Course Structure & Evaluation Scheme

BRANCH: B. Tech. in Computer Science & Engineering
(Effective from Session 2014-15)

IFTM University Moradabad

B.Tech CS&E (Effective from session 2014-2015)
YEAR I, SEMESTER- I

S.N.	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total	Credits
						Mid Term Exam			External Exam		
			L	T	P	CT	AS +AT	Total			
THEORY											
1.	EMA -101	**Engineering Mathematics-I**	3	1	0	20	10	30	70	100	4
2.	EPH -101	**Engineering Physics-I**	3	1	0	20	10	30	70	100	4
3.	ECH -101 / ECH -102	Engineering Chemistry / **Environmental Science**	3	1	0	20	10	30	70	100	4
4.	EEG -101 / EME -101	**Professional Skill Development-I** / Engineering Mechanics	3	1	0	20	10	30	70	100	4
5.	EEE -101 / EEC -101	Electrical Engineering / **Electronics Engineering**	3	1	0	20	10	30	70	100	4
6.	EME -102 / ECS -101	Materials & Manufacturing / **Computer Fundamentals & Programming**	3	1	0	20	10	30	70	100	4
PRACTICALS / PROJECT											
7.	EPH -151 / ECH -151	**Physics Lab** / Chemistry Lab	0	0	2	30	20	50	50	100	1
8.	EEE -151 / EEC -151	Electrical Engg. Lab / **Electronics Engg. Lab**	0	0	2	30	20	50	50	100	1
9.	EME-152 / ECS -151	Materials & Manufacturing Lab / **Computer Lab**	0	0	2	30	20	50	50	100	1
10.	EME-153 / EME -151	**Engineering Graphics Lab** / Mechanical Engg. Lab	0	0	2	30	20	50	50	100	1
11.	EGP-101	**General Proficiency**	-	-	-	-	-	100	-	100	1
		TOTAL	**18**	**06**	**08**	**-**	**-**	**-**	**-**	**1100**	**29**

YEAR I, SEMESTER- II

S.N.	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total	Credits
						Mid Term Exam			External Exam		
			L	T	P	CT	AS +AT	Total			
THEORY											
1.	EMA -201	**Engineering Mathematics-II**	3	1	0	20	10	30	70	100	4
2.	EPH -201	**Engineering Physics-II**	3	1	0	20	10	30	70	100	4
3.	ECH -202 / ECH -201	Environmental Science / **Engineering Chemistry**	3	1	0	20	10	30	70	100	4
4.	EME -201 / EEG -201	**Engineering Mechanics** / Professional Skill Development-I	3	1	0	20	10	30	70	100	4
5.	EEC -201/ EEE -201	Electronics Engineering / **Electrical Engineering**	3	1	0	20	10	30	70	100	4
6.	ECS -201 / EME -202	Computer Fundamentals & Programming / **Materials & Manufacturing**	3	1	0	20	10	30	70	100	4
PRACTICALS / PROJECT											
7.	ECH -251 / EPH -251	**Chemistry Lab** / Physics Lab	0	0	2	30	20	50	50	100	1
8.	ECS -251 / EME -252	Computer Lab / **Materials & Manufacturing Lab**	0	0	2	30	20	50	50	100	1
9.	EEE -251 / EEC -251	**Electrical Engg. Lab** / Electronics Engg. Lab	0	0	2	30	20	50	50	100	1
10.	EME -251 / EME-253	**Mechanical Engg. Lab** / Engineering Graphics Lab	0	0	2	30	20	50	50	100	1
11.	EGP-201	**General Proficiency**	-	-	-	-	-	100	-	100	1
		TOTAL	**18**	**06**	**08**	**-**	**-**	**-**	**-**	**1100**	**29**

(Effective from Session 2014-15)

YEAR: II **SEMESTER: III**

S. No	Course	SUBJECT	PERIODS			SESSIONAL				ESE	TOTAL	CREDITS
			L	T	P	TA	AT	CT	Total			
1.	ECS301	Data Structures Using C	3	1	0	5	5	10+10	30	70	100	4
2.	ECS302	C++ Programming	3	1	0	5	5	10+10	30	70	100	4
3.	ECS303	Computer Organization	3	1	0	5	5	10+10	30	70	100	4
4.	ECS304	Operating System Concepts	3	1	0	5	5	10+10	30	70	100	4
5.	ECS305	Discrete Mathematical Structures	3	0	0	5	5	10+10	30	70	100	3
6.	ECR301	Professional Skill Development -2	3	0	0	5	5	10+10	30	70	100	2
PRACTICALS/Seminar/Projects												
7.	ECS351	Data Structure Lab	0	0	2	10	10	30	50	50	100	1
8.	ECS352	C++ Lab	0	0	2	10	10	30	50	50	100	1
9.	ECS353	Digital and CO Lab	0	0	2	10	10	30	50	50	100	1
10.	EGP301	General Proficiency							100	--	100	1
											1000	25

YEAR: II **SEMESTER: IV**

S. No	Course	SUBJECT	PERIODS			SESSIONAL				ESE	TOTAL	CREDITS
			L	T	P	TA	AT	CT	Total			
1.	ECS401	Data Communication & Network	3	1	0	5	5	10+10	30	70	100	4
2.	ECS402	Design and Analysis of Algorithms	3	1	0	5	5	10+10	30	70	100	4
3.	ECS403	Database Management System	3	0	0	5	5	10+10	30	70	100	2
4.	ECS404	Introduction to Microprocessor	3	1	0	5	5	10+10	30	70	100	4
5.	ECS405	Software Engineering	3	1	0	5	5	10+10	30	70	100	4
6.	EMA401	Computer Based Numerical & Statistical Techniques	3	0	0	5	5	10+10	30	70	100	3
PRACTICALS/Seminar/Projects												
7.	ECS451	DAA Lab	0	0	2	10	10	30	50	50	100	1
8.	ECS452	Microprocessor Lab	0	0	2	10	10	30	50	50	100	1
9.	ECS453	DBMS Lab	0	0	2	10	10	30	50	50	100	1
10.	EGP401	General Proficiency							100	--	100	1
											1000	25

(Effective from Session 2014-15)

YEAR: III **SEMESTER: V**

S. No	Course	SUBJECT	PERIODS			SESSIONAL				ESE	TOTAL	CREDITS
			L	T	P	TA	AT	CT	Total			
1.	ECS501	Computer Graphics	3	0	0	5	5	10+10	30	70	100	3
2.	ECS502	Internet & Java Programming	3	1	0	5	5	10+10	30	70	100	4
3.	ECS503	Artificial Intelligence	3	1	0	5	5	10+10	30	70	100	4
4.	ECS504	Theory of Computation	3	1	0	5	5	10+10	30	70	100	4
5.	ECS505	Computer Architecture	3	1	0	5	5	10+10	30	70	100	4
6.	ECR501	Professional Skill Development-3	3	0	0	5	5	10+10	30	70	100	2
PRACTICALS/Seminar/Projects												
7.	ECS551	Computer Graphics Lab	0	0	2	10	10	30	50	50	100	1
8.	ECS552	Internet & Java Programming Lab	0	0	2	10	10	30	50	50	100	1
9.	ECS553	AI Lab	0	0	2	10	10	30	50	50	100	1
10.	EGP501	General Proficiency							100	--	100	1
											1000	25

YEAR: III **SEMESTER: VI**

S. No	Course	SUBJECT	PERIODS			SESSIONAL				ESE	TOTAL	CREDITS
			L	T	P	TA	AT	CT	Total			
1.	ECS601	Object Modeling Techniques & UML	3	1	0	5	5	10+10	30	70	100	4
2.	ECS602	Web Technology & E-Commerce	3	1	0	5	5	10+10	30	70	100	4
3.	ECS603	Compiler Design	3	1	0	5	5	10+10	30	70	100	4
4.	ECS604	Principles of Programming Language	3	0	0	5	5	10+10	30	70	100	3
5.	ECS605	Elective-I	3	0	0	5	5	10+10	30	70	100	3
6.	ECS606	Multimedia Technology	3	0	0	5	5	10+10	30	70	100	3
PRACTICALS/Seminar/Projects												
7.	ECS651	Mini Project-I	0	0	2	10	10	30	50	50	100	1
8.	ECS652	Web Technology & Multimedia Lab	0	0	2	10	10	30	50	50	100	1
9.	ECS653	Compiler Design Lab	0	0	2	10	10	30	50	50	100	1
10.	EGP601	General Proficiency							100	--	100	1
											1000	25

(Effective from Session 2014-15)

YEAR: IV **SEMESTER: VII**

S. No	Course	SUBJECT	PERIODS			SESSIONAL				ESE	TOTAL	CREDITS
			L	T	P	TA	AT	CT	Total			
1.	ECS701	Distributed Computing	3	1	0	5	5	10+10	30	70	100	4
2.	ECS702	Digital Image Processing	3	1	0	5	5	10+10	30	70	100	4
3.	ECS703	Data Mining & Warehousing	3	1	0	5	5	10+10	30	70	100	4
4.	ECS704	Elective-II	3	1	0	5	5	10+10	30	70	100	4
5.	ECS705	Cryptography & Network Security	3	1	0	5	5	10+10	30	70	100	3
6.	ECR701	Professional Skill Development -4	3	0	0	5	5	10+10	30	70	100	2
PRACTICALS/Seminar/Projects												
7.	ECS751	Distributed Computing Lab	0	0	2	10	10	30	50	50	100	1
8.	ECS752	Mini Project-II	0	0	2	10	10	30	50	50	100	1
9.	ECS753	Colloquium & Summer Training Viva	0	0	2	10	10	30	50	50	100	1
10.	EGP701	General Proficiency							100	--	100	1
											1000	25

YEAR: IV **SEMESTER: VIII**

S. No	Course	SUBJECT	PERIODS			SESSIONAL				ESE	TOTAL	CREDITS
			L	T	P	TA	AT	CT	Total			
1.	ECS801	Elective-III	3	0	0	5	5	10+10	30	70	100	3
2.	ECS802	Elective-IV	0	0	2	10	10	30	50	50	100	4
PRACTICALS/ Seminar/ Projects												
3.	ECS851	Project	0	0	--	25	25	50	100	200	300	18
											500	25

Electives (CSE)

Elective-I

S.No	Code	Name of the Elective
1.	ECS- 505(1)	Natural language Processing
2.	ECS- 505(2)	Advanced Database Management Systems
3.	ECS- 505(3)	Mobile Computing
4.	ECS- 505(4)	Advanced Computer Architecture

Elective-II

S.No	Code	Name of the Elective
1.	EMA-605(1)	Optimization Techniques
2.	ECS-605 (2)	Advanced Web Applications
3.	ECS-605 (3)	Simulation and Modeling
4.	ECS-605 (4)	Embedded System

Elective-III

S.No	Code	Name of the Elective
1.	ECS-703 (1)	Network Programming
2.	ECS-703 (2)	Parallel Computing
3.	ECS-703 (3)	Design of UNIX Operating System
4.	ECS-703 (4)	Virtual Reality

Elective-IV

S.No	Code	Name of the Elective
1.	ECS-704 (1)	Wireless & Sensor Networks
2.	ECS-704 (2)	Semantic Web
3.	ECS-704 (3)	Real Time System
4.	ECS-704 (4)	TCP/IP Protocol Suite
5.	ECS-704 (5)	Big Data and Analytics

(Effective from the session 2015-16)

COMPUTER FUNDAMENTALS & PROGRAMMING

ECS101/ ECS201 **L:T:P- 3:1:0**

Unit-I

Introduction: Introduction to Computer Systems, Generation of Computers, BIOS, Various types of memories, CPU organization, ALU, registers. Introduction to various operating Systems.

Number systems: Binary, hexadecimal, octal and their inter conversions.

Computer Languages and Software & hardware: High Level Languages and Low Level Language, Various types of software. Firmware, Compiler, Interpreter and Assembler. File Allocation Table, Hardware.

Unit –II

Input, Output and storage Units: Introduction to various Input and output Devices

Printers: Various type of Impact and Non- Impact Printers.

Introduction to algorithm and Flow chart: Representation of an algorithm, flowchart symbols and levels of flow chart, advantage and limitations of flowchart and pseudo code.

Basics of programming: Introduction to the design and implementation of correct, efficient and maintainable programs. Use of high level programming languages for the development of programs.

Unit-III

Standard I/O in "C", Fundamental Data Types and Storage Classes: Character types, Integer, short, long, unsigned, single and double-precision floating point, storage classes, automatic, register, static and external, Operators and Expressions: Using numeric and relational operators, mixed operands and type conversion, Logical operators, Bit operations, Operator precedence and associativity.

