COURSE STRUCTURE & SYLLABUS FOR B.TECH. (4 YEARS)

(W.E.F. 2021-2022)

DEPARTMENT OF CS & IT

MJP ROHILKHAND UNIVERSITY

BAREILLY (UP)

Department of Computer Science & Information Technology

About The Department

The Department of Computer Science and Information Technology was established in 1995. It is an integral constituent of the Faculty of Engineering & Technology, MJP Rohilkhand University, Bareilly. The Department offers regular B.Tech., M.C.A. and Ph.D. programmes.

The B.Tech. and MCA programs are duly approved by the AICTE, New Delhi. Whereas, the commencement of the Integrated M.Tech.-Ph.D. program is under process to start from session 2022-23. The well-equipped laboratories, furnished classrooms, and ICT enabled seminar halls, conference room, individual faculty chambers, the separate building of department with surrounding greenery gives an excellent academic atmosphere among the students.

Department of Computer Science and Information Technology
B.Tech. Course Structure

B.Tech First year, Semester-I

SI. No.	Course No.	Subject	Credits	Teaching Schedule Hrs. L	T	P	Total
1.	PH-101T	Engineering Physics-I	4	3	1	0	4
2.	MA-101T	Engineering Mathematics-I	4	3	1	0	4
3.	ME-107 T	Engineering Graphics	2	1	2	0	3
4.	EI-101T	Basic Electronics Engineering	4	3	1	0	4
5.	CY-103T	Environments Studies	2	3	0	0	3
6.	HU-103T	Fundamentals of Economics	2	3	0	0	3
7.	ME-101T	Manufacturing Technology	4	3	1	0	4
		Total	**22**	**19**	**6**	**0**	**25**
Laboratory Courses							
8.	PH-101P	Engineering Physics Lab	2	0	0	3	3
9.	EI-101P	Basic Electronics Engineering Lab	2	0	0	3	3
10.	ME-101P	Workshop Practice Lab	2	0	0	3	3
Total			**6**	**0**	**0**	**9**	**9**
		Semester Total	**28**	**19**	**6**	**9**	**34**

B.Tech First year, Semester-II

Sl. No.	Course No.	Subject	Credits	Teaching Schedule Hrs. L	T	P	Total
1.	PH-102T	Engineering Physics-II	4	3	1	0	4
2.	CY-101T	Engineering Chemistry	4	3	1	0	4
3.	MA-102T	Engineering Mathematics-II	4	3	1	0	4
4.	HU-101T	Communicative English	3	2	1	0	3
5.	CS-101T	Computer Fundamentals & C++ Programming	4	3	1	0	4
6.	EE-101T	Basic Electrical Engineering	4	3	1	0	4
		Total	**23**	**17**	**6**	**0**	**23**
Laboratory Courses							
7.	CY-101P	Engineering Chemistry Lab	2	0	0	3	3
8.	CS-101P	Computer Programming Lab in C++	2	0	0	3	3
9.	EE-101P	Basic Electrical Engineering Lab	2	0	0	3	3
		Total	**6**	**0**	**0**	**9**	**9**
		Semester Total	**29**	**17**	**6**	**9**	**32**

B.Tech Second year, Semester-III

S. No.	Courses No.	Subject	Credits	Teaching schedule			Contact Hrs
				L	T	P	
1	CS-201T	Discrete Mathematical Structure	4	3	1	0	4
2	CS-203T	Data Structure using C++	4	3	1	0	4
3	CS-205T	Object Oriented Programming using JAVA	4	3	1	0	4
4	MA-201T	Engineering Mathematics-III	4	3	1	0	4
5	EC- 205T	Digital Electronics	4	3	1	0	4
6	HU-203T	Universal Human values and Professional Ethics-I	2	3	1	0	3
Total			**22**	**18**	**6**	**0**	**23**
Laboratory Course							
7	CS-203P	Data Structure Lab	2	0	0	3	3
8	CS-205P	Object Oriented Lab using JAVA	2	0	0	3	3
9	EC-201P	Devices & Digital Lab	2	0	0	3	3
Total			**6**	**0**	**0**	**9**	**9**
Semester Total			**28**	**18**	**6**	**9**	**32**

B.Tech Second year, Semester-IV

S. No.	Courses No.	Subject	Credits	Teaching schedule			Contact Hrs
				L	T	P	
1	CS-202T		4	3	1	0	4
2	CS-204T	Computer Organization	4	3	1	0	4
3	CS-206T	Computer Network	4	3	1	0	4
4	CS-208T	Data Base Management System	4	3	1	0	4
5	CS-210T	Python Programming	4	3	1	0	4
6	HU-204T	Universal Human values and Professional Ethics-II	2	3	1	0	3
Total			**22**	**18**	**6**	**0**	**23**
Laboratory Course							
7	CS-202P	Analysis &Design of Algorithm Lab	2	0	0	3	3
8	CS-208P	DBMS Project	2	0	0	3	3
9	CS-210P	Python Programming Lab	2	0	0	3	3
Total			**6**	**0**	**0**	**9**	**9**
Semester Total			**28**	**18**	**6**	**9**	**32**

B.Tech Third year, Semester-V

S. No.	Courses No.	Subject	Credits	Teaching schedule			Contact Hrs
				L	T	P	
1	CS-301T	Data Mining Techniques	4	3	1	0	4
2	CS-303T	Software Engineering	4	3	1	0	4
3	CS-***	Departmental Elective-I	4	3	1	0	4
4	CS-305T	Theory of Computation	4	3	1	0	4
5	CS-307T	Operating Systems	4	3	1	0	4
6	HU-315T	Professional Communication	2	3	1	0	3
Total			**22**	**18**	**6**	**0**	**23**
Laboratory Course							
7	CS-301 P	Network Simulation Lab	2	0	0	3	3
8	CS-305 P	Minor Project	4	0	0	3	3
9	CS-307P	Operating System Lab	2	0	0	3	3
Total			**8**	**0**	**0**	**9**	**9**
Semester Total			**30**	**18**	**6**	**9**	**32**

B.Tech Third year, Semester-VI

S. No.	Courses No.	Subject	Credits	Teaching schedule			Contact Hrs
				L	T	P	
1	CS-302T	Cloud Computing	4	3	1	0	4
2	CS-304 T	Compiler Design	4	3	1	0	4
3	CS-306T	Interactive Computer Graphics	4	3	1	0	4
4	CS-308T	Wireless Networks	4	3	1	0	4
5	CS-***	Departmental Elective-II	3	3	1	0	4
6	HU-316T	Soft Skills	2	3	0	0	3
Total			**21**	**18**	**5**	**0**	**23**
Laboratory Course							
7	CS-302 P	Major Project	6	0	0	6	6
8	CS-306 P	Computer Graphics Lab	2	0	0	3	3
Total			**8**	**0**	**0**	**9**	**9**
Semester Total			**29**	**18**	**5**	**9**	**32**

B.Tech Forth year, Semester-VII

S. No.	Courses No.	Subject	Credits	Teaching schedule			Contact Hrs
				L	T	P	
1	CS-401T	Machine Learning	4	3	1	0	4
2	CS-403T	Digital Image Processing	4	3	1	0	4
3	CS-***	Departmental Elective-III	3	3	1	0	4
4	**-***	Pool Elective	3	3	1	0	4
5	**_***	Open Elective	4	3	1	0	4
6	CS-401	*Seminar based on Online Course MOOC/SWAYAM	4	0	0	0	0
Total			**22**	**15**	**5**	**0**	**20**
Laboratory Course							
7	CS-401 P	Machine Learning Lab	2	0	0	3	3
8	CS-403 P	Dissertation	8	0	0	9	9
Total			**10**	**0**	**0**	**12**	**12**
Semester Total			**32**	**15**	**5**	**12**	**32**

For CSIT students it is compulsory to participate in MOOC/SWAYAM course (8-12 weeks) and show their marks/grade points obtained in MOOC/SWAYAM course taken.

B.Tech Fourth year, Semester-VIII

S. No.	Courses No.	Subject	Credits	Teaching schedule			Contact Hrs
				L	T	P	
1	TRN-401	Internship/Project Work*	28	0	0	0	0
Semester Total			**28**	**0**	**0**	**0**	**0**

***Note:** During Eight Semester Internship students have to develop a working Project in an Industry and this project will be evaluated in the department of CSIT by Internal and External Examiners/Experts.

LIST OF ELECTIVES for B. Tech III Year

CS331T Distributed System
CS332T Advanced Data Base Management System
CS333T Advanced Java Programming
CS334T Linux System Administration
CS335T Graph theory
CS336T Advance Data structure
CS337T Web Technology
CS338T Principles of Programming Languages
CS339T Software Project management
CS340T Programming in R
CS341T Pattern Recognition & Classification

LIST OF ELECTIVES for B. Tech IV Year

CS441T Neural network for Machine Learning
CS442T Data Compression
CS443T Network Security and Cryptography
CS447T Parallel Computing and Algorithms
CS448T Fault Tolerance Computing
CS449T Real Time System
CS450T Computational Geometry
CS451T Natural Language Processing
CS452T Embedded System

Note: Due to rapid change in Industrial needs and Technological advancements, there is a need to revise the syllabus and introduction of new electives. So, the Departmental board is authorized to revise the syllabus as well as introduction of new electives time to tim

Detailed Syllabus

B.Tech. First Year

Computer Fundamentals & C++ Programming

CS-101T
Credits: 4 (3-1-0)

B.Tech. First Year, Semester-II

UNIT I:

Introduction: Basic definition, Classification of Computers, Block diagram of computer and brief idea of its part (I/O, Memory, control unit) with their working and example. **Number System:** Introduction, Data representation-Decimal, Binary, octal,Hexadecimal and their inter convertibility.

Planning the computer program: Purpose of program planning, algorithms,flowcharts, Pseudo code.

UNIT II:

Computer Software: Introduction to software, hardware, Firmware with example, Type of software, Translators and their types (compiler, interpreter, assembler etc.). **Basic operating system concepts:** OS, Types of OS (MS-DOS, WINDOWS, Role of OS with its characteristics in brief (Multi-programming, Multitasking, Multiprocessing, Multi-threading, Time-sharing, online-processing, Real-time processing).

UNIT III:

Introduction to C++: Structured verses Object Oriented Development, Elements of Object Oriented Programming, Introduction to Objects, Classes, Encapsulation and data abstraction, Inheritance, Polymorphism, Overloading. C++ Data types, variables, operators and expressions. Statements and Blocks, if- statement, if-else statement, loops, switch statements.

UNIT IV:

Classes and Objects: Introduction, Classes, Class definition, Class member, member function, Public and Private variables, Derived classes, Constructors and Destructors**.**

UNIT V:

Object Oriented Features: Scope of variables, Inline function, Friend function, Friend class, Parameter passing. Inheritance, types of inheritance. Polymorphism, Overloading, Operator Overloading of Unary and Binary operators, Function Overloading. Templates.

References:

1. —Computer Fundamentalsǁ by V. Rajaraman
2. —Computer Fundamentalsǁby . B. Ram
3. —Programming in C++ǁ by E. Balagurusamy, TMH.
4. 'C++ Primer' by Stanley B. Lippman, Josée Lajoie, and Barbara E. Moo

Detailed Syllabus

B.Tech. Second Year

Discrete Mathematical Structures

CS-201T
Credits: 4 (3-1-0)

B.Tech. Second Year, Semester-III

UNIT I:

SET THEORY: Sets, Set Relations, Set operations, Infinite Collection of sets, Power sets, Venn Diagram, Algebras of sets, Cartesian Products, Inductively, defined sets, Proofs by Mathematical Induction.

FUNCTIONS: Functions, Injective and Surjective, Composition of functions, Inverse, Function, Recursively defined functions, Functions and Set operations, Permutation Function.

UNIT II:

RELATIONS:Relations, Types of relation, Representation of relation, Compositions, of Relations, Equivalence Relations ,Equivalence Classes

COUNTING AND COUNTABILITY : Counting Principles, Functions and Counting, Permutations and Combinations, Principle of inclusion and exclusion, Pigeonhole principle, Extended Pigeonhole principle.

UNIT III:

LOGIC: Propositions, Algebra of propositions, Conditional and Biconditional, Tautology & Contradiction, Disjunctive normal Form and Simplification, Predicates and Quantifiers, Valid Arguments and proofs using tautology concept & without tautology concept. Proofs of Arguments using reduction method.

