Syllabus for B. Sc. Computer Science (Hons) under CBCS w.e.f. the Academic Year 2016-2017

Semester - I		Credits
Core-1	Programming Fundamentals using C	4
	C Programming Lab	2
Core-2	Computer System Architecture	6
GE-1(Generic Elective)	<From other subject>	
AECC(Ability Enhancement Compulsory Course)	Environmental Studies	2
Semester - II		
Core-3`	Data Structures	4
Core-4	Computer Oriented Numerical Methods	4
	Data Structure & Numerical Lab	2+2
GE-2(Generic Elective)	<From other subject>	
AECC-2(Ability Enhancement Compulsory Course)	MIL Communication	2
Semester - III		
Core-5	Object Oriented Programming in C++	4
	C++ Programming Lab	2
Core-6	Operating Systems	6
Core-7	Computer Networks	6
GE-3(Generic Elective)	<From other subject>	
SEC-1(Skill Enhancement Course)	Communicative English	2
Semester - IV		
Core-8	Discrete Structures	6
Core-9	Software Engineering	6
Core-10	Database Management Systems	4
	Database Lab	2
GE-4(Generic Elective)	<From other subject>	
SEC-2(Skill Enhancement Course)	<From the pool of SEC courses>	2
Semester - V		
Core-11	Internet Technologies	6
Core-12	Java Programming	4
	Java Programming Lab	2
DSE-1 (Discipline Specific Elective) **Any one**	Information Security /Microprocessor	6
DSE-2(Discipline Specific Elective) **Any one**	Artificial Intelligence / Introduction to Data Sciences	6
Semester - VI		
Core-13	Computer Graphics	6

Core-14	Data Warehousing and Data Mining	6
DSE-3(Discipline Specific Elective) **Any one**	Cloud Computing / Digital Image Processing	6
DSE-4(Discipline Specific Elective)	Software Development Project Work	6
	Total	**140**

SEMESTER - I

Core – 1

Programming Fundamentals using C

Unit -1
Overview of Procedure oriented programming, Data types, Defining and Initializing Variables, Scope of Variables,Keywords, Casting of Data Types, Operators (Arithmetic, Relational, and Logical), main() function, Compiling and Executing a program, Using Comments in programs, Character I/O (getc, getchar, putc), printf(), scanf(), Basic Header Files (stdio.h, conio.h, math.h, string.h, etc).

Unit -2
Simple Expressions in C, Understanding precedence of Operators in Expressions, Conditional Statements (IF, IF… ELSE, Nested IF, Switch-Case), Iterative Statements(FOR, WHILE, and DO-WHILE), Use of BREAK and CONTINUE in Loops, Nested loops.

Unit -3
Use of functions, Call by Value, Call by Reference, Functions returning value, Void function,One Dimensional Arrays (Declaring an Array, Initializingan Array, Accessing individual elements in an Array, Manipulating array elements usingloops), Use Various types of arrays (integer, float and character arrays / Strings), Two-dimensional Arrays, Workingwith Rows and Columns of a matrix.

Unit -4
Understanding use of structures, Declaring, initializing and using simplestructures, Manipulating individual members of structures, Array ofStructures, Understanding Pointer Variable, Simple use of Pointers, Pointer arithmetic, Differentiating between static and dynamic memory allocation, use of malloc and calloc functions, Simple file handling operations.

Books:

1. Programming in ANSI C - E. Balguruswamy, TMH
2. Let us C - Yaswant Kanitkar, BPB

C Programming Lab

1. Write a program to find the maximum among three numbers.
2. Write a program to find factorial of a number.
3. Write a program to print the Fibonacci series.
4. Write a program to print the prime numbers between 1 to n.
5. Write a program to check if it a Palindrome (e.g., madam).

6. Write a program to check if it is an Armstrong number. (An Armstrong number of three digits is an integer such that the sum of the cubes of its digits is equal to the number itself)
7. Write program to reverse the digits of an input number.
8. Write a program to find the sum of digits of a number.
9. Write a program to find the GCD and LCM of two numbers.
10. Write a program to perform different arithmetic operations using switch….case.
11. Write a program to count the number bits "1" in a given binary number.
12. Write a program to find the factorial of a number using function.
13. Write a program to perform the arithmetic operations using function.
14. Write a program to find the largest element in an array.
15. Write a program to add two matrices.
16. Write a program to multiply two matrices.
17. Write a program to find the position of a given character in a string.
18. Write a program to count the number of times a character occurs in a string.
19. Write a program to create records of 10 students using structure.
20. Write a program to count the number of words, number of lines in a text file.