Unit-IV

Conditional Program Execution: Applying if and switch statements, nesting if and else, restrictions on switch values, use of break and default with switch, Program Loops and Iteration: Uses of while, do and for loops, multiple loop variables, assignment operators, using break and continue.

Unit-V

Modular Programming: Passing arguments by value, scope rules and global variables, separate compilation, and linkage, building your own modules.

Arrays: Array notation and representation, manipulating array elements, using multidimensional arrays, arrays of unknown or varying size, Structure, union, enumerated data types,

Functions: Introduction, types of functions, functions with array, recursive functions, Introduction to pointers, Introduction to file handling, standard C preprocessors, defining and calling macros, conditional compilation, passing values to the compiler.

References:

1. "Let us C", Yashvant Kanitkar
2. "Programming with C", Byron Gottfried
3. "Computer Fundamentals", Anita Goel, Pearson Education
4. "Computer Concepts and Programming in C", E Balaguruswami, McGraw Hill
5. "C programming", Kernighan and Ritchie, PHI
6. "Computer Fundamentals and Programming in C", Reema Thareja, Oxford Publication

B. Tech (Computer Engineering) 2nd Year, 3rd Semester

ECS301 Data Structures Using C L:T:P : 3:1:0

Unit-I

Introduction: Elementary Data Organization, Algorithm, Asymptotic notations, Space and Time Complexity of an algorithm, Time Space Trade off, Information and its storage representation, Representation and its manipulation of Strings, Pattern Matching.

Array: Linear data structures, Arrays, Single and Multidimensional Array, Representation of Array in memory, sparse matrices. Linear search, binary search.

Unit-II

Linked List: Single Linked list, Array and Linked representation of Linked List, Two Way List, Operations on linked lists, Polynomial representation and addition using linked list.

Unit-III

Queues: Queue operations, Circular queue, Priority queues, Array and linked representation of Queue, Dequeue.

Stacks: Stack operations, Array and linked representation of stack, Application of Stack, Prefix and postfix expressions, Recursion, Tower of Hanoi problem,

Unit-IV

Non-Linear data structures: Trees, Binary tree, Inorder, Preorder and Postorder traversals of a Binary tree, Extended binary tree, complete tree, Huffman Algorithm, Multi linked structure, graphs and their representation, spanning trees, dynamic storage management,

Sorting: Selection sort, Bubble sort, Radix sort, Merge Sort, Quick Sort, Insertion Sort, Bucket Sort, HeapSort, topological sorting, external sorting, internal sorting etc.

Unit-V

Search Trees: Binary Search Tree, AVL Tree, B Trees

Hashing: Hashing functions, Collision resolution techniques, Application of Hashing techniques

File structures: external storage devices, sequential files, indexed sequential files, direct files, external searching, linear and virtual hashing.

References:

1. SEYMOUR LIPSCHUTZ, “Data structures”, McGraw Hill International Edition.
2. Sartaj Sahni, Data structures, Algorithms and Applications in Java , , McGraw Hill,
3. J.P.Tremblay and Paul G. Sorenson, “An introduction to data structures with applications”,TMH.
4. Robert Kruse C.L. Tondo and Bruce Leung, “Data Structures and Program Design in C”, Pearson Edu.
5. Tenenbaum A.M and Augenstein M.J, " Data Structures using C ", Prentice Hall of India

ECS301 **C++ Programming** **L:T:P : 3:1:0**

Unit I:

Introduction to C++, Characteristics of Object Oriented languages, Memory model of C++, types of error, Basic program construction, preprocessor directives, comments, types of variables, input/ output using cin and cout, manipulator, type conversion, library functions
Arithmetic operators, relational operators, logical operators, different types of loops, decision making statements, control statements.

Unit II:

Structures, enumerated data types, simple functions, passing arguments to functions, reference arguments, function overloading, function overriding, inline functions, default arguments, variable and storage classes, returning to reference.

Unit III:

A simple class, C++ objects as physical objects, C++ objects as data types, Constructors, Objects as functions arguments, Returning objects from functions, structures and classes
Arrays, Arrays as class Member data, Arrays as objects, String, Overloading Unary operators, Overloading binary operators, Data Conversion

Unit IV

Inheritance, Derived class and Base class, Derived class constructors, Abstract Class
Addresses and pointers, Pointers and Arrays, Pointers and Functions, Pointers and Strings, Memory Management, Pointers to Objects, Pointers to Pointers

Unit V

Virtual Functions, Friend Functions, Static Functions, Assignment and copy Initialization, this pointer
Stream, String I/O, Character I/O. Object I/O, I/O with Multiple Objects, File Pointers, Disk I/O with Member Functions, Error Handling

References

1. Robert Lafore, “Object-Oriented Programming in Turbo C++”, Galgotia Publications pvt. Ltd., 2008
2. Lipman, Stanley B, JonsceLajoie, C++ Primer Reading", AWL, 1999
3. BjarneStroustrup, The C++ Programming Language (English) 3rd Edition, Pearson India, 2002
4. E. Balagurusamy, Object Oriented Programming with C++ , McGraw Hill Education (India),

ECS303 **Computer Organization** **L:T:P : 3:1:0**

Unit-I

Basic structure of computers: Computer Types, Functional units, Basic operational concepts, Bus structures, Software, Performance, multiprocessors and multi computers. Data types, Complements, Data Representation. Fixed Point Representation. Floating Point Representation. Error Detection codes.

Unit-II

Register transfer language and Micro operations: Register Transfer language. Register Transfer, Bus and memory transfer, Arithmetic Micro operations, logic micro operations, shift micro operations, Arithmetic logic shift unit. Instruction codes. Computer Registers Computer instructions – Instruction cycle. Memory – Reference Instructions. Input – Output and Interrupt.

Unit-III

Central processing unit - Stack organization. Instruction formats. Addressing modes. DATA Transfer and manipulation. Program control. Reduced Instruction set computer.

Micro programmed control: Control memory, Address sequencing, micro program example, Design of control unit-Hard wired control. Micro programmed control

Unit-IV

Computer arithmetic: Addition and subtraction, Multiplication Algorithms, Division Algorithms, Floating point Arithmetic operations. Decimal Arithmetic unit, Decimal Arithmetic operations.

The memory system: Memory Hierarchy, Main memory, Auxiliary memory, Associative memory, Cache memory, Virtual memory, Memory management hardware.

Unit-V

Input-output organization : Peripheral Devices, Input-Output Interface, Asynchronous data transfer Modes of Transfer, Priority Interrupt, Direct memory Access, Input – Output Processor(IOP), Serial communication.

Pipeline and vector processing: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline

References

1. Computer System Architecture – M.Moris Mano, IIIrd Edition, PHI / Pearson, 2006.
2. Computer Organization – Car Hamacher, Zvonks Vranesic, Safwat Zaky, V Edition, McGraw Hill, 2002.
3. Computer Organization and Architecture – William Stallings Seventh Edition, PHI/Pearson, 2006.
4. Computer Architecture and Organization – John P. Hayes, Mc Graw Hill International editions, 1998.

ECS304 **Operating System Concepts** **L:T:P : 3:1:0**

Unit – I

Introduction: Definition, Objective, characteristics, functions and services of Operating system, Categorization of Operating systems. Computer system structure, operating system structure, system calls, Kernels, Monolithic and Microkernel

Unit – II

Process concept: process state, process control block, process scheduling queue, schedulers, operation on the process, cooperating process, inter process communication, threads, benefits of threads, multithreading models, threading issues pthreads, Linux thread, java threads, 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; critical region, monitors .

Unit – III

CPU Scheduling: Scheduling Concepts, scheduling Criteria, scheduler, preemptive scheduling and non preemptive scheduling, Scheduling Algorithms, Multiprocessor Scheduling, real time scheduling, scheduling algorithm evaluation.

Deadlock: System model, Deadlock characterization, deadlock handling Strategies, Prevention, Avoidance and detection, Recovery from deadlock.

Unit – IV

Memory Management: concept, address binding, Basic, dynamic loading, overlays, swapping, contiguous and non contiguous memory allocation, fragmentation, paging, page tables, segmentation, segmentation with paging, concept of virtual memory, demand paging, page replacement, Thrashing,

Unit – V

I/O Management and Disk Scheduling: I/O devices, and I/O subsystems, I/O buffering, Disk storage and disk scheduling algorithms, 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, "Operating Systems Concepts", Wiley
2. Sibsankar Halder and Alex A Aravind, "Operating Systems", Pearson Education
3. Harvey M Dietel, "An Introduction to Operating System", Pearson Education
4. D M Dhamdhere, "Operating Systems: A Concept based Approach", 2nd Edition

ECS305 Discrete Mathematical Structures L:T:P : 3:1:0

Unit-I

Set Theory: Introduction, Combination of sets, Multi-sets, Ordered pairs. Proof's of some general identities on sets.

Relations: Definition, Operations on relations, Properties of relations, Composite Relations, Equality of relations, Recursive definition of relation, Order of relations.

Functions: Definition, Classification of functions, Operations on functions, Recursively defined functions. Growth of functions.

Natural Numbers: Introduction, Mathematical Induction, Variants of Induction, Induction with Nonzero Base cases. Proof Methods, Proof by counter – example, Proof by contradiction.

Unit-II

Algebraic Structures: Definition, Groups, Subgroups and order, Cyclic Groups, Cosets, Lagrange's theorem, Normal Subgroups, Permutation and Symmetric groups, Group Homomorphisms, Definition and elementary properties of Rings and Fields, Integers Modulo *n*.

Unit-III

Partial order sets: Definition, Partial order sets, Combination of partial order sets, Hasse diagram.

Lattices: Definition, Properties of lattices – Bounded, Complemented, Modular and Complete lattice.

Boolean Algebra: Introduction, Axioms and Theorems of Boolean algebra, Algebraic manipulation of Boolean expressions. Simplification of Boolean Functions, Karnaugh maps, Logic gates, Digital circuits and Boolean algebra.

Unit-IV

Propositional Logic: Proposition, well formed formula, Truth tables, Tautology, Satisfiability, Contradiction, Algebra of proposition, Theory of Inference

Predicate Logic: First order predicate, well formed formula of predicate, quantifiers, Inference theory of predicate logic.

Unit-V

Trees: Definition, Binary tree, Binary tree traversal, Binary search tree.

Graphs: Definition and terminology, Representation of graphs, Multigraphs, Bipartite graphs, Planar graphs, Isomorphism and Homeomorphism of graphs, Euler and Hamiltonian paths, Graph coloring

Recurrence Relation & Generating function: Recursive definition of functions, Recursive algorithms, Method of solving recurrences.

Combinatorics: Introduction, Counting Techniques, Pigeonhole Principle

References:

1. Liu and Mohapatra, "Elements of Distcrete Mathematics", McGraw Hill
2. Jean Paul Trembley, R Manohar, Discrete Mathematical Structures with Application to Computer Science, McGraw-Hill
3. R.P. Grimaldi, Discrete and Combinatorial Mathematics, Addison Wesley,
4. Kenneth H. Rosen, Discrete Mathematics and Its Applications, McGraw-Hill,
5. B. Kolman, R.C. Busby, and S.C. Ross, Discrete Mathematical Structures, PHI

ECR301 **Professional Skill Development -2** **L:T:P : 3:1:0**

Objective: This course provides the participants with information, and equips them with the requisite skills to make their communication effective and to enable them to deal with feelings, understand assertiveness, develop self-confidence, and work in teams.

