
(7+5)

FOURIER SERIES : Periodic waveforms, even and odd functions, orthogonality relations, Fourier series - Dirchlet’s conditions, statement of Fourier Theorem, Fourier Co-efficients – change of scale , Half range series, Parseval’s theorem – average power of a signal, RMS value, applications – frequency response of a linear system.

(8+5)


(7+5)

INTEGRAL CALCULUS: Evaluation of multiple integrals - Change the order of integration - Application of multiple integrals to find area and volume - Beta and Gamma Integrals - Evaluation of definite integrals in terms of Beta and Gamma functions.

(8+5)

ORDINARY DIFFERENTIAL EQUATIONS OF FIRST ORDER: Modeling- Geometrical meaning- Exact differential equations, Integrating factors- linear differential equations, Bernouli equations - Applications to linear systems.

(7+5)

LINEAR DIFFERENTIAL EQUATIONS OF SECOND AND HIGHER ORDER: Homogeneous linear equations of second order and higher order equations with constant coefficients. Euler-Cauchy equation, Non-homogeneous equations, Solution by variation of parameter - Applications to linear systems.

(8+5)

TEXT BOOKS:

REFERENCES:

15XW12 ENGLISH FOR PROFESSIONAL SKILLS

READING COMPREHENSION: Developing Reading Skills like Skimming and Scanning for information, Critical Reading, Inferential, Cognition, and analytical Skills- appropriate reading texts to be used from general, scientific, and literary genres.

(10)

PRINCIPLES OF CLEAR WRITING: The fundamental aspects of formal writing like objectivity, conciseness, clarity, simplicity, coherence, parallelism, unity, cohesion and accuracy to be focused Writing in different ways to create an emphasis – samples from news items, creative articles and reports to be used.

(4)

TECHNICAL WRITING: Technical Style, Mechanics, Critical Evaluation of different types of technical texts and different genres of technical writing. – Format and different types of formal reports – Technical Papers.

(4)

CORRESPONDENCE: Memos, Principles of Official, Social, and E-mail Correspondence to be focused.

(4)

FOCUS ON SOFT SKILLS: Intra and Interpersonal Communication, Telephone Etiquette, Body language and Interview Techniques, Presentation Techniques – Group communication for effective team working.

(5)

PRACTICALS: Listening exercises using Language Laboratory, Making short speeches, Group Discussions and Role-Plays.

(18)

TEXT BOOKS:
1. Teaching Material prepared by the Faculty, Department of English, PSG College of Technology, Coimbatore.
REFERENCES:

15XW13 MATERIALS SCIENCE


CONDUCTORS AND APPLICATIONS: Drude Lorentz theory of electrical conduction, Band theory of solids - Factors affecting resistivity of metals – temperature, alloying, magnetic field and strain - Applications of conductors – Strain gauge, conducting material, and resistance thermometer. (12)

SEMI CONDUCTORS AND DEVICES: Elemental and compound semiconductors. Intrinsic and extrinsic semiconductors - Properties. Hall effect - Hall coefficient in extrinsic semiconductors, experimental determination of Hall coefficient. Application of Semiconductors –Solar Cells, LED and LCD. Introduction to semiconductor memory devices: Random Access Memory (RAM), Read only Memory (ROM), DRAM CCD. (12)


ADVANCED MATERIALS AND APPLICATIONS: Nano materials - Synthesis - PVD and ball milling techniques,properties, applications. Shape Memory alloys (SMA) – Characteristics, properties of NiTi alloy, application in MEMS. Superconductivity- types of superconductors - High Tc superconductors, Application of superconductors -SQUID, Levitation and cryotron. (12)

TEXTBOOKS:

REFERENCES:

15XW14 ANALOG AND DIGITAL ELECTRONICS

SEMI CONDUCTOR DEVICES AND CIRCUITS: (Qualitative treatment only) Fundamental aspects of semiconductors - PN junction diode -Zener diode - Rectifiers - Zener voltage regulators - Filters - Bipolar Junction Transistors - Transistor Amplifiers - Field Effect Transistor. (7)

NUMBER SYSTEM AND CODES: Binary - Octal - Hexadecimal - BCD - excess three - Gray codes - Error correcting and detecting codes. (7)

DIGITAL CIRCUITS AND GATES: AND, OR, NOT, NAND and NOR gates - exclusive OR gates. Positive and negative logic systems - Digital integrated circuits-Characteristics -TTL and MOS logic circuits - Comparison. (6)

BOOLE ALGEBRA AND KARNAUGH MAPS: Boolean relations - Laws and theorems - Simplifications - Karnaugh maps and simplifications - Don’t care conditions - NAND-NAND realizations. (7)

COMBINATIONAL LOGIC: Design and Implementation of Half and Full adders - Subtractors - Parallel adders - Carry look ahead addition - Encoders and decoders - Multiplexers and De-multiplexers. (8)

SEQUENTIAL LOGIC: R-S, J-K, D and T type Flip-Flops - Binary counters: Ripple and synchronous types - UP/DOWN counters - Decade counters - Shift registers - Ring counters. (7)
OPERATIONAL AMPLIFIERS: Definition of terms - Inverting and non-inverting amplifiers, inverting summing amplifier, integrators and differentiators. (9)

A/D AND D/A CONVERTORS: DACs: weighted and binary ladder types - ADCs: counter, dual slope, successive approximation types. (9)

TEXT BOOKS:

REFERENCES:

15XW15 C PROGRAMMING

PROBLEM SOLVING: Introduction to Problem Solving- Program development- Analyzing and Defining the Problem- Modular Design – Algorithm - Flow Chart - What is a programming language-Types of programming language- Program Development Environment. (3)

C LANGUAGE: Introduction to C Language - C character set - Identifiers and Keywords - Data Types - Constants - Variables - Arrays - Declarations - Expressions - Statements - Symbolic constants - Operators and Expressions - Library Functions - Data Input and Output Functions. (6)

CONTROL STATEMENTS: While Statement - Do While Statement – For Loop – Nested Loop - If Else - Switch - Break - Continue - Comma Operator – goto Statement. (4)

FUNCTIONS: Defining Function - Accessing a Function - Passing Arguments to Functions - Specifying Arguments Data Types - Function Prototypes - Storage Classes - Auto - Static - Extern and Register Variables. (6)

ARRAYS: Defining Array – Processing array - Passing array to a function - Multi dimensional array - Array and strings. (4)

POINTERs: Declarations - Pointers to a function - Pointers and one dimensional arrays - Operating a pointer - Pointer and multi-dimensional arrays - arrays of pointers - passing functions to other functions. (7)

STRUCTURES AND UNIONS: Definition of Structure and Union - Processing a structure – Bit field representations - Structures and pointers - Passing structure to functions - Self-referential structures – Nested structure. (6)

FILES: File Structure concepts introduction - Definitions, concept of record, file operations: Storing, creating, retrieving, updating Sequential, relative, indexed and random access mode, Files with binary mode(Low level), performance of Sequential Files – Operations on Files – Types of Files, Various input and output functions on Files., Enumerated Data Type – Typedef - Preprocessor Directives - Command Line Arguments. (5)

REFERENCES:

TEXT BOOKS:

REFERENCES:

15XW16 ENGINEERING GRAPHICS AND GEOMETRIC MODELLING

INTRODUCTION: BIS specifications - lines, lettering, and dimensioning. Projection –types.
FIRST ANGLE PROJECTION: Introduction- Projection of points, lines, planes, and solids –parallel, perpendicular and inclined to planes.
ISOMETRIC PROJECTION: Introduction- prismatic and cylindrical components.
INTERACTIVE GRAPHICS: Parametric modelling – 1D, 2D and 3D geometry – transformations - display – points, lines using software.

CURVES: Types- parametric curves generation-displaying - evaluating points on curves.

SURFACES: Types- parametric surface generation-displaying - evaluating points on surfaces.

SOLIDS: Generation of part models using Computer Aided Geometric Modelling software.

TEXT BOOKS:

REFERENCES:

LAB:

Engineering Graphics using CAD

1. Introduction to CAD Software.
2. Exercise on first angle projection of
   a. Points  b. Lines
3. Exercise on projection of
   a. Planes b. Solids
4. Exercise on conversion of isometric to orthographic projection.
5. Exercise on orthographic to isometric projection.
6. Exercise on Sectioning of regular solids.
7. Exercise on Perspective projection of simple solids.

Geometric Modeling using a graphical programming language

8. Modeling and displaying a point and line using orthographic projection and performing simple geometric transformation.
9. Modeling and displaying of parametrically represented analytical curves
   a. Circle b. Ellipse
10. Modeling and displaying of parametrically represented synthetic curves
    a. Bezier Curve b. B-spline
11. Modeling and displaying of parametrically represented NURBS curve.
12. Modeling and displaying of parametrically represented synthetic surface.
    a. Planar surfaceb. Ruled surface

Total P: 60

15XW17 C Programming Lab

0 0 4 2

1. Simple programs to understand the concepts of data types.
2. Familiarizing conditional, control and repetition statements
3. Usage of single and double dimensional arrays including storage operation
4. Implementation of functions, recursive functions
5. Defining and handling structures, array of structures and union
6. Implementation of pointers, operation on pointers dynamic storage allocation
7. Creating and processing data files.

