Course Name : **Bachelor of Science**
 Discipline   : **Computer Science**
(Those who join in June 2022 and after)
COURSE OBJECTIVES:

The syllabus for B.Sc. Computer Science degree under semester system has been designed on the basis of Choice Based Credit System, (CBCS) which would focus on job oriented programmes and Value Added Education.

To promote the students to understand the basic knowledge in the field of Computer Science, to train them in writing Programs in different Computer Languages and prepare the students to fulfill the need of the IT industry. To encourage the aspiring students for higher education

ELIGIBILITY FOR ADMISSION:

Candidate should have passed the Higher Secondary Examination conducted by the Board of Higher Secondary Education, Govt. of Tamil Nadu or any other Examinations accepted by the syndicate as equivalent there to with Mathematics / Computer Science as one of the Subjects.

DURATION OF THE COURSE: Three Years

COURSE SCHEME:

Semester	Part	Subject	Hrs	Cr	Int+Ext= Total	Local	Regional	National	Global	Professional Ethics	Gender	Human Values	Environment & Sustainability	Employability	Entrepreneurship	Skill Development	Subject code	Revised/ New/ No Change/ Interchanged. (If revised % of change)
I	Part–I	Tamil/Hindi	6	3	25+75=100		✔					✔					**U22PT11**	
	Part–II	English	6	3	25+75=100				✔	✓		✓					**U22PE11**	
	Part III Core 1	Programming in C	4	4	25+75=100				✔	✓							**U22CSC11**/ U2CSC11	No Change
	Core 2– Lab	LAB: Programming in C	6	3	40+60=100			✔	✔	✓							**U22CSCP11**/ U3CSC1P	No Change
	Core 2	Digital Principles and Applications	4	4	25+75=100					✓							**U22CSC12**	50% change SBE into Core
	Part III Allied 1	Allied: Mathematical Foundation- I	4	4	25+75=100					✓							**U22MAAC11**/ U2MAA1C	No Change
	Part IV SLC	Value Education	-	3	25+75=100				✔			✓					**U22VE11**	
II	Part–I	Tamil/Hindi	6	3	25+75=100		✔					✔					**U22PT21**	
	Part–II	English	6	3	25+75=100				✔	✓		✓					**U22PE21**	
	Part III Core 3	Advanced Programming in C	4	4	25+75=100				✔								**U22CSC21**/ U2CSC21	No Change
	Core 4– Lab	LAB: Advanced Programming in C	6	3	40+60=100				✔	✓							**U22CSCP21**/ U3CSC2P	No Change

Core 4	Computer Organization	4	4	25+75=100			✔	✔							**U22CSC22**	50% change SBE into Core
Part III Allied 2	Allied: Mathematical Foundation- II	4	4	25+75=100			✔	✔							**U22CHAYP21**	No Change
Part IV SLC	Environmental Studies	-	2	25+75=100		✔					✔				**U22ZYS21**	

Year	Part	Subject	Credit	Int=Total	Code
I & II	Part V	NSS/ NCC/ Physical Education – Sports/YRC/RRC	3	100=100	U2NS4/ U2NC4/ U2PS4/ U1YR4/ **U22RR4**

SEMESTER – I
Course I

Course Title : **PROGRAMMING IN C**	Total Hours : 60
Course Code : **U22CSC11**/ U2CSC11	Total Credits : 4

Course Outcomes

COs	CO Statement
CO1	Know the structure of a computer and its functioning. Learn to develop programs through algorithms and flowchart. Know the C character set, constants, variables and data types. Know how variables and constants are used in a C program. Know the various built-in operators, bitwise and special operators, operator precedence and how associative rules are applied. Determine how arithmetic expressions are evaluated.
CO2	Know how the character is read and written using formatted and in unformatted form. Know decision making with different if statement, switch statement and conditional operator. Know the unconditional branching
CO3	Know the purpose of looping. Know the structure and usage of while loop, do loop, and for loop.
CO4	Know about the purpose of array, different types of array and how it is to be used. How to use string variables, strings and different string handling functions and its usage. Know how the arithmetic operations can be used in on strings.
CO5	Know about user defined function and how it is differed from built-in function. Know how the function to be declared, defined and called. Know about scope and life time of variables.

Unit I   12 Hours

Introduction: Components of a computer – concept of Hardware and software – Art of programming through algorithms and flowchart. Overview of C: History of C – Importance of C – Sample programs – Basic structure of C – Programming style – Executing a C program. Constants, variables and Data Types : Introduction – character set – C tokens – keywords and identifiers – constants – variables – Data types – Declaration of variables – Declaration of storage class – Assigning values to variables – defining symbolic constants – constant variable – volatile variable. Operators and expressions: Arithmetic operators – Relational operators – logical operators – Assignment operators – Increment and Decrement operators – Evaluation of expressions – precedence of arithmetic operators – type conversion – operator precedence and associativity.

Unit II   12 Hours

Input and output operations: Reading a character, writing a character – Formatted input, output. Decision Making and Branching : if statement – if…else statement - nesting of if statement – else if ladder – switch statement – question operator – goto statement.

Unit III   12 Hours

Decision Making and Looping : while statement – do statement – for statement.

Unit IV   12 Hours

Array: one dimensional array – declaration – initialization – two dimensional array – dynamic array. Character array and strings : string variables declaration and initialization – reading strings – writing strings – arithmetic operators on strings – string concatenation, comparison – string handling functions – table of strings.

Unit V   12 Hours

User defined functions: need for user defined function – multi function program – function definition – return value – function call, declaration – categories of functions – nesting of functions – recursion – passing array to function – searching and sorting – passing strings to functions – scope, visibility and life time of variables – multifile programs.

Text Books

1. E.Balagurusamy, "Programming in ANSI C", McGraw Hill Education, 8th Edition/2019.
   Unit I Page No.1 – Page No. 99.
   Unit II Page No.100 – Page No. 170
   Unit III Page No.171 – Page No. 211
   Unit IV Page No. 212 – Page No. 290
   Unit IV Page No. 291 – Page No.346

Reference Books

1. Ashok N. Kamthane, Amit Ashok Kamthane, "Programming in C", Pearson, 3rd Edition/2016.
2. Author, "Title of the Book", Publisher's Name, Edition/Year of Publication.

e- Resources

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Course II

Course Title : **LAB: PROGRAMMING IN C**	Total Hours : 90
Course Code : **U22CSCP11/** U3CSC1P	Total Credits : 3

Course Outcomes

COs	CO Statement
CO1	To develop programming skill in assignment statement, decision making statement, loop structure and switch structure
CO2	To develop programming skill in one dimensional array and two dimensional array
CO3	To develop programming skill in string handling and user defined function

   I. Simple Programs

1. Write C programs to find average of three marks, Generate EB Bill, Generate Mark Statement.
2. Write C programs to find greatest of three numbers, Display Multiplication Table for any number.
3. Write C programs to find a number is odd or even, a number is positive or negative.
4. Write C programs to print day of the week, to do four arithmetic operations, and roots of a quadratic equation using **switch()** statement.
5. Write C programs to generate Fibonacci numbers, find Prime numbers in the range of numbers.
6. Write C programs to find value for SIN, COS series, to check a number is adam or not, check a number is Armstrong or not.
7. Write C programs to find sum of digits of a number, reverse a number, check a number is palindrome or not.

II. Programs Using Arrays

1. Write C program to find sum of data in an array and its average
2. Write C program to find biggest and smallest number in an array
3. Write C program to sort the numbers in an array
4. Write a C program to do linear search in an array
5. Write C programs to find number of positive and negative numbers and to find number of odd and even numbers in an array
6. Write C program to add two matrices, subtract two matrices, Transpose of a Matrix.
7. Write C program to multiply two matrices if possible.

III. Programs Using Strings and Functions

1. Write a C program to count number of vowels, consonants and words
2. Write a C program to reverse a string without using built-in function
3. Write a C program to compare two strings, concatenate two strings, copy a string.
4. Write a C program to find smallest of three numbers – Use user defined function
5. Write a C program to find NcR – Use function
6. Write a C program to find nth Fibonacci number using user defined function
7. Write a C program to search a number in an array – use user defined function
8. Write C programs to find factorial, GCD, nth Fibonacci using recursive function
9. Write C program to find string is palindrome or not using User defined function.

Course III

Course Title : **DIGITAL PRINCIPLES AND APPLICATIONS**	Total Hours : 60
Course Code : **U22CSC12**	Total Credits : 4

Course Outcomes

COs	CO Statement
CO1	To understand number systems , codes and conversion as well as logic gates
CO2	To facilitate understanding of Boolean simplification in logic circuit design
CO3	To know the applications of different combinational logic circuits
CO4	To understand the logic circuit Adder and binary level arithmetic manipulation
CO5	To know the basic operation of Flip Flop and design of sequential logic circuits using it.

Unit I 12 Hours

Digital Logic: Binary Number System –Fractions-Octal Number System- Hexadecimal Number System – ASCII - Excess 3- Gray codes - Basic Gates – Boolean algebra – NOR Gates – NAND Gates.

Unit II 12 Hours

Boolean Simplifications: Boolean Laws and Theorems – Sum of Products Methods – Truth Table to Karnaugh Map – Pairs, Quads and Octets – Karnaugh Simplification (SOP Method) - Don't care conditions - Product of Sums method.

Unit III 12 Hours

Data Processing Circuits: Multiplexers – De Multiplexers - Decoders –BCD to Decimal Decoder – Seven Segment Decoder - Encoders – Exclusive OR Gates – Parity Generators and Checkers – Magnitude Comparator.

Unit IV 12 Hours

        Arithmetic Circuits: Binary Addition – Binary Subtraction – Sign-Magnitude – 1's Complement, 2's Complement representation –1's Complement Arithmetic – 2's Complement Arithmetic – Arithmetic Building Blocks – The Adder/Subtracter.

Unit V 12 Hours

        Flip Flops: RS Flip Flops- D Flip Flops –Flip Flop Timing - JK Flip Flops – JK Master Slave Flip Flops – Types of Shift Registers – Serial In Serial Out – Serial In Parallel Out – Asynchronous counters –Synchronous Counters- Mod Counters.

Text Book:
P.Leach, Albert Paul Malvino, Goutan Saha, "Digital Principles and Applications" , Donald Mc Graw Hill, 8th Edition, .
UNIT I – Chapters - 5.1 to 5.10 & 2.1 to 2.2
UNIT II – Chapters – 3.1 to 3.8
UNIT III – Chapters – 4.1 to 4.9
UNIT IV – Chapters – 6.1 to 6.8
UNIT V – Chapters – 8.1 to 8.8, 9.1 to 9.3 & 10.1 to 10.3
Reference Book: Roger L. Tokheim, "Digital Electronics: principles and applications", Mc Graw Hill, 1998.

Course IV

Course Title : **MATHEMATICAL FOUNDATIONS I**	Total Hours : 60
Course Code : **U22MAAC11**/ U2MAA1C	Total Credits : 4

COs	CO Statement
CO1	Able to apply the rules of propositional logic and rules of inference in verifying the validity of an argument or set of statements.
CO2	Well versed in using graph models for several problems in Science and Engineering such as Networks analysis, Scheduling problem, social networks, etc., to get solutions.
CO3	Well equipped in solving problems which are in recursive nature by the methods of recurrence relation.
CO4	Able to use / develop suitable algorithms for finding various closures of a relation which are vital in the field of networks.
CO5	Potential enough to use the concept of eigen values and eigen vectors in communication networks, designing, manufacturing, image processing and so on.

Unit I 12 Hours

        The Foundations: Logic and Proofs: Propositional Logic – Applications of propositional logic – propositional equivalences – (Exclude propositional satisfiability, applications of satisfiability, solving satisfiability problems, and its related problems) – Predicates and QUANTIFIERS – Rules of inference.

Unit II   12 Hours

Relations: Relations and their properties – representing relations – closures of relations – partial orderings (Theorems statement only; exclude lexicographic ordering – exclude lattices).

Unit III   12 Hours

Counting: The basic of counting – The pigeonhole principle – permutation and combinations – Applications of recurrence relations – solving recurrence relations – divide and conquer   algorithms and recurrence relations (All theorems and results statement only).

Unit IV   12 Hours

Graphs: Graphs and Graph models, (Excluding biological networks; Tournaments; all its related examples and problems) – Graph terminology and special types of graphs – representing graphs and graph isomorphism – connectivity (paths – connectedness in undirected graphs – paths and isomorphism – counting paths between vertices) – shortest path problems.

Unit V   12 Hours

Matrices: Introduction – operations – inverse – Rank of a Matrix, solution of simultaneous linear equations – Eigen values and Eigen vectors.