Business Communication Skills (BCS)

Unit	Objective	Course content
Unit 1	To introduce the fundamentals of communication	Communication: Concept, Classification, Purpose, Process, Importance in Management, Structure in Organization Barriers & Gateways in Communication, 7 C's of Communication
	To introduce role of body language in communication	Verbal & Non-Verbal Communication Importance of Non-Verbal Behavior Interpretation during Communication – Body Language, Gestures, Postures, Kinesics, Proxemics & Paralanguage
Unit 2	How should one listen to people? Importance of active listening	Listening: Process, Types, Levels, Barriers & Gateways in Listening Effective Listening, Understanding Speaker's thoughts and feelings while listening and Paraphrasing (interpreting Speaking Style)

Intrapersonal & Interpersonal Relationship Skills (IRS)

Unit 3	Understand the importance of the various skills involved in developing and enriching intrapersonal relationships	**Intrapersonal Skills** Personality: Characteristics of Healthy & Sick personalities Self Awareness, Self Esteem, Self Confidence Assertiveness V/S Aggressiveness Values: types & importance Dealing with Emotions: Anger, Conflict and Depression Emotional Intelligence: Overview
	Be more aware of one's self-confidence, values Understand and handle emotions of self and others	
Unit 4	Understand the necessity and importance of working together as a team	**Interpersonal Skills** The Team: Concept, Elements, Stages, Types Creating Effective Teams: Characteristics and Building Blocks, Key Roles of Team Members Team Player Styles
	Learn how to go about being a good team player and form an effective team	
	Putting team building skills to test in the various activities to understand the status and improve with each	Team Building Activities

	succeeding activity	

Note: *This paper comprises of a number of classroom activities also, based on the given syllabus.*

Reference Books:

1. M.K. Sehgal & V. Khetrapal - Business Communication (Excel Books)
2. Rajendra Pal - Business Communication (Sultan Chand & Sons Publication)
3. P.D. Chaturvedi – Busines Communication (Pearson Education)
4. Elizabeth B. Hurlock – Personality Development (Tata McGraw Hills)

Suggested Readings – BCS

The Seven Habits of Highly Effective People - Stephen R. Covey

Who Moved My Cheese - Dr. Spenser Johnson

Seven Spiritual Laws of Success - Deepak Chopra

I‘m OK You are OK – Erric Seghal

Suggested Readings – IRS

Emotional Intelligence - David Goleman

Working with Emotional Intelligence - David Goleman.

Good to Great - Jim Collins

Goal - Eliyahu Goldratt.

Only the Paranoid Survive - Andrew Grove

All the books in the ―Chicken Soup for the Soul series.

B. Tech (Computer Engineering) 2nd Year 4th Semester

ECS401 Data Communication & Network L:T:P : 3:1:0

Unit -I

Introduction: Data Communications, Networks, The internet, Protocols and Standards, Layered Tasks, Goals and Applications of Networks, The OSI reference model, layers in the OSI Model, TCP/IP Protocol Suite, and Addressing. Transmission Media, Coaxial Cable, Fiber Optics, Line Coding, Modems, Internetworking devices, Bridges, router, repeater, switch.

Unit-II

Data link layer: Introduction, Framing, Error Detection and Correction, Linear block coding, Cyclic Codes, Checksum, Flow and error control, protocols, noiseless channels, noisy channels,

Medium Access sub layer: Channel Allocations, ALOHA protocols, Overview of IEEE standards, FDDI. HDLC, sliding window protocols, Frame relay,switching, Point to point protocols, LAN protocols, Wired LANs Ethernet IEEE 802.3, IEEE 802.4, IEEE 802.5, Wireless LANs

Unit - III

Network Layer: Point to Point Networks, introduction to routing protocols, distance vector routing, Link state routing, Congestion control, Internetworking, TCP / IP, IP packet, IP addressing, Subnetting, IPv6 addresses, Internetworking, IPv4, IPv6 Protocols.

Unit - IV

Transport Layer: Design issues, Duties of transport layer: Multiplexing, De-multiplexing, connection management, Sockets, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), Congestion Control

Session Layer: Design issues, Remote procedure call.

Unit-V

Presentation Layer: Design issues, Data compression techniques, cryptography, Window Management.

Application Layer: File Transfer, Access and Management, Electronic mail, Virtual terminals, other applications. Example Networks - Internet and Public Networks, WWW and HTTP, DNS,FTP, Network Management: SNMP, Network security, Introduction to Digital Signature.

References:

1. Forouzen, "Data Communication and Networking", TMH
2. A.S. Tanenbaum, Computer Networks, Pearson Education
3. W. Stallings, Data and Computer Communication, Macmillan Press
4. G. Shanmugarathinam, ”Essential of TCP/ IP”, Firewall Media

ECS 402 **Design and Analysis of Algorithms** **L:T:P : 3:1:0**

Unit-I

Introduction: Algorithms, Analyzing algorithms, Complexity of algorithms, Growth of functions, Performance measurements, Recurrence relations, Master's Theorem, Quick sort, Merge sort, Heap sort, Comparison of sorting algorithms, Sorting in linear time – counting sort, radix sort, bucket sort .

Unit -II

Hash Tables, Binary Search Trees, Augmenting Data Structures, **Advanced data structures:** Red-Black trees, B-trees, Binomial Heaps, Fibonacci Heaps. Divide and Conquer with examples such as Sorting, Matrix Multiplication and Searching.

Unit - III

Greedy methods, Knapsack, Huffman codes, Activity selection problem, Minimum Spanning trees – Prim's and Kruskal's algorithms, Amortized Analysis

Graph Algorithms: Topological sorting, Single source shortest paths, Dijkstra's and Bellman Ford algorithms, APSP.

Unit - IV

Dynamic programming with examples such as - Matrix chain multiplication, Longest common subsequences, Knapsack, Backtracking, Branch and Bound, Travelling Salesman Problem, Graph Coloring, n-Queen Problem

Unit -V

Sorting networks, String Matching, Matrix Operations, Number Theoretic Algorithms, Convex hull, Computational Geometry, Fast Fourier Transform, Theory of NP-completeness, Approximation algorithms and Randomized algorithms.

References:

1. Thomas H. Coreman, Charles E. Leiserson and Ronald L. Rivest, "Introduction to Algorithms", PHI
2. E. Horowitz & S Sahni, "Fundamentals of Computer Algorithms",
3. Berman, Paul," Algorithms", Cengage Learning.
4. Aho, Hopcraft, Ullman, "The Design and Analysis of Computer Algorithms" Pearson Education, 2008.

ECS403 Database Management Systems L:T:P : 3:1:0

Unit-I

Introduction: An overview of database management system, database system Vs file system, Database architecture, data models, schema and instances, data independence, database language and interfaces, data definitions language, data manipulation language.

Data Modeling using the Entity Relationship Model:

ER model concepts, notation for ER diagram, mapping constraints, keys, Concepts of Super Key, candidate key, primary key, Generalization, aggregation, reduction of an ER diagrams to tables.

Unit-II

Relational data Model and Language: Relational data model concepts, integrity constraints, entity integrity, referential integrity, Keys constraints, Domain constraints, relational algebra, relational calculus, tuple and domain calculus.

Introduction to SQL: Characteristics of SQL, advantage of SQL. SQl data types, Types of SQL commands, SQL operators, Tables, views and indexes, Queries and sub queries, Aggregate functions, Insert, update and delete operations, Joins, Unions, Intersection, Minus, Cursors, Triggers, Procedures in SQL/PL SQL.

Unit-III

Data Base Design & Normalization: Functional dependencies, normal forms, first, second, third normal forms, BCNF, inclusion dependence, loss less join decompositions, normalization using FD, MVD, and JDs, alternative approaches to database design.

Unit-IV

Transaction Processing Concept: Transaction system, Testing of serializability, serializability of schedules, conflict & view serializable schedule, recoverability, Recovery from transaction failures, log based recovery, checkpoints, deadlock handling.

Distributed Database: Concepts of distributed database management systems

Unit-V

Concurrency Control Techniques: Concurrency control, Locking Techniques for concurrency control, Time stamping protocols for concurrency control, validation based protocol, multiple granularity, Multi version schemes, Recovery with concurrent transaction.

References:

1. Korth, Silbertz, Sudarshan," Database Concepts", McGraw Hill
2. Elmasri, Navathe, " Fudamentals of Database Systems", Addision Wesley
3. Date, C. J., "An introduction to database systems", 8th Edition, Pearson Education.
4. Bipin C. Desai, " An Introduction to Database Systems", Gagotia Publications

ECS404 Introduction to Microprocessor L:T:P : 3:1:0

Unit-I

Introduction: Microprocessor evolution and types, microprocessor architecture and operation of its components, addressing modes, interrupts, data transfer schemes, instruction and data flow, timer and timing diagram. Interfacing devices. Architectural advancement of microprocessor. Typical microprocessor development schemes.

Unit-II

8-bit Microprocessors: Pin diagram and internal architecture of 8085 microprocessor, registers, ALU, Control & status, interrupt and machine cycle. Instruction sets. Addressing modes, Instruction formats

Instruction Classification: data transfer, arithmetic operations, logical operations, branching operations, machine control and assembler directives.

Unit-III

16-bit Microprocessor:

Architecture of 8086 microprocessor: register organization, bus interface unit, execution unit, memory addressing, memory segmentation, Operating modes, Instruction sets, instruction format, Types of instructions. Interrupts: hardware and software interrupts.

Unit-IV

Programming: Assembly language programming based on Intel 8085/8086. Instructions, data transfer, arithmetic, logic, branch operations, looping, counting, indexing, programming techniques, counters and time delays, stacks and subroutines, conditional call and return instructions

Unit-V

Peripheral Interfacing: Peripheral Devices: 8237 DMA Controller, 8255 programmable peripheral interface, 8253/8254programmable timer/counter, 8259 programmable interrupt controller, 8251 USART and RS232C.

References:

1. Gaonkar , Ramesh S , “Microprocessor Architecture, Programming and Applications with 8085” , Wiley
2. Ray A K , Bhurchandi K M , “Advanced Microprocessors and Peripherals”, TMH
3. Hall D V ,”Microprocessor Interfacing’, TMH
4. Liu and Gibson G A , “ Microcomputer System: The 8086/8088 family’’ ,PHI
5. Aditya P Mathur, “ Introduction to Microprocessor”, TMH
6. Brey, Barry B, “INTEL Microprocessors”, PHI

ECS405 **SOFTWARE ENGINEERING** **L:T:P : 3:1:0**

Unit-I: Introduction

Software: Introduction, software applications, importance of software evolution of software, Software Components, Software Characteristics, Software Crisis & myths. **Software Engineering paradigms**: introduction, principles & Processes, Software Quality Attributes. Comparison between software engineering & computer science, & software engineering & Engineering. Some terminologies: product & process, deliverables and milestones, measures, metric & indicators. Programs & software products. **Software Development Life Cycle (SDLC) Models**: Water Fall Model, Prototype Model, RAD model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models.

Unit-II: Software Requirement Specifications (SRS)

Requirement Engineering Process: introduction, Information Modeling, Data Flow Diagrams, Decision Tables. **SRS**: Document, components, characteristics, IEEE Standards for SRS, validation Entity Relationship Diagrams. **Software Reliability and Quality Assurance (SQA): Software Reliability:** introduction, Verification and Validation, Software Reliability specification, software quality. Reliability issues, Reliability metrics, Reliability growth model (jelinski-moranda model, little wood and verall's model, step function model) Reliability assessment., etc., fault avoidance , fault tolerance, exception handling,

Software Reliability Assurance (SQA): introduction, properties, plans, goals. SEI-CMM Model. ISO: introduction, ISO 9000 Models, ISO 9126 MODELS. Comparison between ISO 9000 & SEI – CMM Model

Unit-III: Software Design and coding structure

Software design: Introduction, properties, principles **Architectural Design**: introduction, objectives. **Object oriented designs**: basic concept, terminologies, examples. **Low Level Design**: Modularization, Structure Chart, Pseudo Codes, Flow Charts, Coupling and Cohesion Measures, relationship between Coupling and Cohesion,

Design Strategies: Functional versus Object Oriented approach, design verification **Software Coding:** information hiding, programming style, monitoring and control for coding, structured programming, 4GT, etc

Software Measurement and Metrics: introduction, Various Size Oriented Measures: Halestead's Software Science, Function Point (FP) Based Measures, and Cyclomatic Complexity Measures: Control Flow Graphs.

Unit-IV: Software Testing

Testing: definition, principles, Objectives, test oracles, test plan, test case design. **Levels of testing**: Unit Testing: procedure, Integration Testing: objectives, approaches (incremental, top down, bottom up regression, smoke & sandwich), system testing: alpha, beta, acceptance testing. Structural Testing (White Box Testing), Functional Testing (Black Box Testing), **Static Testing Strategies**: Formal Technical Reviews (Peer Reviews), Walk Through, Code Inspection, Compliance with Design and Coding Standards, debugging, error fault & failure

Unit-V: Software Maintenance and Software Project Management

Software maintenance: definition, nature of Software Maintenance, Need for Maintenance, Categories of Maintenance: Preventive, Corrective and Perfective Maintenance, use of Software Maintenance, maintenance characteristics, Cost of Maintenance, maintainability, task during maintenance, maintenance side effects, maintenance ALIEN code, maintenance problems, Software Re-Engineering, reverse software Engineering. Software Configuration Management Activities, Change Control Process, Software Version Control, **CASE:** introduction, levels of case, architecture, case building blocks, objectives, case repository, characteristics of case tools, categories, Estimation of Various Parameters such as Cost, Efforts, Schedule/Duration, Constructive Cost Models (COCOMO), Resource Allocation Models, Software Risk Analysis and Management.