Total P: 60

15XW18 Material Science and Digital Electronics Lab

0 0 4 2

Material Science Lab:
1. Resistivity of an Alloy – Carey Foster's Bridge
2. Band Gap of Thermistor – Post Office Box
3. Thermal Conductivity of Metallic Wire – Wiedmann Franz law
4. Temperature co-efficient of Resistance – Post Office Box
5. Efficiency of Solar Cell
6. Band Gap Determination – Reverse Saturation Current
7. Photodiode Characteristics
8. Determination of Wavelength of laser source using grating

DIGITAL ELECTRONICS LAB :
1. Study of basic logic gates and realisation of logic gates using universal gates.
2. Multiplexer and demultiplexer.
3. Half and full adder / subtractor.
4. Encoder and decoder.
5. Binary decade counter.
6. BCD to seven segment decoder.
7. Study of D/A converter.
8. Crystal Oscillator using logic gates

Total P:60

SEMESTER 2

15XW21 PROBABILITY AND STATISTICS

3 2 0 4


RANDOM VARIABLES: Discrete and continuous random variables - probability mass function and density function - distribution function - Expectation and variance. Discrete distributions: Binomial, Poisson and Geometric - Continuous distributions: Uniform, Normal, Exponential and Weibull - Joint probability distributions - marginal and conditional distributions - statistical independence - Conditional expectation. (12+8)

LIMIT THEOREMS: Moments and moment generating functions- Limit theorems: Markov and Chebyshev inequalities, Law of Large numbers, Central Limit Theorem. (6+4)


CORRELATION AND REGRESSION: introduction - Estimation using the regression line - Correlation analysis -Limitations, errors, and caveats of using regression and correlation analyses - Multiple regression and correlation analysis. (6+5)

ANALYSIS OF VARIANCE: Introduction to design of experiments, Analysis of variance - Completely Randomized Design and Randomized Block Design. (3+2)

Total L:45+T:30 =75

TEXT BOOKS :

REFERENCES :

15XW22 APPLIED LINEAR ALGEBRA

3 2 0 4

LINEAR SYSTEMS: System of linear equations - Consistent and inconsistent systems - Geometric interpretation of linear system in 2 and 3 unknowns - Row reduction and Echelon forms – Vector equation – Matrix equation Ax=b - LU decomposition - Applications of linear systems. (6)

VECTOR SPACES: Euclidean n-space, General vector spaces, Subspaces, Linear independence, Basis and dimension, Row space, Column space. and Null space, Rank and nullity – Change of basis – Similarity - Isomorphism. (10)
LINEAR TRANSFORMATIONS: Introduction, Properties-Kernel and range, Linear Transformation from $\mathbb{R}^n$ to $\mathbb{R}^m$, Matrices of linear transformations. (9)


EIGEN VALUES AND EIGEN VECTORS: Eigen values and Eigen vectors - Diagonalization, Symmetric Matrices, Orthogonal Diagonalization – Singular Value Decomposition – Eigen values and linear transformations - Discrete Dynamical systems. (10)

TEXT BOOKS:

REFERENCES:

TUTORIAL PRACTICE:
1. Introduction to the software and its constructs
2. Solving system of Linear equations by direct methods and Iterative methods.
3. Finding the rank of the given matrix.
4. Finding if the given set of vectors is linear independent or dependent and finding the relationship between the vectors if the set is linearly dependent.
5. Finding images of Linear transformation from $\mathbb{R}^n$ to $\mathbb{R}^n$.
6. Finding the norm of the given vector and angle and distance between two vectors.
7. Constructing an orthonormal basis from the given basis using Gram-Schmidt Process.
9. Finding Eigen values and Eigen vectors of the given matrix and diagonalize the given matrix if possible.

Total L: 45+T: 30=75

15XW23 DATA STRUCTURES AND ALGORITHMS

INTRODUCTION: Software Development process – Abstraction - Data structures - Abstract data Types - Primitive data structures - Analysis of algorithms - Best, worst and average case time complexities –notation (4)

ARRAYS: Operations - implementation of one, two, three and multi dimension arrays – Sparse and dense matrices – Applications; (8)

STACKS: primitive operations - sequential implementation - Applications: Subroutine handling - Recursion – Expression Processing, Parentheses matching. (8)

QUEUES: Primitive operations - sequential implementation - Priority Queues - Dequeues - Applications: Image component labeling; Machine shop simulation. (5)


TREES: Terminologies - implementation - BINARY TREE: Properties - sequential and linked representation - common binary tree operations - traversals - Expression trees - Infix, Postfix and Prefix expressions - Threaded trees - Tournament trees - Heaps, Max heap, Min heap - Applications: Huffman codes. (8)

HASH TABLE: Introduction Hash Function – Collision – successful and unsuccessful search. (3)

SORTING: Insertion Sort, Selection Sort, Sheel sort, Bubble Sort, Heap Sort, Radix Sort – Algorithms and their time complexity. (6)

TEXT BOOKS:

REFERENCES:

15XW24 OBJECT ORIENTED PROGRAMMING


FUNCTIONS IN C++: Function Prototyping - Call by Reference - Return by reference - Inline functions - Default, Const Arguments - Function - Overloading - Friend and Virtual Functions - Classes and Objects - Member functions - Nesting of Member functions - Private member functions - Memory allocation for Objects - Static data members - Static Member Functions - Arrays of Objects - Objects as Function Arguments - Friend Functions - Returning Objects - Const Member functions - Pointers to Members.

CONSTRUCTORS: Parameterized Constructors - Multiple Constructors in a Class - Constructors with Default Arguments - Dynamic Initialization of Objects - Copy and Dynamic Constructors – Destructors overloading.

OPERATOR OVERLOADING: Overloading Unary and Binary Operators - Overloading Binary Operators using Friend functions – Operator Type conversion.


TEMPLATES & EXCEPTION HANDLING: Introduction to Templates, Generic Functions and Generic Classes – Exception Handling – Examples.

STREAMS: String I/O - Character I/O - Object I/O - I/O with multiple Objects - File pointers - Disk I/O with member functions.

TEXT BOOKS:

REFERENCES:

15XW25 COMPUTER ORGANIZATION

DATA AND INSTRUCTION FORMATS: Data types - fixed point and floating point number representation - representation of signed numbers - alphanumeric data representation.

REGISTER TRANSFER AND MICRO OPERATIONS: Register transfer language - inter register transfer - arithmetic micro operations - logic micro operations - shift micro operations - control functions – Arithmetic Logic Shift Unit.
ARITHMETIC AND LOGIC UNIT: Addition/subtraction, multiplication and division with signed numbers. (5)


CENTRAL PROCESSING UNIT: Processor bus organization - stack organization - instruction formats - addressing modes - data transfer and manipulation - RISC and CISC machine characteristics. (5)

MEMORY AND INPUT-OUTPUT UNITS: Memory hierarchy - main memory: RAM and ROM address spaces - associative memory - virtual memory - cache memory – address mapping. (7)

PERIPHERAL DEVICES: I/O interface - I/O bus versus memory mapped I/O - example of I/O interface – DMA - Input-Output processor. (6)

MULTIPROCESSOR SYSTEM ORGANIZATION: Characteristics of Multiprocessors - interconnection structures - cross bar switch, time-shared common bus, multiport memory. (5)

TEXT BOOKS:

REFERENCES:

15XW26 OBJECT COMPUTING LAB

1. Implementation of arithmetic operations using array of objects and dynamic data members.
2. Creation of a class having read-only member function and processing the objects of that class.
3. Creation of a class which keeps track of the member of its instances. Usage of static data member, constructor and destructor to maintain updated information about active objects.
4. Illustration of a data structure using dynamic objects.
5. Usage of static member to count the number of instances of a class.
6. Illustration for the need of default arguments.
7. Usage of a function to perform the same operation on more than one data type.
8. Creation of a class with generic data member.
9. Overloading the operators to do arithmetic operations on objects.
10. Acquisition of the features of an existing class and creation of a new class with added features in it.
11. Implementation of run time polymorphism.
12. Overloading stream operators and creation of user manipulators.
13. Implementation of derived class which has direct access to both its own members and the public members of the base class.
14. Implementation of Streams to store and maintain Library system, with the features of Book Issue and Book Return.

Total P: 60

15XW27 DATA STRUCTURES LAB

1. Sparse & dense Matrix operations using arrays.
2. Stacks using array representation.
3. Conversion of infix expression to postfix expression and evaluation.
4. Queues using array representation.
5. Linked Lists: Singly linked, Doubly linked and Circular lists and applications.
6. Linked Stacks and Queues.
7. Conversion and Manipulation of Expressions.
8. Binary trees and Threaded trees (with graphical representation).
10. Implementation and analysis of Hash Table with collision handling.

Total P: 60

15XW28 WEB DESIGNING LAB
INTRODUCTION: WWW – presentation / business logic layer-Browser architecture – HTTP architecture, Methods.


TEXT BOOKS:

REFERENCES:

1. Create a simple website using html.
2. Create a website using CSS and JavaScript.
3. Create a simple php page to get the name of the user.
4. Create a form and receive the data using php.
5. Create and upload a website to the web using FTP.

Total P: 60

SEMESTER 3

15WX31 DISCRETE STRUCTURES


RELATIONS AND FUNCTIONS: Relations and their properties – Representing relations – Closures of relations – Partial orderings. Functions-Definitions – Composition of functions – Inverse functions – Binary and n-ary operations – Characteristic functions – Hashing function. (6+4)

COUNTING: Permutation and Combination – Generalized Permutation and Combination – Generating Permutation and Combination - Advanced counting techniques - Recurrence relation, Solving recurrence relations using characteristic roots. (7+5)

FORMAL LANGUAGES: Four classes of grammars (Phrase Structure, Context sensitive, Context Free, Regular) - Context free languages: generation trees - ambiguity. (3+2)

FINITE AUTOMATA: Finite State Automata (DFA) - Non-deterministic Finite State Automata (NDFA) - Conversion of NDFA to DFA - Equivalence of regular grammar and finite automata. (6+4)

PUSH DOWN AUTOMATA: Acceptance by final state and empty store, Equivalence of acceptance by final state and empty store, Equivalence of PDA's and CFL's. (7+5)

TURING MACHINES: Construction of simple Turing Machines - Universal Turing Machines - Halting problem. (6+3)

Total L: 45+T: 30=75

TEXT BOOKS:
REFERENCES:

15XW32 DATABASE MANAGEMENT SYSTEM
3 0 0 3


RELATIONAL MODEL: Introduction to Relational Data Model – Basic concepts – Enforcing Data Integrity constraints – Relational Algebra Operations – Extended Relational Algebra Operations


TRANSACTION PROCESSING AND CONCURRENCY CONTROL: Transactions, Locking techniques, Concurrent access, Deadlock handling


Total L:45

TEXT BOOKS:

REFERENCES:

15XW33 TRANSFORM TECHNIQUES
3 2 0 4

TRANSFORM METHODS: Basic waveforms and their properties, Operational calculus, concept of transformation, integral transforms, kernel of a transform, examples of transforms, linearity property.


