation for mobile applications.

Unit-II Basic Design
Introduction to embedded systems design, Embedded OS, Design constraints for mobile applications, both hardware and software related, Architecting mobile applications, User interfaces for mobile applications, touch events and gestures, Achieving quality constraints, performance, usability, security, availability and modifiability.

Unit-III Advanced Design
Designing applications with multimedia and web access capabilities, Integration with GPS and social media networking applications, Accessing applications hosted in a cloud computing environment, Design patterns for mobile applications.

Unit-IV Technology I - Android Platform
Introduction to establishing the development environment, Android architecture, Activities and views, Interacting with UI, Persisting data using SQLite, Packaging and deployment, Interaction with server side applications, Using Google Maps, GPS and Wi-Fi, Integration with social media applications.

Unit V Technology II - IOS Platform
Introduction to Objective C,iOSfeatures,UI implementation, Touch frameworks, Data persistence using Core Data and SQLite, Location aware applications using Core Location and Map Kit, Integrating calendar and address book with social media application, Using
Wi-Fi,iPhone market place.

Outcomes

- Upon completion of the course, the students will be able to
- Describe the requirements for mobile applications.
- Develop design for mobile applications for specific requirements.
- Implement the design using Objective C and iOS.
- Deploy mobile applications in Android and iPhone marketplace for distribution

Teaching and Evaluation guidelines

- 50% on Practical (Higher Level Thinking), 30% on Analysis(Medium Level Thinking), 20% on Techniques and Definitions(Lower Level Thinking).

Text Books

1. Jeff McWherter and Scott Gowell, "Professional Mobile Application Development", Wrox, 2012.
2. Charlie Collins, Michael Galpin and Matthias Kappler, "Android in Practice", DreamTech, 2012.

References Books

1. James Dovey and Ash Furrow, "Beginning Objective C", Apress, 2012
2. David Mark, Jack Nutting, Jeff LaMarche and Frederic Olsson, "Beginning iOS 6 Development: Exploring the iOS SDK", Apress, 2013.

CS515 NETWORK PROGRAMMING

Credits: 3

Objectives

- To understand the fundamental design of the Network Protocol Stack.
- To become fluent with the Application Programming Interfaces(APIs) provided in the UNIX environment for networking.
- To be able to design and build network application/service.

Unit - I Introduction

Simple daytime client and server, transport layer service: TCP, UDP and SCTP, TCP connection establishment and termination, SCTP association establishment and termination, Port numbers, concurrent servers.

Unit - II Elementary TCP Sockets

Socket Address Structures, Value-result arguments, Byte Ordering Functions, Byte manipulation functions, socket, connect, bind, listen, accept, fork and exec, close function. TCP echo server and TCP echo client. I/O multiplexing select and poll functions, getsockopt and setsockopt functions.

Unit - III Elementary UDP and SCTP Sockets

UDP echo server and UDP echo client, recvfrom and sendto functions, lost datagrams, connect function with UDP, lack of flow control with UDP, Introduction to SCTP, functions sctp_bindx, sctp_connectx, sctp_getpaddrs, sctp_freepaddrs, sctp_getladdrs, sctp_sendmsg, sctp_recvmsg, sctp_opt_info, sctp_peeloff, shutdown, sctp client server example.

Unit - IV Unix Domain Protocols

Unix Domain socket address structure, socketpair function, Unix domain stream client/server, unix domain datagram client/server, non-blocking reads and writes, nonblocking connect, nonblocking accept.

Unit - V Daemon Processes, Name and Address Conversions

Domain Name System, gethostbyname, gethostbyaddr, getservbyname, getservebyport, getaddrinfo, IPV4 and IPV6 Interoperability, Daemon processes, syslogd and inetd.

Outcomes

- Ability to understand and reason out the working of socket APIs and their options.
- To be able to build an application/service over a Unix Network interface.

Teaching and Evaluation guidelines

- 20% on An Application (Higher Order Thinking), and 50% on diagrams and architecture (Medium Order Thinking), and 30% on Definition (Lower Order Thinking).

Text Book

1. W. Richard Stevens, Bill Fenner, Andrew M. Rudoff "Unix Network Programming", Third Edition, Pearson Education/PHI, 2005.

Reference Books

1. Barry Nance, "Network Programming in C", PHI 2002
2. Bob Quinn, Dave Shute, "Windows Socket Network Programming", Pearson 2003

CS517 PYTHON PROGRAMMING

Credits: 3

Objectives

- To develop a basic understanding of the Python programming language
- To solve problems requiring the writing of well-documented programs in the Python language
- To learn how to design object-oriented programs with Python classes.

Unit-I Basics of Python Programming

The way of the program – Variables, expressions and statements – Functions – Case Study: interface design – Conditionals and recursion – Fruitful functions – Iteration – Strings - Case Study: word play

Unit-IILists

Lists: Traversing a List, List operations, List Slices, List Methods, Lists and Strings, List Arguments - Dictionaries– Reverse Lookup, Global Variables, Long integers,Tuples: Tuples assignment, Lists and tuples, Dictionaries and tuples, Comparing Tuples– Case Study: data structure selection

Unit-IIIFiles

Files: Reading and Writing, Format operator, Filenames and path, Databases,Pickling, Pipes, Writing Modules –Classes and Objects – Classes and functions – Classes and methods – Inheritance: Class attributes, Class diagrams, Data encapsulation.

Unit-IVSerializing Python Objects

Serializing Python Objects: Saving data to and Loading data from a Pickle file, Pickling without a file, Debugging Pickle files – XML: Parsing XML, Searching for Nodes within an XML Document, Generating XML, Parsing broken XML– HTTP Web Services: Features.

Unit-VPackaging Python Libraries

Packaging Python Libraries: Directory Structure, Classifying your package – Special Method Names: Basics, Classes that act like Iterators, functions, sets, dictionaries- Computed attributes, Classes that can be compared, serialized.

Outcomes

- Master the principles of object-oriented programming and the interplay of algorithms and data structures in well-written modular code;
- Solve problems requiring the writing of well-documented programs in the Python language, including use of the logical constructs of that language;
- Demonstrate significant experience with the Python program development environment.

Teaching and Evaluation Guidelines

- 60% on conceptual understanding (Low Level Thinking) and 40 % on analysis (Medium/ High Level Thinking).

Text Books

2. Allen B. Downey, "Think Python – How to Think Like a Computer Scientist", Second Edition, Green Tea Press, 2015. (http://greenteapress.com/thinkpython2/thinkpython2.pdf)
3. Mark Pilgrim, "Dive Into Python",2004. (http://www.diveintopython.net)

Reference Book

1. AnnapoornimaKoppad, "Introduction to Python Programming", Sixth Edition, 2016.

CS519 DESIGN & ANALYSIS OF PARALLEL ALGORITHM

Credits: 3

Objectives

- Understand the scope, design and model of parallelism
- Know the parallel computing architecture.
- Know the Characteristics, model and design of parallel algorithms.
- Analytical modeling and performance of parallel programs.

Unit-I Introduction

Introduction to parallel Computer – Need of parallel Computing – Flynn's taxonomy: SISD, SIMD, MISD, MIMD – SM Shared Memory Model/PRAM model – PRAM Computation step – PRAM Memory Access method – EREW PRAM PREFIX Computation works– Interconnection Network: Linear Array, Two dimensional array, Tree connection, Perfect Shuffle Connection, Cube Connection.

Unit-II Sorting

Introduction – Quick Sort – Network for sorting – Sorting in a Linear Array – Sorting on CREW model – Sorting on CRCW – Sorting on mesh.

Unit-III Matrix Operations

Introduction – Transpose: Mesh Transpose, Shuffle Transpose, EREW Transpose – Matrix multiplication: Mesh multiplication, Cube Multiplication.

