STUDY SCHEME AND SYLLABUS

FOR

4 YEAR – UG COURSE

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

SANT LONGOWAL INSTITUTE OF ENGINEERING AND TECHNOLOGY, LONGOWAL

Vision & Mission of Department

Vision

To achieve academic & research excellence in the field of Computer Science and Engineering with industrial & social perspective.

Mission

- To provide environment for high quality academics, research and development.
- To disseminate sound knowledge of recent Computer Technologies by organizing seminar/workshops/short-term courses.
- To develop interaction/collaboration with the industry.

GCS - Degree in Computer Science & Engineering							
Group-B							
Semester-I Group-B (UG)							
S.No	Sub Code	Subject Name	L	T	P	Hrs.	Credits
1	CYT-411	Applied Chemistry	3	1	0	4	4
2	HUT-412	Engineering Economics and Entrepreneurship	3	1	0	4	4
3	CST-411	Elements of Computer Programming	2	0	0	2	2
4	ECT-411	Elements of Electronics Engineering	3	1	0	4	4
5	MET-412	Workshop Technology & Practice-I	2	0	0	2	2
6	CYP-411	Applied Chemistry	0	0	2	2	1
7	CSP-411	Elements of Computer Programming	0	0	2	2	1
8	ECP-411	Elements of Electronics Engineering	0	0	2	2	1
9	MEP-413	Engineering Drawing*	0	0	4	4	2
10	WSP-412	Workshop Technology & Practice-I	0	0	4	4	2
		Total	13	3	14	30	23
Semester-II Group-B (UG)							
S.No	Sub Code	Subject Name	L	T	P	Hrs.	Credits
1	AMT-421	Engineering Mathematics	3	1	0	4	4
2	PHT-421	Applied Physics	3	1	0	4	4
3	HUT-421	English Communication & Soft Skills	3	0	0	3	3
4	EET-421	Elements of Electrical Engineering	3	1	0	4	4
5	MET-421	Elements of Mechanical Engineering	3	1	0	4	4
6	PHP-421	Applied Physics	0	0	2	2	1
7	HUP-421	English Communication & Soft Skills	0	0	2	2	1
8	EEP-421	Elements of Electrical Engineering	0	0	2	2	1
9	MEP-421	Elements of Mechanical Engineering	0	0	2	2	1
		Total	15	4	8	27	23
Semester-IIIA Group-A (UG:Practical Training)							
	TPS-501*^	Two weeks Practical Training during summer vacations				80	2 (S/US)
	Semester-III Group-B (UG)						
S.No	Sub Code	Subject Name	L	T	P	Hrs.	Credits
1	CST-511	Operating System	3	0	0	3	3
2	CST-512	Digital Circuit and Logic Design	3	0	0	3	3
3	CST-513	Discrete Mathematics	3	0	0	3	3
4	CST-514	Database Management System	3	0	0	3	3
5	CST-515	Data Communication and Computer Networks	3	0	0	3	3
6	CST-516	Software Engineering	3	0	0	3	3
7	CSP-511	Operating System	0	0	2	2	1
8	CSP-512	Digital Circuit and Logic Design	0	0	2	2	1
9	CSP-514	Database Management System	0	0	2	2	1
10	CSP-515	Data Communication and Computer Networks	0	0	2	2	1
		Total	18	0	8	26	22

	Semester-IV Group-B (UG)						
S.No	Sub Code	Subject Name	L	T	P	Hrs.	Credits
1	AMT-521	Higher Engg Mathematics	4	0	0	4	4
2	CST-521	Web Technologies	3	0	0	3	3
3	CST-522	Computer Organization	3	0	0	3	3
4	CST-523	Data Structures and Algorithms	3	1	0	4	4
5	CST-524	System Software	3	1	0	4	4
6	CST-525	Automata and Formal Languages	3	0	0	3	3
7	CSP-521	Web Technologies	0	0	4	4	2
8	CSP-523	Data Structures and Algorithms	0	0	2	2	1
9	CSP-524	System Software	0	0	2	2	1
		Total	19	2	8	29	25
	Semester-V Group-B (UG)						
S.No	Sub Code	Subject Name	L	T	P	Hrs.	Credits
1	PHT-611	Physics of Matetials	3	1	0	4	4
2	CST-611	Algorithm Analysis and Design	3	1	0	4	4
3	CST-612	Artificial Intelligence	3	0	0	3	3
4	CST-613	Software Reliablity and Testing	3	0	0	3	3
5	CST-614	Microprocessor and Applications	3	0	0	3	3
6	CST-615	Data Mining and Warehousing	3	0	0	3	3
7	PHP-611	Physics of Matetials	0	0	2	2	1
8	CSP-611	Algorithm Analysis and Design	0	0	2	2	1
9	CSP-613	Software Reliablity and Testing	0	0	2	2	1
10	CSP-614	Microprocessor and Applications	0	0	2	2	1
		Total	18	2	8	28	24
	Semester-VI Group-B (UG)						
S.No	Sub Code	Subject Name	L	T	P	Hrs.	Credits
1	AMT-621	Numerical Analysis	3	1	0	4	4
2	CST-621 (A-D)	Elective – I	3	0	0	3	3
3	**O-62*	Open Elective-I	3	0	0	3	3
4	CST-623	Computer Graphics and Multimedia	3	1	0	4	4
5	CST-624	Network Programming	3	1	0	4	4
6	CST-625	Simulation and Modeling	3	1	0	4	4
7	AMP-621	Numerical Analysis	0	0	2	2	1
8	CSP-623	Computer Graphics and Multimedia	0	0	2	2	1
9	CSP-624	Network Programming	0	0	2	2	1
10	CSP-625	Simulation and Modeling	0	0	2	2	1
		Total	18	4	8	30	26
Semester- VIIA (UG:Industrial Training)							
	TPS-701*^	Industrial Training during summer vacations (6 weeks)				200	8 (S/US)

	Semester-VII Group-B (UG)						
S.No	Sub Code	Subject Name	L	T	P	Hrs.	Credits
1	HUM-711	Human Values and Professional Ethics	2	0	0	2	2
2	CST-711 (A-D)	Elective – II	3	0	0	3	3
3	CST-712	Advanced Computer Architecture	3	1	0	4	4
4	CST-713	Compiler Design	3	1	0	4	4
5	**O-71*	Open Elective-II	3	0	0	3	3
6	CSP-715	Project	0	0	6	6	3
7	CSP-716	Emerging Technologies	0	0	2	2	1
		Total	14	2	8	24	20
	Semester-VIII Group-B (UG)						
S.No	Sub Code	Subject Name	L	T	P	Hrs.	Credits
1	CHM-721	Environmental Studies	3	0	0	3	3
2	HUT-721	Principles of Management	3	1	0	4	4
3	CST-721 (A-D)	Elective – III	3	0	0	3	3
4	CST-722	Soft Computing	3	0	0	3	3
5	**O-72*	Open Elective-III	3	0	0	3	3
6	CSP-722	Soft Computing	0	0	2	2	1
7	CSP-723	Project	0	0	6	6	3
8	CSP-724	Seminar	0	0	4	4	2
9	CSP-725	Advanced Technologies	0	0	2	2	1
		Total	15	1	14	30	23
*^ The credit will not be considered for CGPA calculation							

	Theory	Tutorial	Practical	Hrs.	Credits
Total Basic Sciences	19	5	8	32	28
Total Humanities	9	2	2	13	12
Total Other Engineering	11	3	14	28	21
Total Open Electives	9	0	0	9	9
Total Core Subject	77	8	40	125	105
Total Mandatory Courses	5	0	0	5	5
Projects	0	0	12	12	6
Summer Training and Industrial Training					10
Total	130	18	76	224	186

LIST OF ELECTIVES						
S.No	**Subject**	**Subject name**	L	T	P	Cr
Elective-I						
1	CST-621 A	Advance Microprocessor	3	0	0	3
2	CST-621 B	Cryptography	3	0	0	3
3	CST-621 C	Digital signal Processing	3	0	0	3
4	CST-621 D	Natural Language Processing	3	0	0	3
Elective-II						
1	CST-711 A	Operating System internals	3	0	0	3
2	CST-711 B	Distributed Systems	3	0	0	3
3	CST-711C	Operation Research	3	0	0	3
4	CST-621 D	Client-Server architecture	3	0	0	3
Elective-III						
1	CST-721 A	Mobile Communication Systems	3	0	0	3
2	CST-721 B	Embedded Systems	3	0	0	3
3	CST-721 C	Visual Programming	3	0	0	3
4	CST-721 D	Digital image Processing	3	0	0	3

LIST OF OPEN ELECTIVES						
Sr.	**Subject**	**Subject name**	L	T	P	Cr.
Open Elective-I						
1	CSO-621	System Management & Security	3	0	0	3
2	CSO-622	Object Oriented Programming	3	0	0	3
3	CSO-623	Software Engineering	3	0	0	3
Open Elective-II						
1	CSO-711	Internet Technologies	3	0	0	3
2	CSO-712	Computer Networks	3	0	0	3
3	CSO-713	Data Organization	3	0	0	3
Open Elective-III						
1	CSO-721	Java Programming	3	0	0	3
2	CSO-722	Cloud Computing	3	0	0	3
3	CSO-723	Computer graphics	3	0	0	3

Program Outcomes (POs) – UG

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design / Development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one’s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Educational Objectives (PEOs) – UG

1. To provide exposure to students in emerging technologies with adequate practical training & opportunities to work as teams on multidisciplinary projects with effective communication skills and leadership qualities.
2. To prepare students to excel in computing industry profession through quality education with a solid foundation in mathematics, engineering and basic science.
3. To prepare students to inculcate professional ethics, social responsibilities and effectively communicate IT concepts to become leaders, researchers, entrepreneurs and social reformers.
4. To develop professional skills in the students that will prepare them for immediate employment and for life-long learning in advanced areas of computer science and related fields.

Program Specific Outcomes (PSOs) – UG

1. Program Specific Outcome (PSO) 1: The ability to understand, analyse and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient design of computer-based systems of varying complexity.
2. Program Specific Outcome (PSO) 2: The ability to employ modern computer languages, environments, and platforms in creating innovative career paths to be an entrepreneur, lifelong learning and a zest for higher studies and also to act as a good citizen by inculcating in them moral values & ethics.

SEMESTER-I

Title of the course : **Elements of Computer Programming**

Subject code : **CST-411**

Weekly load : 2 Hrs LTP 2-0-0

Credits : 2

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

CO1	Get acquainted with computer hardware and software
CO2	Know about various operating systems and programming languages
CO3	Study the C programming basics and learn the concept of operators
CO4	Study some basic data structures and their implementation
CO5	Learn the use of functions, structures, union etc. for modular programming

CO/PO Mapping : (Strong(3)/Medium(2)/Weak(1) indicates strength of correlation):

COs	Programme Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	0	2	0	0	2	0	0	3	2	3	2	2	2
CO2	3	3	2	3	3	2	0	0	3	2	3	2	2	3
CO3	3	3	3	2	2	1	0	0	0	0	0	2	1	2
CO4	3	0	3	3	2	1	0	0	0	0	0	3	2	2
CO5	3	3	3	3	3	3	0	0	3	2	3	3	3	3

Theory

Unit	Main Topics	Course outlines	Lecture(s)
Unit-1	1. Introduction	Introduction and characteristics of computer system, Generations, Classifications, Applications, Central Processing Unit, Memory, I/O devices, Introduction to operating system and its types, Algorithm, Flowchart.	04
	2. C Programming Basics	Basic program construction, Structure of a C program, Compilation process, preprocessor directives, Comments, Data types, Type conversions, Operators - Arithmetic, Relational, Logical, Conditional, Increment/decrement, Library functions, Header files.	04
	3. Loops and Decision Statements	*for* loop, *while* loop, *do* loop, Various forms of *if* statement, *switch* statement, *break* statement, *continue* statement, *go to* statement.	04
	4. Functions	Defining functions, Passing arguments to functions, Returning values from functions, Reference arguments, Storage classes.	04
Unit-2	5. Pointers	Pointers, Pointers to pointers, Declaring and initializing pointers, Pointer expressions, Pointers and arrays, Pointers and strings.	04
	6. Arrays	Arrays and strings, Declaring an array, Initializing arrays, Accessing the array elements, Working with multidimensional arrays, Declaring and initializing string variables, String handling functions.	04

	7. Structures and Union	Declaring and initializing a structure, Accessing the members of a structure, Nested structures, Array of structures, Using structures in functions, Pointers and structures, Declaring and initializing a union.	04
	8. Files	Reading and writing to text and binary files, Character I/O, String I/O, File pointers, Error handling, Redirection, Command line arguments.	04

Total=32

Recommended Books:

1. Raja Raman V., Fundamentals of Computers, PHI.
2. Kernighan Brian W. and Ritchie, Dennis M., The C Programming language, Dorling Kingsley.
3. Balagurusamy E., Programming in ANSI C, TMH Publications

Title of the course : **Elements of Computer Programming**

Subject Code : **CSP-411**

Weekly load : 2 Hrs LTP 0-0-2

Credit : 1

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

CO1	Solve basic mathematical problems using programming
CO2	Demonstrate the use of loop statements to solve iteration problems
CO3	Implement the concept of modular programming and recursion using functions
CO4	Implementation of decision statements and loops
CO5	Create a file and add, append or retrieve data using file handling

	CO/PO Mapping : (Strong(3)/Medium(2)/Weak(1) indicates strength of correlation):													
COs	Program Outcomes (PO's)/ Program Specific Outcomes (PSO's)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	3	3	0	0	3	3	3	2	3	2
CO2	3	3	3	2	2	2	0	0	3	3	3	2	3	2
CO3	3	3	3	2	3	2	0	0	3	2	3	3	3	3
CO4	3	3	3	3	3	3	0	0	3	2	3	3	3	3
CO5	3	3	3	3	3	3	0	0	3	3	3	3	3	3

LIST OF PRACTICALS

1. WAP to find multiplication and addition of two numbers.
2. WAP to swap two numbers without using third variable.
3. WAP to divide two input numbers (also check divide by 0 condition).
4. WAP to calculate temperature in Fahrenheit to Celsius using formula C= (F- 32)/1.8.
5. WAP to calculate Sum and Average of N numbers using sequence of statements.
6. WAP to convert integer arithmetic to a given number of day and month using switch case.
7. WAP to find maximum out of 3 numbers a, b &c using Control Statements (if, else, nested if, nested else).
8. WAP to find minimum out of 3 numbers a, b & c using Control Statements (if, else, nested if, else)
9. WAP to find whether entered number is palindrome or not.
10. WAP to check entered number is even or odd .
11. WAP to find whether entered year is leap year or not.
12. WAP to find factorial of positive integer using for loop.
13. WAP to input a number from 1 to 10 and print its table.
14. WAP to print all the number between 1 to 100 which are divisible by7 using the concept of loops.
15. WAP to generate Fibonacci series up to n using loops.

16. Write a program to calculate area of circle using function.
17. Write an iterative function to calculate factorial of given number.
18. Write a recursive function to calculate factorial of given number
19. WAP to find even & odd up to a given limit using the concept of array and loops.
20. WAP to reverse a string.
21. WAP to find addition of two matrix of n*n order using the concept of 2 dimensional array
22. WAP to find multiplication of two matrix of n*n order using the concept of 2 dimensional array.
23. WAP program to study the concept of structure.
24. WAP to implement the concept of switch and break statements.
25. WAP to implement the concept of continue statements.
26. WAP to create a data file, retrieve data from the file.

SEMESTER-III

Title of the course : **Operating System**

Subject Code : **CST-511**

Weekly load : 3 Hrs LTP 3-0-0

Credit : 3

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

CO1	Learn basic concepts of Operating System along with implementation of scheduling algorithms in process management
CO2	Analyze critical section problem in Inter process communication and use of memory management techniques
CO3	Implement page replacement algorithms and use virtual memory concepts
CO4	Know about file structure, file management and disk management
CO5	Learn the concept of deadlock and implement various algorithms used for its detection and recovery

CO/PO Mapping : (Strong(S)/Medium(M)/Weak(W) indicates strength of correlation):														
COs	Program Outcomes (PO's)/ Program Specific Outcomes (PSO's)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	1	3	2	0	0	2	2	2	2	2	2
CO2	3	2	2	2	2	2	0	0	2	3	3	2	3	3
CO3	3	3	2	2	0	3	0	0	3	2	2	2	3	2
CO4	3	2	2	2	2	2	0	0	3	3	2	2	2	2
CO5	3	2	1	2	0	2	0	0	3	2	2	2	3	3

Theory

Unit	Main Topics	Course outlines	Lecture(s)
Unit-1	1. Basic Concept of Operating System	Evolution of operating system, Operating System classifications, Fundamental of operating system functions, Multiprogramming, Multiprocessing, Time-sharing systems and real time systems. Software layers & virtual machine.	06
	2. Process Management	Process Overview, process states, multiprogramming, levels of scheduler and CPU scheduling algorithms, multiple-processor scheduling, Threads, Process Scheduling objects and techniques.	06
	3. Interprocess Communication	Concurrent processes - The Critical Section & Mutual Exclusion problem - Algorithms - Semaphores, Critical Region, Conditional Critical Region, Monitors, Messages - Examples in Contemporary OS - Classical Process Co-ordination Problems	06
	4. Memory Management	Memory Hierarchy, Static and Dynamic Memory Allocation, Overview of Swapping, Multiple Partitions Contiguous and Non-Contiguous Memory Allocation, Concepts of Paging, Segmentation.	06
Unit-2	5. Virtual Memory	Virtual Memory Concepts - Demand paging - Performance - Fragmentation & Compaction. Page replacement and Allocation algorithms -Memory Protection - System Calls – Linux/Windows Virtual Memory Techniques.	08

	6. File Management	File concepts, Access methods, Directory structure, File protection, File System structure, Allocation methods, Secondary storage management - Disk structure, Disk scheduling, Disk management, Swap-space management, Disk reliability.	08
	7. Deadlock	Introduction, Analysis of conditions, Prevention & avoidance, Detection & recovery.	08

Total=48

Recommended Books:

1. Silberschatz A & Galvin, Operating System Concepts, John Wiley & Sons
2. W. Stallings, Operating Systems: Internals and Design Principles, Pearson Pub.
3. Andrew S Tanenbaum, Operating Systems - Design and Implementation, PHI
4. Crawley, Operating Systems - An Object oriented Approach, McGraw Hill

Title of the course : **Digital Circuits and Logic Design**

Subject Code : **CST-512**

Weekly load : 3 Hrs LTP 3-0-0

Credit : 3

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

CO1	Perform conversions among different number systems, became familiar with basic logic gates and understand Boolean algebra.
CO2	Simplify Boolean functions by using basicBoolean properties &K-Map.
CO3	Design of combinational circuits such as MUX, DEMUX, Encoder, Decoder etc.
CO4	Understand the design of sequential Circuits such as Flip-Flops, Registers, and Counters.
CO5	Obtain a basic level of Digital Electronics knowledge and set the stage to perform the analysis and design of Complex Digital electronic Circuits.

	CO/PO Mapping : (Strong(3)/Medium(2)/Weak(1) indicates strength of correlation):													
COs	Program Outcomes (PO's)/ Program Specific Outcomes (PSO's)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	2	2	2	1	0	0	2	0	0	2	2	2
CO2	3	2	3	2	2	2	0	0	2	0	0	2	2	2
CO3	3	3	3	2	2	2	0	0	3	3	3	2	2	2
CO4	3	3	3	2	2	3	0	0	3	3	3	3	3	3
CO5	3	3	3	2	2	3	0	0	3	3	3	3	3	3

Theory

Unit	Main Topics	Course outlines	Lecture(s)
Unit-1	1. Introduction, Number Systems and codes	Introduction to the concept of Digital Electronics, Number systems, binary number system, octal number system, hexadecimal number system, signed and unsigned numbers, Arithmetic using Different Number Systems; Representation of Binary Number in Sign-Magnitude, Sign 1's & 2's Complement Notation; Rules for Addition and Subtraction with Complement.	07
	2. Introduction to various types of codes	BCD, EBCDIC, ASCII, Extended ASCII, Gray and other Codes.	05
	3. Boolean Function and its Minimization	Simplification of Boolean Function using Boolean theorems; Canonical and Standard Forms(SOP and POS) for Boolean Functions; Objectives of the Minimization Procedures; Karnaugh Map Method; Don't Care Conditions; Quine-Mccluskey Tabulation Method; Concept of Prime Implicates. Realization of Boolean Functions Using Only NAND and NOR Gates.	07
	4. Combinational Logic Circuits Using Discrete Logic Gates	Half & Full Adder; Half & Full Subtractor; Parity Generator and Checker; Code Converters; Carry look ahead generator; Binary Multiplier; Majority Circuits, Magnitude Comparator.	05
Unit-2	5. Combinational	Binary Parallel; BCD Adder; Encoder, Priority Encoder,	07

	Logic Using MSI Circuits	Decoder; Multiplexer and De-multiplexer Circuits; Implementation of Boolean Functions Using Decoder and Multiplexer; ALU; BCD to 7-Segment Decoder; Common Anode & Cathode 7-Segment Displays; PLA and PAL	
	6. Introduction to Flip-flop Circuits	Basic Concepts of Sequential Circuits; Cross Coupled SR Flip-Flop Using NAND or NOR Gates; D-Type and Toggle Flip-Flops JK Flip-Flop & race Condition; Clocked Flip-Flops; Truth Tables & Excitation Tables for Flip-Flops; Edge & Level Triggering; Master Slave Configuration; Edge triggered D flip-flop; Elimination of Switch Bounce Using Flip-Flops; Flip-Flops With Preset & Clear.	07
	7. Sequential Logic Circuit Design & Counters	Sequential circuit; state table and state diagram; Design procedure; Basic Concepts of Counters and Registers; Shift Left and Right Register; Registers With Parallel Load; SIPO and PISO	06
	8. Ripple (asynchronous) counters	Up Down and Mod-N ripple counters; Design of Synchronous Counter Using State Diagrams and Table; BCD Counters; Modulo-N Counter; Up Down Counter; Ring counter; Johnson Counter, Sequence Generators	04

Total=48

Recommended Books:

1. Morris Mano: “Digital Logic and Computer Design”, PHI.
2. Bartee Thomas: “Digital Computer Fundamentals”, McGraw-Hill.
3. Richard Sandige: “Modern Digital Design”, McGraw-Hill.
4. Taub and Schilling: “Digital Integrated Electronics”, McGraw-Hill.
5. Fletcher W.I.: “Engineering Approach to Digital Design”, PHI.
6. Malvino & Leech: “Digital Principles & Applications”, TMH.
7. J. F. Wakerly: “Digital design: principles and practice package”, Pearson Edu.