UNIT IV:

GRAPH THEORY : Basic Concepts, Paths and Connectivity, Planar Graphs, Regular graph, Complete graph, Bipartite graph, Distance & Diameter, Trees & its types, Rooted Trees, Shortest path algorithm.

UNIT V:

INTRODUCTION TO ALGEBRA : Binary operations, Semigroups, Groups, Rings, Subgroups, Cosets and Lagrange‘s Theorem and its significance.

REFERENCES:-

1. Discrete Mathematics, Schaum‘s Outline, TMH
2. Olympia Nicodemi, —Discrete Mathematicsll, CBS Publications, Delhi.
3. J.P. Trembley & R. Manohar, —Discrete mathematical Structurell, Mc Graw Hill Book Co., NY.
4. Discrete Maths, 5th Edition, Ross-Wright,Pearson
5. Discrete mathematical Structure ,G.Shankar Rao, New Age

Data Structure USING C++

CS203T
Credits 4(3-1-0)

B.tech Second Year, Semester-III

UNIT I:

Basic Concepts & Notation: Data structure concepts and its types, Linear and Non-Linear data structures. Basics of Complexity and their types.

Array as an ADT: one dimensional array, two dimensional array and multidimensional array.

UNIT II:

Stacks: Definition and examples, primitive operations, Array representation of stacks, Example: Infix, Postfix, and Prefix: Basic definitions and Examples, Evaluating a postfix expression, Converting an expression from infix to postfix, Recursion - tower of Hanoi.

Queues and Linked Lists: The Queue and its sequential Representation, Priority Queue; Linked Lists: Inserting and removing nodes from the list, Linked list as a data Structure, Other List structures: Circular Lists, Doubly Linked Lists.

UNIT III:

Trees: Binary Trees,Operation on BinaryTrees, Traversal: Inorder, Preorder, Post order; Application Binary Tree. Expression Tree; Binary Tree Representation: Array representation, Link List representation; Example: Huffman Algorithm.

Binary search tree: inserting into Binary Search Tree (BST), Deleting from a BST, Balanced (AVL) Tree, Search Tree and B-Tree.

UNIT IV:

Search Methods: Basic search Techniques: Sequential Searching, Indexed Sequential Search, B++ tree.

Sorting: Selection sort, bubble sort, insertion sort, quick sort and Merge sort, Heap sort and their time complexity.

Hashing: Hash function: Division Method, Mid-square Method, Folding Method, hash table, collision resolution: linear probing, chaining.

UNIT V:

Graphs and Their Applications: Introduction, Representation of graphs- Adjacency matrix and adjacency list, Wars hall's algorithm, Dijkstra's algorithm, Graph traversal: Depth first search, Breadth First search.

Books

1.Data Structures using C/C++: Tennenbaum, PHI
2.Introduction to Data Structures : Schaum Series.by Lipetu, Mac GrawHill
3.Data Structures by Augenstein &Tenenbaum.

OBJECT ORIENTED PROGRAMMING USING JAVA

CS-205T
Credits: 4 (3-1-0)

B.tech Second Year, Semester-III

UNIT I

Introduction: Introduction – what is java, importance of java, java implementation application of java, sample program & compilation, using block of code. **Data type, operators, control structures:** variables, constants, declaration, literals, scope of variable, type casting, arithmetic operators, relational operators, logical operators, assignment operators, increment –decrement operators, conditional operators, bit wise operators, interface of operators, dot operators, if-else, statement, loops (while, do-while, for break, goto, continue return) switch statement, operator, array –declaration, creation, initialization, length, two-dimensional arrays, string-string arrays, string methods, stringbuffer class.

UNIT II

Introduction of classes, objects and methods: What is class, object & method, defining class, adding variables, adding methods, creating objects, constructors THIS key word, garbage collection, finalize() method, accessing class members, vactors and wrapper classes, inheritance, final variables and methods,final classes, finalizer methods, abstract methods and classes, visibility control – public access, friendly access, protected access,private protected access, String class, Command-Line arguments.

UNIT III

Inheritance: Inheritance, Member access, super class, creating multilevel Hierarchy, Method over loading & overriding, Abstract class, method,Using final to prevent overriding & overloading , the object class, packages and interfaces.

UNIT IV

Multithreaded programming: creating threads, run()method, new thread, thread class, stopping & blocking threads, life cycle of threadnewborn, runnable, running, blocked, dead, waiting sleeping, suspended, blocked, using thread methods, thread priority, synchronization, implementing the Runnable interface. **Exception handling:** exception types, uncaught exceptions, multiple catch clauses, nested try statements, throw, throws, finally.

UNIT V

I/O files in java: Concept of streams, difference between character streams and byte streams. **Applet:** what is an applet, applet lifecycle, applet class, use of java .awt graphics class and its various methods in an applet, Event Handling, Graphical user interface.

Books & References:

1)Programming with Java A Primer, E. Balaguruswamy Tata McGraw Hill Companies.
2)Java Programming John P. Flynt Thomson 2nd.
3)Java Programming Language Ken Arnold Pearson.
4)The complete reference JAVA2, Hervert schildt. TMH.
5)Big Java, Cay Horstmann 2nd edition, Wiley India Edition.

ANALYSIS AND DESIGN OF ALGORITHMS

CS 202T
Credits: 4 (3-1-0)

B.tech Second Year, Semester-IV

UNIT I: Overview: Introduction to basic techniques for designing and analyzing algorithms, including asymptotic analysis and recurrences; divide-and-conquer algorithms; lower bound for comparison based sorting methods, sorting in linear time, greedy algorithms; dynamic programming; backtracking and some graph algorithms for path problems.
Introduction: Algorithm, Psuedo code for expressing algorithms, Performance Analysis-Space complexity, Time complexity, Growth of functions: Asymptotic Notation, Recurrences: substitution method, master method.

UNIT II: Divide and Conquer: General method, applications-Binary search, Finding the maximum and minimum, Quick sort, Heapsort.
Sorting in Linear Time: Lower bounds for sorting, Counting sort, Radix sort, Bucket sort, Medians and Order Statistics, Minimum and maximum.

UNIT III: Greedy method: General method, applications- Knapsack problem, Job sequencing with deadlines, optimal two way merge patterns, Huffman codes, Minimum cost spanning trees: Prims and Kruskal's algorithm, Single Source shortest path:Bellman Ford algorithm, Dijkstra's Algorithm.

UNIT IV: Dynamic Programming: General method, applications, capital budgeting problem, Multistage graphs, Matrix chain multiplication, 0/1 knapsack problem, All Pair shoertest path algorithm.Traveslling salesman Problem.
Backtracking: General method, applications, 8-queen problem, sum of subsets problem, graph coloring, Hamiltonian cycles.

UNIT V: Graph Algorithms: Introduction, representation of graphs, Breadth first search, depth first search, topological sort, strongly connected component, flow networks, ford-fulkerson method.
NP-Hard and NP-Complete problems: Basic concepts, non deterministic algorithms, NP - Hard and NP Complete classes, satisfiability problem, reducibility.

TEXT BOOKS :

1.Introduction to Algorithms, second edition, T. H. Cormen,C. E. Leiserson, R.L. Rivest,and
C. Stein, PHI Pvt. Ltd./ Pearson Education.
2. Fundamentals of Computer Algorithms, Ellis Horowitz,Satraj Sahni and Rajasekharam,Galgotia publications pvt. Ltd.
3. Algorithm Design: Foundations, Analysis and Internet examples, M.T.Goodrich and R.Tomassia, John wiley and sons.
4.Introduction to algorithm, Aho , Hopcraft, Ullman , Rajeev Motwani.

Computer Organization

CS-204T
Credits: 4 (3-1-0)

B.tech Second Year, Semester-IV

UNIT I:

Introduction: Review of digital logic gates, Design of adder and subtractor using gates & K- MAP.

Arithmetic for Computer:- Introduction to number system, negative numbers, Arithmetic Algorithms (addition, subtraction, Booth Multiplication), IEEE standard for Floating point numbers

UNIT II:

Processor Design: Von-Neumann Structure, Processor Organization: General register organization, Stack organization, Addressing modes, instruction types, RISC and CISC.

UNIT III:

Control Design: - Control memory address sequencing, micro instruction interpretation, CPU control unit, Hardwired & Micro Programmed Control Unit, basic concepts of micro programmed control, micro program sequencer for a control memory, micro instruction formats.

UNIT IV:

Memory Organization:- Characteristics of memory systems, Memory Hierarchy, Virtual Memory, Dynamic Address Translation Scheme addressing scheme for main memory, TLB, characteristics and principles of cache memory, elements of cache design, Cache memory organization, Block replacement policies and mapping techniques.

UNIT V:

System Organization:- Synchronous & asynchronous communication, standard communication interfaces, Bus arbitration (Serial and Parallel procedure), Modes of transfer, Programmed I/O (IO addressing, IO instruction), DMA (Cycle Stealing Concept, DMA Controller and DMA Transfer), interrupt driven I/O: Interrupt processing, interrupt hardware, types of interrupts and exceptions.

REFERENCES

1. Computer Architecture and Organization, By John P. Hayes, TMH.
2. Computer organization and design, by John L. Hennessy & David A. Petterson, Morgan Kaufman.
3. Computer System Architecture, by M. Morris Mano, PHI
4. Computer Organization, Stallings(PHI)
5. Structured Computer Organization, Tannenbaum(PHI)

COMPUTER NETWORK

CS-206T
Credits: 4 (3-1-0)

B.tech Second Year, Semester-IV

Unit 1: Introduction: Data communication (Problem definition, types of signals, Modulation, Networks Topologies, Categories of Network (LAN, MAN & WAN), Transmission Media (design factors, classes and characteristics of different transmission medias), Switching techniques, Protocols and layering for Internet, Reference models (OSI and TCP/IP), Network devices (NIC, switch, hubs, Repeater, Bridge, Gateway, Router, Access point)

Unit 2: Data Link Layer: Problem definition, Functions of data link layer, Framing and Data Link Control, Error detection schemes (VRC, LRC, CRC and checksum), Error correction schemes (Hamming), Flow control and sliding window protocols (Simplest, Stop & Wait ARQ, Go-Back-N ARQ, Selective Repeat ARQ), Multiple Access protocols (ALOHA family, CSMA family, Contention-free access, polling and token passing method for MAC protocol, Channelization, Ethernet evaluation through generations (Standard, fast, Gigabit),SDLC, HDLC, SLIP and PPP protocols, IEEE standard (802.3, 802.4, 802.5, 802.6, 802.11).

Unit 3: Network Layer and Internetworking: Problem definition, Datagram and virtual circuit models (IP, MPLS), IP addressing (class-full, Classless, subnetting and super-netting) and forwarding (prefixes, longest matching prefix), IP helpers: ARP, DHCP, Internetworking (fragmentation, path MTU discovery, ICMP), IPv4 datagram, IPv6 header and transition from IPV4 to IPv6, Network Address Translation (NAT), VPN concepts.

Unit 4:Routing: Problem definition, Routing concepts: Chars, Types, Store-and-Forward Packet Switching, Services Provided to the Transport Layer, Connectionless Service and Connection-Oriented Service, Design elements of routing strategies. Shortest cost routing model, Dijkstra's algorithm, Distance Vector and Link-state routing, Hierarchical routing, Flooding, Broadcast routing, Multicast routing, Routing for Mobile Host.

Unit 5: Transport Layer, and Application layer: Problem definition, Sockets, ports and service, Reliable and unreliable delivery (TCP, UDP), Connection establishment and teardown, General Principles of Congestion Control, Congestion Prevention Policies, Congestion control in datagram subnet, TCP congestion control (slow start, fast retransmission and recovery), Techniques for achieving good Quality of Service: Buffering, Traffic shaping, The leaky bucket algorithm, The Token bucket algorithm; Application Layer Protocols: Naming (DNS), Telnet, Electronic Mail, SMTP, ftp, mime, pop3, imap4.

TEXT BOOKS :

1. Computer Networks — Andrew S Tanenbaum, 4th Edition. Pearson, Education/PHI
2. Data Communications and Networking – Behrouz A. Forouzan.Third, Edition TMH.