Unit-IV Numerical problems

Introduction – Solving system of Linear equations: SIMD Gauss Jordan Methods – Roots of Non Linear Equations: SIMD Algorithm (Bisection method), MIMD Algorithm (Newton Method).

Unit-V Graph Problems

Introduction – Computing the Connectivity Matrix – Finding Connected Components – All Pair Shortest path.

Outcomes

- Recall fundamental concepts of parallelism.
- Design and analyze the parallel algorithms for real world problems and implement them on available parallel computer systems.
- Compare and contrast various parallel algorithms using shared memory and MPI.

Teaching and Evaluation guidelines

- 40% on Design and Analysis (Higher Level Thinking), 40% on Comparisons and Statements (Medium Level Thinking), 20% on Techniques and Definitions (Lower order Thinking)

Textbook

1. S.G.Akl, "The Design and Analysis of Parallel Algorithms", Prentice Hall of India, 1989.

Reference Book

1. S. Lakshmivarahan and S.K.Dhall, "Analysis and Design of Parallel Algorithms – Arithmetic and Matrix Problems", McGraw Hill, 1990.

CS521 FUNCTIONAL PROGRAMMING LANGUAGES

Credits: 3

Objectives

- To understand the fundamental design of the Functional Programming Language (FPL).
- Generate suitable design using specific functional paradigm.
- To be able to design and build an application/service over the FPL.

Unit-I Preliminary Concepts

Introduction to Programming languages, Programming domains, Language Evaluation Criteria, influences on Language design, Language categories, Programming Paradigms, Imperative, Object Oriented, functional Programming, and Logic Programming, Programming Language Implementation, Compilation and Virtual Machines, programming environments.

Unit-II Fundamentals of Functional Programming Languages (FPL)

Introduction to Functional Programming; Functional programs; Introduction to Scheme, Order of evaluation, Recursion; Higher-order functions; Anonymous functions; Curryfication; Definitions; Lists; Recursion on flat and nested lists; Correctness proofs; Typed languages, Introduction to Lambda-calculus and LISP, Search strategies in LISP.

Unit-III Erlang

Introduction to Erlang, Basic Syntax, Erlang Data types, Bit Syntax, Functions & Modules, Pattern Matching and Guards, Recursion, Higher Order Functions, Records, Handling Errors, concurrent programming in Erlang. Introduction to Erlang Web servers.

Unit-IV Haskell

Introduction to Haskell, tuples, polymorphism, higher order functions, strings &characters, lazy evaluation, Data-Type declarations, Defining functions over datatypes using patterns,Enumerations,The Shape Datatype of the text, Program Manipulation, Comparing the functional paradigm, Actions and Haskell, Monads, Simple Graphics.

Unit-V Golang

Introduction to Golang, Syntax, Interfaces and Embedding, Array and methods, Slices & Maps, Concurrency pattern, Standard library, Testing method, Debugging, Channels and Race Conditions, Error Handling, Packing & Exporting, Project structure, Pointers.

Outcomes

- Ability to demonstrate a thorough knowledge of various Functional paradigms.
- Ability to implement a detailed Functional programming design in a Functional programming language.
- Ability to critically evaluate issues of patterns and structure in Functional Programming language.

Teaching and Evaluation guidelines

- 40% on Analysis and Programming, 40% on Comparisons and Statements, 20% on Methods and Definitions

Text Books

1. FethiA.Rabhi and Guy Lapalme, "Algorithms - A Functional Programming Approach", Pearson Education.
2. Joe Armstrong, "Programming Erlang. Software for a Concurrent World", O'Reilly publication, 2009.
3. Richard Bird, "Introduction to Functional Programming using Haskell", Prentice Hall; Second Edition, 1998.
4. Alan A. A. Donovan and Brian W. Kernighan, "The Go Programming Language", Addison Wesley, 2015.

Reference Books

1. Robert .W. Sebesta, "Concepts of Programming Languages", Eighth, Pearson Education, 2008.
2. Patric Henry Winston and Paul Horn, "LISP", Pearson Education.

CS523COMPUTER AND NETWORK SECURITY

Credits: 3

Objectives

- To understand the network & system security issues, attacks, and mechanisms
- To comprehend and apply authentication services and authentication algorithms
- To comprehend and apply network layer security protocols, Transport layer security protocols, and Web security protocols.

Unit –I Computer Security Technology and Principles

Overview of Computer Security services – Distributed Denial of Service attacks - Security Issues in TCP/IP suite - Access Control and Cryptographic Tools - Malicious Software - Intrusion Detection - Intrusion Prevention.

Unit-II Symmetric and Asymmetric Key algorithms

Block Ciphers - Fiestal Structure, Data Encryption Standard, Advanced Encryption Standard - Diffie Hellman Key Exchange – RSA – Digital Signatures.

Unit-III Network Security

Internet Protocol Standards - Message Authentication Codes – Hash Functions - IP Security-AH and ESP - SSL Certificates, Authentication protocols – Kerberos – Wireless Threats and Security – WEP, WPA, WPA2.

Unit-IV Software Security and Trusted Systems

Buffer Overflow, Web Security- HTTPS, Trusted Computing and Multi Level Security – Operating System Security.

Unit-V Management Security

Security Policies – Security Auditing – Legal and ethical aspects – Critical Infrastructure security.

Outcomes

- Ability to determine appropriate mechanisms for protecting the network.
- Ability to design a security solution for a given application/system

Teaching and evaluation guidelines

- 40% on Problems, 40 % on System Design, 20% on Techniques and Definitions

Text Books

1. W. Stallings, “Cryptography and Network Security: Principles and Practice”, 5/E, Prentice Hall, 2013

Reference Books

1. AtulKahate, “Cryptography and Network Security”, Tata McGraw-Hill, 2003
2. Aaron E. Earle, “Wireless Security Handbook”, Auerbach publications, Taylor & Francis Group, 2006.
3. Selected SCI/SCIE Journal Papers

CS525 KNOWLEDGE ENGINEERING

Credits: 3

Objectives

- To display the implicit knowledge about a subject in a form that programmers can encode in algorithms and data structures
- To analyze knowledge about the real world and map it to a computable form.
- To know the existing technology for implementation.

Unit-I Logic

Historical Background -Representing Knowledge in Logic - Varieties of Logic -Names, Types, and Measures- Unity Amidst Diversity –Ontology:Ontological Categories -Top-Level Categories-Describing Physical Entities-Defining abstractions- Sets, Collections, Types, and Categories- Space and Time.

Unit-II Knowledge Representations

Knowledge Engineering - Representing Structure in Frames-Rules and Data-Object-Oriented Systems -Natural Language Semantics - Levels of Representation

Unit-III Processes

Times, Events, and Situations - Classification of Processes- Procedures, Processes, and Histories - Concurrent Processes - Computation - Constraint Satisfaction

Unit-IV Contexts and Knowledge Soup

Purposes, Contexts, and Agents:Purpose- Syntax of Contexts- Semantics of Contexts – First-Order Reasoning in Contexts- Modal Reasoning in Contexts- Encapsulating Objects in Contexts-Agents -Knowledge Soup:Vagueness, Uncertainty, Randomness, and Ignorance -Limitations of Logic –Non-monotonic Logic-Theories, Models, and the World-Semiotics

Unit-V Knowledge Acquisition and Sharing

Sharing Ontologies -Conceptual Schema - Accommodating Multiple Paradigms- Relating Different Knowledge Representations -Language Patterns - Tools for Knowledge Acquisition **Case studies**: Hotel Reservation System- Library Database- ACE Vocabulary -Translating ACE to Logic

Outcomes

- Application of logic and ontology to the task of constructing computable models for some domain
- Analyzing a problem, identifying the kinds of things that have to be represented, and mapping them to a computable form.
- Ability to implement examples in the learned technology.