Core – 2

Computer System Architecture

Unit -1

Number systems – Decimal, Binary, Octal and Hexa-decimal number systems and their inter conversion, 1's & 2's complement, Binary Fixed- Point Representation, Arithmetic operations on Binary numbers, Overflow & underflow. Logic Gates, AND, OR, NOT gates and their Truth tables, NOR, NAND & XOR gates, Boolean Algebra – Basic Operations and Boolean Law's, Demorgan's theorem.

Unit -2

Sum of Product & Product of Sum, K-Map, Combinational & Sequential circuits, Half Adder & Full Adder, Adder & Subtractor, Multiplexer, De-multiplexer, Encoder, Decoder.

Unit -3

Flip-flops - RS, D, JK & T Flip-flops, Registers, Shift Registers, Counters.

Unit -4

Central Processing Unit: General register organisation, Stack organisation, Instruction Formats, Addressing modes, Memory: Main memory, Auxiliary memory, DMA- control signals for DMA transfers, Block diagram of DMA controller, DMA transfer in a microcomputer system.

Books:

1. Computer System Architecture - M. Mano, Pearson Education
2. Computer Organization, Fifth edition - Carl Hamacher, McGrawHill
3. Digital Design - M. M. Mano, Pearson Education Asia
4. Computer Fundamentals - B. Ram, New Age International Publishers

SEMESTER - II

Core - 3

Data Structures

Unit -1
Primitive and non-primitive data types, Linear and non-linear data structures, Memory representation of Arrays (Single and Multi-dimensional Arrays), Representation of Stack, Queue, and Circular Queue, Insertion and deletion operations on these data structures, Applications of stack and Queue: Evaluation of recursive functions, Job Queues.

Unit -2
Limitations of Array representation, Linked List and its advantages, Representation of Singly, Doubly and Circularly linked Lists, Insertion and deletion operations on these data structures, Link list representation for Stack and Queue, Applications of linked list: Representation of polynomials, Sparse Matrix and its representation using Array and Linked list.

Unit -3
Introduction to Tree as a data structure, Binary Tree: Definition, related terminologies, Memory representation of Binary tree using array and linked list, Operations such as Inorder, Preorder, and Post order Traversals (recursive algorithms only), Binary Search Tree, Threaded Binary Tree (Representation only),Concept of Height-Balanced Tree.

Unit -4
Searching and Sorting techniques: Linear Search, Binary Search, Comparison of Linear and Binary Search, Selection Sort, Bubble sort, Insertion Sort, Comparison of Sorting techniques. Merging of arrays.

Books:

1. Data Structures, Schaume's Outlines, By Lipschutz TMH Publications
2. Data Structures, By Ellis Horowitz, SartajSahani, Galgotia Publications
3. Data Structures using C & C++ By Aaron M. Tenenbaum, YedidyahLangsam PHI

Core - 4

Computer Oriented Numerical Methods

Unit - 1
Errors & Their Accuracy, Solutions of Algebraic and Transcendental Equations, Bisection Method, The method of false position, The iteration method, Newton Raphson method, Generalized Newton's method, Solutions of system of non-linear Equations: The method of iteration, Newton Raphson method.

Unit - 2
Interpolation Errors in polynomial interpolation, Finite Differences Detection of errors by use of difference tables, Differences of a Polynomial, Newton's formulae for interpolation, Central difference interpolation formulae, Guass's Central difference formulae, Interpolation with unevenly spaced points Lagrange's interpolation, Error in Lagrange's interpolation, Divided differences and their properties, Newton's general interpolation formula-interpolation by iteration, inverse interpolation.

Unit - 3
Differentiation and Integration, Numerical Differentiation, Methods based on interpolation, Non-uniform nodal points-Linear interpolation, quadratic interpolation Uniform nodal points-Linear interpolation, quadratic interpolation Methods based on finite differences Numerical Integration Methods based on interpolation-Newton's Cotes methods, Trapezoidal method, Simpson's method,3/8 Simpson's rule, open type integration rules. Methods based on undetermined coefficients - Newton's methods, Trapezoidal rule, Simpson's rule.

Unit - 4
Solution of System of linear equation by iteration method, Gauss-Sidel method, Jacobi's method, Numerical solution of Ordinary Differential Equation. Solution by Taylor's series, Euler's method, Modified Euler's method, Runge-Kutta method.