Title of the course : **Discrete Mathematics**

Subject Code : **CST- 513**

Weekly load : 3 Hrs LTP 3-0-0

Credit : 3

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

CO1	Understand sets, relations, functions and basic principles of counting and probability
CO2	Apply Propositional logic, Formulate and solve various graph problems
CO3	Understand the concept of Recurrence Relations and Recursive Algorithms and their Solutions by the method of generating functions and know about various Boolean algebra concepts
CO4	Understand the theoretical workings of Basic Probability and Probability Distribution
CO5	Demonstrate various real world scenarios using concepts of Basic Probability , sampling theory

CO/PO Mapping : (Strong(3)/Medium(2)/Weak(1) indicates strength of correlation):														
Cos	**Programme Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	3	3	3	2	0	0	2	0	2	3	2	2
CO2	3	2	3	2	3	2	0	0	2	0	2	3	2	2
CO3	3	3	3	3	3	2	0	0	2	0	2	3	3	2
CO4	3	3	2	2	2	2	0	0	2	0	2	3	3	2
CO5	3	3	2	2	2	2	0	0	2	0	2	3	2	2

Theory

Unit	**Main Topics**	**Course outlines**	**Lecture(s)**
Unit-1	1. Introduction to Sets and Propositions	Introduction, Combinations of sets, Finite and infinite sets, Mathematical induction, Principle of inclusion and exclusion, Multisets, Ordered sets, Propositions.	04
	2.Basic principles of counting	Counting Principles: Basics of counting, Pigeonhole Principle, Permutations, Combinations, Generation of permutations and combinations.	05
	3.Basic principles of probability	Discrete probability, Conditional probability, Information and mutual information.	03
	4.Relations and Functions	Introduction, A relational model for data bases, Properties of binary relations, Equivalence relations and partitions, Partial ordering relations and lattices, Definition & properties of Lattice, Sub lattice, Distributive & Boolean algebra, a job scheduling problem.	05
Unit-2	5. Mathematical logic	Propositions, logical operators & propositional algebra.	03
	6. Graphs and Planer graphs	Introduction, Basic terminology, Multigraphs and weighted graphs, Paths and Circuits, Shortest paths in weighted graphs, Eulerian paths and circuits.	04
	7. Recurrence	Introduction, Linear recurrence relations with	04

	Relations and Recursive Algorithms	constant coefficients, Homogeneous solutions, Particular solutions, Total solutions, Solutions by the method of generating functions, Recursive definitions, Recursive algorithms.	
	8. Groups, rings and Boolean algebra	Group rings and Boolean algebra: Binary operations, semi groups and monoids, integers, groups, subgroups, rings and fields, principle of duality, Boolean lattices.	04

Total=32

Recommended Books:

1. Rosen K.H., "Discrete Mathematics and Its Applications", 6/E, MGH.
2. Kolman B., Busby R.C. & Ross S., "Discrete Mathematical Structure", 5/E, PHI.
3. Tremblay J. P. & Manohar R., "Discrete Mathematical structure with applications to computer science", MGH.
4. Deo Narsingh., "Graph theory with applications to Engineering & Computer Science", PHI.
5. Liu C.L., "Elements of Discrete Mathematics", MGH.
6. Joshi , "Maths Foundation of Discrete Mathematics", Wiley Eastern

Title of the course : **Database Management System**

Subject Code : **CST-514**

Weekly load : 3 Hrs LTP 3-0-0

Credit : 3

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

CO1	Gain a good understanding of the architecture and functioning of database management systems as well as associated tools and techniques
CO2	Understand principles of data modelling using entity relationship to develop a good database design and normalization techniques to normalize a database
CO3	Understand and use structured query language to query, update, and manage a database
CO4	Evaluate and optimize queries
CO5	Understand transaction processing, backup and recovery techniques

CO/PO Mapping : (Strong(S)/Medium(M)/Weak(W) indicates strength of correlation):														
COs	Programme Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	2	2	0	0	2	2	2	3	3	2
CO2	3	2	2	2	2	2	0	0	2	2	2	2	2	2
CO3	2	2	3	2	2	2	0	0	2	2	2	2	3	2
CO4	2	3	2	3	2	2	0	0	2	2	2	2	2	3
CO5	3	2	2	2	3	3	0	0	3	3	3	2	3	3

Theory

Unit	Main Topics	Course outlines	Lecture(s)
Unit-1	1. Introduction:	Data, data processing requirement, desirable characteristics of an ideal data processing system, traditional file based system, its drawback, concept of data dependency, Def of database, database management system.	04
	2. Database concepts	3-schema architecture, database terminology, benefits of DBMS, Database development process - conceptual data modeling, logical database design, physical database design, database implementation, database maintenance.	06
	3. Database Analysis	Conceptual data modeling using E-R data model -entities, attributes, relationships, generalization, specialization, specifying constraints. 5 – 6 practical problems based on E-R data model.	06
	4. Database Design	Logical database design and relational data model: Introduction to relational database theory: *def* of relation, relational model operators, relational model integrity rules, Normalization- 1NF, 2NF, 3NF, 4NF, BCNF & practical problems based on these forms. Denormalization	08
Unit-2	5. Database Implementation	Introduction to SQL, DDL aspect of SQL, DML aspect of SQL – update, insert, delete & various form of SELECT-simple, using special operators, aggregate functions, group by clause, sub query, joins, co-related sub query, union clause.	08
	6. Query optimization	Introduction, Overview of optimization process, expression transformation, database statistics, A divide and conquer strategy.	06

	7. Transaction processing	Transaction concept, transaction state, Implementation of atomicity and durability, concurrent execution, Serializability, recoverability, Implementation of isolation, transaction definition in SQL.	04
	8. Overview of backup and recovery process	Failure classification, Storage structure, recovery and atomicity, log based recover , shadow paging, recovery with concurrent transaction, buffer management, failure with loss of non- volatile storage, advance recovery techniques.	06

Total=48

Recommended Books:

1. A Silberschatz, H. F. Korth, and S Sudarshan, Database System Concepts, TMH.
2. McFadden, F.Hoffer, M. B Modern database management, Prescott.
3. C.J Date, An Introduction to Database Systems, Addison, Wesley.
4. Raghu Ramakrishnan and Gehrke,Database Management System, McGraw-Hill.
5. Margaret.H.Dunham , Data Mining. Introductory and advanced topics, Pearson.

Title of the course : **Data Communication and Computer Networks**

Subject Code : **CST-515**

Weekly load : 3 Hrs LTP 3-0-0

Credit : 3

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

CO1	Understand basics of computer networks
CO2	Learn use of physical and datalink layer in networking
CO3	Understand the concept of MAC and Network layer
CO4	Learn various protocols used in transport and application layer
CO5	Understand OSI and TCP/IP models

CO/PO Mapping : (Strong(3)/Medium(2)/Weak(1) indicates strength of correlation):														
Cos	**Programme Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	2	0	0	1	0	0	0	0	0	0	2	1	1
CO2	2	2	0	0	2	0	0	0	0	2	0	2	2	2
CO3	2	3	2	2	2	2	0	0	2	2	0	2	2	2
CO4	2	2	3	2	2	2	0	0	2	2	0	2	2	2
CO5	2	2	2	2	2	2	0	0	2	2	0	0	3	2

Theory

Unit	**Main Topics**	**Course outlines**	**Lecture(s)**
Unit-1	1. Introduction & Basics of Computer Networks	Need & Evolution of Computer Networks, Data communication and its components, Description of LAN, MAN, WAN, OSI and TCP/IP models with description of Data Encapsulation & peer to peer communication, Comparison of OSI and TCP/IP. Introduction to wired network, optical Network and wireless network, Flow of communication: Half duplex, duplex and full duplex, Communication Links: point to point , multipoint, physical and logical topologies, protocols and standards.	06
	2. Physical Layer	Functions of physical layer-Bit representation and data rate: bandwidth, bit rate, baud rate, signals, low pass channels, band pass channels, digital versus analog bandwidth, transmission impairments and bit rate, need of encoding & modulation, Encoding techniques, Modulation techniques.	05
		Interfaces and media- Dispersion, Jitter, Latency and collision. Transmission Media –Guided media: Shielded twisted pair, Unshielded twisted pair, Coaxial cable, Optical Fiber cable, Unguided media: Propagation methods, electromagnetic spectrum, wireless transmission waves	04
	4. Data link Layer	Functions of data link layer, Framing, addressing, Error	07

		control: error detection and correction techniques-parity check, checksum, cyclic redundancy check, hamming code. Flow control: Simplex protocol, Sliding window protocols- Go Back by N and Selective Repeat	
Unit-2	5. Medium Access Sublayer and LAN architectures	Access control, Multiple Access protocols- ALOHA, CSMA, CSMA/CD CSMA/CA, Controlled access methods: Reservation, polling ,token passing, LAN architectures: Ethernet 802.3: traditional, fast & gigabit ethernet, Token Bus, Token Ring, LAN & WAN devices – Router, bridge, switch, HUB, Modem etc. Switching techniques.	06
	6. Network Layer	Functions of network layer, , Network layer addressing, , IP addressed classes. Subnetting : Sub network, Subnet mask. Dynamic address Configuration, Autonomous system, Routing Protocols-Interior routing protocols : RIP, IGRP, OSPF and EIGRP, Exterior routing protocols : BGP. Network-layer data gram, IP protocol.	10
	7. Transport Layer	Functions of transport layer, Client Server Model, port address, socket address, Protocols: TCP & UDP. Three-way handshakes open connection.	06
	8. Application Layer	Application layer design issue. Application layer Protocol: TELNET, FTP, HTTP, SMTP, WWW and recent development.	04

Total=48

Recommended Books:

1. Tanenbaum, Computer Network, Prentice Hall India
2. William Stalling, Data and Computer Communication, Prentice Hall
3. Douglas E. Comer, Internetworking with TCP/IP Volume – I, Prentice Hall India
4. W. Richard Stevens, TCP/IP Illustrated Volume-I, Pub. Addison Wesley
5. B. Forouzan, Data Communication And Networking, TMH

Title of the course : **Software Engineering**

Subject Code : **CST-516**

Weekly load : 3 Hrs LTP 3-0-0

Credit : 3

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

CO1	Gain understanding of software development life cycle
CO2	Prepare SRS document for a software project
CO3	Apply software design and development techniques
CO4	Apply estimation techniques for software development
CO5	Implement testing at each phase of SDLC

	CO/PO Mapping : (Strong(3)/Medium(2)/Weak(1) indicates strength of correlation):													
Cos	Program Outcomes (PO's)/ Program Specific Outcomes (PSO's)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	1	1	0	0	2	0	3	3	1	1
CO2	3	3	3	2	2	1	0	0	2	0	2	2	2	2
CO3	3	0	3	2	2	1	0	0	2	0	2	2	2	3
CO4	2	0	2	2	2	2	0	0	2	0	3	2	2	3
CO5	3	0	2	3	2	2	0	0	2	0	2	2	2	3

Theory

Unit	Main Topics	Course outlines	Lecture(s)
Unit-1	1. Evolving role of Software	Introduction to Software Engineering, importance of Software, The Software Evolution, Software Characteristics, Software Applications, Software Crisis: Problem and Causes.	05
	2.Software Development Life Cycle Models	Build and fix model, Waterfall model, Prototyping Model, RAD Model, Incremental Model, Spiral Model, Selection of a life cycle model	07
	3. S/W scope	resources, estimation, decomposition techniques, empirical estimation models. Project scheduling, refinement of major tasks, scheduling project plan,	06
	4. Software reliability	Software reliability models, Software quality, software quality ISO standards, Capability Maturity Model, The system engineering hierarchy information engineering, information strategy planning, requirement analysis, analysis principles,.	06
Unit-2	5. Software Testing	Software testing Fundamentals, Test Case design, White box testing, Basis path testing, Control structure testing, Black box testing.	08
	6. Post implementation review	Review plan. S/W maintenance and enhancement procedure. System security.	05
	7. Reverse Engineering	Scope, Levels of reverse engineering, tools, software re-engineering, documentation	05
	8.Control Measures	Threats & control measures, disaster/recovery planning, ethics in system development, ethics codes & standard of behavior.	06

Total=48

Recommended Books:

1. Roger S. Pressman, Software Engineering, A Practitioner's Approach, McGrawHill International Edition.
2. Ian Sommerville, Software Engineering, Addison-Wesley Publishing Company
3. James F. Peter, Software Engineering - An Engineering Approach, John Wiley
4. Pankaj Jalote, An integrated Approach to Software Engineering, Narosa.

Title of the course : **Operating System**

Subject Code : **CSP-511**

Weekly load : 2 Hrs LTP 0-0-2

Credit : 1

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

CO1	Implement CPU scheduling algorithms
CO2	Implement Page replacement algorithms
CO3	Implement Deadlock handling algorithms
CO4	Implement various memory management techniques
CO5	Implement various file allocation strategies

CO/PO Mapping : (Strong(S)/Medium(M)/Weak(W) indicates strength of correlation):														
Cos	Program Outcomes (PO's)/ Program Specific Outcomes (PSO's)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	3	2	2	0	0	2	2	2	2	3	3
CO2	3	2	2	2	2	2	0	0	2	2	3	2	3	2
CO3	3	2	2	2	1	2	0	0	3	3	2	2	3	2
CO4	3	3	2	2	2	2	0	0	3	2	2	3	3	2
CO5	3	3	2	2	2	2	0	0	2	3	2	2	3	2

LIST OF PRACTICALS

1. WAP to implement following CPU scheduling algorithms:
    - FCFS
    - SJF
    - Priority
    - Round Robin
2. WAP to implement MVT and MFT.
3. WAP to implement Bankers algorithm for deadlock avoidance.
4. WAP to implement Bankers algorithm for deadlock prevention.
5. WAP to implement following page replacement algorithms:
    - FIFO
    - LRU
6. WAP to implement paging technique of memory management.

Title of the course : **Digital Circuit & Logic Design**

Subject Code : **CSP-512**

Weekly load : 2 Hrs LTP 0-0-2

Credit : 1

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

CO1	Implement the various logic gates such as AND, OR, NOT, NAND, NOR, XOR
CO2	Simplify the given expression and realize it using basic gates and universal gates.
CO3	Design and implement the various combinational such as adder and subtractorusing logic gates
CO4	Design and implement the multiplexer and demultiplexer circuits using NAND gates
CO5	Design and implement the various sequential circuits such as flip-flops using logic gates.

	CO/PO Mapping : (Strong(3)/Medium(2)/Weak(1) indicates strength of correlation):													
Cos	Program Outcomes (PO's)/ Program Specific Outcomes (PSO's)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	2	2	2	0	0	2	2	2	2	2	2
CO2	3	2	2	2	2	2	0	0	2	2	2	2	2	2
CO3	3	2	2	1	2	2	0	0	3	2	2	3	3	2
CO4	3	3	3	2	2	2	0	0	3	3	3	3	3	3
CO5	3	3	3	2	2	2	0	0	3	3	3	3	3	3

LIST OF PRACTICALS

1. Study of Logic gates- AND,OR,NOT,NAND,NOR,XOR on different inputs.
2. To simplify the given expression and to realize it using Basic gates and Universal gates.
3. Design and realization of Half adder/Substractor using NAND gates.
4. Design and realization of Full adder using Logic gates.
5. Realization of R-S Flip-flop.
6. Realization of J-K Flip-flop.
7. To design and set up the following circuit
    a. 4:1 Multiplexer (MUX) using only NAND gates.
    b. 1:4 Demultiplexer(DE-MUX) using only NAND gates.

Title of the course : **Database Management System**

Subject Code : **CSP-514**

Weekly load : 2 Hrs LTP 0-0-2

Credit : 1

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

CO1	Understand, analyze and apply common SQL statements including DDL, DML and DCL statements to perform different operations.
CO2	Apply various constraints on database tables using different keys.
CO3	Implement relational algebra and relational calculus query.
CO4	Develop programs using PL/SQL.
CO5	Create views, forms and reports.

CO/PO Mapping : (Strong(S)/Medium(M)/Weak(W) indicates strength of correlation):

Cos	Program Outcomes (PO's)/ Program Specific Outcomes (PSO's)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	3	2	3	0	0	2	2	2	2	3	3
CO2	3	2	3	3	3	3	0	0	3	3	2	3	3	3
CO3	2	2	3	3	2	3	0	0	3	2	2	2	2	2
CO4	3	3	2	2	2	2	0	0	2	2	1	2	2	2
CO5	2	2	2	3	3	3	0	0	3	3	2	2	2	2

LIST OF PRACTICALS

1. Introduction to various constraints such as Primary key, secondary key, Super key, etc.
2. To implement Data Definition Commands (create, drop).
3. To implement Data Manipulation Commands (insert, delete, update, select)
4. To implement Data Control Commands (Commit, revoke, rollback, connect, execute)
5. Create Table, SQL for Insertion, Deletion, Update and Retrieval using aggregating functions.
6. Write Programs in PL/SQL, Understanding the concept of Cursors.
7. Write Program for Join, Union & intersection etc.
8. Creating Views, Writing Assertions, and Triggers.
9. Creating Forms, Reports etc.
10. WAP in PL/SQL for adding two numbers.
11. WAP in PL/SQL for reversing the number. For example the number is 12345 and reverse number will be 54321)
12. WAP in PL/SQL to find the number is even or odd.
13. WAP in PL/SQL to count numbers from 1 to 100.
14. WAP to test MAX, MIN, GROUP BY and ORDER BY commands.

Title of the course : **Data Communication & Computer Networks**

Subject Code : **CSP-515**

Weekly load : 2 Hrs LTP 0-0-2

Credit : 1

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

CO1	Understand the concept of different network and its components
CO2	Configure cable connection and testing using various commands
CO3	Implement ALOHA protocol
CO4	Implement the connection between different nodes by using different topologies
CO5	Understand how to share resources on the network.

CO/PO Mapping : (Strong(S)/Medium(M)/Weak(W) indicates strength of correlation):

Cos	Programme Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02
CO1	2	2	2	2	1	2	0	0	2	3	2	2	3	2
CO2	2	2	2	2	2	2	0	0	2	3	2	2	2	2
CO3	2	2	3	2	2	2	0	0	2	3	2	2	2	2
CO4	2	3	3	3	2	3	0	0	2	3	2	2	2	2
CO5	3	2	3	2	2	1	0	2	2	3	2	2	3	2

LIST OF PRACTICALS

1. Introduction to LAN with its cables, connectors and topologies.
2. To connect two personnel computer with straight thru and cross over twisted pair.
3. Introduction to motherboard and installation of LAN card.
4. Case study of Ethernet (10 base 5,10 base 2,10 base T).
5. Create a simple network with two PCs using a hub.
    a. Identify the proper cable to connect the PCs to the hub
    b. Configure workstation IP address information.
    c. Test connectivity using the Ping command
    d. Installation and working of Telnet.
6. Implement the ALOHA protocol for packet communication between a number of nodes connected to a common bus.
7. Implement the ALOHA protocol for packet communication between a number of nodes connected to a star topologies.

