SEMESTER-I

Title of the course : **Elements of Computer Programming**
Subject Code : **CS-411**
Weekly load : 5 Hrs LTP 3-0-2
Credit : 4 (Lecture 3, Practical 1)

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	Elements of computer processing, Hardware and software, Introduction and feature wise comparison of various Operating Systems, Including DOS, Windows and Linux, Problem solving-algorithms and flowcharts. Structured Programming vs. Object Oriented Programming.	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* stat ement, *go to* statement.	03
	4. Arrays	arrays and strings, Declaring an array, Initializing arrays, Accessing the array elements, Working with multidimensional arrays, Declaring and initializing string variables, Arithmetic operations on characters, String handling functions.	04
	5. Functions	Defining functions, Passing arguments to functions, Returning values from functions, Reference arguments, Variables and storage classes, Static functions.	05

Unit-2	6. Pointers	Pointers, Pointers to pointers, Declaring and initializing pointers, Pointer expressions, Pointer increment and scale factor, Pointers and arrays, Pointers and strings.	05
	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.	03
	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. Kernighan Brian W. and Ritchie, Dennis M, The C Programming language, Dorling Kingsley.
2. Balagurusamy, E., Programming in ANSI C, TMH Publications

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

Subject Code : **CS-411**

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.

Title of the course : **Computer Fundamental & Information Technology**
Subject Code :**CS-412**
Weekly load : 3Hrs 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 basics of computer system, its architecture, Programming languages and Number system
CO2	Understand the basic concepts of data communication, network topologies and familiar with the use of communication protocols
CO3	Learn and explore new IT techniques in various applications and to identify the issues related to security
CO4	Access internet and use its various applications
CO5	Gain knowledge of social impacts of Information Technology

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	3	0	0	0	2	2	2	3	3	2
CO2	3	3	2	3	2	2	0	0	2	3	2	3	3	2
CO3	3	2	3	2	3	2	0	0	2	3	2	3	3	3
CO4	3	2	2	2	2	1	2	2	2	2	2	3	3	2
CO5	3	2	3	2	3	2	0	0	2	2	2	3	3	3

Theory

Unit	Main Topics	Course outlines	Lecture(s)
Unit-1	1. Introduction	Introduction and Characteristics, Generations, Classifications, Applications, Central Processing Unit and Memory, Communication between various units, Processor speed, Multiprocessor system	04
	2. Memory and various input and output devices	Introduction to Memory, Memory hierarchy, Primary memory and its types, Secondary Memory, Classification of Secondary memory, Various secondary storage devices and their functioning, their Merits and demerits	06
	3. Number System	Introduction and type of Number system, Conversion between number system, Arithmetic operations on number system, Signed and unsigned number system	04
	4. Software Computer Languages and Computer Program	Classification, Examples, Introduction of operating system, Evolution, type and function of OS, Various Examples and comparison, Unix commands, Evolution and classification of programming language, Generation of programming language, Feature and selection of good programming language, Development of program, algorithm and flowchart, Program testing and debugging, Program documentation and Paradigms, Characteristics of good program	10
Unit-2	5. Internet Basics	Evolution and basic internet term, Getting connected to internet and Internet application, Email and its working, Searching the web, Languages of internet, Internet and	06

		viruses	
	6. Data communication	Data communication and transmission media, Multiplexing and Switching, Computer network and network topology, Communication protocols and Network Devices	06
	7. Applications of IT	Business through Computer, Computer for Education, Scientific use, Medicine &Health care, Engineering, Manufacturing & Computer for Home, Theatre, Film & Television. Legal practice & Law Enforcement.	06
	8. Social impacts of Information Technology	Introduction, Privacy, Security and Integrity of Information, Disaster Recovery, Intellectual property rights, career opportunities in the field of IT	06

Total=48

Recommended Books:

1. V. Raja Raman, Fundamentals of Computers, PHI.
2. Harley Hahy, AxexBLeoh, internet Complete Reference Fundamentals of IT,Mc-GrawHill.
3. Mandeep Handa,Fundamentals of IT & Windows based computer courses,ABS Publications

SEMESTER-II

Title of the course : **Web Applications**
Subject Code **: CS-421**
Weekly load : 6 Hrs LTP 2-0-4
Credit : 4 (Lecture 2, Practical 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	Identify the issues related to privacy and security of web documents
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	2	2	2	3	2	0	0	3	3	3	3	3	3
CO5	2	1	2	2	3	2	0	0	3	2	2	3	2	3