DISCRETE FOURIER TRANSFORM: Discrete convolution – Periodic sequence and circular convolution – Decimation- in-time and decimation-in-frequency algorithms – Computation of inverse DFT. (7+5)


DISCRETE WAVELET TRANSFORM: Discretization, Orthonormal wavelets, Haar-wavelet, Shannon-wavelet, Daubechies-wavelet. Comparison with Fourier series. Case studies – Energy compaction and compression for 1-d and 2-d signals. (8+5)

Total L:45+T:30=75

TEXT BOOKS:

REFERENCES:

15XW34 ADVANCED DATA STRUCTURES

INTRODUCTION: Algorithm – analysis of algorithms – best case and worst case complexities, analysis of some algorithms using simple data structures, Amortized time complexity. (4)

BINARY SEARCH TREES: Searching – Insertion and deletion of elements – Analysis. (2)

AVL TREES: Definition – Height – searching – insertion and deletion of elements, AVL rotations – Analysis. (3)

SPLAY TREES: Definition, splay steps, searching, insertion and deletion, Amortized analysis. (2)

MULTIWAY SEARCH TREES: Indexed Sequential Access – m-way search trees – B-Tree – searching, insertion and deletion - B+ trees - Tries. (4)

GRAPHS: Definition – representations (Adjacency matrix, packed adjacency list and linked adjacency list) – network representation – Graph search methods (Breadth first and depth first traversals). (4)

DIVIDE AND CONQUER: Method – examples – Merge sort, Quick sort, Binary Search. (5)

GREEDY METHOD: Optimization problems – method – examples – Minimum cost spanning tree (Kruskal’s and prim’s algorithms), Topological sorting, optimal storage on tapes. (4)

DYNAMIC PROGRAMMING: Method – examples – All pairs shortest path problem – Traveling salesman problem. (4)

BACK TRACKING: Method – Examples – Eight queen’s problem, Hamiltonian Cycles. (4)

BRANCH & BOUND: Method – Examples – 0/1 Knapsack, Traveling Salesman problem. (4)


Total L:45

TEXT BOOKS:

REFERENCES:

**15WX35 MICROPROCESSOR SYSTEMS AND PROGRAMMING**

**INTRODUCTION TO MICROPROCESSORS:** Evolution of Microprocessors - Microprocessor based systems - Advantages and limitations. (5)

**INTEL 8086/88 PROCESSOR:** Block diagram of 8086 - Addressing modes – Instruction format - Instructions - assembler directives – Construction of Machine code. (6)

**ASSEMBLY LANGUAGE PROGRAMMING:** Programs for multi precision addition, subtraction-block moves-array processing-string processing-procedures and macros. (5)

**INTERRUPT SYSTEMS:** Advantages and disadvantages of interrupts - Interrupt systems of 80x86 processors – Programmable Interrupt Controller. (4)

**ADVANCED MICROPROCESSORS:** Comparison of 286,386 processors with 8086-memory paging mechanisms-features of 486 and Pentium processors. (4)

**PROTECTED MODE PROGRAMMING:** Protected mode - descriptor tables-operation-programming. (5)

**PENTIUM PROCESSOR:** Special Pentium Registers – Super scalar Architecture – Pipelining – Branch Prediction. (5)

**MEMORY DESIGN:** Design of Memory sections for 8086 and 8088 Microprocessors. (5)

**BASIC I/O INTERFACE:** I/O port address decoding-useful I/O hardware - I/O devices - Programming Peripheral Interface – Direct Memory Access. (6)

**TEXT BOOKS:**

**REFERENCES:**

**15WX36 RDBMS LAB**

**SQL**
1. Working with DDL and DML commands of SQL for creation and manipulation of single, multiple tables.
2. Working with Triggers and stored procedures.
3. Developing a Package using a database.
   **Note:** Problem Sheets will be provided.

**15WX37 ADVANCED DATA STRUCTURES LAB**

Implementation of the following problems:
1. Binary search Trees and its operations with graphical display.
2. Demonstration of AVL Rotations.
4. An appropriate illustration using graphs and graph traversals.
5. Divide and Conquer versions of Merge sort, Quick sort and binary search.
6. Greedy method implementation of Topological sort, Minimum cost spanning tree.
7. Dynamic Programming implementation of Traveling Salesperson problem.
8. Eight queen’s problem backtracking.

**15XW38 ASSEMBLY LANGUAGE PROGRAMMING LAB**

1. Study of Assembler (Turbo) and Assembler Directives.
2. Study of INT 21H functions for input and output.
3. Multi-precision addition and subtraction.
4. Packing and unpacking of BCD digits.
5. Conversion of BCD numbers into ASCII characters and vice versa.
6. Delay loop implementation.
7. Arrangement of numbers in ascending and descending order.
8. Checking whether a given character string is a PALINDROME.
10. BCD to Binary conversion and vice versa.
11. To check whether a given string is a substring of another.
12. Implementation of LEFT(), RIGHT(), SUBSTR() functions.
13. To display the contents of the given memory locations.
15. To find the Minimum and the Maximum number of a given array.

Total P:60

**SEMESTER 4**

**15XW41 ACCOUNTING AND FINANCIAL MANAGEMENT**

**COST ACCOUNTING:** Cost classification - significance of overhead Cost - Preparation of Cost sheet - Concept of cost volume profit analysis - Concept of variance - Principles of Job Costing, batch costing and Process costing - Operating Costing - Modern techniques/concepts of Cost Control/ Cost Management. (14)

**FINANCIAL ACCOUNTING:** Double Entry Book keeping concepts - Journalisation of Business Transactions - Subsidiary Books - Preparation of Profit and Loss Account and Balance sheet from Trial balance - Simple problems - Methods of depreciation. (16)

**FINANCIAL RATIO ANALYSIS:** Uses and Nature - preparation of Liquidity Ratios - coverage Ratios and profitability Ratios from profit & Loss Account and Balance sheet - common size Income statement and common size Balance sheet. (11)

**GOALS AND FUNCTIONS OF FINANCIAL MANAGEMENT:** Finance function - Importance of Corporation finance - objectives of Financial Management - organization of the finance function - concept of time value of money. (6)

**PRINCIPLES OF CAPITAL BUDGETING:** Kinds of capital Budgeting Decisions - Evaluation of proposals from the given cash inflows - Net present value versus Internal rate of return method problems. (6)

**WORKING CAPITAL MANAGEMENT:** Definition and importance of working capital - factors affecting working capital - Inventory management - simple problems - Receivables Management - cash Budget Preparation - Estimate of overall working capital requirements - Various sources of financing. (7)

Total L:60

**TEXT BOOKS:**

**REFERENCES:**

**15XW42 DATA COMMUNICATION NETWORKS**

**BASIC CONCEPTS:** Introduction to Network Applications – Categories of Networks – Layered Architecture - The OSI Model – Functions of the Layers. (5)
DATA TRANSMISSION: Types of Network - Network Topologies - Analog and Digital data transmission - Data encoding - Bandwidth and data rate- Bit Rate, Baud Rate - Sampling Rate.

CONNECTING DEVICES: Cabling - Auto crossover detection - Repeaters, Hubs, Bridges, Switches, Routers, Backbone networks

SWITCHING: Circuit Switching - Space Division Switches - Time Division Switches - Space and Time Division Switch Combinations - Packet switching - Datagram Approach - Virtual Circuit Approach - Connection oriented Vs Connectionless Services.


DATA LINK CONTROL AND PROTOCOLS: Line Discipline - Flow Control - Error control - Stop and Wait - Sliding Window - Synchronous Protocols - High Level Data Link Control, PPP.

MULTIPLE ACCESS: Random access - Controlled access - Channelization - Local Area networks - Traditional Ethernet - Fast Ethernet, Gigabit Ethernet - Ethernet over optical links - SONET-SDH


TEXT BOOKS:

REFERENCES:

15XW43 OPERATIONS RESEARCH


LINEAR PROGRAMMING: Graphical method for two dimensional problems - central problems of Linear Programming - Definitions - Simplex - Algorithm - Phase I and Phase II of Simplex Method - Revised Simplex Method.


DECISION THEORY: Decision processes - Naive decision criteria - Decision trees - Utility - Von Neumann Utilities


SIMULATION: Introduction to Simulation - Simulation study - Types of Simulation - Limitations of Simulation - Areas of Simulation - Simulation of Queues, Networks and Inventory models.

TEXT BOOKS:
REFERENCES:

15XW44 OPERATING SYSTEMS


PROCESS AND THREADS: Relationship between process and threads – Thread State – Thread Synchronization – Types of Thread – Multithreading model

PROCESS SCHEDULING: Scheduling basics - CPU-I/O interleaving - (non-)preemption - context switching - Types of Scheduling – Scheduling Criteria – Scheduling Algorithms.


VIRTUAL MEMORY MANAGEMENT: Need for Virtual Memory management – Demand Paging – Copy on write - Page Fault handling – Demand Segmentation – Combined demand segmentation and paging - Thrashing- working set model.


CASE STUDIES: UNIX, Linux, Windows NT.

TEXT BOOKS:

REFERENCES:

TUTORIAL PRACTICE:
1. Practicing UNIX Commands
2. Writing SHELL Scripts
3. Writing programs using UNIX System Calls
4. Process Creation and Execution
5. Thread Creation and Execution
6. Process / Thread Synchronization using semaphore
7. Developing Application using Inter Process communication (using sharedmemory, pipes or message queues)
8. Implementation of Memory Management Schemes
9. Implementation of file allocation technique (Linked, Indexed, Contiguous)

Total L: 45+T: 30=75

15XW45 SOFTWARE ENGINEERING TECHNIQUES


SOFTWARE PLANNING: Software Project Estimation - different techniques of project cost estimation Decomposition technique - COCOMO & PUTNAM models. (3)


CASE STUDIES (4)

Total L: 45

TEXT BOOKS:

REFERENCES:

15XW46 COMPUTER NETWORKS LAB

0042

1. Study of different types of Network cables and Practically implement the cross-wired cable and straight through cable using clamping tool.
2. Parallel Communication using 8 bit parallel cable
3. Serial communication using RS 232C
4. Network Protocol Analysis
5. Operating Systems and LAN Implementation
6. Study of basic network command and Network configuration commands.
7. Configure a Network topology using packet tracer software.
8. Familiarizing with various tools like Ethernet analyser, traffic generation (XIA)
9. PPP client server connection
10. Configure a Network using Distance Vector Routing protocol

Total P: 60

15XW47 WINDOWS PROGRAMMING LAB

0042


.NET PROGRAMMING USING C#: Introduction to NET - C# Language Features - OOP with C# - Types and members - Inheritance and Interfaces – Delegates - Events - Lambda Expressions – Generics - NET Framework APIs - File Handling and
Serialization - LINQ to Objects - ADO.NET Entity Framework - Memory Management APIs - Threading -Thread pool- Signaling events- Synchronization.

**WINDOWS PRESENTATION FOUNDATION:** WPF concepts and features - Creating a simple WPF application - Event Handling - Creating a User Interface - Managing Windows - Resources, Styles, and Triggers - Control Templates - Data Binding in WPF - Binding to LINQ and XML - Multithreading with WPF.