Books:

1. Introductory methods of Numerical Analysis - By S. S. Sastry, PHI
2. Numerical Methods for Scientific and Engineering students - M.K.Jain, S.R.K.Iyengar, New age international (P) Ltd.
3. Computer Oriented Numerical Methods, - V. Rajaraman, PHI

Data Structure & Numerical Lab

1. Write a program in C to search for an item in an array and display its position using Binary search.
2. Write a program in C to arrange a set of numbers in ascending order of values using Selection sort technique.
3. Write a program in C to arrange a set of numbers in ascending order of values using Bubble sort technique.
4. Write a program in C to perform Insertion and Deletion operations in a Stack represented as an array.
5. Write a program in C to perform Insertion and Deletion operations in a Queue data structure represented as an array.
6. To find out the root of the Algebraic and Transcendental equations using Bisection method.
7. To find out the root of the Algebraic and Transcendental equations using Newton-Raphson method.
8. To implement Numerical Integration using Trapezoidal rule.
9. To implement Numerical Integration using Simpson 1/3 rule.
10. To implement Numerical Integration Simpson 3/8 rule.

SEMESTER - III

Core - 5

Object Oriented Programming in C++

Unit -1
Object Oriented Programming concept, Procedural vs OOP programming, OOP terminology and features, Tokens, Character set, Keywords, Data-types, Constants and variables, expressions, Standard

Library and header files. Operator and Expressions: Arithmetic Operator, Increment/Decrement Operator, Relational Operator, Logical Operator and conditional operators, library functions, Logical Expressions.

Unit - 2

Control statements, IF, IF …ELSE, Nested IF, Switch….Case, Looping statements, While, Do-while, For statements, nested loops.

Classes and Objects: Need for Classes, Declaration of Classes, referencing class Members, Data members and member Functions, Inline Functions, Creation of objects

Unit -3

Use of access specifiers, Public and Private, Function Overloading, use of Constructors and Destructors, Types of constructors: default, parameterized, and copy constructors, Operator overloading, Friend function, Arrays of objects.

Unit - 4

Concept of Inheritance, Types of inheritance: Single level, multi-level, multiple, hybrid, Use of protected access specifier, Function overriding, Exception handling, Simple file handling.

Books:

1. Object Oriented Programming with C++ -E. Balaguruswamy, TMH
2. Let us C++ -YashavantKanetkar, BPB
3. Object Oriented Programming with C++ -Sourav Sahay, Oxford University Press
4. The C++ Programming Language - Bjarne Stroustrup, Addison-Wesley

C++ Programming Lab

1. Define a class called STUDENT with the data members Roll No., Name, Marks secured in five subjects. Write member functions to do the following:
    i. Read data
    ii. Find the total mark and division
    iii. Display Roll No., Name, Total mark, and Division
2. Define a class called SHAPE with appropriate data members. Find the area of different geometrical shapes using function overloading.
3. Define a class called ACCOUNT with the data members Account no. Customer name, Amount and initialize with suitable constructor. Write member functions to do the following:
    i. Deposit amount
    ii. Withdraw amount
    iii. Check balance
4. Using operator overloading add two given Lengths expressed as Feet and Inch.
5. Using operator overloading add two given TIMEs expressed as Hour : Minute : Second.
6. Concatenate two strings by overloading the '+' operator.
7. Define a class called PLAYER with the data members Player ID, player name, highest runs scored, batting average, and number of wickets taken. Create 10 player instances (using array of objects) and initialize them with parameterized constructors. Write a member function to display the details of a player on inputting the player ID.

8. Define a class called PERSON with the data members Name, DOB, PAN #. Inherit two classes from it (i) CUSTOMER with A/C no. & Amount and (ii) EMPLOYEE with Organization, Designation & Salary. Write suitable member functions to do the following:
    i. Input data for both base as well as derived class objects
    ii. Display customer details along with name, DOB and PAN #
    iii. Display employee details along with name, DOB and PAN #

9. Define a class called STACK and implement the PUSH and POP operations on it.
10. Define a class called QUEUE and implement the Insertion and Deletion operations on it.

Core - 6

Operating Systems

Unit -1
Introduction, Basic OS functions, resource abstraction, types of operating systems–Batch, Multi programming, Time sharing, and Real time systems; operating systems for personal computers, Operating System Organization, Processor and user modes, kernels, system calls and system programs.

Unit -2
Process Management, Process State Transition diagram, Non-pre-emptive and pre-emptive scheduling algorithms: FCFS, Shortest Job First, Round Robin, Priority Scheduling, Concurrent processes, concept of critical section, semaphores, Concept of Deadlock, Condition for deadlock. Concept of deadlock prevention, detection and recovery.

Unit -3
Memory Management, Physical and virtual address space, memory allocation strategies: fixed and variable partitions, Paging, Segmentation, Demand paging, virtual memory, Page replacement techniques (FIFO, LRU and Optimal).

Unit -4
File and I/O Management, Directory structures: Single level, multi-level, and tree structured directory, Concept of file, file operations, file allocation methods, Disk scheduling techniques(FCFS, Shortest Seek Time First, and Scan), File Protection and Security Policy, File Authentication andAccess control.