Teaching and Evaluation Guidelines

- 50% on conceptual understanding (Higher Level Thinking) and 20 % on analysis (Medium/ High Level Thinking) and 30% on implementation.

Text Book

1. John F. Sowa, "Knowledge Representation: Logical, Philosophical, and Computational Foundations", 2000.

Reference Books

1. Ronald Brachman, Hector Levesque "Knowledge Representation and Reasoning", The Morgan Kaufmann Series in Artificial Intelligence, 2004.
2. Arthur B. Markman, "Knowledge Representation", Lawrence Erlbaum Associates,1998.

CS527 -DATA WAREHOUSING AND DATA MINING

Credits: 3

Objectives:

- To understand the components used in data warehousing, basic idea about OLAP.
- To understand the detailed functioning of Data Mining and various classification and prediction.
- To assess the mining object in web based application.

Unit I - Data Warehousing and Business Analysis

Data Warehousing Components – Building A Data Warehouse – Mapping Data Warehouse to a Multiprocessor Architecture – DBMS Schemas for Deduction Support – Data Extraction, Cleanup and Transformation Tools – Query Tools and Applications – Online Analytical Processing (OLAP) – OLAP and Multidimensional Data Analysis.

Unit II - Data Mining

Data Mining Functionalities – Data Preprocessing – Data Cleanup – Data Integration and Transformation – Data Reduction – Data Discretization and Concept Hierarchy Generation. Association Rule Mining: Efficient and Scalable Frequent Item Set Mining Methods – Mining Various Kinds of Association Rules – Association Mining to Correlation Analysis – Constraint Based Association Mining.

Unit III - Classification and Prediction

Issues Regarding Classification And Prediction – Classification By Decision Tree Introduction – Bayesian Classification – Rule Based Classification- Classification By Back Propagation – Support Vector Machines – Associative Classification – Lazy Learners – Other Classification Methods – Prediction – Accuracy And Error Measures – Evaluating The Accuracy of a Classifier or Predictor – Ensemble Methods – Model Section.

Unit IV- Cluster Analysis

Types of Data in Cluster Analysis – a Categorization of Major Clustering Methods – Partitioning Methods – Hierarchical Methods – Density Based Methods – Grid Based Methods – Model Based Clustering Methods – Clustering High Dimensional Data – Constraint Based Cluster Analysis – Outlier Analysis.

Unit V-Mining Object and Web Data

Multidimensional Analysis and Descriptive Mining of Complex Data Objects – Spatial Data Mining – Multimedia Data Mining – Text Mining – Mining the World Wide Web.

Outcomes:

- Ability to understand the mechanism used in both Data Warehousing as well as Data Mining
- Technical understanding of various prediction and classification, how the data mining has been used in web based.

Teaching and Evaluation guidelines:

- 30% on Technologies Used (Higher Order Thinking), and 50% on diagrams and architecture (Medium Order Thinking), and 20% on Definition (Lower Order Thinking).

Text Books:

1. Jiawei Han and MichelineKamber, "Data Mining Concepts and Techniques", Elsevier, 2 nd Edition, 2008.
2. Alex Berson and Stephen J.Smith, "Data Warehousing, Data Mining & OLAP", Tata McGraw-Hill, 10 th Reprint 2007.

Reference Books:

1. K.P.Soman,ShyamDiwakarandV.Ajay "InsightintoDataminingTheory and Practice",EasterEconomyEdition, PrenticeHallofIndia, 2006.
2. G.K.Gupta"IntroductiontoDataMiningwithCaseStudies",EasterEconomyEdition,Prentice HallofIndia, 2006.
3. Pang-NingTan,MichaelSteinbachandVipinKumar"IntroductiontoDataMining",Pearson Education,2007.

LIST OF ELECTIVES FOR EIGHT SEMESTER

CS512 ADVANCED DATABASE MANAGEMENT SYSTEMS

Credits: 3

Objectives

- Understand basic database concepts, including the structure and operation of the relational data model.
- Construct simple and moderately advanced database queries using Structured Query Language (SQL).
- Understand and successfully apply logical database design principles, including E-R diagrams and database normalization.
- Understand the role of the database administrator.

Unit-I Concepts

EER-to-Relational mapping - Integrity constraints in data modeling - Review of normalization theory - Review of file structures and access methods.

Unit-II Basic Algorithms

Use of heuristics - Optimization algorithm - Heuristic optimization of query graphs - Using cost estimations in query optimization.

Unit-III More Concepts

Concurrent execution - Implementation of Atomicity, Durability - Isolation - Recoverability - Serializability of schedules - Testing for conflict - Serializability - View serializability.

Unit-IV Lock-based protocols

Timestamp-based protocols - Validation-based protocols – Multi-version schemes - Deadlock handling, Log based recovery- Buffer management - Recovery with concurrent transactions - Recovery techniques - Shadow paging.

Unit-V Database System Architectures

Parallel databases - Advanced transaction processing - Emerging database applications - Recent trends and developments.

Outcomes

- Master the basics of SQL and construct queries using SQL.
- Be familiar with a commercial relational database system (Oracle) by writing SQL using the system.
- Be familiar with the relational database theory, and be able to write relational algebra expressions for queries.
- Be familiar with basic database storage structures and access techniques: file and page organizations, indexing methods including B-tree, and hashing.
- Be familiar with the basic issues of transaction processing and concurrency control.
- Master working successfully on a team by design and development of a database application system as part of a team.

Teaching and Evaluation guidelines

- 50% on Application (Higher Order Thinking), and 30% on Methods and Techniques(Medium Order Thinking), and 20% on Tool functions (Lower Order Thinking).

Textbooks

1. A.Silberschatz, H.F.Korth, S.Sudarshan, "Database System Concepts", Fourth Edition, McGraw Hill, 2000.
2. R.Elmasri, S.B.Navathe, "Fundamentals of Database Systems", Third Edition, Pearson Education, 2000.

Reference Books

1. S.K.Singh, "Database System Concepts, Design and Applications", Second Edition, Pearson Education, 2011.
2. Raghu Ramakrishnan, Johannes Gehrke," Database Management Systems", Third Edition,McGraw-Hill; 2002.

CS514–MACHINE LEARNING AND SOFT COMPUTING

Credits: 3

Objectives

- To understand the Machine Learning algorithms and its evaluation
- To understand how Machine Learning is useful in real time applications
- To understand the mixture of different classifier models

Unit I - Introduction to Learning Methods

General to specific ordering of hypotheses - Inductive bias. Decision Tree Learning - Rule Learning - Propositional and First Order – Overfitting - Cross-Validation - Experimental Evaluation of Learning Algorithms - Instance Based Learning - k Nearest neighbor algorithm - Radial basis functions.

Unit II - Computational Learning Theory

Probably Approximately Correct (PAC) learning - Sample complexity - Computational complexity of training - VapnikChervonenkis dimension - Artificial Neural Networks- Linear threshold units – Perceptrons - Multilayer networks and backpropagation - recurrent networks.

Unit III - Probabilistic Machine Learning

Maximum Likelihood Estimation – MAP - Bayes Classifiers -.Bayes optimal classifiers - Minimum description length principle - Bayesian Networks - Inference in Bayesian Networks - Bayes Net Structure.

Unit IV - Learning Unlabeled data

EM - K-means and Hierarchical Clustering - Clustering and Unsupervised Learning - Hidden Markov Models - Reinforcement Learning - Support Vector Machines.

Unit V - Ensemble learning

Boosting – Training and Testing Phase - Bagging- Training and Testing Phase - Stacking.

Outcomes

- Familiarity with a set of well-known supervised, unsupervised and semi-supervised learning algorithms.
- Ability to implement some basic machine learning algorithms.
- Ability to comprehend a Machine Learning conference/Journal paper

Teaching and evaluation guidelines

- 40% on Problems, 40 % on Analysis, 20% on Techniques and Definitions.