Reference

1. R. S. Pressman, Software Engineering: A Practitioners Approach, McGraw Hill.
2. Rajib Mall, Fundamentals of Software Engineering, PHI Publication.
3. K. K. Aggarwal and Yogesh Singh, Software Engineering, New Age International Publishers
4. Pankaj Jalote, Software Engineering, Narosa Publication
5. A. Leon and M. Leon, Fundamentals of Software Engineering, Vikas Publication

EMA401 Computer Based Numerical & Statistical Techniques L:T:P : 3:1:0

Unit-I

Introduction: Numbers and their accuracy, Computer Arithmetic, Mathematical preliminaries, Errors and their Computation, General error formula, Error in a series approximation

Solution of Algebraic and Transcendental Equations:

Bisection Method, Iteration method, Method of false position, Newton Raphson method, Methods of finding complex roots, Muller's method, rate of Convergence, polynomial equations.

Unit-II

Solution system of linear equations, gauss- seidal method, LU decomposition method.

Interpolation: Finite Differences, Differences tables

Polynomial Interpolation: Newton's forward and backward formula**.**

Interpolation with unequal intervals: Lagrange's Interpolation, Newton divided difference formula

Unit -III

Numerical Integration and Differentiation: Introduction Numerical differentiation, Numerical Integration: Trapezoidal rule, Simpson's 1/3 and 3/8 rule, Boole's rule, Waddle's rule.

Solution of differential equations: Picard's Method, Euler's Method, Taylor's Method, Runga-Kutta Methods, Predictor Corrector Methods.

Unit-IV

Statistical Techniques –I

Moments, Moment generating functions, Skewness , Kurtosis, Linear, non- Linear and multiple regression analysis, Probability theory, Correlation, Binomial, Poisson and Normal distributions.

Unit-V

Statistical Techniques –II

Sampling theory (small and large), Test of significance: Chi-square test, t- test, analysis of variance (one way), Application to engineering, medicine, agriculture etc.

Time series and forecasting (moving and semi-averages), Statistical quality control methods, Control charts, X, R, p, np, and c charts.

References:

1. B. S .Grewal , "Engineering Mathematics" , Khanna Publishers
2. B . S . Grewal , "Higher Engineering Mathematics", Khanna Publishers
3. E. Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons
4. C. Ray Wylie & Louis C . Barrett , "Advanced Engineering Mathematics" ,TMH
5. Chandrika Prasad, "Advanced Mathematics for Engineers", Prasad Mudranalaya.
6. Gupta & Malik, "Numerical Techniques In Science & Engineering Computer Fundamentals With Programming In C", Krishna Prakashan

B. Tech (Computer Engineering) 3rd Year, 5th Semester

ECS501 Computer Graphics L:T:P : 3:1:0

Unit – I

Introduction and Line Generation: Types of computer graphics, Graphic Displays- Random scan displays, Raster scan displays, Frame buffer and video controller, Points and lines, Line drawing algorithms, Circle generating algorithms, Mid point circle generating algorithm, and parallel version of these algorithms.

Unit – II

Transformations: Basic transformation, Matrix representations and homogenous coordinates, Composite transformations, Reflections and shearing.

Windowing and Clipping: Viewing pipeline, Viewing transformations, 2-D Clipping algorithms- Line clipping algorithms such as Cohen Sutherland line clipping algorithm, Liang Barsky algorithm, Line clipping against non rectangular clip windows; Polygon clipping – Sutherland Hodgeman polygon clipping, Weiler and Atherton polygon clipping, Curve clipping, Text clipping.

Unit – III

Three Dimensional: 3-D geometric primitives, 3-D Object representation, 3-D Transformation, 3-D viewing, projections, 3-D Clipping.

Unit – IV

Curves and Surfaces: Quadric surfaces, Spheres, Ellipsoid, Blobby objects, Introductory concepts of Spline, Bspline and Bezier curves and surfaces.

Unit –V

Hidden Lines and Surfaces: Back Face Detection algorithm, Depth buffer method, A- buffer method, Scan line method, basic illumination models – Ambient light, Diffuse reflection, Specular reflection and Phong model, Combined approach, Warn model, Intensity Attenuation, Color consideration, Transparency and Shadows.

References:

1. Donald Hearn and M Pauline Baker, “Computer Graphics C Version”, Pearson Education
2. Amrendra N Sinha and Arun D Udai,” Computer Graphics”, TMH
3. Donald Hearn and M Pauline Baker, “Computer Graphics with OpenGL”,Pearson education
4. Steven Harrington, “Computer Graphics: A Programming Approach”, TMH
5. Rogers, “ Procedural Elements of Computer Graphics”, McGraw Hill

ECS502 **Internet and Java Programming** **L:T:P : 3:1:0**

Unit I:

Internet: Internet, Connecting to Internet: Telephone, Cable, Satellite connection, Choosing an ISP, Introduction to Internet services, E-Mail concepts, Sending and Receiving secure E-Mail, Voice and Video Conferencing.

Unit II:

Core Java: Introduction, Operator, Data type, Variable, Arrays, Control Statements, Methods & Classes, Inheritance, Package and Interface, Exception Handling, Multithread programming, I/O, Java Applet, String handling, Networking, Event handling, Introduction to AWT, AWT controls, Layout managers, Menus, Images, Graphics.

Unit III:

Java Swing: Creating a Swing Applet and Application, Programming using Panes, Pluggable Look and feel, Labels, Text fields, Buttons, Toggle buttons, Checkboxes, Radio Buttons, View ports, Scroll Panes, Scroll Bars, Lists, Combo box, Progress Bar, Menus and Toolbars, Layered Panes, Tabbed Panes, Split Panes, Layouts, Windows, Dialog Boxes, Inner frame.

JDBC: The connectivity Model, JDBC/ODBC Bridge, java.sql package, connectivity to remote database, navigating through multiple rows retrieved from a database.

Unit IV

Java Beans: Application Builder tools, The bean developer kit(BDK), JAR files, Introspection, Developing a simple bean, using Bound properties, The Java Beans API, Session Beans, Entity Beans, Introduction to Enterprise Java beans (EJB),

RMI: Introduction to RMI (Remote Method Invocation), A simple client-server application using RMI.

Unit V

Java Servlets: Servlet basics, Servlet API basic, Life cycle of a Servlet, Running Servlet, Debugging Servlets, Thread-safe Servlets, HTTP Redirects, Cookies, Introduction to Java Server pages (JSP).

References

1. R. Krishnamoorthy, S. Prabhu, “Internet and Java Programming”, New Age International Publishers
2. Margaret Levine Young, “The Complete Reference Internet”, Tata Mcgraw-hill Education Pvt. Ltd.
3. Thampi, “Object Oriented Programming in JAVA” Wiley Dreamtech Publication.
4. Balagurusamy E, “Programming in JAVA”, Tata Mcgraw-hill Education Pvt. Ltd.
5. Dustin R. Callway, “Inside Servlets”, Addison Wesley.
6. Mark Wutica, “Java Enterprise Edition”, QUE.
7. Steven Holzner, “Java2 Black book”, Wiley Dreamtech Publication.
8. Liang, “Introduction to Java Programming, Comprehensive Version”, Pearson Education.

ECS503 **Artificial Intelligence** **L:T:P : 3:1:0**

Unit-I

INTRODUCTION: Introduction, What is Artificial Intelligence?, Problems and Search, The AI Problems, The Underlying Assumption, What is an AI Technique, The Level of the Model, Criteria for Success, Some General References,

Unit-II

STATE SPACE SEARCH : Problems, Problem Spaces, and Search: Defining the Problem as a State Space Search, Production systems, Problem Characteristics, Production System Characteristics, Issues in the Design of Search Programs, Additional Problems, Heuristic Search Techniques: Generate-and- Test, Hill Climbing, Best-First Search, Problem Reduction, Constraint Satisfaction, Means-Ends Analysis.

Unit-III

KNOWLEDGE REPRESENTATION: Knowledge Representation Issues, Representations and Mappings, Approaches to knowledge Representation, Predicate Logic, Semantic Nets, Frames, The Frame Problem, Syntactic-Semantic Spectrum of Representation, Logic and Slot-and-Filler Structures, Resolution ,Other Representational Techniques, Summary of the Role of Knowledge, Procedural Versus Declarative knowledge, Logic Programming, Forward versus Back ward Reasoning, Matching, Control Knowledge.

Unit- IV

EXPERT SYSTEM AND LEARNING: Existing Systems (DENDRAL, MYCIN), domain exploration, Meta , Knowledge, Expertise Transfer, Self Explaining System, Introduction to learning, Various techniques used in learning, introduction to neural networks, applications of neural networks, common sense, reasoning, some example of expert systems.

Unit-V

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

Reference

1. Artificial Intelligence, Elaine Rich, Kevin Knight, Tata McGrawHill
2. Artificial Intelligence – A modern approach, Stuart Russel, Peter Norwig, Pearosn Education.
3. Principles of Artificial Intelligence, Nelson N.J., Springer Verlag, Berlin

ECS504 **Theory of Computation** **L:T:P : 3:1:0**

Unit-I

Automata: Basic machine, FSM , Transition graph, Transition matrix, Deterministic and non-deterministic FSM'S, Equivalence of DFA and NDFA, Mealy & Moore machines, minimization of finite automata, Two-wayfinite automata. Regular Sets and Regular Grammars: Alphabet, words, Operations, Regular sets, Finite automata and regular expression, Myhill-Nerode theorem Pumping lemma and regular sets, Application of pumping lemma, closure properties of regular sets.

Unit-II

Context –Free Grammars: Introduction to CFG, Regular Grammars, Derivation trees and Ambiguity, Simplification of Context free grammars, Normal Forms (Chomsky Normal Form and Greibach Normal forms).

Unit-III

Pushdown Automata:Definition of PDA, Deterministic Pushdown Automata, PDA corresponding to given CFG, CFG corresponding to a given PDA. Context Free Languages: The pumping lemma for CFL's, Closure properties of CFL's, Decision problems involving CFL's.

Unit-IV

Turing Machines: Introduction, TM model, representation and languages acceptability of TM Design of TM, Universal TM & Other modification, Church's hypothesis, composite & iterated TM. Turing machine as enumerators. Properties of recursive & recursively enumerable languages,Universal Turing machine

Unit-V

Tractable and Untractable Problems: P, NP, NP complete and NP hard problems, examples of these problems like satisfy ability problems, vertex cover problem, Hamiltonian path problem, traveling sales man problem, Partition problem etc.

References:

1. K.L.P Mishra & N. Chandrasekaran, "Theory of Computer Science", PHI Learning
2. John E. Hopcroft, Jeffery Ullman, "Introduction to Automata theory, Languages & computation" , Narosa Publishers.
3. Michael Sipsev,"Theory of Computation", Cengage Learning
4. John C Martin, "Introduction to languages and theory of computation", McGraw Hill
5. Kohavi, "Switching & Finite Automata Theory", TMH

ECS505 Computer Architecture L:T:P : 3:1:0

Unit-I

Overview of von Neumann architecture: Instruction set architecture; The Arithmetic and Logic Unit, The Control Unit, Memory and I/O devices and their interfacing to the CPU; Measuring and reporting performance; CISC and RISC processors.

Unit II

Pipelining: Basic concepts of pipelining, data hazards, control hazards, and structural hazards; Techniques for overcoming or reducing the effects of various hazards.

Hierarchical Memory Technology: Inclusion, Coherence and locality properties; Cache memory organizations, Techniques for reducing cache misses; Virtual memory organization, mapping and management techniques, memory replacement policies.

Unit III

Instruction level parallelism: Concepts of instruction-level parallelism (ILP), Techniques for increasing ILP; Superscalar, super-pipelined and VLIW processor architectures; Vector and symbolic processors; Case studies of contemporary microprocessors,

Unit IV

Multiprocessor Architecture: Taxonomy of parallel architectures; Centralized shared-memory architecture, synchronization, memory consistency, interconnection networks; Distributed shared-memory architecture, Cluster computers.

Unit V

Non von Neumann Architectures: Data flow Computers, Reduction computer architectures, Systolic Architectures.

References:

1. John L. Hennessy and David A. Patterson, Computer Architecture: A Quantitative Approach, Morgan Kaufmann.
2. John Paul Shen and Mikko H. Lipasti, Modern Processor Design: Fundamentals of Superscalar Processors, Tata McGraw-Hill.
3. M. J. Flynn, Computer Architecture: Pipelined and Parallel Processor Design, Narosa Publishing House.