Books:

1. Operating Systems Concepts -A. Silberschatz and P.B. Galvin, John Wiley
2. Operating Systems - A Concept based Approach – D M Dhamdhere, TMH
3. Modern Operating Systems - A.S. Tanenbaum, Pearson Education
4. Operating Systems - Concepts and design- M. Milenkovic, Tata McGraw Hill

Core - 7

Computer Networks

Unit -1
Introduction to Computer Networks, Network Hardware, Network Software, Network Topologies (Star, Ring, Bus, Mesh), Network Classifications, Network Protocol, Layered Network Architecture, Overview of OSI Reference Model, Overview of TCP/IP protocol suite, Data

Unit -2
Communication Fundamentals and Techniques, Analog and Digital Signal, Data-rate limits, Multiplexing Techniques - FDM, TDM, Transmission Media, Networks Switching Techniques and Access Mechanisms, Circuit Switching, Packet Switching- Connectionless Datagram Switching, Connection-Oriented, Virtual Circuit Switching.

Unit -3
Dial-up Modems, Digital Subscriber Line, Cable TV for data transfer, CSMA/CD protocols, Ethernet LANs, Connecting LAN and Back-bone Networks - Repeaters, Hubs, Switches, Bridges, Router and Gateways, Routing protocols, IP Addressing.

Unit -4
Transport Layer Functions and Protocols, Error and flow control, Connection establishment and release, Three-way handshaking, Overview of Application Layer Protocol, DNS, overview of WWW & HTTP Protocols, Electronic Mail.

Books:

1. Data Communications and Networking - B. A. Forouzan
2. Computer Networks - A. S. Tanenbaum

SEMESTER - IV

Core - 8

Discrete Structures

Unit -1
Sets - finite and Infinite sets, Functions, Relations, Properties of Binary Relations, Closure, Partial Ordering Relations, counting -Pigeonhole Principle, Permutation and Combination; Mathematical Induction, Principle of Inclusion and Exclusion.

Unit -2
Growth of Functions: Asymptotic Notations, Summation formulas and properties, Bounding Summations, Approximation by Integrals.
Recurrences: Recurrence Relations, generating functions, Linear Recurrence Relations with constant coefficients and their solution, Substitution Method.

Unit -3
Graph Theory: Basic Terminology, Models and Types, multigraphs and weighted graphs, Graph Representation, Euler and Hamiltonian Paths and Circuits, Trees, Basic Terminology and properties of Trees, Introduction to Spanning Trees.

Unit -4
Prepositional Logic: Introduction, Use of propositions to represent simple sentences, Logical Connectives, Well-formed Formulas, Tautologies, Equivalences, Inference Theory.

Books:

1. Elements of Discrete Mathematics - C.L. Liu, D.P. Mahopatra, TMH
2. Discrete Mathematics and Its Applications - Kenneth Rosen, McGraw Hill

Core - 9

Software Engineering

Unit -1
The Evolving Role of Software, Software Characteristics, Software Engineering Approach, Software Process Framework, Framework and Umbrella Activities, Process Models, Capability Maturity Model Integration (CMMI).

Unit -2
Software Requirement Analysis: Requirement Analysis and Modelling Techniques, Flow Oriented Components of SRS, Need for SRS, Software Project Management: Project Estimation, Project Scheduling, Software Risks: Risk Management, Risk Identification, Risk Projection and Risk Refinement, RMMM.

Unit -3
Software Quality: Software Quality Assurance, Metrics for Process and Projects, Software Design: Design Concepts, Software Architecture, Data Design at the Architectural Level and Component Level, Mapping of Data Flow into Software Architecture.

Unit -4
Software Testing: Strategic Approach to Software Testing, Test case generation, Validation Testing, System Testing, Black-Box Testing, White-Box Testing, Path Testing.

Books:

1. Fundamentals of Software Engineering - Rajiv Mall
2. Software Engineering: A Practitioner's Approach - R.S. Pressman

Core - 10

Database Management Systems

Unit -1
Concept of Database and DBMS, Characteristics of database approach, Role of DBMS, Data models (Relational, Hierarchical, network and Object-oriented), Layered architecture of DBMS, Data independence.

Unit -2
Entity Relationship(ER) Modeling, Entity types, relationships, constraints. Relational data model, relational constraints, Mapping ER models to relational database, Relational algebra, SQLqueries.

Unit -3
Database design, Data dependencies (functional transitive, and multi-valued), Normalforms(INF, 2NF, and 3NF), Database transactions: Transaction Processing, ACID properties, concurrency control.

Unit -4
File Structure and Indexing, overview of File organizations (Sequential, Indexed, and Direct Access files), Indexing (Primary index, secondary index, clustering index), Concept of B and B+ trees.