Text Book:
1. .Kenneth.H Rosen, *"Discrete Mathematics and its Applications" , Mc Graw Hill, , .*
2. *M.Venkatraman, N.Sridharan, N.Chandrasekaran, "Discrete Mathematics", The National publishing Company, 2009.*

UNIT I – Text Book 1 - Chapter 1 Sections : 1.1 - 1.4, 1.6
UNIT II – Text Book 1 - Chapter 9 Sections : 9.1, 9.3 - 9.6
UNIT III – Text Book 1 - Chapter 6 Sections : 6.1 - 6.3. Chapter 8 Sections : 8.1 – 8.3 (pages 527- 529 only). (Exclude algorithms and relations on page 507 and its related problems.
UNIT IV – Text Book 1 - Chapter 10 Sections : 10.1 - 10.4, 10.6.
UNIT V – Text Book 2 - Chapter 6 Sections : 6.1 - 6.5, 6.7.

SEMESTER - II
Course V

Course Title : **ADVANCED PROGRAMMING IN C**	Total Hours : 60
Course Code : **U22CSC21**/ U2CSC21	Total Credits : 4

Course Outcomes

COs	CO Statement
CO1	Know how the structures are used in C Language. Know how the members of the structures are accessed. Know how structure is stored in an array and accessed. Know the Union and how its members are accessed and stored in the memory.
CO2	Know the concept of pointer, how it is used in a program, array, functions and structures.
CO3	Know what is File, why do we need?, Know the usage of sequential file and random file and how it can be accessed.
CO4	Know about dynamic memory allocation and its usage. Know the linked list concept and how it is implemented.
CO5	Know about pre-processor, macro substitution, file inclusion, compiler control directives and pre-processor directives. Know bitwise logical operators, shift operators, ones complement operator, masking and how it is used in programming

Unit I   12 Hours

Structures and Unions: defining and declaring a structure – accessing member-initialization – copying and comparing – operations on members – arrays of structures – arrays within structures – structures within structures – structures in function – Union – size of structures – bit fields.

Unit II   12 Hours

Pointers: Introduction – declaring a pointer – accessing the address of a variable – accessing a variable through pointer – chain of pointers – pointer expression – pointer increments and scale pointer – pointer and arrays – pointer and character strings – array of pointers – function that return multiple values – pointers as function arguments – function returning pointers – pointer to function – pointers and functions – pointers and structures.

Unit III   12 Hours

File Management: Introduction – defining and opening a File – closing a File – I/O operations on Files – Random Access File – command line argument.

Unit IV   12 Hours

Dynamic Memory Allocation and Linked Lists: Introduction – Allocating a block of memory , multiple block of memory – releasing the used space – Altering the size of a block – linked list concepts, advantages - creation – insertion – deletion – application.

Unit V   12 Hours

Preprocessor: Introduction – Macro substitution – file inclusion – compiler control directives – Bit level programming : bitwise logical operators - bitwise shift operators – 1's complement operator - Masking.

Text Books
1. E.Balagurusamy, "Programming in ANSI C", McGraw Hill Education, 8th Edition/2019.
   Unit I Page No.347 – Page No. 380.
   Unit II Page No.381 – Page No. 420
   Unit III Page No.421 – Page No. 444
   Unit IV Page No. 445 – Page No. 480
   Unit IV Page No. 481 –Page No.494, Page No. 511 - Page No.515

Reference Books
2. Ashok N. Kamthane, Amit Ashok Kamthane, "Programming in C", Pearson, 3rd Edition/2016.
3. Author, "Title of the Book", Publisher's Name, Edition/Year of Publication.

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Course Title : **LAB: ADVANCED PROGRAMMING IN C**	Total Hours : 90
Course Code : **U22CSCP21/** U3CSC2P	Total Credits : 3

Course Outcomes

COs	CO Statement
CO1	To get programming practice in structure and structure array
CO2	To get programming practice in Pointer concept
CO3	To get programming practice in FILE concept
CO4	To get programming practice in Dynamic memory usuage

Cycle I : Structure Concepts
1. Write a program to process students marks in an examination – use structure array
2. Write a program to process employee salary – Use structure array
3. Write a program to process inventory of a book shop – Use Structure array
4. Write a program to add two complex numbers - Use structure array
5. Write a program to increment the Time by one second – Use structure

Cycle II : Pointer Concepts
1. Write a program to sum all data in array – use pointer
2. Write a program to find length of a string and reverse the string using pointer
3. Write a program using function to swap two numbers using pointers
4. Write a program using function to compare two integer arrays to find whether they are identical
5. Write a program for a set of students to process exam marks using structure pointer.

Cycle III : File Concepts
1. Write a C program to identify odd and even numbers and kept in a separate files.
2. Write a C program to prepare electricity bill – use FILE
3. Write a C program to prepare inventory report of a book shop - Use FILE
4. Write a program to prepare student mark sheet – Use FILE
5. Write a program to prepare EB bill of consumers – Use FILE

Cycle IV : Dynamic Memory Allocation and Bit Level Programming Concepts
1. Write a C program to store string in a memory buffer and to modify the original buffer size to store large size string – Use Dynamic memory allocation
2. Write a C program to create linked list for storing vowels and to find number of vowels in it
3. Write a C program for insert and delete a number in a linked list which is having numbers in sorted order
4. Write a C program to test a number is odd or even using bitwise AND operator
5. Write a C program to perform addition and multiplication using bitwise operator

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Course VI

Course Title : **COMPUTER ORGANIZATION**	Total Hours : 60
Course Code : **U22CSC22**	Total Credits : 4

Course Outcomes

COs	CO Statement
CO1	Know how the computer operations are specified with register transfer statements and how these are executed with clock pulses. Know about microprogramming and designing control unit.
CO2	Know about how the registers communicate with the ALU, the operations of the memory stack, different instruction formats, addressing modes and RISC
CO3	Know about different arithmetic algorithms implement with digital hardware
CO4	Know about. different peripheral devices and how these devices communicate with each other
CO5	Know about different memory and its need, implementation

Unit I   12 Hours

Basics of Computer Organization: Instruction Codes – Computer Registers – Timing and Control –Hardwired control- Instruction Cycle – Micro programmed control – Control Memory – Address Sequencing

Unit II   12 Hours

Central Processing Unit: Introduction – General Register Organization – Stack Organization – Instruction Formats – Addressing Modes- Program control- RISC.

Unit III   12 Hours

Arithmetic Unit : Introduction – Addition and Subtraction – Multiplication Algorithms - Division Algorithms.

Unit IV   12 Hours

Input – Output Organization: Peripheral devices - I/O Interface – Asynchronous Data Transfer – Modes of Transfer – Priority Interrupt – Direct Memory Access

Unit V   12 Hours

Memory organization: Memory Hierarchy – Main Memory – Auxiliary Memory - Associative Memory – Cache memory – Virtual memory.

Text Book
1. Computer System Architecture – M.Morris Mano & Rajib Mall, Pearson revised 3rd edition, 2022

UNIT I – Chapters - 6.1, 6.2, 6.3, 6.4, 6.5, 8.1, 8.2
UNIT II– Chapters -9.1, 9.2, 9.3, 9.4, 9.5, 9.7, 9.8
UNIT III– Chapters -11.1, 11.2, 11.3, 11.4
UNIT IV– Chapters -12.1, 12.2, 12.3, 12.4, 12.5, 12.6
UNIT V– Chapters -13.1, 13.2, 13.3, 13.4, 13.5, 13.6

Reference Book
1. Computer Organization and Architecture, William Stallings, Pearson 7th Edition.

Course Title : **MATHEMATICAL FOUNDATIONS II**	Total Hours : 60
Course Code : **U22MAAC21** /U4MAA2C	Total Credits : 4

Course Outcomes

COs	CO Statement
CO1	Extract various parameters like mean, median, mode and Standard deviation etc., according to the types of sampled data.
CO2	Pick out more stabled data among various observations by analyzing the factors like standard deviation, correlation coefficient and coefficient of variance.
CO3	Understand the concept of random variables, probability density function, expectation of a random variable and essential properties.
CO4	Able to frame as well as test the hypothesis an hence able to Interpret and demonstrate the behaviour/happening of the population under consideration.
CO5	Apply statistical tools like t-test, F-test for large sample and χ^2–test for small samples to get prediction/details about the population from the samples. Able to help in prediction and formulation of suitable policies in Trading issues, Industry or Commercial problems, economic crisis, Science and engineering related problems.

Unit I   12 Hours
      Introduction to Statistics – Primary and secondary data – classification, tabulation, and diagrammatic representation of statistical data – Bar charts, Pie Diagrams – graphical representation of data – Histograms, Frequency polygon, Ogives.

Unit II   12 Hours
      Measures of dispersion, - characteristics – coefficient of dispersion – coefficient of variation – moments – skewness and kurtosis – Pearson's coefficient of skewness – Powley's coefficient of skewness – coefficient of skewness based on moments.

Unit III   12 Hours
      Simple correlation – Karl pearson coefficient of correlation – correlation coefficient for A bivariate frequency distribution – Rank correlation – regression – lines of regression – properties of regression coefficient.

Unit IV   12 Hours
      Events and sets – sample space – concept of probability – addition and multiplication theorem on probability – conditional probability and independence of events - Baye's theorem – concept of random variable – Mathematical expectation.

Unit V   12 Hours
      Concept of sampling distributions – standard error – Tests of significance based on t, chi square and F distributions with respect to mean, variance.

Text Books
1. S.P.Gupta, "Statistical methods", Sultan Chand & Sons, publication, /2004.
   Unit I   Pages 2-8, 13-19, 40-42, 91-95, 128-138, 143 -145, 164 - 175.
   Unit II Pages 268-270, 283-288, 293-296, 330-331, 334-341 (kelly's coefficient of skewness excluded), 349-352.
   Unit III Pages 386-398, 404 – 411, 439 -442, 447-451.
   Unit IV Pages 758 - 799.
   Unit V Pages 889-894, 910-915, 970-971, 1006-1009.

Reference Books
1. Dr.S.Arumugam, and A.Thangapandi Issac, "Statistics", New Gamma Publications house, 2002.

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Course Name : **Bachelor of Science**

Discipline   : **Computer Science**

(Those who joined in 2018 and after)

COURSE SCHEME:

Semester	Part	Subject	Hour	Credit	Int+Ext =Total	Local	Regional	National	Global	Professional Ethics	Gender	Human Values	Environment & Sustainability	Employability	Entrepreneurship	Skill Development	Subject Code	Revised / New / No Change / Interchanged & Percentage of revision
III	Part I	Tamil /Hindi	6	3	25+75=100		✔					✔					U3PT3/ U1PH3	Revised / 60 %
	Part II	English	6	3	25+75=100				✔	✓		✓					U3PE3	Revised / 90 %
	Part III Core 5	Java Programming	4	4	25+75=100				✔	✓				✓			U3CSC31	Revised / 20 %
	Part III Core 6– Lab	LAB: Programming in Java	6	3	40+60=100			✔	✔	✓				✓			U1CSC3P1/ U2CSC3P	No Change
	Part III Core 7	Data Structures	4	4	25+75=100				✔	✓						✓	U2CSC32	No Change
	Part III Allied 3	Resource Management Techniques	4	4	25+75=100				✔	✓							U2MAA3C	No Change
IV	Part I	Tamil / Hindi	6	3	25+75=100		✔					✔					U2PT4/ U1PH4	Revised / 60 %
	Part II	English	6	3	25+75=100				✔	✓		✓					U3PE4	Revised / 65 %
	Part III Core 8	Advanced Java Programming	4	4	25+75=100				✔	✓				✓			U3CSC41	Revised / 20%
	Part III Core 9– Lab	LAB: Programming in Advanced Java	6	4	40+60=100			✔	✔	✓				✓			U3CSC4P	Revised / 20%
	Part III Core 10	Operating Systems	4	4	25+75=100				✔	✓							U2CSC42	No Change
	Part III Allied 4	Numerical Methods	4	4	25+75=100				✔	✓							U2MAA4C	No Change

SELF LEARNING COURSES

Semester	Course Name	Credit	External Mark = Total Mark	Subject Code
V	Microcontrollers and Embedded System Development in C	5	100 = 100	U1CSSL51
V	Introduction to Python Programming	5	100 = 100	U1CSSL52
V	Software Testing	5	100 = 100	U1CSSL53
V	Internet of Things	5	100 = 100	U1CSSL54

Self-Learning Course

Subject	Semester	Credit	Ext =Tot	Subject Code
Human Rights	IV	5	100 = 100	U1CSL41

Year	Part	Subject	Credit	Int=Total	Code
I & II	Part V	NSS/ NCC/ Physical Education – Sports/YRC/RRC	1	100=100	U2NS4 / U2NC4/ U2PS4 / U1YR4/ U1RR4

SEMESTER III

CORE 5 – JAVA PROGRAMMING

Contact Hours per week : 4   **Subject Code: U3CSC31**

Contact Hours per semester : 60

Objective: The subject helps the students to understand Core Java features and to develop skills regarding.