Kai Hwang, Advanced Computer Architecture: Parallelism, Scalability, Programmability, McGraw-Hill.

ECR-501 **Professional Skill Development-3** **L:T:P : 3:1:0**

ECS-601 Object Oriented Techniques & UML L:T:P : 3:1:0

UNIT I

Introduction: The meaning of Object Orientation, object identity, Abstraction, Encapsulation, information hiding, polymorphism, inheritance, importance of modeling, principles of modeling.

Object Modeling: Objects and classes, links and association, generalization and inheritance, aggregation, abstract class, multiple inheritance, meta data, candidate keys, constraints.

Unit – II

Dynamic Modeling: Events and states, operations, nested state diagrams and concurrency, advanced dynamic modeling concepts, a sample dynamic model.

Unit – III

Functional Modeling: Data flow diagram, nested data flow diagrams, Control flows, specifying operations, constraints, Relation of functional to object and dynamic models.

Unit- IV

OMT Methodology

Object Oriented Analysis, Object oriented design, Object design, Combining three models, Designing algorithms, design optimization, Implementation of control, Adjustment of inheritance, Object representation, Physical packaging. Documenting design Decisions.

Comparison of Methodologies: Structured analysis and structured design (SA/SD), Jackson Structured Development (JSD).

Unit- V

Mapping object oriented concepts using non-object oriented language, Translating classes into data structures, Passing arguments to methods, Implementing inheritance, associations encapsulation. Object oriented programming style: reusability, extensibility, robustness, programming in the large. Procedural v/s OOP, Object oriented language features: Abstraction & Encapsulation.

References:

1. James Rumbaugh et. al, “Object Oriented Modeling and Design”, PHI

2. Grady Booch, James Rumbaugh, Ivar Jacobson, “The Unified Modeling Language ser Guide”, Pearson Education

3. Booch, Maksimchuk, Engle, Young, Conallen and Houstan, “Object Oriented Analysis and Design with Applications”, Pearson Education

ECS602 Web Technology and E Commerce L:T:P : 3:1:0

Unit I:

Web: Introduction to web, W3C, protocols governing the web, web project and traditional project, web team.

HTML: Elements, list, table, images, frames, forms, Introduction to HTML5, difference between HTML4 and HTML5

Unit II:

Cascaded Style Sheet (CSS): Introduction, Style rule, Selectors, Introduction to CSS3, difference between CSS and CSS3

XML: DTD, XML schemas, parsing of XML

JavaScript: Introduction, variables, condition statements, operators, javascript popup boxes, functions, events and event handling; introduction to AJAX

Unit III:

Web Server: Introduction to web server, Understanding of Tomcat web server

JSP: Introduction, features of JSP, JSP architecture, types of JSP directives, JSP actions, Error handling within JSP, JSP sessions, Java Database connectivity (JDBC).

Unit IV

E-Commerce: Introduction to E-Commerce, E-Commerce framework, E-Commerce and Media Convergence, The anatomy of E-Commerce Applications, E-Commerce consumer applications, E-Commerce Organization applications

Network Infrastructure for E-Commerce: Market forces influencing the I-Way, Components of the I-Way, Network Access equipment

Network Security and Firewalls: Client-Server Network Security, Emerging Client-Server security threats, Firewall in practice, Data and Message Security

Unit V

E-Commerce and World Wide Web: Architectural Framework for E-Commerce, World Wide Web as the Architecture, Security and the Web

E-Payment Systems: Types of E-payment systems, Digital Token-Based E-payment systems, smart cards and E-payment Systems, Risk and e-payment systems

Electronic Data Interchange: Definition of EDI, EDI vs E-Mail, EDI Applications in Business, EFT, EDI Legal, Security and Privacy issues, Supply Change Management

References

1. Ravi Kalakota, Andrew Winston, “Frontiers of Electronic Commerce”, Addison- Wesley.
2. Ivan Bayross,” HTML, DHTML, Java Script, Perl & CGI”, BPB Publication.
3. Ivan Bayross,” HTML5 and CSS3 made simple”, BPB Publication.
4. Xavier, C, “ Web Technology and Design” , New Age International
5. Deitel, “Java for programmers”, Pearson Education
6. Jackson, “Web Technologies” Pearson Education
7. Patel and Barik, ”Introduction to Web Technology & Internet”, Acme Learning
8. Laudon, “E-Commerce: Business, Technology, Society”, Pearson Education

ECS603 **Compiler Design** **L:T:P : 3:1:0**

Unit I

Introduction Language Processors, The Structure of a Compiler, The Science of Building a Compiler, Applications of Compiler Technology. Lexical Analysis The Role of the Lexical Analyzer, Input Buffering, Specification of Tokens, Recognition of Tokens, The Lexical Analyzer LEX, Finite Automata, From Regular Expressions to Automata, Design of Lexical Analyzer Generator.

Unit II

Syntax Analysis Context Free Grammars, Writing a Grammar, Top Down Parsing, Bottom Up Parsing, Introduction to LR Parsing: Simple LR, More Powerful LR parsers, Using Ambiguous Grammars, Parser Generators.

Unit III

Syntax Directed Translation Syntax Directed Definitions, Applications of Syntax Directed Translation, Syntax Directed Translation Schemes. Intermediate Code Generation Variants of Syntax Trees, Three Address Code, Types & Declarations, Translation of Expressions, Type Checking, Control Flow, Backpatching, Switch Statements.

Unit IV

Run Time Environments Storage Organizations, Access to Nonlocal Data on Stack, Heap Management, Introduction to Garbage Collection. Code Generation Issues in the Design of a Code Generator, The Target Language, Addresses in the Target Code, Basic Blocks and Flow Graphs, Optimization of Basic Blocks, A Simple Code Generator.

Unit V

Machine Independent Optimizations The Principal Sources of Optimizations, Introduction to Data Flow Analysis, Foundations of Data Flow Analysis, Constant Propagation, Partial Redundancy Elimination, Loops in Flow Graphs, Region Based Analysis, Symbolic Analysis.

References:

1. Compilers, Principles, Techniques & Tools (Second Edition). Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffery D. Ullman.
2. C. Fischer and R. LeBlanc. Crafting a Compiler, Benjamin Cummings, 1991.
3. V Raghvan, " Principles of Compiler Design", TMH

ECS-604 Principles of Programming Languages L:T:P : 3:1:0

Unit -I

Introduction: Characteristics of programming Languages, Factors influencing the evolution of programming language, developments in programming methodologies, desirable features and design issues. Programming language processors: Structure and operations of translators, software simulated computer, syntax, semantics, structure, virtual computers, binding and binding time.

Unit -II

Elementary and Structured Data Types: Data object variables, constants, data types, elementary data types, declaration, assignment and initialization, enumeration, characters, strings. Structured data type and objects: Specification of data structured types, vectors and arrays, records, variable size data structure, pointers and programmer constructed data structure, Sets files. Sub Program and programmer defined data types: Evolution of data types, abstractions, encapsulations, information hiding, sub programmes, abstract data types.

Unit -III

Sequence Control; Implicit and Explicit sequence control, sequence control with within expression and statements, recursive sub programmes, exception handling, co routines, Scheduled sub programmes, concurrent execution. Data control referencing environments, static and dynamic scope, local data local data referencing environment, shared data: Explicit common environment dynamic scope parameter passing mechanism.

Unit -IV

Storage Management: Major run time requirements, storage management phases, static storage management, stack based, heap based storage management. Syntax and translation: General syntactic criteria, syntactic element of a language, stages in translation, formal syntax and semantics.

Unit -V

Operating and Programming Environment: Batch Processing Environments, Embedded system requirements, Theoretical models, Introduction to Functional Programming, Lambda calculus, Data flow language and Object Oriented language, Comparison in various general and special purpose programming languages e.g. Fortran, C, Pascal, Lisp, etc.

References:

1. Terrance W Pratt, "Programming Languages: Design and Implementation" PHI
2. Sebesta, "Concept of Programming Language", Addison Wesley
3. E Horowitz, "Programming Languages", 2nd Edition, Addison Wesley
4. "Fundamentals of Programming Languages", Galgotia

ECS606 **Multimedia Technology** **L:T:P : 3:1:0**

Unit-I:

Introduction to Multimedia, Multimedia Information, Multimedia Objects, Multimedia in business and work. Convergence of Computer, Communication and Entertainment products Stages of Multimedia Projects : Multimedia hardware, Memory & storage devices, Communication devices, Multimedia software's, presentation tools, tools for object generations, video, sound, image capturing, authoring tools, card and page based authoring tools

Unit-II

Introduction to multimedia components, multimedia hardware, SCSI, IDE, MCI, multimedia data and file formats, RTF,TIFF, MIDI, JPEG, DIB, MPEG, multimedia tools, presentations tools.

Unit-III

Huffman Coding, Shannon Fano Algorithm, Huffman Algorithms, Adaptive Coding, Arithmetic Coding Higher Order Modeling. Finite Context Modeling, Dictionary based Compression, Sliding Window Compression, LZ77, LZW compression, Compression, Compression ratio loss less & lossy compression.

Unit-IV

Digital Audio concepts, Sampling Variables, Loss less compression of sound, loss compression & silence compression.

Unit-V

Multimedia authoring and user interface, hypermedia messaging, mobile messaging, hypermedia message component, creating hypermedia message, integrated multimedia message standards, integrated document management, distributed multimedia systems.

Reference:

1. Tay Vaughan “Multimedia, Making IT Work” Osborne McGraw Hill.
2. Buford “Multimedia Systems” Addison Wesley.
3. Agrawal & Tiwari “Multimedia Systems” Excel.
4. Mark Nelson “Data Compression Book” BPB.
5. David Hillman “Multimedia technology and Applications” Galgotia Publications.
6. Rosch “Multimedia Bible” Sams Publishing.
7. Sleinreitz “Multimedia System” Addison Wesley.

ECS-701 Distributed Computing L:T:P : 3:1:0

Unit I

Introduction, Goals of distributed computing. Characterization of distributed system, Theoretical foundation of distributed system, Hardware Concepts, bus based multiprocessor switched multiprocessor, bus based multicomputer, switched multicomputer, Software Concepts, Network Operating Systems, True Distributed System,

Unit II

Multiprocessor time sharing system, Design issues, Communication, Layered Protocols, ATM networks.

Client Server model, Remote Procedure Call, Group Communication, Synchronization: Clock Synchronization, Mutual Exclusion, Election Algorithms, Atomic Transaction.

Unit III

Deadlock, Threads, System models, Processor Allocation, Scheduling in Distributed Systems, Fault Tolerance, Real time distributed systems.

Agreement protocols: Introduction, system model, classification of agreement protocols, Application of agreement protocols, Atomic commit in distributed database system.

Unit IV

Distributed file systems: Distributed file system design, implementation, Trends in Distributed File Systems, Distributed shared memory, consistency models, page based distributed shared memory, shared variable distributed shared memory, and distributed programming languages

Unit V

Case studies: Amoeba: Introduction, Objects and capabilities in Amoeba, Process and Memory Management in Amoeba, Communication in Amoeba, The Amoeba Services. DCE: Introduction, Threads, Remote Procedure call, Time, Directory Service and Security Services, Distributed File System

References:

1. G. Coulouris, J. Dollimore, T. Kindberg, " Distributed systems concepts and design" Pearson
2. Andrew S.Tanenbaum, "Distributed Operating Systems", Pearson Education Asia, 2001.
3. Mukesh singhal and Niranjan G.Shivaratri, "Advanced concepts in Operating system', Tata McGraw Hill.
4. Pradeep.k and Sinha, "Distributed operating systems, PHI, Newdelhi, 2001.

ECS-702 **Digital Image Processing** **L:T:P : 3:1:0**

Unit – I

Digital Image Fundamentals: - Digital image Representation – Functional Units of an Image processing system. Visual perception – Image Model _ Image sampling and Quantization – grayscale resolution – pixel relationship – image geometry. Image Transforms – Unitary Transform, Discrete Fourier Transform, Cosine Transform, Sine Transform, Hadamard Transform, Slant and KL Transform.

Unit – II

Image Enhancement – Histogram processing , Spatial domain enhancement, Image smoothing ,Image Sharpening , Frequency domains Enhancement , Color Image Processing methods- Color Image Models

Unit –III

Image restoration and compression Degradation Model – Discrete Formulation – Circulant matrices – Constrained and Unconstrained restoration geometric transformations fundamentals – Compression Models – Error Free Compression – Lossy Compression – International Image Compression Standards.