REFERENCES :

1. An Engineering Approach to Computer Networks-S.Keshav, 2nd Edition, Pearson Education
2. Understanding communications and Networks, 3rd Edition, W.A. Shay, Thomson
3. Data Networks, D. Bertsekas and R Gallager, PHI.
4. W. Stallings, Data and Computer Coomunication, Pearson education.

Data Base Management Systems

CS-208T
Credits: 4 (3-1-0)

B.tech Second Year, Semester-IV

UNIT I

Introduction: Data Base System Concepts, database system architecture, Data models and their types, Data base scheme and Instances, Data Independence, Data Base Languages and Interfaces, DBA role.

Data Modeling Using the Entity-Relationship Model: ER model concepts, Notations for ER diagram, Extended E-R diagram, Extended E-R model, E-R model design issues, constraints, keys: Weak entity set strong entity set, Relationships of higher degree.

UNIT II

Relational Data Model and Languages: Relational model concepts, E.F. Code rules for RDBMS, constraints, Relational Algebra operations, Extended relational algebra operations, Relational Calculus, Tuple and Domain relational calculus

SQL (DDL, DML, DTCL, DCL): Basic Structure and queries; set operators, Aggregate function, Derived Relations, Modification of the Database, Joined relations and up-dates in SQL, Advance SQL (SQL data types, Embedded-SQL, Dynamic SQL)

UNIT III

Database Design: Functional dependencies, Normal forms, First second, and third normal forms, BCNF, Multi-valued dependencies and Fourth Normal form, Join Dependencies and Fifth Normal form. **Transaction Processing concepts:** Transaction and system concepts, transaction states, ACID properties of transactions, concurrent execution schedules and Recoverability, serializability of schedules. **Query Processing and Optimization:** Measures of Query cost, Cost, Evaluation of expression; Optimization: Transformation of relational expression, Choice of evaluation plan.

UNIT IV

Concurrency Control Techniques: Lock based protocols: Two phase and three phase Locking Techniques for Concurrency Control; Time-Based Protocols: Time stamping and concurrency control; Deadlock handling: Concepts and Necessary conditions, Deadlock prevention, Deadlock avoidance. **Storage and Query Processing:** Overview of physical storage, Magnetic disks, RAID, File organization, Data dictionary, Indexing, B+ Tree Index, B Tree Index files, Static and Dynamic Hashing.

UNIT V

Protecting the Database against Misuse: Integrity constraints, Principle of security, security, Views, Encryption and Decryption Techniques, RSA Algorithm, Diffie Hellman Algorithm.

References:

1) Abraham Silberschatz. Henry F. Korth S.Sudarshan; database system concepts, McGraw hill Book co. 1997.

2) Date, C.J; An introduction to database system volume I & II, Addison-Wesley, 1981, 1983.

3) Ullman, Jeffrey D: Principles of database systems 2nd Edn Galgotial Publication Pvt. Ltd. 1982.

Python Programming

CS-210T
Credits: 4 (3-1-0)

B.tech Second Year, Semester-IV

Unit -1 Introduction to Python- Writing and Executing First Python Program Literal, Constants, Numbers, Strings, Variables, and Identifiers, Data Types, Input/Output Operation, Comments, Reserved Words Indentation , Operators and Expressions, Arithmetic Operators, Comparison Operators, Shortcut Operators, Unary Operators, Bitwise Operators, Shift Operators, Logical Operators, Membership Operators, Identity Operators, Operators Precedence and Associativity, Expressions in Python, Operations on Strings, Concatenation, Multiplication (or String Repetition), Slice a String, Type Conversion. **Decision Control Statements:** if statement, if-else Statement, Nested if statements, if-elif-else statement, Basic Loop Structures: while loop, for Loop, Nested Loops, The break Statement, The continue Statement, The pass Statement.

Unit -2 Building Blocks in Python - Functions : Definition ,Calling ,Parameters ,Variable Scope and Lifetime ,Local and Global Variables , return statement ,Required Arguments , Keyword Arguments ,Default Arguments ,Variable-length Arguments , Lambda Functions , Documentation Strings , Recursive Functions. **Modules :**The from…import statement ,Name of Module ,Making your own Modules .

Unit-3 Python Strings : Concatenating, Appending, and Multiplying Strings ,String Formatting Operator , Built-in String Methods ,Slice Operation , in and not in operators ,Comparing Strings ,Iterating String ,The String Module .Regular Expressions : match() , search() , sub() , findall() , finditer(). **File Handling** :File Path ,Types of Files ,ASCII Text Files ,Binary Files ,Opening and Closing Files ,Reading and Writing Files ,Renaming and Deleting Files . **Data Structures** :Lists ,Tuple ,Sets ,Dictionaries ,List vs Tuple vs Dictionary vs Set .

Unit-4 Classes and Objects : Introduction ,Classes and Objects, Defining Classes ,Creating Objects, Data Abstraction and Hiding through Classes ,Class Method and self Argument ,The __init__() Method , The __del__() Method ,Public and Private Data Members, Private Methods , Calling a Class Method from Another Class Method , Built-in Functions to Check, Get, Set, and Delete Class Attributes, Built-in Class Attributes .

Unit-5 Inheritance Introduction , Inheriting Classes in Python , Polymorphism and Method Overriding , Types of Inheritance , Composition or Containership or Complex Objects , Abstract Classes and Interfaces , Metaclass ; **Error and Exception Handling :** Introduction to Errors and Exceptions , Syntax Errors, Logic Error , Exceptions , Handling Exceptions , Multiple Except Blocks , Multiple Exceptions in a Single Block , Except Block Without Exception , The else Clause , Raising Exceptions , Instantiating Exceptions , Handling Exceptions in Invoked Functions , Built-in and User-defined Exceptions , The finally Block , Pre-defined Clean–up ActionRe-raising Exception , Assertions in Python.

Books

- Python Programming: Using Problem Solving Approach : Reema Thareja
- Core Python Programming by R. Nageswara Rao

Detailed Syllabus

B.Tech. Third Year

WIRELESS NETWORK

CS-308T
Credits: 4 (3-1-0)

B.tech Third Year, Semester-V

UNIT-I

Overview of wireless communication: History, Different Generations, General characteristics of mobile devices, Electromagnetic spectrum, Radio propagation mechanisms, characteristics of wireless medium, wireless topology, cellular system (cell concepts, cell hierarchy, cell fundamentals)

UNIT-II

WLAN: Technical issue (uses, design goal, types, components and services offered by a typical IEEE 802.11 network), IEEE 802.11 standard (physical layer, MAC layer mechanism & functionalities, CSMA/CA mechanism). HIPERLAN: HIPERLAN standard, HyperLAN/1 (physical layer, DLC & RLC layer, MAC sub-layer), HyperLAN/2 (Physical layer, MAC sub-layer, power conservation issues) BLUETOOTH: Specifications, transport protocol group, middleware protocol group, profile.

UNIT-III

Medium access control (wireless): Motivation for a specialized MAC (hidden and exposed terminals, near and far terminals), SDMA, FDMA, TDMA and CDMA.

UNIT- IV

Mobile Network layer: Mobile IP: Goals, assumptions, entities and terminology, IP packet delivery, agent advertisement and discovery, registration, tunneling and encapsulation, optimizations, and dynamic host configuration protocols (DHCP).

UNIT- V

Mobile Transport layer: Traditional TCP, Indirect TCP, Snooping TCP,, Mobile TCP, Fast retransmission/ fast recovery, transmission/time-out freezing, selective retransmission, transaction oriented TCP. Wireless Application Protocol WAP: Introduction, protocol architecture and treatment of protocols of all layers.

Books:

1. Murthy and Manoj, Ad Hoc Wireless Networks, Pearson Educationpublication.
2. Jochen Schiller,—Mobile Communicationsǁ,Addison-Wesley.
3. Stojmenovic and Cacute, —Handbook of Wireless Networks and Mobile Computingǁ, Wiley, 2002, ISBN 0471419028.

SOFTWARE ENGINEERING

CS-303T
Credits: 4 (3-1-0)

B.tech Third Year, Semester-V

UNIT I: Introduction: Introduction to software engineering, software crisis, software characteristics & application, software development life cycle model, waterfall model, iterative waterfall model , prototyping model, evolutionary model, spiral model, Agile development.

Pr**oject Management :** project management concept, software process and project metrics, project size estimation metrics, project estimation technique, empirical estimation technique, COCOMO – A heuristic estimation technique ,Halstead's software science-an analytical technique ,staffing level estimation, scheduling.

UNIT II: Software Requirement Specification : requirement analysis , requirement elicitation techniques like FAST ,QFD & use case approach,DFD ,ER-diagram ,nature of SRS, characteristic & organization of SRS ,Alternative analysis techniques , data sturucture oriented methods ,the DSSD Approach , Jackson system development.

UNIT III: System Design: Design concept or principal, design fundamental abstraction, refinement, modularity,software architecture, control hierarchy, design techniques and its implementation:structure approach , functional approach ,object oriented approach.

UNIT IV: Testing And Maintenance: coding guidelines ,code review ,testing process,design of test case ,functional testing ,structural testing ,software testing techniques : unit testing ,integration testing (topdown and bottomup), alphaand beta testing,system testing and debugging ,maintenance process , maintenance model, reverse – engineering and re – engineering ,documentation ,verification vs validation.

UNIT V: Software Reliability And Quality Assurance : quality concepts & characteristics ,software quality assurance ,software quality activity, cost impact of software , formal technical review, the review meeting ,review reporting and record keeping ,review guide line , SQA,CMM & ISO 9001 Standard.

References:

1.Software engineering : A Practitioner's approach by Roger S. Pressman (MC-Graw Hill International Edition).
2.An Integrated Approach To Software Engineering: Pankaj Jalote , NarosaPublication
3.Software Engineering Concepts By Fairley (TMH)
4. Fundamental Of Software Engineering: Rajib Mall.PHI

THEORY OF COMPUTATION

CS-305T
Credits: 4 (3-1-0)

B.tech Third Year, Semester-V

UNIT 1: Introduction

A general introduction to Strings, languages, graphs, trees and relations, Models of Computation: RAM and RASP Models of Computation, Finite State Machines, Regular expressions; Deterministic - Finite systems, Non deterministic Automata with and without e-moves, equivalence of DFA and NDFA without e-moves, Construction of DFA from NDFA with e-moves, FA with output: Moore and Mealy machine, Equivalence of Moore and Mealy Machine, Applications and Limitation of FA.

UNIT 2: Properties of regular sets

Regular expression (RE) , Definition, Operators of regular expression and there precedence, Algebraic laws for Regular expressions, Kleen‘s Theorem, Construction of Regular expression from FA, DFA to Regular expression, Arden Theorem, Non Regular Languages, Pumping Lemma for regular Languages. Application of Pumping Lemma, Closure properties of Regular Languages, Decision properties of Regular Languages.

UNIT 3: Context Free Grammars (CFG)

Chomsky Hierarchy of Grammars: Type0, 1, 2 and 3 Grammars. Context free grammar(CFG) and Context Free Languages (CFL): Definition, Examples, Derivation , Derivation trees, Ambiguity in Grammar, Ambiguous to Unambiguous CFG, Simplification of CFGs, Normal forms for CFGs: CNF(Chomsky normal form) and GNF (Griebach normal form), Conversion of a given grammar into Chomsky normal form, Griebach normal form (examples only). Closure properties of CFLs, Decision Properties of CFLs: Emptiness, Finiteness and Membership, Pumping lemma for CFLs.

UNIT 4. Push Down Automata

Definition of instantaneous descriptions, definition of Deterministic PDA, Construction of PDA for a given language, Two Stack PDA and its construction, construction of CFL‘s given the transition function of PDA, Equivalence of PDA and CFG, CFG to PDA and PDA to CFG.

UNIT 5: Turing machine (TM)

Definition, Types of TM, Different representations of TM, Construction of Turing machines for simple languages, Definition of Computable languages and functions, Definition of total recursive, partial recursive functions, Church Thesis, Post correspondence Problem, Halting problem.

Text Books:

1.John E Hopcroft, Rajeev Motwani, Jeffrey D Ullman, —Introduction to Automata Theory, Languages and Computation‖, Pearson Education

2. Peter Linz, —An Introduction to formal language and automata‖, Third edition, Narosa Publication.

References:

1. Kamala Krithivasan, Rama R, —Introduction to Formal Languages, Automata Theory and Computation‖, Pearson Education.

2.Martin J. C., —Introduction to Languages and Theory of Computations‖, TMH.