Uni-1 Introduction : Features of Java Language – Types of Programs – Java Architecture – Literals – Data types – Variables – Structure of Java Program – Comments – Expression and Statements – Type Conversion – Arithmetic Operators – Bitwise Operators – Relational Operators – Logical Operator – Ternary Operator – Operator Precedence.

Unit-2 Control Structure and Arrays: If…else Statement – Switch Statement – while Statement – do…while Statement – for Statement – Break in Loop – One Dimensional Array – Multi Dimensional Array.

Unit-3 Class and Interface: Definition – new operator and objects – dot operator – Method Declaration and Calling – Constructors – Instance Variable – this in Constructor – Method Overloading – Passing Objects as Parameters – Sub Class – Method Overriding – Final Class – Method – Variable – Object destruction – Static Class – Method – Variable – Abstract Class – Package – Import Statement – Access modifier – Interfaces .

Unit-4 String, Wrapper & Exception classes: Number Class – Character Class – Boolean Class – String Class – String Buffer Class – Types Of Exception – Catching Exception – Rethrowing Exception – User Exception – Finally Block – Checked and Unchecked Exceptions.

Unit-5 I/O and Multithreading: I/O Streams – File Class – Byte Stream – Disk File Handling – Memory Handling – Filtered Byte Stream – Random access File – Character Stream – Multithreading – Creations – Thread States – Multithreaded Programming – Thread Priorities – Waiting For Thread – Join Method – Controlling Threads.

Test Book: Programming in Java2, Dr.K.Somasundaram , Publisher : JAICO Publishing House. First Edition, 2013
Unit 1: Chapters 1.2 To 1.4, 2.1 To 2.3, 3.1 To 3.4, 4.1 To 4.6
Unit 2: Chapters 5.1 To 5.7, 6.1, 6.2
Unit 3: Chapters 7.1 To 7.9, 8.1 To 8.9, 9.1 To 9.4
Unit 4: Chapters 10.1 To 10.3, 12.1 To 12.4, 12.6, 12.7, 14.1, 14.2
Unit 5: Chapters 13.1 To 13.6, 13.10, 13.11, 15.1 To 15.7

Ref. Book: Programming with java, E.Balagurusamy TMH, 4th Edition, 2013.
Note : Question Setters are requested to include programming exercises from the text book in addition to theory concepts, in the Summative Examination
[Key concepts, Brief Cases, Review Questions, Debugging & Programming Exercises of each chapter must be read & practiced at home is absolutely necessary to fulfill the objectives. Summer Projects may be assigned to students.]

CORE 6 : LAB: PROGRAMMING IN JAVA

Contact Hours per week   :   6   **Subject Code: U1CSC3P1/U2CSC3P**
Contact Hours per semester : 90
Objectives:
        To develop the skill to write a computer program to solve specified problems using pure object oriented concepts.
   1. Program to compute factorial value of N using command line arguments
   2. Program to find biggest value of an array using command line arguments
   3. Program to calculate sum of two complex numbers using class and objects
   4. Program to calculate Euclidean distance between two co-ordinates using class and objects
   5. Program to find area and volume of a rectangle using single inheritance.
   6. Program to process student's marks using multiple inheritance
   7. Program to check the given string is palindrome or not using String Buffer class
   8. Program to insert integer objects into a vector and compute sum by reading from it
   9. Program to add two complex numbers using package and class concept
   10. Program to compute area of circle using package and interface concept
   11. Program to illustrate unchecked exception
   12. Program to illustrate checked exception
   13. Program to illustrate multithreading by extending Thread class
   14. Program to illustrate multithreading by implementing Runnable interface
   15. Program to copy a text file using character stream class
   16. Program to copy an image using a byte stream class

CORE 7 - DATA STRUCTURES

Contact Hours per week   :   4   **Subject Code: U2CSC32**
Contact Hours per semester : 60

Objectives:

This subject focuses on the concepts, Operations and Applications of different Data Structures namely Array, Linked List, Stack, Queues, Graph and Tree.

UNIT I   **(10 HRS)**

Definitions, Concepts, Overview and Implementation of Data Structures – Arrays: Definition, Terminologies, One-Dimensional Array –   Various operations on Arrays – Application of arrays – Multi-dimensional Arrays: Representation and types- Pointer Arrays.

UNIT II   **(10 HRS)**

Linked List: Definition – Single Linked List: Representations and operations on a Single Linked List – Circular Linked List: Searching and merging operations – Double Linked List: Representation and operations on a Double Linked List.

UNIT III   **(10 HRS)**

Stacks: Definition, Array and Linked List representations, PUSH and POP Operations on Stack – Application of Stack: Evaluation of Arithmetic Expressions – Queues: Definition, Array and Linked List Representations, Insertion and Deletion operations on Queues using array and Linked List representations – Circular Queues: Representation, Insertion and Deletion operations.

UNIT IV   **(10 HRS)**

Tables: Rectangular Tables, Jagged Tables, Inverted Tables – Hash Tables – Hashing Techniques: Division, Mid square, Folding, Digit Analysis methods. Graphs: Terminologies Representations (Set, Linked, Matrix) – Graph Traversals: BFS and DFS traversals on Linked List Representation of Graphs

UNIT V   **(12 HRS)**

Trees: Terminologies, Definitions – Binary Trees: Types, Linear Representation, Linked Representation – Insertion, Deletion, Traversal operations on a Binary Tree (Using sequential and Linked representation) – Expression Tree: Construction and Evaluation operation – Binary Search Tree: Searching data in BST.

Text Book:

Classic Data Structures, Debasis Samanta ,Second Edition, PHI, 2009
        I Unit – Pages: 1-9, 12-33
        II Unit – Pages: 36-60
        III Unit – Pages: 105-121, 153-164
        IV Unit – Pages: 189-198, 416-425, 438-443
        V Unit – Pages: 212-218, 222-228, 230-241, 250-256

Reference Book:

1. Data Structures – Chithra, P.T.Rajan, Vijay Nichole Pvt Ltd, 2006.

ALLIED 3 – RESOURCE MANAGEMENT TECHNIQUES

Contact Hours per week : 4   **Subject Code: U2MAA3C**
Contact Hours per semester : 60

Objectives: To provide the student with the concept of operations research techniques and problem solving in LPP, Simplex method, Primal-dual Simplex method, Assignment and transportation Problem.

Unit-I: **Development of OR-Definition of OR-Modeling**- Characteristics and Phases-Tools, Techniques& Methods-scope of OR.

Unit-II: Linear Programming Problem-Formulation-Slack& surplus variables-Graphical solution of LPP.

Unit-III: **Simplex Method**-Computational Procedure-Big-M method- Concept of duality in LPP-Definition of primal dual problems-General rules for converting any primal into its dual.

Unit-IV: **Duality Theorems** (without proof)- Primal dual correspondence-Duality and Simplex method-Mathematical formulation of assignment problem-Method for soling assignment problem.

Unit-V: **Mathematical formulation of Transportation Problem**-Methods for finding IBFS for the Transportation Problems.

Text Book:
Operations Research, S.D.Sharma, Kedar Nath Ram Nath & Co., Edition 15, 2008
Unit I: Chapter-1(1.1, 1.2, 1.4,1.5,1.8,1.9,1.10,1.11)
Unit II: Chapter-3 (3.1, 3.2, 3.3,3.3.1,3.3.2,3.3.3.,3.3.4,3.4,3.5)
Unit III: Chapter-5 (5.1,5.2,5.2.1,5.3,5.4,5.5.4)
        Chapter- 7 (7.1,7.2,7.3,7.4)
Unit IV: Chapter-7 (7.5) (Statements only); 7.6, 7.7
        Chapter 12 (12.2,12.3,12.4)
Unit V: Chapter-11 (11.2 to 11.8)

Reference Book(s):
1. Operation Research, Nita H.Shah, Ravi M.Gor and Hardik soni,Prentice-Hall of India , Pvt Ltd ,New Delhi 2008.
2. R.Sivarethinamohan, Operation Research, Tata McGraw Hill,2005

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SEMESTER – IV
CORE 8 – ADVANCED JAVA PROGRAMMING

Contact Hours per week: 4   **Subject Code: U3CSC41**
 Contact Hours per semester: 60

Objective: This subject helps the students to understand advanced concepts of JAVA technology such as Applet, Graphics, AWT, Event Handling, Servlet, Networking & RMI and JDBC

UNIT I: **(10 HRS)**
        Applet and Graphics: Applet life cycle, Applet methods, Passing parameters to Applets, getDocumentBase() and getCodeBase(), Using images, Applet interfaces, Difference between Applet and Application Program, Drawing lines and different Shapes, Clipping.

UNIT II: **(15 HRS)**
        AWT and Event Handling: Introduction, Component, Frame, Button class, Layout Management, Insets, Canvas, Label, Text field, Check Box, Check Box Group, Choice, List, Menu, Event handling, Adapter class.

UNIT III: **(14 HRS)**
        Networking and RMI: TCP/IP, UDP/IP, IP Address, DNS, Port, URL, Socket Programming using TCP/IP and UDP/IP, RMI packages, Programming using RMI.

UNIT IV: **(14 HRS)**
        Servlet: Introduction, DHTML, CGI script, Java Servlet, Servlet Container, Servlet Life Cycle, Servlet Interface, Generic Servlet Class, HttpServlet Class, HttpServlet Interface, getOutputStream method, SetHeader() method, parameter passing to servlet, More about Servlet Owner, Java Web Server and Cookies.

UNIT V: **(12 HRS)**
        JDBC: Introduction to SQL, Data Base Connectivity, ODBC, JDBC, JDBC architecture, Connection, ODBC DSN, Statement object, Working with ResultSet.

Text Book: Internet & Java Programming, First edition: 2002, R. Krishnamoorthy and S. Prabhu, Publishers: New Age International, Reprint 2014
UNIT I: Chapters 16 and 17
UNIT II: Chapters 19
UNIT III: Chapters 18 and 21
UNIT IV: Chapters 22
UNIT V: Chapter 23.1 to 23.11
Reference Book: Java Complete Reference, Herbert Schildt, Tata Mc Graw Hill, Edition V, 2007.

CORE 9 LAB: PROGRAMMING IN ADVANCED JAVA

Contact Hours per week : 6   **Subject Code: U3CSC4P**

Contact Hours per semester : 90

Objective: To develop the skill to write a computer program to solve specified problems using advanced features in JAVA

1. I-Cycle: Applet & Graphics

Ex.No	Title
1	a) Illustrate life cycle of the Java Applet b) Display an Image in Java Applet
2	a) Play Music clip in Java Applet b) Passing Parameter from HTML document to Applet
3	a) Display Different Shapes in Java Applet b) Display Polygons using two different ways in Java Applet
4	a) Illustrate Clipping Method in Java Applet b) Display an Alternate Circles Pattern in Java Applet
5	a) Move down the text using Java Applet animation b) Scroll the text using Java Applet animation
6	a) Display Dynamic Colors using Java Applet animation b) Display Digital Clock using Java Applet animation

II-Cycle: AWT & Event Handling

7	a) Sum Of Digits using AWT- Event Handling b) Factorial Calculation using AWT- Event Handling
8	a) Password Verification using AWT- Event Handling b) Simple Calculator using AWT- Event Handling
9	a) Different Shape Display using AWT- Event Handling b) Manipulate Menu Selection using AWT-Event Handling
10	a) Check Box Event using AWT-Event Handling b) Text Box Event using AWT-Event Handling
11	a) Mouse Events using Mouse Listener in AWT-Event Handling b) Mouse Events using Mouse Motion Listener in AWT-Event Handling
12	a) Key Events using Key Listener in AWT-Event Handling b) Window Event using Window Listener in AWT-Event Handling

III- Cycle: Networking & RMI

13   a) Sending and Receiving Single Line of Text using TCP
     b) Sending and Receiving Multiple Lines of Text using TCP
     c) Sending and Receiving a text file using TCP

14   a) Sending and Receiving Single Line of Text using UDP
     b) Sending and Receiving Multiple Lines of Text using UDP
     c) Sending and Receiving a text file using UDP

15   a) Simple Calculator using RMI
     b) Factorial Calculation using RMI
     c) Compare two numbers for equality using RMI

16   a) Length of String using RMI
     b) Compare two Strings for equality using RMI
     c) Reverse the given String using RMI

IV- Cycle: Servlet & JDBC

17   a) Factorial Calculation using GenericServlet
     b) Odd or Even using GenericServlet

18   a) Simple Calculator using Generic Servlet
     b) Book Selection using GenericServlet

19   a) Factorial Calculation using Http Servlet
     b) Odd or Even using Http Servlet

20   a) Simple calculator using Http Servlet
     b) Book Selection using Http Servlet

21   a) Illustration of JDBC using Connection String
     b) Illustration of JDBC using DSN

CORE 10 OPERATING SYSTEMS

Contact Hours per week   : 4   **Subject Code:U2CSC42**
Contact Hours per semester : 60
Objective:
The subject gives exposure to Operating systems concepts and its components at the introductory level.
Unit 1: (1.1, 1.2, 1.12, 1.13, 3.1 to 3.5)
Operating systems introduction - What is an operating system – Operating system component and goals – Operating system architectures – Process introduction - Process states – Process management – Interrupts - Interprocess communication.