Theory

Unit	**Main Topics**	Course outlines	**Lecture(s)**
Unit-1	1. Introduction	Understanding Web fundamentals, type of domains, URL, ISP, Internet technology and protocols, World-Wide-Web (WWW) – history & evolution.	04
	2. Internet basics	Basics of Internet, IP addressing, type of domains, DNS, ISP, protocols – HTTP, TCP/IP.	02
	3. Web Services	E-mail, Browsers, Search fundamentals, Search engines Telnet, FTP etc.	04
	4. HTML	Structure of HTML program, basic tags, Headers and Footers, working with text layout tags, page layout tags, images, hyper-linking etc.	06
Unit-2	5. Enhancing HTML flavors	Introduction to Tables, Frames, Forms, List & Links.	04
	6. Web site frills	Introduction to Cascading style sheets, building better web pages, Navigation techniques, Web graphics - fancy buttons and menus, understanding multimedia - audio & video etc.	04
	7. Privacy & security	Secure web documents, basics of Encryption-decryption,	04

		digital signatures, types & role of Firewalls.	
	8. Dynamic functionality in Web pages	Basics of DHTML, using HTML, CSS & XML , similarities & difference between HTML, CSS & XML, interactivity with Java Script, adding applets to web pages.	04

Total=32

Recommended Books:

1. Matthew MacDonald, Creating a Web site; SPD-Oreilly.
2. TeodoruGugoiu, HTML, XHTML, CSS & XML; Firewall Media.
3. Michael Morrison, Head First Java Script; SPD-O'reilly.
4. Raymond Greenlaw& Ellen Hepp, Fundamentals of Internet & WWW; TMH.
5. Ramesh Bangia, Learning HTML 4.0; Khanna Publisher.

Title of the course : **Web Applications Lab**

Subject Code **: CS-421**

LIST OF PRACTICALS

1. Design & Discuss the structure of HTML program.
2. Introduction to URLs & URL classes and various type of domains.
3. Study & comparison between IPv4 & IPv6 addressing classes.
4. Design a web page using text layout tags
5. Design a web page using page layout tags.
6. Design a web page to insert images & hyper-links between different pages.
7. Write a HTML program using TABLE and its associated tags.
8. Design a web page to elaborate the attributes associated with FORMS.
9. Design a web page using nested FRAMES.
10. Design a web page to demonstrate the multimedia controls.
11. Design a web page using graphics & frills to make the web page user friendly.
12. Write a HTML program and explain various styles of cascading.
13. Write a program that elaborate the significance of table/ text using CSS.
14. Design a web page to demonstrate the working of applets programs.
15. Design a web page to embed a video. The video should be functional within the web page.
16. Design a web page to have its own Back and Forward links. If user click Back/Forward button of explorer, then session should be expired.

Title of the course : **Object Oriented Programming**
Subject Code : **CS-422**
Weekly load : 7 Hrs LTP 3-0-4
Credit : 5 (Lecture 3, Practical 2)

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

CO1	Understand the difference between object oriented programming and procedural oriented language and data types in C++
CO2	Choose data types and structures to solve mathematical and scientific problems
CO3	Write program using C++ features such as composition of objects, Operator overloading, inheritance, Polymorphism etc.
CO4	Simulate the problem in the subjects like Operating system, Computer networks and real world problems
CO5	Illustrate the process of data file manipulations using C++

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	2	2	2	2	0	0	2	1	0	2	3	2
CO2	3	3	3	2	2	3	0	0	3	3	2	3	3	2
CO3	3	3	3	3	2	3	0	0	3	2	3	3	2	3
CO4	3	3	3	3	3	2	0	0	2	2	2	3	2	3
CO5	3	3	3	3	2	3	0	0	3	3	3	3	2	3