Textbooks

1. Hastie, Tibshirani, Friedman,"The elements of Statistical Learning",3rd edition, Springer, 2003.
2. Christopher Bishop, "Pattern recognition and machine learning",2nd edition, Springer, 2011.

References

1. Stephen Marslan, "Machine Learning: An Algorithmic Perspective",2nd edition, Chapman and Hall/CRC, 2014.
2. Recently published IEEE/ACM paper.

CS516 - BIG DATA ANALYTICS

Credits: 3

Objectives:

- To gain knowledge on Big data, Hadoop and its Components, Map Reduce, Infosphere Big Insights and streams.
- Design an effective and sustainable system that can manipulate large data using Big data tools.

Unit- I INTRODUCTION

Big Data Characteristics: Volume-Variety-Velocity-Veracity- Analytics- Basic Nomenclature-Analytics Process Model- Analytical Model Requirements-Types of Data Sources- Sampling-Types of Data Elements.

Unit- IIHADOOP FRAMEWORKS AND HDFS

Frameworks: A Brief History of Hadoop-The Hadoop Ecosystem- Hadoop Releases- The Building Blocks of Hadoop: Name Node-Data Node-Secondary Name Node-Job Tracker-Task Tracker- The Hadoop Distributed File system(HDFS): The Design of HDFS- HDFS Concepts-Hadoop File Systems

Unit -III MAP REDUCE

Anatomy of a Map Reduce: Map Reduce1-Map Reduce - Failures: Failures in Classic Map Reduce- Failures in YARN- Job Scheduling: The Fair Scheduler- the Capacity Scheduler-Shuffle and Sort- Input Formats- Output Formats.

Unit- IV HIVE AND PIG

Hive: The Hive Shell- Hive Services-Comparison with Traditional Databases- HiveQL-Tables-Querying Data- User Defined Functions- Pig: Installing and Running Pig- Comparison with Databases- Pig Latin- User Defined Functions- Data Processing Operators- Case Study : Hadoop and Hive at Facebook-Nutch Search Engine- Log Processing at Rackspace.

Unit- V INFOSPHERE BIG INSIGHTS AND STREAMS

InfoSphere Big Insights: Analytics for Big data at rest- A Hadoop Ready Enterprise- Quality file system- Compression- Administrative tooling- Security- Enterprise Integration-Improved workload scheduling- Adaptive map reduce-InfoSphere Streams- Analytics for Big data in motion- Basics working of InfoSphere Streams.

Outcomes

- Analyze big data challenges in various domains including social media, transportation, finance and medicine.
- Apply MAP-REDUCE programming model for better optimization of results.

- Identify and use the suitable Hadoop components and Methodologies for modeling large databases in real time applications.
- Devise a quality and secure system that satisfy the needs of big data in motion by adopting infosphere insights and streams.

Teaching and Evaluation guidelines

- 40% on knowledge and comprehension (Lower Order Thinking), 30 % on Application (Medium Order Thinking), and 30% on Analysis and synthesis (higher Order Thinking).

Text Books

1. Bart Baesens, "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications," First Edition, Wiley Publications ,2014.
2. Paul Zikopoulos, IBM, Chris Eaton, Paul Zikopoulos "Understanding Big Data: Analytics for Enterprise Class Hadoop and streaming Data", First Edition, The McGraw-Hill Companies, 2012.

Reference Books

1. Tom White, "Hadoop:The Definitive Guide," Third Edition, O'REILLY Publications, 2012.
2. Noreen Burlingame and Lars Nielsen, "A Simple Introduction To Data Science", First Edition, New Street Communications, LLC, Wickford, Rhode Island, 2012.
3. Chuck Lam "Hadoop in action," First Edition, Manning Publications, 2011.

CS518-R PROGRAMMING

Credits:3

Objectives

- Master the use of the R interactive environment
- Understand the different data types, data structures in R
- Manipulate strings in R
- Understand basic regular expressions in R

Unit I - Introduction

Introduction and preliminaries - Simple manipulation - Numbers and vectors - Quoting and escape sequence - Missing values - Objects - their modes and attributes - ordered and unordered factors - Arrays and Matrices - Lists and Data frames.

Unit II - Basics

Reading data from file – Grouping - Loops and conditional execution - Writing your own functions - Probability and distributions- Statistical model in R.

Unit III - Graphics

Scatterplot - Line graph - Bar graph – Histogram - Box plot - Controlling overall appearance of the graph - Using colours in plots.

Unit IV - Data Analytics

Simple linear regression - Residuals and fitted value - prediction and confidence bands – correlation - Linear models - polynomial regression - Regression through the origin - Two way ANOVA with replication - Analysis of covariance.

Unit 5: R-Advanced analytics and web application using R-shiny

Logistic regression - Generalized linear models - logistic regression on tabular data - logistic regression using raw data – prediction - model checking - Building your own web page using R shiny - taking control of reactivity - inputs and outputs - running and sharing your creations.

Outcomes

- Mastering the R environment
- Application of R programming for simple case studies in Data Mining, Data Analytics.

Teaching and evaluation guidelines

- 40% on Problems, 40 % on Analysis, 20% on Techniques and Definitions

Text Books

1. Peter Dalgaard, “Introductory statistics with R”, Second edition,springer, 2008.
2. Winston Cbang, “R graphics cook book” ,O'Reilly publication, First edition, 2013

Reference Books

1. Mark Gardener, “Beginning R: The statistical programming”, Weilly Publication,2012.

CS520 - CROSS PLATFORM APPLICATION DEVELOPMENT

Credits: 3

Objectives

- To introduce broad perspective of cross platform development.
- To understand the concept of native mobile application design.
- To be familiar with lead players in Cross Platform Application Development.

Unit-I: Introduction

Introduction to cross platform Applications, Development, Interfaces and Interactions, Introduction to Mobile OS Architectures, Application stores, Native, hybrid mobile world and mobile web applications.

Unit-II: Architecture

History and overview of mobile development, Architecting Solutions for Cross-Platform Development - Creating Shared Code Projects, Portable Class Libraries, MVC Design Pattern, Service-Oriented Architecture, Testing, Options for creating mobile applications using PhoneGap, PhoneGap for Android, PhoneGap for iOS, JQuery and JQMobile, HTML 5 for mobile, Simple Example

Unit-III: Xamarin

Overview of Xamarin, Building Windows Universal and Phone Applications – XAML, Layout Controls, Navigation Controls, Form Controls, Windows Universal Applications, Windows Phone Applications**,** Cross-Platform Development with Xamarin.Forms - Understanding XAML, Page Views, Controls, Layout Views, Scrollable Views**.**

Unit-IV: Web Techniques

Ajax, JSON and REST services,Basics and Advance of CSS3 - CSS Syntax, Applying CSS - External, Inline & Tags, Introduction to Box model - margins, padding and borders , Block level and Inline level elements, Positioning : absolute and fixed, JavaScript, Jquery and Ajax- Basics of browser interaction, Introduction to event handlers in Javascript, What is jQuery and difference between jQuery and Javascript, DOM manipulation using jQuery, Introduction to jQuery UI and how to customize plugins, JSON data structure, Using AJAX, gathering response and manipulating DOM to update page realtime.

Unit-V: Data Processing

Webservices and Database access, XML, JSON, Local Data Storage, Device Differences, Data-Binding-MVVM Design Pattern, XAML Binding Syntax, Data Access Classes, NET, Binding to SQLite Database Data.

Outcomes

- Ability to understand the applicability of cross platform approach in current trend.
- To be able to build an applications for mobile application and web application

Text Books

1. Charles Petzold, "Creating Mobile Apps with Xamarin.Forms", Preview Edition.
2. Xamarin Cross-platform Application Development, Second Edition ,Jonathan Peppers.