Unit 2: (5.1, 5.2.2, 5.2.3, 5.3, 5.4.1, 5.6.1, 5.6.3, 7.5, 7.6, 7.7, 7.8, 7.9, 7.10)
Asynchronous concurrent execution - Critical section – Mutual exclusion primitives – Implementing primitives - Dekker's algorithm – Mutual exclusion with semaphores – Counting semaphores - Four conditions for deadlock – Deadlock solutions – Deadlock prevention – Avoidance – Detection - Recovery.

Unit 3: (8.1 to 8.6, 8.7.1 to 8.7.5)
Processor scheduling – Scheduling levels – Preemptive and non preemptive scheduling – Priorities – Scheduling objectives – Scheduling criteria – Scheduling algorithms – FIFO – RR – SPF – HRRN – SRT.

Unit 4: (9.4, 9.5, 9.6, 9.8, 9.9, 10.2, 10.3, 10.4, 11.2 to 11.5, 11.6.1 to 11.6.6)
Memory hierarchy - Management strategies - Contiguous vs Noncontiguous allocation – Fixed partition multiprogramming –Variable partition multiprogramming – Virtual memory - Block mapping – Paging – Locality – Demand and Anticipatory paging - Page replacement - Replacement strategies.

Unit 5: (12.2 to 12.5, 13.2 to 13.6)
Evolution of secondary storage – Characteristics – Why disk scheduling – Disk scheduling strategies – Data hierarchy – Files – File systems – File organization – File allocation

Text book: *"Operating Systems" by Deitel, Deitel, and Choffnes, Pearson Education, 3rd Edition, 2004.*

Reference Book: *" Operating Systems" by Godbole, TMH 2nd edition, 2005*
" Operating Systems" by Dhamdere, TMH 2nd edition, 2006.

ALLIED 4 – NUMERICAL METHODS

Contact Hours per week : 4   **Subject Code: U2MAA4C**
Contact Hours per semester : 60

Objectives: To give better skills for solving mathematical problems by numerical methods in the area algebraic equation, simultaneous, equations, interpolation, differentiation, integration& differential equations.

Unit-I: **Algebrai and Transcendental Equations**: Errors in numerical computation - Iteration method -Bisection method – Regula Falsi method – Newton Raphson method - Horner's method.

Unit-II: **Simultaneous Equations**: Introduction - Simultaneous equations - Back substitution - Gauss Elimination method - Gauss – Jordan Elimination method - Calculation of Inverse of a matrix - Crout's method - Iterative methods – Gauss - Jacobi Iteration method - Gauss seidal Iteration method - Newton Raphson's method for simultaneous equations.

Unit-III: **Interpolation & Introduction** - Newton's interpolation Formulae - Central difference Interpolation formulae - Gauss forward, Gauss backward, Lagrange's interpolation formulae - Divided differences - Newton's divided difference formula - Inverse Interpolation.

Unit –IV: Numerical Differentiation and Integration: Introduction - Derivates using Newton's forward difference formula - Derivates using Newton's backward difference formula - Numerical Integration - Newton-cotes quadrature formula - Trapezoidal Rule - Simpson's one third rule - Simpson's 3/8 th rule.

Unit-V: Numerical Solution of Ordinary Differential Equations: Introduction - Taylor series method -Picard's method - Euler's method - Runge-kutta method of second, third, fourth order - Predictor & corrector methods - Mile's method.

Text Book:
Numerical Methods, Second Edition, S.Arumugam, A.Thangapandi Issac, A.Somasundaram, SCITECH publications, 2002.
Unit I: Chapter-3

Unit II: Chapter-4 (excluding Relation method and its related problems)

Unit III: Chapter-7 (Sections: 7.0, 7.1, 7.2((i), (ii) and related problems); 7.3,7.4,7.5,7.6)

Unit IV: Chapter-8 (Sections: 8.0,8.1,8.2 related problems,8.5 (excluding Weddles rule, Booles rule, Romberg's method and related problems))

Unit V: Chapter-10 (Sections : 10.0,10.1,10.2,10.3(excluding modified Euler's method & its related problems) 10.4,10.5,10.6)

Course Name : Bachelor of Science
Discipline : Computer Science
(For those who join in June 2018 and after)

Semester	Part	Name of the Subject	Hours	Credit	Int+Ext= Total	Local	Regional	National	Global	Professional Ethics	Gender	Human Values	Environment & Sustainability	Employability	Entrepreneurship	Skill Development	Subject Code	Revised / New / No Change / Interchanged & Percentage of revision
V	Part III Core	Computer Algorithms	4	4	25+75=100				✔	✓							U2CSC51/ U1CSE54	No Change
	Part III Core	LAB: PHP and MYSQL	5	3	40+60=100			✔	✔	✓							U1CSC5P1	No Change
	Part III Core	LAB: Python in Programming	5	3	40+60=100	✔		✔	✔	✓				✓	✓		**U3CSC5P2**	NEW
	Part III Elective	System Software / Computer Networks / Data Mining	5	5	25+75=100				✔	✓				✓	✓		**U2CSE51/** U2CSE52/ U1CSE53	Transfer / No Change / No Change
	Part III Elective	Data Base Management Systems / Information Security / Cloud Computing	5	5	25+75=100				✔	✓							U2CSE54/ U1CSE55/ U2CSE56	No Change
	SBE-3	LAB: Angular JS Programming	2	2	40+60=100			✔	✔	✓				✓	✓		**U2CSS5P1**	New
	SBE-4	Employability Skills	2	2	25+75=100			✔		✓							U1PS51	No Change
	NME 1	LAB: Office Automation	2	2	40+60=100	✔	✔			✓				✓			**U3CSN5P**	New
VI	Part III Core	Software Engineering	4	4	25+75=100				✔	✓							U2CSC61 / U1CSC51	No Change
	Part III Core	Computer Graphics and Digital Image Processing	4	*4*	25+75=100				✔	✓							**U3CSC62**	Change / 60%
	Part III Core	Mobile Computing	5	4	25+75=100				✔	✓				✓			U2CSC63	No Change
	Part III Elective	Project: Software Development	5	5	Internal 100=100				✔	✓				✓		✓	U2CS6PR	No Change
	Part III Core	LAB: Android Programming	6	3	40+60=100	✔		✔	✔	✓				✓	✓		U2CSC6P2/ **U2CSC6P1**	No Change
	SBE-5	LAB: DOT NET Programming	2	2	40+60=100			✔	✔	✓				✓	✓		**U3CSS6P1**	Change (Reduced) / 40%
	SBE-6	LAB: Node JS Programming	2	2	40+60=100			✔	✔	✓				✓	✓		**U2CSS6P2**	New
	NME 2	LAB: Fundamentals of Web Designing	2	2	40+60=100				✔	✓				✓			**U3CSN6P**	New

Self-Learning Courses:

Subject	Credit	Ext =Tot	Subject Code
Microcontrollers and Embedded System Development in C	5	100 = 100	U1CSSL51
Introduction to Python Programming	5	100 = 100	U1CSSL52
Software Testing	5	100 = 100	U1CSSL53
Internet of Things	5	100 = 100	U1CSSL54

SEMESTER V

COMPUTER ALGORITHMS

Contact Hours per week: 4hrs   **Credit: 4**
Contact Hours per semester: 60hrs   **Subject Code: U2CSC51/ U1CSE54**
Objective:
To give training to develop algorithm for solving problems using Divide and Conquer, Greedy, Dynamic Programming, Backtracking and Branch and Bound Techniques.

COURSE OUTCOMES:
       In this course, the students will
CO1: To develop efficient programs in terms of execution time and memory space.
CO2: Analyze the developed programs to compute order of computing time.
CO3: To develop programs based on the Algorithmic techniques namely Divide and conquer, Dynamic programming, Greedy method, Backtracking and Branch and Bound.
CO4: Know the importance of minimizing computing time and how these algorithmic techniques make the program execution faster.

Unit I: **(12 HRS)**
Algorithms: Importance of developing efficient algorithms – Analysis – order – Branch and Bound: Illustrating with 0/1 Knapsack.
Unit II: **(12 HRS)**
Divide and Conquer: Binary Search – Merge sort – divide and conquer approach - Quick Sort – Arithmetic with large numbers – when not to use divide and conquer.
Unit III: **(12 HRS)**
Dynamic Programming: Binomial coefficients – Floyds algorithm for shortest paths – Dynamic programming and optimisation problems – chained matrix multiplication – Optimal binary search tree – The travelling salesperson problem.
Unit IV: **(12 HRS)**
Greedy Approach: Minimum spanning trees – Dijkstra's algorithm for single source shortest path – Scheduling - Huffman code.
Unit V: **(12 HRS)**
Backtracking: The Backtracking techniques - n Queens Problem – Monte carlo algorithm to estimate the efficiency of a backtracking algorithm - Sum of Subsets – Graph Colouring – Hamiltonian circuits
Text Books:
Fundations of Algorithms Using C++ Pseudocode, Third edition, Richard Neapolitan, Kumars Naimipour. Narosa Publication, 2004.

UNIT I   - Chapters – 1 (1.1 to 1.4, 6.1)
UNIT II - Chapters – 2 (2.1 - 2.4, 2.6)
UNIT III - Chapters – 3 (3.1 to 3.6)
UNIT IV - Chapters – 4 (4.1 to 4.4)
UNIT V   - Chapters – 5 (5.1 to 5.6)

Reference Books:
1. Fundamentals of Computer Algorithms, Ellis Horrowitz, Sartaj Sahni, Sanguthevar Rajasekaran, Galgotia publications 2005.
2. Introduction to Algorithms, Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, Prentice Hall of India, 2006.

LAB: PHP and MYSQL
Contact Hours per week: 5hrs   **Credit: 3**
Contact Hours per semester: 75 hrs   **Subject Code: U1CSC5P1**

COURSE OUTCOMES :
In this course, the students will
CO1: To describe the PHP scripting language, and create basic PHP scripts using proper PHP syntax.
CO2: To create elaborate scripts, write HTML forms, and program PHP to handle the form data.
CO3: How to use PHP to create dynamic Web sites that are responsive to users and can alter content based on differing situations.
CO4: Develop the competence to create databases and tables, and sort and retrieve data using SQL and MySQL.
CO5: Understand the usage of PHP and MySQL in dynamic web development.
CO6: Enrich the knowledge of PHP language data types, logic controls, built-in and userdefined functions.
CO7: Make the students learn how to write server-side Web applications.
CO8: Gain the PHP programming skills needed to build interactive, data-driven sites successfully
CO9: Explore working with form data using cookies and sessions.

Objective:
To make the students as web developers by creating a dynamic web page as well as web sites using PHP Scripting language with manipulation of databases
1. Write a program to display three marks of five students in a table
2. Write a PHP program to design a client page to get two numbers and add, subtract, multiply and divide them in server and display
3. Write a PHP program to design a page to get age of a person and display he/she is eligible for vote or not in server page.
4. Write a PHP program to design a client page to get five marks of a student and display total, Average, Grade in server page
5. Write a PHP program to Get 'n' value in the client page and display its factorial value in the server page
6. Write a PHP program to Get 'n' value in the client page and display Fibonacci series in the server page
7. Write a PHP program to Get 'n' value in the client page and display multiplication table of n in the server page.

8. Write a PHP program to Get two text value in client page, done string manipulation and display in server page(Any five functions)
9. Write a PHP program to Get value 'n' in the client page and display Reversed number in the server page
10. Write a PHP program to find Sum of digits
11. Write a PHP program to find Biggest number using Function
12. Write a PHP program to display Book details using Foreach Loop
13. Write a PHP program to display registration Form
14. Write a PHP program to Copy from one file to another file
15. Write a PHP program to Multiples of 7 using REQUIRE
16. SELECT commands in MY-SQL
17. DML/TCL commands in MY-SQL
18. Retrieve and process Employee Pay-bill calculation using PHP & MY-SQL
19. Retrieve and process EB-Bill calculation using PHP & MY-SQL
20. Inventory shop

CORE – LAB: PYTHON IN PROGRAMMING

Contact Hours per week: 5hrs   **Credit :3**
Contact Hours per semester: 75 hrs   **Subject Code:U3CSC5P2**
Course Outcome

Upon completion of the course, students will be able to

CO1	Describe the Numbers, Math functions, Strings, List, Tuples and Dictionaries in Python
CO2	Express different Decision Making statements and Functions
CO3	Interpret Object Oriented Programming in Python
CO4	Understand and summarize different File handling operations
CO5	Understand Mutithreading and Regular expressions Concepts in Python
CO6	Explain how to design GUI Applications in Python and evaluate different database operations
CO7	Design and develop Client Server network applications using Python

LAB LIST

1. Find the sum of two numbers using Command Line argument.
2. Get one number from user, and prints a countdown from that number to zero using While Loop.
3. Find the sum of all the primes for the given range using for loop.
4. Program that accepts a sequence of whitespace separated words as input and prints the words after removing all duplicate words and sorting them alphanumerically
5. String Manipulation
6. Find mean, median, mode for the given set of numbers using list data structure.
7. Compute cumulative product of a list of numbers using function.
8. Demonstrate use of tuple and its related functions.
9. Count the numbers of characters in the string and store them in a dictionary data structure
10. Print the each line of a file in reverse order.
11. Compute the number of characters, words and lines in a file.