Unit – IV

Image Analysis and Computer Vision: Spatial feature Extraction – Transform feature –Edge detection-Boundary Representation-Region Representation-Moment Representation-Structure-Shape Features-Texture-Scene Matching and Detection-Image Segmentation-Classification techniques-Morphology- Interpolation.

Unit –V

Sensing 3D shape: how the 3rd dimension changes the problem. Stereo 3D description, 3Dmodel, matching, TINA. Direct 3D sensing-structured light, range finders, range image segmentation. Emerging IT applications: Recognition of characters, Fingerprints and faces-Image databases.

References:

1. Rafael C. Gonzalez & Richard E. Woods, “Digital Image Processing”, 2nd Ed, Pearson Edu, 2004
2. S.Sridhar , ” Digital Image processing”,,Oxford university press, 2012
3. A.K. Jain, “Fundamental of Digital Image Processing”, PHI. 2003
4. Fundamentals of Digital Image Processing-A.K.Jain
5. Image Processing and machine vision-Milan Sonka,Vaclav Hlavae
6. Pattern Recognition Principles-J.T. Tou and R.C.Gonzalez
7. Syntactic Pattern Recognition and applications.-King Sun Fun
8. Computer vision-Fairhurst (PHI).

ECS-703 **DATA MINING AND WAREHOUSING** **L:T:P : 3:1:0**

Unit-I

Introduction: Data Mining Definition & Functionalities, Data Processing, Form of Data Preprocessing, Data Cleaning: Missing Values, Noisy Data, (Binning, Clustering, Regression, Computer and Human inspection), Inconsistent Data, Data Integration and Transformation.

Data Reduction:- Data Cube Aggregation, Dimensionality reduction, Data Compression, Numerosity Reduction, Clustering, Discretization and Concept hierarchy generation.

Unit-II

Concept Description:- Definition, Data Generalization, Analytical Characterization, Analysis of attribute relevance, Mining Class comparisons, Statistical measures in large Databases. Measuring Central Tendency, Measuring Dispersion of Data, Graph Displays of Basic Statistical class Description, Mining Association Rules in Large Databases, Association rule mining, mining Single-Dimensional Boolean Association rules from Transactional Databases– Apriori Algorithm, Mining Multilevel Association rules from Transaction Databases and Mining Multi Dimensional Association rules from Relational Databases.

Unit-III

Classification and Predictions: What is Classification & Prediction, Issues regarding Classification and prediction, Decision tree, Bayesian Classification, Classification by Back propagation, Multilayer feed-forward Neural Network, Back propagation Algorithm, Classification methods K-nearest neighbor classifiers, Genetic Algorithm.

Cluster Analysis: Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Grid-Based Methods, Model-Based Clustering Methods, Clustering High-Dimensional Data, Constraint-Based Cluster Analysis, Outlier Analysis, Applications and Trends in Data Mining.

Unit-IV

Data Warehousing: Overview, Definition, Delivery Process, Difference between Database System and Data Warehouse, Multi Dimensional Data Model, Data Cubes, Stars, Snow Flakes, Fact Constellations, Concept hierarchy, Process Architecture, 3 Tier Architecture, Data Mart.

Unit-V

Aggregation, Historical information, Query Facility, OLAP function and Tools. OLAP Servers, ROLAP, MOLAP, HOLAP, Data Mining interface, Security, Backup and Recovery, Tuning Data Warehouse, Testing Data Warehouse.

References:

1. M.H.Dunham,"Data Mining:Introductory and Advanced Topics" Pearson Education
2. Jiawei Han, Micheline Kamber, "Data Mining Concepts & Techniques" Elsevier
3. Sam Anahory, Dennis Murray, "Data Warehousing in the Real World : A Practical Guide for Building Decision Support Systems, Pearson Education
4. Mallach,"Data Warehousing System",McGraw –Hill
5. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, "Introduction to Data Mining", Pearson education.

ECS-705 CRYPTOGRAPHY AND NETWORK SECURITY L:T:P : 3:1:0

Unit-I

Introduction to cryptography, Introduction to security attacks, services and mechanism,. Classical encryption techniques substitution Ciphers and transposition ciphers, cryptanalysis, steganography, Stream and block ciphers Conventional **Encryption**: Conventional encryption model, classical encryption techniques substitution ciphers and transposition ciphers, cryptanalysis, stereography, stream and block ciphers. Modern Block Ciphers: Block ciphers principals, Shannon's theory of confusion and diffusion, data encryption standard(DES), strength of DES, differential and linear crypt analysis of DES, block cipher modes of operations, triple DES, IDEA encryption and decryption, strength of IDEA, confidentiality using conventional encryption, traffic confidentiality, key distribution, random number generation.

Unit-II

Introduction to graph, ring and field, prime and relative prime numbers, modular arithmetic, Fermat's and Euler's theorem, Euclid's Algorithm, Extended Euclidean Algorithm, Advanced Encryption Standard (AES) , Chinese Remainder theorem, discrete logarithms. Principals of public key crypto systems, RSA algorithm, security of RSA, key management, Diffle-Hellman key exchange algorithm, introductory idea of Elliptic curve cryptography, Elganel encryption.

Unit-III

Message Authentication and Hash Function: Authentication requirements, authentication functions, message authentication code, hash functions, birthday attacks, security of hash functions and MACS, MD5 message digest algorithm, Secure hash algorithm(SHA). Digital Signatures: Digital Signatures, authentication protocols, digital signature standards (DSS), proof of digital signature algorithm.

Unit-IV

Key Management and distribution: Symmetric key distribution, Diffie-Hellman Key Exchange, Public key distribution, X.509 Certificates, Public key Infrastructure. **Authentication Applications**: Kerberos and X.509, directory authentication service, electronic mail security-pretty good privacy (PGP), S/MIME.

Unit-V

IP Security: Architecture, Authentication header, Encapsulating security payloads, combining security associations, key management. Web Security: Secure socket layer and transport layer security, secure electronic transaction (SET). System Security: Intruders, Viruses and related threads, firewall design principals, trusted
systems.

.**References:**

1. William Stallings, "Cryptography and Network Security: Principals and Practice",
2. Pearson Education.
3. Behrouz A. Frouzan: Cryptography and Network Security, TMH

4. Bruce Schiener, “Applied Cryptography”. John Wiley & Sons
5. Bernard Menezes,” Network Security and Cryptography”, Cengage Learning.
6. Atul Kahate, “Cryptography and Network Security”, TMH
7. Johannes A. Buchmann, “Introduction to Cryptography”, Springer-Verlag

ECR-701 **Professional Skill Decvelopment-4** **L:T:P : 3:1:0**

ELECTIVE-I

ECS505(1) Natural Language Processing L:T:P : 3:1:0

UNIT-I

Introduction: Knowledge in Language Processing, Ambiguity, Models and Algorithm. Regular Expressions and Automata: Regular Expressions, Finite State Automata. Morphology and Finite State Transducers: Survey of Mostly English Morphology, Finite State Morphological Parsing, Combining FST Lexicon and Rules.

UNIT-II

N-Grams: Counting Words in Corpora, Simple (Unsmoothed) N-Grams, Smoothing, Backoff, Deleted Interpolation. Word Classes and Part of Speech Tagging: English Word Classes, Targets for English, Part of Speech Tagging, Rules Based Part of Speech Tagging. Context Free Grammars for English: Context Free Rules and Trees, Sentence Level Constructions, The Noun Phrase, Co-ordination, The Verb Phrase Subcategorization, Auxiliaries.

UNIT-III

Parsing with Context Free Grammars: Parsing as Search, A Basic Top Down Parser, The Earley Algorithm, Finite State Parsing Methods. Features and Unification: Feature Structures, Unification of Feature Structures, Implementing Unification, Parsing with Unification Constraints, Types and Inheritance. Lexicalized and Probabilistic Parsing: Probabilistic Context Free Grammars, Probabilistic Lexicalized CFGs, Dependency Grammars.

UNIT IV

Representing Meaning: Computational Desiderata for Representations, Meaning Structure of Language, First Order Predicate Calculus. Semantic Analysis: Syntax Driven Semantic Analysis, Attachments for a Fragment of English, Integrating Semantic Analysis into the Earley Parser, Robust Semantic Analysis. Lexical Semantics: Relations Among Lexemes and Their Senses, The Internal Structure of Words, Creativity and the Lexicon. Word Sense Disambiguation and Information Retrieval.

UNIT V

Discourse: Reference Resolution, Text Coherence, Discourse Structure. Natural Language Generation: An Architecture for Generation, Surface realization, Discourse Planning. Machine Translation: Language Similarities & Differences, The Transfer Metaphor, The Interlingua Idea: Using Meaning, Direct Translation, Using Statistical Techniques.

References:

1. Jurafsky,D., Martin, J.H., “Speech and language processing”, PHI
2. Manning, C.D., Schutze, H, “Foundations of statistical natural language processing” MIT press.
3. Allen, J., “Natural Language Processing”, Benjamin/ Cummins Publishing
4. Wall L. et W, “Programming PERL”, O’Reilly

ECS505(2) Advanced Database Management Systems L:T:P : 3:1:0

UNIT- I

DATA STORAGE & QUERYING: File Structures: Heap files, Sorted files, Hashing, RAID., Indexing files: Single level, Multiple level, B-Trees, Query Processing & Optimization: Translating SQL queries in relational algebra, External sorting, Various operations like SELECT, JOIN etc, Combining operations using pipelining, Query optimization using heuristics, Selectivity & Cost estimation. Database Tuning: Physical Database Design, Tuning in Relational Systems.

UNIT-II

TRANSACTION MANAGEMENT: Transaction processing concepts: Properties, Schedules, Serializability, Transaction support in SQL., Concurrency control techniques: Two phase locking, Timestamp ordering, Multiversion, Database recovery techniques: Recovery concepts, Deferred update, Immediate update, Shadow paging.

UNIT-III

DATABASE SECURITY: Database security issues, Discretionary access control, Mandatory & role based access control, Database audit.

UNIT-IV

DISTRIBUTED DATABASES: Distributed database concepts, System architecture; Distributed database design, Fragmentation, Replication, Allocation; Types of distributed databases; Query processing in distributed databases.

UNIT-V

EMERGING TECHNOLOGIES: Data mining: Data mining concepts, Association rules, Classification, Clustering, Application of data mining. Data warehousing: Characteristics of Data warehouses, Data modeling of data warehouses, typical functionality of data warehouses. XML & Internet databases, Object relational databases,case studies of leading database systems.

References:

1. Elmasri R. & Navathe S. B. , Fundamentals of Database Systems, Pearson Education.
2. Silberschatz A., Korth H. F. & Sudarshan S., Database System Concepts, McGraw Hill.
3. Carlo Zaniolo, Stefano Ceri, Christos Faloutsos, Richard T. Snodgrass, V.S. Subrahmanian, Roberto Zicari "Advanced Database Systems", The Morgan Kaufmann Series
4. Raghu Ramakrishnan, Johannes Gehrke,"Database Management Systems", McGraw-Hill Education

ECS-505(3) **Mobile Computing** **L:T:P : 3:1:0**

Unit-I

Introduction, issues in mobile computing, overview of wireless telephony: cellular concept, GSM: air-interface, channel structure, location management: HLR-VLR, hierarchical, handoffs, channel allocation in cellular systems, GPRS.

Unit- II

Wireless Networking, Wireless LAN Overview: MAC issues MAC (Hidden and exposed terminals, Near and far terminals), SDMA, FDMA, TDMA, CDMA. IEEE 802.11, Blue Tooth, Wireless multiple access protocols, TCP over wireless, Wireless applications, data broadcasting, Mobile IP (Goals, assumptions, entities and terminology, IP packet delivery, agent advertisement and discovery, registration, tunneling and encapsulation, optimizations), WAP: Architecture, protocol stack, application environment, applications. Dynamic Host Configuration Protocol (DHCP).

Unit-III

Mobile Transport Layer: Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/fast recovery, Transmission /time-out freezing, Selective retransmission, Transaction oriented TCP. Database Issues: Hoarding techniques, caching invalidation mechanisms, client server computing with adaptation, power-aware and context-aware computing, transactional models, query processing, recovery, and quality of service issues.

Unit-IV

Data Dissemination: Communications asymmetry, classification of new data delivery mechanisms, push-based mechanisms, pull-based mechanisms, hybrid mechanisms, selective tuning (indexing) techniques. Adhoc networks, localization, MAC issues, Routing protocols, global state routing (GSR), Destination sequenced distance vector routing (DSDV), Dynamic source routing (DSR), Ad Hoc on demand distance vector routing (AODV), Temporary ordered routing algorithm (TORA), QoS in Ad Hoc Networks, applications,security in MANETs.