**TEXT BOOKS:**

**REFERENCES:**

**EXERCISES:**
1. Applications using MFC.
2. Windows forms applications using .NET
3. Building custom controls using .NET framework
4. Windows applications using Data binding
5. Standalone and Web Applications using WPF

**TOTAL P:60**

---

**15XW48 MATHEMATICAL COMPUTING LAB**

**0 0 4 2**

**TRANSFORM TECHNIQUES:**
1. Construct basic waveforms and interpret their properties.
2. Solve Differentiation, integration and differential equations.
3. Evaluate Laplace transform and its inverse.
4. Solve initial value problems using Laplace transform techniques.
5. Evaluate Harmonics of Fourier series and its expression.
6. Find Infinite Fourier transform and inverse.
7. Find Infinite Fourier sine and cosine transform.
8. Sampling of Continuous function.
11. Construct planes, lines, skew lines, circle and sphere in 3D geometry.

**OPTIMIZATION TECHNIQUES:**
1. Solving L.P.P using Simplex, Two phase Dual Simplex and Revised Simplex methods.
2. Finding initial basic feasible solution by North-West corner rule, Matrix minimum method and Vogel’s approximation method and also perform optimality test by Modi method.
5. Solving Simulation problems.

**TOTAL P:60**

---

**SEMESTER 5**

**15XW51 UNIX ARCHITECTURE AND PROGRAMMING**

**3 0 0 3**


**FILE SYSTEM STRUCTURE:** Kernel architecture - Kernel data structure - Buffer Cache - Structure of Buffer pool - Scenarios for buffer retrieval - Reading and Writing disk blocks - Advantages and Disadvantages of buffer cache - Inode - Structure of regular file - Conversion of a pathname to an inode - Inode assignment to a new file - allocation of disk blocks.

**TOTAL P:60**

---

22


TEXT BOOKS:

REFERENCES:

15XW52 JAVA PROGRAMMING


EXCEPTION HANDLING: Fundamentals - Exception types - Uncaught Exception - Using Try and Catch - Multiple catch clauses - Nested Try statements - Throw - Throws - Java Built-in Exception - Creating your own subclasses.

MULTI THREADED PROGRAMMING: Java thread model - Priorities - Synchronization - Messaging - Thread class and runnable Interface - Main thread - Creating the Thread - Synchronization - Interthread Communication – Deadlock.


TEXT BOOKS:

REFERENCES:

15XW53 TCP/IP NETWORKS AND APPLICATIONS


ROUTING: IP forwarding – Core Routers – Peer backbones – AS – Vector Distance Routing – Linkstate Routing – Path Vector Routing – RIP, OSPF

TCP&UDP: Ports, UDP header, TCP header, connections, ACK, sliding windows, options, connection states: Analysing packets – performance measurements– Congestion control – Quality of Service- Integrated Services

APPLICATION LAYER: DNS – TELNET – FTP – SMTP - SNMP - HTTP.

SECURITY- Firewalls and Internet Access – Packet Level Filters – Firewall Architecture- DMZ, proxy servers, IDS-VPN- Need for VPN-Addressing and Routing – Application Gateway – Network Address Translation (NAT) – Multi Address NAT – Port Mapped NAT

TEXT BOOKS:

REFERENCES:

15XW54 OBJECT ORIENTED ANALYSIS AND DESIGN


UNIFIED PROCESS: Phases – Inception, Elaboration, Construction, Transition.

UML: The importance of modeling - Basic structural modeling – Advanced Structural modeling – Basic behavioral modeling – Advanced behavioral modeling – Architectural modeling.


TEXT BOOKS:

REFERENCES:

TUTORIAL PRACTICE:
UML Modeling for Case Studies:
1. Use case diagram for credit card processing
2. Sequence diagram and Collaboration diagram for database connectivity
3. Interaction diagram for grocery shopping
4. Activity diagram for order processing
5. State diagram for CPU execution
6. Class diagram for electronic shopping cart
7. Package diagram for web server connection
8. Deployment diagram for TCP/IP layout

15XW56 JAVA PROGRAMMING LAB
1. To create runtime polymorphism using abstract class, interface
2. To create callback feature using interface.
3. To create a program for interface inheritance
4. To implement a user defined package
5. To implement a user defined checked exception and unchecked exception
6. To create threads, thread groups
7. To create inter-thread communication using shared memory, piper stream.
8. To implement socket connections (UDP, TCP).

Total P:60

15XW57 TCP/IP APPLICATIONS LAB

1. Introduction to a network simulator like NS-2.
2. Using a simulator configure a router.
3. Static and default routing.
4. Configure and test RIP and OSPF.
5. Create a TCP socket between a server and a client and authenticate the user.
6. Implement a Package using the concepts of socket programming.

Total P:60

15XW58 UNIX SHELL AND SYSTEM PROGRAMMING LAB

1. Simple Bash shell Programs with basic Unix Commands – Essential Commands, General Purpose Utilities, Filters, Process and Communication.
2. Bash Shell Programs using advanced programming concepts like getopt.
3. Low level File, Process and IPC System Calls using C.
4. Implement a package using Shell Programming / System Calls
   Note: Separate Problem Sheets will be provided for Shell and System Calls.

Total P:60

SEMESTER 6

15XW61 PRINCIPLES OF COMPILER DESIGN


MACRO LANGUAGE AND MACRO PROCESSORS: Macro instructions, features of a macro facility – implementation. (6)

LOADERS: Loader schemes – compile and go loaders, general load scheme – absolute loaders – direct linking loaders and their design. Other loading schemes: linking loaders, overlays, dynamic binders. (6)

COMPILERS: Introduction – Structure of a compiler – phases of a compiler - compiler writing tools - Bootstrapping. (2)

LEXICAL ANALYSIS: Role of a lexical analyzer – finite automata – regular expressions to finite automata – minimizing the number of states of a deterministic finite automata – implementation of a lexical analyzer. (6)


Automatic Parsing Techniques – LR parsers – canonical collection of LR (0) items – construction of SLR parsing tables. (3)

INTERMEDIATE CODE GENERATION: Postfix notation, Quadruples, triples, indirect triples, Translation of Expressions - control flow – Representing information in a symbol table – introduction to code optimization – basic blocks – DAG representation – error detection and recovery - code generation. (8)

Total L:45

TEXT BOOKS:

REFERENCES:

15XW62 MACHINE LEARNING


REFERENCES:

REFERENCES:

15XW63 SOFTWARE PATTERNS

INTRODUCTION TO PATTERNS: Reusable object oriented software, Motivation, Best design practices of object oriented software, Coupling and Cohesion, Types of Cohesion and Coupling, Benefits of patterns, Definition of a Pattern, Types, Pattern description, Pattern Language, IDIOMS, Framework, Architecture.

REFERENCES:
REFERENCES:

TUTORIAL PRACTICE:
1. Developing object oriented systems using Design Patterns.
2. Designing and giving architectural solutions to real time systems using Architectural Patterns.
3. Refactoring open source projects using Refactoring tools.
4. Develop simple refactoring tools.
5. Adopt new refactoring techniques to make the implementation more reusable.

Total L: 45+T:30=75

15XW64 SOFTWARE TESTING

INTRODUCTION: Need for testing – Psychology of testing – Testing economies – Types of testing – SDLC and testing – Verification and Validation.

DEVELOPING A TEST APPROACH: Defining a software system testing strategy - Developing software system testing tactics - Testing tools – Test Plan and Test Cases.

TESTING A SOFTWARE USING A LIFE CYCLE METHODOLOGY: Requirements phase testing - Design phase testing - Program phase testing - Desk debugging and program peer view test tools - Evaluating test results - Installation phase testing - Acceptance testing.

TESTING METHODOLOGY FOR SOFTWARE MAINTENANCE: Testing the correctness of the installing a software change - Testing the validity of a software cost estimate - Testing the progress of the software system - Inspecting test plan and test cases - Software Inspection - Costs and Benefits - Overview - The Inspection Process.

TESTING OBJECT ORIENTED SOFTWARE: Challenges – Differences from testing non-OO software – Class testing strategies – class modality – State based testing.


TEXT BOOKS:

REFERENCES:

TUTORIAL PRACTICE:
1. Preparation and Review of SRS and Design documentation for developed package.
2. Exercise for code review process.
3. Prepare test plan for developed package.
4. Prepare test cases for Unit Testing.
5. Prepare test cases for System and Integration Testing.
6. Prepare test cases for Acceptance (End to end scenario) and Regression testing.
7. Execute Test cases for each scenario and document the outcome (Bugs raised, status, verification etc).
9. Update the different versions of the code onto a Version Control System.
10. Test the package for load, performance and other non-functional requirements using open source tools.
15XW66 PRINCIPLES OF COMPILER DESIGN LAB

2. Study of basic features of DOS and UNIX internals.
3. Design and Implementation of a Text Editor.
5. Design and Implementation of a Macro Processor.
6. Implementation of Transition diagram to strip off comment statements from a given source file.
8. Design and Implementation of a Symbol Table Manager.
9. Implementation of the following Parsing algorithms.
   a. Recursive descent Parser  
   b. Shift reduce Parser.
10. Implementation of a Syntax Directed Translation Engine to

Total P:60

15XW67 MACHINE LEARNING LAB

Download the datasets from UCI machine learning repository / www.kaggle.com for classification and clustering
1. Implement the following Classification algorithms for the above datasets
   a. Naïve Bayes Algorithm
   b. Decision tree
   c. SVM
   d. K nearest neighbor
2. Do tenfold cross validation experiments and statistical validation using t-test and ANOVA
3. Implement different clustering techniques

Total P:30

15XW68 DISTRIBUTED ENTERPRISE COMPUTING LAB

CLIENT/SERVER COMPUTING: Approaches to client server computing – enterprise architectural overview - component based software development for enterprise – java enterprise system - operating system services for client – server types – server side scripting – operating system services for client – client and server software requirements
DISTRIBUTED ENTERPRISE SYSTEMS: Services using EJB: Naming Services, Directory and Trading services, Activation Services, Transaction Services, Security Services
FRAMEWORKS: Struts - Java Server Faces – Spring – Hibernate – Ruby on Rails

TEXT BOOKS:

REFERENCES:
1. George Reese, "Database programming, with JDBC and Java", O'Reilly, 2013.

**Programs to demonstrate:**
1. Develop a host application and install it in another system.
2. Convert the developed application to two, three and multi-tiered application using the latest front and back end technologies.
3. Migrate the application to distributed environment.
4. Demonstrate the communication between the tiers using interfaces.
5. Session beans.
7. RMI communication between two applications.
8. Web Service with its client.
9. Conversion of entity bean to web service.
10. Application using any one of the frameworks.

Total P: 60

**SEMESTER 7**

**15XWP1 PROJECT WORK I**

**SEMESTER 8**

**15XW81 DATA MINING**

**INTRODUCTION:** Motivation for Data Mining – Importance – Definition – Kinds of data for Data Mining – Data Mining functionalities – Patterns – Classification of Data Mining Systems – Major issues in Data Mining.  