12. Retrieving data from a file using regular expression.
13. Retrieving information from HTML file using Regular Expression.
14. Perform two tasks simultaneously using thread.
15. Thread communication using queue
16. Create a GUI for an Expression Calculator using tk.
17. Chatting Program using TCP.
18. File Transfer using FDP.
19. Program to implement DML operations.
20. Retrieving row from a MySQL database table using GUI.

Elective 1 System Software

Contact Hours per week: 5hrs   **Credit: 5**
Contact Hours per semester: 75 hrs   **Subject Code: U2CSE51**
COURSE OUTCOMES:
Upon Completion of the course, students will be able to

CO1	Understand different processor architectures and system-level design processes.
CO2	Design, analyze and implement one pass, two pass or multi pass assembler
CO3	Interpret the design concepts of Loaders and Linkers.
CO4	Attain Knowledge in Macro Processors functions and its features
CO5	Acquire the knowledge of compiler & its features

UNIT I: **(15 Hrs)**
   BACKGROUND: System Software and Machine Architecture – The Simplified Instructional Computer (SIC) – SIC Machine Architecture-SIC/XE Machine Architecture – Traditional Machines – VAX Architecture-Pentium Pro Architecture – RISC Machines – UltraSPARC Architecture-PowerPC Architecture-Cray T3E Architecture.
   OTHER SYSTEM SOFTWARE: Database Management Systems – Basic Concept of a DBMS-Levels of Data Description-Use of a DBMS – Text Editors – Overview of the Editing Process - User Interface - Editor Structure - Interactive Debugging Systems – Debugging Functions and Capabilities - Relationship with other Parts of the System - User-Interface Criteria.

UNIT II: **(15 Hrs)**
   ASSEMBLERS: Basic Assembler Functions – A Simple SIC Assembler – Assembler Algorithm and Data Structures - Machine-Dependent Assembler Features – Instruction Formats and Addressing Modes - Program Relocation - Machine-Independent Assembler Features – Literals - Symbol-Defining Statements - Expressions - Program Blocks - Control Sections and Program Linking - Assembler Design Options – One-Pass Assemblers - Multi-Pass Assemplers.

UNIT III: **(15 Hrs)**
   LOADERS AND LINKERS: Basic Loader Functions – Design of an Absolute Loader - A Simple Bootstrap Loader - Machine-Dependent Loader Features – Relocation - Program Linking - Algorithm and Data Structures for a Linking Loader - Machine-Independent Loader Features – Automatic Library Search - Loader Options - Loader Design Options – Linkage Editors - Dynamic Linking - Bootstrap Loaders.

UNIT IV: **(15 Hrs)**
   MACRO PROCESSORS: Basic Macro Processor Functions – Macro definition and Expansion – Macro Processor Algorithm and Data Structures - Machine-Independent Macro Processor Features – Concatenation of Macro Parameters - Generation of Unique Labels - Conditional Macro Expansion - Keyword Macro Parameters - Macro Processor Design

Options – Recursive Macro Expansion - General-Purpose Macro Processors - Macro Processing within Language Translators.

UNIT V: (15 Hrs)

COMPILERS: Basic Compiler Functions – Grammars - Lexical Analysis - Syntactic Analysis - Code Generation -- Machine-Dependent Compiler Features – Intermediate Form of the Program - Machine-Dependent Code Optimization - Machine-Independent Compiler Features – Structured Variables - Machine-Independent Code Optimization - Storage Allocation - Block-Structured Languages -- Compiler Design Options – Division into Passes – Interpreters – P=Code Compilers – Compiler-Compilers.

TEXT BOOK
1. **"System Software – An Introduction to Systems Programming"** by **Leland L.Beck and D.Manjula**, Pearson Education, Third Edition, 2013.

Unit I	:	Chapter 1 – 1.1 to 1.5,
		Chapter 7 – 7.1 to 7.3
Unit II	:	Chapter 2 – 2.1 to 2.4
Unit III	:	Chapter 3 – 3.1 to 3.4
Unit IV	:	Chapter 4 – 4.1 to 4.3
Unit V	:	Chapter 5 – 5.1 to 5.4

Reference Books:
1. **"Systems programming and Operating Systems"** by **D.M.DHAMDHERE**, Tata McGraw-Hill, Second Revised Edition,1999.
2. **"Systems programming"** by **John J.Donovan**, Tata McGraw-Hill,1972.

Elective 1.1 COMPUTER NETWORKS

Contact Hours per week: 5 HRS   **Subject Code: U2CSE52**
Contact Hours per Semester: 75 HRS   **Credit: 5**
Objective:
The subject helps students to understand the concepts and mechanism of data communications and networking.

COURSE OUTCOMES :
In this course, the students will
CO1: Provide foundation knowledge of Network Hardware and Network Software
CO2: Give an in-depth knowledge about ISO/OSI and TCP/IP protocol stacks
CO3: Classify type of media and IEEE LAN standards
CO4: Present various types of error handling mechanisms
CO5: Gain Knowledge on routing algorithms as well as application layer functions

UNIT I: 15 Hrs
Introduction-Data Communication, Networks, Protocols and Standards, Organizations. Basic Concepts-Line Configuration, Topology, Transmission mode, Categories of Networks.OSI Model-Layered Architecture, Functions of the layers, TCP/IP Protocol suite.
UNIT II: 15 Hrs
Transmission Media Guided Media, Unguided media, Transmissions impairment, Performance Error detection and Correction-Types of errors, Detection, VRC, LRC, CRC, Checksum.

UNIT III: **15 Hrs**
Datalink control-Line discipline, Flow control, Error Control. Local Area Networks-project 802,Ethernet, Token bus, Token Ring**.**

UNIT IV: **15 Hrs**
Networking and Internetworking devices-Repeaters, Bridges, Routers, Gateways, other devices, Routing Algorithms, Distance Vector Routing, Link State Routing. Transport Layer - Duties, Connection,

UNIT V: **15 Hrs**
Session layer – Services, Synchronization points, Presentation layer - Encryption, Decryption and Authentication and Compression. Application layer - FTAM and VT.

Text Books:
Data Communications and Networking (2nd Edition) -Behrouz A. Forouzan, Tata McGraw-Hill Publishers
UNIT I - Chapters1,2,3
UNIT II - Chapters 7, 9.1 to 9.6
UNIT III - Chapters 10,12.1 to 12.5
UNIT IV - Chapters 21, 22.1, 22.2
UNIT V - Chapters 23

Reference Books:
1. 1.Data Communications and Computer Networks, Brijendra Singh. Prentice-Hall of India Pvt Ltd. New Delhi, Second Edition,2007.
2. Computer Networks-A.Tananbaum, Pearson Education Asia, prentice hall India 2007.

Elective 1.3 DATA MINING

Contact Hours per week: 5 Hrs   **Credit: 5**
Contact Hours per semester: 75 Hrs   **Subject Code: U1CSE53**
Objective:
To make the students to explore the abundant data repositories available for developing intelligence and knowledge based systems.

COURSE OUTCOMES :
          In this course, the students will
CO1: Understand the essentials of database and knowledge base.
CO2: Analyze the architecture of data mining and its components educated.
CO3: Inculcate the effective ways of data pre-processing educated to students.
CO4: Make the students know the importance association mining educated to students.
CO5: Learn the essentials of classification mining.
CO6: Impart the knowledge on cluster mining and different clustering techniques.
CO7: Elaborate text mining, spatial mining, web mining etc.

UNIT I   **(15 HRS)**
Introduction: Data mining application – data mining techniques – data mining case studies the future of data mining – data mining software.
Association rules mining: Introduction -Basics-task and a Naive algorithm- Apriori algorithm – improve the efficiency of the Apriori algorithm – mining frequent pattern without candidate generation (FP-growth) – performance evaluation of algorithms.

UNIT II   (15 HRS)

Data warehousing: Introduction – Operational data sources- data warehousing – Data Warehousing design – Guidelines for data warehousing implementation - Data warehousing - Metadata.

Online analytical processing (OLAP): Introduction – OLAP characteristics of OLAP system – Multidimensional view and data cube - Data cube implementation - Data Cube operations OLAP implementation guidelines.

UNIT III   (15 HRS)

Classification: Introduction – decision tree – over fitting and pruning - DT rules - Naïve Bayes method- estimation predictive accuracy of classification methods - other evaluation criteria for classification method – classification software

UNIT IV   (15 HRS)

Cluster analysis: cluster analysis – types of data – computing distances-types of cluster analysis methods - partitioned methods – hierarchical methods – density based methods – Dealing with large databases – quality and validity of cluster analysis methods - cluster analysis software.

UNIT V   (15 HRS)

Web data mining: Introduction- web terminology and characteristics- locality and hierarchy in the web- web content mining-web usage mining- web structure mining – web mining software.

Search engines: Search engines functionality- search engines architecture – Ranking of web pages.

Text Books

Introduction to Data mining with case studies, G.K. Gupta, PHI Private limited,
New Delhi, 2008
Unit I – Chapters 1 & 2
Unit II- Chapters 7 & 8
Unit III – Chapter 3
Unit IV – Chapter 4
Unit V – Chapters 5 & 6

Elective 2.1 DATABASE MANAGEMENT SYSTEMS

Contact Hours per week: 5 Hrs   **Credit: 5**
Contact Hours per semester: 75 Hrs   **Subject Code: U2CSE54**
Objective:

To inculcate the basics of database concepts and its importance in the current world of database dominated systems and technology.

COURSE OUTCOMES :

   In this course, the students will

CO1: Educate the students on the essentials of database and database components.
CO2: The architecture of database and the languages used to maintain DBMS was educated.
CO3: To find the effective ways of modeling a database.
CO4: To recognize the importance of relational data models and its operation educated.
CO5: To acquire the knowledge on relational algebra and relational calculus to know the
      procedural and declarative ways of manipulating of database.
CO6: To enrich the students on functional dependencies and the different ways of
      normalizing a database.
CO7: Create awareness the students on effectively protecting the database by giving
      exposure of on transaction processing, concurring control techniques and database

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security.

CO8: Make the students aware of the fundamentals of database and its effective management.

Unit I: (15 HRS)
Databases and Database Users: Introduction – characteristics of Database approaches – actors on the scene- workers behind the scene- advantages of using the DBMS approach- a brief history of Database applications- when not to use a DBMS.

Database System Concepts and Architectures: Data models, schemas, and instances – Three schema architecture and Data Independence- Database Languages and Interfaces- the Database system environment- centralized and client-server architecture for DBMS- classification of Database Management Systems.

Unit II: (15 HRS)

Data modeling using the entity relationship model : Using high-level conceptual data models for database design- entity type, entity set, attributes and keys-relationship types, relationship sets, roles, structural constraints- weak entity types- refining the ER design for the company database- relationship types of degree higher than two.
The Enhanced Entity Relationship Model (EER): Subclasses, Super classes, and Inheritance-Specialization and Generalizations.

Unit III: (15 HRS)
The Relational Data Model and Relational Database Constraints: relational Model concepts-relational model constraints and relational database schemas.
The Relational Algebra and Relational Calculus: Unary Relational Operations- SELECT and PROJECT- Relational algebra operations from set theory- binary relational operations: JOIN and DIVISION- additional relational operations- Tuple relational calculus- the Domain relational calculus

Unit IV: (15 HRS)
Functional Dependencies and Normalization for Relational Databases: Informal design guidelines for relation schemas- Functional dependencies –normal forms based on primary keys- general definitions of second and third normal forms- Boyce code normal forms.

Unit V: (15 HRS)
Introduction to Transaction Processing concepts and theories: introduction to transaction processing- transaction and system concepts- desirable properties of transactions-characterizing schedules based on recoverability - characterizing schedules based on serializability.
Concurrency control techniques: control techniques- two phase locking techniques for concurrency control – concurrency control based on timestamp ordering.
Database Security: Introduction to database security issues –discretionary access control based on granting and revoking privileges- mandatory access control and role based access control for multilevel security- introduction to statistical database security- introduction to flow control- encryption and public key infrastructure.