Books:

1. Database Systems Concepts - A. Silberschatz, H. F. Korth, S. Sudarshan (McGraw Hill)
2. Fundamentals of Database Systems - Elmsari and Navathe (Addision Wesley)
3. Database Management Systems – Rajiv Chopra, S Chand

Database Lab

Create tables as indicated against each question and write SQL statements to answer the given queries:

1. Student (roll_no, name, department, marks), Attendance (roll_no, department, attendance)
    a) Create the table with above schema
    b) Display the details of the students
    c) Display the details of the student with attendance less than 20
    d) Find the average mark of student having attendance less than 20
    e) Find the average mark.
    f) Display the details of the students whose name starts with ‘s’
    g) Display details of the student with mark greater than 70
    h) Display the details of the students whose name starts with ‘s’ or ‘c’
    i) Find subject wise average mark
    j) Display details of the students whose age is between 20 and 23

2. Course (roll_no, subject, mark) Attendance (roll_no, name, attendance)
    a) Create the table with above schema
    b) Find the Roll no. of the student securing the highest mark in a given subject
    c) Display the roll_no, marks of student who have taken the subject “IT”

d) Display the average marks of the students who have attendance less than 25
e) Find average mark for each subject
f) Find lowest marks in each subject
g) Find the Roll no.s of the students securing highest mark in each subject
h) Find the student names with highest and lowest attendance
i) Display the subjects taken by the students whose attendance more than 30
j) Display the attendance details of the students whose mark less than 200

3. Employee (Emp_Id, Name, Address, Salary) Leave(Emp_Id,Leave_Taken)
   a) Create the table with above schema
   b) Count the number of employee with salary greater than 5000
   c) Find average salary of the employee who have taken more than 15 leaves
   d) Find average salary of all the employees
   e) Display the details of the employee with highest salary
   f) Display the leave details of the employee whose name starts with 'R'
   g) Display the details of the employee whose salary less than 3000
   h) Count the number of employee belongs to "Education" department
   i) Display the details of the employee whose salary is between 10000 and 20000
   j) Find average salary of the employees belong to "Revenue" department

SEMESTER - V

Core - 11

Internet Technologies

Unit -1
The Internet and WWW:Understanding the WWW and the Internet, Emergence of Web, Web Servers, Web Browsers, Protocols.
Building Web Sites, Planning for designing Web pages, Model and structure for a Website, Developing Websites, Basic HTML, Lists, Tables and Forms, Frames for designing a good interactive website.

Unit -2
JAVA Script:Programming Fundamentals, Statements, Expressions, Operators, Popup Boxes, Control Statements, Try…. Catch Statement, Throw Statement, Objects of Javascript: Date object, array object, Boolean object, Math object
CSS:External Style Sheets, Internal Style Sheets, Inline Style, The class selector, div & span tag.

Unit -3
DOM:HTML DOM, inner HTML, Dynamic HTML (DHTML), DHTML form, XML DOM
CGI/PERL:Introduction to CGI, Testing & Debugging Perl CGI Script, Using Scalar variables and operators in Perl Java Applet

Unit -4
Introduction to Java, Writing Java Applets, Life cycle of applet, Java Use of Objects, Array and Array List class, JDBC Fundamentals, Establishing Connectivity and working with connection interface, Working with statements, Creating and Executing SQL Statements, Working with Result Set Objects.

Books:

1. Web Warrior Guide to Web Design Technologies - Don Gosselin, Joel Sklar& others, Cengage Learning
2. Web Programming: Building Internet Applications - Chris Bates, Wiley Dreamtech
3. Programming the World Wide Web - Robert W Sebesta, Pearson

Core - 12

Java Programming

Unit -1

Java Architecture and Features, Difference between C++ and Java, Compiling and Executing a Java Program, Variables, Constants, Keywords, Data Types, Operators, Expressions, Executing Basic Java Programs, Conditional and looping statements.

Unit -2

Java Methods, Definition, Scope, Passing and Returning Arguments, Type Conversion and Type Checking, Built-in Java Class Methods, Using Arrays(1-D and 2-D),Java Strings: Java String class, Creating and Using String Objects, Manipulating Strings.

Unit -3

Defining and Using Classes in Java, Controlling Access to Class Members, Constructors, Method Overloading, Class Variables and Methods, Objects as parameters, final keyword

Unit -4

Inheritance (Single Level and Multilevel), Method Overriding, Interfaces and Packages, Extending interfaces and packages, Introduction to Applets, Writing Java Applets, Event Handling in Java.

