Format for Syllabus

Name of the Course: Computer Engineering Group (**Discrete Mathematics**)			
Course Code: CST/3/301		**Semester: Third**	
Duration:		**Maximum Marks:100**	
Teaching Scheme		**Examination Scheme**	
Theory: 3 hrs./week		Class Test : 20	Marks
Tutorial: hrs./week		Teachers Assessment: 10	Marks
Practical:		End Semester Exam.: 70	Marks
Credit: 3			
Aim:			
Sl. No.			
1.	To learn basic concept of Discrete Mathematics.		
Objective:			
Sl. No.	Students will able to:		
1.	· Understand relation between Mathematics and applications in Computer Science & Engineering		
2.	· Acquire sufficient Mathematical techniques necessary for practical problems used in computerscience		
3.	· Acquire knowledge of Mathematical term, concept, principals, and different methods.		
4.	· Develop ability to apply Mathematical methods to solve technical		
Pre-Requisite:			
Sl. No.			
1.	Basic Concept of Math's		
2.	Calculation of Numbers		
3.	Introduction to Formula		

Contents (Theory)		Hrs./Unit	Marks
Unit: 1	Mathematical Logic 1.1 Statement and Notation 1.2 Connectives – Negation, Conjunction, Disjunction, Statement Formulas and truth Tables, Conditional and Biconditional, Well-formed Formulas, Tautologies, Equivalence of Formulas, Duality Law, Tautological Implications 1.3 Normal Forms – Disjunctive and Conjunctive Normal Forms. 1.4 The Theory of Inference for the Statement Calculus – validity using Truth Table, Rules of Inference, Consistency of Premises and Indirect method of proof 1.5 Predicate Calculus : Rules of precedence of logical operators Predicate (propositional) functions	**04**	

Unit: 2	**SET THEORY** 2.1 CONCEPT OF SETS**:** Notation – Subset – Superset – Empty set – Universal set – Examples 2.2 OPERATION ON SETS**:** Union – Intersection – Complementation – Difference – Symmetric difference – Problems relating simple set identities 2.3 Definition of power set – Cartesian product of finite number of sets – Simple problems 2.4 Cardinality of a set 2.5 Finite and infinite sets	**07**	
Unit: 3	3.1 RELATION BETWEEN TWO SETS**:** Binary relation as a subset of Cartesian product 3.2 Reflexive, symmetric & transitive relations – Examples 3.3 Equivalence relation – Examples 3.4 Partition – problems	**04**	
Unit: 4	4.1 FUNCTIONS**:** Definition of function – Domain, Co-domain & Range of a function 4.2 Injective, Surjective and Bijective functions – Related problems	**03**	
Unit: 5	**MATRIX THEORY** **5.1** ELEMENTARY TRANSFORMATION ON A MATRIX**:** Equivalent matrices – Definition of sub-matrix of a matrix – Rank of a matrix (definition) – Echelon form of a matrix – Theorems on rank (statement only) – Evaluation of rank of a matrix – Problems 5.2 ADJOINT of a square matrix – Definition of INVERSE of a matrix – Uniqueness of the inverse – Theorems on inverse of matrices – Problems 5.3 System of SIMULTANEOUS LINEAR EQUATIONS – Test of consistency; Solution of n Linear Equations in n unknowns – Problem, Solution of m Linear equations in n unknowns with m<n and m>n – Problems. 5.4 Definition of Eigenvalues and Eigenvectors;Characteristic values and Characteristic vectors of a Matrix; Characteristic equation – relation between Characteristic Roots and Characteristic Vectors, Nature of Characteristic Roots of special type of Matrices– The Process of finding the Eigenvalues and Eigenvectors –Theorems and Related problems.	10	
Unit: 6	**COUNTING TECHNIQUES** 6.1 PRINCIPLE OF INCLUSION AND EXCLUSION**:** Statement of the principle – Set theoretic problems relating to principles of inclusion and exclusion 6.2 MATHEMATICAL INDUCTION**:** Concept of Induction – Statement of the principle of Mathematical Induction – Application of the principle of Induction in various problems 6.3 RECURRENCE RELATION**:** Definition – Examples	06	

	(Fibonacci series etc.) – Linear recurrence relations with constants coefficients – Homogeneous solutions – Particular solutions – Total solutions – Problems		
Unit: 7	**GRAPH THEORY** 7.1 Introduction – Definition of a graph –Directed & Undirected graphs(Definition & Example); Basic Terminology – Loop, Multigraph,Pseudograph,Simplegraph,Finite and Infinite graphs- Definition and examples; 7.2 Subgraph Spanning subgraph-Removal of a Vertex and an edge-Induced subgraph- Definition &Example; 7.3 Graph Isomorphism – Definition and Examples; 7.4 Walk, Paths, length and Circuits –Definition and Examples; 7.5 Euler graphs –Euler path, Euler Circuit – Definition and examples; 7.6 Hamiltonian Graphs – Definition and example – Problems 7.7 Sequential Representation of Graphs 7.8 Linked Representation of Graphs 7.9 Traversal of Graphs 7.8 Shortest Path, Shortest path algorithm – Dijkstra's algorithm, Floyd-Warshall algorithms – Problems. BFS algorithm-DFS 7.9 Application of Graph	08	
Unit: 8	**TREE:** 8.1 Definition & properties of trees – Distance & centre in a tree ; 8.2 Rooted tree- Co Tree-definition & example; 8.3 Binary trees –Definition & Properties, Path length, Binary tree representation of general trees-Problems, Traversal. 8.4 Spanning tree – Branch of tree- chord- definition & properties; Spanning tree in a weighted graph 8.5 Algorithm for constructing Spanning tree – Graph theoretic algorithms – Minimal Spanning tree algorithm – Kruskal's Algorithm -Problems	**06**	
Total		**48**	

Text Books:

Name of Authors	Title of the Book	Edition	Name of the Publisher
J.P Tremblay R. Manohar	Discrete Mathematical Structures with Applications to Computer Science		McGraw Hill
Swapan Kumar Chakraborty&BikashKanti Sarkar	Discrete Mathematics		OXFORD

T. Sengadir	Discrete Mathematics and Combinatorics		PEARSON
Lipschutz& Lipson	Discrete Mathematics		McGraw Hill
Iyengear	Discrete Mathematics		Vikas
Purna Chandra Biswal	Discrete Mathematics and Graph Theory		PHI
Veerarajan	Discrete Mathematics		McGrawHill
Geetha	Discrete Mathematics		Scitech