SEMESTER-IV

Subject Name : Web Technologies

Subject Code : **CST-521**

Weekly load : 3 Hrs LTP 3-0-0

Credit : 3

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

CO1	Understanding of Web fundamentals and its working around the world
CO2	Understanding and Web Development skills using different flavours of HTML along with CSS technology and interactive validations of different elements using JavaScript/ vbscript
CO3	Understanding E-commerce market and being aware of prime security issues while developing applications
CO4	Understanding the programming skills using java as Internet programming tool, developing client-server applications, Swings & Events Exception Handling, Servletand JDBC applications
CO5	The Practicability of all above contents is covered in Lab-Sessions

	CO/PO Mapping : (Strong(3)/Medium(2)/Weak(1) indicates strength of correlation):													
COs	Program Outcomes (PO's)/ Program Specific Outcomes (PSO's)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	2	2	2	0	0	1	2	2	2	3	2
CO2	2	3	3	2	3	2	0	0	3	3	3	2	3	2
CO3	2	1	1	2	2	2	0	0	3	2	2	2	3	3
CO4	3	3	3	2	3	2	0	0	3	2	2	2	3	3
CO5	3	3	3	3	3	2	0	0	3	3	3	2	3	3

Theory

Unit	Main Topics	Course outlines	Lecture(s)
Unit-1	1. Introduction	Understanding Web fundamentals, URL, ISP, W3C – Architecture, Evolution, Website Designing strategies, major issues in Web Development, Web Browsers, Web-Servers, Search Engines.	08
	2. E-Commerce	Definition, Types of E-commerce, merits & demerits, Problems and issues related to Internet based E-commerce, M-Commerce, E-commerce laws & forms of agreements, E-governance & role of government.	08
	3. HTML5 & CSS3	Features of HTML5, Revisiting basic tags in HTML5, New markup elements of HTML5, New Forms, Tables, Images, List & Links, Audio & Video attibutes of HTML5, Introduction to VB Script – variables, arrays, looping & conditional statements, printing text using Vbscript. Enhancing web page features using CSS3, Advanced Java script.	08
Unit-2	4. Security	E-commerce & security, Web security schemes, Cryptography, VPN, Firewalls, IDS.	08
	5. Advanced JAVA	Core Java and advanced Java-AWT GUI components, Swings & Events Exception Handling JDBC.	08

	6. Server-side Programming	Introduction to XML, XML-DTD, JSP, Servlet technology, J2EE & RMI.	08

Total=48

Recommended Books:

1. Uttam K. Roy, Web technologies; Oxford.
2. Zak Ruvalcaba & Anne Boehm, Murach's HTML5 and CSS3; SPD.
3. Firuza Aibara, HTML5 for beginners; SPD.
4. Jim Farley and William Crawford, Java Enterprise in a nutshell; SPD-O'reilly.
5. Michael Morrison, Head First Java Script; SPD-O'reilly.

Title of the course : **Computer Organization**

Subject Code : **CST-522**

Weekly load : 3 Hrs LTP 3-0-0

Credit : 3

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

CO1	Understand the evolution and trends of Computer Architecture and Organization
CO2	Understand the micro-operations executed in the system and thereby construction of ALU
CO3	Understand the instruction format, classification and execution in the system
CO4	Understand the organization of CPU and Control Unit
CO5	Understand the memory structure and organization

CO/PO Mapping : (Strong(3)/Medium(2)/Weak(1) indicates strength of correlation):														
Cos	Programme Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	0	0	1	1	0	0	0	0	0	0	2	1	1
CO2	2	0	0	2	2	1	0	0	0	0	0	2	2	2
CO3	1	0	0	2	2	2	0	0	0	0	0	2	2	1
CO4	3	0	0	2	3	2	0	0	0	0	0	2	2	2
CO5	2	0	0	2	2	2	0	0	0	0	0	2	2	2

Theory

Unit	Main Topics	Course outlines	Hour(s)
Unit-1	1. Introduction	Computer architecture, organization and designing. Historical architectural trends, Data representation (fixed point and floating point)	06
	2. Register Transfer Language and Micro-Operations	Register transfer language, Register transfer language, Bus & memory transfer, Arithmetic, logic and shift micro-operations, constructing an arithmetic logic shift unit.	06
	3. Basic Computer Architecture and Design	Computer registers, Instructions, Instruction codes, Instruction formats, Instruction classifications, Memory reference instruction, Register reference instruction, Input/Output & Interrupts Instruction set completeness, Instruction Execution cycle, Interrupts, interrupt cycle, Timing & control, complete computer description & design of basic computer	07
	4. Central Processing Unit	General Register Organization. Stack Organized CPU. Addressing Modes. Data Transfer and Manipulation. RISC Vs CISC. Introduction to Parallel and pipeline Processing	05
Unit-2	5. Control Organization	Hardwired and micro-programmed control organization. Horizontal and Vertical Microprogramming.	06
	6. Input Output Organization	I/O interfacing, Asynchronous data transfer, Modes of transfer, Priority interrupt, Input Output processor	06

	7. Memory Organization	Memory Systems: principle of locality, principles of memory hierarchy Caches, associative memory, main memory, Virtual memory, Paging and Segmentation	06
	8. Case Studies	Case studies of the contemporary architecture for processors of families like Intel and AMD	06

Total=48

Recommended Books:

1. Hamacher, Vranesic “Computer Organization”, McGraw Hill.
2. Stalling , “Computer Organization, TMH.
3. John. P. Hays, “Computer Architecture and Organization, McGraw Hill.
4. Carpirdli, “Computer Architecture & Organization, Pearson Education Asia
5. M. Mano, “Computer Architecture & Organization”, PHI

Title of the course : **Data Structures and Algorithms**

Subject Code : **CST-523**

Weekly load : 4 Hrs LTP 3-1-0

Credit : 4

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

CO1	Introduce various techniques for representation of the data in the real world
CO2	To design and implement various data structure algorithms
CO3	Familiar with the utilization of the data structures in problem solving
CO4	Learn how to analyse the time and space requirements of a given algorithm
CO5	To develop application using various data structure algorithms.

	CO/PO Mapping : (Strong(3)/Medium(2)/Weak(1) indicates strength of correlation):													
COs	Program Outcomes (PO's)/ Program Specific Outcomes (PSO's)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	2	0	0	0	2	0	0	0	1	0
CO2	3	3	3	3	3	2	0	0	3	3	3	2	3	2
CO3	3	3	3	3	3	2	0	0	3	3	3	3	3	3
CO4	3	3	3	3	3	2	0	0	3	3	2	2	3	3
CO5	3	3	3	3	3	3	0	0	3	3	2	3	3	3

Theory

Unit	Main Topics	Course Outlines	Lecture(s)
Unit-1	1. Introduction	Basic concepts and notations; Data structures and data structure operations; Mathematical notation and functions; Algorithmic complexity and time-space trade off.	04
	2. Recursion	Recursion; Types of recursion; Examples of recursion – the exponential power of a number, Fibonacci numbers, the greatest common divisor, towers of Hanoi.	06
	3. Arrays	Introduction; One-dimensional array – storage, traversing, insertion, deletion, searching; Multidimensional arrays – two-dimensional arrays, general multidimensional arrays; String processing and manipulation.	07
	4. Linked List	Introduction; Basic concepts of linked list – memory representation, building a linked list, traversing, insertion, deletion, searching; Doubly linked list; Merging two lists; Header linked list; Circular linked list.	07
Unit-2	5. Stacks & Queues	Stack, Representation of stack, Implementation of stack; Polish notation; Queues; Implementation of queues; Circular queues; Double ended queues; Priority queues.	06
	6. Trees	Binary trees; Complete binary trees; Extended binary tree; Representation of binary tree; Insertion and deletion from the binary tree; Tree traversals using in-order, pre-order and post-orders; Applications of binary tree; search tree; Heap tree, Balanced binary tree; B-trees.	08

	7. Graphs	Basic concepts & definitions; Representation of graph – Adjacency list, Adjacency matrix; Path matrix, Graph traversal – BFS, DFS; Shortest path algorithms.	05
Unit	**Main Topics**	**Course Outlines**	**Lecture(s)**
Unit-2	8. Sorting & Searching	Linear search; Binary search; Bubble sort; Insertion sort; Quick sort; Selection sort; Merge sort; Heap sort; Selection sort, Hashing Techniques.	05

Total=48

Recommended Books:

1. Lipschutz, Schaum Series, Data Structures , TMH.
2. A. M. Tanenbaum, Data Structures using C and C++, Pearson Education.
3. Trembley Sorenson, Introduction to Data Structures with Applications, TMH.

Title of the course : **System Software**

Subject Code : **CST-524**

Weekly load : 4 Hrs LTP 3-1-0

Credit : 4

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

CO1	Understanding different machine architecture
CO2	Phases of assemblers, Compilers and their features
CO3	Understanding the issues related to macro processor design and its implementation
CO4	Understanding the concepts of different loaders and linkers
CO5	Understand about computer hardware and the installation procedure of system software and application software.

CO/PO Mapping : (Strong(3)/Medium(2)/Weak(1) indicates strength of correlation):														
Cos	Programme Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	0	2	0	2	0	0	0	2	0	0	2	2	1
CO2	2	0	0	0	3	0	0	0	2	0	0	2	2	2
CO3	2	0	0	0	3	0	0	0	2	0	0	2	2	1
CO4	2	0	0	0	3	0	0	0	2	0	0	2	2	2
CO5	2	0	0	0	3	0	0	0	2	0	0	2	2	2

Theory

Unit	Main Topics	Course outlines	Lecture(s)
Unit-1	1. Introduction	Definition and Role of System Software, Examples of System Software, Evolutions of System Software, System Software and Machine Architecture, Some common architecture – SIC, CISC and RISC Machines.	08
	2. Assembler	Introduction, Basic Assembler features, Single passes Assembler, Two Pass Assembler, Design of Operation code table, Symbol table, Literal table.	08
	3. Macro Processor	Introduction of Macros, Macro processor design, Forward reference, Backward reference, positional parameters, keyword parameters, conditional assembly, Macro calls within Macros.	04
	4. Implementation of Macro Processor	Implementation of macros within Assembler. Designing Macro name table, Macro Definition table, Kew word parameter table, Actual parameter table, Expansion time variable storage	04
Unit-2	5. Compile Structure	Analysis-synthesis model of compilation, various phases of a compiler, tool based approach to compiler construction.	08
	6. Loaders	Absolute loader, Relocation - Relocating loader, Dynamic loader, Bootstrap loader, Linking-loader, Program relocatablity, Design of Absolute Loader,	04
	7. Linkers	Design of direct-linking loader, other Loader scheme e.g. (Binders, Linking Loaders, Overlays, Dynamic Binders)	04

	8. Other common System Software's	Introduction and brief discussion on Editors: Types and Structure; Operating System: Definition and types e.g. single, multi -Tasking, multi – user (referring to MS-DOS, LINUX and UNIX); Device Drivers: Definition, role and types;	08

Total=48

Recommended Books:

1. Donovan, J.J., System programming, McGraw-Hill.
2. Dhamdhere, System Programming, TMH.

Title of the course : **Automata and Formal Languages**

Subject Code : **CST-525**

Weekly load : 3 Hrs LTP 3-0-0

Credit : 3

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

CO1	Understand basic properties of deterministic and nondeterministic finite automata
CO2	Understand the relation between types of languages and types of finite automata
CO3	Design grammars and recognizers for different formal languages
CO4	Prove or disprove theorems in automata theory using its properties
CO5	Determine the decidability and intractability of computational problems

CO/PO Mapping : (Strong(3)/Medium(2)/Weak(1) indicates strength of correlation):														
Cos	Programme Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	3	2	1	2	0	0	2	2	2	2	2	2
CO2	2	3	3	2	1	2	0	0	2	2	2	3	3	2
CO3	2	3	3	2	2	3	0	0	3	2	2	3	3	2
CO4	2	3	3	3	3	2	0	0	2	2	2	3	3	3
CO5	2	3	3	3	3	3	0	0	2	2	2	3	2	3

Theory

Unit	Main Topics	Course outlines	Lecture(s)
Unit-1	1. Finite Automata	Finite state systems, Deterministic, non deterministic finite automata, equivalence of deterministic and non-deterministic finite automata, Finite automates with & without Ɛ-moves, 2 way finite automata with output, equivalence of Mealy and Moore machines.	08
	2. Regular Languages	Identification of Regular expressions, Finite Automata and Regular expression	04
	3. Properties of Regular Sets:	The pumping lemma for regular sets, closure properties of regular sets, decision algorithms of regular sets, The Myhill-Nerode Theorem & minimization of finite Automata.	05
	4. Context free grammars	Introduction to context free grammars, derivation trees, top-down & bottom up parsing methods, ambiguous context free grammars, Chomsky and Greibach normal forms.	05
Unit-2	5. Pushdown Automata:	Deterministic and Non-deterministic pushdown automata, Equivalence of context free languages and sets accepted by pushdown automata, Deterministic context free languages.	04
	6. Properties of Context free Languages	The pumping Lemma for context free languages, closure properties of context free languages, decision algorithms for context free languages, Coke-Kasmi-Young algorithm.	06

	7. Turning Machines:	Introduction to Turing Machines, Deterministic, non-deterministic, two way infinite tape, multi tape, Constructions of Turing Machines for n!, n*n.	08
	8. Turning Machines	Post Correspondence problem, Unsolvability of the halting problems.	08

Total=48

Recommended Books:

1. Daniel A. Cohen, Introduction to Computer Theory, John Wiley and Sons (1996)
2. Hopcroft John E., Ullman Jeffrey D. and Motwani R., Introduction to Automata Theory, Languages and Computation, Pearson Education (2006).
3. Michael Sipser, Introduction to the Theory of Computation, Thomson (2007).
4. Lewis Harry R., Elements of Theory of Computation, PHI (1997).
5. K.L.P. Mishra, N. Chandrasekaran, "Theory of Computer Science: Automata.

Title of the course : **Web Technologies**

Subject Code : **CSP-521**

Weekly load : 4 Hrs LTP 0-0-4

Credit : 2

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

CO1	Understand the various web services, protocols and basics of internet
CO2	Design and develop websites
CO3	Develop web applications using the latest front end technologies; HTML5, CSS3, & JavaScript
CO4	Understand the concept of database connectivity and client server architecture
CO5	Implement dynamic functionality in web pages

CO/PO Mapping : (Strong(3)/Medium(2)/Weak(1) indicates strength of correlation):														
Cos	Programme Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	2	2	2	2	0	0	2	2	2	2	3	2
CO2	2	2	2	2	3	2	0	0	3	3	3	3	3	3
CO3	2	2	2	2	3	1	0	0	3	2	2	3	2	3
CO4	2	0	1	0	1	1	0	0	2	1	1	2	3	3
CO5	2	1	2	2	3	2	0	0	3	2	2	3	2	3

LIST OF PRACTICALS

1. Introduction to various protocols used in internet technology and protocols associated with e-mail service.
2. Introduction to various types of domains, URLs & URL classes.
3. Comparative analysis IPv4 & IPv6.
4. Study & Analysis of E-commerce models, M-commerce along with merits & demerits.
5. Design a VPN using different platforms.
6. Design a HTML page using CSS3 features.
7. Design a HTML5 page using CSS3 features to enhance Table properties.
8. Design a HTML5 page using CSS3 features to enhance Forms properties.
9. Create a HTML page using java script to perform validation checks at different text boxes.
10. Create a HTML page using VB script to perform various controls/checks at different components and printing.
11. Design a web page to use google web fonts.

12. Design a web page using JDBC components and FORM elements.
13. How to use Query – a case study.
14. Design a client-server program using servlets.
15. Design a web page to provide instant sharing option for all major social network websites.

Title of the course : **Data Structures and Algorithms**

Subject Code : **CSP-523**

Weekly load : 2 Hrs LTP 0-0-2

Credit : 1

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

CO1	To impart the basic concepts of data structures and algorithms
CO2	Design, implement, test, and debug programs using a variety of data structures including linked lists, stacks, queues, binary search trees, heaps and graphs
CO3	Familiar with the utilization of the data structures in problem solving
CO4	Implement and know when to apply standard algorithms for searching and sorting
CO5	Learn to choose the appropriate data structure and algorithm design method for a specified application

	CO/PO Mapping : (Strong(3)/Medium(2)/Weak(1) indicates strength of correlation):													
COs	Program Outcomes (PO's)/ Program Specific Outcomes (PSO's)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	1	0	0	0	1	0	0	2	2	2
CO2	3	3	3	2	3	2	0	0	3	3	3	2	3	3
CO3	3	3	3	2	3	2	0	0	2	2	3	2	3	3
CO4	3	3	3	3	3	3	0	0	3	2	2	3	3	2
CO5	3	3	3	3	3	3	0	0	3	3	3	3	3	3

LIST OF PRACTICALS

1) WAP to generate Fibonacci Series using recursion.
2) Write a function that interchanges the first element with last element, second element with second last element and so on.
3) WAP to multiply two Matrices.
4) Write a Function that removes all duplicate elements from an Array.
5) WAP that insert an element in beginning of Linear Link List.
6) WAP that delete an element from the beginning of the Linear Link List.
7) WAP that delete an element from the end of the Linear Link List.
8) WAP that delete an element after a given element of the given Linear Link List.
9) WAP that reverse the element of the Linear Link List.
10) WAP that concatenate two Linear Linked List.
11) WAP to remove the Top element of Stack.
12) WAP to insert (or push) an element at the Top of Stack.
13) WAP to insert an element at the end of queue.
14) WAP to remove the first element of the queue.
15) WAP to illustrate the implementation of Binary Search Tree.
16) WAP to sort an array of integer in Ascending Order using Bubble Sort.
17) WAP to sort an array of integer in Ascending Order using Insertion Sort.
18) WAP to sort an array of integer in Ascending Order using Quick Sort.

19) WAP to search an element using Linear Search Method.
20) WAP to search an element using Binary Search Method.

Title of the course : **System Software**

Subject Code : **CSP-524**

Weekly load : 2 Hrs LTP 0-0-2

Credit : 1

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

CO1	Understand the architecture of various machines
CO2	Implement of Single Pass and Two Pass Assembler
CO3	Implement of Absolute Loader and Text Editor
CO4	Understanding the concepts of different loaders and linkers
CO5	Understand about computer hardware and the installation procedure of system software and application software.

CO/PO Mapping : (Strong(3)/Medium(2)/Weak(1) indicates strength of correlation):														
Cos	Programme Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	0	2	0	2	0	0	0	2	0	0	2	2	1
CO2	2	0	0	0	3	0	0	0	2	0	0	2	2	2
CO3	2	0	0	0	3	0	0	0	2	0	0	2	2	1
CO4	2	0	0	0	3	0	0	0	2	0	0	2	2	2
CO5	2	0	0	0	3	0	0	0	2	0	0	2	2	2

LIST OF PRACTICALS

1. Study of general machine architecture and different machine architectures available.
2. Implementation of Assembly language programs using microprocessor kit.
3. Implementation of a Symbol table with functions to create, insert, modify, search and display in C language.
4. Implementation of a single pass assembler in C language.
5. Implementation of pass one of a two pass assembler in C language
6. Implementation of pass two of a two pass assembler in C language.
7. Implementation of an Absolute loader in C language.
8. Implementation of simple text editor with features like insertion/deletion of a character word and sentence in C language.

SEMESTER-V

Title of the course : **Algorithm Analysis and Design**

Subject Code : **CST-611**

Weekly load : 4 Hrs LTP 3-1-0

Credit : 4

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

CO1	Understand about algorithm complexities
CO2	Have an understanding of elementary and advanced data structures
CO3	Acquire knowledge about various advanced design and analysis techniques such as divide-and-conquer, greedy algorithms, dynamic programming, branch-and-bound
CO4	Know the concept of tractable and intractable problems and the P, NP, NP-complete problems
CO5	Utilize data structures and/or algorithmic design techniques for developing efficient computer algorithm for solving real-world problems

CO/PO Mapping : (Strong(3)/Medium(2)/Weak(1) indicates strength of correlation):														
Cos	Program Outcomes (PO's)/ Program Specific Outcomes (PSO's)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	3	2	2	0	0	2	0	2	2	2	2
CO2	3	3	3	2	2	2	0	0	2	0	2	2	2	2
CO3	3	2	2	2	3	2	0	0	3	3	3	3	3	2
CO4	3	3	3	3	3	3	0	0	3	2	3	3	2	2
CO5	3	3	3	2	3	2	0	0	3	3	3	3	3	3

Theory

Unit	Main Topics	Course outlines	Lecture(s)
Unit-1	1. Introduction	Algorithm definition, algorithm analysis, designing algorithms, growth of function, time and space complexities	04
	2. Recurrences and sorting	Substitution method, iteration method, recursion tree method master method, sorting, heap sort, quick sort, selection sort, radix sort, insertion sort	04
	3.Elementary data structures	Stacks, Queues, Heaps trees and graphs, Height balanced trees: Red Black trees, AVL trees.	04
	4. Advanced Data structures	B-trees, Binomial Heaps, Fibonacci Heaps	02
Unit-2	5. Advanced design techniques	Basics of dynamic programming, All pair shortest path and 0/1 knapsack problem using DP, greedy method, minimum spanning tree and knapsack problem using greedy	05
	6. Dynamic Programming	Divide and conquer, Branch and Bound, travelling salesperson problem using branch and bound and other applications of branch and bound	04
	7. Graph algorithms	Basics definition of graphs and basic algorithms, minimum spanning trees, single source and all pair shortest path problem. Min cut Maxflow problem, ford-fulkerson algorithm, string matching algorithm	06
	8. Problem clauses	P, NP, NP-hard and NP-complete, deterministic and non-deterministic polynomial time algorithm	03

Total=32

Recommended Books:

1. E.Horowitz & S.Sahani, Fundamentals of Computer Algorithms. Galgotia Publications.
2. Aho, Hopcroft,Ullman, the design and analysis of computer algorithms,
3. Cormen, Leiserson , Rivest , Stein:" Introduction to Algorithms", the MIT Press.
4. Knuth, Donald E., "The Art of Computer Programming, Vol I &III", Pearson Education.
5. Sara Baase, Allen van Gelder , "Computer Algorithms" , 3/E, Pearson Education.
6. Sartaj Sahni, "Data Structures, Algorithms and Applications in C++", Universities Press/Orient Longman.
7. J. Kleinberg, E. Tardos: "Algorithm Design", 1/E, Pearson Education.