Theory

Unit	Main Topics	Course outlines	Lecture(s)
Unit-1	1. Review	Review of basic concepts of object-oriented programming, Comparison between procedural programming paradigm and object-oriented programming paradigm.	04
	2. Classes and Objects	Specifying a class, Creating class objects, Accessing class members, Access specifiers – public, private, and protected, *C*lasses, Objects and memory, Static members, The const keyword and classes, Static objects, Friends of a class, Empty classes, Nested classes, Local classes, Abstract classes, Container classes, Bit fields and classes.	04
	3. Console Based I/O	Concept of streams, Hierarchy of console stream classes, Input/output using Overloaded operators >> and << and Member functions of I/O stream classes, Formatting Output, Formatting using *ios* class functions and flags, Formatting using manipulators.	04
	4. Constructors and Destructors	Need for constructors and destructors, Copy constructor, Dynamic constructors, Destructors, Constructors and destructors with static members, Initialize lists.	04

	5. Operator Overloading and Type Conversion	Defining operator overloading, Rules for overloading operators, Overloading of unary operators and various 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
Unit-2	6. 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
	7. 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
	8. Virtual Functions and Polymorphism	Concept of Binding - Early binding and late binding, Virtual functions, Pure virtual functions, Abstract classes, Virtual destructors & polymorphism.	05
	9. Exception Handling	Review of traditional error handling, Basics of exception handling, Exception handling mechanism, Throwing mechanism, Catching mechanism, Rethrowing an exception, Specifying exceptions.	05
	10. 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.	04

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 : **Object Oriented Programming Lab**
Subject Code : **CS-422**

LIST OF PRACTICALS

1) WAP to find the area of circle/rectangle.
2) WAP to find Simple Interest.
3) WAP to swap two numbers without using third variable.
4) WAP to illustrate the use of Implicit and Explicit type casting.
5) WAP to generate pyramid of digits using nested loops.
6) WAP to generate Fibonacci series.
7) WAP to find the maximum of given numbers.
8) WAP to pass arguments by value and by address.
9) WAP to illustrate the use of reference parameters.
10) WAP of Switch statement.
11) WAP to illustrate function overloading.
12) WAP to illustrate the use of default arguments.
13) WAP to reverse a string using class and object.
14) WAP to covert a given string from uppercase to lowercase.
15) WAP to count the number of vowels in a given sentence.
16) WAP to search a given item in a list.
17) WAP to add/multiply two matrices.
18) WAP to add diagonal elements of two matrices.
19) WAP to calculate the sum of all the elements of a matrix using function.
20) WAP to find the factorial of a number using recursive function.
21) WAP to illustrate the use of pointer variable.
22) WAP a program to implement the structures.
23) WAP to implement Union.
24) WAP to create a Class Employee with the following specifications:
    private members : name [20] characters,
    Employee_ ID int,
    Basic, DA, HRA Float
    salary Float
    calculate_sal() function computes the salary and returns it. Salary is the sum of Basic, DA and HRA.
    public members: Readdata() function accepts the data values and invokes the calculate() function.
    Display() function shows the results on screen.
25) WAP to create a friend function which would be able to swap the values of data members of two objects of same class.
26) WAP to initialize the objects using constructors.
27) WAP to implement function overloading.
28) WAP to implement polymorphism feature for '+' operator.
29) WAP to perform Program to illustrate Single/Multiple/Multilevel/Hybrid Inheritance.
30) WAP to illustrate the derivation and execution of constructor and destructor member functions in case of Inheritance.
31) WAP to create a file. Record structure and the name of file are given by user.
32) WAP that makes use of the: try, catch and throw keywords.
33) Create a function that throws an exception.
34) WAP that contains multiple catch statements.

Title of the course : **Troubleshooting & Maintenance Lab**
Subject Code : **CS-423**
Weekly load : 2Hrs LTP 0-0-2
Credit : 1 (Practical 1)

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

CO1	Learn the different types of servicing and maintenance tools
CO2	Install different operating systems and other software
CO3	Troubleshoot techniques and procedures
CO4	Study different hardware and software faults
CO5	Gain hand on experience by detecting various faults using special kits

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	2	0	0	0	2	0	0	0	0	0	0	3	2	2
CO2	2	0	0	0	2	0	0	0	0	0	0	2	2	1
CO3	1	1	0	0	2	0	0	0	0	0	0	2	3	2
CO4	2	0	0	0	0	0	0	0	0	0	0	2	2	1
CO5	2	0	0	0	2	0	0	0	2	0	0	3	3	2

LIST OF PRACTICALS

1. Study different types of servicing and maintenance tools.
2. Study and installation of different Operating System.
3. Study of the beep diagnostic.
4. Switch on the computer and check the problems if hard disk is not present.
5. Study the different types of Troubleshooting techniques and procedures.
6. Check if the window is not opening, then troubleshoot the software fault.
7. Troubleshoot the problems if modem is not detected.
8. Troubleshooting of CD/DVD ROM.
9. Study the different types of analysis measured techniques.
10. Check out the problems if printer is not working.
11. Study the different types of hardware faults.
12. Study the different types of software faults.
13. Troubleshoot the problem if battery problem occurs.
14. Study troubleshooting of Wireless Sensor Network.