Reference Books:

Name of Authors	Title of the Book	Edition	Name of the Publisher
R Akerkar& R Akerkar	Discrete Mathematics		PEARSON
Lipschutz& Lipson	Discrete Mathematics (Solved Problems Series)		McGraw Hill
G.Suresh Singh	Graph Theory		PHI
Dr.SukhenduDey	Graph Theory with Application		SPD

Suggested list of Assignments / Tutorial:

Sl. No.	Topic on which tutorial is to be conducted
1.	Analyze designed algorithm
2.	Study of dynamic & static Memory allocation
3.	Explain linear, non-linear data structure

Note:

Sl. No.	
1.	Question Paper setting tips: **End Semester Examination: Question should be made as per class weight and must cover whole syllabus. Objective Type: 20 marks (answered in one or two sentences. Subjective type: 50 marks. To be set at least 8 question and to be answered 5 questions each carrying 10 marks**

Name of the Course : Programming in C	
Course Code: CST/3/302	**Semester: Third**
Duration: Six Months	**Maximum Marks: 150**
Teaching Scheme:	**Examination Scheme:**
Practical: 3 hrs./week	Class Test : 20 Marks

Theory: 3 hrs./week	Teachers Assessment: 10 Marks
Credit : 3+2	End Semester Exam. : 70 Marks
	Practical / Sessional : 25 (Internal) + 25 (External)

Aim of the Course:

S. No	Aims about
1.	To study the structure programming concept.
2.	To study Linear Data Structure.
3.	To study Looping and Branching.
4.	To study subscripted variables and user defined data types.
5.	To study user defined functions.
6.	To study pointers in depth.
7.	To study formatted and unformatted files.

Objective of the course:

S. No	The students will be able to -
1.	Describe the concepts of constants, variables, data types and operators.
2.	Develop programs using input and output operations.
3.	Write programs using different looping and branching statements.
4.	Write programs based on arrays and strings handling functions.
5.	Write programs using user-defined functions, structures and union.
6.	Write programs using C pointers.
7.	Use formatted and unformatted files to store and access data.

Pre-Requisites -

S. No	
1.	Interaction with DOS / Windows Operating System.
2.	Ability to develop logic / flow of simple problem.

Unit No.	Contents	Hrs/Unit	Marks
1	**Basics of C** 1.1 History of C, Advantages of Structured Program, Files (source, header, object, binary executable) used in C, Characteristics of C. 1.2 C character set, Tokens, Constants, Variables, Keywords, Data types used in C. 1.3 C operators (arithmetic, logical, assignment, relational, unary, binary, increment and decrement, conditional, bit wise, special, comma, sizeof, postfix, prefix etc.), Operator precedence, Associativity of operators, Type conversion, Typecasting. 1.4 Formatted input, Formatted output.	**4**	
2	**Decision Control and Looping Statements** 2.1 Decision making and branching statements, if statement (if, if-else, else-if ladder, nested if-else), Switch case statement. 2.2 Iterative/Loop statement, Entry controlled & exit controlled loop structure & differences, while, do-while, and for loop structure, Break and continue statement, Conditional and unconditional Goto statement, nested loop structure.	**4**	
Unit No.	**Contents**		**Marks**
3	**Arrays and Strings**	**6**	

	3.1. Advantages of subscripted variables/ arrays, Declaration and initialization of one dimensional, two dimensional and character arrays, Accessing array elements. 3.2. Declaration and initialization of string variables, String handling functions from standard library (strlen (), strcpy (), strcat (), strcmp ()), String operations to extract substring from left, right, middle of a string, Replacement of string characters, Concatenation of two strings.		
4	**Functions** 4.1 Functions, Need of functions, Prototype declaration, Scope and lifetime of variables, Defining functions, Passing parameter types, Function call (call by value, call by reference), Return values. 4.2 **Storage classes**, Category of function (No argument No return value, No argument with return value, Argument with return value), Recursion and use of memory stack, Types of recursion.	**10**	
5	**Pointers** 5.1. Understanding pointers, Declaring and accessing pointers, Null Pointers, Generic Pointers, Pointers arithmetic and expressions. 5.2. Passing arguments to function using pointers, Pointers and arrays, Passing an array to a function, Array name and Pointer. 5.3. Pointers and Strings, Array of pointers, Function pointers, Pointers to pointers. 5.4 Memory usage, Dynamic memory allocation, Drawbacks of pointer.	**10**	
6	**Structures, Union and Enumerated Data types** 6.1 Structures, Defining structure, Declaring and accessing structure members, Typedef declaration, Initialization of structure, Arrays of structure, Nested structure, Structures and functions, Pointer to a structure, Self-referential structure. 6.2 Unions, Defining union, Declaring and accessing union members, Initialization of union, Arrays of union variables, Nested union, Union under structure, Differences between structure and union. 6.3 Enumerated data, Assigning and accessing enumerated variables, Enumeration type conversion, comparing and I/O operations on enumerated types.	**8**	
Unit No.	**Contents**	**Hrs/Unit**	**Marks**
7	**Pre-processor Directives** Introduction, Types of pre-processor directives, Macros, Rules for using macros, Distinction between functions and macros.	**2**	

8	**User defined Files** Introduction to files, Different modes for opening files, Using formatted and unformatted files in C, Read data from files, Writing data to files, Different functions for random selection of records.	**6**	

Practical / Sessional Works

Skills to be developed**:**

Intellectual skills:

- Use of programming language constructs in program implementation.
- Apply different logics to solve given problem.
- Write program using different implementations for the same problem.
- Identify different types of errors as syntax, semantic, fatal, linker & logical.
- Debugging of programs.
- Understanding different steps and stages to develop complex program.