(3)

**DATA PREPROCESSING:** Types of data, Data cleaning, Aggregation, Sampling – Data Reduction – Feature subset selection - \( \chi^2 \) and Information Gain.  

(5)

**DATA WAREHOUSE and OLAP TECHNOLOGY:** Overview- Need for Data Warehouse- multidimensional data model-Data Warehouse architecture - Data warehousing Schemas - Data Warehousing to Data mining  

(5)

**MINING FREQUENT PATTERNS, ASSOCIATIONS AND CORRELATIONS:** Basic concepts – Efficient and Scalable Frequent Itemset Mining methods – Apriori, FP Tree.  

(5)

**ENSEMBLE OF CLASSIFIERS:** Classification – Evaluating the accuracy of a classifier- Ensemble Learning– Bagging, Boosting, Cascading – Ensemble pruning.  

(5)

**CLUSTERING:** Categorization of major clustering methods – density based methods –DBSCAN, OPTICS, DENCLUE- Outlier analysis.  

(3)

**MINING DATA STREAMS:** Challenges-Mining time- Series databases and sequence data – Stationary data stream learning- Hoeffding trees- Evolving data stream mining.  

(5)

**MINING MASSIVE DATA SETS:** Challenges- Distributed file system – Introduction to Map Reduce- Mining high dimensional association rules- CARPENTER- classifying high-dimensional data- PLANET- clustering high-dimensional Data-BIRCH-Distributed Data Mining  

(8)

**APPLICATIONS AND TRENDS IN DATA MINING:** Spatial Data Mining – Graph Mining- Web Mining – Text Mining.  

(6)

Total L: 45

**TEXT BOOKS:**
REFERENCES:

15XW82 SOFT COMPUTING

ARTIFICIAL INTELLIGENCE AND SOFT COMPUTING: Subject of AI -- Problem solving by intelligent search -- Breadth First Search, Depth First Search, Iterative Deepening, Hill Climbing, Iterative Deepening, A*, Best First Search. (7)


FUZZY SET THEORY: Basic Definitions and Terminologies -- Set theory operations -- Membership function formulation and parameterization -- Fuzzy rules and reasoning -- Extension principle and fuzzy relations, Fuzzy if then rules, Fuzzy reasoning -- Fuzzy Inference Systems -- Mamdani fuzzy model, Sugeno Fuzzy models, Tsukamoto fuzzy models. (13)


TEXT BOOKS:

REFERENCES:

15XW83 SOFTWARE PROJECT MANAGEMENT

INTRODUCTION: Software Projects various other types of projects - Problems with software projects - an overview of project planning - Project evaluation - Project Analysis and technical planning - Project estimates - Preparation of Estimates - COCOMO model - Function Point Analysis - Putnam Model - Non-development overheads. (10)

ACTIVITY PLANNING: Project schedules - Sequencing and scheduling projects - Network planning models - Shortening project duration - Identifying critical activities. (9)

RISK MANAGEMENT: Resource allocation - Monitoring and Control - Managing people and organizing teams - Planning for small projects - Handling large projects - Divide and Conquer - Software Project survival. (9)

SOFTWARE CONFIGURATION MANAGEMENT: Basic functions, responsibilities, standards, configuration Management, Prototyping - Models of prototyping. (9)

Case study using Project management tools. (8)

TEXT BOOKS:

15XW86 DATA MINING LAB

1. Implementation of data mining techniques using WEKA.
2. Implementation of Association rule mining using Apriori algorithm and FP Growth algorithm.
3. Classification rules using Decision Tree classifier, Ensemble of Classifiers.
4. Implementation of clustering algorithms.
5. Case studies using R programming.
6. A Package using data mining techniques based on research papers.

Total P: 60

15XW87 SOFT COMPUTING LAB

Develop the following packages:

1. Define an application and implement using Fuzzy Logic.
2. Define an application and implement using Genetic Algorithm.
3. Define an application and implement using any type of Neural Network.
4. On any one of the application, suggest an improvement using any other technique.

Note: The applications should be based on Research Publications.

Total P: 60

15XW88 CASE STUDY LAB

Assigned based on the area of interest of the student.

Total P: 60

SEMESTER 9

15XW91 PRINCIPLES OF MANAGEMENT AND BEHAVIOURAL SCIENCES

PRINCIPLES OF MANAGEMENT: Meaning, Definition and Significance of Management, Basic Functions of Management – Planning, Organizing, Staffing, Directing and Controlling. Organizational Environment – Social, Economic, Technological and Political. Corporate Social Responsibility - Case discussion


Organizational Behaviour: Significance of OB, Impact of culture on organization. Role of leadership and leadership styles. Personality and Motivational Theories. Attitudes, Values and Perceptions at work - Case discussion

Group Behaviour: Group dynamics, Group formation and development, group structure and group cohesiveness. Informal organization – Sociometry – Interaction analysis - Exercises


Total L: 45
15XW92 WEB SERVICES


VALID XML DOCUMENT: Document Type Declarations and Document Type Definitions (DTDs) - Internal and External DTDs - Validating XML documents using DTD - Entities and Attributes - General and Parameter Entities.


JSON: Introduction to JSON - JSON Data Structure - JSON Object, Text - Comparison with XML - Validating JSON using JSON Schema - JSON Lint - Creating / Parsing JSON Messages with JavaScript.


WSDL & UDDI: WSDL Document structure - Types, Messages, Port Types, Bindings, Ports, Services - SOAP Binding - HTTP GET and POST Binding.


Designing Read-only Services - Designing Read-Write Services - Resource Oriented Services vs SOAP based Services.

Total L: 45

TEXT BOOKS:

REFERENCES:

15XW93 INFORMATION RETRIEVAL

INTRODUCTION: Overview of IR Systems - Historical Perspectives - Goals of IR - The impact of the web on IR - The role of artificial intelligence (AI) in IR.

TEXT REPRESENTATION: Statistical Characteristics of Text: Zipf's law; Porter stemmer; morphology; index term selection; using thesauri.

Basic Tokenizing, Indexing: Simple tokenizing, stop-word removal, and stemming; inverted indices; Data Structure and File Organization for IR - efficient processing with sparse vectors.


TEXT CATEGORIZATION AND CLUSTERING: Categorization: Rocchio; Naive Bayes, kNN; Clustering: Agglomerative clustering; k-means; Expectation Maximization (EM); Dimension Reduction: LSI, PCA.

INFORMATION FILTERING TECHNIQUES: introduction to Information Filtering, Relevance Feedback - Applications of Information Filtering. RECOMMENDER SYSTEMS: Collaborative filtering and Content-Based recommendation of documents and products.

WEB SEARCH: IR Systems and the WWW - Search Engines: Spidering, Meta Crawlers; Link analysis: Hubs and Authorities, Google PageRank, Duplicate Detection

INFORMATION EXTRACTION AND INTEGRATION: Extracting data from text; Basic Techniques: NE Recognition, Co-reference Resolution, Relation Extraction, Event Extraction; Extracting and Integrating specialized information on the web, Web Mining and Its Applications.

TEXT BOOKS:

REFERENCES:

15XW96 INFORMATION RETRIEVAL LAB

EXERCISES
1. Building a web crawler
2. HITS/PageRank for ranking of Web Pages
3. Spam detection personal mails in R
4. Build a simple recommender system
5. Designing a personalized Search Engine
6. Identifying near duplicates in web pages
7. Extracting information from web pages
8. Designing a Desktop search engine

Total P: 60

15XW97 WEB SERVICES LAB

2. Simple case studies to understand JSON
3. Developing a case-study to test web services technology.
4. Developing and deploying web services using .NET, J2EE.
5. Simple exercise to create RESTful services.

Total P: 30

15XW98 OPEN SOURCE SOFTWARE LAB


RUBY PROGRAMMING LANGUAGE: Foundations and Scaffolding – Ruby Building Blocks, Ruby Ecosystem, The Core of Ruby - Classes, Objects, and Modules, Projects and Libraries, Error Handling, Files and Databases, Files and Databases, Deploying Ruby


**TEXT BOOKS:**

**REFERENCES:**

**EXERCISES:**
1. Discovering the GitHub collaboration platform.
2. Lab assignments using NumPy/SciPy, SQLAlchemy, PyTables, PyQt, TreeDict, Sage.
3. Lab exercises in Ruby.

**SEMINTER 10**

**15XWP2 PROJECT WORK II**

**0 0 0 12**

**PROFESSIONAL ELECTIVES**

**15XWA1 MODELLING AND SIMULATION**

**3 2 0 4**

**PRINCIPLE OF COMPUTER MODELLING AND SIMULATION**: Monte Carlo simulation. Nature of computer modeling and simulation. Limitations of simulation, areas of application. (3)

**SYSTEM AND ENVIRONMENT**: Components of a system - discrete and continuous systems. Models of a system - A variety of modelling approaches. (4)


**RANDOM NUMBER GENERATION**: Techniques for generating random numbers - Midsquare method - The midproduct method - Constant multiplier technique - Additive congruential method - Linear congruential method - Tausworthe method - Tests for random numbers - The Kolmogorov_Smirnov test - The Chi-square test. (5)


**DESIGN AND EVALUATION OF SIMULATION EXPERIMENTS**: Input - Output analysis - variance reduction techniques - Antithetic variables - verification and validation of simulation models. (5)

**DISCRETE EVENT SIMULATION**: Concepts in discrete-event simulation, manual simulation using event scheduling, single channel queue, two server queue, simulation of inventory problem. (7)
SIMULATION LANGUAGES - GPSS - SIMSCRIPT - SIMULA - SIMPLE_1, Programming for Discrete event systems in GPSS, SIMPLE_1 and C. (5)

CASE STUDIES: Simulation of LAN - Manufacturing system - Hospital system. (5)

TEXT BOOKS:

REFERENCES:

TUTORIAL PRACTICE:
1. Implement variance reduction.
2. Implement event scheduling.
4. Simulate a manufacturing system.