SEMESTER-III

Title of the course : **Operating System**
Subject Code : **CS-511**
Weekly load : 3Hrs LTP 3-0-2
Credit : 4 (Lecture 3, Practical 1)

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(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	2	2	1	3	2	0	0	2	0	0	2	2	2
CO2	3	1	1	1	0	0	0	0	0	0	0	2	2	2
CO3	3	1	2	2	2	2	0	0	0	0	2	2	2	3
CO4	3	2	2	0	0	0	0	0	0	0	0	2	2	2
CO5	3	3	2	3	3	2	0	0	2	0	3	3	2	2

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. Inter-process 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 –	08

		Linux/Windows Virtual Memory Techniques.	
	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 : **Operating System Lab**
Subject Code : **CS-511**

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 Circuits and Logic Design**

Subject Code : **CS-512**

Weekly load : 5Hrs LTP 3-0-2

Credit : 4 (Lecture 3; Practical 1)

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 basic Boolean 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	2	2	2	2	2	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	Half & Full Adder; Half & Full Subtractor; Parity Generator and Checker; Code Converters; Carry look ahead generator;	05

	Using Discrete Logic Gates	Binary Multiplier; Majority Circuits, Magnitude Comparator.	
Unit-2	5. Combinational Logic Using MSI Circuits	Binary Parallel; BCD Adder; Encoder, Priority Encoder, 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	07
	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 : **Digital Circuit & Logic Design Lab**

Subject Code : **CS-512**

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 : **Data Structures and Algorithms**
Subject Code : **CS-513**
Weekly load : 7 Hrs LTP 3-0-4
Credit : 5 (Lecture 3, Practical 2)

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	PO/12	PSO1	PSO2
CO1	3	3	3	3	2	0	0	0	2	0	0	1	2	1
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
	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.
4. Harowitz&Sahni, Data Structures,Galgotia Publications.

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

Subject Code : **CS-513**

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 : **Database Management System**
Subject Code : **CS-514**
Weekly load : 3Hrs LTP 3-0-4
Credit : 5 (Lecture 3, Practical 2)

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. 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 : **Database Management System Lab**

Subject Code : **CS-514**

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 & intersectionetc.
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 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.

SEMESTER-IV

Title of the course : **Web Technologies**
Subject Code : **CS-521**
Weekly load : 7 Hrs LTP 3-0-4
Credit : 5 (Lecture 3, Practical 2)

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. 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. FiruzaAibara, 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 : **Web Technologies Lab**

Subject Code : **CS-521**

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 : **Computer Organization**
Subject Code : **CS-522**
Weekly load : 3Hrs 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 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	Lecture(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 Communication and Computer Networks**
Subject Code : **CS-523**
Weekly load : 5 Hrs LTP 3-0-2
Credit : 4 (Lecture 3; Practical 1)

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 control: error detection and correction techniques-parity	07

		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 Sublayerand 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 : **Data Communication & Computer Networks Lab**

Subject Code : **CS-523**

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.

Title of the course : **System Software**
Subject Code : **CS-524**
Weekly load : 5 Hrs LTP 3-0-2
Credit : 4 (Lecture 3, Practical 1)

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 : **System Software Lab**

Subject Code : **CS-524**

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 :**CS-611**
Weekly load : 4Hrs LTP 2-2-0
Credit : 3 (Lecture 2, Tutorial 1)

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	:	**Software Engineering**	
Subject Code	:	**CS-612**	
Weekly load	:	5 Hrs	LTP 3-0-2
Credit	:	4 (Lecture 3, Practical 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

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	Threats & control measures, disaster/recovery planning,	06

	Measures	ethics in system development, ethics codes & standard of behavior.	