Motor Skills:

- Proper handling of Computer System**.**

A sample List of Practical / Sessional works to be done (Leading '*' denotes the harder problems)

S. No.	Specific problem(s) related with practical / sessional work	Skill area
01	i) Displaying hexadecimal, decimal, octal number format of the entered numbers. ii) Displaying entered number with leading zeros and trailing zeros. iii) Displaying entered number with right and left justification. iv) Displaying with different formatting specifiers.	Formatted output. (Any two)
02	v) To find greatest / smallest of three numbers. vi) To display pass class, second-class, distinction according to the marks entered from the keyboard. vii) To find even or odd numbers. viii) To display spellings of number 1-10 on entry. ix) Implementation and displaying the menu to execute 1. ADD, 2. SUBTRACT 3. MULTIPLICATION, 4. DIVISION using switch case. x) To check whether there exist real roots of a quadratic equation and if exist find them.	Two way and multiway Branching. (Any four)
03	xi) To display our College name twenty times on screen. xii) To demonstrate Continue and Break statements within loop structure. xiii) To add first 'n' natural, even, odd numbers using different loop structures. xiv) To find GCD, LCM of two integral numbers. xv) To generate simple number triangle for n rows. xvi) To generate Pascal triangle for n rows. xvii) To add the series 1 + (1 + 2) + (1 + 2 + 3) + …+ (1 +2 +3 + …+n) xviii) To generate all prime numbers within the given range. xix) To find all the Armstrong numbers within 100 to 1000. xx)	Loop structure and nested loop structure. (Any six)
S. No.	Specific problem(s) related with practical / sessional work	Skill area
04	xxi) To find the largest and smallest numbers from array elements.	Arrays and

	xxii) *To sort array elements in ascending / descending order. xxiii) To enter elements for 3X3 matrix and display them. xxiv) To calculate addition / subtraction of 2 dimensional matrix. xxv) *To calculate multiplication of 2 dimensional matrix. xxvi) To find the number of vowels and consonants in a string. xxvii) Implementation of strlen(), strcpy(), strcat() and strcmp() functions. xxviii) To check whether a string is palindrome or not. xxix) *To replace a specific character/string by another character/string in a multiword string. xxx) *To make the abbreviated form of a multiword string.	Strings (Any six)
05	xxxi) To calculate the value of ${}^{n}C_{r}$, n≥r using function xxxii) *To find the sum of the series $1+\frac{x}{1!}+\frac{x^2}{2!}+\cdots\frac{x^n}{n!}$ for n ≥ 1, x ≥ 0 using function. xxxiii) To interchange the biggest and smallest number in to calculate factorial a one dimensional array using function. xxxiv) To calculate factorial of any given number using recursion. xxxv) To demonstrate call by reference, call by value. xxxvi) To read and display an integer array using pointer. xxxvii) To read and display a text using a character pointer to a string. Also count the number of characters, words and lines in the text. xxxviii) *To read, display, add and subtract of two times defined using hour, minutes and values of seconds. xxxix) *To read and display the contents of a structure variable using pointer to a structure.	User defined functions, structures and pointers. (Any five)
06	xl) Handling with unformatted, formatted files in different operational mode. xli) To count the number characters and number of lines in a file. xlii) To copy one file into another by copying one character at a time / multiple characters simultaneously (using fgets() and fputs()). xliii) To write records of student to a file using array of structure and display them accordingly. xliv) *A text menu driven program to append a record, to edit a particular record, to display a predefined record, to delete a particular record from a previously created student file.	Formatted and unformatted files. (Any two)

Text Books

Name of the Authors	Titles of the Book	Edition	Name of the Publisher
ReemaThareja	Programming in C	Second	OXFORD University Press
Kamthane	C programming: Test your skills		Pearson
Venugopal	Mastering C		TMH
E.Karthikeyan	A Textbook on C		PHI
Srivastava	C in Depth		BPB
E. Balgurusamy	Programming in C	Fourth	Tata Mc-Graw Hill
R.S.Bichkar	Programming with C		University Press
David Griffiths	Head First C		SPD
Jeyapoovan	A First Course in Programming with C		Vikas
Amiya Kumar Rath	Programming in C		Scitech

Reference Book

Kanetkar	Let Us C		BPB
Steve oualine	Practical C Programming		SPD
NarainGehani	An Advanced Introduction ANSI C		University Press

Question Paper setting tips: **End Semester Examination: Question should be made as per class weight and must cover whole syllabus. Objective Type: 20 marks (answered in one or two sentences. Subjective type: 50 marks. To be set at least 8 question and to be answered 5 questions each carrying 10 marks**

1. 2. **Websites:**

- **http://cplus.about.com/od/beginnerctutoriali/a/blctut.htm**
- **http://computer.howstuffworks.com/c.htm**
- **http://www.indiastudycenter.com/studyguides/sc/objtest/default.asp**

Demo lectures with power point presentations using LCD projector should be arranged to develop programming concepts of the student.

Name of the Course: Digital Logic Design	
Course Code: CST/3/303	**Semester: Third**
Duration:	**Maximum Marks: 100 (Theory) + 50 (practical)**
Teaching Scheme	**Examination Scheme**
Theory: 3 hrs./week	Mid Semester Exam.: 20 Marks
Tutorial: hrs./week	Assignment & Quiz: 10(Th.)+25(Pr) Marks
Practical: 2 hrs./week	End Semester Exam.: 70(Th)+25(Pr) Marks
Credit: 3+1	
Aim: To understand Digital electronics and able to design digital circuit and to understand A/D and D/A converter	
Sl. No.	

1.	To study different logic families and number system.
2.	To introduce different logic gates, their Boolean algebra and combinational logic design using those gates.
3.	To learn how to design sequential logic using flip flop. To study different A/D and D/A converters
Objective: Student will be able to	
Sl. No.	
1.	Design simple logic circuits.
2.	Assemble logic circuits.
3.	Test the logic circuits.
4.	Observe outputs of logic circuits
5.	Troubleshoot digital circuits.
6.	Use A/D and D/A converters.
7.	Design and verify Sequential circuit.

Pre-Requisite:	
Sl. No.	
1.	Basic knowledge of Basic electronics is helpful.