Total L: 45+T: 30=75

15XWA2 ADVANCED DATABASE MANAGEMENT SYSTEMS


OBJECT AND SPATIAL DATABASES: Object Model Vs Relational model - Object Oriented Databases - Introduction to ORDBMS - Complex data types - Structured types and Inheritance-Nesting and un-nesting of Relations – Query Processing in ORDBMS – Spatial Databases : Fundamentals of GIS - Spatial Data Types- Spatial relations – Spatial Queries -Spatial indexing techniques - R-trees, KD trees- Quad trees - Applications of spatial databases (9)

PARALLEL AND DISTRIBUTED DATA BASES: Architecture of parallel databases – Parallel query evaluation, Paralyzing individual operations, Parallel query optimization - Homogeneous and Heterogeneous databases - Architecture of distributed data bases - Storing data in distributed data bases - Distributed query processing -Distributed Transactions. (10)

DATABASE INTEGRATION: Data integration: schema directed data integration - Data exchange: Schema mapping and information preservation-Information Preserving XML Schema Embedding. (8)

NoSQL DATABASES: Big Data and Challenges, NoSQL data models – Key value pair - DynamoDB, Column store - BigTable-Hbase, Document oriented store- MongoDB –Graph data bases – Neo4g – Apache Hadoop (10)

TEXT BOOKS:

REFERENCES:

TUTORIAL PRACTICE:
Programming exercises are given in the following topics:
1. Query optimization
2. Object relational databases
3. Parallel/Distributed databases
4. Spatial databases
15XWA3 SOFTWARE METRICS

**FUNDAMENTALS OF MEASUREMENT:** Measurement in Software Engineering-Scope of Software Metrics - Measurement and Models-Measurement scales and scale types-Classifying software measures - Software Measurement validation - Software Metrics Data collection - Analyzing software measurement data. (10)

**MEASURING INTERNAL PRODUCT ATTRIBUTES:** Size and Structure - Measuring external product attributes. (5)

**SOFTWARE RELIABILITY:** Measurement and prediction - Parametric Reliability Growth models - The recalibration of software reliability growth predictions. (10)

**RESOURCE MEASUREMENT:** Productivity, teams and tools- Making process predictions - Good estimates - Models of effort and cost - Dealing with Problems of current estimation methods. (10)

**MEASUREMENT AND MANAGEMENT:** Planning - Measurement program - Measurement tools-Measurers - analysts - audience - Measurement in practice. (10)

**TEXT BOOKS:**

**REFERENCES:**

**TUTORIAL PRACTICE:**
1. Complete the time recording log and Defect Recording log.
2. PSP Programming assignment.
3. Assess the Quality of the Student’s PSP Data and record your observations in the specified format.
4. Estimate the size of the program using PSP Techniques and record it in the specified format.

15XWA4 PARALLEL AND DISTRIBUTED COMPUTING

**INTRODUCTION:** Forms of Computing – Monolithic – Distributed – Parallel-Cooperative - Computational demands of parallel processing, Flynn’s classification – Terminology. (5)

**PARALLEL COMPUTER ARCHITECTURES:** Classification – Inter connection networks – Vector computers – Shared memory parallel computers – Cache coherence – Distributed shared memory parallel computers – Message passing parallel computers – Cluster of workstations. (5)

**PARALLEL PROGRAMMING MODELS:** Shared memory model, Message passing model - Synchronous and Asynchronous message passing models, Leader-Election algorithm, Breadth-First Search. Shortest Paths, Broadcast and Converge cast, Data Parallel model. (5)


**DISTRIBUTED COMPUTING:** Introduction to Distributed Programming - System Models- Architectural models - Client-server model, Peer-to-peer model- Variations of the above models -Distributed computing paradigms – Inter process communication -The API for the Internet protocols - External data representation and marshalling - Group communication - Case study: inter process communication in UNIX - Distributed file systems. (8)

EMERGING AREAS OF PARALLEL AND DISTRIBUTED SYSTEMS: Grid computing, Peer-to-peer systems, Overlay networks, Edge computing and Ad-hoc networks.

TEXT BOOKS:

REFERENCES:

TUTORIAL PRACTICE:
1. Analyze Parallel algorithms to predict performance.
2. Implement Dekker’s algorithm.
3. Implement Dinning philosopher algorithm.
4. Implement Array processing.
5. Implement Matrix Computation, Searching and Sorting algorithms using parallel processing.
6. Implement parallel algorithms using MPI.
7. Analyze the implementation of the above algorithms in a distributed environment.

Total L: 45+T: 30=75

15XWA5 DATA COMPRESSION


ADAPTIVE HUFFMAN CODING: Adaptive coding - Updating the Huffman tree - the code.

ARITHMETIC HUFFMAN CODING: Arithmetic coding - The code.

STATISTICAL MODELING: higher-order modeling - finite context modeling - adaptive modeling – highest- order modeling.

SLIDING WINDOW COMPRESSION: lz77 algorithm - lzss compression - Compression code.


SPEECH COMPRESSION: digital audio concepts - lossless compression of sound.


TEXT BOOKS:

REFERENCES:

TUTORIAL PRACTICE:
1. Implement Shannon Fano algorithm and Huffman algorithm.
2. Design compression and decompression program using adaptive Huffman coding.
3. Implement arithmetic coding algorithm.
4. Design compression program using statistical modeling upto 3 order.
5. Design compression and decompression program using L277 algorithm.

Total L: 45+T: 30=75

15XWA6 COMPUTER GRAPHICS AND VISUALIZATION

GRAPHICS INPUT - OUTPUT DEVICES: Raster scan Displays - Random scan displays - Direct view storage tubes - Flat panel displays - Mouse - Track Ball - Joy Stick - Digitizers - Touch panels - LCD. GRAPHICAL USER INTERFACE AND INTERACTIVE INPUT METHODS: The user dialog - Input of graphical data - Input function - Interactive picture construction techniques - Virtual reality environments.


TWO DIMENSIONAL GRAPHICS: Basic transformations - Matrix representation and homogeneous coordinates - Composite transformations - Line drawing algorithms: DDA and Bresenham's algorithms - Circle generation algorithms: Mid point circle algorithm - Point clipping - Line clipping; Cohen Sutherland algorithm - Polygon clipping: Sutherland Hodgeman algorithm - Line covering.

RASTER GRAPHICS: Fundamentals: generating a raster image, representing a raster image, scan converting a line drawing, displaying characters, speed of scan conversion, natural images - Solid area scan conversion: Scan conversion of polygons, Y-X algorithm, properties of scan conversion algorithms - Interactive raster graphics: painting model, moving parts of an image, feed back images.


IMAGE PROCESSING FUNDAMENTALS: Sampling and Quantization, Image Enhancement - Histogram Processing, Filtering.

THREE DIMENSIONAL GRAPHICS: 3D transformations - Viewing 3D graphical data - Orthographic, oblique, perspective projections - Hidden lines and hidden surface removal.

FRACTAL-GEOMETRY METHODS: Tiling the plane - Recursively defined curves - Koch curves - C curves - Dragons - Space filling curves - Fractals - Grammar based models - Graftals - Turtle graphics - Ray tracing.

Note: Algorithms in have to be implemented by using C++/ OpenGL.

TEXT BOOKS:

REFERENCES:

TUTORIAL PRACTICE:
1. Implementation of Simple transformations.
2. Implementation of Line drawing algorithms.
3. Windowing and Line Clipping.
4. Polygon clipping.
5. Implementation of an Analog Clock.
6. Polygon filling algorithms.
7. Merging of a circle and square.
9. Image Processing Functions In Matlab

Total L: 45+T: 30=75

15XWA7 REAL TIME AND EMBEDDED SYSTEMS

INTRODUCTION TO EMBEDDED SYSTEMS: Definition – Examples of Applications – Important characteristics of these applications – real-time system and definitions – real –time system – Common misconceptions – Overview of science of real-time systems and examples of research problems.


TESTING EMBEDDED SYSTEMS: Design for Testability - Built-In-Self-Test (BIST) for Embedded Systems - Boundary Scan Methods and Standards - On-line Testing of Embedded Systems

TEXT BOOKS:

REFERENCES:

TUTORIAL PRACTICE:
1. Design RTS program using Round Robin method.
2. Design RTS program with two threads which create deadlock.
3. Design RTS program using semaphore.
4. Design RTS program which uses message queue, mail box, pipe.
5. Design RTS program to create priority Inversion.

Total L: 45+T: 30=75

15XWA8 MOBILE COMPUTING

INTRODUCTION: Introduction to wireless networking, Advantages and disadvantages of wireless networking, Evolution of mobile communication generations- CDMA, FDMA, TDMA. Challenges in mobile computing – Vertical and horizontal applications of Wireless Networking–Wireless LAN and Wireless WAN.


GSM: Mobile services - System architecture -- Handover – GPRS – Mobile services – System Architecture – Location Management


Building smart client applications – Mobile Operating systems – Client development process – Design, Development, implementation, testing and deployment phase. Thin client development process – design, development, implementation, testing and deployment phase.


TEXT BOOKS:

REFERENCES:

TUTORIAL PRACTICE:
Developing Mobile based applications using J2ME, Windows CE, Symbian OS, and Android OS.
Suggested Applications:
1. Online Shopping Cart
2. Airline Reservation System
3. WAP Portal Site
4. M-Commerce applications
5. Location based Services
6. Mobile games

Total L: 45+T: 30=75

15XWA9 SERVICE ORIENTED ARCHITECTURE


TEXT BOOKS:

REFERENCES:
TUTORIAL PRACTICE:
1. Implement a XML Web Service by using Microsoft Visual Studio.Net
2. Implementation of webservice using Java APIs
3. Create a content syndication using RSS
4. Web service design / Coding projects

Total: 45L+30T=75

15XWAA PRINCIPLES OF PROGRAMMING LANGUAGES

INTRODUCTION:

IMPERATIVE PROGRAMMING:

OBJECT ORIENTED PROGRAMMING:
Groupings of Data and Operations:- Constructs fro Program Structuring, Information Hiding, Program Design with Modules, Modules and Defined Types, Class Declarations in C++, Dynamic Allocation I C++, Templates: Parameterized Types, Implementation of Objects in C++ - Object-Oriented Programming:- What is an Object?, Object-Oriented Thinking - Objects in Smalltalk. (6)

FUNCTIONAL PROGRAMMING:

OTHER PARADIGMS:

TEXT BOOKS:

REFERENCES:

TUTORIAL PRACTICE:
1. Language tools like LEX, YACC.
2. Inter – Intra sequence control mechanism.
5. List Operations in Prolog.
6. Fact finding & Theorem proving in Prolog.
7. Recursive functions in Functional programming language.
8. Expression evaluation in functional programming language.

Total: 45+30=75

15XWAB AGILE SOFTWARE DEVELOPMENT
AGILE COMPUTING - An Introduction– The Problem with parsing experience-Three levels of listening Cooperative game of Invention and Communication-Individuals-Overcoming Failure modes-Working Better in some ways than others - Drawing on Success modes

AGILE PROCESS MODELS – Extreme programming, ASD, DSDM, Scrum, Crystal, FDD, Agile Modeling

TEAM COMMUNICATION -Communicating and Cooperating teams – Convection currents of information-Jumping communication gaps-Teams as communities-Teams as Ecosystems

AGILE METHODOLOGIES -Agile and self-adapting-The crystal methodologies-Crystal orange web-The agile software development manifesto-The agile alliance-Peter Naur, Programming as TheoryBuilding.