3.Papadimitrou, C. and Lewis, C.L., —Elements of the Theoryof Computation‖, PHI.

4.K.L.P. Mishra and N.Chandrasekaran, —Theory of Computer Science : Automata, Languages and Computation‖, PHI

5.Cohen D. I. A., —Introduction to Computer theory‖, JohnWiley & Sons.

6.John E Hopcroft, Jeffrey D Ullman,—Introduction to Automata Theory, Languages and Computation‖, Narosa Publication.

OPERATING SYSTEM

CS-307T
Credits: 4 (3-1-0)

B.tech Third Year, Semester-V

Unit – I

Introduction : Operating system and functions, Classification of Operating systems- Batch, Interactive, Time sharing, Real Time System, Multiprocessor Systems, Multiuser Systems, Multiprocess Systems, Multithreaded Systems, Operating System Structure- Layered structure, System Components, Operating System services, Reentrant Kernels, Monolithic and Microkernel Systems.

Unit – II

Concurrent Processes: Process Concept, Principle of Concurrency, Producer / Consumer Problem, Mutual Exclusion, Critical Section Problem, Dekker's solution, Peterson's solution, Semaphores, Test and Set operation; Classical Problem in Concurrency- Dining Philosopher Problem, Sleeping Barber Problem; Inter Process Communication models and Schemes, Process
generation.

Unit – III

CPU Scheduling: Scheduling Concepts, Performance Criteria, Process States, Process Transition Diagram, Schedulers, Process Control Block (PCB), Process address space, Process identification information, Threads and their management, Scheduling Algorithms, Multiprocessor Scheduling. Deadlock: System model, Deadlock characterization, Prevention, Avoidance and detection, Recovery from deadlock.

Unit – IV

Memory Management: Basic bare machine, Resident monitor, Multiprogramming with fixed partitions, Multiprogramming with variable partitions, Protection schemes, Paging, Segmentation,
Paged segmentation, Virtual memory concepts, Demand paging, Performance of demand paging, Page replacement algorithms, Thrashing, Cache memory organization, Locality of reference.

Unit – V

I/O Management and Disk Scheduling: I/O devices, and I/O subsystems, I/O buffering, Disk storage and disk scheduling, RAID. File System: File concept, File organization and access mechanism, File directories, and File sharing, File system implementation issues, File system protection and security.

References:

1. Silberschatz, Galvin and Gagne, —OperatingSystems Conceptsǁ, Wiley
2. Sibsankar Halder and Alex A Aravind, —Operating Systemsǁ, Pearson Education
3. Harvey M Dietel, — An Introduction to Operating Systemǁ, Pearson Education
4. D M Dhamdhere, —OperatingSystems : A Concept based Approachǁ, 2nd Edition, TMH
5.William Stallings, —Operating Systems: Internals and Design Principles ǁ, 6th Edition, Pearson Education

CLOUD COMPUTING

CS-302T
Credits: 4 (3-1-0)

B.tech Third Year, Semester-VI

UNIT-I

Cloud Computing Overview Origins of Cloud computing – Cloud components - Essential characteristics – On-demand selfservice, Broad network access, Location independent resource pooling ,Rapid elasticity , Measured service, Comparing cloud providers with traditional IT service providers, Roots of cloud computing.

UNIT-II

Cloud Insights Architectural influences – High-performance computing, Utility and Enterprise grid computing, Cloud scenarios – Benefits: scalability ,simplicity ,vendors ,security, Limitations – Sensitive information - Application development- security level of third party - security benefits, Regularity issues: Government policies.

UNIT-III

Cloud Architecture- Layers and Models Layers in cloud architecture, Software as a Service (SaaS), features of SaaS and benefits, Platform as a Service (PaaS), features of PaaS and benefits, Infrastructure as a Service (IaaS), features of IaaS and benefits, Service providers, challenges and risks in cloud adoption. Cloud deployment model: Public clouds – Private clouds – Community clouds - Hybrid clouds - Advantages of Cloud computing.

UNIT-IV

Cloud Simulators- CloudSim and GreenCloud Introduction to Simulator, understanding CloudSim simulator, CloudSim Architecture(User code, CloudSim, GridSim, SimJava) Understanding Working platform for CloudSim, Introduction to GreenCloud

UNIT-V

Introduction to VMWare Simulator Basics of VMWare, advantages of VMware virtualization, using Vmware workstation, creating virtual machines-understanding virtual machines, create a new virtual machine on local host, cloning virtual machines, virtualize a physical machine, starting and stopping a virtual machine.

BOOKS:

1.Cloud computing a practical approach - Anthony T.Velte , Toby J. Velte Robert Elsenpeter,
TATA McGraw- Hill
2. Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate
3.Cloud computing for dummies- Judith Hurwitz , Robin Bloor , Marcia Kaufman ,Fern Halper, Wiley Publishing, InC
4. Cloud Computing (Principles and Paradigms), Edited by Rajkumar Buyya, James Broberg, Andrzej Goscinski, John Wiley & Sons, Inc. 2011

COMPILER DESIGN

CS-304T
Credits: 4 (3-1-0)

B.tech Third Year, Semester-VI

UNIT I

Introduction to Compiling: Compiler, Translator and itsNeed, The phases of a compiler, phases of _C' compiler, Cousins of the Compiler, grouping of Phases, Bootstrapping.

Lexical Analysis: Role of lexical analyzer, Input buffering, specification & Recognition of tokens, Finite automata, Regular sets and expression, Conversion of Regular expression to FNA, Obtaining Regular expression from Finite Automata, Optimization of DFA states.

UNIT II

Basic Parsing Techniques: Context Free Grammar, Derivation and Parse Tree, Parsers: Top-down Parsing (Predictive Parser , Back tracking Parser or Recursive-descent parsing , LL parsing) ,Bottom Up Parsing (Shift –reduce parser, LR, Parser , SLR Parser , LALR Parser).

Syntax Directed Translation: Syntax directed definition, L- attribute and S- attribute definition, 3-address code, Inter mediate Code, Postfix notation, Quadruples, Triples, implementation of syntax directed translator, parse tree and syntax tree.

UNIT III

Symbol Tables : The contents of symbol table, Entering information in to symbol Table , Information about run time storage location, Data structure for symbol tables, representing scope information in Symbol Table , Storage allocation , Activation Record , Static Allocation, (call and return sequence, access to nonlocal names, setting up the access link.)

UNIT IV

Error detection and recovery: Errors, Error recovery, Errors and Recovery in Lexical phase , Syntactic-phase , Semantic phase, LR Parsing , Predictive Parsing .

UNIT V

Code optimization: Principles sources of optimization, loop optimization, DAG representation of basic blocks, values numbers and algebraic laws, Global data-flow analysis.

UNIT 8: Code Generation: Issues in the design of code generator, a simple code generator, register allocation and assignment, code generation from DAG.

References:

1.Aho, Sethi& Ullman, —Compilers Principles & Techniques & Toolsll, Addision Wesley.
2.Aho&Ulman, —Compiler Design, —Narosa Publishers, New Delhi.

INTERACTIVE COMPUTER GRAPHICS

CS-306T
Credits: 4 (3-1-0)

B.tech Third Year, Semester-VI

UNIT I

Introduction:

Origin of computer graphics, display devices, General purpose Graphics software display of solid objects.

Input Devices : Pointing and positioning devices, three dimensional input devices. Graph input techniques.

Display Techniques and Devices:

Point plotting techniques, coordinate, system and intcremental methods, line drawing algorithms, circle generators, display devices, CRT, inherited memory devices, the storage tube display, refresh line-drawing display.

UNIT II

Graphics Package and Display Files:

A simple graphics, segment functions for segmenting the display files, posting and unposting, segment naming schemes. Appending to segment refresh concurrent with reconstruction free storage allocation, display file structure, geometric models, defining symbols procedures, display procedure, structured display files.

UNIT III

Two Dimensional Transformations:

Principle concatenation matrix representation, a line dipping algorithm, midpoint division, dipping other graphics entities, polygon dipping viewing transformation, tiny windowing transformation.

UNITIV

Event Handling & Input Fractions:

Introduction, polling, interrupts, the event queue, functions for handling eveifits, polling task design, light pen interrupts, dragging and fix, htt detection, on-line character recognizers.

UNIT V

Raster Graphics:

Introduction, generating a raster image, interactive faster graphics raster display hardware.

3-D Graphics :

Realism of 3D Graphics, 3D Transformation, Projections and its types. Curves & surfaces, hidden line and surface elimination (Z-Buffer Algorithm), Introduction To Virtual Reality.

References:

1) Principles of interactive coinsurer graphics by W. M. Newman & R. F. Sproull, Me Graw Hill.

2)Computer Graphics by Donald Heam & Baker, PHI.

3) Mathematical Approach To Computer Graphics, Rodger,

CS-301T **Data Mining Techniques** **Credits 4(3-1-0)**

UNIT 1: Introduction: Types of data, learning of Computers, Self-learning & Methodology of science, Understanding of Concept learning using A kangaroo in mist example. KDD: Definition, Golden rules to setup KDD environment, KDD-processes; Introduction to Data mining, Data Mining System Architecture, Different phases of Datamining process, Types of Datamining techniques and Application areas; Data Preprocessing (Cleaning: Handling of missing values and Noisy data; Data Integration and Transformation, Data Reduction), **Data Warehouse:** problem definition, characteristics, OLAP, Multidimensional Data Analysis and data warehouse schemas, 3-level Architecture of data warehouse, Bigdata, DW vs Data Lake VS Lake house.

UNIT 2:Data Science: Problem definition, data, data types and data exploration, data science and data science process; **Artificial Intelligence:** Overview, AI For Data Mining, AI evolution, AI canonical Architecture, Machine learning deep Dives, Machine learning for datamining, Ensemble learning such as Random Forests, Bagging and AdaBoost; **Deep Learning:** Problem definition, McCulloch–Pitts model, Activation functions, single layer and multilayer Perceptions and examples,Anatomy of NN and design choices, major types of Neural networks.

UNIT 3: Data Mining (Supervised learning) Tasks: Problem definition, **Regression:** Introduction, Statistical modeling (KNN), model fitness and comparison; Linear Regression Model, estimate of the regression coefficient, model selection,Bias vs Variance;Logistic Regression Model, Estimation in Logistic regression, classification using logistic model, multiple logistic regression model; **Classification:** Introduction, regression vs classification, Types of classification Techniques, ensembled classifier, types of ensembled classifier; Decision Tree:Introduction, Tree construction principle, Basic Algorithm for Decision tree Induction, Understanding of Entropy and Gini Index using ID3, C-4.5 and CART algorithms;

UNIT 4: Data Mining (Supervised learning) Tasks: Problem definition, **Clustering:** Problem definition, clustering paradigms, Measurethe quality of clustering, Major Clustering Approaches: Partitioning clustering method [K-means and k-medoids (PAM, CLARA, & CLARANS) algorithms], Hierarchical clustering method [(BIRCH, CURE)], Density Based Method (DBSCAN), Model based clustering method, and Constraint based clustering method, outlier analysis; **Association Rules:** Problem definition, Frequent item set generation, Rule generation, Challenges, Apriori algorithm, Partition algorithms, Pincer search algorithms, Incremental algorithms, Border algorithm.

UNIT 5: Other Data Mining Tasks: Web Mining: Problem definition, Types of Web Mining (Web content mining, Web structure mining, Web users mining); **Text Mining:** Types and Challenges, Intelligent Information Retrieval for Text mining, Text classification; **Search engine for web mining**: Basics and its component, Web search product and services, Search Strategies for search Engine [word Frequency, Popularity, and expert database), Approaches for Ranking the Web pages (Page Rank, Hubs and Authorities).

References:

Detailed Syllabus

B.Tech. Fourth Year

MACHINE LEARNING

CS-401T
Credits: 4 (3-1-0)

B.Tech. Fourth Year, Semester-VII

Unit I: Overview and Introduction to Bayes Decision Theory: Machine intelligence and applications, pattern recognition concepts classification, regression, feature selection, supervised learning class conditional probability distributions,Examples of classifiers bayes optimal classifier and error, learning classification approaches.

Unit II: Linear machines: General and linear discriminants, decision regions, single layer neural network, linear separability, general gradient descent, perceptron learning algorithm, mean square criterion and widrow-Hoff learning algorithm; multi-Layer perceptrons: two-layers universal approximators, backpropagation learning, on-line, off-line error surface, important parameters.