Contents (Theory)		Hrs./Unit	Marks
Unit: 1 Name of the Topics: Introduction to digital electronics, Boolean algebra, Number system and codes.	1.1 Concept of logic 1.2 Advantages and Disadvantages of Digital circuits 1.3 Introduction to digital ICs, Characteristics of digital ICs 1.4 Logic families comparison of TTL, CMOS and ECL logic Families (No circuits) 1.5 Number System - Introduction to Binary, Octal, Decimal, Hexadecimal number system 1.6 Conversion between Number systems 1.7 1's complement and 2's complement and Binary arithmetic (addition, subtraction) 1.8 BCD code, BCD arithmetic (addition, subtraction).	5	
Unit: 2 Name of the Topics: **Logic Gates And Boolean Algebra**	2.1 Logical symbol, logical expression and truth table of AND, OR, NOT, NAND, NOR, EX-OR and EX-NOR gates. 2.2 Universal gates – NAND and NOR gates 2.3 Logical circuits of basic gates using universal Gates. More than 2 input gates by using 2 input gates 2.4 Basic laws of Boolean algebra, Duality theorem, De Morgan's theorem.	5	
Unit: 3 Name of the Topics: **Combinational Logic Design / Circuits**	3.1 Simplification of Boolean expression using Boolean algebra. 3.2 Construction of logical circuits forms Boolean expressions. 3.3 Boolean expressions using Sum of products and product of sums forms.	12	

	3.4 K-map representation of logical functions and minimization (2,3,4 variable). 3.5 Standardization of SOP & POS equations 3.6 Truth table, K-map, Simplified logical expression and logical circuit using basic gates and universal gates of: (a) Half adder and full adder. (b) Half subtractor and full subtractor. Binary parallel adder, adder-subtractor, BCD adder. 3.7 Block diagram, Truth table, Logical expression and logic diagram of Multiplexers (4:1 and 8:1), Multiplexer Cascading and use of Multiplexer in implementation of Boolean function. 3.8 Block diagram and Truth table of Demultiplexer (1:4; 1:8; 1:16). Block diagram and Truth table of Encoders and Decoder. Use of Decoder in implementation of Boolean function. 3.9 Design of different code converter, BCD to 7 segment decoder, Comparator, Parity Checker and Generator		
Unit: 4 Name of the Topics: **Flip Flops And Sequential Logic Design**	4.1 One-bit memory cell, concept of clock signal 4.2 Symbol and Logic diagram using NAND gates, working and truth table of R S flip-flop. 4.3 Symbol and Logic diagram using NAND gates, working, truth table and timing diagram of Clocked R S flip flop. 4.4 Triggering: edge triggering and level triggering 4.5 Symbol and Logic diagram using NAND gates, working, truth table and timing diagram of J-K flip flop. 4.6 Block diagram and truth table of Master slave J-K flip flop. 4.7 Symbol, working and truth table of D- flip flop and T-flip flop. 4.8 Excitation table of different Flip-Flop. Conversion of one Flip-Flop to other. <u>Applications of flip flops</u> 4.9 Concept, Modulus, Working, truth table, timing diagram of a counter. 4.10 Asynchronous counter (3 bit, 4 bit); 4.11 Design of mod N-counter: working, truth table and timing diagram 4.12 3-bit Synchronous counter: working, truth table and timing diagram 4.13 Block diagram, Working, Truth Table and waveforms of Shift register: SISO, SIPO, PISO, PIPO (4-bit) and Universal Shift register (4-bit).	10	
Unit: 5 Name of the Topics: **Memories**	5.1 Classification of memories 5.2 RAM, ROM, PROM, EPROM, EEPROM. 5.3 Circuit diagram using CMOS transistors and	5	

	working of Static and Dynamic RAM.		
Unit: 6 **A-D And D-A Converters**	6.1 Circuit diagram and working of R-2R Ladder DAC and Weighted resistor DAC. 6.2 DAC specifications 6.3 Block diagram and working of Ramp ADC, Dual slope ADC and Successive approximation ADC. 6.4 ADC specification 6.5 Advantages and Disadvantages of various methods.	7	
Total		**15**	

Contents (Practical)

Sl. No.	Skills to be developed
1.	Intellectual Skills: Able to design, test and debug any digital circuit.
2.	Motor Skills: Exposer to Digital world through studying this.

Suggested list of Laboratory Experiments:

Practical

Sl. No.	Laboratory Experiments
1.	Study of Digital IC datasheets and noting down the characteristics for TTL & CMOS logic families. Pin Diagram
2.	Verification of truth table of logic gates.
3.	Implementation of different gates by using Universal gates.
4.	Formation of more than 2 inputs gate by using 2 input gates only.
5.	Construction of Half adder and Full adder.
6.	Construction of Multiplexers.
7.	Construction of code converters/ decoder drivers.
8.	Verification of truth table of Flip flops by using ICs.
9.	Up-down counters by using JK or T flip flops (IC)
10.	Design of registers by using Flip flops.
11.	Use of A to D Converter(by using IC).

**** Any Digital electronics oriented Laboratory experiment can also be done by using PSpice simulation software like Electronics Workbench.**

Suggested list of Assignments / Tutorial:

Text Books:

Name of Authors	Title of the Book	Edition	Name of the Publisher
Kharate	Digital Electronics		Oxford
Mano, Ciletti	Degital Design	5th	Pearson
Salivahanan&Arivazhagan	Digital Circuit & Design		Vikas
SoumitraMandal	Digital Electronics		TMH
A.K.Maini	Digital Electronics		Wiley
Anand Kumar	Fundamentals of Digital Circuits		PHI
R P Jain	Modern Digital Electronics		TMH

P.Raja	Digital Electronics		Scitech
Gupta, singhal	Digital Electronics		Katson Books
Reference Books:			
Name of Authors	Title of the Book	Edition	Name of the Publisher
Floyd	Digital Fundamentals	10^{th}	Pearson
S P Bali	2000 solved problems in Digital Electronics – Sigma series		TMH

Sl. No.	
1.	Question Paper setting tips: **End Semester Examination: Question should be made as per class weight and must cover whole syllabus. Objective Type: 20 marks (answered in one or two sentences. Subjective type: 50 marks. To be set at least 8 question and to be answered 5 questions each carrying 10 marks**

Name of the Course: Computer Engineering Group (**Data structure**)

Course Code: CST/3/304	**Semester: Third**
Duration: Six months	**Maximum Marks:200 (Practical 50+50)**
Teaching Scheme	**Examination Scheme**
Theory: 3 hrs./week	Class Test : 20 Marks
Tutorial: hrs./week	Teachers Assessment: 10 Marks
Practical: 3hrs./week	End Semester Exam.: 70Marks
Credit:3+2	

Aim:

Sl. No.	
1.	To develop skills in selecting or designing and implementing appropriate data structures in developing software to solve problems
2.	To acquaint students with principles of algorithms
3.	To familiarize with control and data structures of C programming language, and abstract data types

Objective:

Sl. No.	Students will able to:
1.	· Write complex applications using structured programming methods.