Title of the course : **Artificial Intelligence**

Subject Code : **CST-612**

Weekly load : 3 Hrs LTP 3-0-0

Credit : 3

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

CO1	Solve a problem as a state space problem.
CO2	Apply suitable search technique for a random search problem.
CO3	Understand probabilistic reasoning.
CO4	Understand optimization and inference algorithms for model learning
CO5	Design and develop programs for an agent to learn and act in a structured environment.

CO/PO Mapping : (Strong(3)/Medium(2)/Weak(1) indicates strength of correlation):														
Cos	Program Outcomes (PO's)/ Program Specific Outcomes (PSO's)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	2	2	1	0	0	0	0	0	2	2	1
CO2	2	3	2	3	2	2	0	0	0	2	2	2	3	2
CO3	2	2	2	3	3	3	0	0	2	2	2	3	3	2
CO4	2	2	2	3	3	3	0	0	2	3	3	3	3	2
CO5	2	2	2	2	3	2	0	0	2	2	2	2	2	3

Theory

Unit	Main Topics	Course outlines	Lecture(s)
Unit-1	1 Introduction	Introduction, Importance of AI and Applications of AI. Expert Systems, Pattern recognition, Natural Language Processing Evolutionary algorithm, Fuzzy logic, Neural Networks.	08
	2. Problem Solving Techniques	Problem state spaces, problem characteristics, production system, Search space control: Uninformed search- Depth first search, Breadth first search, Depth first search with iterative deepening, Heuristic search – Simple Hill Climbing, Steepest ascent Hill Climbing, A* algorithm, AO* algorithm, Minimax search procedure for game playing, Alpha beta cut-offs.	08
	3. Knowledge Representation	Propositional and predicate logic, resolution in predicate logic, question answering, theorem proving. Semantic networks, Frames and scripts, conceptual graphs, conceptual dependencies.	08
Unit-2	4. Knowledge Acquisition	Types of learning, General learning models, learning Automata, Intelligent Editors, Learning by Induction.	06
	5. Motion and Gaming	Topics in Motion planning, Algorithms and Complexity results for collision avoidance - the configuration space approach, Weak slot & strong slot (Filter Structure). Game Playing, Planning, Understanding – learning, common sense & Natural language processing	06
	6. Parallel and Distributed AI	Parallel & distribution AI, Connectionist models, Expert systems, perception & Action	06

	7. Languages for AI Problem Solving:	Introduction to Prolog- syntax and data structures, representing objects and relationships, built in predicates. Introduction to LISP- basic and intermediate LISP programming	06

Total=48

Recommended Books:

1. Andrew C., Staugaard Jr., "An Introduction to Applied Machine Intelligence", Prentice Hall
2. K. Boyer, L. Stark, H. Bunke, "Applications of AI, Machine Vision and Robotics" World Scientific Pub Co.
3. S. Russell and P. Norvig, "Artificial Intelligence: A Modern Approach", Prentice Hall.
4. I. Bratko, "Prolog Programming for Artificial Intelligence", Addison-Wesley.
5. Rich E., "Artificial Intelligence", Tata McGraw Hills
6. George F. Luger, "Artificial Intelligence: Structures and Strategies for Complex Problem Solving", Pearson Education Asia.

Title of the course : **Software Reliability & Testing**

Subject Code : **CST-613**

Weekly load : 3 Hrs LTP 3-0-0

Credit : 3

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

CO1	Understand the concept of reliability and access the difference between H/W & S/W reliability and evaluate different S/W engineering technologies
CO2	Understand and anticipate the possible causes of failure and knowledge of how to prevent them and know about various parameter determination methods
CO3	Analyze and test a S/W system, when it is evolved to accommodate a set of change requirements such as adding new functionalities, bug fixing etc
CO4	How to test software appropriately and effectively and have hands-on experience with test generation and test automation.
CO5	Design reliability models for software systems.

CO/PO Mapping: (Strong(3)/Medium(2)/Weak(1) indicates strength of correlation):														
Cos	Program Outcomes (PO's)/ Program Specific Outcomes (PSO's)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	1	1	0	0	2	0	3	3	1	1
CO2	3	3	3	2	2	1	0	0	2	0	2	2	2	2
CO3	3	0	3	2	2	1	0	0	2	0	2	2	2	3
CO4	2	0	2	2	2	2	0	0	2	0	3	2	2	3
CO5	3	0	2	3	2	2	0	0	2	0	2	2	2	3

Theory

Unit	Main Topics	Course outlines	Lecture(s)
Unit-1	1. Introduction	Software Reliability & Hardware Reliability, Basic Concepts, Availability, Modeling.	08
	2. Selected Models	Execution Time Component, Calendar Time Component, Model Choice.	08
	3. Applications:	System Engineering, Project Management, Management of Operational Phase, Evaluation of S/W Engineering Technologies.	08
Unit-2	4. System Definition	Failure definition, System Configuration, Text Run Selection.	08
	5. Parameter Determination	Execution Time Component, Calendar Time Component.	08
	6. Project Specific Techniques	Unobserved Failures, Failure Time Measurement, Evolving Programs, Changes in Environment, Other Consideration.	08

Total=48

Recommended Books:

1. Pressman, Software Engineering concepts, TMH.

Title of the course : **Microprocessor and Applications**

Subject Code : **CST-614**

Weekly load : 3 Hrs LTP 3-0-0

Credit : 3

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

CO1	Learn about the concept of microprocessor, microcontrollers and their applications in real World
CO2	Get acquainted to 8-bit microprocessor, its internal architecture and bus
CO3	Study the 8085 instructions set and use it to solve programming problems
CO4	Study the concept of interrupts in microprocessors
CO5	Gain a perspective of microprocessor interfacing with peripheral devices

CO/PO Mapping : (Strong(3)/Medium(2)/Weak(1) indicates strength of correlation):														
Cos	Programme Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	0	2	0	1	0	0	0	0	0	0	2	2	2
CO2	1	0	2	0	1	0	0	0	0	0	0	2	1	1
CO3	2	0	2	0	0	0	0	0	0	0	0	2	2	2
CO4	2	0	0	2	1	0	0	0	0	0	0	2	1	1
CO5	2	0	2	1	1	0	0	0	0	0	0	2	2	2

Theory

Unit	Main Topics	Course outlines	Lecture(s)
Unit-1	1. Introduction	History and evolution of Microprocessors, An over view of 8085, Need and Applications of Microprocessors, Comparison of Microprocessor and Microcontroller.	04
	2. 8085 Microprocessor	General 8-bit Microprocessor and its architecture – Intel 8085 Microprocessor, Pin Configuration, Addressing Modes, , CPU Architecture, Registers, ALU Control Unit, memory organization & interfacing	08
	3. 8085 Micro processor	Instruction Set, Instruction Formats, Instruction Classification, Timing diagrams – T-states, machine cycles, instruction cycle	06
	4. Assembly Language Programming:	Programming of Microprocessors using 8085 instructions, use of Arithmetic, logical, Data transfer, Branch Operations, stack and I/O instructions in programming, Programming Techniques Looping, Counting and Indexing.	06
Unit-2	5. Interrupts	The 8085 Interrupt, 8085 Vectored interrupts, Restart instructions, Interrupts: Software and Hardware, Enabling, Disabling and masking of interrupts. Memory mapped I/O, I/O mapped I/O, I/O operations, Programmed I/O, Interrupt driven I/O.	06
	6. Interfacing Data Converters:	Digital- to- Analog (D/A) Converters, Analog- to-Digital (A/D) Converters.	04

	7. Peripherals and Interfacing for 8085 Microprocessors	The 8255A Programmable Peripheral Interface, The 8259 A Programmable Interrupt Controller, 8253 Timer, Use of timer, 8279 Programmable key board/ Display interface, Direct Memory Access (DMA) and the 8257 DMA Controller, serial communication	08
	8. Introduction to 8086 Microprocessors	Architecture of 8086, block diagram, register set, flags, Pin description, operating modes, Temperature Controller, Traffic light Controller, Comparison of 8-bit, 16-bit and 32-bit microprocessors.	06

Total=48

Recommended Books:

1. Ramesh S. Gaonkar, Microprocessor Architecture, Programming & Applications with 8085, Penram International Publishing.
2. Douglas V Hall, Microprocessors and Interfacing: Programming & Hardware, Tata McGraw Hill.
3. Mazidi & Mazidi, The 8085 Microcontroller & Embedded system, using Assembly and C, Pearson edu.
4. Badri Ram , Advanced Microprocessors and Interfacing; TMH

Title of the course : **Data Mining and Warehousing**

Subject Code : **CST-615**

Weekly load : 3 Hrs LTP 3-0-0

Credit : 3

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

CO1	Analyze the concepts of data warehouse and data mining
CO2	Develop skills to write queries using DMQL
CO3	Extract knowledge using data mining techniques
CO4	Adapt to new data mining tools
CO5	Learn the tools and techniques used for Knowledge Discovery in Databases

CO/PO Mapping : (Strong(3)/Medium(2)/Weak(1) indicates strength of correlation):														
Cos	Program Outcomes (PO's)/ Program Specific Outcomes (PSO's)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	2	1	1	2	0	0	2	0	0	2	3	2
CO2	2	3	3	2	2	2	0	0	2	2	2	2	2	3
CO3	2	3	3	3	2	3	0	0	3	2	2	2	3	3
CO4	2	3	3	3	2	3	0	0	2	2	2	2	2	3
CO5	2	2	2	2	2	2	0	0	2	0	2	2	3	3

Theory

Unit	Main Topics	Course outlines	Lecture(s)
Unit-1	1. Introduction	Introduction, Relational Databases, Data Warehouses, Transactional databases, Advanced database Systems and Application.	04
	2. Data Mining	Data Mining Functionalities, Classification of Data Mining Systems, Major Issues in Data Mining.	06
	3. Data Warehouse	Introduction, A Multidimensional data Model, Data Warehouse Architecture, Data Warehouse Implementation, Data Cube Technology, From Data warehousing to Data Mining.	06
	4. Data Processing	Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization and concept Hierarchy Generation, Data Mining Primitives, Languages and System Architecture: Data Mining Primitives, DMQL, Architectures of Data Mining Systems.	06
Unit-2	5. Concept Description	Data Generalization & Summarization – Based Characterization, Analytical Characterization, and Mining class Comparisons, Mining Descriptive Statistical Measures in Large Databases. Mining Association Rules in Large Databases, Association Rule Mining, Single – Dimensional Boolean Association Rules,	08
	6. Association Rules	Multilevel Association Rules from Transaction Databases, Multi Dimensional Association Rules from Relational Databases, From Association Mining to Correlation Analysis, Constraint – Based Association Mining.	06
	7. Classification and Prediction	Classification & Prediction, Issues Regarding Classification & Prediction, Classification by decision Tree	08

		Induction, Bayesian Classification, Classification by Back propagation, Classification based on concepts & Association Rule, Other Classification, Prediction, Classification Accuracy, Cluster Analysis**,** Types of.	
	8. Cluster Analysis	Data in Cluster Analysis, Partitioning methods, Hierarchical methods, Density – Based Methods, Grid – Based Methods, Model – Based Clustering Methods, Outlier Analysis	04

Total=48

Recommended Books:

1. Jiawei Han & Micheline Kamber, Data Mining Concepts & Techniques, Harcout
2. I.H. Witten E. Frank, Data Mining, Morgan Kaufman

Title of the course : **Algorithm Analysis and Design**

Subject code : **CSP-611**

Weekly load : 2 Hrs LTP 0-0-2

Credits : 1

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

CO1	Learn how to analyse a problem and design a solution for the problem
CO2	Acquire hands-on skills to implement various advanced algorithm design such as divide-and-conquer, greedy algorithms
CO3	Implement Quick sort ,Merge sort algorithm, BFS and DFS algorithms
CO4	Implement Dynamic Programming algorithm for the 0/1 Knapsack problem
CO5	Utilize data structures and/or algorithmic design techniques for developing efficient computer algorithm for solving real-world problems

CO/PO Mapping : (Strong(3)/Medium(2)/Weak(1) indicates strength of correlation):														
Cos	Program Outcomes (PO's)/ Program Specific Outcomes (PSO's)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	2	0	0	0	0	0	0	2	1	2
CO2	3	3	3	2	2	0	0	0	0	0	0	0	2	2
CO3	3	3	2	2	0	2	2	0	0	0	0	0	3	3
CO4	0	0	1	1	0	1	0	2	1	2	0	1	2	3
CO5	3	3	3	2	2	0	0	0	0	0	0	0	2	2

LIST OF PRACTICALS

Complexity analysis:

1. To analyze the time complexity of insertion sort.
2. To analyze the time complexity of quick sort.
3. To analyze the time complexity of merge sort.

Graphs:

4. To implement Dijkstra’s algorithm.
5. To implement Warshall algorithm.
6. To implement Bellman-Ford algorithm.
7. To implement Depth First Search algorithm.
8. To implement Breadth First Search algorithm.
9. To implement Prim’s algorithm.
10. To implement Kruskal algorithm.

Greedy approach:

11. To implement fractional Knapsack problem using greedy approach.

Dynamic programming:

12. To implement largest common subsequence.
13. To implement matrix chain multiplication.

Title of the course : **Software Reliability & Testing**

Subject Code : **CSP-613**

Weekly load : 2 Hrs LTP 0-0-2

Credit : 1

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

CO1	Gain understanding of software development life cycle
CO2	Prepare SRS document for a software project
CO3	Apply software design and development techniques
CO4	Apply estimation techniques for software development
CO5	Implement testing at each phase of SDLC

CO/PO Mapping : (Strong(3)/Medium(2)/Weak(1) indicates strength of correlation):														
Cos	Programme Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	1	1	0	0	2	0	3	3	1	1
CO2	3	3	3	2	2	1	0	0	2	0	2	2	2	2
CO3	3	0	3	2	2	1	0	0	2	0	2	2	2	3
CO4	2	0	2	2	2	2	0	0	2	0	3	2	2	3
CO5	3	0	2	3	2	2	0	0	2	0	2	2	2	3

LIST OF PRACTICALS

1) Study of Software and Hardware reliability.
2) Evaluation of Software Engineering Technologies.
3) Study of any web testing tool (e.g. Selenium)
4) Write the test cases for any known application (e.g. Banking application)
5) Study of any bug tracking tool (e.g. Bugzilla, bugbit)
6) Study of any test management tool (e.g. Test Director)
7) Create a test plan document for any application (e.g. Library Management System)
8) Study of any open source-testing tool (e.g. Test Link)

Title of the course : **Microprocessor & Applications**

Subject Code : **CSP-614**

Weekly load : 2 Hrs LTP 0-0-2

Credit : 1

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

CO1	Understand the basics of microprocessor 8085 and assembly language programming
CO2	Implement basic arithmetic and logical problems using assembly language programming
CO3	Implement the compliment operation and some operation on array using assembly language
CO4	Use assembly programming to convert values from one number system to another
CO5	Interface and program a peripheral device from microprocessor 8085 using assembly language programming

CO/PO Mapping : (Strong(3)/Medium(2)/Weak(1) indicates strength of correlation):														
Cos	Programme Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	0	2	2	2	0	0	0	0	0	0	2	2	2
CO2	2	0	2	2	1	0	0	0	0	0	0	2	1	1
CO3	2	0	2	2	1	0	0	0	0	0	0	2	2	2
CO4	2	0	2	0	1	0	0	0	0	0	0	2	1	1
CO5	2	0	2	0	1	0	0	0	1	0	0	2	2	2

LIST OF PRACTICALS

1) Experiment to study pin diagram and all basic parts of 8085 microprocessor kit.
2) Experiment to study addressing modes and Instruction set of 8085 microprocessor.
3) Assembly Language program to add two 8-bit and 16-bit numbers.
4) Program to find 1's and 2's complement of 8-bit and 16 bit numbers.
5) Program to find larger of two numbers.
6) Program to find largest number in an array.
7) Program to find smallest number in an array.
8) Program to perform multi byte addition.
9) Program to perform multi byte subtraction.
10) Program to arrange data array in ascending order.
11) Program to arrange data array in descending order.
12) Program to find sum of a series of 8-bit numbers that finds the result in 8-bit form.
13) Program to find sum of a series of 8-bit numbers that finds the result in 16-bit form.
14) Program to perform multiplication of two 8-bits numbers and store result in 16-bit form.

15) Program to perform division of two 8-bits numbers and store result in 16-bit form.
16) Program to find out the square root of a number.
17) Program to transfer a block of data from one section of memory to another section of memory.
18) Program to perform 8-bit subtraction to consider positive as well as negative results.
19) Program to perform 8-bit addition to consider positive as well as negative results.
20) Program to illustrate the use of interrupts.
21) Program to design hexadecimal and modulo 10 counter.
22) Program to convert a BCD number to binary.
23) Program to convert a binary number to BCD.
24) Program to convert an ASCII character to hexadecimal number.
25) Program to convert a hexadecimal number to ASCII character.

SEMESTER-VI

Title of the course : **Advanced Microprocessor**

Subject Code : **CST-621A**

Weekly load : 3 Hrs LTP 3-0-0

Credit : 3

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

CO1	Learn about the concept of microprocessor, microcontrollers and their applications in real World
CO2	Get acquainted to 8-bit microprocessor, its internal architecture and bus
CO3	Study the 8085 instructions set and use it to solve programming problems
CO4	Study the concept of interrupts in microprocessors
CO5	Gain a perspective of microprocessor interfacing with peripheral devices

CO/PO Mapping : (Strong(3)/Medium(2)/Weak(1) indicates strength of correlation):														
Cos	Programme Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	0	2	0	1	0	0	0	0	0	0	2	2	2
CO2	1	0	2	0	1	0	0	0	0	0	0	2	1	1
CO3	2	0	2	0	0	0	0	0	0	0	0	2	2	2
CO4	2	0	0	2	1	0	0	0	0	0	0	2	1	1
CO5	2	0	2	1	1	0	0	0	0	0	0	2	2	2

Theory

Unit	Main Topics	Course outlines	Lecture(s)
Unit-1	1. Evolution of Microprocessors	8-bit and 16-bit microprocessors, Intel, Zilog and Motorola processors.	06
	2. Architecture of a 16-bit Microprocessor	Intel 8086 and 8088 processor, concept of pipelining and memory segmentation, logical address, offset address and physical address; Bus Interface Unit (BIU); Execution Unit (EU), segment registers.	06
	3. Operation of 16-bit Microprocessor	Pin configuration of Intel 8086/8088; Minimum and maximum modes of operation; Address bus, data bus and control bus; Clock generator Intel 8284; Memory organization, memory address space.	08
	4. Interfacing	Interfacing concepts, interfacing memory; Input-output techniques, interfacing of I/O devices to the processor.	06
Unit-2	5. Addressing Modes	Data related addressing modes- register, immediate, direct, register indirect, based relative, indexed relative, and based indexed, branch related addressing modes- intrasegment direct and indirect, intersegment direct and indirect.	06
	6. Instruction Set of 16-Bit Microprocessor	Machine cycles, data transfer, arithmetic, bit manipulation, string, program execution transfer and processor control instructions.	04
	7. Assembler Directives	ASSUME, DB, DD, DQ, DT, DW, DUP, END, EQU, EVEN, ORG, OFFSET, PROC, ENDP, LABEL and PTR.	04
	8. Assembly Language Programming	Macro-assembler, segment definition and models.	04

	9. Interrupt Structure	Interrupt pointer, type numbers, processing of interrupt, internal and external interrupts, interrupt priorities, BIOS routines, Coprocessors and Multiprocessing.	04

Total=48

Recommended Books:

1. H. Hall, D. V, Microprocessors and Interfacing –Programming, Tata McGraw-Hill
2. Bahadure, N. B, Microprocessors: The 8086/8088, 80186/80286, 80386/80486 and the Pentium Family, Prentice Hall of India.
3. Triebel, W. A. and Singh, A, The 8088 and 8086 Microprocessors, Programming Interfacing, Software, Hardware and Applications, PHI
4. Brey, Barry B, The Intel microprocessors: 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium, Pentium Pro, and Pentium II processors: architecture, programming, and interfacing, PHI.

Title of the course : **Cryptography**

Subject Code : **CST-621B**

Weekly load : 3 Hrs LTP 3-0-0

Credit : 3

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

CO1	Know about information security, which includes an overview of public and secret key Cryptosystems
CO2	Comprehend and apply authentication services and mechanisms
CO3	Identify system vulnerabilities of communication protocols
CO4	Apply the knowledge and skills obtained to study further concepts in information security
CO5	To learn about how to maintain the Confidentiality, Integrity and Availability of a data.