Unit III: Learning decision trees: Inference model, general domains, symbolic decision trees, consistency, learning trees from training examples entropy, mutual information, ID3 algorithm criterion, C4.5 algorithm continuous test nodes, confidence, pruning, learning with incomplete data. Instance-based Learning: Nearest neighbor classification, k-nearest neighbor, nearest neighbor error probability,

Unit IV: Machine learning concepts and limitations: Learning theory, formal model of the learnable, sample complexity, learning in zero-bayes and realizable case, VC-dimension, fundamental algorithm independent concepts, hypothesis class, target class, inductive bias, occam's razor, empirical risk, limitations of inference machines, approximation and estimation errors, Tradeoff.Machine learning assessment and Improvement: Statistical model selection, structural risk minimization, bootstrapping, bagging, boosting.

Unit V: Support Vector Machines: Margin of a classifier, dual perceptron algorithm, learning nonlinear hypotheses with perceptron kernel functions, implicit non-linear feature space, theory,
zero-Bayes, realizable infinite hypothesis class, finite covering, margin-based bounds on risk, maximal margin classifier.

Books:

1. E. Alpaydin, Introduction to Machine Learning, Prentice Hall of India, 2006.
2. T. M. Mitchell, Machine Learning, McGraw-Hill, 1997.
3. C. M. Bishop, Pattern Recognition and Machine Learning, Springer, 2006.
4. R. O. Duda, P. E. Hart, and D.G. Stork, Pattern Classification, John Wiley and Sons, 2001.
5. Vladimir N. Vapnik, Statistical Learning Theory, John Wiley and Sons, 1998.
6. Shawe-Taylor J. and Cristianini N., Cambridge, Introduction to Support Vector Machines, University Press, 2000.

DIGITAL IMAGE PROCESSING

CS-403T
Credits: 4 (3-1-0)

B.Tech. Fourth Year, Semester-VII

Unit I

Introduction and Fundamentals Motivation and Perspective, Applications, Components of Image Processing System, Element of Visual Perception, A Simple Image Model, Sampling and Quantization.

Image Enhancement in Spatial Domain Introduction; Basic Gray Level Functions – Piecewise-Linear Transformation Functions: Contrast Stretching; Histogram Specification; Histogram Equalization; Local Enhancement; Enhancement using Arithmetic/Logic Operations – Image Subtraction, Image Averaging; Basics of Spatial Filtering; Smoothing - Mean filter, Ordered Statistic Filter; Sharpening – The Laplacian.

Unit II

Image Enhancement in Frequency Domain Fourier Transform and the Frequency Domain, Basis of Filtering in Frequency Domain, Filters – Low-pass, High-pass; Correspondence Between Filtering in Spatial and Frequency Domain; Smoothing Frequency Domain Filters – Gaussian Lowpass Filters; Sharpening Frequency Domain Filters – Gaussian Highpass Filters; Homomorphic Filtering.

Image Restoration A Model of Restoration Process, Noise Models, Restoration in the presence of Noise only-Spatial Filtering – Mean Filters: Arithmetic Mean filter, Geometric Mean Filter, Order Statistic Filters – Median Filter, Max and Min filters; Periodic Noise Reduction by Frequency Domain Filtering – Bandpass Filters; Minimum Mean-square Error Restoration.

Unit III

Color Image Processing Color Fundamentals, Color Models, Converting Colors to different models, Color Transformation, Smoothing and Sharpening, Color Segmentation.

Morphological Image Processing Introduction, Logic Operations involving Binary Images, Dilation and Erosion, Opening and Closing, Morphological Algorithms – Boundary Extraction, Region Filling, Extraction of Connected Components, Convex Hull, Thinning, Thickening

Unit IV

Registration Introduction, Geometric Transformation – Plane to Plane transformation, Mapping, Stereo Imaging – Algorithms to Establish Correspondence, Algorithms to Recover Depth **Segmentation** Introduction, Region Extraction, Pixel-Based Approach, Multi-level Thresholding, Local Thresholding, Region-based Approach, Edge and Line Detection: Edge Detection, Edge Operators, Pattern Fitting Approach, Edge Linking and Edge Following, Edge Elements Extraction by Thresholding, Edge Detector Performance, Line Detection, CornerDetection.

Unit V

Feature Extraction Representation, Topological Attributes, Geometric Attributes **Description** Boundary-based Description, Region-based Description, Relationship.

Object Recognition Deterministic Methods, Clustering, Statistical Classification, Syntactic Recognition, Tree Search, Graph Matching

BOOKS:

1.Digital Image Processing", R.C. Gonzalez and R.E. Woods, 3 rd Edition, Prentice-Hall
2.Digital Image Processing using MATLAB, R.C. Gonzalez, R.E. Woods, and S. L. Eddins, Pearson Prentice-Hall

DIGITAL IMAGE PROCESSING

CS-403T
Credits: 4 (3-1-0)

B.Tech. Fourth Year, Semester-VII

Unit I

Introduction and Fundamentals Motivation and Perspective, Applications, Components of Image Processing System, Element of Visual Perception, A Simple Image Model, Sampling and Quantization.

Image Enhancement in Spatial Domain Introduction; Basic Gray Level Functions – Piecewise-Linear Transformation Functions: Contrast Stretching; Histogram Specification; Histogram Equalization; Local Enhancement; Enhancement using Arithmetic/Logic Operations – Image Subtraction, Image Averaging; Basics of Spatial Filtering; Smoothing - Mean filter, Ordered Statistic Filter; Sharpening – The Laplacian.

Unit II

Image Enhancement in Frequency Domain Fourier Transform and the Frequency Domain, Basis of Filtering in Frequency Domain, Filters – Low-pass, High-pass; Correspondence Between Filtering in Spatial and Frequency Domain; Smoothing Frequency Domain Filters – Gaussian Lowpass Filters; Sharpening Frequency Domain Filters – Gaussian Highpass Filters; Homomorphic Filtering.

Image Restoration A Model of Restoration Process, Noise Models, Restoration in the presence of Noise only-Spatial Filtering – Mean Filters: Arithmetic Mean filter, Geometric Mean Filter, Order Statistic Filters – Median Filter, Max and Min filters; Periodic Noise Reduction by Frequency Domain Filtering – Bandpass Filters; Minimum Mean-square Error Restoration.

Unit III

Color Image Processing Color Fundamentals, Color Models, Converting Colors to different models, Color Transformation, Smoothing and Sharpening, Color Segmentation.

Morphological Image Processing Introduction, Logic Operations involving Binary Images, Dilation and Erosion, Opening and Closing, Morphological Algorithms – Boundary Extraction, Region Filling, Extraction of Connected Components, Convex Hull, Thinning, Thickening

Unit IV

Registration Introduction, Geometric Transformation – Plane to Plane transformation, Mapping, Stereo Imaging – Algorithms to Establish Correspondence, Algorithms to Recover Depth

Segmentation Introduction, Region Extraction, Pixel-Based Approach, Multi-level Thresholding, Local Thresholding, Region-based Approach, Edge and Line Detection: Edge Detection, Edge Operators, Pattern Fitting Approach, Edge Linking and Edge Following, Edge Elements Extraction by Thresholding, Edge Detector Performance, Line Detection, CornerDetection.

Unit V

Feature Extraction Representation, Topological Attributes, Geometric Attributes **Description** Boundary-based Description, Region-based Description, Relationship.

Object Recognition Deterministic Methods, Clustering, Statistical Classification, Syntactic Recognition, Tree Search, Graph Matching

BOOKS:

1.Digital Image Processing", R.C. Gonzalez and R.E. Woods, 3 rd Edition, Prentice-Hall
2.Digital Image Processing using MATLAB, R.C. Gonzalez, R.E. Woods, and S. L. Eddins, Pearson Prentice-Hall

Syllabus of Electives for

B.Tech. Third Year

Distributed System

CS-331T
Credits: 4 (3-1-0)

Elective (B.Tech. Third Year)

UNIT I

Introduction to distributed system : What is distributed system, Advantages of distributed systems over centralized systems and PCs, Disadvantages of distributed system. Hardware concepts: Bus based multiprocessors, switched Multiprocessors, Bus based multi computer, Switched multicomputers. Software Concepts: Network OS, true distributed systems, Multiprocessor time sharing system.

UNIT II

Architecture of Distributed System: Motivation of distributed operating system, System Architecture types, Various issues in distributed operating system: Global Knowlege, Naming,Scalability, Compatibility, Process Synchronization, Resource Management, Security, Client-Server computing model. The Massage Passing Model, Remote procedural calls.

UNIT III

Theoretical Foundations of Distributed Operating system: Inherent limitation of distributed system, absence of global clock, Absence of shared memory, Lamport's Logical clock, Global State Chandy-Lamport's global state recording algorithm, terminationdetection.

UNIT IV

Distributed deadlock, Distributed Mutual Exclusion and Agreement Protocol: Mutual Exclusion: Centralized Algorithm, Distributed algorithm, Token ring algorithm.Deadlock in distributed system. Distributed deadlock detection, Distributed deadlock prevention., Introduction to Agreement protocols, System models: Asynchronous Vs Synchronous Computation,

UNIT V

Distributed data storage and distributed Query Processing :
Data Replication, Data Fragmentation (horizontal, vertical and mixed), Data replication and fragmentation, Query Transformation, Simple join Processing. Semijoin strategy. Commit protocols-two phase commit and three phase commit, Concurrency control- locking protocol and time stamping, Deadlock handling - centralized and distributed approaches.

References:

1)Advanced Concepts in operating system by MukeshSinghal and Niranjan G. Shivaratri.
2) Distributed operating system by Andrew S.Tanenbaum.

Advanced DBMS

CS-332T
Credits: 4 (3-1-0)

Elective (B.Tech. Third Year)

Unit I

Introduction to distributed database systems, transaction processing Concurrency control techniques, security, Distributed Data Base architecture.

Unit II

Introduction to object oriented database system, Definition of Objects, Review of Key Object- oriented programming concepts, Object Orientation for Database Systems, Relational Extensions to Object-oriented Database Systems, Object Orientation in Relational Databases, Uses for Object-oriented Database.

Unit III

Introduction to data mining, Self-learning, What is data warehouse and why do we need, Designing decision support systems, Integration with data mining.

Unit IV

Introduction to knowledge discovery process, Data selection, cleaning. Enrichment coding data mining, Preliminary analysis of the data set using traditional query tools, Decompose trees, Association rules, Neural networks, Genetic algorithms Introduction to setting up a KDD environment.

Unit V

Advanced Transaction processing: Remote Backup systems, Transaction Processing Monitors, TP-Monitor Architectures, High-Performance Transaction systems. Long Duration Transactions, Transactional Workflows, Query Optimization security and production, Encryption, Statistical Database. Data base triggers, functions, procedures, packages and forms with respect to existing database.

S. No	Title	Author	Publisher
1	Distributed Data base system,.	Stegano Ceri and qiuseppe Pelagati	Mc-Graw Hill
2	Distributed Object Oriented Data-Systems Design	Prabhat K. Andleigh, Michacl R. Gretzinger	PTR Prentic Hall Inc
3	Data Mining, Addison, Wesley	Pieter Adriaans Dolf Zantinge	Longman Ltd

Advance JAVA Programming

CS-333T
Credits: 4 (3-1-0)

Elective (B.Tech. Third Year)

UNIT I

Collections: Basic,Collection Interfaces, Concrete Collections, The Collections Framework

Multithreading : Creating thread and running it, Multiple Thread acting on single object, Synchronization, Thread communication, Thread group, Thread priorities, Daemon Thread, Life Cycle of Thread

UNIT II

Networking: Internet Addressing, InetAddress, Factory Methods, Instance Methods, TCP/IP Client Sockets, URL, URL Connection, TCP/IP Server Sockets, Datagrams

Enterprise Java Bean: Preparing a Class to be a JavaBean, Creating a JavaBean,JavaBean Properties, Types of beans, Stateful Session bean, Stateless Session bean, Entity bean

UNIT III

Java Database Connectivity (JDBC): Merging Data from Multiple Tables: Joining, Manipulating Databases with JDBC, Prepared Statements, Transaction Processing, Stored Procedures C Servlets: Servlet Overview and Architecture, Interface Servlet and the Servlet Life Cycle, Handling HTTP get Requests, Handling HTTP post Requests, Redirecting Requests to Other Resources, Session Tracking, Cookies, Session Tracking with HttpSession

UNIT IV

Java Swing

Working with JFrame, JApplet, Jpanel, JTextfield, JPasswordField, Jbutton,Jcheckbox, Jradiobutton, Jlist, Jscrollpane, Jcombobox,Jmenu, Jmenubar,JMenuItem, JpopupMenu, JTree, JTable

Java Server Pages (JSP): Introduction, Java Server Pages Overview, A First Java Server Page Example, Implicit Objects, Scripting, Standard Actions, Directives, Custom Tag Libraries

Remote Method Invocation: Defining the Remote Interface, Implementing the Remote Interface, Compiling and Executing the Server and the Client.