2.	· Demonstrate understanding of the abstract properties of various data structures such as stacks, queues, lists, and trees.
3.	· Use various data structures effectively in application programs.
4.	· Implement various data structures in more than one manner.
5.	· Compare different implementations of data structures and to recognize the advantages and disadvantages of the different implementations.
6.	· Demonstrate understanding of various sorting algorithms, including bubble sort, insertion sort, selection sort, heap sort and quick-sort. C
7.	· Compare the efficiency of various sorting algorithms in terms of both time and space.
8.	· Program multiple file programs in a manner that allows for reusability of code.
9.	· Trace and code recursive functions.

Pre-Requisite:	
Sl. No.	
1.	Fundamentals of Programming Languages

Contents (Theory)		Hrs./Unit	Marks
Unit:1 Name of the Topics: Fundamentals of Computer	1.1 Data Representation 1.2 Abstract data Types 1.3 Data Structure and Structured Types 1.4 Atomic Type 1.5 Difference between Abstract Data Types, Data Types And Data Structures 1.6 Data Types 1.7 Linear data type 1.8 Non- Linear data type 1.9 Primitive data type 1.10 Non primitive data type 1.11 Refinement Stages	**03**	
Unit: 2	**Principles of programming and Analysis of Algorithms:** 2.1 Algorithms 2.2 Different approaches for designing an algorithm 2.3 Complexity 2.4 Big 'O' Notation 2.5 Algorithm analysis	**02**	
Unit: 3 Name of the Topics: **Introduction to Windows XP/7.**	**Stacks:** 3.1 Introduction to Stacks 3.2 Stacks as an Abstract Data Type 3.3 Primitive operations of stacks 3.3 Representation of Stacks through Arrays 3.4 Representation of Stacks through Linked List 3.5 Application of Stacks 2.6 Stack and Recursion	**04**	
Unit: 4 Name of the Topics: **Use of Office or Open Office**	**Queues:** 4.1 Introduction 4.2 Queue as an Abstract Data Type	04	

	4.3 Representation of Queues 4.4 Operations on queue: Searching, Insertion, Deletion. 4.5 Circular Queues 4.6 Priority Queue 4.7 Application of Queues		
Unit: 5 Name of the Topics: **Introduction to Internet**	**Linked List**: 5.1 Introduction, 5.2 Terminologies Node, Address, Pointer, Information, Next, Null pointer, Empty list etc. 5.3 Operations on list Searching, Insertion and Deletion 5.4 Types of lists Linked list and Circular list 5.5 Reverse and Merging Linked list 5.6 Array stacks, queues, implementation using list.	08	
Unit: 6 Name of the Topics: **Usage of Computers in Various Domains**	**Trees:** 6.1 Introduction to Binary Trees 6.2 Types of Trees 6.3 Basic Definition of Binary Trees 6.4 Operations on Binary Search Tree 6.5 Type of tree Binary, Height balanced and Weight balanced tree 6.6 Operations on trees, 6.7 Searching Depth-first search and Breadth-first search 6.8 Traversing Pre-order, In-order and Post-order 6.9 Insertion, 6.10 Deletion,	08	
Unit: 7	**Graphs:** 7.1 Introduction to Graphs 7.2 Terms Associated with Graphs 6.3 Terminology graph, node (vertices), arcs (edge), directed graph, in-degree, out-degree, adjacent, successor, predecessor, relation, Weight, path, length 7.4 Sequential Representation of Graphs 7.5 Linked Representation of Graphs 7.6 Traversal of Graphs 7.7 Spanning Trees 7.8 Shortest Path 7.9 Application of Graph	**06**	
Unit: 8	**Searching & Sorting:** 8.1 Sorting-An Introduction 8.2 Efficiency of Sorting Algorithms 8.3 Bubble Sort 8.4 Selection Sort 8.5 Quick Sort 8.6 Insertion Sort 8.7 Merge Sort 8.8 Binary Tree Sort 8.9 Radix Sort	08	

	8.10 Shell Sort 8.11 Heap Sort 8.12 Searching-An Introduction, Binary Search.		
Unit: 9	Hashing 9.1 Hash functions 9.2 Deleting items from hash tables	02	
Total		**45**	

Contents (Practical)

Sl. No.	Skills to be developed
1.	Intellectual Skills: · Use of programming language constructs in program implementation. · To be able to apply different logics to solve given problem. · To be able to write program using different implementations for the same problem · Study different types of errors as syntax semantic, fatal, linker & logical · Debugging of programs · Understanding different steps to develop program such as · Problem definition · Analysis · Design of logic · Coding · Testing · Maintenance (Modifications, error corrections, making changes etc.)
2.	Motor Skills:· Proper handling of Computer System**.**

List of Practical:

Sr. No.	Practical
	Programs based on: Array operations, insertion, deletion
	Programs based on Stacks Implementation of PUSH & POP operations, Evaluate postfix expressions, Infix to postfix conversions.
	Recursive programs: factorial, Fibonacci, Ackerman function, and tower of Hanoi.(any two)
	Programs for demonstrating queue operations. one recursive program converted to non-recursive ones
	Programs based on Linked lists
	Programs based on trees Creating a binary tree, in order, pre order and post order traversal of binary tree, deleting a node from binary tree.

	Programs for implementing various sorting techniques. (Minimum three sorting techniques from topics mentioned in the syllabus))
	Programs for implementing various sorting and searching techniques. (Minimum two searching techniques from topics mentioned in the syllabus.)
	Assignments based on graph theory.
	Program based on hashing.