Reference Books

1. Professional Cross-Platform Mobile Development in C# - Dr John Hunter Kenny Goers Ben Horgen Scott Olson Turid H Horgen
2. Mobile App Development with HTML5 - Mark Lassoff
3. Mobile Apps Made Simple: The Ultimate Guide to Quickly Creating, Designing and Utilizing Mobile Apps for Your Business – (2nd Edition) Jonathan McCallister

CS522 - MANAGEMENT INFORMATION SYSTEMS

Credits: 3

Objectives

- Understand types of MIS applications in organisations
- Discuss the development of management information systems in organisations.
- Select and design MIS systems appropriate to meet management requirements.
- Critically evaluate MIS contributions to the strategic management of organisations

Unit I Management within organisations

Management activities, roles and levels.Management Planning and Control. Strategic Planning within an organisation: activities, techniques and results. The nature of decision-making: decision-making models and classification of decision-making situations. The nature of information: classifications and characteristics. The nature of information and decision-making at different management levels.

Unit II MIS Applications

Management Reporting Systems, Decision Support Systems, Group Decision Support Systems, Office Information Systems, Knowledge Based Systems that support management - Expert Systems - Neural Network systems. The application of On-Line Analytical Processing/Data mining/Business Intelligence tools in supporting management decision making.

Unit III MIS Relationships

Data warehouses and data mining facilities - the relationship between data warehousing and other MIS facilities - the relationships of MIS to other enterprise applications - Transaction Processing Systems and Enterprise Resource Planning systems.

Unit 1V Development of MIS

The role of Strategic Planning - Strategic IS planning in identifying MIS requirements - MIS role in supporting Strategic Planning/SISP, Managing MIS projects: Project management methodologies - MIS feasibility study - Assessment of economic, technical, social and political issues from an MIS perspective - Cost-Benefit Analysis.

Unit V Trends

Developments in hardware, software, Internet and communications capabilities and their implication for MIS, Trends in management and organisations, MIS and mobile computing, MIS and social media.

Outcomes

- To understand MIS in both the wider managerial context and in the narrower confines of theselection, support, design and development of computer applications.
- To focus on the concepts a manager needs to understand, in order to make effective use of computerized information systems.

Text Books

1. Kenneth C. Laudon& Jane P. Laudon, "Essentials of Management Information Systems", Tenth Edition, Pearson Prentice-Hall, 2012.
2. O'Brien, James A, "Management Information Systems", Tenth Edition, Tata McGraw Hill, 2010.
3. Terry Lucey, "Management Information Systems", Ninth Edition, Thompson, 2005.

Reference Books

1. McNurlin, Sprague & Bui, "Information Systems Management in Practice", Eight Edition, Prentice Hall , 2013.
2. Efraim Turban, Jay Aronson & Tin-Peng Liang, "Decision Support Systems and Intelligent Systems", Ninth International Edition, Pearson Prentice- Hall, 2010.

CS524 – REAL TIME SYSTEMS

Credits: 3

Objectives

- To studyissues related tothe designand analysisofsystems with real-time constraints.
- To studythe various Uniprocessorand Multiprocessor schedulingmechanisms.
- To learn about various real time communication protocols.
- To study the difference between traditional and real time databases.

Unit - I Introduction to Real Time Computing

Real Time Systems: Concepts - Examples - Applications– Structure –Characterization-Hardand Softtiming constraints- DesignChallenges- Performancemetrics. Programming Languages for RealTimeSystems

Unit - II Real Time Scheduling

Task assignment and Scheduling - Task allocation algorithms - Single-processor and Multiprocessortaskscheduling-Clock-drivenandpriority-basedschedulingalgorithms- Fault tolerant scheduling

Unit - III Real Time Communication

Networktopologies andarchitectureissues-Protocols:contention based - token based - polled bus – deadlinebased protocol –Faulttolerant routing.

Unit - IV Programming Languages and Tools

Hierarchical decomposition - Run-time error handling - Overloading - Timing specification - Recent trends and developments.

Unit - V Real Time Databases

Transaction priorities–Concurrency control issues–Disk scheduling algorithms– Two phase approach to improve predictability.

Outcomes

- Knowledge about Schedulabilityanalysis.
- Abilityto learn Real-time programmingenvironments.
- Knowledge aboutreal time communication and databases.
- Abilityto develop real timesystems.

Teaching and evaluation guidelines

- 50% on Problems (Higher Order Thinking), and 30% on Algorithms (Medium Order Thinking), and 20% on Terms and Terminologies (Lower Order Thinking)

Text Book

1. C.M.Krishna,KangG.Shin–"Real TimeSystems",InternationalEdition, Tata McGraw HillCompanies,Inc., New York, 2010.

Reference Books

1. PhilipA.LaplanteandSeppoJ.Ovaska,"Real-TimeSystemsDesignand Analysis: Tools forthe Practitioner''Fifth Edition,IEEEPress,Wiley, 2011.
2. JaneW.S. Liu, "Real-TimeSystems", First Edition, Pearson EducationIndia, 2000.

CS526- ENTERPRISE RESOURCE PLANNING

Credits: 3

Objectives

- To able to build an understanding of the fundamental concepts of ERP systems
- To demonstrate architecture and working of different modules in ERP
- To develop and design the modules used in ERP systems and can customize the existing modules of ERP systems.

Unit-I INTRODUCTION TO ERP

Overview – Benefits of ERP – ERP and Related Technologies – Business Process Reengineering – Data Warehousing – Data Mining – On–line Analytical Processing – Supply Chain Management.

Unit- II ERP IMPLEMENTATION

Implementation Life Cycle – Implementation Methodology – Hidden Costs – Organizing Implementation – Vendors- Consultants and Users – Contracts – Project Management and Monitoring.

Unit - III BUSINESS MODULES

Business Modules in an ERP Package – Finance – Manufacturing – Human Resource – Plant Maintenance – Materials Management – Quality Management – Sales and Distribution.

Unit- IV ERP MARKET

ERP Market Place – SAP AG – PeopleSoft – Baan Company – JD Edwards World Solutions Company – Oracle Corporation – QAD – System Software Associates.

Unit - V ERP PRESENT AND FUTURE

Turbo Charge the ERP System – EIA – ERP and E–Commerce – ERP and Internet – Future Directions in ERP.

Outcomes

- Ability to implement ERP package for industry
- Ability to design and deploy the supply chain management

Teaching and evaluation guidelines

- 40% on Design (Higher Order Thinking), 40% on Implementation (Medium Order Thinking), 20% on Techniques (Lower Order Thinking).

Text Books

1. Joseph A. Brady, Ellen F. Monk, Bret J. Wangner, "Concepts in Enterprise Resource Planning", Fourth Edition, CENGAGE Learning Custom Publishing, 2011
2. Alexis Leon, "ERP Demystified", Third Edition, Tata McGraw Hill, 2014.

Reference Books

1. Vinod Kumar Garg and N.K .Venkata Krishnan, "Enterprise Resource Planning – Concepts and Planning", Prentice Hall, 1998.
2. Jose Antonio Fernandz, "The SAP R /3 Hand book", Third Edition, Tata McGraw Hill,2006.

CS528 NATURAL LANGUAGE PROCESSING

Credits: 3

Objectives

- To understand the representation and processing of Morphology and Part-of Speech taggers
- To appreciate various techniques used for speech synthesis and recognition
- To understand different aspects of natural language syntax and the various methods used for processing syntax
- To understand different methods of disambiguating word senses
- To know about various applications of natural language processing.