UNIT V

Common Object Request Broker Architecture (CORBA): Technical/Architectural Overview, CORBA Basics, CORBA services

Introduction Smart Phone Application Development: Introduction to android platform, Creating application template, adding activity, intent, services to application, using Google map API

Reference Book:

1. —Advanced Java 2 Platform HOW TO PROGRAMll by H. M.Deitel, P. J. Deitel, S. E. Santry – Prentice Hall
2.
3. —BeginningJava™ EE 6 Platform with GlassFish 3 From Novice to Professionalll by Antonio Goncalves -Apress publication

References:

1. Programming with Java A Primer, E. Balaguruswamy Tata McGraw Hill Companies.
2. Java Programming John P. Flynt Thomson 2nd.

Linux System Administration

CS-334T
Credits: 4 (3-1-0)

Elective (B.Tech. Third Year)

Unit 1 Introduction: Duties of the Administrator, Administration tools, Overview of permissions. Processes: Process status, Killing processes, process priority. Starting up and Shut down: Peripherals, Kernel loading, Console, The scheduler, init and the inittab file, Run-levels, Run level scripts.
Managing User Accounts: Principles, password file, Password security, Shadowfile, Groups and the group file, Shells, restricted shells, user management commands, homes and permissions, default files, profiles, locking accounts, setting passwords, Switching user, Switching group, Removing users.

Unit 2 Managing Unix File Systems: Partitions, Swap space, Device files, Raw and Block files, Formatting disks, Making file systems, Superblock, I-nodes, File system checker, Mounting file systems, Logical Volumes, Network File systems, Boot disks.
Configuring the TCP/IP Networking : Kernel Configuration; Mounting the /proc File system, Installing the Binaries, Setting the Hostname, Assigning IP Addresses, Creating Subnets, Writing hosts and networks Files, Interface Configuration for IP, ifconfig, netstat command, Checking the ARP Tables; Name service and resolver configuration.

Unit 3 TCP/IP Firewall: Methods of Attack, What Is a Firewall? What Is IP Filtering? Setting Up Linux for Firewalling Testing a Firewall Configuration; A Sample Firewall Configuration: IPAccounting, Configuring the Kernel for IP Accounting, Configuring IP Accounting, Using IPAccounting Results
IP Masquerade and Network Address Translation : Side Effects and Fringe Benefits, Configuring the Kernel for IP Masquerade, Configuring IP Masquerade.

Unit 4 The Network Information System: Getting Acquainted with NIS, NIS Versus NIS+ , The Client Side of NIS, Running an NIS Server, NIS Server Security.
Network file system: Preparing NFS, Mounting an NFS Volume, The NFS Daemons, The exports File.
System Backup & Recovery: Log files for system and applications; Backup schedules and methods (manual and automated).

Unit 5 Active Directory, LDAP

S. No	Title	Authors	Publishers
1	System Software	L.L. Beck	Pearson Education
2	PC System Prog	Michel Ticher	Abacus
3	Linux network Adminis	Kirch	O'Rielly
4	Unix system administ	Maxwell	TMH
5	The Practice of System & Network Administration	Limoncelli	Pearson

Graph theory

CS-335T
Credits: 4 (3-1-0)

Elective (B.Tech. Third Year)

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

Unit 3 Incidence matrix - Submatrices 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 - Directed Paths and Connectedness - Euler Graphs - Adjacency Matrix of a Digraph.

Unit 4 Algorithms: Connectedness and Components - Spanning tree - Finding all Spanning Trees of a Graph -Set of Fundamental Circuits - Cut Vertices and Separability - Directed Circuits.

Unit 5 Algorithms: Shortest Path Algorithm - DFS - Planarity Testing - Isomorphism

S. No	Title	Author	Publisher
1	Graph Theory: With Application to Engineering and Computer Science	Narsingh Deo	PHI
2	Introduction to Graph Theory	R.J. Wilson	Pearson Education
3	A text book of Graph Theory	R. Balakrishan, K. Rangnathan	Springer

Advanced Data Structures

CS-336T
Credits: 4 (3-1-0)

Elective (B.Tech. Third Year)

Unit 1: Introduction- Basic concepts, Computational Models, Fixed Universe successor problem and other data structure problems.

Unit 2: Binary Search trees- Introduction, Height of Binary search tree, Basic Operations in Binary Search Tree: Search, Successor, predecessor, insert, deletion, minimum, maximum, Balancing trees, random binary search tree- treaps, optimal binary search tree, Cartesian tree and its applications.

Unit 3: Balanced Search Trees- Introduction, rotations, AVL Trees- insertion, deletion, Red Black Trees- height of Rb tree, insertion, deletion, Splay Trees- properties, splaying modes, splay tree operations, insertion, deletion, searching.

Unit 4: Multiway Search Trees- m-way search tree, B-tree-insertion, deletion, B+ tree-Searching, insertion, deletion, analysis, Finger Search Tree and level Linking, finger searching, finger search tree, search in finger tree, Randomized Finger Search Trees-Finger searching in Treaps, Finger searching in Skip Lists, Applications, (2,3) trees- height, insertion, deletion, application in range query, x-fast tree, y-fast tree.

Unit 5: String Data Structures- Introduction, Digital Search trees- searching, insertion, deletion, Binary tries, patricia trie, Suffix Trees, Suffix Array, Correspondence between suffix array and suffix tree.

Unit 6: Data Structure for Disjoint Sets- Introduction, Disjoint set operations, Determining connected components of an undirected graph, Disjoint set representation-Linked representation, Disjoint set forests, Shallow threaded trees, Applications- Maze generation, Kruskal's Minimum spanning tree.

Unit 7: Hashing Techniques- Introduction, Static Hashing, Hash functions, Cuckoo hashing, Bloom filters- design and applications.

Web Technology

CS-337T
Credits: 4 (3-1-0)

Elective (B.Tech. Third Year)

UNIT 1: INTRODUCTION

History of Web, Protocols governing Web, Creating Websites for individual andCorporate World, Cyber Laws, Web Applications, Writing Web Projects, Identification of Objects, Target Users, Web Team, Planning and Process Development Introduction toInternet Services.

UNIT 2: HTML:

Concept of Hypertext, Versions of HTML, Elements of HTML,Formatting Tags, Links, Hyperlinks, Image & Image map, List, Tables, Frames,Forms, Style Sheets, Background and Color Controls. DHTML: Introduction toDHTML. Advanced Netscape DHTML, Advanced Microsoft DHTML & Crossbrowser DHTML JavaScript: Introduction, Statements, Functions, objects inJavaScript, Events and Event Handling, Arrays, FORMS, Buttons, Checkboxes,Text fields and Text areas.

UNIT 3: CSS

Introduction, List, Tables, Images, Forms, Frames; Introduction to scripting languages: Problems with HTML & SGML, Types of XML Markup, Displaying an XML Document, Document Type Definitions (DTD), Linking,Using Style Sheets with XML. Data Interchange with an XML document,Client-side usage, Server Side usage;

UNIT 4: XML

CSS Document type definition, XML schemes, Object Models,Presenting XML, Using XML Processors: DOM and SAX, Introduction to Java Script, Object in Java Script, Dynamic HTML with Java Script Web project, Web Team, Communication Issues, the Client, Multidepartmental& Large scale Websites, Quality Assurance and Testing, Technological advances and Impact on Web Teams, Overview of Static or Dynamic Web page, Portal, Search Engine.

UNIT 5: PHP& MYSQL

PHP Introduction, Creating PHP Script, Running PHP Script, Variables & Constants, data types, Operators.PHP Conditional Statements, Control Statements, Arrays, Functions, Working with forms and database using MySQL.

UNIT 6: JSP

Introduction to JSP, JSP processing, JSP Application Design, Tomcat Server, Implicit JSP objects,Conditional Processing, Declaring variables and methods, Error Handling and Debugging, Sharingdata between JSP pages, Sharing Session and Application Data.

UNIT 7 - AJAX & CGI-PERL

AJAX Introduction, AJAX with XML, AJAX with PHP, Common Gateway Interface and Perl Programming.

Text books:

1) Burdman, —collaborative web developmentǁ addision Wesley
2) ASP.NET 21 days, TMH
3) —magic with HTML, DHTML, Javascriptǁ, laxmi publication.
4) —web technologyǁ, laxmi publication

Principles of Programming Languages

CS-338T
Credits: 4 (3-1-0)

Elective (B.Tech. Third Year)

UNIT 1: Introduction:
Why study programming language?, Charactristics of programming Languages, Factors influencing evolution of programming language, attributes of a good language, Role of programming language, Evolution of software architecture, Language Paradigms Language Standardization,.

UNIT 2: Virtural computer and actual computer:
Structure and operations of a compiler, Translator and software related components, syntax and semantics, Software simulation, Virtural computer and actual computer, Binding and Binding time.

UNIT 3: Data objects, variables and constant:
Data types, specification of elementary data types, types checking (Static and dynamics).

UNIT 4: Vectors and arrays:
Implementation of one and multi dimension arrays, records and structures, their implementation, Record and arrays with structured component, pointer.

UNIT 5: Parallel programming:
Principle of Parallel programming language co routines, synchronization of tasks using interrupts, semaphores and messages, mutual exclusion, critical section.

UNIT 6: Abstract data types:
Data Abstraction, information, hiding, encapsulation by subprograms-subprograms as Abstract operation, subprogram definition & invocation, generic subprogram.

UNIT 7: Subprogram control:
Simple subprogram call-return with its implementation Recursive program with its implementation Referencing environment .

References:
1) Programming Languages (2nd ed.) by Ravi Sethi
2) Programming Languages (2nd ed.) by Ravi Sethi & Terrence W. Pratt.

Software Project Management

CS-339T
Credits: 4 (3-1-0)

Elective (B.Tech. Third Year)

Unit 1 Introduction and Software ProjectPlanning Fundamentals ofSoftware Project Management (SPM), Need Identification, Vision and Scope document, Project Management Cycle, SPM Objectives, Management Spectrum, SPM Framework, Software Project Planning, Planning Objectives, Project Plan, Types of project plan, Structure of a Software Project Management Plan, Software project estimation, Estimation methods, Estimation models, Decision process.

Unit 2 Project Organization and Scheduling Project Elements, Work Breakdown Structure (WBS), Types of WBS, Functions, Activities and Tasks, Project Life Cycle and Product Life Cycle, Ways to Organize Personnel, Project schedule, Scheduling Objectives, Building the project schedule, Scheduling terminology and techniques, Network Diagrams: PERT, CPM, Bar Charts: Milestone Charts, Gantt Charts.

Unit 3 Project Monitoring and ControlDimensions of Project Monitoring & Control, Earned Value Analysis, Earned Value Indicators: Budgeted Cost for Work Scheduled (BCWS), Cost Variance (CV), Schedule Variance (SV), Cost Performance Index (CPI), Schedule Performance Index (SPI), Interpretation of Earned Value Indicators, Error Tracking, Software Reviews, Types of Review: Inspections, Deskchecks, Walkthroughs, Code Reviews, Pair Programming.

Unit 4 Software Quality Assurance and Testing Testing Objectives, Testing Principles, Test Plans, Test Cases, Types of Testing, Levels of Testing, Test Strategies, Program Correctness, Program Verification & validation, Testing Automation & Testing Tools, Concept of Software Quality, Software Quality Attributes, Software Quality Metrics and Indicators, The SEI Capability Maturity Model CMM), SQA Activities, Formal SQA Approaches: Proof of correctness, Statistical quality assurance, Cleanroom process.