Case Studies

TEXT BOOKS:

REFERENCES:

TUTORIAL PRACTICE :
1. Exercise for modular development.
2. Exercise for Incremental delivery approach.
4. Exercise for proving the productivity using pair programming approach.
5. Exercise for understanding the concept of "Simple Design".
6. Exercise to understand "Test first " technique.
7. Writing user stories.
8. Creation of vision card.
9. Writing acceptance tests.
10. Exercise for refactoring the code.

Total L: 45+T: 30=75

15XWAC SYSTEM SECURITY


DATABASE SECURITY: The Need for Database Security - Database Access Control- Inference- Statistical Databases - Database Encryption- Multilevel databases Security


TEXT BOOKS:

REFERENCES:

TUTORIAL PRACTICE:
1. Implementation of authentication
2. Access control policy implementation
3. Practice on buffer overflow attack
4. SQL injection attack
5. Cross site scripting
6. DOS attacks

Total L: 45+T: 30=75

15XWAD PERVERSIVE COMPUTING

INTRODUCTION: Past, present, future; the pervasive computing market, m-Business, challenges and future of pervasive computing - modeling key for pervasive computing - pervasive system environment interaction - architectural design for pervasive system, application examples of pervasive computing: Healthcare, Tracking, emergency information systems, home networking appliances and entertainment.

DEVICE TECHNOLOGY FOR PERVERSIVE COMPUTING: Hardware, computing devices and their characteristics - pervasive information access devices-smart identification, smart card, labels, tokens - embedded controls, smart sensors, actuators - Human-machine interfaces, Biometrics - Various operating systems for pervasive devices.


APPROACHES FOR DEVELOPING PERVERSIVE APPLICATIONS: Categorization - smart services for pervasive application development - developing mobile applications – presentation transcoding – device independent view component – heterogeneity of device platforms - Context Awareness and Mobility to build pervasive applications.

CONTEXT AWARE SYSTEMS: Modelling - mobility awareness - spatial awareness - temporal awareness - ICT system awareness - Intelligent Systems - basic concepts- autonomous systems - reflective and self-aware systems - self management and autonomic computing - complex systems.


Location dependent information system- location dependent data – location aware queries – location dependent queries – moving object database queries - query transition steps in LDQ processing.

TEXT BOOKS:

REFERENCES:

TUTORIAL PRACTICE:
1. Create Application with onClick, onKeyDown, onFocusChanged Event Handlers
2. Create Application with Toast Notifications
3. Create Application with Android's Advanced User Interface Functions

43
4. Create Android Audio/Video Application
5. Create Application to Create, Modify and Query an SQLite Database
6. Create Application that Works with an Android Content Provider
7. Create application that performs Data Storage and Retrieval from Android External Storage
8. Create Location-Aware application that uses Proximity Alerts and Google Maps API
9. Implementation of small packages to demonstrate all APIs.

Note: All implementations using android.

Total L: 45+T: 30=75

15XWAE SEMANTIC WEB

INTRODUCTION TO SEMANTIC WEB: Today’s Web - From Today’s Web to the Semantic Web - Examples - Semantic Web Technologies - A Layered Approach. (4)

DESCRIBING STRUCTURED WEB DOCUMENTS USING XML: Introduction to Markup languages - The XML Language - Structuring - Namespaces - Addressing and Querying XML Documents - Processing. (8)

DESCRIBING WEB RESOURCES IN RDF: Introduction to RDF - Basic Ideas - RDF: XML-Based Syntax - RDF Schema: Basic Ideas - RDF Schema - An Axiomatic Semantics for RDF and RDF Schema - A Direct Inference System for RDF and RDFS - Querying in RQL. (9)

WEB ONTOLOGY LANGUAGE: OWL Introduction - The OWL Language - Examples - OWL in OWL - Future Extensions. (8)


APPLICATIONS: Horizontal Information Products - Data Integration - e-Learning - Web Services - Other Scenarios. (4)

ONTOLOGY ENGINEERING: Constructing Ontologies Manually - Reusing Existing Ontologies - Using Semiautomatic Methods - On-To-Knowledge Semantic Web Architecture. (4)

TEXT BOOKS:

REFERENCES:

2. Creating XML DTD and XSD for the given XML document.
3. Design a XSLT to display the XML document (given as input) based on the constraints given.
4. Generate an RDF graph.
5. Create an RDFS ontology (in triple or graph notation).
6. Write an RDF/XML encoding for the given situation.
8. A Package to implement the techniques.

Total L: 45+T: 30=75

15XWAF CLOUD COMPUTING

INTRODUCTION TO PARALLEL AND DISTRIBUTED COMPUTING: Introduction, Architecture and Distributed computing models and technologies SOA, Web Services (5)

GRID, CLUSTER AND UTILITY COMPUTING: Introduction, Architecture, Pros & Cons, Real time applications. (4)


ADVANCED WEB TECHNOLOGIES: AJAX and Mashup – Programming examples using applications.

MAP REDUCE PARADIGMS: Introduction, GFS Architecture, HDFS Architecture, Hbase, Google big Table, Amazon’s (key value) pair storage and Microsoft’s Azure infrastructure, Map reduce programming examples.

CLOUD COMPUTING FRAMEWORK: Amazon EC3, S3 storage revises, Aneka frame work, IBM blue Cloud.

APPLICATIONS: Distributed search engine and distributed data mining in the cloud.

TEXT BOOKS:

REFERENCES:

TUTORIAL PRACTICE:
1. Parallel programming using pvm on Linux platform
2. Develop web services using Eclipse or similar tools
3. Virtualization (VM Ware, VCloud, Hyper V)
4. Develop a Mashup website based on 2 or more existing websites
5. Build Private cloud compatible with AWS API using Eucalyptus
6. Build Cloud platform using Openstack
7. Package development using tools supported by cloud providers as a free service

Total L: 45+T: 30=75

15XWAG HUMAN COMPUTER INTERACTION

INTRODUCTION: Design, Models, Evaluation. Need to understand people, computers and methods. Motivation. Contexts for HCI.


CASE STUDIES:
Web design: Build a web application to demonstrate various techniques. Focus on user interaction, design and ease of use.
Mobile app design: Build a mobile application to demonstrate the following: Issues with interactions in mobile. Limitations of building apps in the small screens of mobile device; Designing the app for better usability.
Game development: Build a game to understand the challenges in building a rich as well as an easy to use interface.

TEXT BOOKS:
REFERENCE:

TUTORIAL PRACTICE:
1. Web design: Build a web application with preference to user interaction, design and ease of use.
2. Mobile app design: Build a mobile application to demonstrate issues with interactions in mobile; using small screens of mobile device with better usability.
3. Game development: Build a game to understand the challenges in building a rich as well as an easy to use interface.

Total L: 45+T: 30=75

15XWAH SOCIAL NETWORK ANALYSIS

INTRODUCTION:
Motivation - different sources of network data - types of networks - tools for visualizing network data - review of graph theory basics.

GRAPH THEORETIC PROPERTIES OF SOCIAL NETWORKS:
Notions of centrality - Strong and weak ties – Homophily - Structural Balance.

DYNAMIC PROPERTIES OF NETWORKS:
Information diffusion - networks effects on information diffusion - maximizing influence spread - power law and heavy tail - preferential attachment models - small world phenomenon - cascading behavior on networks - Epidemics.

BEHAVIORAL PROPERTIES ON NETWORKS:
Network economics - Bargaining and power in networks - Sponsored search markets.

MINING GRAPHS:
Community and cluster detection: random walks - spectral methods - link analysis for web mining.

TEXTBOOKS:

REFERENCES:

TUTORIAL PRACTICE:
1. Getting acquainted with UCINET and Netdraw.
2. Implementing graph-theoretic/social network metrics using UCINET.
3. Working with Visualization, Ego networks, Centrality, Community Detection etc.

Total L: 45+T: 30=75

15XWAI ADVANCED COMPUTER GRAPHICS

GEOMETRICAL TRANSFORMATIONS:
2D Transformations- Homogeneous Coordination and metric representation – Composition of 2D transformations – Window to view port transport, Efficiency- Matrix representation of 3D transformations – Composition of 3D transformation – Transformation as a change in coordinate system.

VIEWING IN 3D:

OBJECT HIERARCHY:

Total L: 45+T: 30=75
INPUT DEVICES – INTERACTION TECHNIQUES AND INTERACTION TASKS: Interaction hardware – Basic interaction tasks – Composite interaction tasks. (3)

DIALOGUE DESIGN: The form and content of user-computer dialogues – User interface styles – Important design considerations – Modes and syntax – Visual design – The design methodology (3)

USER INTERFACE SOFTWARE: Basic interaction – handling models - window management systems – output handling in window systems – Input handling in windows systems – Interaction technique toolkits – User-interface management systems. (3)

REPRESENTING CURVES AND SURFACES: Polygon meshing – parametric cubic curves, parametric bicubic surfaces, quadric surfaces. (3)


REALISM: Fundamental difficulties – Rendering techniques for line drawing – Rendering techniques for shaded images – Improved object models – Dynamics – stereopsis – Improved displays – Interacting with our other senses – Aliasing and antialiased. (3)


ANIMATION: Conventional and Computer assisted Animation – Animation languages – Methods of controlling animation - Basic rules of animation – Problems peculiar to animation. (3)

TEXT BOOKS:

REFERENCES:

TUTORIAL PRACTICE:
Implement the following using the OpenGL library in VC++
1. Using glRect function, draw : a) A flurry b) A checkerboard
2. Write the window to view port mapping functions, and use it to draw the sine curve in real world coordinates.
3. Using user defined lineTo and moveTo functions, plot the Fibonacci series.
4. Write the Canvas class and its supporting classes. Use the Canvas class to draw a simple meander.
5. Write functions to change the background and foreground colors.
6. Write a function to draw an n-sided polygon (using the basic Canvas class and line To and move To functions)
7. A program to draw the Sierpinski gasket.
8. A program to draw the graph of a given mathematical function f(x).
9. A program to read a data file that contains a collection of Polylines in the appropriate format and draw each polyline.
10. A parameterized function to display a house and call it many times by passing different values to form a village.
11. A program that displays a colored triangle and rectangle and rotates them at different angles along two axis.