Unit-V

Research issues in Mobile Ad hoc Networks: Clustering issues in mobile Ad hoc Networks, Energy Conservation and Consumption Issues, QoS issues in MANET, Study of Network Simulators (Glomosim / NS2),

Reference:

1. Jochen Schiller, “Mobile Communications”, Addison-Wesley, second edition, 2004.
2. Stojmenovic and Cacute, “Handbook of Wireless Networks and Mobile Computing”, Wiley, 2002
3. Charles Perkins, Mobile IP, Addison Wesley.
5. Charles Perkins, Ad hoc Networks, Addison Wesley.
6. Upadhyaya, “Mobile Computing”, Springer

7. Adelstein, Frank, Gupta, Sandeep KS, Richard III, Golden , Schwiebert, Loren, “Fundamentals of Mobile and Pervasive Computing”, ISBN: 0071412379, McGraw-Hill Professional, 2005.
8. Hansmann, Merk, Nicklous, Stober, “Principles of Mobile Computing”, Springer, second edition, 2003.

ECS-505 (4) **Advanced Computer Architecture** **L:T:P : 3:1:0**

Unit-I

Parallel computer models: The state of computing, Classification of parallel computers, Multiprocessors and multicomputers, Multivector and SIMD computers.

Program and network properties: Conditions of parallelism, Data and resource Dependences, Hardware and software parallelism, Program partitioning and scheduling, Grain Size and latency, Program flow mechanisms, Control flow versus data flow, Data flow Architecture, Demand driven mechanisms, Comparisons of flow mechanisms.

Unit-II

Pipelining: Linear pipeline processor, nonlinear pipeline processor, Instruction pipeline Design, Mechanisms for instruction pipelining, Dynamic instruction scheduling, Branch Handling techniques, branch prediction, Arithmetic Pipeline Design, Computer arithmetic principles, Static Arithmetic pipeline, Multifunctional arithmetic pipelines

Unit-III

Arithmetic for computers: Signed and unsigned Numbers, Addition and Subtraction, Multiplication, Division, Floating Point. CPU Performance and Its factors, Evaluating performance of CPU.

Unit – IV

Memory Hierarchy Introduction, The basics of Cache, Measuring and Improving of Cache Performance, Virtual Memory, Common framework for memory hierarchies

UNIT V

Enterprise Memory subsystem Architecture: Enterprise RAS Feature set: Machine check, hot add/remove, domain partitioning, memory mirroring/migration, patrol scrubbing, fault tolerant system.

Reference:

1. Kai Hwang, “Advanced computer architecture”; TMH. 2000
2. D. A. Patterson and J. L. Hennessey, “Computer organization and design”, Morgan Kaufmann, 2nd Ed. 2002
3. Computer System Architecture – M.Moris Mano, IIIrd Edition, PHI / Pearson, 2006.

Elective-II

EMA-605 (1) OPTIMIZATION TECHNIQUES L:T:P : 3:1:0

Unit -I

Introduction to linear Programming: Introduction to Linear Programming Problems, Formulation of Linear Programming Problems, Graphical method for solution of LPP, Additional Examples,

Solving LPPs: The simplex method for solution of LPP, the essentials of simplex method, setting up the simple method, The Algebra of the simplex method, simplex method in Tabular form. Tie Breaking in simplex method,

Solution of maximization and minimization problems, Big-M method, Two phase method, Unbounded and degenerate solution of LPP, Duality in Linear programming

Unit -II

Duality theory: Primal Dual Relationships, Other Algorithm for linear programming, The dual simplex method, Transportation & assignment Problems: The transportation Problems, A streamlined simplex method for the transportation problems, North West corner rule, Least cost method, Vogel's approximation method for obtaining initial feasible solutions, Stepping stone and MODI method to get optimal solution, Transshipment problem. The Assignment Problem, Hungarian model.

Unit -III

Network optimization Models, The shortest path Problem, the minimum spanning tree problem, the maximum flow problem, the minimum cost flow problem, The Project Management with PERT/CPM, Scheduling problem with PERT/CPM, Dealing with uncertain activity durations, considering Time cost Tradeoffs, Scheduling and Controlling, Projects costs, An evaluation of PERT/CPM.

Unit -IV

Game Theory: The formation of two persons, Zero sum games, solving simple games, games with mixed strategies, Graphical solution Procedure, Solving by LP.

Unit -V

Inventory Theory: Components of inventory models, Deterministic continuous review models, A deterministic periodic review model, A stochastic continuous review model.

Reference:

1. Hiller and Lieberman, Introduction to Operation Research (Seventh Edition) Tata McGrawHill Publishing Company Ltd
2. Ravindren Philips and Solberg, Operation Research Principles and Practice(Second Edition) John Wiley & Sons.

ECS-605 (2) **Advanced Web Applications** **L:T:P : 3:1:0**

Unit I

Introduction to Markup languages, SGML, SGML vs HTML, introduction to XML, Document type definitions, XML Schemas, XML namespaces, Object Models, Presenting XML Using XML Processors : DOM and SAX, Parsing XML documents

Unit II

Introduction to XML Web services, Creating Web Service, Setting the Web Service, Attribute, Test and Run Your Web Service, Consuming a Web Service in Client, Application, Consuming a Third Party Web service

Unit III

Database Processing: Database programming using ODBC, studying database connectivity APIs, accessing database from server side scripting page, Application specific database Actions

Crystal Report: Overview to Crystal Reports, Creating Crystal Reports with wizards, Integrating with Web Applications, Customizing the Report Viewer

Unit IV

Understanding AJAX Technology, How AJAX Works, Building a ASP.NET Page with Ajax, Using UpdatePanel Control, AJAX Server Controls, AJAX Control Toolkit, Downloading and Installation, AJAX Control Toolkit Extenders

Unit V

IIS: Architecture of IIS 7, Internet Information Service Manager

Deployment: Methods of Deploying Web Application, Deploy Windows Application, Deploying Website, Publishing Website

References:

1. Burdman, “Collaborative Web Development” Addison Wesley.
2. Chris Bates, “Web Programing Building Internet Applications”, 2nd Edition, WILEY, Dreamtech
3. Joel Sklar , “Principal of web Design” Vikash and Thomas Learning
4. Horstmann, “CoreJava”, Addison Wesley.
5. Herbert Schieldt, “The Complete Reference:Java”, TMH.
6. Hans Bergsten, “Java Server Pages”, SPD O’Reilly

ECS-605 (3) SIMULATION AND MODELLING L:T:P : 3:1:0

Unit-1

System definition and components, stochastic activities, continuous and discrete systems, system modeling, types of models, static and dynamic physical models, static and dynamic mathematical models, full corporate model, types of system study.

Unit-II

System simulation, why & when to simulate, nature and techniques of simulation, comparison of simulation and analytical methods, types of system simulation, real time simulation, hybrid simulation, simulation of pure-pursuit problem, single-server queuing system and an inventory problem, Monte-Carlo simulation, Distributed Lag models, Cobweb model.

Unit-III

Simulation of continuous systems, analog vs. digital Simulation, Simulation of water reservoir system, Simulation of a servo system, Discrete system simulation, fixed time-step vs. even to even model, generation of random numbers, test for randomness, Monte-Carlo computation vs. stochastic simulation.

Unit-IV

System dynamics, exponential growth models, exponential decay models, modified exponential growth models, logistic curves, generalization of growth models, system dynamic diagrams Introduction to SIMSCRIPT: Program, system concepts, origination, and statements, defining the telephone system model.

Unit-V

Simulation of PERT Networks, critical path computation, uncertainties in activity duration, resource allocation and consideration, Simulation languages and software, continuous and discrete simulation languages, expression based languages, object oriented simulation, general purpose vs. application - oriented simulation, packages, CSMP-III, MODSIM-III.

References

1. Geoftrey Gordon, “System Simulation”, PHI
2. Jerry Banks, John S. C Barry L. Nelson David M. Nicol, “Discrete Event System Simulation”, Pearson Education
3. Averill M. Law, W. David Kelton, “System Modeling and simulation and Analysis”,TMH

ECS-605 (4) EMBEDDED SYSTEMS L:T:P : 3:1:0

Unit-I

Introduction to embedded systems: Classification, History, Characteristics and requirements, embedded software Architectures, inside embedded system: Processor, memory, peripherals, software, algorithms, Examples of embedded system, Embedded Systems on a Chip (SoC) and the use of VLSI designed circuits.

Unit-II

Timing and clocks in embedded systems, Task Modeling and management, Real time operating System issues. Embedded Processor: Embedded system Design Signals, frequency spectrum and sampling, digitization (ADC, DAC), Signal Conditioning and Processing.

Unit-III

Modeling and Characterization of Embedded Computation System. Embedded Control and Control Hierarchy, Communication strategies for embedded systems: Encoding and Flow control.

Unit-IV

Programming Concepts and Embedded Programming in C, C++, Programming in assembly language (ALP) vs. High Level Language, Embedded Programming in C++, Programming of 8051 microcontroller, instruction set, addressing modes, port programming.

Unit-V

Introduction to Real time operating system, task concepts and task scheduling in RTOS, Rate monotonic (RM), EDF scheduling, resource allocation, Fault-Tolerance, Formal Verification.

References:

1. H.Kopetz, “Real-Time Systems”, Kluwer, 1997.
2. R.Gupta, “Co-synthesis of Hardware and Software for Embedded Systems”, Kluwer 1995.
3. Rajkamal, “Embedded Systems”, TMH, 2008
4. Steve Heath, Embedded Systems Design, Second Edition-2003, Newnes,
5. Mazidi & Mazidi,“ The 8051 microcontroller and embedded systems”, PHI

Elective-III

ECS-703 (1) Network Programming L:T:P : 3:1:0

Unit-I

Introduction to Network Programming: OSI model, Unix standards, TCP and UDP & TCP connection establishment and Format, Buffer sizes and limitation, standard internet services, Protocol usage by common internet application.

Unit-II

Sockets: Address structures, Byte ordering and manipulation function, Elementary TCP sockets– Socket, connect, bind, listen, accept, fork and exec function, concurrent servers. Close function and related function.

Unit-III

TCP client server: Introduction, TCP Echo server functions, Normal startup, terminate and signal handling server process termination, Crashing and Rebooting of server host shutdown of server host.

I/O Multiplexing and socket options: I/O Models, select function, Batch input, shutdown function, poll function, TCP Echo server, getsockopt and setsockopt functions. Socket states, Generic socket option IPV6 socket option ICMPV6 socket option IPV6 socket option and TCP socket options.

Unit-IV

Elementary UDP sockets: Introduction UDP Echo server function, lost datagram, summary of UDP example, Lack of flow control with UDP, determining outgoing interface with UDP.

Elementary name and Address conversions: DNS, gethost by Name function, Resolver option, Function and IPV6 support, uname function, other networking information.

Unit-V

IPC : Introduction, File and record locking, Pipes, FIFOs streams and messages, Name spaces, system IPC, Message queues, Semaphores. **Remote Login:** Terminal line disciplines, Pseudo-Terminals, Terminal modes, Control Terminals, rlogin Overview, RPC Transparency Issues.

References :

1. UNIX Network Programming, Vol. I, Sockets API, 2nd Edition. - W.Richard Stevens, Pearson Edn. Asia.

2. UNIX Network Programming, 1st Edition, - W.Richard Stevens. PHI.

ECS605(1) **Parallel Computing** **L:T:P : 3:1:0**

Unit I

Introduction of parallel computing, Model of parallel computing: Synchronous - vector/array, SIMD, Systolic; Asynchronous - MIMD, reduction model.

Flynn's classifications, Handler's classifications, Kung's taxonomy, SPMD.

Unit II

Abstract parallel computing models: Combinational circuits, Sorting network, PRAM models, Interconnection RAMs. Parallelism approaches - data parallelism, control parallelism

Unit III

Performance Measurement: Laws governing performance measurements. Metrices - speedups, efficiency, utilization, communication overheads, single/multiple program performances, bench marks.

Unit IV

Parallel Processors: Taxonomy and topology - shared memory multiprocessors, distributed memory networks. Processor organization - Static and dynamic interconnections. Embeddings and simulations.

Unit V

Parallel Programming: Shared memory programming, distributed memory programming, object oriented programming, data parallel programming, functional and dataflow programming.

Scheduling and Parallelization: Parallel programs scheduling. Loop scheduling. Parallelization of sequential programs. Supporting environments for parallel computing.