LIST OF SAMPLE PROBLEMS FOR DATA STRUCTURE LAB(for example)

1. To write a program to check whether a word is palindrome or not.
2. To create a two dimensional array of numbers and calculate & display the row & column sum and the grand total.
3. To write a program of matrix multiplication.
4. To write a program to insert (Push) an element into the sack and delete (Pop) an element from the stack using pointer.
5. To write a program to convert an infix expression to a postfix expression.
6. To evaluate a postfix expression.
7. To write a program to insert an element in the queue and delete an element from the queue using pointer.
8. To create a circular queue and add an element and delete an element from a circular queue.
9. To write a program of a structure containing an item name along with the unit price. The user enters the item name and quantity to be purchased. Program print outs total price of item with name using pointer in a structure or array in a structure.
10. To create a single linked list and — (a) insert a node in the list (before header node, in between two nodes, end of the list); (b0 delete a node from the list (1^{st} node, last node, in between two nodes); (c) Concatenate two lists.
11. To create a doubly linked list and — (a) insert a node in the list (before header node, in between two nodes, end of the list); (b) delete a node from the list (1^{st} node, last node, in between two nodes); (c) Concatenate two lists.
12. To create a circular linked list and insert & delete an element from the list.
13. Write a program to merge two shorted linked list.
14. Write a program to reverse a linked list.
15. To write a program to calculate the binomial co-efficient of ${}_nC^r$ of two numbers using recursive function. Also write the same program using function in non-recursive way.
16. To write a program to generate Fibonacci Series using recursive function. Also write the same program using function in non-recursive way.
17. To write a program to sort a list of numbers using — (i) Heap Sort, (b) Quick Sort, (c) Bubble Sort.
18. To write a program to sort a list of numbers using — (i) Insertion Sort, (b) Merge Sort, (c) Radix Sort.
19. To write a program to create a binary tree and traverse it in pre-order and post-order form.
20. To write a program to create a binary search tree and — (a) insert a new node in the BST, (b) search a node in the BST, (c) delete a node from the BST.

———

Text Books:

Name of Authors	Title of the Book	Edition	Name of the Publisher
ReemaThareja	Data Structures Using C		OXFORD
A.K.Sharma	Data Structures Using C		PEARSON
DebasisSamanta	Classic Data Structures	2^{nd}	PHI

Lipschutz	Data Structure		TMH
Tenenbaum, Langsam&Augenstein	Data Structures Using C		PEARSON
Horowitz, Sahni	Fundamentals of data Structures		University Press
Prof. P.S Deshpande Prof. O.G. Kakde	C & Data Structures		Dreamtech PRESS
Udit Agarwal	Data Structures Using C		Katson Books
Goyal, Kumar	A Simplified Approach to Data Structure		SPD
Nag	Data Structure and algorithms using C		Vikas
Dr.A.Bhowmick	Data Structure & Algorithm		Schand
A. K. Rath, A. K. Jagadev	Data Structures Using C	2nd	SCITECH
Reference Books:			
Name of Authors	Title of the Book	Edition	Name of the Publisher
Kumar & Paul	Data Structure and algorithm		JBBL
Tremblie and Sorrenson	An Introduction To Data Structure With Application		TMH Publications

Suggested list of Assignments / Tutorial:	
Sl. No.	Topic on which tutorial is to be conducted
1.	Analyze designed algorithm
2.	Study of dynamic & static Memory allocation
3.	Explain linear, non-linear data structure

Note:	
Sl. No.	
1.	Question Paper setting tips: **End Semester Examination: Question should be made as per class weight and must cover whole syllabus. Objective Type: 20 marks (answered in one or two sentences. Subjective type: 50 marks. To be set at least 8 question and to be answered 5 questions each carrying 10 marks**

Name of the Course: Computer Organization and Architecture	
Course Code: CST/3/305	**Semester: Third**
Duration:	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**
Theory: 3 hrs./week	Mid Semester Exam.: 20 Marks
Tutorial: hrs./week	Attendance, Assignment & Quiz: 10 Marks
Practical:	End Semester Exam.: 70 Marks
Credit: 3	

Aim: To understand computer, how it works and its internal structure and to know how to improve the performance of computer by using efficient design issues.

Sl. No.	
1.	To understand the structure and operational concept of computer system.
2.	To learn the how numbers represented in computers and process them.
3.	To understand memory system and access mechanism of IO devices.
4.	To learn pipelining and parallel processing.

Objective: Student will be able to

Sl. No.	
1.	Understand a computer system that has hardware and software components, which controls and makes them useful.
2.	Understand the fixed and floating point number representation in computer.
3.	Understand how arithmetic operation will be performed in computer system.
4.	Gain knowledge on Cache and virtual memory.
5.	To understand Interrupt and DMA access.
6.	Gain knowledge on RISC and CISC architecture.
7.	Understand how pipelining and parallel processing improves the performance of computer system.

Pre-Requisite:

Sl. No.	

1.	Basic knowledge of computer is helpful.
2.	Basic knowledge of number system is helpful
3.	

Contents (Theory)		Hrs./Unit	Marks
Unit: 1 Name of the Topics: Basics of Computer system	1.1 Concept of Von Neumann Architecture and its features. 1.2 Components of Computer system – Structure of CPU, function of Memory unit and IO unit. 1.3 Different generation of Computer system. 1.4 Concept of PC, Laptop, workstation, Server, Super Computer.	3	
Unit: 2 Name of the Topics: **Instruction structure and addressing modes, Number Representation**	2.1 Instruction Format. 0,1,2,3 address instruction. Execution steps of a typical instruction through different parts of CPU and memory. 2.2 Different addressing modes with example. 2.3 Representation of Integers in Computer system. 2.4 Representation of Floating point numbers in computer system. 2.5 Biased exponent, IEEE format for single and double precision numbers.	5	
Unit: 3 Name of the Topics: **Arithmetic**	3.1 Addition/Subtraction unit block diagram and function. 3.2 Multiplication circuit diagram and multiplication of positive numbers. 3.3 Multiplication of negative numbers and Booths algorithm and its flowchart with example. 3.4 Restoring and non-restoring division process with flowchart and example. 3.5 Floating point addition/subtraction algorithm and flowchart (no example).	8	
Unit: 4 Name of the Topics: **Memory and IO devices**	4.1 Memory Hierarchy model and comparison on cost, speed and size. 4.2 Cache memory, Mapping technique, Hit ratio, Replacement algorithm. 4.3 Concept of virtual memory technique, address translation method, TLB. 4.4 Different methods of IO access mechanism 4.5 Programmed IO or Status check IO, Interrupt Mechanism, DMA data transfer, IO processor. 4.6 Different types of interrupt, Priority interrupt, Simultaneous interrupt. 4.7 DMA transfer modes – Burst mode, Cycle stealing mode.	8	
Unit: 5 Name of the Topics: **Control unit design issue**	5.1 Hardwired Control unit design. 5.2 Microprogrammed Control unit design. 5.3 Concept of Horizontal and vertical microprogramming. 5.4 Comparison between hardwired Control unit and microprogrammed control unit.	5	