Text Book:
Fundamentals of Database Systems - RAMEZ ELMASRI, SHAMKANT B.NAVATHE - Fifth Edition - Pearson Publications, New Delhi-2009.
UNIT I: Chapters 1.1, 1.3 to 1.8, 2.1 to 2.6
UNIT II: Chapters 3.1 to 3.7, 3.9, 4.1,4.1
UNIT III: Chapters 5.1, 5.2, 6.1 to 6.7
UNIT IV: Chapters 10.1 to 10.5
UNIT V: Chapters 17.1 to 17.5, 18.1, 18.2, 23.1 to 23.6

Reference Books:
Database Management Systems - G.K.Gupta - Second Edition - PHI Learning Private Limited, New Delhi-2008.
Database Management concepts - Raghurama Krishnan, Johannes Gehrke - Third Edition - Tata Mc Graw Hill, New Delhi-2009.

Elective 2.3 INFORMATION SECURITY

Contact Hours per week: 5hrs
Contact Hours per semester: 75hrs   **Subject Code: U1CSE55**
Objective:
To continually strengthen and improve the overall capabilities of the information security management system and also increase professional skills in terms of information security management and technology.

COURSE OUTCOMES :
In this course, the students will
CO1: Give the foundation of information security and its underlying technologies
CO2: Provide a wide coverage of the issues and attacks in information security
CO3: Learn how to deal with security analysis and design pertaining to information security
CO4: Enumerate the logical and physical design of information security systems

Unit 1: Introduction to Information Security (IS)   **(15 Hrs)**
History – Security – Information Security – Critical Characteristics – Components of IS – Securing the Components of IS – Life Cycles
Unit 2: Security Investigation   **(15 Hrs)**
Need for Security – Business needs – Threats – Attacks – Legal, Ethical & Professional Issues in IS
Unit 3: Security Analysis   **(15 Hrs)**
Risk Management – Identifying Risks – Risk Assessment – Accessing and Controlling Risks
Unit 4: Logical Design   **(15 Hrs)**
Policies, Standards and Practices – Security Models – Visa Model – Design of Security Architecture – Planning for Continuity
Unit 5: Physical Design   **(15 Hrs)**
Security Technology – Intrusion Detection Systems – Scanning and Analysis Tools – Cryptography and Encryption Based Solutions – Access Control Devices – Physical Security – Security and Personnel
Text Books:
Information Security, S. Sharanya, Charulatha Publications, July 2012
Reference Books:
 1. Scott Barman, "Writing Information Security Policies", Sams Publishing, 2002.
 2. Thomas. R.Peltier, "Information Policies, Procedures and Standards", CRC Press, 2004

Elective 2.2 – CLOUD COMPUTING

Contact Hours per Week: 5 hrs   **Credits: 5**
Contact Hours per Semester: 75 hrs   **Subject Code: U2CSE56**
COURSE OUTCOMES:
  ➢ To understanding cloud computing in different ways.
  ➢ To evaluate cloud based solutions against the time, energy, expense required to leverage them.
  ➢ To gain knowledge about how to access the cloud.
  ➢ To know the future of cloud computing

Unit I   **15 hrs**

Cloud Computing – An Overview: Introduction – History of Cloud Computing – Characteristics of Cloud – Cloud Computing Model. Issues and challenges of Cloud Computing – Advantages, Disadvantages of Cloud computing – Security, Privacy and Trust – Virtualization – Threats to Cloud Computing – Next Generation of Cloud Computing. Cloud Computing Architecture – Introduction – Cloud Architecture - Cloud Computing models – Comparison of Service models – Deployment Models – Identity as a Service.

Unit II   **15 hrs**
Virtualization in Cloud: Introduction – Virtualization – Implementation of Virtualization - Virtualization support at the OS level – Middleware Support for Virtualization - Advantages of Virtualization - Application Virtualization - Virtualization Implementations Techniques – Hardware Virtualization - Types of Virtualization – Load balancing in Cloud Computing - Logical Cloud Computing Model – Virtualization for Data Centre.

Unit III   **15 hrs**
Security Issues and Challenges in Cloud Computing: Introduction – Security Challenges in Cloud Computing – Information Security in Cloud Computing – Security, Privacy and Trust. **Security Management**: Introduction – Security Reference Architecture – Security Issues in Cloud Computing – Classification of Security Issues – Types of Attackers – Security risks in Cloud Computing – Security Threats against cloud Computing – Novel Security Approaches.

Unit IV   **15 hrs**
Web Services: Introduction – Amazon Web Services – Microsoft Azure – Google App Engine. **Data Security and Privacy**: Introduction – Data Security – Privacy.

Unit V   **15 hrs**
Cloud Computing Applications: Introduction – Business Applications – Finance and Banking Application – Cloud Computing in Education.
Mobile Cloud Computing: Introduction – Need of Mobile Cloud Computing – Mobile Computing Architecture – Technologies of MCC – MCC Applications – Issues in MCC – Challenges in Building Applications – Platforms.

Text Book:
Cloud Computing by V.K.Pachghare, PHI Learning Private Limited, 2016.

Unit I   : Chapter 1, 2.
Unit II   : Chapter 3.
Unit III   : Chapter 4, 5.
Unit IV   : Chapter 7, 8.
Unit V   : Chapter 11, 13.

Reference Books:

1. Cloud Computing by A Practical Approach by Anthony T.Velte, Toby J.Velte, Robert Elsenpeter, Tata McGraw-Hill Education Private Limited, New Delhi, 2010 Edition, Fifth Reprint 2011.
2. Cloud Computing Bible by Barrie Sosinsky, Wiley India Private Limited, Reprint 2011

SBE - LAB: AngularJS Programming

Contact Hours per Semester: 26hrs   **Credits: 2**
                                                       Subject Code: U2CSS5P1

Course Outcome

Upon completion of the course, students will be able to

CO1   Implement built-in directives in AngularJS

CO2   Interpret the usage of filters

CO3   Understand the Angular core module

CO4   Build Angular forms

CO5   Create a Custom directives and Custom filters

List of Programs

1. To display hello World Application in AngularJS
2. To implement controller in AngularJS
3. To use $scope Object in AngularJS
4. To implement ng-repeat and ng-init directives in AngularJS
5. To implement ng- model and ng-view directive in AngularJS
6. To develop Custom directives
7. To display the Arithmetic Operations of numbers in AngularJS
8. To implement Arrays in AngularJS
9. To implement the following built in filters
    a. a)Lowercase b)Uppercase c)Number d)JSON and e)Currency
10. To develop custom filters
11. To implement AngularJS Services
12. To display list of Book names and author names in a table format.
13. To create a Forms in AngularJS
14. To implement database in AngularJS

SBE- EMPLOYABILITY SKILLS

Contact Hours per week: 2   **Subject Code: U1PS51**
Contact Hours per Semester: 30   **Credits: 2**
Objectives:
       To enrich the Employability Skills by imparting Reasoning skills, Aptitude skills and General Knowledge.

Unit I : Quantitative Aptitude – Averages, Percentage, Profit & Loss, Ratio & Proportion, Time & Work, Time & Distance, Clock.   **(6-hours)**

Unit II : Quantitative Aptitude –Problems on Ages, Boat & Stream, Simple Interest, Compound Interest, Area, Partnerships.   **(6-hours)**

Unit III: Reasoning   **(6-hours)**
Verbal Reasoning - Analogy, Classification, Series, Coding & Decoding, Blood Relations, Direction Sense Test.

Unit IV: Reasoning   **(6-hours)**
Verbal Reasoning - Number Test, Ranking & Time sequence Test, Alphabet Test, Logical Venn Diagrams.

Unit V: **(6-hours)**
General Knowledge: Abbreviations, Acronyms, Famous Personalities, Important Days, Capital Cities, Currencies, Books and Authors, Inventions.

Reference Books:
1. Verbal & Non Verbal Reasoning   -   R.S.Aggarwal
2. Quantitative Aptitude   -   R.S.Aggarwal
3. Subjective & Objective Quantitative Aptitude   -   R.S.Aggarwal
4. Malayala Manorama Year Book, 2014

NME 1 -LAB: Office Automation

  Hours:26 Hrs.   **Credit: 2**
                                    Subject Code: U3CSN5P

COURSE OUTCOMES:
To impart the Students' the designing skills in preparing documents, worksheets, presentation, and to make them effectively utilize the computer in preparation of documents and reports by giving hands-on experience in lab.
After Completing this course, students are able to

CO1	Manipulate the text using the available option
CO2	Demonstrate the working of advanced features
CO3	Perform calculation based on the user requirements
CO4	Prepare data for the presentations

1. Create a bio data and manipulating a text using MS-Word.
2. Create a document and design a department invitation using formatting option.
3. Create a document and to insert picture in right side and related information in left side using page layout option in MS-Word.
4. Create a text manipulation with scientific notations in MS-Word.
5. Create a class timetable using table option in MS-Word.
6. Create a table along with table formatting options using MS-Word.
7. Write a college invitation letter and merge the draft with student's personal database using mail merge on a letter head MS-Word.
8. Draw a flowchart to find sum of two numbers using drawing toolbars in MS-Word.

9. Create a student personal details using Formatting cell option in MS-Excel.
10. Create a student mark sheet and to find the total and average of each student using formula editor in MS-Excel.
11. Create a student mark sheet and determine rank, class using sorting and filtering function in MS-Excel.
12. Create a worksheet for student mark analysis and prepare the Bar and Pie Charts in MS-Excel.
13. Create a suitable worksheet with necessary information and make out a suitable chart showing gridlines, legends and titles for axes in MS-Excel.
14. Manipulate two worksheet data in a single page in MS-Excel.
15. Create a PowerPoint presentation (five slide minimum) relevant to your course of study or field of work.
16. Create a PowerPoint presentation using various theme and variant.
17. Create a PowerPoint presentation using Pictures and Layouts.
18. Create a PowerPoint presentation using various Slide Transitions and Custom animation.

SEMESTER VI

SOFTWARE ENGINEERING

Contact Hours per week: 4Hrs   **Subject Code: U2CSC61 / U1CSC51**
Contact Hours per Semester: 60Hrs   **Credit: 4**
Objective:
 To make the students to understand the steps in Software Development and Maintenance and to make the students to involve themselves into the activities of Software Engineering in the class room.

COURSE OUTCOMES :
In this course, the students will
CO1: Know the different approaches of developing an efficient software.
CO2: Facilitate the knowledge of technological and managerial aspect of incorporating software.
CO3: Aware the development of process of software.
CO4: Develop the skills in cost estimation.
CO5: Learn how to fulfill good software requirements specification.
CO6: Delineate the ways of designing a software product effectively.
CO7: Understand the different validation and verification techniques of software testing.
CO8: Know the different ways of maintaining software.
CO9: Develop a wholesome approach to define and develop qualitative software.

UNIT I   **(12 HRS)**
Introduction and Planning a Software Project: Definitions-Size Factors-Quality and productivity factors-Defining the Problem-Developing solution strategy-Planning and development Process-Planning the Organizational structure.
UNIT II   **(12 HRS)**
Software Cost estimation: Software Cost Factors-Cost Estimations Techniques-Staffing Level Estimation-Estimating software Maintenance cost.
UNIT III   **(12 HRS)**
Software Requirements Definition: Software Requirement Specification-Formal Specification Techniques-Languages and Processors for Requirements

UNIT IV   (12 HRS)

System Design: Design Concepts-Modules and Modularization criteria-design notations-design Techniques-text plans-design Guidelines.

UNIT V   (12 HRS)

Verification and Validation and Maintenance: Quality assurance-static analysis-Symbolic Execution-Unit testing and Debugging-System Testing-Maintainability during Development-Maintenance Tools and Techniques.

Text Books:

Richard Fairley, Software Engineering Concepts ,TMH,1985,27th Reprint 2008

Unit 1: Chapters - 1.1, 1.2, 1.3, 2.1, 2.2, 2.3, 2.4

Unit 2: Chapters - 3.1, 3.2, 3.3,3.4

Unit 3: Chapters – 4.1, 4.2, 4.3

Unit 4: Chapters - 5.1, 5.2, 5.3, 5.4, 5.7, 5.9

Unit 5: Chapters – 8.1, 8.3, 8.4, 8.5, 8.6, 9.1, 9.5

Reference Books:

1.Software Engineering- K.L.James,Prentice Hall of India Pvt.Ltd,New Delhi-2009.