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 : **Software Engineering Lab**

Subject Code : **CS-612**

LIST OF PRACTICALS

1. To study various phases in SDLC using different models.
2. Develop a requirement specification for desired project
3. To study the feasibility of particular project.
4. To analyze the project and creating SRS document.
5. Draw DFD (level 0, level 1) and data dictionary for desired project.
6. To perform the user's view analysis: Use case diagram
7. To draw the structural view diagram: Class diagram, object diagram
8. To perform various testing using the testing tool unit testing, integration testing.

Title of the course : **Discrete Mathematics**
Subject Code : **CS- 613**
Weekly load : 4Hrs LTP 2-2-0
Credit : 3 (Lecture 2, Tutorial 1)

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 Relations and Recursive Algorithms	Introduction, Linear recurrence relations with constant coefficients, Homogeneous solutions, Particular solutions, Total solutions, Solutions by the method of generating functions, Recursive definitions, Recursive algorithms.	04
	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 : **Microprocessor and Applications**
Subject Code :**CS-614**
Weekly load : 5 Hrs LTP 3-0-2
Credit : 4 (Lecture 3; Practical 1)

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 : **Microprocessor & Applications Lab**

Subject Code : **CS-614**

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 sets of 8085 microprocessors.
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.

SEMINAR (CS-615)

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

CO1	Explore students to the real working environment and get acquainted with the organization structure, business operations and administrative functions
CO2	Promote and develop presentation skills and import a knowledge society
CO3	Set the stage for future recruitment by potential employers
CO4	Learn in depth knowledge of selected topics
CO5	Learn report writing skills

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	1	2	1	2	2	1	2	1	2	1	1	1
CO2	3	3	2	2	1	2	3	2	2	1	2	1	1	2
CO3	3	2	2	2	2	2	1	1	1	2	1	3	1	2
CO4	2	1	3	2	2	2	1	3	2	2	2	1	2	1
CO5	3	2	2	1	1	2	1	1	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 objective stated and achieved.

SEMESTER-VI

Title of the course : **Advanced Microprocessor**
Subject Code :**CS-621A**
Weekly load : 3Hrs LTP 3-0-0
Credit : 3 (Lecture 3)

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

CO1	Understand various 8-bit and 16-bit microprocessors and their architecture
CO2	Study the internal architecture, working and interfacing of 16-bit microprocessor
CO3	Learn assembly language programming and assembler directives
CO4	Study interrupt structure
CO5	Understand microprocessor architecture, interrupts and interface

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	3	1	2	0	0	0	1	2	0	2	2	1
CO2	2	0	2	1	1	0	0	0	2	2	0	2	3	2
CO3	2	0	2	2	2	0	0	0	2	2	0	2	2	2
CO4	2	0	1	1	2	0	0	0	2	2	0	2	2	1
CO5	2	0	2	0	0	0	0	0	1	1	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 : **CS-621B**
Weekly load : 3Hrs LTP 3-0-0
Credit : 3 (Lecture 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	Understand the cryptographic techniques and Internet security protocols
CO3	Comprehend and apply authentication services and mechanisms
CO4	Identify system vulnerabilities of communication protocols
CO5	Apply the knowledge and skills obtained to study further concepts in information security

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	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 :**CS-621C**
Weekly load : 3Hrs LTP 3-0-0
Credit : 3 (Lecture 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 low pass 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	1	0	2	2	3
CO2	3	3	3	2	2	2	0	0	2	1	2	3	2	2
CO3	3	3	3	3	2	3	2	0	2	2	2	3	2	2
CO4	3	3	3	3	3	2	2	0	2	3	2	3	2	2
CO5	2	1	3	2	0	0	0	0	0	2	2	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,	08

		frequency analysis of signals, using DFT.	
	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 :**CS-621D**
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	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 sectional 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 : **Automata and Formal Languages**
Subject Code : **CS-622**
Weekly load : 4Hrs LTP 2-2-0
Credit : 3 (Lecture 2; Tutorial 1)

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	02
	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.	

Total=32

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 : **Computer Graphics and Multimedia**
Subject Code : **CS-623**
Weekly load : 7 Hrs LTP 3-0-4
Credit : 5 (Lecture 3; Practical 2)

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 Multimedia	Evolution of Multimedia, structure and components of multimedia, internet and multimedia, multimedia and interactivity, multimedia devices. Animation, Animation principles, animation tools, various animation effects.	06
	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 : **Computer Graphics and Multimedia Lab**

Subject Code : **CS-623**

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 : **Software Reliability & Testing**
Subject Code :**CS-624**
Weekly load : 5 Hrs LTP 3-0-2
Credit : 4 (Lecture 3, Practical1)

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	Understand different time dependent and time independent software reliability models.
CO5	Design reliability models for software systems.