Unit: 6 Name of the Topics: **RISC, CISC architecture and pipelining**	6.1 Characteristic features of RISC architecture 6.2 Comparison between RISC and CISC. 6.3 Concept of parallel processing and Flynn's Classification 6.4 Concept of instruction pipelining. 6.5 Space-time diagram, Speed-up due to pipelining. 6.6 Running the pipeline with minimum idling. 6.7 RISC architecture and pipelining. 6.8 Different pipeline hazards and their detection and minimization.	12	
Unit: 7 Name of the Topics: **Vector Processing and Array Processor**	7.1 Concept of vector processing. Techniques used in vector processing 7.2 Speed advantage of vector processing. Vector processing instruction format. 7.3 Concept of array processor. 7.4 Different types of array processors.	4	
Total		**45**	

Text Books:

Name of Authors	Title of the Book	Edition	Name of the Publisher
Stallings	Computer Organization and Architecture		Pearson
HWANG	Advanced Computer Architecture (SIE)		TMH
Hamacher, Vranesic, Zaky	Computer Organization	5th	TMH
Rao	Computer System Architecture		PHI
Goyel&Sindwani	Computer Organization with Architecture		Katson
Parhami	Computer Architecture		Oxford
Basu	Computer Organization with Architecture		Vikas
Rajiv Chopra	Adv Computer Architecture		Schand

Reference Books:

Name of Authors	Title of the Book	Edition	Name of the Publisher
Rajaraman&Radhakrishnan	Computer Organization and Architecture		PHI
Mano	Digital Logic an Computer Design		Pearson
Note:			
Sl. No.			

1.

Question Paper setting tips: **End Semester Examination: Question should be made as per class weight and must cover whole syllabus. Objective Type: 20 marks (answered in one or two sentences. Subjective type: 50 marks. To be set at least 8 question and to be answered 5 questions each carrying 10 marks**

Name of the Course: Electronics Devices & Circuits	
Course Code: CST/3/306	**Semester: Third**
Duration:	**Maximum Marks: 100 (Theory) + 50 (practical)**
Teaching Scheme	**Examination Scheme**
Theory: 3 hrs./week	Mid Semester Exam.: 20 Marks
Tutorial: hrs./week	Assignment & Quiz: 10(Th.)+25(Pr) Marks
Practical: 2 hrs./week	End Semester Exam.: 70(Th)+25(Pr) Marks
Credit: 3+1	

Aim:This subject will enable the students to comprehend the concepts and working principle of electronics devices and circuits and their application in electronic system. The knowledge acquired by student will help them to troubleshoot and repair electronic circuits and devices.

Sl. No.	
1.	To study Different Diode and transistor with their Characteristics.
2.	To Rectifier and Power supply.
3.	To learn about OPAMP, timer, SCR, UJT etc.
4.	To know the basics of LED, LCD, photodiode, phototransistor and solar cell.
5.	To understand the basics of ICs.

Objective: Student will be able to

Sl. No.	
1.	Identify the electronics circuit element.
2.	Know the characteristics of different semiconductor devices.
3.	To make simple semiconductor circuit and to test them.
4.	Observe outputs of the circuits
5.	To make rectifier circuits.

Pre-Requisite:

Sl. No.	
1.	Knowledge of Physics (specially semiconductor) is helpful.

Contents (Theory)		Hrs./ Unit	Marks
Unit: 1 Name of the Topics: DIODE	1.1 Elementary idea of ordinary diode, Forward biased and Reverse biased condition, VI characteristics of ordinary diode 1.2 BREAKDOWN:Zener and avalanche – Construction of and operation of Zener diode in reverse biased condition. 1.3	4	

	Characteristics and equivalent circuits, specifications – Simple voltage regulator circuit		
Unit: 2 Name of the Topics: **Bipolar Transistor**	2.1 Construction and operation of NPN and PNP transistors- V-I characteristics, transistor in active, saturation and cut-off-CE, CB, CC configuration and their differences, 2.2 Definitions of current gains and their relationship. I. Concept of Q-point – AC and DC load line – Stabilization and stability factor II. TYPES OF BIASING**:** (a) Base Bias, (b) Collector Feedback Bias, (c) Emitter Feedback Bias, (d) Potential Divider Bias. 2.3 Transistor as simple small signal amplifier & oscillator and their simple applications	7	
Unit: 3 Name of the Topics: **FIELD EFFECT TRANSISTOR**	3.1 Construction, operation and VI characteristics of JFET, pinch-off voltage, drain résistance, transconductance, amplification factor and their relationship 3.2 Enhancement and depletion type MOSFET- concepts of CMOS 3.3 Differences between BJT and JFET	4	
Unit: 4 Name of the Topics: **RECTIFIER & POWER SUPPLY**	4.1 Half-wave and full-wave rectifier, average voltage, rms voltage, efficiency and ripple factor, percentage voltage regulation, 4.2 Function of filter circuits**:** Capacitor input filter, inductive filter, Π type filter – Calculation of ripple factor and average output voltage 4.3 Series and shunt regulator using transistor, IC regulator 4.4 Concept of switch mode power supply 4.5 Block schematic description of uninterrupted power supply.	12	
Unit: 5 Name of the Topics: **OPERATIONAL AMPLIFIER**	5.1 Circuit operation of differential amplifier. 5.2 Introduction to operational amplifier – Inverting and non-inverting mode and their gain calculation – Common mode rejection ratio – Bias current – Offset voltage and current – Slew rate, open loop and closed loop gain – Input and output impedance – Frequency response and virtual ground 5.2 Applications of OPAMP as**:** Adder, Subtractor, Voltage Follower, Integrator, Differentiator, Comparator, Schmitt Trigger	7	
Unit: 6 **TIMER CIRCUITS**	6.1 Principle of operation of electronic timer 6.2 Functional description of internal blocks of timer IC555 6.3 Use of 555 timers in monostable and astable mode 6.4 Principle of operation of digital timer	4	
Unit: 7 **ELEMENTARY IDEA OF UJT & SCR**	7.1 Basic construction and operation of UJT and SCR	2	

Unit: 8 **OPTOELECTRONICS**	8.1 Elementary ideas of LED, LCD, 8.2 Photodiode, Phototransistor and Solar cell and their applications	3	
Unit: 9 I**NTEGRATED CIRCUITS**	9.1 Basic idea of ICs – Classifications: linear and digital ICs, 9.2 SSI, MSI, LSI and VLSI – field of applications	2	
Total		**45**	

Contents (Practical)

Sl. No.	Skills to be developed
1.	Intellectual Skills: Able to design, test and debug SEMICONDUCTOR CIRCUIT.
2.	Motor Skills:Can able to design better semiconductor circuit.