Books:

1. Programming with Java - E. Balaguruswamy, 4th Edition, McGraw Hill
2. Programming in Java - Sachin Malhotra and Saurabh Choudhury, Oxford University Press
3. Programming with JAVA -John R. Hubbard, Schaum's Series, McGraw Hill

Java Programming Lab

1. Write a Java Program to define a class called Student (Name, Roll No, Course, Marks in five papers). Find division of the student.
2. Write a Java Program to define a class, describe its constructor, overload the Constructor and instantiate its object.
3. Write a Java Program to define a class, define instance methods and overload them and use them for dynamic method invocation.
4. Write a Java Program to demonstrate use of sub class.
5. Write a Java Program to demonstrate use of nested class.
6. Write a Java Program to implement array of objects.
7. Write a Java program to practice using String class and its methods.
8. Write a Java Program to implement inheritance and demonstrate use of method overriding.

9. Write a program to demonstrate use of implementing interfaces.
10. Write a program using Applet to display a message in the Applet.

Discipline Specific Electives

DSE – 1

(Under DSE-1, a student has to choose either Information Security or Microprocessor)

Information Security

Unit -1
Introduction to Information security, Security issues, types of Attacks, Security Services, Cryptography, Encryption and decryption techniques, Substitution ciphers, Transpositions Cipher, Confusion, diffusion, Symmetric and Asymmetric Encryption, DES, Hash function, key exchange

Unit -2
Program Security: Secure programs, Non malicious Program errors, Malicious codes, virus, Trap doors, Salami attacks, Covert channels, Control against program
Protection in OS: Memory and Address Protection, Access control, File Protection, User Authentication

Unit -3
Database Security: Requirements, Reliability, Integrity, Sensitive data, Inference, Multilevel Security
Security in Networks: Threats in Networks, Security Controls, firewalls, Intrusion detection systems, Secure e-mails

Unit -4
Administrating Security: Security Planning, Risk Analysis, Organisational Security Policy, Physical Security, Ethical issues in Security, Cyber criminals and Cyber laws, Digital Signatures, Digital Certificates

Books:
1. Security in Computing - C. P. Pfleeger and S. L. Pfleeger, PHI
2. Network Security Essentials - Applications and Standards - W. Stallings, PHI

Microprocessor

Unit -1
Evolution, Architecture of 8085. CPU, Address & Data Bus. Memory mapping and organization. Register Organization. Memory mapped I/O & I/O mapped I/O

Unit -2
Assembly Language Programming: Timing diagram of different cycles. Types of Addressing Modes. Instruction Set of 8085. Arithmetic, Data transfer, stack I/O instruction & programming as assembly language

Unit -3
Architecture of 16-bit microprocessor: 8086, 8088. Types of addressing modes, Addressing and address decoding. Instructions set &assembly language programming

Unit -4
General purpose programmable peripheral devices 8255, Interfacing of 8151, 8251, 8253, 8257, 8259, 8279

Books:
1. Microprocessor Architecture, Programming and Applications – R. S. Gaonkar
2. Microprocessor and Digital Systems – D. Hall
3. Microprocessor – S. I. Ahson

DSE – 2

(Under DSE-2, a student has to choose either Artificial Intelligence or Introduction to Data Science)

Artificial Intelligence

Unit -1
Definition of AI, Characteristics of AI problems, AI problem solving approaches, State space search, problem reduction, search techniques, Breadth first and Depth first techniques, Heuristic search techniques, Hill climbing, Best first search.

Unit -2
Knowledge representation in AI, propositional logic, Semantic nets, Frames, and Scripts.
Handling uncertainty in AI problems, Probabilistic reasoning, Bayesian Belief networks

Unit -3
Concept of Learning, types of learning, Artificial Neural networks, ANN structures, Feed forward networks, Back propagation network, Applications of ANN.

Unit -4
Natural language processing, levels of knowledge used in language understanding, parsing, top-down and bottom-up parsing, transition networks
Expert systems, ES architecture, need for ES, steps for developing an expert system.

Books:

1. Artificial Intelligence: A Practical Approach – Rajiv Chopra, S. Chand publications
2. Introduction to Artificial Intelligence and Expert Systems – D W Patterson, PHI

Introduction to Data Science

Unit -1
Data Scientist's Tool Box: Turning data into actionable knowledge, introduction to the tools that are used in building data analysis software: version control, markdown, git, GitHub, R, and RStudio.

Unit -2
R Programming Basics: Overview of R, R data types and objects, reading and writing data, Control structures, functions, scoping rules, dates and times, Loop functions, debugging tools, Simulation, code profiling

Unit -3

Getting and Cleaning Data: Obtaining data from the web, from APIs, from databases and from colleagues in various formats. Basics of data cleaning and making data
Exploratory Data Analysis: techniques for summarizing data, eliminating or sharpening potential hypotheses about the world, common multivariate statistical techniques to visualize high-dimensional data.