Unit 5 Project Management and ProjectManagement Tools SoftwareConfiguration Management: Software Configuration Items and tasks, Baselines, Plan for Change, Change Control, Change Requests Management, Version
Control, Risk Management: Risks and risk types, Risk Breakdown Structure (RBS), Risk Management Process: Risk identification, Risk analysis, Risk planning, Risk monitoring, Cost Benefit Analysis, Software Project Management Tools: CASE Tools, Planning and Scheduling Tools, MS-Project.

S. No	Title	Author	Publisher
1	Software Project ManagementM.	Cotterell , Bob Hughes	McGrew Hill
2	Software Project Managemnet	S. A. KelkarPHI	PHI

Programming in R

CS-340T
Credits: 4 (3-1-0)

Elective (B.Tech. Third Year)

Unit 1 Introduction: Basic fundamentals; installation and use of software; RStudio, R for mathematics: Arithmetic, Logarithms and Exponentials, E-Notation; Assigning Objects, Vectors: Creating a Vector, Sequences, Repetition, Sorting, and Lengths, Matrix Operations and Algebra, Multidimensional Array, Non-numeric values, String and its operations, Factors, List and Data Frames, special values, reading/writing data, Reading files: R-Ready Data Sets and Reading in External Data Files, import/export data, correlation and agregation.

Unit 2 Control structures, Loops, and Function: If Statements, else Statements, if-else statement, Nesting and Stacking Statements, The switch statement, Loops: For and while, Functions: Function creation and return statements, recursive functions, scoping rules.

Unit 3 Data Analysis: Data: Numeric, Categorical, univariate and multivariate, Analysis of Data: Centrality: Mean, Median, Mode, Counts, Percentages, and Proportions Quantiles, Percentiles, Spread: Variance, Standard Deviation, and the Interquartile Range. Covariance and Correlation Outliers.

Unit 4 Machine Learning: Regression in R: simple, multi-linear, and stepwise, Decission Tree
in R, R Random Forest, Kmeans clustering, examples

Unit 5 Data Visualization: Using plot with Coordinate Vectors, Graphical Parameters: Automatic Plot Types, Title and Axis Labels, Color, The ggplot2 Package, Bar plots and Pie Charts, Histograms, Box plot, Scatter plot.

Books:

1. Beginning R: The Statistical Programming Language by Mark Gardener, Wiley, 2013.
2. The R Software-Fundamentals of Programming and Statistical Analysis by Pierre Lafaye de Micheaux, Rémy Drouilhet, Benoit Liquet, Springer 2013.
3. A Beginner's Guide to R (Use R) by Alain F. Zuur, Elena N. Ieno, Erik H.W.G. Meesters, Springer 2009.
4. Data Analysis and Graphics Using R. by John Maindonald and John Braun Cambridge University Press, Cambridge, 2nd edition, 2007. ISBN 978-0-521-86116-8.
5. The R book by Crawley, Michael J John Wiley & Sons, 2012.
6. The book of R: a first course in programming and statistics by Davies, Tilman M., No Starch Press, 2016.

Pattern Recognition and Classification

CS-341T
Credits: 4 (3-1-0)

Elective (B.Tech. Third Year)

Unit 1 **Introduction:** Basics of pattern recognition, Design principles of pattern recognition system, Learning and adaptation, Pattern recognition approaches, Mathematical foundations Linear algebra, Probability Theory, Expectation, mean and covariance, Normal distribution, multivariate normal densities, Chi squared test.

Unit 2 Statistical Patten Recognition: Bayesian Decision Theory, Classifiers, Normal density and discriminate functions,

Unit 3 Parameter estimation methods: Maximum-Likelihood estimation, Bayesian Parameter estimation, Dimension reduction methods - Principal Component Analysis (PCA), Fisher Linear discriminate analysis, Expectation-maximization (EM), Hidden Markov Models (HMM), Gaussian mixture models.

Unit 4 Nonparametric Techniques: Density Estimation, Parzen Windows, K-Nearest Neighbor Estimation, Nearest Neighbor Rule, Fuzzy classification.

Unit 5 Unsupervised Learning & Clustering: Criterion functions for clustering, Clustering Techniques: Iterative square - error partitional clustering – K-means, agglomerative hierarchical clustering, Cluster validation.

S. No	Title	Author	Publisher
1	Pattern Recognition	Rchard O. Duda, Peter E. Hart and David G. Stork	John Wiley
2	Pattern Recognition and Machine Learning	C. M. Bishop	Springer

Syllabus of Electives

B.Tech. Fourth Year

Neural Network for Machine learning

CS-441T
Credits: 4 (3-1-0)

Elective (B.Tech. Fourth Year)

UNIT 1: Introduction, well posed learning problems, Machine learning approach, perspective and issues in machine learning, elements of Machine learning, types of machine learning: supervised learning, unsupervised learning, reinforcement learning, recommender system, linear regression with one variable (cost function, example), regression with multi variable and applications, gradient descent, overview of soft computing and applications.

UNIT 2: Introduction to Artificial Neural Systems, Neural Computation: Some Examples and Applications, biological Neurons, dendrite, synapses and their weights, pre- and post-synaptic signals, activation potential and activation function. Excitatory and inhibitory synapses. The biasing input. Types of activating functions, Models of Artificial Neural Networks, Neural Processing,

Unit 3: Learning and adaptation, Learning as Approximation or Equilibria Encoding, Supervised and Unsupervised Learning, Neural Network Learning Rules: Hebbian Learning Rule, Perceptron Learning Rule, Delta Learning Rule, Least-Mean-Square (Widrow-Hoff) Learning Rule, Correlation Learning Rule, Winner-Take-All Learning Rule, Outstar Learning Rule

Unit 4: Perceptron, Single-Layer Perceptron Classifiers, Classification Model, Features, and Decision Regions, Discriminate Function, perceptron for classification.

Unit 5: Multilayer Feed Forward Neural Network, Supervised Learning, Linearly Nonseparable Pattern Classification, Error Back-Propagation algorithm, Fast training algorithms.
Self-Organising Maps, Kohonen networks Recurrent Networks, Hopfield networks.

Text Books:

1.Tom M. Mitchell. "Machine Learning" McGraw-Hill, 1997.
2.P. Langley. "Elements of Machine Learning" Morgan Kaufmann Publishers, Inc. 1996.
3.Artificial neural Networks, Zurada, Jacek M.
4.Neural Networks for Pattern Recognition,. Bishop, C. M. (1995), Oxford University Press.
5.Neural Networks: A Comprehensive Foundation, Simon Haykin.
6.Artificial neural Networks, B. Yegnanarayana, PHI
7. Neural networks, Fuzzy logic and Genetic Algorithms, S. Raj sekaran , Vijayalakshmi Pari, PHI.

DATA COMPRESSION

CS-442T
Credits: 4 (3-1-0)

Elective (B.Tech. Fourth Year)

Unit - I: Introduction

Compression Techniques: Loss less compression, Lossy Compression, Measures of prefonnance, Modeling and coding, Mathematical Preliminaries for Lossless compression: A brief introduction to information theory, Models: Physical models, Probability models, Markov models, composite source model, Coding: uniquely decodable codes, Prefix codes.

Unit – II: Huffman coding

The Huffman coding algorithm: Minimum variance Huffman codes, Adaptive Huffman coding: Update procedure, Encoding procedure, Decoding procedure. Golomb codes, Rice codes, Tunstall codes, Applications of Huffman coding: Loss less image compression, Text compression.

Unit-III: Arithmetic Coding

Coding a sequence, Generating a binary code, Comparison of Binary and Huffman coding, Applications: Bi-level image compression. Dictionary Techniques: Introduction, Static Dictionary: Diagram Coding, Adaptive Dictionary. The LZ77 Approach, The LZ78 Approach, Applications: File Compression-UNIX compress, Image Compression: The Graphics Interchange Format (GIF), Compression over Modems: V.42 bits, Predictive Coding: Prediction with Partial match (ppm): The basic algorithm, The ESCAPE SYMBOL, length of context, The Exclusion Principle, The Burrows- Wheeler Transform: Move-to-front coding, Multi-resolution Approaches, Facsimile Encoding, Dynamic Markoy Compression.

Unit – IV: Mathematical Preliminaries for Lossy Coding

Distortion criteria, Models, Scalar Ouantization: The Quantization problem, Uniform Quantizer, Adaptive Quantization, Non uniform Quantization.

Unit-V: Vector Quantization

Advantages of Vector Quantization over Scalar Quantization, The Linde-Buzo- Gray Algorithm, Tree structured Vector Quantizers. Structured Vector Quantizers.

Books:

1. Khalid Sayood, Introduction to Data Compression, Morgan Kaufmann Publishers

Network security and Cryptography

CS-443T
Credits: 4 (3-1-0)

Elective (B.Tech. Fourth Year)

Unit 1 **Introduction:** Terminology, Substitution ciphers and Transposition ciphers, Simple XOR, One-Time Pads, Computer Algorithms. Cryptographic Protocols

Unit 2 **Protocol Building Blocks:** Introduction, Communication using Symmetric Cryptography, One-Way Hash Functions, One-Way Hash Functions, Communication using Public-Key Cryptography, Digital Signatures, Digital Signatures with Encryption.

Unit 3 **Protocols:** Authentication and Key exchange, Key Exchange, Authentication, Multiple key public key cryptography, Secret splitting, Secret Sharing, Cryptographic protection. Zero- Knowledge Proofs, Zero-Knowledge Proofs of Indentity, Blind Signatures, Obilivious Transfer, oblivious signature, Simultaneous contract singing Cryptographic Techniques

Unit 4 **Key Management :** Generating Keys, Nonlinear Keyspaces, Transferring Keys, Verifying Keys, Using Keys.

Unit 5 **Using Algorithms:** Choosing an Algorithm, Public-Key cryptography versus Symmetric cryptography, Encrypting Communication Channels, Encrypting data for Storage.
Cryptographic Algorithms: RSA, DES

S. No	Title	Author	Publisher
1	Applied Cryptography	Bruce Schneier, John Viley & Sons.	
2	Network Security and Cryptography	WillamStalling	
3	Concept of Network Security and Cryptography	Frozen	

Artificial Intelligence

CS-444T
Credits: 4 (3-1-0)

Elective (B.Tech. Fourth Year)

Unit-I

Introduction: Introduction to Artificial Intelligence, Foundations and History of Artificial Intelligence,can machine think?, AI techniques, components of AI, Applications of Artificial Intelligence,Intelligent Agents, Structure of Intelligent Agents. Computer vision, Natural Language Possessing.

Unit-II

Introduction to Search : Searching for solutions, Uniformed search strategies(BFS,DFS), Informed search strategies(hill climbing search,best-first search,A* search,IDA*,AO*), Local search algorithms and optimistic problems, Adversarial Search, Search for games, Alpha - Beta pruning.

Unit-III

Knowledge Representation & Reasoning: Propositional logic, Theory of first order logic,Inference in First order logic, Forward & Backward chaining, Resolution, Probabilistic reasoning, Utility theory, Hidden Markov Models (HMM), Bayesian Networks.

Unit-IV

Machine Learning : Supervised and unsupervised learning, Decision trees, Statistical learning models, Learning with complete data - Naive Bayes models, Learning with hidden data – EM algorithm, Reinforcement learning,

Unit-V

Pattern Recognition : Introduction, Design principles of pattern recognition system, Statistical Pattern recognition, Parameter estimation methods - Principle Component Analysis (PCA) and Linear Discriminant Analysis (LDA), Classification Techniques – Nearest Neighbor (NN) Rule, Bayes Classifier, Support Vector Machine (SVM), K – means clustering.

References:

1.Stuart Russell, Peter Norvig, —Artificial Intelligence – A Modern Approachǁ, Pearson Education
2. Elaine Rich and Kevin Knight, —Artificial Intelligenceǁ, McGraw-Hill
3.E Charniak and D McDermott, —Introduction to Artificial Intelligenceǁ, Pearson Education
4. Dan W. Patterson, —Artificial Intelligence and Expert Systemsǁ, Prentice Hall of India,

Network Management System

CS-445T
Credits: 4 (3-1-0)

Elective (B.Tech. Fourth Year)

Unit 1 Data communications and Network Management Overview: Analogy ofTelephone Network Management, Communications protocols and Standards, Case Histories of Networking and Management, Challenges of Information Technology Managers, Network Management: Goals, Organization, and Functions, Network and System Management, Network Management System Platform, Current Status and future of Network Management.