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	3	3	2	1	2	0	0	2	0	3	3	3	3
CO2	3	3	3	2	2	2	0	0	2	2	2	2	2	2
CO3	3	2	3	1	2	2	0	0	2	2	1	2	3	3
CO4	1	2	3	2	2	1	0	0	2	2	2	2	2	2
CO5	1	1	2	2	2	2	0	0	2	3	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 : **Software Reliability & Testing**
Subject Code :**CS-624**

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 : **Simulation and Modelling**
Subject Code : **CS-625**
Weekly load : 2Hrs LTP 2-0-0
Credit : 2 (Lecture 2)

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

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 : **Network Programming**
Subject Code : **CS-626**
Weekly load : 6 Hrs LTP 2-0-4
Credit : 4 (Lecture 2; Practical 2)

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 : **Network Programming Lab**

Subject Code : **CS-626**

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 : **Emerging Technologies Lab**
Subject Code : **CS-627**
Weekly load : 4Hrs LTP 0-0-4
Credit : 2 (Practical 2)

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-VII

Title of the course : **Operating Systems Internals**
Subject Code :**CS-711A**
Weekly load : 3Hrs LTP 3-0-0
Credit : 3 (Lecture 3)

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

CO1	Learn different types of Operating Systems along with its concepts, knowledge of kernel and architecture
CO2	Analyze file structure, file permissions, directories and use of buffer cache
CO3	Know about structures of processes, process control, layout of system memory, system calls
CO4	Understand the need and use of inter-process communication
CO5	Implement memory management policies and multiprocessor systems

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	2	0	0	0	0	0	0	2	2	2
CO2	2	2	0	0	0	0	0	0	0	0	0	2	3	2
CO3	3	2	2	2	2	2	0	0	2	3	3	2	3	2
CO4	3	2	2	2	2	2	0	0	3	2	2	3	2	2
CO5	3	2	2	2	2	2	0	0	2	3	2	2	3	2

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 :**CS-711B**
Weekly load : 3Hrs 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 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	Introduction to distributed object based systems, Overview of CORBA and DCOM and their comparison.	04

	Systems		
	8. Distributed File System and Document Based Systems	Introduction to distributed file system, distributed document-based systems, their examples.	04

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 :**CS-711C**
Weekly load : 3Hrs LTP 3-0-0
Credit : 3 (Lecture 3)

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

CO1	Use the knowledge of operations research to solve problems like linear programmingproblem (LPP), transportation problem and assignment problem
CO2	Understand different application areas of operations research like maximum flow problem, shortest path problem, game theory and queuing theory
CO3	Succeed in stating whether a problem can be solved using operations research and solving problems using techniques of operations research
CO4	Understand the working of game theory
CO5	Learn the concept of queuing 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	2	2	2	2	0	0	2	2	2	2	3	2
CO2	2	2	3	2	2	2	0	0	2	2	2	2	2	3
CO3	2	2	2	3	2	2	0	0	2	2	2	2	2	3
CO4	2	2	3	3	2	3	0	0	2	2	2	2	2	3
CO5	2	2	2	3	2	3	0	0	2	2	2	2	2	3

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. Transshipment 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 :**CS-711D**
Weekly load : 3Hrs LTP 3-0-0
Credit : 3 (Lecture 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	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	2	2	2	0	0	2	0	2	2	2	2
CO2	2	2	2	2	2	2	0	0	2	3	2	2	2	2
CO3	2	2	2	3	2	2	0	0	2	2	2	2	3	2
CO4	3	2	2	3	2	2	0	0	3	2	3	3	3	2
CO5	2	3	3	3	2	3	0	0	2	3	2	2	2	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 : **CS-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 uniprocessor and multiprocessor system
CO2	Design issues of vector and pipeline computers
CO3	Learn SIMD computer design and its effects on computation
CO4	Understand inter-processing element communication
CO5	Interpret performance of different pipelined processors.