Unit -4
Concepts and tools behind reporting modern data analyses in are producible manner, To write a document using R markdown, integrate live R code into statistical program, compile R markdown documents using knitr and related tools, organize data analysis so that it is reproducible and accessible to others.

Books:

1. Doing Data Science: Straight Talk from the Frontline - Rachel Schutt, Cathy O'Neil, Schroff/O'Reilly
2. Data Science for Business: What You Need to KnowAbout Data Mining and Data-Analytic Thinking - Foster Provost, Tom Fawcett, O'Reilly
3. Data Smart: Using data Science to Transform Information intoInsight John W. Foreman, John Wiley & Sons
4. Mining the Social Web: Data mining Facebook, Twitter, Linkedln,Google+,GitHub, and More - Matthew A. Russel, O'Reilly Media

SEMESTER - VI

Core - 13

Computer Graphics

Unit -1
Definition, Application, Pixel, Frame Buffer, Raster and Random Scan display, Display devicesCRT, Color CRT Monitors, Scan Conversion of line- DDA algorithm of line drawing, Scan conversion of circle- Bresenham's circle generating algorithm, Polygon Filling-Scan line polygon filling algorithm.

Unit -2
2-D transformation, Translation, Rotation, Scaling, Homogeneous Coordinates, 3-D transformation, Translation, Rotation Scaling, Reflection, Shear.

Unit -3
Window to view port transformation, clipping, line clipping, Cohen –Sutherland line clipping, Polygon clipping, Sutherland and Gary Hodgman polygon clipping algorithm.

Unit -4
Hidden Surface removal—Depth comparison, Z-Buffer Algorithm, Back-Face Removal, The Painter's Algorithm, Scan-Line Algorithm, Subdivision Algorithm.

Books:

1. Computer Graphics – Donald Hearn and M. Pauline Baker (Pearson)
2. Computer Graphics - Zhigang Xiang, Roy A. Plastock (McGraw-Hill, India)
3. Computer Graphics – Er. Rajiv Chopra, (S. Chand Publication)
4. Principles of Interactive Computer Graphics − W.M. Newmen, R F Sproull (McGraw Hill)

Core – 14

Data Warehousing and Data Mining

Unit -1
Concept of a Data warehouse, features of data warehousing: subject oriented, integrated, time variant, and non-volatile, multi-dimensional data model, data cubes, OLAP operations: roll-up, drill-down, slice and dice, Architecture of data warehouse.

Unit -2
Concept of Data mining, data mining techniques, process of knowledge discovery in databases, mining frequent patterns, market basket analysis, Association rule mining, Interestingness measures.

Unit -3
Classification and prediction, classification techniques, decision tree, rule-based classification, k-Nearest neighbor classifier, Bayesian classification, linear regression.

Unit -4
Cluster analysis, clustering techniques, k-Means and k-Medoids methods, Introduction to Hierarchical and Density-Based methods, Outliers.
Applications of data mining in finance, business, social networks, and web mining.

Books:

1. Data Mining: Concepts and Techniques - J Han and M Kamber, Elsevier
2. Data Mining Techniques - Arun K Pujari, University Press

Discipline Specific Electives

DSE – 3

(Under DSE-3, a student has to choose either Cloud Computing or Digital Image Processing)

Cloud Computing

Unit -1
Recent trends in Computing: Grid Computing, Cluster Computing, Distributed Computing, Utility Computing, Cloud Computing, Cloud service providers, Benefits and limitations of Cloud Computing

Unit -2
Cloud Computing Architecture, Comparison with traditional computing architecture (client/server), Services provided at various levels, Service Models- Infrastructure as a Service(IaaS), Platform as a Service(PaaS), Software asa Service(SaaS), How Cloud Computing Works, Deployment Models- Public cloud, Private cloud, Hybrid cloud, Community cloud

Unit -3
Service Management in Cloud Computing, Service Level Agreements(SLAs), Billing & Accounting, Comparing Scaling Hardware: Traditional vs. Cloud, Economics of scaling.
Examples of cloud systems like Google App Engine, Microsoft Azure, AmazonEC2.

Unit -4

Cloud Security, Infrastructure Security, Network level security, Host level security, Application level security, Data security and Storage- Data privacy and security Issues, Jurisdictional issues raised by Data location, Authentication in cloud computing

Books:

1. Cloud Computing – U S Pandey and K Choudhary, S Chand
2. Cloud Computing: Principles and Paradigms - Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Wiley

Digital Image Processing

Unit -1

The digitized image and its properties, Applications of image processing, image representation, sampling, quantization, color images, metrics and topological properties of digital images, histograms, image quality, noise image.