2.Fundamentals of Software Engineering- Rajib Mall, Prentice Hall of India Pvt Ltd.,New Delhi-2003

Computer Graphics and Digital Image Processing

Contact Hours per Semester: 60 hrs   **Credits: 4**

                                                 Subject Code: U3CSC62

Course Outcome

      Upon completion of the course, students will be able to

CO1	Acquire knowledge in the core concepts of computer graphics
CO2	Understand the various algorithms for drawing output primitives.
CO3	Gain knowledge in the fundamentals of Digital Image Processing
CO4	Examine intensity transformations and spatial filtering.
CO5	Interpret image segmentation and representation techniques.

UNIT I   (12 hrs)

Overview of Graphics Systems: Video Display Devices – Raster and Random Scan Systems – Input Devices – Hard Copy Devices. **Output Primitive:** Points and Lines - Line Drawing Alorithms - Circle Generating Algorithms - Filled-Area Primitives. **Attributes of Output Primitives:** Line Attributes - Curve Attributes - Color and Gray Scale Levels - Area Fill Attibutes - Character Attributes - Bundled Attributes – Inquiry Functions – Anti-aliasing.

UNIT II: (12 HRS)

Two - Dimensional Geometric Transformations: Basic Transformations – Matrix Representations - Composite Transformations - Other Transformations – Transformations between Coordinate Systems.

UNITIII: (12 HRS)

Fundamentals of Digital Image Processing: What is Digital Image Processing? – The Origins of Digital Image Processing – Examples of Fields that Use Digital Image Processing – Fundamental Steps in Digital Image Processing – Components of Image Processing System. **Digital Images Fundamentals:** Image Sampling and Quantization - Basic Relationship between Pixels.

UNIT IV: (12 HRS)

Intensity Transformations and Spatial Filtering: Basic Intensity Transformation Functions – Histogram Processing – Fundamentals of Spatial Filtering – Smoothing (Lowpass) Spatial

Filters - Sharpening (Highpass) Spatial Filters. **Color Image Processing:** Color Fundamentals – Color Models – Pseudocolor Image Processing – Basics of Full-Color Image Processing – Color Transformations - Color Image Smoothing and Sharpening.

UNIT V:(12 HRS)
Image Segmentation: Fundamentals – Points and Line. Edge Models, Basic Edge Detection – Thresholding: Basic of Intensity Thresholding.

Text Books:
1. Computer Graphics - Donald Hearn, M. Pauline Baker, Prentice Hall of India Pvt. Ltd., New Delhi, 2nd edition, 1994
   UNIT I: Chapters 2.1 - 2.3, 2.5, 2.6, 3.1 - 3.2, 3.5 - 3.6, 3.11
   UNIT II: Chapters 4.1 – 4.8
2. Digital Image Processing, Fourth Edition, Rafael Gonzalez and Richard Woods, Pearson, 2018.
   UNIT III: Chapters 1, 2.4-2.5.
   UNIT IV: Chapters 3.1 – 3.6, 6.1 – 6.6
   UNIT V: Chapter 10.1, 10.2 (Detection of Points, Line Detection, Edge Models, Gradient Operators) – 10.3

References:
1. Fundamentals of Computer Graphics, Peter Shirley, Michael Ashikhmin, Second Edition, 2005.
2. Digital Image Processing, An Algorithmic Introduction Using Java, First Edition, Wilhelm Burger and Mark J. Burge, Springer International Edition, 2008.

MOBILE COMPUTING

Contact Hours per week: 5 hrs   **Sub. Code: U2CSC63**
Contact hours per semester: 75 hrs   **Credit : 4**
Objective: The subject enables students in understanding the literature pertaining to the emerging discipline of Mobile computing systems.

COURSE OUTCOMES :
In this course, the students will
CO1: Provide a detailed coverage of mobile computing and communication aspects
CO2: Learn how to treat Mobile transport and network protocols
CO3: Give an exhaustive coverage to MANET and WSN
CO4: Deal with mobile application development as well as types of mobile OS

Unit 1: *Introduction to Mobile Computing and Wireless Networking*   *15 Hrs*
Mobile handsets, wireless communications and server applications – Cell phone system – Types of telecommunication networks – Computer networks – LAN – LAN architectures – Components of wireless communication system – Architecture of mobile telecommunication system – Wireless networking standards – WLANs – Bluetooth technology – What is mobile computing – Mobile computing vs Wireless networking – Mobile computing applications – characteristics – Structure of mobile computing application – Cellular mobile communications – GSM – GPRS – UMTS – Software defined radio
Chapters: (1.1 to 1.11, 2.1 to 2.10)

Unit 2: *Mobile Protocols*   *15 Hrs*
Properties of MAC protocols – Issues of wireless MAC protocol – Taxonomy of MAC protocol – Fixed assignment schemes – Random assignment schemes – Reservation based schemes – 802.11 MAC standard – MAC protocol for Ad Hoc networks – Cognitive radio ad

hoc network – Mobile IP – Packet delivery – Overview – Features of mobile IP – Key mechanism used in mobile IP – Route optimization – DHCP – overview of TCP/IP – TCP in mobile networks

Chapters: (3.1 to 3.9, 4.1 to 4.7, 5.1 and 5.8.3)

Unit 3: *Mobile Ad Hoc Networks*   *15 Hrs*

A few basic concepts – MANET characteristics – MANET Applications – MANET Design issues – Routing – Routing in MANETs – Popular MANET routing protocols – Vehicular Ad Hoc Networks – MANET vs VANET – Security issues in MANET – Attacks on Ad Hoc Networks – Security attack counter measures

Chapters: (7.1 to 7.13)

Unit 4: *Wireless Sensor Networks*   *15 Hrs*

WSN vs MANET – Applications – Architecture of the sensor node – Challenges in the design of effective WSN – Characteristics of Sensor Networks – Wireless sensor network routing protocols – Target coverage – clustered wireless sensor networks.

Chapters: (8.1 to 8.8)

Unit 5: *Mobile operating systems & Mobile application development*   *15 Hrs*

A few basic concepts – Special constraints and requirements of Mobile OS – Survey of commercial mobile operating systems – comparative study of mobile OS – Operating systems for sensor networks - Mobile devices as web clients – WAP – J2ME – Android application development – Applications of M Commerce – B2B Applications – Structure of M Commerce – Pros and Cons of M Commerce

Chapters: (9.1 to 9.5, 10.1 to 10.4, 11.1 to 11.4)

Text Book:

Fundamentals of Mobile Computing by Prasant Kumar Pattnaik & Rajib Mall – EEE PHI second edition 2016

Reference Book:

Mobile Computing by Asoke K Talukder & Roopa R Yavagal – TMH First edition Reprint 2008

Elective: Project: SOFTWARE DEVELOPMENT

Contact Hours per week: 5 hrs   **Sub. Code: U2CS6PR**
Contact hours per semester: 75 hrs   **Credit: 5**

COURSE OUTCOMES :

In this course, the students will

CO1: Train the students to develop projects effectively.

CO2: Give the students an in depth knowledge of developing structured software programming techniques.

CO3: Exposure the students to pointer programming, file based approaches and usage of language structures.

CO4: Give the students the knowledge of developing web designing applications and android based programming applications.

Objective: To train the students to develop software applications in web based and data processing domains. Students have to develop to applications. First one is for webpage development and second one is be done from the theoretical subjects, like, Data Structure, Computer Algorithm, Operating System, Multimedia, Computer Network, and Computer Graphics.

- Students have to undertake projects individually.

- Every student needs to develop two software applications.
- Of these, first one is to be done using PHP/MySql or JSP/Access or .NET/Access environments
- First application must be completed and evaluated for 50 marks at the end of January.
- Second application must be completed and evaluated for 50 marks at the end of March.
- Each application is evaluated with two reviews. PPT presentation is mandatory for second review.
  [Review 1: 10 Marks, Review 2: 10 Marks, Software Completion: 30 Marks: Total: 50 marks]
- Total Marks awarded: 2 X 50 = 100 marks.
- Entire assessment is done on the basis of Internal evaluation only.
- Student needs to score a minimum of 40% mark to pass the subject.

LAB: Android Programming

Contact Hours per week: 6 hrs   **Sub. Code: U2CSC6P2**
Contact hours per semester: 90 hrs   **Credit:3**

COURSE OUTCOMES :
In this course, the students will
CO1: Develop Mobile Application based on open source software.
CO2: Learn to use widgets in linear layout and relative layout.
CO3: Apply style and theme.
CO4: Use menu, submenu and shortcut for the menus.
CO5: Handle Dialog box, toast and status bar.
CO6: Develope app with security feature.
CO7: Use database in the App.

Objective:
   To meet out the current trends of mobile app development.
   Train the students in developing mobile apps using android.
Lab List:
   1. Develop an Android Application to welcome a user.
   2. Develop an Android Application using linear layout.
   3. Develop an Android Application using relative layout.
   4. Develop an Android Application using table layout.
   5. Develop an Android Application using frame layout.
   6. Develop an Android Application using intents.
   7. Develop an Android Application using onClick event.
   8. Develop an Android Application using listview.
   9. Develop an Android Application using option menu.
   10. Develop an Android Application using context sensitive menu.
   11. Develop an Android Application to create new widget.
   12. Develop an Android Application that displays a alert dialog notification.
   13. Develop an Android Application that displays a status bar notification.
   14. Develop an Android Application to add data into SQLite.

SBE – 5 LAB: DOTNET PROGRAMMING

Contact Hours per Semester: 26 hrs **Credits: 2**

Subject Code: U3CSS6P1

Course Outcome

Upon completion of the course, students will be able to

CO1	Design and Create windows programs in VisualBasic.NET programming language
CO2	Work with Visual Basic Forms, Toolbox Controls and Properties
CO3	Use a modern IDE to visually and programmatically create programs with GUI's
CO4	Design and implement applications using an object-oriented methodology
CO5	Use ADO.NET to store data in database and retrieve it.

1. To create login form.
2. To check given number is odd or even and Prime or not.
3. To create function
4. To design simple application using CheckBox, RadioButton, DateTimePicker.
5. Dynamically change the background color using Scrollbar.
6. To Design Digital Clock.
7. To Design menu for arithmetic operation.
8. Transfer items between 2 listboxes (single or all)
9. To implement array operation (insert, length,reverse,sort,indexof)
10. To implement string operation (compare,equal,remove,replace,contain)
11. To implement Stack operation.
12. Student Mark sheet preparation, connect to database and Perform insert,delete, update, select operation

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SBE - 6 LAB: Node JS Programming

Contact Hours per Semester: 26 hrs **Credits: 2**

Subject Code: U2CSS6P2

Course Outcome

Upon completion of the course, students will be able to

CO1	Understand the basics of the frame work
CO2	Use MySQL to store data in a database
CO3	Create Interface to a MongoDB database and a web service
CO4	Build advanced, scalable and high performance web applications

1. Hello World using Node.js
2. Modules in Node.js
3. Require function in Node.js
4. HTTP module in Node.js
5. File system in Node.js
6. Events in Node.js
7. File upload in Node.js
8. Retrieve contents from MySQL in Node..js
9. Create and Sort MongoDB using Node.js
10. Perform Insert, Delete and Update in MongoDB using Node.js
11. Query MongoDB database using Node.js

NME – LAB: Fundamentals of Web Designing

Contact Hours per Semester: 26hrs   **Credits: 2**

Subject Code: U3CSN6P

Course Outcome

Upon completion of the course, students will be able to

CO1	Create basic web pages
CO2	Insert ordered and unordered lists within a web page.
CO3	Insert a graphic within a web page.
CO4	Create a table within a web page.
CO5	Implement a variety of hyperlinks to connect pages.
CO6	Apply CSS styles to some page elements

1. Design a web page for displaying a document using basic html elements
2. Design a web page with <hr> , <div> and heading tags
3. Design a web page for displaying a document using colors and style attribute
4. Design a web page with order and unorder lists.
5. Design a web page with nested lists and marquee tag
6. Design a web page with definition lists.
7. Design a web page with image tag
8. Design a web page with anchor tag
9. Design a web page with basic table tag
10. Design a web page with table tag and row span and col span attributes
11. Design a web page with frame tag
12. Design a web page with basic form elements
13. Design a web page for illustrating Cascading Style Sheets
14. Design a web page for illustrating Embedded Multimedia.

Course Name : **Bachelor of Science**
Discipline   : **Computer Science**
(Those who joined in 2018 and after)
COURSE SCHEME:

SELF LEARNING COURSES

Semester	Course Name	Credit	External Mark = Total Mark	Subject Code
V	Microcontrollers and Embedded System Development in C	5	100 = 100	U1CSSL51
V	Introduction to Python Programming	5	100 = 100	U1CSSL52
V	Software Testing	5	100 = 100	U1CSSL53
V	Internet of Things	5	100 = 100	U1CSSL54

SELF - LEARNING COURSE - 1
Microcontrollers and Embedded System Development in C
Credit: 5   **Subject Code: U1CSSL51**
Total marks 100 (EXTERNAL)
Study Objective: This topic will motivate students to explore on their own about microcontroller programming basics and to design embedded system based applications.
Prerequisite: Knowledge on C language and computer organization.