Unit 2 SNMPV1 Network Management: Organization and Information and Information Models. Managed network: Case Histories and Examples, The History of SNMP Management, The SNMP Model, The Organization Model, System Overview, The Information Model. SNMPv1 Network Management: Communication and Functional Models. The SNMP Communication Model, Functional model. SNMP Management: SNMPv2: Major Changes in SNMPv2, SNMPv2 System Architecture, SNMPv2 Structure of Management Information, the SNMPv2 Management Information Base, SNMPv2 Protocol, Compatibility with SNMPv1.

Unit 3 SNMP Management: RMON: What is Remote Monitoring? , RMON SMI and MIB,RMON1, RMON2, ATM Remote Monitoring, A Case Study of Internet Traffic Using RMON Telecommunications Management Network: Why TMN? , Operations Systems, TMN Conceptual Model, TMN Standards, TMN Architecture, TMN Management Service Architecture, An Integrated View of TMN, Implementation Issues.

Unit 4 Network Management Tools and Systems: Network Management Tools, Network Statistics Measurement Systems, History of Enterprise Management, Network Management systems, Commercial Network management Systems, System Management, Enterprise Management Solutions

Unit 5 Web-Based Management: NMS with Web Interface and Web-Based Management,Web Interface to SNMP Management, Embedded Web-Based Management, Desktop management Interface, Web-Based Enterprise Management, WBEM: Windows Management Instrumentation, Java management Extensions, Management of a Storage Area Network, Future Directions.

S. No	Title	Author	Publisher
1	Network Management, Principles and Practice	Mani Subrahmanian	Pearson Education
2	Network management	Morris	Pearson Education
3	Principles of Network System Administration	Mark Burges, Wiley Dreamtech	
4	Distributed NetworkManagement	Paul, John Wiley	

Object Oriented Analysis and Design

CS-446T
Credits: 4 (3-1-0)

Elective (B.Tech. Fourth Year)

Unit-I Introduction to OOAD Whatis OOAD? Whatis UML? Whatare the Unitedprocess(UP) phases Case study the NextGen POS system, Inception Use case Modeling Relating Use cases include, extend and generalization.

Unit-II Elaboration Domain Models Finding conceptual classes and description classes Associations Attributes Domain model refinement Finding conceptual class hierarchies Aggregation and Composition UML activity diagrams and modeling

Unit-III System sequence diagrams - Relationship between sequence diagrams and use cases Logical architecture and UML package diagram Logical architecture refinement UML class diagrams - UML interaction diagrams

Unit-IV GRASP: Designing objects with responsibilities Creator – Information expert Low Coupling Controller High Cohesion Designing for visibility Applying GoF design patterns – adapter, singleton, factory and observer patterns.

Unit-V UML state diagrams and modeling Operation contracts Mapping design to code UML deployment and component diagrams

S. No	Title	Author	Publisher
1	Applying UML and Patterns: An Introduction to object-oriented Analysis and Design and iterative development	Craig Larman	Third Edition, Pearson Education
2	Object-Oriented Analysis & Design: Understanding System Development with UML 2.0	Mike O'Docherty	John Wiley & Sons
3	Java Design Patterns – A Tutorial	James W- Cooper	Wesley

Parallel Computing and Algorithms

CS-447T
Credits: 4 (3-1-0)

Elective (B.Tech. Fourth Year)

UNIT 1: Introduction: Sequential model, need of alternative model, Parallel processing terminology, c ontrasting pipelining and data parallelism, control parallelism, scalability, sieve of Eratosthenes.

UNIT 2: PRAM algorithms: model of serial computation, PRAM model of parallel computation, PRAM algorithms: Parallel reduction, prefix sums, List ranking, preorder tree traversal, merging two sorted lists.

UNIT 3: Processor Arrays and Multiprocessors: Processor organizations: Mesh networks, Binary tree network, Hypertree network, Pyramid network, Buttefily network, hypercube network, Cube Connected Cycle, Shuffle Exchange network, de Bruijn network, Mapping data to processors on processor arrays and multicomputers. Multiprocessors: UMA and NUMA.

UNIT 4: Matrix Multiplication: sequential multiplication, Matrix Multiplication on 2D mesh, Hypercube and shuffle exchange SIMD model, Algorithm for Multiprocessors.

UNIT 5: Parallel Sorting Algorithm: Enumeration sort, lower bound on parallel sorting, odd-even transposition sort, Bitonic merge.

UNIT 6: Graph Algorithms – searching a graph, Connected components.

References:

1) M.J. Quinn, —Designing Efficient Algorithms for Parallel Computerǁ by Mc Graw Hill.
2) S.G. Akl, —Design and Analysis of Parallel Algorithmsǁ

3) S.G. Akl, ǁParallel Sorting Algorithmǁ by Academic Press.

Fault Tolerance computing

CS-448TN
Credits: 4 (3-1-0)

Elective (B.Tech. Fourth Year)

Unit 1 INTRODUCTION: Fundamental terminology, Objective of Fault Tolerance, Applications of Fault-Tolerant computing, Reliability, Safety, Availability and Maintainability Modeling using Markov chain, Dependability Evaluation technologies, Failure rate, reliability function. Mean time to Failure(MTTF), Mean Time between, failures(MTBF) Mean time to Repair (MTTR)

Unit 2 Architecture of Fault Tolerant Computer: Taxonomy, Fault Avoid ance Techniques, Fault Detection at IBM, Dynamic redundancy in multiple computer system & Recovery on Time and Space, Fault, Detection Techniques, Detection of errors in Data Management, Component Fault Detection, Detection Tests at System level.

Unit 3 Reliable Design and Fault Diagnosis: Hazard, Fault Detection in Combinational circuits, fault location Experiments, BooleanDifferences, Fault Detectionby Path Sensitizing.

Unit 4 Coding Theory For Fault-Tolerant System: Error models, Basic structural properties ofparity check codes, Matrix description of parity check codes, vectorspace properties of parity check codes Error checking the syndrome, Group properties of Parity check codes, Distance properties of parity check codes Polynomial algebra and cyclic codes, Hamming single error correcting codes, Unidirectional error correcting and Detecting codes, Asymnetric Errorcorrecting codes, single-Asymmetric error correcting code.

Unit 5 Software Design Faults: Approaches foruniprocess software: ExceptionHandling Framework, Recovery Block Approach, N-version Programming. Backward Recovery in Concurrent systems: Domino Effect, Conversations, and FT-Actions, Conversation using monitors, Using Distributed-Action. Forward recovery in concurrent Systems: Exception Resolution Exception Handling with FT-Action.

S. No	Title	Author	Publisher
1	Fault Tolerance Computing: Fundamental Concepts	V. Nelson	IEEE Computer
2	Design and analysis of reliable and fault tolerance Computed Systems	Mustafa Abd-El-Barr	Imperial College Press
3	Fault tolerance Computing	Dhiraj K. Pradhan, Jacob A. Abraham	Prentic Hall

Real Time System

CS-449T
Credits: 4 (3-1-0)

Elective (B.Tech. Fourth Year)

Unit 1 **Introduction to real-time computing-**Structure of a real-time system - Characterization of real-time systems and tasks - Performance measures.

Unit 2 **Task Assignment and Scheduling-** Uniprocessor scheduling algorithms - Task assignment - Mode changes - Fault tolerant scheduling.

Unit 3 **Real-time Communication-** Network topologies and architecture issues - Protocols - Contention-based, token-based, polled bus - Fault tolerant routing.

Unit 4 **Real-time Databases-** Transaction priorities and aborts - Concurrency control issues - Scheduling algorithms - Two-phase approach to improve predictability.

Unit 5 **Programming Languages and Tools-** Hierarchical decomposition - Run-time error handling - Overloading - Timing specification - Recent trends and developments.

S. No	Title	Author	Publisher
1	Real-Time Systems	C. M. Krishna and Kang G. Shin	McGraw Hill
2	Real-Time Systems	Jane W.S. Liu	Prentice Hall.
3	Real-Time Systems‖ Theory and Practice ‖	Ragib Mall	Preason

Computational Geometry

CS-450T
Credits: 4 (3-1-0)

Elective (B.Tech. Fourth Year)

Unit 1 INTRODUCTION: Application Domains–Line Segment Intersection–Intersection of Convex Polygons Polygon Triangulation

Unit 2 GEOMETRIC SEARCHING: Geometric Searching –Range Searching –Kd-Trees – Range trees –Point-Location Problems

Unit 3 CONVEX HULL PROBLEM: Convex hull Problem–Preliminaries –Convex hullAlgorithms in the Plane –Graham's scan -Jarvis's March –Quick Hull –Divide-and-conquer – Dynamic Convex Hull Maintenance –Delaunay Triangulation

Unit 4 PROXIMITY PROBLEMS: Proximity Problems –Fundamental Algorithms (Closest Pair – All Nearest Neighbors – Euclidean Minimum Spanning Tree –Nearest Neighbor Search) – Lower bounds – Closest Pair Problem : A Divide – and -Conquer Approach

Unit 5 VORONOI DIAGRAM: Voronoi Diagram – Proximity Problems Solved by the VoronoiDiagram –Planar Applications

S. No	Title	Author	Publisher
1	Computational Geometry: An Introduction	Franco P. Preparata, Michael I. Shamos,	Springer, 1985
2	Computational Geometry: Algorithms and Applications	Franco P. Preparata, Michael I. Shamos, Mark de Berg, Otfried Cheong, Marc van Kreveld, Mark Overmars	Springer, 3rd edition, 2008
3	Computational Geometry,	Satyan L. Devadoss and Joseph O'Rourke, Discrete and	Princeton University Press, 2011.
4	Algorithms in Combinatorial Geometry, EATCS Monographs in Computer Science	Herbert Edelsbrunner	Springer Verlag, 1987

Natural Language Processing

CS-451T
Credits: 4 (3-1-0)

Elective (B.Tech. Fourth Year)

Unit 1 Introduction to NaturalLanguage Understanding: The study of Language, Applicationsof NLP, Evaluating Language Understanding Systems, Different levels of Language Analysis, Representations and Understanding, Organization of Natural language Understanding Systems, Linguistic Background: An outline of Englishsyntax.

Unit 2 Introduction to semantics and knowledge representation, Some applications like machine translation, database interface.

Unit 3 Grammars and Parsing: Grammars and sentence Structure, Top-Down and Bottom-Up Parsers, Transition Network Grammars, Top-Down Chart Parsing. Feature Systems and Augmented Grammars: Basic Feature system for English, Morphological Analysis and the Lexicon, Parsing with Features, Augmented Transition Networks.

Unit 4 Grammars for Natural Language: Auxiliary Verbs and Verb Phrases, Movement Phenomenon in Language, Handling questions in Context-Free Grammars. Human preferences in Parsing, Encoding uncertainty, Deterministic Parser.

Unit 5 Ambiguity Resolution: Statistical Methods, Probabilistic Language Processing, Estimating Probabilities, Part-of-Speech tagging, Obtaining Lexical Probabilities, Probabilistic Context-Free Grammars, Best First Parsing. Semantics and Logical Form, Word senses and Ambiguity, Encoding Ambiguity in Logical Form.

S. No	Title	Author	Publisher
1	NLP: A Paninian Perspective	Akshar Bharti, Vineet Chaitanya and Rajeev Sangal	Prentice Hall, New Delhi
2	Natural Language Understanding	James Allen	Pearson Education
3	Speech and Language Processing	D. Jurafsky, J.H. Martin	Pearson Education
4	Language as a Cognitive Process	T. Winograd	Wesley

Embedded System

CS-452T
Credits: 4 (3-1-0)

Elective (B.Tech. Fourth Year)

Unit 1 Introduction to embedded systems: Classification, Characteristics and requirements

Unit 2 Timing and clocks in Embedded systems, Task Modeling and management, Real time operating system issues.

Unit 3 Signals, frequency spectrum and sampling, digitization (ADC, DAC), Signal Conditioning and Processing. Modeling and Characterization of Embedded Computation System.

Unit 4 Embedded Control and Control Hierarchy, Communication strategies for embedded systems: Encoding and Flow control.

Unit 5 Fault-Tolerance Formal Verification.

S. No	Title	Author	Publisher
1	Embedded System	Raj Kamal	TMH
2	Embedded System	A.P Godse, A.O Mulani	Technical Publication
3	Intro To Embedded System	Shibu	TMH