CO/PO Mapping : (Strong(3)/Medium(2)/Weak(1) indicates strength of correlation):

Cos	Program Outcomes (PO's)/ Program Specific Outcomes (PSO's)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	3	2	0	0	0	0	2	0	1	2	2	2
CO2	2	2	2	2	1	2	0	0	2	2	2	2	2	3
CO3	2	2	2	2	1	2	0	0	2	2	2	2	2	3
CO4	2	2	2	2	2	2	0	0	1	2	2	2	3	2
CO5	2	3	2	2	1	0	0	0	1	2	2	2	3	3

Theory

Unit	Main Topics	Course outlines	Lecture(s)
Unit-1	1. Introduction	Terminology: Security, Security Attacks, Security Services, Security Mechanisms, OSI Security Architecture, A Model for Inter-network Security, Internet Standards.	06
	2. Symmetric Ciphers	Symmetric Cipher model, substitution techniques, Transposition techniques, Rotor machines, Steganography, Block Cipher principles,	06
	3. Data Encryption	Data Encryption standard, Strength of DES, Differential and Linear Crypto-analysis, Block Cipher Design principles	05
	4. Advanced Encryption Standard	Evaluation Criteria for AES, The AES Cipher, Multiple Encryption, Triple DES, Block Cipher modes of Operation.	05
Unit-2	5. Key Encryption and Hash functions:	Public Key Cryptography Principles, Public-Key Cryptography Algorithms, Key Management, Diffie-Hellman Key exchange, Digital Signatures, Digital signature standard, Authentication protocols, Cryptography and Message Authentication, Approaches to Message Authentication,	12
	6. Hash Functions	Secure Hash Functions and HMAC.	04

	7. Network Security Applications	Authentication Applications, Kerberos, X.509 Directory Authentication Service, Public Key Infrastructure, Kerberos Encryption Techniques Electronic Mail Security, Pretty Good Privacy (PGP), S/MIME, Introduction to Firewalls.	08
	8. Firewalls	Introduction to Firewalls, Various types of Firewall	02

Total=48

Recommended Books:

1. William Stallings, Cryptography and Network Security, Principles and practices, PHI.
2. William Stallings, Network Security Essentials ,PHI

Title of the course : **Digital Signal Processing**

Subject Code : **CST-621C**

Weekly load : 3 Hrs LTP 3-0-0

Credit : 3

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

CO1	To understand the basics of discrete time signals, systems and their classifications.
CO2	To analyze the discrete time signals in both time and frequency domain.
CO3	To design lowpass digital IIR filters according to predefined specifications based on analog filter theory and analog-to-digital filter transformation.
CO4	To design Linear phase digital FIR filters using fourier method, window technique
CO5	To Understanding of spectral analysis of the signals

	CO/PO Mapping : (Strong(3)/Medium(2)/Weak(1) indicates strength of correlation):													
COS	Program Outcomes (PO's)/ Program Specific Outcomes (PSO's)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	1	1	0	0	0	0	0	0	0	2	2	3
CO2	3	3	3	2	2	0	0	0	0	0	0	3	2	1
CO3	3	3	3	3	2	0	0	0	1	0	0	3	1	1
CO4	3	3	3	3	3	1	1	0	1	0	0	3	1	1
CO5	2	1	3	2	0	0	1	2	0	0	1	2	1	2

Theory

Unit	Main Topics	Course outlines	Lecture(s)
Unit-1	1. Introduction	Classification of signals, transformation of independent variable. Concept of frequency in discrete time sinusoidal and harmonically related complex exponential	10
	2. Discrete Time Signals And Systems	Interconnection of systems, LTI systems: properties, impulse response convolution sum. Response of LTI systems to arbitrary input; LTI systems characterized by linear constant coefficient difference equations, structures for realization of LTI systems, recursive and non recursive realization of FIR systems	08
	3. Z-Transform	Introduction Z-transform pair, properties of region of convergence (ROC) for the Z-transform, properties of Z-transform	06
	4. LTI Systems	Analysis and characterization of LTI systems using Z-transforms .System functions for interconnection of LTI systems. Block diagram representation for causal LTI systems described by difference equations and rational system functions.	04
Unit-2	5. Discrete Fourier Transform (Dft)	Frequency domain sampling and reconstruction of discrete time signals, DFT, inverse DFT (IDFT), DFT as a linear transformation, relationship of the DFT to other transforms, properties of DFT, use of DFT in linear filtering, filtering of long sequences, frequency analysis of signals, using DFT.	08

	6. Fast Fourier Transform Algorithms	Direct computation of DFT, divide and conquer approach to computation of the DFT, radix-2 FFT algorithms, use of FFT algorithm efficient computation of the DFT of two real sequences, and of the DFT of a 2N point real sequence.	04
	7. Implementation Of Discrete Time Systems	Introduction, structures for FIR systems: Direct form, cascade form and lattice structure, structures for IIR systems: Direct form, cascade form, parallel form and lattice structures. Fixed point representation of numbers, errors resulting from rounding and truncation.	04
	8. Design Of Digital Filters	General considerations, causality and its implications, characteristics of practical frequency selective filters, design symmetric linear phase FIR filters using rectangular and hamming window.	04

Total-48

Recommended Books:

1. A.V Oppenheim and R.W.Schafer., Digital Signal Processing, Pearson Ed.
2. S. Salivaharan, A Vallavraj. C Granapriya, Digital Signal Processing, TMH
3. Proakis & Manolakis, Digital Signal Processing, Pearson Ed

Title of the course : **Natural Language Processing**

Subject Code : **CST-621D**

Weekly load : 3 Hrs LTP 3-0-0

Credit : 3

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

CO1	Accomplishments of knowledge and comprehension
CO2	Able to demonstrate, application, analysis, synthesis and evaluation
CO3	Understand the concepts of morphology, syntax, semantics and pragmatics of the language
CO4	Recognize the significance of pragmatics for natural language understanding
CO5	Teach students the leading trends and systems in natural language processing.

CO/PO Mapping : (Strong(3)/Medium(2)/Weak(1) indicates strength of correlation):														
Cos	Program Outcomes (PO's)/ Program Specific Outcomes (PSO's)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	2	1	3	2	0	0	2	2	2	2	2	1
CO2	2	3	3	3	2	2	0	0	3	3	2	2	2	2
CO3	3	2	3	3	2	3	0	0	3	3	3	3	3	2
CO4	2	2	2	2	2	2	0	0	2	2	3	3	3	3
CO5	3	2	3	2	3	2	0	0	2	2	3	3	3	3

Theory

Unit	Main Topics	Course Outlines	Lecture(s)
Unit-1	1. Introduction	Applications of Natural Language Processing; Levels of linguistic processing – morphology, syntax, semantics.	04
	2. Goals of NLP	Language processors – recognizers, transducers, parsers, generators; Language as a rule-based system; Language understanding as an inferential activity.	06
	3. Resources for NLP	Lexicons and knowledge bases; Elements of formal language theory – alphabet, string, language, grammar, productions, symbol vocabulary, generator, recognizer, procedure; Types of grammar; the Chomsky hierarchy.	08
	4. Computational Morphology	Lemmatization; Part-of-Speech tagging; Finite-State analysis.	04
Unit-2	5. Parsing	Definition of a parser; derivations; basic parsing strategies for context free grammars; determinism and non-determinism; decidability.	06
	6. Implementation of Parser	Data structures and algorithms for parsing; unification based grammar formalisms.	06
	7. Ambiguity and its Resolution	Syntactic ambiguities and heuristics; lexical ambiguities and selectional restrictions; indeterminacy of reference.	07
	8. Generation and Dialogue	Syntactic generation algorithms and reversibility; text planning; modeling dialogue agents.	07

Total=48

Recommended Books:

1. Daniel Jurafsky and James H. Martin, Speech and Language Processing, Prentice Hall.
2. James F. Allen, Natural Language Understanding, Benjamin-Cummings.
3. G. Gazdar, C. Mellish, Natural Language Processing in Prolog: An Introduction to Computational Linguistics, Addison Wesley.

Title of the course : **System Management & Security**

Subject Code : **CSO-621**

Weekly load : 3 Hrs LTP 3-0-0

Credit : 3 (Lecture 3)

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

CO1	Comprehend and implement various cryptographic algorithms to protect the confidential data.
CO2	Identify network vulnerabilities and apply various security mechanisms to protect networks from security attacks.
CO3	Apply security tools to locate and fix security leaks in a computer network/software.
CO4	Secure a web server and web application.
CO5	Configure firewalls and Intrusion Detection System

CO/PO Mapping : (Strong(3)/Medium(2)/Weak(1) indicates strength of correlation):														
Cos	Program Outcomes (PO's)/ Program Specific Outcomes (PSO's)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	2	2	1	1	2	1	0	2	2	1	2	1
CO2	1	2	0	2	1	2	2	1	0	1	2	1	2	2
CO3	2	3	3	3	3	3	0	0	3	2	2	3	1	1
CO4	1	0	0	2		0	2	1	1	2	2	1	2	2
CO5	1	0	0	2	0	0	1	1	1	2	2	1	2	2

Theory

Unit	Main Topics	Course outlines	Lecture(s)
Unit-1	1. Introduction	Basic concepts: threats, vulnerabilities, controls; risk; confidentiality, integrity, availability; security policies, security mechanisms; assurance; prevention, detection, deterrence.	06
	2. Basic cryptography	Basic cryptographic terms, Historical background, Symmetric crypto primitives, Modes of operation, Cryptographic hash functions, Asymmetric crypto primitives.	06
	3. Program security	Flaws, Malicious code: viruses, Trojan horses, worms Program flaws: buffer overflows, time-of-check to time-of-use flaws, incomplete mediation Defenses, Software development controls ,Testing techniques	06
	4. Security in conventional operating systems	Memory, time, file, object protection requirements and techniques, Protection in contemporary operating systems, Identification and authentication, Identification goals, Authentication requirement, Human authentication, Machine authentication Mid-term Review: topics	06
	5. Trusted operating systems	Assurance; trust, Design principles, Evaluation criteria, Evaluation process.	06

Unit-2	6. Database management systems security	Database integrity, Database secrecy, Inference control, multilevel databases.	06
	7. Network security	Network threats: eavesdropping, spoofing, modification, denial of service attacks o Introduction to network security techniques: firewalls, virtual private networks, intrusion detection.	06
	8. Management of security	Security policies, Risk analysis, Physical threats and controls, Legal aspects of security, Privacy and ethics.	06

Total=48

Recommended Books:

1. William Stalling, Cryptography and Network Security, Prentice Hall.
2. Cyber Security,Nina Godbole and Sunit Belapure, Wiley.
3. Data Communication and Networking, Behrouz A Foouzan, McGraw Hill.

Title of the course : **Object Oriented Programming**

Subject Code : **CSO-622**

Weekly load : 3 Hrs LTP 3-0-0

Credit : 3 (Lecture 3)

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

CO1	Understand the difference between object oriented programming and procedural programming
CO2	Choose data types and structures to solve mathematical and scientific problems
CO3	Write programs using C++ features such as composition of objects, operator overloading, inheritance, polymorphism etc.
CO4	Simulate the real world problems into object-oriented programs
CO5	Illustrate the process of data file manipulations using C++

	CO/PO Mapping : (Strong(3)/Medium(2)/Weak(1) indicates strength of correlation):													
CO's	Program Outcomes (PO's)/ Program Specific Outcomes (PSO's)													
	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	1	0	0	0	0	0	0	0	2	3	1
CO2	3	3	3	3	3	3	0	0	3	3	3	3	3	3
CO3	3	3	3	3	3	3	0	0	3	3	3	3	3	3
CO4	3	3	3	3	3	3	0	0	3	3	3	3	3	3
CO5	3	3	3	3	3	3	0	0	3	3	3	3	3	3

Theory

Unit	Main Topics	Course outlines	Lecture(s)
Unit-1	9. Introduction	Basic concepts of object-oriented programming, Characteristics of object-oriented programming, Comparison between procedural programming paradigm and object-oriented programming paradigm.	06
	10. Classes and Objects	Specifying a class, Creating class objects, Accessing class members, Access specifiers – public, private, and protected, Static members variables and functions, Static class objects, The const keyword, Friend functions, Friend classes, Empty classes, Nested classes, Local classes, Abstract classes, Container classes.	06
	11. Constructors and Destructors	Need for constructors and destructors, Default constructor, Parameterized constructor, Copy constructor, Dynamic constructors, Destructors, Constructors and destructors with static members.	06
	12. Inheritance	Introduction, Defining derived classes, Forms of inheritance, Ambiguity in multiple and multipath inheritance, Virtual base class, Object slicing, Overriding member functions, Object composition and delegation, Order of execution of constructors and destructors.	06
	13. Virtual Functions and Polymorphism	Concept of Binding - Early binding and late binding, Virtual functions, Pure virtual functions, Abstract classes, Virtual destructors & polymorphism.	06

Unit-2	14. Operator Overloading and Type Conversion	Defining operator overloading, Rules for overloading operators, Overloading of unary operators and binary operators, Overloading of new and delete operators, Type conversion - Basic type to class type, Class type to basic type, Class type to another class type.	06
	15. Pointers and Dynamic Memory Management	Understanding pointers, Accessing address of a variable, Declaring & initializing pointers, Accessing a variable through its pointer, Pointer arithmetic, Pointer to a pointer, Pointer to a function, Dynamic memory management - new and *delete* Operators, Pointers and classes, Pointer to an object, Pointer to a member, *this* Pointer, Self-referential classes, Possible problems with the use of pointers - Dangling/wild pointers, Null pointer assignment, Memory leak and allocation failures.	06
	16. Managing Data Files	File streams, Hierarchy of file stream classes, Error handling during file operations, Reading/Writing of files, Accessing records randomly, Updating files, Data formatting in memory buffers.	06

Total=48

Recommended Books:

1. Lippman, S.B. and Lajoie, J., C++Primer, Pearson Education .
2. Stroustrup, Bjarne, The C++ Programming Language, Pearson Education.
3. Yashwant Kanetkar, Let Us C++, BPB
4. Robert Lafore, Turbo C++, Pearson India

Title of the course : **Software Engineering**

Subject Code : **CSO-623**

Weekly load : 3 Hrs LTP 3-0-0

Credit : 3 (Lecture 3)

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

CO1	Gain understanding of software development life cycle
CO2	Prepare SRS document for a software project
CO3	Apply software design and development techniques
CO4	Apply estimation techniques for software development
CO5	Implement testing at each phase of SDLC

	CO/PO Mapping : (Strong(3)/Medium(2)/Weak(1) indicates strength of correlation):													
Cos	Program Outcomes (PO's)/ Program Specific Outcomes (PSO's)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	1	1	0	0	2	0	3	3	1	1
CO2	3	3	3	2	2	1	0	0	2	0	2	2	2	2
CO3	3	0	3	2	2	1	0	0	2	0	2	2	2	3
CO4	2	0	2	2	2	2	0	0	2	0	3	2	2	3
CO5	3	0	2	3	2	2	0	0	2	0	2	2	2	3

Theory

Unit	Main Topics	Course outlines	Lecture(s)
Unit-1	1. Evolving role of Software	Introduction to Software Engineering, importance of Software, The Software Evolution, Software Characteristics, Software Applications, Software Crisis: Problem and Causes.	05
	2.Software Development Life Cycle Models	Build and fix model, Waterfall model, Prototyping Model, RAD Model, Incremental Model, Spiral Model, Selection of a life cycle model	07
	3. S/W scope	resources, estimation, decomposition techniques, empirical estimation models. Project scheduling, refinement of major tasks, scheduling project plan,	06
	4. Software reliability	Software reliability models, Software quality, software quality ISO standards, Capability Maturity Model, The system engineering hierarchy information engineering, information strategy planning, requirement analysis, analysis principles,.	06
Unit-2	5. Software Testing	Software testing Fundamentals, Test Case design, White box testing, Basis path testing, Control structure testing, Black box testing.	08
	6. Post implementation review	Review plan. S/W maintenance and enhancement procedure. System security.	05
	7. Reverse Engineering	Scope, Levels of reverse engineering, tools, software re-engineering, documentation	05

	8.Control Measures	Threats & control measures, disaster/recovery planning, ethics in system development, ethics codes & standard of behavior.	06

Total=48

Recommended Books:

1. Roger S. Pressman, Software Engineering, A Practitioner's Approach, McGrawHill International Edition.
2. Ian Sommerville, Software Engineering, Addison-Wesley Publishing Company
3. James F. Peter, Software Engineering - An Engineering Approach, John Wiley
4. Pankaj Jalote, An integrated Approach to Software Engineering, Narosa.

Title of the course : **Computer Graphics and Multimedia**

Subject Code : **CST-623**

Weekly load : 4 Hrs LTP 3-1-0

Credit : 4

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

CO1	Provide comprehensive introduction about computer graphics system and design algorithms
CO2	Familiar with two dimensional and three dimensional transformations
CO3	Familiar with techniques of clipping, hidden surface removal and shading
CO4	Provide information about Multimedia and data compression techniques
CO5	To develop multimedia application and analyze the performance of the same

CO/PO Mapping : (Strong(3)/Medium(2)/Weak(1) indicates strength of correlation):														
Cos	Programme Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	0	2	0	2	0	0	0	0	0	0	2	3	2
CO2	2	0	2	2	1	0	0	0	0	0	0	2	3	2
CO3	2	3	2	2	2	0	0	0	2	0	2	2	3	3
CO4	2	3	2	2	2	0	0	0	2	0	2	2	3	2
CO5	2	3	2	2	2	0	0	0	2	0	2	2	3	2

Theory

Unit	Main Topics	Course outlines	Lecture(s)
Unit-1	1. Overview of graphics systems, Output Primitives	Display devices, physical input and output devices: storage tube graphic displays, Raster Refresh, Plasma Panel Displays, Liquid Crystals, Point plotting, Line Drawing algorithms – Slope Line Method, DDA algorithms, Bresenham's Line algorithm	06
	2. Two-dimensional Transformations	Basic transformations-translation, scaling, rotation, Matrix representation and homogenous coordinates, composite transformations, Rotation about an arbitrary point, scaling relative to a fixed point	06
	3. Windowing and Clipping Techniques	Windowing concepts, clipping algorithms-Line clipping – Cohen-Sutherland algorithm	06
	4. 3D Transformations and Projections	Scaling, rotation, translation, rotation about arbitrary axis, Parallel projections, perspective projections	06
Unit-2	5. Hidden-Surface and Hidden-Line Removal	Back face removal method, Depth-buffer method, Scan-line method	06
	6. Shading Overview	Polygon shading methods: Z-Flat shading, Lambert flat	06
	7.Introduction to	Evolution of Multimedia, structure and components of	06

	Multimedia	multimedia, internet and multimedia, multimedia and interactivity, multimedia devices. Animation, Animation principles, animation tools, various animation effects.	
	8. Data compression and standards	Text compression, image compression, various methods of compression, run-length coding, Huffman coding, LZW Encoding, JPEG-objectives and architecture.	06

Total=48

Recommended Books:

1. Hearn & Baker, “Computer Graphics”, PHI.
2. Newman & Sproul, “Principles of Interactive Graphics”,Mcgraw Hill.
3. Steven Harrington, “Computer Graphics-A Programming Approach”,Mcgraw Hill.
4. Sinha & Udai, “Computer Graphics”, Mcgraw Hill.

Title of the course : **Network Programming**

Subject Code : **CST-624**

Weekly load : 4 Hrs LTP 3-1-0

Credit : 4

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

CO1	Learn basics and advanced techniques of socket based client server programming
CO2	Identify and apply various socket programming concepts and mechanisms
CO3	Understand functionality of various TCP sockets
CO4	Gain depth knowledge of sockets and the system calls needed to support network programming
CO5	Effectively use the socket interface to develop Client-Server Internet applications

CO/PO Mapping : (Strong(3)/Medium(2)/Weak(1) indicates strength of correlation):														
Cos	Programme Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	3	3	2	2	0	0	2	3	3	3	3	2
CO2	2	2	3	3	2	2	0	0	2	3	2	3	3	2
CO3	2	3	3	2	2	2	0	0	2	3	2	3	3	2
CO4	2	2	3	2	2	2	0	0	2	2	2	2	3	3
CO5	2	2	2	2	2	2	0	0	2	2	2	2	2	3

Theory

Unit	Main Topics	Course outlines	Lecture(s)
Unit-1	1. Introduction	Review of basic concepts of addressing IPV4 and IPV6, port, classless and classful addressing, basic concept of fork and exec function.	04
	2. Socket Introduction	Socket address structure, byte ordering functions, byte manipulations functions, read, written and readline functions	04
	3. TCP Sockets	Basic concepts of socket, bind, connect, listen and accept functions, concurrent server, close function, getsockname and getpeername functions, TCP echo client server, wait and waitpid function I/O Multiplexing, select and poll functions, IPV4 socket options.	04
	4. UDP and Raw Socket	Recvfrom and sendto functions, UDP echo client server, connectfunction, TCP and UDP echo server using select, raw socket.	04
Unit-2	5. Address Conversion	Gethostbyname function, gethostbyaddr function, uname function, getaddrinfo, getnameinfo function.	04
	6. Client Server Design Alternatives	TCP test client, iterative server, concurrent server, preforked server.	02
	7. Threads	Creation and termination of thread, TCP echo server using thread, thread specific data.	04
	8. Interprocess communication	Inter process communication using pipes, FIFO or named pipes, mutex and condition variables, record locking, IPC facilities: message passing, semaphore, shared memory.	06

Total=32

Recommended Books:

1. Douglas E. Comer, David L. Stevens, Inter-networking with TCP/IP: Client Server Programming and Applications, Vol. III, PHI.
2. Jaffrey D. Schank, Client server Applications and Architecture, BPB Novell press.
3. Douglas J. Reilly, Client-server server Developers guide, Addision Wesley Developers press.
4. UNIX Network Programming, Networking APIs: Sockets and XTI, Prentice Hall.