Unit-I Morphology and Part of Speech Processing

Introduction –Regular Expressions and Automata- Non-Deterministic FSAs-Transducers – English Morphology - Finite-State Morphological Parsing - Porter Stemmer - Tokenization- Detection and Correction of Spelling Errors- N-grams – Perplexity - Smoothing - Interpolation – Backoff- Part-of Speech Tagging – English Word Classes – Tag sets - Rule-Based - HMM - Transformation-Based Tagging - Evaluation and Error Analysis- Hidden Markov and Maximum Entropy Models

Unit-II Syntax Analysis

Formal Grammars of English – Constituency - Context-Free Grammars –Grammar Rules – Tree banks - Finite-State and Context-Free Grammars - Dependency Grammars- Syntactic Parsing – Parsing as Search - Ambiguity - Dynamic Programming Parsing Methods –CKY- Earley and Chart Parsing-Partial Parsing-Evaluation- Statistical Parsing – Collins Parser-Language and Complexity - The Chomsky Hierarchy -The Pumping Lemma

Unit-III Semantic Interpretation

Representation of Meaning – Desirable Properties - Computational Semantics -Word Senses - Relations Between Senses – WorldNet - Event Participants- Proposition Bank -Frame Net – Metaphor

Unit-IV Pragmatic Interpretation

Computational Lexical Semantics – Word Sense Disambiguation- Supervised Word Sense Disambiguation - Dictionary and Thesaurus Methods- Word Similarity - Minimally Supervised WSD - Hyponymy and Other Word Relations - Semantic Role Labeling -Unsupervised Sense Disambiguation. Computational Discourse - Discourse Segmentation - Unsupervised Discourse Segmentation - Text Coherence - Reference Resolution –Phenomena – Features and algorithms - Pronominal Anaphora Resolution

Unit-VApplications

Information Extraction – Named Entity Recognition - Relation Detection and Classification - Temporal and Event Processing - Template-Filling - Biomedical Information Extraction. Question Answering and Summarization -Information Retrieval -Factoid Question Answering - Summarization - Single and Multi-Document Summarization - Focused Summarization - Evaluation. Dialog and Conversational Agents – Properties of Human Conversations - Basic

Dialogue Systems – Voice XML – Information State and Dialogue Acts - Markov Decision Process Architecture. Machine Translation –Issues in Machine Translation - Classical MT and the Vauquois Triangle -Statistical MT - Phrase-Based Translation Model - Alignment in MT – IBM Models –Evaluation

Outcomes

- To identify the different linguistic components of given sentences
- To design a morphological analyser for a language using finite state automata
- To use machine learning algorithms
- To design an application that uses different aspects of language processing

Teaching and Evaluation Guidelines

- 50% on conceptual understanding (Low Level Thinking) and 20 % on analysis (Medium/ High Level Thinking) and 30% on implementation.

Text Books

1. NitinIndurkhya, Fred J. Damerau, "Handbook of Natural Language Processing, Second Edition" (Chapman & Hall/CRC Machine Learning & Pattern Recognition), 2010
2. Alexander Clark, Chris Fox, Shalom Lappin, "The Handbook of Computational Linguistics and Natural Language Processing" Wiley-Blackwell; First Edition, 2010.

Reference Books

1. Jurafsky and Martin, "Speech and Language Processing", Pearson Prentice Hall; Second Edition , 2008
2. Christopher D. Manning and HinrichSchütze, 'Foundations of Statistical Natural Language Processing", MIT Press, 1999
3. Stevan Bird, "Natural Language Processing with Python", O'Reilly Media; First Edition,2009.
4. Natural Language Understanding (2nd Edition) [Paperback], Addison- Wesley; Second Edition, 1994

CS530 CLOUD COMPUTING

Credits: 3

Objectives

- To introduce the broad perceptive of cloud architecture and model.
- To understand the concept of Virtualization.
- To be familiar with the lead players in cloud.
- To understand the features of cloud simulator.
- To apply different cloud programming model as per need.
- To be able to set up a private cloud.
- To understand the design of cloud Services.
- To learn to design the trusted cloud Computing system.

Unit-I Cloud Architecture and Model

Technologies for Network-Based System, System Models for Distributed and Cloud Computing, NIST Cloud Computing Reference Architecture, Cloud Models, Characteristics, Cloud Services, Cloud models (IaaS, PaaS, SaaS), Public vs Private Cloud, Cloud Solutions, Cloud ecosystem, Service management, Computing on demand.

Unit-II virtualization

Basics of Virtualization, Types of Virtualization, Implementation Levels of Virtualization, Virtualization Structures, Tools and Mechanisms, Virtualization of CPU, Memory, I/O Devices, Virtual Clusters and Resource management, Virtualization for Data-CenterAutomation.

Unit-III Cloud Infrastructure

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

Unit-IV Programming Model

Parallel and Distributed Programming Paradigms, MapReduce, Twister and Iterative MapReduce, Hadoop Library from Apache, Mapping Applications,Programming Support, Google App Engine, Amazon AWS, Cloud Software Environments, Eucalyptus, Open Nebula, OpenStack, Aneka, CloudSim

Unit-V Security in the Cloud

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

Outcomes

- Compare the strengths and limitations of cloud computing.
- Identify the architecture, infrastructure and delivery models of cloud computing.
- Apply suitable virtualization concept.
- Choose the appropriate cloud player, Programming Models and approach.
- Address the core issues of cloud computing such as security, privacy and interoperability
- Design Cloud Services and Set a private cloud

Teaching and Evaluation guidelines

- 40% on Theory(Higher order Thinking), 30% on Analysis(Medium order Thinking), 20% on Tools and Applications(Lower order Thinking).

Text Books

1. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.
2. John W.Rittinghouse and James F.Ransome, "Cloud Computing: Implementation, Management, and Security", CRC Press, 2010.
3. Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing, A Practical Approach", TMH, 2009.

Reference Books

1. Kumar Saurabh, "Cloud Computing – insights into New-Era Infrastructure", Wiley India,2011.
2. George Reese, "Cloud Application Architectures: Building Applications and Infrastructure in the Cloud" O'Reilly.
3. Ronald L. Krutz, Russell Dean Vines, "Cloud Security – A comprehensive Guide to Secure Cloud Computing", Wiley – India, 2010.

LIST OF GLOBAL ELECTIVES

CS1001 CLOUD COMPUTING

Credits: 3

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- To introduce the broad perceptive of cloud architecture and model.
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- To be familiar with the lead players in cloud.
- To understand the features of cloud simulator.
- To apply different cloud programming model as per need.
- To be able to set up a private cloud.
- To understand the design of cloud Services.
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Technologies for Network-Based System, System Models for Distributed and Cloud Computing, NIST Cloud Computing Reference Architecture, Cloud Models, Characteristics, Cloud Services, Cloud models (IaaS, PaaS, SaaS), Public vs Private Cloud, Cloud Solutions, Cloud ecosystem, Service management, Computing on demand.

Unit-II virtualization

Basics of Virtualization, Types of Virtualization, Implementation Levels of Virtualization, Virtualization Structures, Tools and Mechanisms, Virtualization of CPU, Memory, I/O Devices, Virtual Clusters and Resource management, Virtualization for Data-CenterAutomation.

Unit-III Cloud Infrastructure

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

Unit-IV Programming Model

Parallel and Distributed Programming Paradigms, MapReduce, Twister and Iterative MapReduce, Hadoop Library from Apache, Mapping Applications,Programming Support, Google App Engine, Amazon AWS, Cloud Software Environments, Eucalyptus, Open Nebula, OpenStack, Aneka, CloudSim

Unit-V Security in the Cloud

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

Outcomes

- Compare the strengths and limitations of cloud computing.
- Identify the architecture, infrastructure and delivery models of cloud computing.
- Apply suitable virtualization concept.
- Choose the appropriate cloud player, Programming Models and approach.
- Address the core issues of cloud computing such as security, privacy and interoperability
- Design Cloud Services and Set a private cloud

Teaching and Evaluation guidelines

- 40% on Theory(Higher order Thinking), 30% on Analysis(Medium order Thinking), 20% on Tools and Applications(Lower order Thinking).