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	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. 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 : **Artificial Intelligence**
Subject Code : **CS-713**
Weekly load : 5 Hrs LTP 3-0-2
Credit : 4 (Lecture 3; Practical 1)

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

CO1	Know the background of AI and various applications of AI
CO2	Understand different knowledge representation techniques and reasoning
CO3	Understand problems and solution related to Game playing, NLP etc
CO4	Understand the concept of connectionist models and Expert Systems
CO5	Do programming in LISP or Prolog

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	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 : **Artificial Intelligence Lab**

Subject Code : **CS-713**

LIST OF PRACTICALS

1. Introduction to prolog programming.
2. W.A.P for the introduction to prolog programming by a simple prolog program.
3. Program to find if given number is positive or negative.
4. Program to find the factorial of a number using recursion and accumulators and cut.
5. Program illustrating the use of recursion that is finding sum of first N Integers.
6. Write a program to check whether a given person is a member of Club.
7. W.A.P to concatenate two sub list.
8. Program to find the length of a list using 'Recursion' and then using "Recursion and Accumulators".
9. Write a program to delete an element from the list.

Title of the course : **Data Mining and Warehousing**
Subject Code : **CS-714**
Weekly load : 3Hrs LTP 3-0-0
Credit : 3 (Lecture 3)

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

CO1	Analyze the concepts of data warehouse and data mining
CO2	Learn the tools and techniques used for Knowledge Discovery in Databases
CO3	Equip with data mining skills through hands on sessions on tools and techniques taught
CO4	Adapt to new data mining tools
CO5	Explore recent trends in data mining such as web mining, spatial-temporal mining

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	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	Classification & Prediction, Issues Regarding	08

	and Prediction	Classification & Prediction, Classification by decision Tree 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 : **Compiler Design**
Subject Code : **CS-715**
Weekly load : 4Hrs LTP 2-2-0
Credit : 3 (Lecture 2, Tutorial 1)

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, Intermediatecode generation optimization, bookkeeping, error handling, regular expressions, finite automata.	04
	3. Parsing:	Context free grammar, Derivation & Parse Trees, parsers: shift reduce, operatorprecedence, top down predictive, efficient parsers; LR parser, LR(O), SLR, LALR, implementation of parsers.	04
	4. Syntax Directed Translation:	Different schemes & implementation, immediate code, Parsetrees, 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 basicblocks, 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 : **Advanced Technology Lab**
Subject Code : **CS-716**
Weekly load : 4Hrs LTP 0-0-4
Credit : 2 (Practical 2)

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.

PROJECT(CS-717)

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.

SEMESTER-VIII

Title of the course : **Mobile Communication Systems**
Subject Code :**CS-721A**
Weekly load : 3Hrs 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 basic principles of mobile communication systems
CO2	Analyze mobile communications with the interpretation of the call prints
CO3	Gain knowledge of various generations of mobile communication systems
CO4	Learn the basic principles of the modern mobile and wireless communication systems
CO5	Understand the operation of mobile communications systems

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	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 :**CS-721B**
Weekly load : 3Hrs LTP 3-0-0
Credit : 3 (Lecture 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	Task And Task States, Tasks and Data, Semaphores and	08

	Operating Systems	shared data, operating system services, Message queues, Timer Function, Events, Memory Management, Interrupt 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 :**CS-721C**
Weekly load : 3Hrs LTP 3-0-0
Credit : 3 (Lecture 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 :**CS-721D**
Weekly load : 3Hrs LTP 3-0-0
Credit : 3 (Lecture 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 : **CS-722**
Weekly load : 5 Hrs LTP 3-0-2
Credit : 4 (Lecture 3, Practical 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

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 : **Soft Computing Lab**

Subject Code : **CS-722**

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 : **High Speed Communication Network**
Subject Code : **CS-723**
Weekly load : 3Hrs 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 latest high speed communication technologies.
CO2	Analyze the need of Fibre, ISDN and B-ISDN.
CO3	Analyse and Set up protocol designing issues for Communication networks.
CO4	Apply various network layer techniques for designing subnets and supernets and analyse packet
CO5	Understand the routing algorithm for high speed networks.