Title of the course : **Simulation and Modelling**

Subject Code : **CST-625**

Weekly load : 4 Hrs LTP 3-1-0

Credit : 4

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

CO1	Analyze the system and its behavior so that the physical behavior of a system can transform into a mathematical model that can in turn transform into an efficient algorithm for simulation purpose.
CO2	Understand the methodology for modeling& simulation of continuous, discrete and combined systems using simulation languages.
CO3	Have basic knowledge on simulation software and use it in solving of engineering problems, analysis and validation of the results.
CO4	Understand how simulation modeling can aid in effective decision-making.
CO5	Knowledge about a system and develop the capability to apply the same to study systems through available software.

CO/PO Mapping : (Strong(3)/Medium(2)/Weak(1) indicates strength of correlation):														
Cos	Program Outcomes (PO's)/ Program Specific Outcomes (PSO's)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	2	2	2	0	0	2	1	2	2	2	2
CO2	2	2	2	3	2	3	0	0	3	2	2	3	3	2
CO3	2	2	2	2	2	2	0	0	3	2	2	3	2	2
CO4	2	2	2	2	2	3	0	0	2	2	2	3	2	2
CO5	1	2	2	2	2	2	0	0	3	3	2	2	3	2

Theory

Unit	Main Topics	Course outlines	Lecture(s)
Unit-1	1. Introduction	Concept of a system, stochastic activities, continue and discrete system, system modeling, mathematical modeling, principle used in modeling.	04
	2. Simulation of Systems	Concepts of simulation of continuous systems with the help of two examples; use of integration formulas; concepts of discrete system simulation with the help of two examples, Generation of random numbers, Generation of non-uniformly distributed numbers.	08
	3. Simulation of Queuing Systems	Rudiments of queuing theory, Simulation of Single-Server queue, two-server queue, general queues.	04
Unit-2	4. Simulation in Inventory Control and Forecasting:	Elements of inventory theory, inventory models, Generation of Poisson and Erlang variants, forecasting and regression analysis.	06
	5. Design and Evaluation of Simulation Experiments:	Experimental layout and validation. Simulation Languages: Continuous and discrete simulation languages, Block-Structured continuous simulation languages, expression based languages,	06

	6. Discrete simulation languages	Discrete system simulation languages, simscript, GPSS, SIMULA, Simpack, GASP IV, CSIM, factors in selection of a discrete system simulation languages.	04

Total=32

Recommended Books:

1. Narsingh Deo, System Simulation with Digital Computer, Prentice-Hall of India.
2. Gordon, System Simulation, Prentice Hall of India.

Title of the course : **Computer Graphics and Multimedia**

Subject Code : **CSP-623**

Weekly load : 2 Hrs LTP 0-0-2

Credit : 1

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

CO1	Implement different types of object using various graphics functions and design algorithms
CO2	Perform various transformations on two dimensional and three dimensional objects
CO3	Implement different types of clipping techniques on different types of objects
CO4	Understand the various object filling techniques
CO5	Implementation of removing hidden surfaces

CO/PO Mapping : (Strong(3)/Medium(2)/Weak(1) indicates strength of correlation):														
Cos	Programme Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	0	1	0	2	0	0	0	0	0	0	2	3	2
CO2	2	0	1	0	1	0	0	0	0	0	0	2	3	2
CO3	2	0	1	1	1	0	0	0	0	0	0	2	3	3
CO4	2	0	1	0	0	0	0	0	0	0	0	2	3	2
CO5	2	0	1	1	1	0	0	0	0	0	0	2	3	2

LIST OF PRACTICALS

1) List out and discuss the use of basic graphics functions in “graphics.h”.
2) WAP to draw a hut or another geometric figure.
3) WAP to implement slope line method.
4) WAP to draw a line using Digital Differential Analyzer (DDA) Algorithm
5) WAP to draw a circle and ellipse using midpoint algorithm.
6) WAP to draw a line using Bresenham's Line Algorithm (BLA) for lines with slopes positive and greater than 1.
7) WAP to draw a line using Bresenham's Line Algorithm (BLA) for lines with slopes negative and greater than 1.
8) WAP to translate about the origin
    a) Two Dimensional Object
    b) Three Dimensional object
9) WAP to perform Scaling of a
    a) Two Dimensional Object
    b) Three Dimensional Object
10) WAP to rotate about the origin
    a) Two Dimensional Object

b) Three Dimensional Object

11) WAP to implement Shear Transformations.
12) WAP to implement Two Dimensional Composite Transformations.
13) WAP to implement Three Dimensional Composite Transformations.
14) WAP to fill different types of geometric shapes using Flood Fill algorithm.
15) WAP to fill different types of geometric shapes using Boundary Fill algorithm.
16) WAP to perform line clipping using Cohen Sutherland Algorithm.
17) WAP to perform polygon clipping.
18) WAP to implement Sutherland – Hodgeman algorithm for Polygon clipping.
19) WAP to remove hidden surface from a three dimensional object.

Title of the course : **Network Programming**

Subject Code : **CSP-624**

Weekly load : 2 Hrs LTP 0-0-2

Credit : 1

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

CO1	Learn basics and advanced techniques of socket based client server programming
CO2	Identify and apply various socket programming concepts and mechanisms
CO3	Understand functionality of various TCP sockets
CO4	Gain depth knowledge of sockets and the system calls needed to support network programming
CO5	Effectively use the socket interface to develop Client-Server Internet applications

CO/PO Mapping : (Strong(3)/Medium(2)/Weak(1) indicates strength of correlation):														
Cos	Programme Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	3	3	2	2	0	0	2	3	3	3	3	2
CO2	2	2	3	3	2	2	0	0	2	3	2	3	3	2
CO3	2	3	3	2	2	2	0	0	2	3	2	3	3	2
CO4	2	2	3	2	2	2	0	0	2	2	2	2	3	3
CO5	2	2	2	2	2	2	0	0	2	2	2	2	2	3

LIST OF PRACTICALS:

1. Installation of Linux Operating system.
2. How to connect to Linux/Unix (Logging on).
3. Creating and managing user accounts.
4. How to work with files and directories.
5. Perform an experiment to understand working of file utilities.
6. Perform an experiment to understand working of resource monitoring utilities.
7. Searching a file
8. Write and execute at least 10 programs in Linux using shells such as
    a. Factorial of numbers
    b. Even/odd numbers.
    c. Fibonacci series.
    d. Prime numbers
    e. Arrange the numbers.
    f. Reverse of numbers.
    g. Lower case to upper case
    h. Greatest of three numbers etc.
9. Perform experiments to understand the working of all vi-editor commands.
10. Installing and configuring X-windows

11. Installation of device drivers
12. Customizing desktop
13. Write a program that creates a zombie and verify that the process is zombie.
    Send a data from parent to child over a pipe.

Title of the course : **Simulation and Modeling**

Subject code : **CSP-625**

Weekly load : 2 Hrs LTP 0-0-2

Credits : 1

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

CO1	Analyze the system and its behaviour so that the physical behaviour of a system can transform into a mathematical model that can in turn transform into an efficient algorithm for simulation purpose.
CO2	Understand the methodology for modelling& simulation of continuous, discrete and combined systems using simulation languages.
CO3	Have basic knowledge on simulation software and use it in solving of engineering problems, analysis and validation of the results.
CO4	Understand how simulation modelling can aid in effective decision-making.
CO5	Knowledge about a system and develop the capability to apply the same to study systems through available software.

CO/PO Mapping : (Strong(3)/Medium(2)/Weak(1) indicates strength of correlation):														
Cos	Program Outcomes (PO's)/ Program Specific Outcomes (PSO's)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	2	2	2	0	0	2	1	2	2	2	2
CO2	2	2	2	3	2	3	0	0	3	2	2	3	3	2
CO3	2	2	2	2	2	2	0	0	3	2	2	3	2	2
CO4	2	2	2	2	2	3	0	0	2	2	2	3	2	2
CO5	1	2	2	2	2	2	0	0	3	3	2	2	3	2

LIST OF PRACTICALS

1. Introduction to MATLAB.
2. Write programs to implement various constructs such as branching statements, loops, functions, additional data types, plots, arrays, inputs/outputs etc. in MATLAB.
3. Write a program to add two matrices using MATLAB.
4. Write a program to find the transpose of a matrix using MATLAB.
5. Computer generation of random numbers using MATLAB.
6. Perform testing of random number generators using MATLAB.
7. Simulation of Single Server Queuing System using MATLAB.
8. Simulation of Two-Server Queuing System using MATLAB.
9. Introduction regarding usage of any Network Simulator.

SEMESTER-VII

Title of the course : **Operating Systems Internals**

Subject Code : **CST-711A**

Weekly load : 3 Hrs LTP 3-0-0

Credit : 3

CO1	Learn basic concepts of Operating System along with implementation of scheduling algorithms in process management
CO2	Analyze critical section problem in Inter process communication and use of memory management techniques
CO3	Implement page replacement algorithms and use virtual memory concepts
CO4	Know about file structure, file management and disk management
CO5	Learn the concept of deadlock and implement various algorithms used for its detection and recovery

CO/PO Mapping : (Strong(S)/Medium(M)/Weak(W) indicates strength of correlation):

COs	Program Outcomes (PO's)/ Program Specific Outcomes (PSO's)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	1	3	2	0	0	2	2	2	2	2	2
CO2	3	2	2	2	2	2	0	0	2	3	3	2	3	3
CO3	3	3	2	2	0	3	0	0	3	2	2	2	3	2
CO4	3	2	2	2	2	2	0	0	3	3	2	2	2	2
CO5	3	2	1	2	0	2	0	0	3	2	2	2	3	3

Theory

Unit	Main Topics	Course outlines	Lecture(s)
Unit-1	1. Introduction to Operating System	Operating system, purpose and basics, services, assumptions about hardware, introduction to the kernel.	04
	2. Operating System Concepts	System concepts, kernel data structures, system administration, architecture of the Unix and windows NT operating systems.	04
	3. Internal representation of files:	Buffer headers, structures of the buffer pool, reading and writing disk blocks, advantages & disadvantages of buffer cache, structure of regular files, directories, i-nodes, conversion of path names to an in order superblock,	08
	4. File Permissions	allocation of disk blocks, open read & write file, file creation, change directory & root, change owner & mode, pipes, dup, link, unlink, mounting & unmounting file systems, file system abstractions & maintenance.	08
Unit-2	5. The structure of processes & process control:	The process states & transitions, layout of system memory, context of a process, saving the context of a process, manipulation of process address space, process creation, signals, process termination, user id of a process, changing the size of a process, the shell, process scheduling, system calls.	10
	6. Inter process Communication	Intercrosses communications, process tracing, network communications, and sockets.	04

	7. Memory management policies	Swapping and paging, demand paging, a hybrid system with swapping and demand paging, memory management in multi user operating systems.	05
	8. Multiprocessor systems:	Driver interfaces, disk drivers, terminal drivers, streams, problems of multiprocess systems, semaphores, solutions with master and slave processors, solutions with semaphores.	05

Total=48

Recommended Books:

1. Marrice J Back, The design of the Unix O/S, PHI.

Title of the course : **Distributed Systems**

Subject Code : **CST-711B**

Weekly load : 3 Hrs LTP 3-0-0

Credit : 3

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

CO1	Understand the components of distributed computing, its networks, protocols, communication and interconnection architecture
CO2	Recognize the inherent difficulties that arise due to distributed-ness of computing resources
CO3	Learn and explore mobile & wireless computing and their applications to real world problems
CO4	Understand the basics of distributed object & file based system. Also familiarize with the design, implementation and security issues of distributed system
CO5	To develop a simple distributed system.

CO/PO Mapping : (Strong(3)/Medium(2)/Weak(1) indicates strength of correlation):														
Cos	Program Outcomes (PO's)/ Program Specific Outcomes (PSO's)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	2	2	2	0	0	2	3	2	2	3	2
CO2	2	2	2	2	2	2	0	2	2	3	2	2	2	2
CO3	3	2	2	2	2	2	0	2	2	3	2	3	3	2
CO4	3	2	3	2	2	2	0	2	2	3	2	3	2	2
CO5	3	3	2	2	3	3	0	2	2	2	2	3	1	2

Theory

Unit	Main Topics	Course outlines	Lecture(s)
Unit-1	1. Introduction to Distributed Systems	Definition of distributed systems, their objectives, types, hardware and software concepts, architecture.	06
	2. Web Services Concepts	Introduction to XML, SOAP, Web and Grid services concepts.	06
	3. Communication	Inter process communication, Remote Procedure Call (RPC), Remote Method Invocation (RMI), Remote Object Invocation, and Message Oriented Communication.	08
	4. Processes	Introduction to threads, Threads in distributed and non distributed systems, Client side software, Design issues for Servers, Software agents.	06
Unit-2	5. Naming	General issues with respect to naming, Name resolution, implementation of a name space, Domain name Systems, X.500 name space.	06
	6. Security	Introduction to security in distributed systems, General issues in authentication and access control, Security management: Key management, secure group management, authorization management; examples: Kerberos, x.509 certificates.	08
	7. Distributed Object-based Systems	Introduction to distributed object based systems, Overview of CORBA and DCOM and their comparison.	04
	8. Distributed File System and	Introduction to distributed file system, distributed document-based systems, their examples.	04

	Document Based Systems		

Total=48

Recommended Books:

1. Andrew S Tanenbaum, Principles and Paradigms of Distributed Sytsems, Pearson Education.
2. George Coulouris, Distributed Systems, Addison Wesley.

Title of the course : **Operation Research**

Subject Code : **CST-711C**

Weekly load : 3 Hrs LTP 3-0-0

Credit : 3

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

CO1	Describe clearly a problem, identify its parts and analyze the individual functions. Feasibility study for solving an optimization problem.
CO2	Becoming a mathematical translation of the verbal formulation of an optimizationproblem.
CO3	To design algorithms, the repetitive use of which will lead reliably to finding an approximate solution.
CO4	Evaluate and measure the performance of an algorithm. Discovery, study and solve optimization problems.
CO5	Understand optimization techniques using algorithms. Investigate, study, develop, organize and promote innovative solutions for various applications.

	CO/PO Mapping : (Strong(3)/Medium(2)/Weak(1) indicates strength of correlation):													
Cos	Program Outcomes (PO's)/ Program Specific Outcomes (PSO's)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	0	0	0	0	0	1	0	2	2
CO2	3	3	3	3	0	0	0	0	2	0	0	1	3	2
CO3	2	2	3	2	0	0	2	0	0	0	0	0	3	3
CO4	2	2	2	2	2	0	0	0	0	1	0	0	2	3
CO5	0	0	2	1	0	2	0	0	3	1	1	0	2	1

Theory

Unit	Main Topics	Course outlines	Lecture(s)
Unit-1	1. Linear Programming	Basic concepts and notations. Mathematical formulation of linear programming problem (L.P.P.). Graphical solution. Fundamental theorem. Standard format. Simplex method. Two phase method. Big M method. Degeneracy.	08
	2. Primal and dual method	. Primal and Dual. Solution of primal and Dual and vice versa. Complementary slackness condition.	05
	3. Transportation Problem	Basic concepts and notations. Balanced and unbalanced transportation problems. Initial BFS of TP using north west corner rule, Matrix Minima method and Vogel's approximation method. Improving an initial BFS to optimum BFS. Transhipment problem.	08
	4. Assignment Problem	Definition of assignment problem. Hungarian method to solve assignment problem.	05
Unit-2	5. Network Analysis and Models	Notations and definitions. Arrow diagram. CPM (Critical Path Method) and PERT (program evaluation and Review Technique). Crashing. Maximum Flow Problem (MFP) and Shortest Path Problem (SPP).	08

	6. Game Theory	Introduction. Maximum and Minimum criterion. Saddle point. Games without a saddle point. 2*2 games with and without saddle point (Mixed strategies). Two persons zero sum 2*n or n*2 games. Dominance rule. Graphical method solution.	08
	7. Queuing Theory	Notation and basic concepts. Analysis of M/M/1/FCFS and M/M/1/C/FCFS with poisson pattern of arrivals and exponentially distributed service time)	06

Total=48

Recommended Books:

1. A.H. Taha, Operation Research, PHI Pvt. Ltd.
2. S.D. Sharma, Kedar Nath, Om Prakash, Operation Research.
3. D.S. Hira, P.K. Gupta, Operation Research, S. Chand & Co.

Title of the course : **Client Server Architecture**

Subject Code : **CST-711D**

Weekly load : 3 Hrs LTP 3-0-0

Credit : 3

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

CO1	Understand distributed computing and client-server architecture
CO2	Analyze the need of distributed computing and remote-method invocation
CO3	Understand Java IDL technology for distributed objects
CO4	Understand fundamental concepts of Web Services
CO5	Analyze the contents the packet contents of different protocols.

CO/PO Mapping : (Strong(3)/Medium(2)/Weak(1) indicates strength of correlation):														
Cos	Program Outcomes (PO's)/ Program Specific Outcomes (PSO's)													
	PO1	PO2	PO 3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	1	2	2	0	0	0	0	2	2	1	1
CO2	2	2	2	2	2	2	0	0	0	0	2	2	2	2
CO3	2	2	2	2	2	2	0	0	0	2	2	2	2	2
CO4	2	2	2	2	2	2	0	0	0	2	2	2	2	2
CO5	2	1	2	0	2	2	0	0	0	2	2	0	3	2

Theory

Unit	Main Topics	Course outlines	Lecture(s)
Unit-1	1. Fundamental of Distributed Systems:	Client/Server technology an introduction, Classification – Mainframe, File sharing, Client/Server, Distributed/Collaborative architecture, Distributed Computing Environment–DCE architecture, Type of Client/Server Architecture – Two- tier architecture, Three-tier architecture, Distributed/Collaborative enterprise architecture.	06
	2. Technologies	Complementary Technologies to 3-tier – Object – oriented Design, Database Two Phase Commit Processing, Remote Procedure Call, Message Oriented Middleware.	06
	3. Distributed Computing Environment: Remote Method Invocation:	Structure – Client/Server Model, Defining distributed Environment, Motivation for Distributed Computing, Developing the Distributed Computing Architecture Framework, Fundamental Technologies & Design Mechanism.	08
	4. Remote Method Invocation	Distributed Object Model, RMI System Overview, Client interfaces, Registry interfaces, Remote object interface, Stub interface, Exception in RMI.	06
Unit-2	5. Distributed Component Object Model	The DCOM Architecture, Component & Reuse, Location Independence, Language Neutrality, Connection Management, Scalability, Performance, Bandwidth & Latency, Security, Local Balancing, Fault Tolerance, Ease of Deployment, Protocol Neutrality, Platform Neutrality,	06
	6. Integration	Seamless Integration with other Internet Protocols.	04

	7. The Common Object Request Broker	Overview of CORBA, The object request Broker, OMG Interface Definition Language, Language Mapping, Interface Repository, Stubs & Skeletons, Dynamic Invocation & Dispatch, Object Adapters	08
	8. Case study	Java IDL (Interface Definition Language).	04

Total=48

Recommended Books:

1. P.M. Heinchieus, Object-oriented Design Architecture and Implementation, Addison Wesley .

Title of the course : **Advance Computer Architecture**

Subject Code : **CST-712**

Weekly load : 4 Hrs LTP 3-1-0

Credit : 4

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

CO1	Understand the evolution and trends of Computer Architecture and Organization
CO2	Understand the micro-operations executed in the system and thereby construction of ALU
CO3	Understand the instruction format, classification and execution in the system
CO4	Understand the organization of CPU and Control Unit
CO5	Understand the process of input/output in the system which includes the interfacing of I/O devices

CO/PO Mapping : (Strong(S)/Medium(M)/Weak(W) indicates strength of correlation):														
COs	Program Outcomes (PO's)/ Program Specific Outcomes (PSO's)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	2	2	2	0	0	2	2	2	2	2	2
CO2	2	2	2	2	2	2	0	0	2	2	2	2	3	2
CO3	1	2	2	2	2	2	0	0	2	2	2	2	2	2
CO4	3	2	2	2	3	2	0	0	2	3	2	2	2	3
CO5	2	2	2	2	2	2	0	0	2	3	2	2	2	2

Theory

Unit	Main Topics	Course outlines	Lecture(s)
Unit-1	1. Introduction to Parallel Processing	Evolution of Computer Architecture, Parallelism in Uniprocessor systems, Parallel Computer Structures, Architectural Classifications schemes, Multiprocessors and Multicomputers, Multivector and SIMD Computers, Parallel processing applications	07
	2. Memory and Input-Output Subsystems	Hierarchical Memory structure, Virtual memory system, Memory Allocation and Management, Cache Memories and Management, Input-Output Subsystems.	06
	3. Pipelining and Vector Processing	Pipelining, Instruction and Arithmetic Pipelines, Principles of Designing Pipelined Processors, Vector Processing Requirements.	06
	4. Pipeline Computers and Vectorization Methods	Vector Super Computers, Scientific attached Processors, Architecture of Cray-I, Pipeline Chaining and Vector Loops, Vectorization and Optimization Methods.	07
Unit-2	5. Array Processors and Interconnection networks	SIMD Array Processors, SIMD Interconnection Networks Static & Dynamic Networks, Mesh Connected Network, Cube interconnection networks	07