Unit 1: 8051 Microcontrollers and Internal architecture
Microcontrollers & embedded processors, 8051 family overview, Inside 8051,Program counter and ROM, 8051 flag bits and the PSW register, 8051 register banks and stack.
Unit 2: 8051 Programming in C
Data types, Time delay in 8051, I/O programming in 8051, Logic operations in 8051, Data conversion programs in 8051, Accessing ROM and Data serialization using 8051.
Unit 3: Timer programming in C
8051 timers, programming timers in C, programming counters in C
Unit 4: Serial port programming in C
Basics of serial communication, 8051 connection to RS232, Serial port programming in C
Unit 5: Interrupts programming in C
8051 interrupts, Timer interrupts, external hardware interrupts, serial communication interrupts and all interrupt programming in C
Text book:
The 8051 Microcontroller and Embedded Systems – Using Assembly and C, Second Edition, Prentice Hall. Authors: *Muhammad Ali Mazidi, Janice Gillispie Mazidi & Rolin D. McKinlay.*
Chapters: 1, 2, 7,9,10 & 11. (Excluding Assembly language programming)

SELF - LEARNING COURSE -2
INTRODUCTION TO PYTHON PROGRAMMING

Credit: 5   **Subject Code: U1CSSL52**

Total marks 100(EXTERNAL)

Learning Objectives:

1. To develop logic for Problem Solving.

2. To develop problem solving skills and their implementation through **Python (version: 2.7)**

3. To understand Open Source Software.

Prerequisite: Knowledge on Java and C++ Programming.

Unit I:

Getting Started: Introduction to Python- an interpreted high level language, interactive mode and script mode. **Variables, Expressions and Statements:** Values, Variables and keywords; Operators and Operands in Python: (Arithmetic, relational and logical operators), operator precedence, Expressions and Statements (Assignment statement); Taking input (using raw_input() and input()) and displaying output(print statement);
Putting Comments.

Unit II:

Functions: Importing Modules (entire module or selected objects), invoking built in functions, functions from math module (for e.g. ceil, floor, fabs, exp, log, log10, pow, sqrt, cos, sin, tan, degrees, radians), using random() and randint() functions of random module to generate random numbers, composition. **Defining functions,** invoking functions, passing parameters *(default parameter values, keyword arguments)*, scope of variables, void functions and functions returning values, flow of execution.

Unit III:

Conditional constructs and looping: if else statement While, For (range function), break, continue, else, pass, Nested loops, use of compound expression in conditional constructs and looping

Unit IV:

PROGRAMMING WITH PYTHON: Strings: Creating, initialising and accessing the elements; String operators: +, *, in, not in, range slice [n:m]; Comparing strings using relational operators; String functions & methods: len, capitalize, find, isalnum, isalpha, isdigit, lower, islower, isupper, upper, lstrip, rstrip, isspace, istitile, partition, replace, join, split, count, decode, encode, swapcase, Pattern Matching

Unit V:

Lists: Concept of mutable lists, creating, initializing and accessing the elements, traversing, appending, updating and deleting elements; List operations (joining, list slices); List functions & methods: len, insert, append, extend, sort, remove, reverse, pop **Dictionaries:** Concept of key-value pair, creating, initializing and accessing the elements in a dictionary, traversing, appending, updating and deleting elements. Dictionary functions & Methods: cmp, len, clear(), get(), has_key(), items(), keys(), update(), values(). **Tuples:** Immutable concept, creating, intialising and accessing the elements in a tuple; Tuple functions: cmp(), len(), max(), min(), tuple()

TEXTBOOKS:
1. Open Source: **Python (version: 2.7)**: https://www.python.org/about/gettingstarted/
2**.** A Byte of Python – Swaroop CH (A free book on Programming with Python).

SELF LEARNING COURSE - 3
SOFTWARE TESTING

Credit: 5   **Total Mark: 100**
Subject Code: U1CSSL53

UNIT 1:
        Principles of Testing, Software development life cycle models: phases of software project, quality, quality assurance, quality control - testing, verification, validation - process model to represent different phases - Life cycle models (waterfall, prototyping and rapid application development, spiral and iterative, The V, modified V models).

UNIT 2:
        White box testing: static testing, structural testing, challenges in white box testing. Black box testing: what is black box testing?, why?, when?, how to do black box testing?

UNIT 3:
        Integration Testing: Integration testing as a type of testing – Integration testing as a phase of testing – scenario testing – Defect Bash. System and acceptance testing: why? – functional Vs non functional – functional system testing – non functional testing – acceptance testing – summary of testing.

UNIT 4:
        Performance testing: factors governing – methodology – tools – process for performance testing. Regression testing: what is? - Types – when to do? – How to do ? – Best practices.

UNIT 5:
        Test Metrics and Measurements: what are metrics and measurements? – why mwrtics in testing? – types of metrics – project metrics – progress metrics – productivity metrics – release metrics.

TEXT BOOK :
Software Testing Principles and practices , Srinivasan Desikan, Gopalaswamy ramesh, Pearson Publication, 2016.

SELF - LEARNING COURSE - 4
INTERNET OF THINGS

Credit : 5   **Total Marks : 100**
Subject Code: U1CSSL54

UNIT I: IoT Introduction – Introduction, Features, Advantages & Disadvantages, Embedded devices and system, IoT Eco system and IoT framework

UNIT II: Architecture and Domains
Architecture models, IoT Energy domain, Iot Biometric domain, Security Camera and Door Lock system, Smart home and city, Smart agriculture, Healthcare and transportation, transform Business

UNIT III: IoT Devices
Smart Objects, IoT devi es and IoT boards in market

UNIT IV: IoT platforms
IoT palatform, ThinkWorx platform

UNIT V: Communication Protocols
Data link, Network and Session layer

References :
1. https://www.javatpoint.com/iot-tutorial
2. Internet of Things - Architecture and Design Principles First Edition (English, Paperback, Raj Kamal) Mc Graw Hill publishers
3. Internet of Things with Arduino and Bolt Paperback by Ashwin Pajankar (Author)

Course Name : **Bachelor of Science**
Discipline   : **Computer Science**
(Those who joined in 2018 and after)
COURSE SCHEME:

VALUE ADDED COURSES

Course Name	Internal Mark = Total Mark	Subject Code
HTML, CSS and Java Script	100 = 100	V1CS1
Web Designing With Distribution Packages	100 =100	V1CS2
Big Data Analytics Using R Tool	100 = 100	V1CS3
Office Automation	100 = 100	V1CS4

HTML, CSS and JAVA SCRIPT

Total Hours : 30   Subject code: V1CS1   Internal Marks : 100

HTML
1. A Program to illustrate body, pre and text Font tags
2. A Program to illustrate comment,h1….h6, and div tag
3. A Program to illustrate Order List and Un order List tags
4. A Program to illustrate Nested and Definition tag
5. A Program to illustrate Img and Hyper Link (anchor) tags
6. A Program to illustrate Table tag
7. A Program to illustrate Frame tag
8. A Program to illustrate Form tag
9. A Program to illustrate Embedded Multimedia

CSS
10. A Program to illustrate CSS (cascading style sheet)
11. Add a Cascading Style sheet for designing the web page
12. Design a CSS to create menu.

JAVA SCRIPT
13. To perform all arithmatic operation
14. To search an element in an array of size "n"
15. To illustrate a subroutine
16. To compute the gcd of 2 numbers using function.
17. To find the second largest number in an array.
18. To check whether the given integer is palindrome or not
19. To illustrate different in-built string functions.
20. To illustrate math and date object's predefined methods
21. Design a dynamic web page with validation using javascript

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VALUE ADDED COURSES
WEB DESIGNING WITH DISTRIBUTION PACKAGES

Subject code : V1CS2
Introduction :
     HTML, CSS, PHP   2 hours

 Software and server knowledge :
Dreamweaver, ATOM editor, WAMP   1 hour

HTML vs. PHP :
     Running local server and hosting web page locally 2 hours

Database connection :
     MySQL, connecting database with server   2 hours

Developing a website
     Static websites, dynamic websites, CMS   6 hours

Introduction to distribution packages
     CMS vs. static websites vs. dynamic websites   2 hours

Wordpress
Packages installation and execution   3 hours

Website themes
Customizing the website   2 hours

Distribution packages and plugins
Extending the functionality of packages   2 hours

Drupal
Packages installation and execution   2 hours

Customization
Customizing the drupal package   2 hours

Website Hosting
FTP file transfer, cPanel, live hosting and customization   4 hours

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BIG DATA ANALYTICS USING R TOOL
(Prerequisite: Postgraduate students only)

Subject Code: V1CS3

Contact Hours per Semester: 30hrs

Course Outcome

Upon completion of the course, students will be able to

CO1	Learn about current state of Big Data processing using R programming language and its powerful statistical capabilities
CO2	Understand how to use R
CO3	Import a variety of data formats into R
CO4	Apply regression, clustering, and classification in R
CO5	Explore and visualize data in R

UNIT I: **(4 hrs)**

Introduction to R: What is R? - History of R – Basics of R

UNIT II: **(4 hrs)**

Getting Started with R: Installing R – Importing packages

UNIT III: **(5 hrs)**

Loading and Handling Data in R: Loading data sets in R – Including libraries

UNIT IV: **(5 hrs)**

Exploring Data in R: Data visualization – Data exploration

UNIT V: **(12 hrs)**

Linear Regression using R: Linear regression basics – Data analytics in linear regression model

Logistic Regression using R: Logistic regression basics – Data analytics in logistic regression model

Text Book:

"**Data Analytics using R**", Seema Acharya, McGraw-Hill Education, First Edition, 2018.

Unit I	:	Chapter 1
Unit II	:	Chapter 2
Unit III	:	Chapter 3
Unit IV	:	Chapter 4
Unit V	:	Chapter 5, 6

Reference Book:

1. "**Big Data Analytics with R**," Simon Walkowiak, Packt publications, First[st] Edition,2016.
2. "**Big Data Analytics with R and Hadoop**", Vignesh Prajapati, Packt publications, First Edition, 2013.

VALUE ADDED COURSE
OFFICE AUTOMATION

Total Hours : 30   Subject code:V1CS4

Internal Marks : 100

Course Outcome

Upon completion of the course, students will be able to

CO1	Create a document in Microsoft Word with formatting
CO2	Work effectively with features that affect the page layout of a document
CO3	Use Mail Merge Wizard to perform mail merges
CO4	Set up the chart function of Excel to represent numeric data in multiple formats.
CO5	Format data and Cells
CO6	Create slide presentations that include text, graphics, animation, and transitions.
CO7	Build a new database with related tables.
CO8	Query a database using different methods.

WORD PROCESSING

1. Open a word document to prepare "RESUME" by performing the following operations.
   a) Formatting the text, alignment and font style.
   b) Page setup (margin, alignment, page height and width).
2. Create a word document to prepare an application form for college.
3. Create a student mark sheet using table, find out the total and average marks and display the result.
4. Design an invitation of inauguration function using different fonts, font sizes, bullets and word art/ clip art.
5. Mail merge
   i) Prepare a business letter for more than one company using mail merge.
   ii) Prepare an invitation and to be sent to specify address in the data source.

SPREADSHEET PROCESSING

6. Create a suitable worksheet with student mark information and use data sort to display the results. Also use data filters to answer at least five different criteria.
7. Create a suitable worksheet with necessary information and make out a suitable chart showing gridlines, legends and titles for axes.
8. Prepare salary bill in a worksheet showing Basic pay, DA, HRA, Gross salary, PF, Tax and Net Salary using suitable Excel functions.
9. Create, display and interact with the data using pivot tables and pivot charts of Excel features.

POWERPOINT PROCESSING

10. Create a presentation to explain various aspects of college using auto play
11. Create a presentation to explain the sales performance of a company over a period of five years. Include slides covering the profile of the company, year wise sales and graph with gridlines, legends and title for axes. Use clipart and animation features.

12. Create a presentation from various design templates
13. Prepare a presentation using auto content wizard
14. Create a presentation with the audio and video effect.

DATABASE PROCESSING

15. Create a "Student details" table for storing marks of N students. The fields of the table are: Reg.no., name, mark1, mark2, mark3 , assignment mark, seminar mark. Set the following constrains in the table.
　　i) Set primary key in the Reg.no. field
　　ii) Assignment marks should be of maximum 5
　　iii) Seminar marks should be of maximum 10
16. Create a query for calculating total and average marks in the student table
17. Create a "Book Details" table with the fields book name, author name, price, name of the publisher, year of publication. Prepare the following queries by using this table:
　　i) use "like" function to filter the author names beginning with the letter "A"
　　ii) list those books which are published after the year 2010.
　　iii) Make a new table with the fields author name and book name.