Text Books

1. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.
2. John W.Rittinghouse and James F.Ransome, "Cloud Computing: Implementation, Management, and Security", CRC Press, 2010.
3. Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing, A Practical Approach", TMH, 2009.

Reference Books

1. Kumar Saurabh, "Cloud Computing – insights into New-Era Infrastructure", Wiley India,2011.
2. George Reese, "Cloud Application Architectures: Building Applications and Infrastructure in the Cloud" O'Reilly.
3. Ronald L. Krutz, Russell Dean Vines, "Cloud Security – A comprehensive Guide to Secure Cloud Computing", Wiley – India, 2010.

CS1002 MOBILE COMPUTING

Credits: 3

Objectives

- To understand the networking concept of mobile networks.
- To learn the basics of wireless voice and data communication technologies.
- To study the working principles of wireless LAN and its standards
- To build skills in working with wireless applications protocols to develop mobile content applications.

Unit-I Mobile Networks

Cellular Wireless Networks – GSM – Architecture – Protocols – Connection Establishment – Frequency Allocation – Routing – Mobility Management – Security –GPRS.

Unit-II Wireless Networks

Wireless LANs and PANs – IEEE 802.11 Standard – Architecture – Services –Network – HiperLAN–Bluetooth-Wi-Fi–WiMAX.

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Unit-III Routing

Mobile IP – DHCP – Adhoc– Proactive and Reactive Routing Protocols – Multicast Routing.

Unit-IV Transport and Application Layers

Mobile TCP– WAP – Architecture – WWW Programming Model– WDP – WTLS – WTP – WSP – WAE – WTA Architecture – WML – WMLScripts.

Unit-V Pervasive Computing

Pervasive computing infrastructure-applications- Device Technology - Hardware, Human-machine Interfaces, Biometrics, and Operating systems– Device Connectivity – Protocols, Security, and Device Management- Pervasive Web Application architecture-Access from PCs andPDAs-AccessviaWAP.

Outcomes

- Apply the fundamental design paradigms and technologies to mobile computing applications.
- Develop consumer and enterprise mobile applications using representative mobile devices and platforms using modern development methodologies.
- Design effective mobile interfaces using human computer interaction principles

Teaching and Evaluation guidelines

- 50% on Application (Higher Order Thinking), and 30% on Methods and Techniques (Medium Order Thinking), and 20% on Tool functions (Lower Order Thinking).

Text Books

1. Jochen Schiller, “Mobile Communications”, PHI, Second Edition, 2003.
2. JochenBurkhardt, “Pervasive Computing: Technology and Architecture of Mobile Internet Applications”, Addison-Wesley Professional; Third Edition, 2007.

Reference Books

1. Frank Adelstein, Sandeep KS Gupta, Golden Richard, “Fundamentals of Mobile and Pervasive Computing”, McGraw-Hill 2005
2. DebashisSaha, “Networking Infrastructure for Pervasive Computing: Enabling Technologies”, Kluwer Academic Publisher, Springer; First edition, 2002
3. Agrawal and Zeng, “Introduction to Wireless and Mobile Systems”, Brooks/ Cole (Thomson Learning), First edition, 2002
4. UweHansmann, LotharMerk, Martin S. Nicklons and Thomas Stober, “Principles of Mobile Computing”, Springer, New York, 2003.

CS1003 INFORMATION SECURITY

Credits: 3

Objectives

- To understand the security services, attacks, mechanisms, types of attacks
- To comprehend and apply authentication services, authentication algorithms
- To comprehend and apply security protocols, Transport layer security protocols, Web security protocols.

Unit –I Computer Security Technology and Principles

Security Goals – Denial of Service attacks - Access Control Techniques, Malicious Software - Intrusion Detection -Intrusion Prevention.

Unit-II Symmetric and Asymmetric Key algorithms

Block Ciphers, Fiestal Structure, Data Encryption Standard, Advanced Encryption Standard, Diffie Hellman Key Exchange.

Unit-III Network Security

User Authentication – Network Authentication - Message Authentication Codes – Hash Functions - IP Security-AH and ESP, SSH - Authentication protocols

Unit-IV E-Commerce Security

RSA, Digital Signatures, SSL/TLS, DSA.

Unit-V Wireless Security

Wireless vulnerabilities – threats – attacks - Various wireless networks – Security solutions – WEP, WPA, WPA2.

Outcomes

- Be able to determine appropriate mechanisms for protecting the network.
- Design a security solution for a given application, system with respect to security of the system

Teaching and evaluation guidelines

- 40% on Problems, 40 % on System Design, 20% on Techniques and Definitions

Text Books

1. W. Stallings, "Cryptography and Network Security: Principles and Practice", 5/E, Prentice Hall, 2013

Reference Books

1. AtulKahate, "Cryptography and Network Security", Tata McGraw-Hill, 2003
2. Yang Xiao and Yi Pan, "Security in Distributed and Networking Systems", World Scientific, 2007.
3. Aaron E. Earle, "Wireless Security Handbook", Auerbach publications, Taylor & Francis Group, 2006.
4. Selected IEEE/ACM/Elsevier papers

CS1004 INTRODUCTION TO DATA STRUCTURES

Credits: 3

Objectives

- To introduce basic data structures and their applications in the real world scenario.
- To be able to analyze and choose the best data structure for a given application.

Unit–I Introduction

Development of Algorithms - Notations and analysis, LINKED LISTS: Introduction to Data Structures, Pointers- Basic Operations- Applications- Dynamic storage management - Circular Linked Lists-Doubly Linked List.

Unit-II Stacks and Queues

STACKS: Basic Stack Operations- Stack Applications, QUEUES: Operations- Queue Applications

Unit-III Trees

Binary Trees - Binary search trees –Applications, Treetraversals-preorder-inorder-postorder-Height balanced trees – Red black trees.

Unit-IV Graphs

Graphs –Representation- Graph traversals-BFS-DFS- Topological sort- spanning trees.

Unit-V Searching, Sorting and Hashing

Searching Techniques: Linear search - Binary search- Sorting Techniques: Selection sort-Bubble sort- Insertion sort- Hash table methods.

Outcomes

- Develop programs to implement linear and nonlinear data structures.
- Analyze and Identify suitable data structure design techniques for problem solving.

Teaching and Evaluation Guidelines

- 60% on conceptual understanding (Low Level Thinking) and 40 % on analysis (Medium or High Level Thinking).

Text Books

1. J.P.Tremblay and P.G.Sorenson, "An Introduction to Data Structures with applications", Second Edition, Tata McGraw Hill, 1981.
2. Richard Gileberg, Behrouz A. Forouzan, "Data Structures: A Pseudo code Approach with C", Second Edition, 2007.

Reference Books

1. G.A.V. Pai, "Data Structures and Algorithms", Second Edition, Tata McGraw Hill, 2009.
2. DebasisSamanta, "Classic Data Structures", Second Edition, PHI Learning, 2009.

CS1005 OPERATING SYSTEMS CONCEPTS

Credits: 3

Objectives

- To know the basics such as process and CPU scheduling algorithms
- To understand the critical regions and dead lock problem
- To understand virtual memory concept, thrashing problem and page replacement algorithms
- To understand the file tables, access algorithms, and spoofing

Unit-I Basic OS Concepts

Overview of Operating Systems, functionalities and characteristics of OS, hardware concepts related to OS, CPU states, I/O channels, Memory hierarchy, microprogramming, process, PCB.

Unit-II Synchronization

Signals, forks and pipes, interrupt processing, Peterson's solution - Bakery algorithm - Hardware-based solutions - Semaphores - Critical regions - Problems of synchronization - Deadlock prevention and recovery - Banker's algorithms.

Unit-III Memory Management

Swapping – Contiguous Memory Allocation – Paging – Segmentation – Segmentation with Paging – Virtual Memory – Demand Paging – Process Creation – Page Replacement – Allocation of Frames – Thrashing.