	6. Parallel Algorithms for Array Processors	SIMD matrix multiplication, Parallel sorting for array processors, Associative Array Processing	06
	7. Multi processor Architecture	Functional Structures, Multi stage networks for multiprocessors, Parallel Memory Organization	06
	8. Multiprocessor programming	Multiprocessor Operating Systems, Exploiting Concurrency for Multiprocessing	07

Total=48

Recommended Books

1. Hawang Kai, Briggs F.A, "Computer Architectures and Parallel Processing", McGraw-Hill.
2. Kain Richard Y, "Advanced Computer Architecture", PHI
3. Hwang Kai, "Advanced Computer Architecture", McGraw-Hill
4. Mano M. "Computer System Architecture", PHI

Title of the course : **Compiler Design**

Subject Code : **CST-713**

Weekly load : 4 Hrs LTP 3-1-0

Credit : 4

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

CO1	Introduce the major concept areas of language translation and compiler design
CO2	Enrich the knowledge in various phases of compiler ant its use, code optimization techniques, machine code generation, and use of symbol table
CO3	Extend the knowledge of parser by parsing LL parser and LR parser
CO4	Provide practical programming skills necessary for constructing a compiler
CO5	Understands Intermediate Code Generation and Code Optimization

CO/PO Mapping : (Strong(3)/Medium(2)/Weak(1) indicates strength of correlation):														
Cos	Program Outcomes (PO's)/ Program Specific Outcomes (PSO's)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	2	0	2	2	0	0	1	0	1	2	3	3
CO2	2	2	2	2	2	2	0	0	2	0	2	2	2	2
CO3	3	2	2	2	2	2	0	0	2	2	2	3	2	2
CO4	3	2	2	2	2	3	0	0	2	2	2	2	2	2
CO5	3	2	2	2	2	2	0	0	3	0	1	2	2	2

Theory

Unit	**Main Topics**	**Course outlines**	**Lecture(s)**
Unit-1	1. Introduction:	Introduction to translators (assemblers, compilers, interpreters)	04
	2. Introduction to phases of compiler	Lexical & Syntax analysis, Intermediate code generation optimization, bookkeeping, error handling, regular expressions, finite automata.	04
	3. Parsing:	Context free grammar, Derivation & Parse Trees, parsers: shift reduce, operator precedence, top down predictive, efficient parsers; LR parser, LR(O), SLR, LALR, implementation of parsers.	04
	4. Syntax Directed Translation:	Different schemes & implementation, immediate code, Parse trees, syntax-trees.	04
Unit-2	5. Intermediate code generation	Three address code, quadruples triple, translation of assignment statements, Boolean expressions, postfix notation any parser.	04
	6. Error Detection & Recovery:	Errors, Lexical-phase errors, syntactic-phase errors, semantic errors.	04
	7. Code Optimization:	Sources of optimization, loop optimization DAG representation of basic blocks, Value number & algebraic laws, Global data-flow analysis, Dominators, Reducible flow graphs, loop invariant computations, Induction variables eliminations, Backward flow problems.	04

	8. Code Generation:	Object programs, problems in code generation, Register allocation & assignment code generation from DAG‘s.	04

Total=32

Recommended Books:

1. Aho A. V., Ullman J. D., Sethi R., Compilers Principles, Techniques and Tools, Pearson Education.
2. John Levine, Tony Mason, Doug Brown, Lex and Yacc, O’REILLY.
3. Kenneth C. Louden, Compiler Construction and Practice, Thomson Publication.
4. Dhamdhere, Compiler Construction, Macmillan Publication.

Title of the course : **Internet Technologies**

Subject Code : **CSO-711**

Weekly load : 3 Hrs LTP 3-0-0

Credit : 3 (Lecture 3)

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

CO1	Understanding of Web fundamentals and its working around the world
CO2	Understanding and Web Development skills using different flavours of HTML along with CSS technology and interactive validations of different elements using JavaScript/ vbscript
CO3	Understanding E-commerce market and being aware of prime security issues while developing applications
CO4	Understanding the programming skills using java as Internet programming tool, developing client-server applications, Swings & Events Exception Handling, Servletand JDBC applications
CO5	The Practicability of all above contents is covered in Lab-Sessions

	CO/PO Mapping : (Strong(3)/Medium(2)/Weak(1) indicates strength of correlation):													
COs	Program Outcomes (PO's)/ Program Specific Outcomes (PSO's)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	2	2	2	0	0	1	2	2	2	3	2
CO2	2	3	3	2	3	2	0	0	3	3	3	2	3	2
CO3	2	1	1	2	2	2	0	0	3	2	2	2	3	3
CO4	3	3	3	2	3	2	0	0	3	2	2	2	3	3
CO5	3	3	3	3	3	2	0	0	3	3	3	2	3	3

Theory

Unit	Main Topic	Sub Topic	Lectures
Unit-1	**Internet**	Internet: Basics of Internet, Network, Computer Network , Evolution of theInternet, Growth of the World Wide Web and Big Data; Internet Model: Client-Server models, basics of TCP/IP and ISO Model; Architecture of the Intranet/Internet /Extranet; Access methods: dialup, ISDN, ADSL/2+, cable, LAN, WIFI, Mobile & Satellite;	8 Hour
	www	Introduction to WWW, W3C , Proxy servers; Application areas of internet in E-commerce, Education, Entertainment such as games and gambling; Introduction to Internet of Things (IoT); Search Engines, webbots, integrity of information, databases online;	6 Hour
	Protocols	TCP/IP model, TCP/IP fixed and dynamic IP addressing, IPv4 and IPv6. DNS and URLs. Email: email clients, server and gateways, SMTP, POP3, IMAP and Webmail. File transfer – FTP; Remote login – telnet. WWW – HTTP and HTTPS.	6 Hour
	Technologies	Mobile and Ubiquitous computing, EDGE/3G/HSPA+/4G ,GPS (with reference to USA, EU, India), QR codes, RFID, location and context awareness.	4 Hour

Unit-2	**Internet Language**	Introduction to Static and dynamic HTML, Evolution of HTML 1.0 to 5.0; Scripting languages: JavaScript or VBscript, Dot Net. DOM model, XML, CSS and XSL.	8 Hour
	Website |Development	Development tools: page and site authoring, delivery and maintenance tools; Mobile Web; Usability issues.	4 Hour
	Performance measurement	Performance: speed, reliability, downtime, bandwidth; Use of network utility tools to discover performance issues;	6 Hour
	Security Issues, Solutions	Security policies/ Privacy/ Identification/ Authentication /Access control; Hardware and software, Risk assessment, vulnerabilities; Threats and attack methods such as: Viruses, Spam, Root kits, "phishing", and its solution Firewalls – spyware plug-ins, Antivirus;	6 Hour

Total 48

Recommended Reading

1. Presten Gralla and Michael Troller., How the Internet Works, Que, (8 th Edition), 2006. 0789736268 978-0789736260
2. Perry J. et al, The Internet – Illustrated Introductory, Course Technology (3rd Ed) 0619109580
3. World Wide Web Consortium (W3C) http://www.w3.org

Title of the course : **Computer Networks**

Subject Code : **CSO-712**

Weekly load : 3 Hrs LTP 3-0-0

Credit : 3 (Lecture 3)

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

CO1	Understand basics of computer networks
CO2	Learn use of physical and datalink layer in networking
CO3	Understand the concept of MAC and Network layer
CO4	Learn various protocols used in transport and application layer
CO5	Understand OSI and TCP/IP models

theory

CO/PO Mapping : (Strong(3)/Medium(2)/Weak(1) indicates strength of correlation):														
Cos	**Programme Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	2	0	0	1	0	0	0	0	0	0	2	1	1
CO2	2	2	0	0	2	0	0	0	0	2	0	2	2	2
CO3	2	3	2	2	2	2	0	0	2	2	0	2	2	2
CO4	2	2	3	2	2	2	0	0	2	2	0	2	2	2
CO5	2	2	2	2	2	2	0	0	2	2	0	0	3	2

Unit	**Main Topics**	**Course outlines**	**Lecture(s)**
Unit-1	1. Introduction	Need & Evolution of Computer Networks, Description of LAN, MAN, WAN and wireless Networks, OSI and TCP/IP models with description of Data Encapsulation & peer to peer communication, Comparison of OSI and TCP/IP.	06
	2. Basics of Computer Networks	Basic terminology of computer networks - bandwidth, physical and logical topologies, Media – 10 base Z, 10base S, 10base T, 100baseTX, 100base FX, 1000baseLX and wireless. LAN & WAN devices – Router, bridge, Ethernet switch HUB, Modem.	06
	3. Physical Layer	Representation, one bit on physical modem i.e. in wired network, optical Network and wireless N/W, Encoding / Modulation – Manchester Encoding, AM, FM and PM. Dispersion, Jitter, Latency and collision. Different types of Media – Shielded twisted pair, Unshielded twisted pair, Coaxial cable, Optical Fiber cable and wireless.	06
	4. Data link Layer	Framing, Error control and Flow control, Data link control and protocols – Simplex protocol, Sliding window protocol	06
	5. Medium Access Sublayer	Channel Allocations, Multiple Access protocols- ALOHA, CSMA, CSMA/CD protocols, Collision free protocols, Token Ring, FDDI, Bridges and recent developments.	06

Unit-2	6. Network Layer	Segmentation and autonomous system path determination, Network layer addressing, Network-layer data gram, IP addressed classes. Subnetting – Sub network, Subnet mask. Routing algorithm – optimality Principle, Shortest path routing, Hierarchical routing, Broadcast routing, Multicast routing, tunneling Fragmentation and DHCP. Routing Protocol – RIP, IGRP, OSPF and EIGRP.	06
	7. Transport Layer	Layer 4 Protocol TCP & UDP. Three-way handshakes open connection. Session Layer design issue, Presentation layer design issue, and Application layer design issue.	06
	8. Application Layer	Application Layer protocols: TELNET, FTP, HTTP,SNMP, DNS, SMTP, FTP, HTTP, WWW and recent development.	06

Total=48

Recommended Books:

1. Tanenbaum, Computer Network, Prentice Hall India
2. William Stalling, Data and Computer Communication, Prentice Hall
3. Douglas E. Comer, Internetworking with TCP/IP Volume – I, Prentice Hall India
4. W. Richard Stevens, TCP/IP Illustrated Volume-I, Pub. Addison Wesley
5. B. Forouzan, Data Communication And Networking, TMH

Title of the course : **Data Organization**

Subject Code : **CSO-713**

Weekly load : 3 Hrs LTP 3-0-0

Credit : 3 (Lecture 3)

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

CO1	Gain a good understanding of the architecture and functioning of database management systems as well as associated tools and techniques
CO2	Understand principles of data modeling using entity relationship to develop a good database design and normalization techniques to normalize a database
CO3	Understand and use structured query language to query, update, and manage a database
CO4	Evaluate and optimize queries
CO5	Understand transaction processing, backup and recovery techniques

CO/PO Mapping : (Strong(3)/Medium(2)/Weak(1) indicates strength of correlation):														
Cos	**Programme Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	3	2	2	0	0	0	0	0	0	3	2	3
CO2	3	2	2	2	2	0	0	0	2	0	2	2	2	2
CO3	2	2	3	2	2	2	0	0	3	2	2	2	2	2
CO4	2	2	2	2	2	2	0	0	2	0	2	2	2	3
CO5	3	3	2	2	3	2	0	0	2	2	2	2	2	3

Theory

Unit	**Main Topics**	**Course outlines**	**Lecture(s)**
Unit-1	1. Data processing concepts:	Data, information, hierarchy of data organization, purpose of data processing, data processing systems, data processing cycle, data processing operations, Modes of processing, keys, master file, transaction file, data management.	06
	2. Data representation	Units of representation- Binary number, hexadecimal, octal, decimal, alphanumeric character strings- ASCII and EBCDIC, basic terminology- logical and physical record, extent, dataset.	05
	3. File Storage devices	Online storage, offline storage devices, Auxiliary storage devices- Magnetic tape storage, Magnetic disk storage, hard disk and other direct access storage devices, numerical problems in access time calculation.	07
	4. Structure, organization & processing of files.	File creation, File access, File manipulation and maintenance, File generation, Sequential and Direct file organisation and indexed sequential files.	06

Unit-2	5. Introduction to database management system	Three level system architecture. Concepts of relational Database, Management Applications, Types of Database Models, Network Model, Hierarchical Model, RDBMS,ER model.	06
	6. Introduction to SQL	Part of SQL - DML, DDL, DCL and Query Language creating and manipulating tables Inserting data into tables, Restricting and validating Data Entry with constraints	06
	7. Hashing and indexing	Dynamic hashing techniques: Extendible, linear and dynamic hashing. Indexed and relative files	06
	8. Tree structures	B trees and B+-trees as index structures and their maintenance. File inversion, secondary key retrieval techniques.	06

Total=48

Recommended Books:

1. Data Processing & File Structures By E.S. Loomis, PHI
2. Betty Salzberg, File Structures: An Analytical Approach, Prentice Hall, 1988.
3. Alan L. Tharp, File Organization and Processing, John Wiley & Sons, 1988.
4. Henry F. Korth, Abraham Silberschatz, Database System Concepts, 3rd ed. McGraw Hill, 1997.

Title of the course : **Project**

Subject Code : **CSP-715**

Weekly load : 6 Hrs LTP 0-0-6

Credit : 3

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

CO1	Learn about different software development process models and how to choose an appropriate model for a project of real life problems
CO2	Learn to work as a team and to focus on getting a working project done on time with each student being held accountable for their part of the project
CO3	Work as professionals with portfolio ranging from data management, network configuration, database and software design for management & administration of entire system
CO4	To understand need of project management.
CO5	To understand project scheduling concept and risk.

CO/PO Mapping : (Strong(3)/Medium(2)/Weak(1) indicates strength of correlation):														
Cos	Program Outcomes (PO's)/ Program Specific Outcomes (PSO's)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	2	2	0	0	2	2	2	2	2	2
CO2	3	3	2	2	2	2	0	0	2	2	2	2	2	2
CO3	3	2	2	2	2	2	0	0	1	2	2	3	2	2
CO4	2	2	3	2	2	0	0	0	2	2	3	2	3	2
CO5	3	2	2	3	2	0	0	0	2	0	2	2	3	3

In this, the student must select an area from emerging technologies and specify the objectives to be achieved. Evaluation criteria will be based on objectives stated and achieved.

Title of the course : **Emerging Technologies Lab**

Subject Code : **CSP-716**

Weekly load : 2 Hrs LTP 0-0-2

Credit : 1

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

CO1	Familiarize with various emerging technology tools
CO2	Analyze of difference between different programming languages
CO3	Use various front end and back end tools in application development
CO4	Familiarize with various emerging technology tools specific to Java and Dot Net
CO5	Understand different information security techniques

CO/PO Mapping : (Strong(3)/Medium(2)/Weak(1) indicates strength of correlation):														
Cos	Programme Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	2	2	0	0	2	3	2	3	3	3
CO2	3	3	3	3	2	2	0	0	2	3	2	2	3	3
CO3	3	3	3	2	3	3	0	0	2	3	2	2	2	2
CO4	2	3	2	3	3	3	0	0	2	3	2	3	3	3
CO5	3	3	3	3	2	2	0	0	2	3	2	2	2	2

LIST OF PRACTICALS

1. An Overview of Emerging Technologies in the field of Computer Science & Engineering.
2. Familiarization with various Emerging Technologies in context of Visual Display devices.
3. Familiarization with various Emerging Technologies in the Operating Systems domain.
4. A comparative analysis on C, C++ and C# Languages.
5. Familiarization with various Emerging Technologies specific to JAVA platform.
6. Familiarization with various Front End tools in the application development.
7. Familiarization with various Back End tools in the application development.
8. Familiarization with various emerging technologies in the Web Development.
9. Familiarization with the application development using Dot Net Platform.
10. Familiarization with various emerging technologies in Computer Networks.
11. To study different information security techniques in the Cryptography.
12. A Review over emerging technologies in the Distributed Systems.

SEMESTER-VIII

Title of the course : **Mobile Communication Systems**

Subject Code : **CST-721A**

Weekly load : 3 Hrs LTP 3-0-0

Credit : 3

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

CO1	Make students familiar with fundamentals of mobile communication systems.
CO2	Identify the requirements of mobile communication as compared to static communication.
CO3	Identify the limitations of 2G and 3G wireless mobile communication and use design of 4G and beyond mobile communication systems.
CO4	Outline cellular mobile communication standards.
CO5	Analyze various methodologies to improve the cellular capacity

CO/PO Mapping : (Strong(3)/Medium(2)/Weak(1) indicates strength of correlation):														
Cos	Program Outcomes (PO's)/ Program Specific Outcomes (PSO's)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	0	0	0	0	2	0	0	2	2	2	2	3	2
CO2	2	2	2	0	0	2	0	0	2	3	2	2	2	2
CO3	2	2	2	2	2	2	0	0	2	3	3	2	2	2
CO4	3	2	2	2	2	2	0	0	2	3	2	3	2	3
CO5	2	2	2	2	2	2	0	0	2	3	2	2	3	3

Theory

Unit	Main Topics	Course outlines	Lecture(s)
Unit-1	1.Introduction	History of wireless communication, Need of mobility, Application of wireless communication, Cellular concept	06
	2.First Generation (1G) Mobile Systems	Advanced Mobile Phone System (AMPS) and Nordic Mobile Telephony (NMT), frequency allocation, channels, modulation, multiple access scheme, network operation.	08
	3.Second Generation (2G) Mobile Systems	Network architecture, channels and operation of GSM, CDMAOne (IS-95), and IS-41, mobility management, Network operations of GPRS, CDMATwo (IS-95B), CDPD, and HCSD.	10
Unit-2	4.Third Generation (3G) Mobile Systems	3G spectrum requirements, enabling technologies, service classes, applications and radio access standards (WCDMA and CDMA2000), Introduction to EDGE and WLAN. Introduction to 4G.	12
	5.Network Layer Mobility	Mobile IP, Goals, Assumptions and requirements, Entities and terminology, IP packet delivery, Agent advertisement and discovery, Registration, Tunnelling and Encapsulation , Optimisation , Reserve Tunnelling, ipv6 Protocol, Dynamic Host configuration Protocol(DHCP), Micro-mobility.	12

Total=48

Recommended Books:

1. J.Schiller, Mobile Communications, Pearson Education.
2. Pomportsis, Wireless Networks, John Wiley and Sons.

Title of the course : **Embedded Systems**

Subject Code : **CST-721B**

Weekly load : 3 Hrs LTP 3-0-0

Credit : 3

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

CO1	Identify embedded hardware
CO2	Describe the differences between the general computing system and the embedded system, also recognize the classification of embedded systems..
CO3	Understand microprocessor architecture, interrupts and interface
CO4	Understand software development and tools for embedded systems
CO5	Understand use of RTOS in designing of embedded systems

CO/PO Mapping : (Strong(3)/Medium(2)/Weak(1) indicates strength of correlation):

Cos	Program Outcomes (PO's)/ Program Specific Outcomes (PSO's)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	0	0	0	0	2	0	0	0	0	0	2	1	2
CO2	3	2	2	2	0	2	0	0	2	2	2	2	2	3
CO3	2	2	2	2	2	2	0	0	1	0	0	2	2	3
CO4	2	2	3	2	3	2	0	0	2	2	2	2	2	2
CO5	2	2	3	2	3	2	0	0	2	2	2	2	2	2

Theory

Unit	Main Topics	Course outlines	Lecture(s)
Unit-1	1. Introduction Review of Embedded Hardware	Terminology, Gates, Timing Diagram, Memory, Microprocessor Buses, Direct Memory Access, Interrupts, Built instructions on the Microprocessor.	06
	2. Interrupts	Conventions used on Schematic, Interrupts, Microprocessor Architecture, Interrupt Basic, Shared Data Problem, Interrupt Latency.	05
	3. PIC Micro controller	Introduction, CPU Architecture, Registers, Instruction Sets, Addressing Modes, Programs, Interfacing Methods, Parallel I/O Interface, Parallel Port Interface,	08
	4. Interfacing	Memory Interfacing, High Speed I/O Interfacing, Interrupts – Interrupt Service Routine – features of Interrupts – Interrupt vector & Priority, Timing Generation & Measurements, Input Capture, Output Compare, Frequency Measurement, Serial I/O Device RS232, RS845, Analog Interfacing, Applications.	08
Unit-2	5. Software Development & Tools	Embedded System Evolution Trends, Round – Robin, Robin with Interrupts, Function Scheduling architecture, Algorithms, Introduction to assembler, Compiler and Cross compilers and Integrated Development Environment IDE,	08
	6. Concepts of OOI and Simulator	Object Oriented Interfacing, Recursion, Debugging Strategies, and Simulators.	05
	7. Real Time Operating Systems	Task And Task States, Tasks and Data, Semaphores and shared data, operating system services, Message queues, Timer Function, Events, Memory Management, Interrupt	08

		Routines in an RTOS Environment, Basic Design Using RTOS.	

Total=48

Recommended Books:

1. D.D. Gajski, F. Vahid, J. Gong, S. Narayan, Specification and Design of embedded Systems, Prentice Hall.
2. Steve Heath, Newnes, Embedded Systems Design.