Total L: 45+T: 30=75

15XWAJ COMPUTER VISION AND IMAGE ANALYSIS


DIGITAL IMAGE ANALYSIS: Preprocessing, Binary Image Analysis, Edge detection - First order derivative, Second order detection, Color edge detection, Pyramid edge detection, Edge linking and boundary detection, Segmentation - Region based segmentation, clustering techniques, boundary detection, thresholding. (8)

**IMAGE TRANSFORMS:** Overview of discrete transforms, Fourier Transform, Discrete Cosine transform, Discrete Haar transform, Principal components transform, Discrete Wavelet Transform, Filtering.

**IMAGE FEATURE ANALYSIS:** Overview, Feature Extraction - Shape, histogram, color, spectral, textural features, feature Analysis. Image Compression - Overview, Lossless compression methods, lossy compression methods.

**MORPHOLOGICAL OPERATIONS:** Binary Dilation, Erosion, Opening and Closing, Hit-or-Miss Transform, Basic Morphological Algorithms, Extension to Gray-Scale Images.

**IMAGE COMPRESSION:** Basic requirements, Types of compression, Coding Algorithms.

**APPLICATIONS** – CBIR, CBVR, Activity Recognition, computational photography, Biometrics, stitching and document processing; Modern trends - super-resolution; GPU, Augmented Reality; cognitive models, fusion and SR&CS.

**TEXT BOOKS:**

**REFERENCES:**
3. Adrian McEwen, Hakim Cassimally,

**TUTORIAL PRACTICE:**
1. Implementation of Image segmentation and edge detection.
2. Implementation of feature extraction.
3. Implementation of image classification and clustering.
4. Developing simple image analysis applications.

**15XWAK BIG DATA ANALYTICS**


**RELATED TECHNOLOGIES**– Cloud computing – Relationship between cloud computing and big data - Internet of Things (IOT): IOT preliminaries – relationship between IOT and Big data; Data Centre – Hadoop – Preliminaries and Big Data – NoSQL - Hadoop eco system - Data loading techniques – Flume - Sqoop– Hive - Pig Latin - Mahout – HDFS- Map and Reduce.

**BIG DATA GENERATION AND ACQUISITION:**– Enterprise data – IOT data – Internet data – Biomedical data – Data generation from fields - Data Collection – Transportation - Preprocessing.


**MASSIVE DATA ANALYTICS:** Map-reduce for machine learning, Nearestneighbor classifier, Multi-task learning, Topic model.


**TEXT BOOKS:**

**REFERENCES:**

TUTORIAL PRACTICE:
1. Implementation of data generation related concepts.
2. Implementation of data analysis concepts.
3. Developing applications.

Total L: 45+T: 30=75

OPEN ELECTIVES

15XWO1 ENTERPRENEURSHIP

INTRODUCTION TO ENTREPRENEURSHIP: Definition – Characteristics and Functions of an Entrepreneur – Common myths about entrepreneurs – Importance or Entrepreneurship. Seminar in R5 & R6. (5)


DEVELOPING AN EFFECTIVE BUSINESS MODEL: The Importance of a Business Model – Starting a small scale industry - Components of an Effective Business Model. (5)

APPRAISAL OF PROJECTS: Importance of Evaluating Various options and future investments- Entrepreneurship incentives and subsidies – Appraisal Techniques. (8)

FORMS OF BUSINESS ORGANIZATION: Sole Proprietorship – Partnership – Limited liability partnership - Joint Stock Companies and Cooperatives. (4)


THE MARKETING FUNCTION: Industry Analysis – Competitor Analysis – Marketing Research for the New Venture – Defining the Purpose or Objectives – Gathering Data from Secondary Sources – Gathering Information from Primary Sources – Analyzing and Interpreting the Results – The Marketing Process. (5)

INTELLECTUAL PROPERTY PROTECTION AND ETHICS: Patents – Copyright - Trademark- Geographical indications – Ethical and social responsibility and challenges. (4)

TUTORIAL PRACTICE:
Case studies

Total L:45+T:30=75

TEXT BOOKS:

REFERENCES:
**15XWO2 COMPUTER FORENSICS**

**COMPUTER AND FORENSICS:** Introduction – Stand-alone computer crimes – Computer evidence – Computer Forensics evidence and courts – Internet laws and statutes; Forensics process – Securing evidence – Law enforcement and methodology. (8)

**FORENSICS EVIDENCE:** Sources – Seizure – Collection – Integrity – Handling; Acquisition and Duplication of data. (8)

**DATA ANALYSIS:** Metadata extraction – File Signature analysis – System analysis – Examining unallocated space – Data carving – Recovering deleted data and partitions (6)

**WINDOWS FORENSICS:** Registry Analysis – Executable file analysis – Recycle Bin Forensics – Evidence Recovery from Print and Spool files. (5)

**INTERNET FORENSICS:** Domain Name Ownership Investigation – Email Forensics – Messenger Forensics – Browser Forensics. (6)

**MOBILE DEVICE FORENSICS:** Hand-held devices and Forensics – Reconstructing user’s activities and deleted data. (4)

**MEMORY FORENSICS AND MALWARE ANALYSIS:** Memory data collection and Examination – Analyzing Windows and Linux systems for malware – Reverse Engineering tools and techniques. (6)

**ANTI-FORENSICS:** Erasing Evidence. (2)

**TEXT BOOKS:**

**REFERENCES:**

**TUTORIAL PRACTICE:**
1. Implementation of data analysis techniques.
2. Implementation of system analysis concepts.
3. Implementation of email forensics concepts.
4. Implementation of hand-held device forensics activities.

Total L: 45+T: 30=75

**15XWO3 WIRELESS NETWORKS**


**WLAN TECHNOLOGIES:** wireless network architectures – 802.11 PHYs – 802.11 MAC – WPA and 802.11i: Security – 802.11e: MAC Enhancements for Quality of Service – Related Wireless Standards (Hyperlan, HomeRF, Bluetooth, Zigbee, Wireless USB)-WiFi and Wi MAX Standards. (8)

**AD HOC AND SENSOR NETWORKS:** Ad hoc Network- Characteristics- Table-driven and Source-initiated On Demand routing protocols, Hybrid protocols - Routing in intermittently connected mobile networks. Wireless Sensor networks- Classification, MAC and Routing Protocols. (8)


TEXT BOOKS:

REFERENCES:

TUTORIAL PRACTICE:
1. Study of NS-2 simulator.
2. Simulation of a IEEE 802.11 LAN under various conditions using NS-2 simulator.
4. Simulation of different routing protocols using simulators.
5. Simulation of TCP over error-prone wireless network using NS-2 simulator.
6. Development of Mobile application using blue tooth.

Total L:45+T:30 = 75

15XWO4 RANDOMIZED ALGORITHMS

INTRODUCTION: Randomized algorithms, randomized quick sort, Karger’s min-cut algorithm Las Vegas and Monte Carlo algorithms, computational models and complexity classes.


PROBABILISTIC METHODS: Overview of the method-maximum satisfiability - finding a large cut. Expander graphs.

MARKOV CHAINS AND RANDOM WALKS: Markov chains, Random walk on graphs - connectivity in undirected graphs – Expanders and rapidly mixing random walks.


ONLINE ALGORITHMS: Paging problem-adversary models- paging against an oblivious adversary-relating the adversaries-the adaptive online adversary, k-server problem.

PARALLEL AND DISTRIBUTED ALGORITHMS: Sorting on a PRAM – Maximal Independent sets.

NUMBER THEORETICAL ALGORITHMS: Polynomial roots and factoring, primality testing.


TEXT BOOKS:

REFERENCES:

TUTORIAL PRACTICE:
1. Implementation of randomized quick sort and solve real time problems using it.
2. Find solution for s-t min-cut problem adapting min cut algorithm.
3. Implementation of randomized selection and problems related to it.
4. Implementation of treap data structure.
5. Problems using randomized hash table.
6. Implement the shortest path and fast min-cut algorithms.
7. Implementation of randomized primality testing.
8. Implement the K-server on-line algorithms.

52

15XWO5 DATA VISUALIZATION


STATIC DATA VISUALIZATION – tools – working with various data formats.

DYNAMIC DATA DISPLAYS: Introduction to web based visual displays – deep visualization – collecting sensor data – visualization – D3 framework - Introduction to Many eyes and bubble charts

MAPS – Introduction to building choropleth maps

TREES – Network visualizations – Displaying behavior through network graphs

BIG DATA VISUALIZATION – Visualizations to present and explore big data – visualization of text data and Protein sequences

TEXT BOOKS:

REFERENCES:

TUTORIAL PRACTICE:

Note: Explore software like R, Python, Google Vision, Google Refine, and ManyEyes; Data sets are available on Gap minder, Flowing data

1. Visualization of static data.
2. Visualization of web data.
3. Visualization of sensor data.
4. Visualization of protein data.

Total: L:45+T:30 = 75

15XWO6 APPLIED GRAPH THEORY


CONNECTIVITY: Vertex and edge connectivity, Vertex and edge cuts, relationship between vertex and edge connectivity, bounds for connectivity. Harary’s construction of k-connected graphs.

EULERIAN AND HAMILTONIAN GRAPHS:Eulerian graphs, Route inspection problem, Hamiltonian graphs, Gray codes and Hypercubes, Travelling sales person problem.


PLANAR GRAPHS: Properties, Kuratowski’s statement, triangulation of polygons using vertex coloring, construction of Voronoi diagrams, Delaunay triangulations.
RANDOM GRAPHS: Random graph – Definitions of G (n, p) and G(n, M) models, power law degree distribution, Web graph models, applications to social networks.  

53

TEXT BOOKS:

REFERENCES:

TUTORIAL PRACTICE:
Case Studies

15XWO7 CRYPTOGRAPHY

INTRODUCTION: Security Problems in computing – security goals –attacks – Services and mechanisms

(3)

BASICS OF NUMBER THEORY: Divisibility — Euclidean and Extended Euclidean algorithms, Modular arithmetic- Computing modular inverse – modular exponentiation- efficient algorithms, generators and primitive roots in groups, Fermats little theorem, Chinese remainder theorem-PRNG

(6)


(8)

PUBLIC KEY CRYPTOGRAPHY: Concept of public key cryptography – RSA cryptosystem- - the RSA problem – Integer factorization problem, Discrete log problem,- El Gamal cryptosystem, Elliptic curve cryptosystem

(10)


(10)

AUTHENTICATION AND KEY DISTRIBUTION PROTOCOLS: Data originauthentication and entity authentication, challenge and response–Diffie Hellman key predistribution, session key distribution – The Needham Schroeder scheme, Kerberos – Certificates

(8)

TEXT BOOKS:

REFERENCES:

TUTORIAL PRACTICE:
Case Studies

Total L:45+T:30=75