Unit-IV File Systems

File Concept – Access Methods – Directory Structure – File System Mounting – File Sharing – Protection – File System Structure – File System Implementation – Directory Implementation – Allocation Methods – Free Space Management.

Unit-V I/O Systems

Kernel I/O Subsystem – Disk Structure – Disk Scheduling – Disk Management – Swap Space Management – RAID Structure – Case study on Linux System – Case study on Windows XP.

Outcomes

- Ability to implement CPU scheduling algorithms and resolve problems related to critical regions
- Ability to implement page replacement algorithms like FCFS, LRU, etc.
- Ability to change UNIX access controls to protect the files

Teaching and Evaluation guidelines

- 20% on an Application (Higher Order Thinking), and 50% on Methods and Algorithms (Medium Order Thinking), and 30% on Definition (Lower Order Thinking).

Text Books

1. A. Silberchatz, P. B. Galvin, "Operating System Concepts", Addison Wesley, Ninth Edition, 2013.
2. W. Stallings, "Operating Systems", Prentice Hall, Fifth Edition, 2005.

Reference Book

1. A.Tannenbaum, “Modern Operating Systems”, Third Edition, Prentice Hall, 2009.

CS1006OBJECT ORIENTED PROGRAMMING WITH C++

Credits: 3

Objectives

- To understand fundamentals of programming such as variables, conditional and iterative execution, methods, etc.
- To impact the program using more advanced C++ features such as composition of objects, operator overloads, dynamic memory allocation, inheritance and polymorphism, file I/O, exception handling, etc.
- To understand and build C++ classes using appropriate encapsulation and design principles.

Unit-I Introduction

Object oriented programming concepts – Data types – Tokens – Expressions- operators- decision making statements, looping statements- conditional – unconditional looping statements

Unit-II Basic Programming Features

Arrays – Functions- Standard C++ library functions- void functions- Boolean functions,-I/O functions- passing by reference-passing by constant reference- Inline functions- Default arguments- Structures– Pointers

Unit-IIIObject Oriented Programming Concepts

Classes – Objects - Access functions -Constructor and Destructor- Static data members-static function members–function and Operator overloading - Type Conversion-Inheritance.

Unit-IVAdvanced Object Oriented Programming Concepts

Polymorphism – Run time polymorphism – Virtual Functions- virtual destructors-pure virtual functions-Abstract classes - Manipulators - Exception Handling.

Unit-V Strings and File Handling

File Handling– I/O Streams - String Handling –Manipulation of Strings - Templates–Function templates- Class templates Standard- Template Library

Outcomes

- Ability to implement language features used in C++
- Ability to design and implement object-oriented software to solve moderately complex problems.

Teaching and Evaluation guidelines

- 30% on knowledge and comprehension (Lower Order Thinking), 30 % on Application (Medium Order Thinking), and 40% on Analysis and synthesis (higher Order Thinking).

Text Books

1. P.J. Deitel, "C++ How to Program", Sixth edition ,Prentice-Hall of India Pvt. Ltd., 2013.
2. E. Balagurusamy, "Object Oriented Programming with C++", Sixth edition, McGraw Hill Company Ltd., 2013.

Reference Books

1. Robert Lafore, “Object oriented programming in C++”, Fourth Edition, Galgotia Publication.2008.
2. B. Trivedi, “Programming with ANSI C++”, Second Edition, Oxford University Press, 2012.
3. Ira Pohl, “Object Oriented Programming using C++”, Second Edition, Pearson Education, Reprint 2013.
4. S. B. Lippman, JoseeLajoie, Barbara E. Moo, “C++ Primer”, Fourth Edition, Pearson Education, 2012.

CS1007 WEB OF THINGS

Credits: 3

Objectives

- To have a grasp on Data and Knowledge Management and use of Devices
- To understand the state of the Art
- To understand real world Design constraints

Unit-I Introduction

Networking & Web Basics - IoT - The Vision, Applications - IoT Components – Sensors – Actuators – Intelligent Analytics – Intelligent Analysis

Unit-II IoT Architecture

Traditional TCP/IP protocol stack and IoT Protocol Stack – Data Formats – Representational State Transfer (REST) and activity streams

Unit-III IoT Communication

Fundamentals- Devices and gateways, Local and wide area networking, Data management, Communication protocols – Constrained Application Protocol (CoAP).

Unit-IV IoT Implementation

Introduction to Microcontrollers (Raspberry Pi, Arduino Boards) – Operating System (Micro Python) – Programming language (Python, Embedded C)

Unit- V Case Study and implications

Real-World Design Constraints- Technical Design constraints - Data representation and visualization, Interaction and remote control. Case Studies: IoT in Disaster Management System, &IoT in Agriculture – Societal Implications.

Outcomes

- Working ability with Raspberry Pi
- Demonstration of real world web applications connecting things

Teaching and evaluation guidelines

- 40% on Design, 40% on Comparisons and Statements, 20% on Techniques and Definitions

Textbook

1. Vijay Madisetti and ArshdeepBahga, “Internet of Things (A Hands-on-Approach)”, 1st Edition, VPT, 2014.

Reference Books

1. Francis daCosta, “Rethinking the Internet of Things: A Scalable Approach to Connecting Everything”, 1st Edition, Apress Publications, 2013
2. Selected IEEE/ACM papers

CS1008 COMPUTER NETWORKS

Credits: 3

Objectives

- To provide insight about networks, topologies, and the key concepts
- To gain comprehensive knowledge about the layered communication architectures (OSI and TCP/IP) and its functionalities
- To understand the principles, key protocols, design issues, and significance of each layer in OSI and TCP/IP
- To know the basic concepts of network security.

Unit-I Basics of Computer Network

Introduction-OSI 7 Layered architecture TCP/IP protocol stack -Network devices - Hub/Repeaters-bridges-routers-switches-Physical layer-UTP-STP- Coaxial and Fiber optic cable -simplex- half-duplex and full-duplex communication-bandwidth and throughput-circuit switching-packet switching.

Unit–II Understand the Concepts of LAN and Data Link Layer Protocols

Local area network-Network topologies: Bus- Star- Ring -Token ring network-Ethernet frame format (IEEE 802.3)-CSMA/CD- CSMA/CA-wireless LAN frame format (IEEE 802.11)-Bluetooth -WAP.

Unit-III Network layer

Internet and Intranet- Internet protocol-connection oriented (virtual circuit) and connectionless (datagram) services-IPv4 and IPv6 protocols-packet transfer mechanism using routers and IP address-multicast routing.

Unit–IV Transport Layer

Transport layer services-TCP- Address Resolution Protocol- RARP- port and sockets- UDP-gateways- principles of reliable data transfer- Principles of congestion control.

Unit–V Application Layer

DNS server- email transfer-POP server-SMTP server-FTP- Web server-Web browser- HTTP - remote login-network security-security services.

Outcomes

- Obtain insight about basic networks and layered communication architectures.
- Analyze a network under congestion and propose solutions for reliable data transfer.
- Examine the protocols operating at different layers of TCP/IP model.

Teaching and Evaluation guidelines

- 40% on knowledge and comprehension (Lower Order Thinking), 30 % on Application (Medium Order Thinking), and 30% on Analysis and synthesis (higher Order Thinking).

Text Books

1. Andrew S. Tanenbaum and David J. Wetherall, “Computer Networks”, Fifth Edition, 2010.
2. BehrouzForouzan, “Data Communication and Networking” 3rd edition, TMH.

Reference Books

1. William Stallings,"Data and Computer Communications", 7th edition, PHI.
2. Ata Elahi Thomson, "Network communication Technology", First Editon, Publlished by Delmar Thomson Learning, 2001.
3. AchyutGodbole, "Data Communication and Networking ", Third Edition, TMH, 2004.