Suggested list of Laboratory Experiments:

Practical

Sl. No.	Laboratory Experiments
1.	To be familiar with the common assembly tools.
2.	To be able to identify the following passive and active circuit elements**:** — diode, transistors, SCR, DIAC, TRIAC, LED, LCD, photodiode, phototransistors, ICs etc.
3.	To be familiar with the following basic instruments**:** — Multimeter, oscilloscope, power supply and function generator.
4.	To study the VI characteristics of an ordinary diode and reverse biased Zener diode.
5.	To study the rectifier with and without capacitor filter for**:** (a) half-wave rectifier ;(b) full-wave rectifier; (c) bridge rectifier.
6.	Determination of frequency response characteristics of RC coupled amplifier circuit and calculation of bandwidth, midband gain, input impedance and out-put impedance for**:** (a) single stage amplifier; (b) double stage amplifier
7.	To study the following applications of op-amp using IC741**:** (a) adder; (b) subtractor; (c) differentiator (d) integrator; and, (e) voltage follower.
8.	To study the characteristics of IC555 timer connected as**:** (a) astablemulti-vibrator; (b) monostablemulti-vibrator.

**** Any Electronics oriented Laboratory experiment can also be done by using PSpice simulation software like Electronics Workbench or Open Source software.**

Suggested list of Assignments / Tutorial:

Text Books:

Name of Authors	Title of the Book	Edition	Name of the Publisher
Boylestad&Nashalsky	Electronic Devices and Circuit Theory	10th	Pearson
Salivanan	Electronic Devices and Circuits		TMH
Floyd	Electronic Devices	7th	Pearson
Bell	Electronic Devices and Circuits		OXFORD
Maini& Agarwal	Electronic Devices and Circuits		WILEY
Malvino	Electronic Principles		TMH
Nagrath	Electronic Devices and Circuits		PHI

Bogart, Beasley & Rico	Electronic Devices and Circuits	6th	Pearson
Floyd &Buchla	Fundamentals of Analog Circuit	2nd	Pearson
Reference Books:			
Name of Authors	Title of the Book	Edition	Name of the Publisher
Singh & Singh	Electronic Devices and Circuits	2nd	Pearson
Chattopadhayay	Analog Electronics		Knowledge Kit Publication

Note:	
Sl. No.	
1.	Question Paper setting tips: **End Semester Examination: Question should be made as per class weight and must cover whole syllabus. Objective Type: 20 marks (answered in one or two sentences. Subjective type: 50 marks. To be set at least 8 question and to be answered 5 questions each carrying 10 marks**

**** For All Theoretical SubjectMarks of End Semester Examination will be distributed as – 20 (Objectives- Answer should be given with explanation and avoid fill in the blank type questions) + 50 (Subjective – covering whole syllabus properly).**

Name of the Course : Professional Practice-I (PC Maintenance)		
Course Code: CST/3/PP-I		**Semester: Third**
Duration: Six Months		**Maximum Marks:50**
Teaching Scheme:		**Examination Scheme:**
Practical/ Sessional: 2Hrs/week		Practical / Sessional : 50 (Internal)
Credit: 2		
Aim of the Course:		
S. No.	**Aims about**	
1.	To do the maintenance of the Computer, peripherals and its add-on cards.	
2.	To understand basic working of the computer motherboard, peripherals and add-on cards	
3.	To select the proper peripheral as per their specification and requirement.	
Objective of the course:		
S. No.	The students will be able to -	
1.	Debug and repair the faults in system.	
2.	Assemble the system.	
3.	Load the operating system and device drivers in the system.	
Pre-Requisites -		
S. No.		
1.	Computer software and elementary hardware knowledge.	
2.	PC configuration and setup, quality requirement	
3.	Personal computer hardware troubleshooting.	

Practical / Sessional Works

Skills to be developed**:**

Intellectual skills:

- Understanding basic hardware of computer.
- Fault finding of input/output devices.
- Troubleshooting of input/output devices.
- Proper connection of input / output devices.

Motor Skills:

- Proper handling of Computer System hardware**.**

A sample List of Practical / Sessional works to be done)

S. No.	Specific problem(s) related with practical / Sessional work	Skill area
01	Drawing the motherboard layout of Pentium IV and studying the chipset through data books or Internet.	Perception
02	CMOS setup of Pentium.	BIOS
03	Hard Disk Partitioning.	Logical Storage
04	Study of HDD: Identify various components of HDD and write their functions.	Storage Devices
05	Study and installation of any one display cards: VGA or SVGA display cards.	Display devices & Driver
06	Installation of Scanner, Printers and Modems.	Different accessories
07	Study of SMPS (ATX)	Power Supply
08	Assembling and disassembling of Personal Computer	Operational ability
09	Study of Diagnostic Software's. (Any one)	Applications
10	Fault findings:	Fault detection

	(a) Problems related to monitor. (b) Problems related to CPU.	and correction

S. No.	Specific problem(s) related with practical / Sessional work	Skill area
11	Installation of Operating System.	Installation
12	Configuration of Client and Server PC, Laptop and Network components.	Execution
13	RS232C communication between two computers.	Networking

Text Books:

Name of Authors	Titles of the Book	Edition	Name of the Publisher
Mike Meyers,Scott Jernigan	Managing &Troubleshooting PCs		Tata McGraw Hill
Bigelow	Bigelow's Troubleshooting, Maintaining & Repairing PCs		Tata McGraw Hill
Mark Minasi	The Complete PC Upgrade & Maintenance Guide		Wiley
Scott Muller	Upgrading & Repairing PC		Techmedia
Gupta	Comdex Hardware & Networking Course Kit		Dreamtech
James	Computer Hardware: Installation, Interfacing, Trouble Shooting and Maintenance		PHI
Dr.SachinKadam	Computer Architecture and Maintenance		SPD

**** During Internal Examination all departmental Lecturers should be present.**