References:

1. M. J. Quinn.Parallel Computing: Theory and Practice, McGraw Hill.
2. T. G. Lewis and H. El-Rewini. Introduction to Parallel Computing, Prentice Hall.
3. Vipin Kumar, Ananth Grama, Anshul Gupta, George Karpis “Introduction to Parallel Computing: Design and Analysis of Parallel Algorithms”, IEEE Distributed System

ECS-703 (3) Design of UNIX Operating System L:T:P : 3:1:0

Unit-I

Overview of the System: System structure, User perspective, Operating System Services, Introduction to the Kernel: Architecture of the UNIX Operating System, Introduction to system concepts, Kernel Data structures, System Administration, The Buffer Cache: Buffer Headers, Structures of the buffer pool, scenarios for retrieval of the buffer, Reading and writing of the Disk blocks, Advantages and disadvantages of the buffer cache

Unit-II

Internal representation of files: INODE, structure of a regular file, directories, conversion of a path name to an INODE, Superblock, INODE assignment to a new file, allocation of disk blocks, other file types, System calls for the file System: Open, read, write, file and record locking, adjusting the position of the file I/O, Close, file creation, change directories and change root, pipes, mounting and un-mounting file systems, link and uplinks, file system abstractions and maintenance.

Unit-III

The structure of processes: process state and transitions, layout of system memory, the context of a process, process address space manipulation, sleep, Process Control: process creation and termination, signals, the user ID of a process, changing the size of a process, the shell, system boot and INIT process

Unit-IV

Process scheduling and time: system calls for scheduling and time , memory management policies: swapping and demand paging, The I/O system: Driver interfaces, disk and terminal drivers, Interprocess communication: Process tracing, network communications, sockets

Unit-V

Multiprocessor systems: problem and solution of multiprocessor systems, the TUNIS system, performance limitations, Distributed UNIX systems: satellite processors, the new castle connection, Transparent distributed file system, transparent distributed model

References:

1. Maurice J. Bach, " The design of the UNIX Operating system" PHI

ECS-703 (4) **Virtual Reality** **L:T:P : 3:1:0**

Unit I

Introduction: The three I's of virtual reality, commercial VR technology and the five classic components of a VR system.

Unit II

Input Devices: (Trackers, Navigation, and Gesture interfaces): Three dimensional position trackers, navigation and manipulation, interfaces and gesture interfaces. Output Devices: Graphics displays, sound displays and haptic feedback.

Unit III

Modeling: geometric modeling, kinematics modeling, physical modeling, behavior modeling, model management Human factors: Methodology and terminology, user performance studies, VR health and safety issues.

Unit IV

Applications: Medical applications, military applications, robotics applications. VR programming-I: Introducing Java 3D, loading and manipulating external models, using a lather to make shapes

Unit V

VR programming-II: 3D Sprites, animated 3D sprites, particle systems.

References:

1.Virtual Reality Technology, Second Edition, Gregory C. Burdea & Phillippe Coiffet John Wiley & Sons, Inc.

2. Killer Game Programming in Java, Andrew Davison, Oreilly- SPD, 2005.

Elective-IV

ECS-704(1) Wireless & Sensor Networks L:T:P : 3:1:0

Unit 1

Understanding wireless network principles: Wireless channel, propagation, multiple access and modulation, Wireless technologies and architectures, Significance of sensor networks in the wide subject of wireless networking; Introducing sensor node: Hardware and software components of a node ,Limitations of a sensor node ,Characteristics of a sensor node, Example sensor nodes

Unit 2

Sensor network architecture and design principles: Sensor network scenarios, Optimization goals and figures of merit, Designing sensor Networks, Service interfaces and gateway concept; WSN Programming and Medium access control (MAC): WSN Programming Demo, Fundamentals of MAC protocols. Different types of MAC protocols.

Unit 3

Link Layer protocols and Addressing: Fundamentals of Link Layer, Error Control, Framing & Link Management, Addressing and naming in sensor networks; Time synchronization and topology control: Time synchronization, Topology Control

Unit 4

ID-Centric Routing protocols and WSN Simulation, Gossiping and energy efficient Uni-casing, Broadcast, Multicast and Geographic routing, Sensor Network Simulation Tutorial; Data Centric and Content-based networking: Introduction and data-centric routing, Data aggregation.

Unit 5

Transport layer and quality of service: Reliable Delivery, Coverage and Deployment, Congestion and rate control, QoS; Sensor network security: Network security basics, Wireless network security ,Security for sensor networks ; Advanced topics and potential research areas about sensor networks

Reference

1. Handbook of Sensor Networks: Algorithms and Architectures, I. Stojmenovic, John Wiley & Sons, 2005.
2. Ad Hoc & Sensor Networks: Theory and Applications, C. De Morais Condeiro and D.Agrawal, World Scientific Pub, 2006.
3. Networking Wireless Sensors, B. Krishnamachari, Cambridge University Press, 2006.
4. Algorithms for Sensor and Ad Hoc Networks, Ed. Wagner, D., Wattenhofer, R., Springer Verlag, 2007.
5. Wireless Sensor Networks: An Information Processing Approach, Feng Zhao and Leonidas Guibas, Morgan Kaufman, 2004.

6. Mobile, Wireless, and Sensor Networks: Technology, Applications and Future Directions, Rajeev Shorey, A. Ananda, Mun Choon Chan, and Wei Tsang Ooi (Eds), IEEE Press, 2006.
7. Handbook of Sensor Networks: Compact Wireless and Wired Sensing Systems, Mohammad Ilyas, Imad Mahgoub, CRC Press, 2004.
8. Protocols and Architectures for Wireless Sensor Networks, by Holger Karl and Andreas Willig Publisher: John Wiley & Sons (May 31, 2005) ISBN: 0470095105

ECS-704 (2) **Semantic Web** **L:T:P : 3:1:0**

Unit I

Structured Web Documents in XML Introduction , The Semantic Web Vision , Today's Web, From Today's Web to the Semantic Web Layered approach to Semantic Web Technologies

Unit-II

Overview of Structured Web Documents in XML , XML Language Overview , Structuring ,Namespaces , Addressing and Querying XML Documents , Processing of documents.

Unit III

Describing Web Resources in RDF Understanding content: Metadata, metadata standards, XML+metadata specification, RDFBasics , XML-Based Syntax , RDF Schema: Direct Inference System for RDF , Querying in RQL

Unit IV

Web Ontology Language: , Web Ontology Language, OWL , Future Extensions , case study of any one ontology editor i.e Sesame or Protege, Monotonic Rules syntax and Semantics , Nonmonotonic Rules syntax and semantics .

Unit V

Applications Semantic Applications,demonstrating power of semantic technology for search, personalization, contextual directory and custom/enterprise applications; next generation semantic content management , Contributions of IR, AI, Logic, NLP, DB and IS to Semantic Web, Ontology integration versus interoperation

References :

1. Grigoris Antoniou and Frank van Harmelen, A Semantic Web Primer , The MIT Press
2. Daconta, Obrst and Smith , The Semantic Web: A Guide to the Future of XML, Web Services and Knowledge Management. Wiley 2003.
3. Munindar P. Singh and Michael N. Huhns, Service-Oriented Computing, Wiley & Sons.

ECS-704 (3) **Real Time System** **L:T:P : 3:1:0**

Unit I:

Introduction to real time systems, Typical Real Time Applications: Digital Control, High Level Controls, Signal Processing etc , Hard Real Time Systems and Soft Real Time System ,structure, issues, task classes, performance measures for real time systems-their properties, traditional measures, cost functions and hard deadlines. Estimation of program run time-source code analysis, accounting for pipelining and caches.

Unit II:

Task Assignment and Scheduling-Rate monotonic scheduling algorithm, Preemptive earliest deadline first algorithm, Using primary and alternative tasks. Task Assignment-Utilization balancing algorithm, next fit for RM(Rate monitoring) scheduling, Bin packing assignment algorithm for EDF, Myopic offline scheduling(MOS) algorithm, Focused addressing and bidding(FAB) algorithm, Buddy strategy, Assignment with precedence conditions.

Unit III:

Programming Languages & Tools- Desired language characteristics,, data typing, control structures, hierarchical decomposition, packages, run time error handling, Overloading and genetics, Multitasking, Low level programming, Fex, Euclid, Run time support.

Unit IV:

Real time Communication-Communication media, network topologies. Protocols-Contention based, Token based, Stop-and-Go, Polled bus, Hierarchical round robin, deadline based.

Unit V:

Fault Tolerance Techniques- Fault, fault types, fault detection, fault and error containment, hardware and software redundancy, time redundancy, information redundancy. Reversal checks, Malicious or Byzantine failures, Integrated failure handling.

References:-

1. C.M Krishna and Kang G. Shin, Real Time Systems, TMH
2. Stuart Bennelt, Real time computer control and introduction, Pearson education, 2003
3. Jane W.S Liu, Real time systems, Mc-Graw Hill

ECS-704 (4) **TCP/IP Protocol Suite** **L:T:P : 3:1:0**

Unit I

Introduction: Uses of Computer Networks, Network and Protocol Architecture, Reference Model (ISO-OSI, TCP/IP-Overview

Unit II

Physical Layer: Data and signals, Transmission impairments, Data rate limits, performance factors, Transmission media, Wireless transmission, Telephone system (Structure, trunks, multiplexing & Switching)

Unit III

Data Link Layer: Design issues, Error detection & correction, Data Link Protocols, sliding window protocols, HDLC,WAN Protocols.

Unit IV

Medium Access Sub layer: Channel allocation problem, multiple access protocols, IEEE standard 802.3 & 802.11 for LANS and WLAN, high-speed LANs, Network Devices-repeaters, hubs, switches bridges.

Unit V

Network Layer: Design issues, Routing algorithms, congestion control algorithms, Internetwork protocols, Internetwork operation

References:

1. W. Stallings, "Data and Computer Communications", Pearson Education, 8th Ed, 2007.
2. D. E. Comer., "Computer Networks & Internets", Pearson Education, 4th Ed, 2007
3. B. A Forouzan.,"Data Communications & Networking",4th Ed, Tata McGraw Hill, 2007.
4. A. S. Tanenbaum. "Computer networks", Pearson Education, 4th ed , 2006.

ECS-704 (5) **Big Data and Analytics** **L:T:P : 3:1:0**

Unit I:

Types of Digital Data: Structured, Sources of structured data, Ease with Structured data, Semi-Structured, sources of semi-structured data, Unstructured, sources of unstructured data, Issues with terminology, Dealing with unstructured data, Place me in the basket
Big data: Introduction to big data, need of big data, characteristics of big data, Challenges with big data, Big data stack

Unit II:

Big Data Analytics: Analytics 1.0, Analytics 2.0, Analytics 3.0, Traditional BI vs. Big Data Environment
Big Data technology Landscape: NoSQL Databases, NoSQL Vs. RDBMS, NewSQL, Hadoop, Hadoop 1.0 vs. Hadoop 2.0, Introduction to Data Science is multi-disciplinary and Data Scientist

Unit III:

Hadoop: Why not RDBMS, Distributed Computing Challenges, A Brief History of Hadoop, Hadoop Overview, Hadoop Components, High Level Architecture of Hadoop
Hadoop Distributed File System: HDFS Architecture, Daemons Related to HDFS, Working with HDFS Command, Special Features of Hadoop

Unit IV

Processing Data With Hadoop: Introduction, How Map Reduce Works, Map Reduce Example, Word Count Example using Java
NoSQL: Recap of NoSQL databases, MongoDB - CRUD, MongoDB- Arrays, Java Scripts, Cursors, Map Reduce Programming, Aggregations
Cassandra: CQLSH - CRUD, Counter, List, Set, Map, Tracing

Unit V

Hive: Introduction to Hive, History of Hive and Recent Releases of Hive, Hive Features,Hive Integration and Work Flow, Hive Data Units, Hive Architecture, Hive Primitive Data Types and Collection Types, Hive File Formats
Hive Query Language - Statements: DDL, DML, Hive Partitions, Bucketing, Views, Sub Query, Joins, Hive User Defined Function, Aggregations in Hive, Group by and Having, Serialization and Deserialization, Hive Analytic Functions

References

1. Seema Acharya, Subhashini Chellapan, “Big Data and Analytics”, Wiley
2. Judith Hurwitz, Alan Nugent,Fern Halper, Marcia Kaufman,”Big data for dummies”, Wiley
3. Tom White ,”Hadoop: The Definitive Guide”, Orielly
4. Chuck Lam, “Hadoop in action”, Manning Publications
5. Dirk Deroos, Paul C. Zikopoulos, Roman B. Melnyk,Bruce Brown, “Hadoop for dummies”, Wiley