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	PS02
CO1	2	1	0	0	1	2	0	0	1	2	0	2	2	3
CO2	2	2	1	2	2	2	0	0	2	2	2	2	2	3
CO3	2	2	2	2	3	2	0	0	2	3	2	2	2	2
CO4	2	3	3	3	3	2	0	0	2	3	2	2	3	2
CO5	2	3	2	2	2	3	0	0	2	3	3	2	2	2

Theory

Unit	Main Topics	Course outlines	Lecture(s)
Unit-1	1. Gigabit Ethernet	High Speed LAN	
		Overview of fast Ethernet, Gigabit Ethernet – overview, specifications, layered protocol architecture, network design using Gigabit Ethernet, applications, 10GB Ethernet – overview, layered protocol architecture, applications.	08
	2. Wireless Networks	Existing and emerging standards, Wireless LAN(802.11), Broadband Wireless(802.16), Bluetooth(802.15) their layered protocol architecture and security. Mobile Networks – GSM, CDMA and GPRS	08
	3. Fibre Channel	Fibre channel physical characteristics – topologies & ports, layered protocol architecture, class of service, technology comparison, SAN overview and architecture.	06
	4. Frame Relay	High Speed WAN	
		Protocol architecture, frame format, routing, congestion control.	06
Unit-2	5. ISDN & B-ISDN	Channels, interfaces, addressing, protocol architecture, services and B-ISDN	08
	6. ATM	Virtual circuits, cell switching, reference model, traffic management.	06

	7. Routing Protocols	OSPF, BGP, internet multicasting, mobile IP, Introduction to	06

Total=48

Recommended Books:

1. William stalling, “High Speed Networks and Internets”, Pearson Education.
2. Tere Parnell, “Building high speed Networks”, TMH.

Title of the course : **Parallel Computing**
Subject Code : **CS-724**
Weekly load : 3Hrs 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 concepts related to parallel computing
CO2	Learn how to measure the performance of parallel computers
CO3	Understand the advanced processor technology and memory hierarchy
CO4	Learn the concepts behind multithreaded architecture and multicore programming
CO5	Analyse the efficiency of a parallel processing system and evaluate the types of application for which parallel programming is useful.

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	PSO1	PSO2
CO1	2	1	2	2	0	0	0	0	0	0	0	1	1
CO2	2	2	3	3	2	2	0	0	2	2	0	2	2
CO3	2	2	3	2	2	2	0	0	2	2	2	3	2
CO4	3	2	2	2	2	2	0	0	2	2	2	2	2
CO5	3	3	2	3	3	2	0	0	2	3	2	3	3

Theory

Unit	Main Topics	Course outlines	Lecture(s)
Unit-1	1. Introduction	The state of Computing, Multiprocessors and Multi computers, Multi vector and SIMD Computers, Architectural Development Tracks	06
	2. Parallel Computing Concepts	Conditions of parallelism, Program Partitioning and scheduling, Program Flow Mechanism, System Interconnect Architecture	06
	3. Metrics and scalability	Performance Metrics and Measures, Parallel Processing Applications, Speedup Performance Laws, Scalability Analysis and Approaches	06
	4. Processor Hierarchy	Advanced Processor Technology, Superscalar and vector Processors,	06
Unit-2	5. Memory Hierarchy	Memory Hierarchy Technology, Virtual Memory Technology	06
	6.Multiprocessor, multicomputing, SIMD	Multiprocessor system Interconnects, Cache Coherence and synchronization, Message Passing Mechanism. Vector Processing Principles, Multivector Multiprocessors, Compound Vector Processing, SIMD Computer Organization, The Connection Machine CM-5.	06
	7. Scalability and architecture	Latency-Hiding Techniques, Principles Of Multithreading, Fine-Grain MultiComputers, Scalable and Multithreaded Architecture, dataflow and Hybrid Architectures.	06

	8. Multicore Programming	Single-Core Processor Fundamentals, Introduction to Multi Core Architecture, System Overview of Threading, Fundamental Concepts of Parallel Programming, Threading and Parallel Programming.	06

Total=48

Recommended Books:

1. Kai Hwang, F. Briggs, "Computer Architecture and Parallel Processing", McGraw Hill
2. M. Flynn, "Computer Architecture: Pipelined and Parallel Processor Design", 1/E, Jones and Bartlett.
3. Harry F. Jordan, "Fundamentals of Parallel Processing", Prentice Hall
4. Hesham El-Rewini and Mostsfa Abd-El-Barr, "Advanced Computer Architecture and Parallel Processing, Wiley-Interscience".
5. Shameem Akhter & Jason Roberts, "Multi-Core Programming", Intel Press.

PROJECT (CS-725)

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.