Title of the course : **Visual Programming**

Subject Code : **CST-721C**

Weekly load : 3 Hrs LTP 3-0-0

Credit : 3

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

CO1	Provide information about visual programming basics and its components
CO2	Familiar with Socket Programming and Window Libraries
CO3	Learn various components of C++
CO4	Use different controls in programming
CO5	Understand the concept of Window programming and their applications

CO/PO Mapping : (Strong(3)/Medium(2)/Weak(1) indicates strength of correlation):													
Cos	Programme Outcomes (POs)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	0	0	0	0	0	1	0	0	2	2	3
CO2	2	3	2	3	2	2	0	0	3	2	2	2	3	2
CO3	2	2	3	2	2	2	0	0	2	2	2	3	3	2
CO4	2	3	3	3	2	2	0	0	2	3	2	2	3	2
CO5	2	3	3	2	2	2	0	0	3	3	2	3	3	3

Theory

Unit	Main Topics	Course outlines	Lecture(s)
Unit-1	1.Introduction	Visual programming basics, Application framework fundamental, windows programming (Win32 programming), and visual c++.	04
	2. Memory Concepts	Memory management, DLLs, Win32 API.	05
	3. Visual C++ components	Resource compiler, MFC, modal Dialog, Windows Common Control, the Modeless Dialog and Windows Common Dialogs.	08
	4. Controls	ActiveX Control, Bitmap, Reading and Writing, Documents, SDI, MDI applications.	06
Unit-2	5. TCP/IP concept	Socket Programming using Win Sock, TCP/IP, Document-View Structure.	06
	6. Windows Libraries	MFC Libraries viz Cview, Cfile, Cpoint, Cdialog.	06
	7. WIN32 Programming	WIN32 programming, Difference between a Windows program and a typical DOS program, Windows Programming modal, Windows Memory management,	07
	8. Window Applications	A skeletal Windows Application: WinMain function, Window Function, Components of a Skeletal Application, Windows style, Device context, Creation of LISTBOX class, Dialog Boxes and SCROLLBAR class.	08

Total=48

Recommended Books:

1. David J. Kruglenski, VISUAL C++ programming, Microsoft Press.
2. Newcomer, WIN32 Programming, Addison Wesley.

Title of the course : **Digital Image Processing**

Subject Code : **CST-721D**

Weekly load : 3 Hrs LTP 3-0-0

Credit : 3

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

CO1	Learn the fundamental concepts and applications of image processing
CO2	Cover the basic theory and algorithms that are widely used in image processing
CO3	Provide mathematical foundations for digital manipulation of images such as image acquisition, segmentation, Fourier transformation and compression
CO4	Understand the basic concepts of performing Image restoration, Image compression, Color image processing, Image segmentation and Object Recognition
CO5	Understand and review image transforms

CO/PO Mapping : (Strong(3)/Medium(2)/Weak(1) indicates strength of correlation):

Cos	Program Outcomes (PO's)/ Program Specific Outcomes (PSO's)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	0	0	0	0	0	0	0	0	0	2	2	2
CO2	2	3	2	2	2	2	0	0	2	2	2	2	3	2
CO3	3	3	3	3	2	2	0	0	2	2	2	3	3	2
CO4	2	2	2	3	2	2	0	0	2	2	2	2	3	2
CO5	2	0	0	0	0	0	0	0	0	0	0	2	3	2

Theory

Unit	Main Topics	Course outlines	Lecture(s)
Unit-1	1. Introduction	Image model, human vision, digital images representation, image acquisition, storage, processing, communication and display, Image Geometry, Image transformations,	10
	2. Fourier Transformation	Discrete Fourier transformation, Fast Fourier Transformation, other represent able image transformation.	08
	3. Image Enhancement	Image enhancement, special domain and frequency domain methods, enhancement by point frequency,	06
	4. Filters	Special filtering, enhancement in frequency domain, color image frequency.	04
Unit-2	5. Image Restoration	Image restoration, degradation model, algebraic approval to restoration, constrained least square restoration, Interactive restoration, restoration in special domain.	08
	6. Image Compression	Image compression, image compression models, loss less and glossy image compressions methods.	04
	7. Image Segmentation	Image segmentation, detection of discontinuities, Region oriented segmentation.	04
	8. Image Detection	edge detection and boundary detection, shareholding,	04

Total=48

Recommended Books:

1. Rafacl C. Gonzalez, Digital image processing, Addison Wesley.
2. Jain Tenber, Digital Image Processing, PHI.

Title of the course : **Soft Computing**

Subject Code : **CST-722**

Weekly load : 3 Hrs LTP 3-0-0

Credit : 3

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

CO1	Understand fuzzy logic and its applications.
CO2	Acquire knowledge of artificial neural networks and their applications.
CO3	Solve single-objective optimization problems using genetic algorithms.
CO4	Apply soft computing to solve problems in varieties of application domains.
CO5	To familiarize with soft computing concepts.

CO/PO Mapping : (Strong(3)/Medium(2)/Weak(1) indicates strength of correlation):														
Cos	Program Outcomes (PO's)/ Program Specific Outcomes (PSO's)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	2	2	0	0	2	2	2	3	2	2
CO2	3	3	3	3	3	2	0	0	3	2	2	3	2	3
CO3	3	3	3	2	2	2	0	0	3	3	3	3	3	2
CO4	3	3	3	2	2	3	0	0	3	3	3	3	3	3
CO5	2	3	2	2	2	3	0	0	3	3	3	2	3	3

Theory

Unit	Main Topics	Course outlines	Lecture(s)
Unit-1	1. Fuzzy Set Theory	Introduction to Fuzzy Sets, Operation on Fuzzy Arithmetic and Fuzzy Relations.	04
	2. Fuzzy Rules and Fuzzy Reasoning	Multivalued logics, Fuzzy propositions, Fuzzy Quantifiers, Linguistic Hedges, Fuzzy Inference and Reasoning, Rules Composition and Defuzzification. Examples of use of Fuzzy logic in control of real world systems.	10
	3. Genetic Algorithms	Biological background of Genetic Algorithms; Simple Genetic Algorithm, Chromosome representations; crossover operations; Mutation operations, Operational Rates; concept of exploration and exploitation , Selection Schemes; Fitness function design; Population size; Replacement Schemes; Parameter tuning and control ,Convergence of algorithm, Application of Genetic Algorithms	12
Unit-2	4. Artificial Neural Networks	Introduction to Biological Neuron, Architecture, Learning : Supervised and Unsupervised, Backpropagation and Feedforward Networks, Perceptron, Adaline, Backpropagation Multilayer Perceptrons, Backpropgation Learning Rule, Methods of Speeding, Radial Basis Function Networks, Support Vector Machine. Competitive Learning Networks, Kohonen self-organising networks, The Hopfield Network.	12

	5. Neuro- Fuzzy Modeling	Neural Networks and Fuzzy Logic, Fuzzy Neuron, Fuzzy Perceptron, Fuzzy classification Networks using Backpropogation, Fuzzy Neural Inference System, Fuzzy Adaptive Resonance Theory, Fuzzy Associative Memory, Neural-Fuzzy Systems, Neuro Fuzzy Evolutionary Integration.	10

Total=48

Recommended Books:

1. Satish Kumar, Neural Networks, TMH
2. George J, Bo Yuan, Fuzzy Sets and Fuzzy Logic: Theory and Applications, PHI.
3. Man and Kwong, Genetic Algorithms: Concepts and Designs, Springer Verlag.
4. Neuro- Fuzzy and Soft Computing, Jang, Sun, E.Mizutani, PHI

Title of the course : **Java Programming**

Subject Code : **CSO-721**

Weekly load : 3 Hrs LTP 3-0-0

Credit : 3 (Lecture 3)

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

CO1	Understanding of Web fundamentals and its working around the world
CO2	Understanding and Web Development skills using different flavors of HTML along with CSS technology and interactive validations of different elements using JavaScript/ Vbscript
CO3	Understanding E-commerce market and being aware of prime security issues while developing applications
CO4	Understanding the programming skills using java as Internet programming tool, developing client-server applications, Swings & Events Exception Handling, Servletand JDBC applications
CO5	The Practicability of all above contents is covered in Lab-Sessions

CO/PO Mapping : (Strong(3)/Medium(2)/Weak(1) indicates strength of correlation):														
Cos	Programme Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	2	2	0	0	0	0	0	0	2	2	1
CO2	2	2	2	2	2	2	0	0	2	2	2	2	3	2
CO3	2	2	2	2	2	2	0	0	2	2	2	2	2	3
CO4	3	2	3	3	3	2	0	0	3	3	2	2	3	3
CO5	3	2	3	2	2	2	0	0	3	2	2	2	3	2

Theory

Unit	Main Topics	Course outlines	Lecture(s)
Unit-1	1. Overview of Java	Introduction, Installation & configuring JVM , Java features, Java tools, Java application types, Concept of Structured Programming & Object-Oriented Programming, Java comparisons with C and C++, Java & World Wide Web, Java Program Stucture and Java tokens.	05
	2. Java Fundamentals	Java Fundamentals: Identifiers, Variables, Keywords, Literals(constants), Operators and Controls stuctures, Java Classes, Objects, Methods, Data types, Arrays, Vectors, Strings, Wrapper Classes and type casting in Java.	07
	3. Manging Errors & Exceptions	Types of Errors, Exception Handling, Interfaces & Packages, Method Overloading & Inheritance, Java's Access specifier, Java's Modifiers.	06
	4. Applets & Graphics Programming	How Applets differ from Applications, Applet life cycle, Passing parameters to Applets, Creating Animations etc.	06

Unit 2	5. Managing I/O Streams	Concept of Streams (Files in Java), Byte Stream Classes, Character Streams Classes, Reading from keyboard, FileInputStream and FileOutputStream Classes, FileReader & FileWriterClasses	06
	6. Threading & Multithreading	Introduction, Creating and Running a Thread, The Thread Life Cycle.	06
	7. AWT Components	AWT Hierarchy, Labels, Buttons, Checkboxes, Text Components and Containers.	06
	8. JDBC-ODBC	Introduction to DBMS, ODBC, JDBC, Connectivity of Java with Database Using JDBC:ODBC Bridge.	06

Total=48

Recommended Books:

1. Programming with Java, E. Balagurusamy, TMH
2. Head First Java, Sierra, SPD-Oreilly.
3. Java for professionals, B. M. Harwani, SPD-Oreilly.
4. Java Programming, Dr. Rajiv Choppra, New Age

Title of the course : **Cloud Computing**

Subject Code **: CSO-722**

Weekly load : 3 L T P 3 0 0

Credit : 3 (Lecture 3)

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

CO1	To create a brief understanding of cloud computing and other related technologies (Grid/cluster etc.).
CO2	To understand cloud service models, deployment models and service inception through virtualization in cloud.
CO3	To understand various security issues in cloud as well as an overview of the basic architectures of cloud computing.
CO4	To understand the basic architecture of cloud computing
CO5	To understand the advanced cloud architecture

CO/PO Mapping: (Strong(S)/Medium(M)/Weak(W) indicates strength of correlation)													
Cos	Program Outcomes (PO's)/ Program Specific Outcomes (PSO's)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	1	2	2	3	3	2	2	0	2	0	1	3	3
CO2	2	2	3	2	3	0	2	0	0	1	0	2	3
CO3	3	2	2	1	3	0	0	0	0	3	0	2	3
CO4	3	2	2	3	3	1	2	0	3	0	0	3	3
CO5	3	3	3	3	3	2	1	1	2	2	0	2	1

Theory

Unit	**Main Topics**	**Course outlines**	**Lecture(s)**
Unit-1	1. Understanding Cloud Computing	Background of cloud computing, enabling technologies and technology innovations, introduction to cloud computing including benefits, challengers and risks. Reference Architecture: cloud consumer, cloud service provider, cloud broker, cloud Auditor, cloud carrier. Boundaries of cloud computing.	08
	2. Service deployment Models and Virtualization	Cloud Characteristics, Cloud service model, cloud deployment models. Virtualization concepts: types of virtualization, benefits of virtualization, introduction to various virtualization operating systems.	08
	3. Cloud Security	Security concepts: Confidentiality, privacy, integrity, authenticity, availability, access control, non-repudiation, Threat, Vulnerability, Risk, Security Controls, Virtualization Attack: Guest hopping, attacks on the VM, VM migration attack. Legal and compliance issues: responsibility, ownership of data, right to penetration test, compliance for cloud provider vs. compliance for the customer.	08
Unit-2	4. Cloud Computing Architecture	Fundamental Cloud Architectures: Architecture of Workload Distribution, Resource Pooling, Dynamic Scalability, Capacity, Service Load Balancing.	08

	5. Advance cloud computing architecture	Hypervisor Clustering, Load Balanced Virtual Server Instances, Zero Downtime, Cloud Balancing, Resource Reservation, Dynamic Failure Detection and Recovery, Storage Workload Management	08
	6. Case study	Public cloud environment: Understanding and exploring Amazon web services, managing and creating EC2 instances.	08

Total=48

Recommended Books:

1. Thomas Erl, Zaigham Mahmood, Ricardo Puttini, "Cloud Computing: Concepts, Technology and Architecture", Prentice Hall.
2. John W. Rittinghouse, James F. Ransome, "Cloud Computing Implementation, Management and Security", CRC Press.
3. Alfredo Mendoza, "Utility Computing Technologies, Standards, and Strategies", Artech House INC.
4. Bunker, Darren Thomson, "Delivering Utility Computing",John Wiley and Sons Ltd.
5. George Reese, "Cloud Application Architectures", O'reilly Publications.
6. Ronald L. Krutz, Russell Dean Vines, "cloud Security: A Comprehensive Guide to Secure Cloud Computing" Wiley

Title of the course : **Computer Graphics**

Subject Code : **CSO-723**

Weekly load : 3 Hrs LTP 3-0-0

Credit : 3 (Lecture 3)

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

CO1	Provide comprehensive introduction about computer graphics system and design algorithms
CO2	Familiar with two dimensional and three dimensional transformations
CO3	Familiar with techniques of clipping, hidden surface removal and shading
CO4	Provide information about Projections and shading techniques
CO5	To recognize the software utilized in constructing computer graphics applications.

CO/PO Mapping : (Strong(3)/Medium(2)/Weak(1) indicates strength of correlation):														
Cos	**Programme Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	0	2	0	2	0	0	0	0	0	0	2	3	2
CO2	2	0	2	2	1	0	0	0	0	0	0	2	3	2
CO3	2	3	2	2	2	0	0	0	2	0	2	2	3	3
CO4	2	3	2	2	2	0	0	0	2	0	2	2	3	2
CO5	2	3	2	2	2	0	0	0	2	0	2	2	3	2

Theory

Unit	**Main Topics**	**Course outlines**	**Lecture(s)**
Unit-1	1. Overview of graphics systems	Display devices, physical input and output devices: storage tube graphic displays, Raster Refresh, Plasma Panel Displays, Liquid Crystals	06
	2. Output Primitives	Point plotting, Line Drawing algorithms – Slope Line Method, DDA algorithms, Bresenham's Line algorithm	06
	3. Two-dimensional Transformations	Basic transformations-translation, scaling, rotation, Matrix representation and homogenous coordinates, composite transformations, Rotation about an arbitrary point, scaling relative to a fixed point	06
	4. Windowing and Clipping Techniques	Windowing concepts, clipping algorithms-Line clipping– Cohen-Sutherland algorithm, Polygon Clipping algorithms, Text Clipping.	06
Unit 2	5.Three-dimensional Transformations	Scaling, Rotation, Translation, Rotation about arbitrary axis.	06
	5. Projections	Parallel projections, perspective projections	06
	6. Visible Surface Detection and	Back face removal method, Depth-buffer method, Scan-line	06

	Hidden-Surface Removal	method	
	7. Shading Overview	Polygon shading methods: Flat shading, Gouraud Shading, Phong Shading.	06

Total=48

Recommended Books:

1. Computer Graphics, Hearn & Baker, PHI
2. Principles of Interactive Graphics, Newman & Sproul, Mcgraw Hill
3. Computer Graphics-A Programming Approach, Steven Harrington, Mcgraw Hill
4. Computer Graphics, Sinha & Udai, Mcgraw Hill

Title of the course : **Soft Computing**

Subject Code : **CSP-722**

Weekly load : 2 Hrs LTP 0-0-2

Credit : 1

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

CO1	Understand fuzzy logic and its applications.
CO2	Acquire knowledge of artificial neural networks and their applications.
CO3	Solve single-objective optimization problems using genetic algorithms.
CO4	Apply soft computing to solve problems in varieties of application domains.
CO5	To familiarize with soft computing concepts.

CO/PO Mapping : (Strong(3)/Medium(2)/Weak(1) indicates strength of correlation):														
Cos	Program Outcomes (PO's)/ Program Specific Outcomes (PSO's)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	2	2	0	0	2	2	2	3	2	2
CO2	3	3	3	3	3	2	0	0	3	2	2	3	2	3
CO3	3	3	3	2	2	2	0	0	3	3	3	3	3	2
CO4	3	3	3	2	2	3	0	0	3	3	3	3	3	3
CO5	2	3	2	2	2	3	0	0	3	3	3	2	3	3

LIST OF PRACTICALS

1. To study of Biological Neural Network.
2. To study of Artificial neural Network.
3. WAP of Perceptron Training Program.
4. WAP to implement Delta rule.
5. WAP for Back Propagation Algorithm.
6. WAP for Back Propagation Algorithm by second method.
7. WAP to implement Fuzzy set operation and properties.
8. To study of Genetic Algorithm.
9. WAP to verify various laws associated with Fuzzy set.
10. To study of Bioinformatics.

Title of the course : **Project**

Subject Code : **CSP-723**

Weekly load : 6 Hrs LTP 0-0-6

Credit : 3

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

CO1	Evaluate social impact of technology.
CO2	Evaluate environmental impact of technology.
CO3	Design system for real-life applications.
CO4	To understand need of project management.
CO5	To understand project scheduling concept and risk.

CO/PO Mapping : (Strong(3)/Medium(2)/Weak(1) indicates strength of correlation):														
Cos	Program Outcomes (PO's)/ Program Specific Outcomes (PSO's)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	0	0	0	2	2	2	2	2	2	2
CO2	3	3	2	2	0	0	0	2	2	2	2	2	2	2
CO3	3	2	2	2	2	0	0	2	2	3	2	3	3	2
CO4	2	2	3	2	2	0	0	3	2	3	2	2	3	2
CO5	3	2	2	2	1	0	0	2	2	2	2	2	3	3

In this, the student must select an area from emerging technologies and specify the objectives to be achieved. Evaluation criteria will be based on objectives stated and achieved.

Title of the course : **Seminar**

Subject Code : **CSP-724**

Weekly load : 4 Hrs LTP 0-0-4

Credit : 2

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

CO1	Evaluate social impact of technology.
CO2	Evaluate environmental impact of technology.
CO3	design system for real-life applications.
CO4	To understand need of project management.
CO5	To understand project scheduling concept and risk.

CO/PO Mapping : (Strong(3)/Medium(2)/Weak(1) indicates strength of correlation):														
Cos	Program Outcomes (PO's)/ Program Specific Outcomes (PSO's)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	2	2	0	0	2	2	2	2	2	2
CO2	3	3	2	2	2	2	0	0	2	2	2	2	2	2
CO3	3	2	2	2	2	2	0	0	1	2	2	3	2	2
CO4	2	2	3	2	2	0	0	0	2	2	3	2	3	2
CO5	3	2	2	3	2	0	0	0	2	0	2	2	3	3

In this, the student must select an area from emerging technologies and specify the objectives to be achieved. Evaluation criteria will be based on objectives stated and achieved.

Title of the course : **Advanced Technology**

Subject Code : **CSP-725**

Weekly load : 2 Hrs LTP 0-0-2

Credit : 1

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

CO1	Design web applications using ASP.NET
CO2	Use ASP.NET controls in web applications
CO3	Debug and deploy ASP.NET web applications
CO4	Create database driven ASP.NET web applications and web services
CO5	Write various PHP programs

CO/PO Mapping : (Strong(3)/Medium(2)/Weak(1) indicates strength of correlation):														
Cos	Programme Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	3	2	2	2	0	0	3	2	2	3	3	3
CO2	2	3	2	2	3	3	0	0	2	2	2	2	2	3
CO3	3	3	3	2	3	2	0	0	2	2	2	2	2	2
CO4	3	3	3	3	2	2	0	0	2	2	2	2	3	2
CO5	3	3	2	2	3	2	0	0	3	2	2	2	3	3

LIST OF PRACTICALS:

1. Create web page for Course Registration using ASP .NET.
2. Create web pages for banking using ASP .NET.
3. Create web pages for Shopping Cart using ASP .NET.
4. Create web pages for Airline reservation using ASP .NET.
5. Create web pages for Job portal using ASP .NET.
6. Create web pages for On-Line Telephone Billing System using ASP .NET.
7. Create web pages for On-Line Quiz using ASP .NET..
8. Create web pages for Hospital Management System using ASP .NET.
9. Write a PHP Program to demonstrate the techniques of Exception Handing and Error Handling.
10. Write a PHP program to process the marks obtained by students and embed it in HTML. Use the Multi-Dimensional array concept.
11. Write a PHP program using Looping and Control Structures.
12. Write A PHP program to demonstrate the concept of user-defined Functions.
13. Write a PHP program to demonstrate constructors and destructors.
14. Write a PHP program for database management.

15. Write a PHP program for cookies and sessions.
16. Write a PHP program to read a file from an HTTP server and save it into a compressed file.