Unit -2

Image pre-processing**,** Pixel brightness transformation, position dependent brightness correction, grey scale transformation, geometric transformation, local pre-processing, image smoothening, edge detectors, zero-crossing, canny edge detection, local pre-processing and adaptive neighbourhoodpre-processing, image restoration.

Unit -3

Image Segmentation, Threshold detection methods, optimal thresholding, multispectral thresholding, thresholding in hierarchical data structures, edge based image segmentation, edge image thresholding, edge relaxation, border tracing, border detection.

Unit -4

Image textures: Statistical texture description, methods based on spatial frequencies, co-occurrence matrices, edge frequency, and texture recognition.

Image representation and description: Representation, boundary descriptors, regional descriptors

Books:

1. Digital Image Processing - Rafael C. Gonzalez, Richard E. Woods, Pearson Education
2. Fundamentals of Digital Image Processing - Anil K. Jain, PHI Learning Pvt. Ltd.
3. Digital Image Processing - Kenneth R. Castleman, Pearson Education, Inc.
4. Digital Image Processing and Analysis - Bhabatosh Chanda & Dwijesh Dutta Majumder, PHI Learning Pvt. Ltd., New Delhi.

DSE – 4

Software Development Project Work

A student has to undertake a software development project work under the guidance of a teacher during the 6th semester. After completion of the project, the student has to submit a project report which will be evaluated by an External Examiner.

Two Generic Elective Courses (GE) meant for Honours Students of other Disciplines (Each course is of 6 credits)

Generic Elective Courses (GE)

Computer Science Paper - 1
Problem Solving using Computers

Unit -1

Computer Fundamentals: Introduction to Computers: Characteristics of Computers, Uses of Computers, Types and generations of Computers.

Basic Computer Organization - Units of a computer, CPU, ALU, memory hierarchy,registers,I/O devices.

Unit - 2

Techniques of Problem Solving: Flowcharting, algorithms, Programdesign, coding, compilation, program execution, Debugging, Types of errors in programming, Documentation, Structuredprogramming, Top-down and bottom-up program design

Unit -3

C Programming: Defining and Initializing Variables, Scope of Variables,Keywords, Data Types, Casting of Data Types, Operators (Arithmetic, relational, and Logical), Using Comments in programs, Character I/O (getc, getchar, putc), Formatted and Console I/O (printf(), scanf(), Basic Header Files (stdio.h,iostream.h, conio.hetc).

Unit -4

Conditional Statements in C Programming: IF, IF..ELSE, Nested IF, Switch-Case statements, Looping Statements: FOR loop, WHILE loop and Do-WHILE loop

One Dimensional Arrays, Two-dimensional Arrays, Concept of Structure, accessing structure members, User-defined Functions in C

Books:

1. Computer Fundamentals - P. K. Sinha &Priti Sinha, BPB Publications
2. Computer Fundamentals - Anita Goel, Pearson Education
3. Programming in ANSI C - E. Balguruswamy, TMH
4. Let us C –YaswantKanitkar, BPB

Computer Science Paper - 2

Database Management Systems

Unit -1
Concept of Database and DBMS, Characteristics of database approach, Role of DBMS, Data models (Relational, Hierarchical, network and Object-oriented), Layered architecture of DBMS, Data independence.

Unit -2
Entity Relationship(ER) Modeling, Entity types, relationships, constraints. Relational data model, relational constraints, Mapping ER models to relational database, Relational algebra, SQLqueries.

Unit -3
Database design, Data dependencies (functional transitive, and multi-valued), Normalforms(INF, 2NF, and 3NF), Database transactions: Transaction Processing, ACID properties, concurrency control.

Unit -4
File Structure and Indexing, overview of File organizations (Sequential, Indexed, and Direct Access files), Indexing (Primary index, secondary index, clustering index), Concept of B and B+ trees.

Books:

1. Database Systems Concepts - A. Silberschatz, H. F. Korth, S. Sudarshan (McGraw Hill)
2. Fundamentals of Database Systems - Elmsari and Navathe (Addision Wesley)
3. Database Management Systems – Rajiv Chopra, S Chand

B. Sc. Computer Science (Regular) under CBCS
w.e.f. the Academic Year 2016-2017

Semester – I		**Credits**
Core- A1	Problem Solving using Computer	4
	C Programming Lab	2
Core- B1	<From other subject>	
Core- C1	<From other subject>	
AECC(Ability Enhancement Compulsory Course)	Environmental Studies	2
Semester – II		
Core- A2	Database Management Systems	4
	Database Lab	2
Core- B2	<From other subject>	
Core- C2	<From other subject>	
AECC-2(Ability Enhancement Compulsory Course)	MIL Communication	2
Semester – III		
Core- A3	Operating Systems	6
Core- B3	<From other subject>	
Core- C3	<From other subject>	
SEC-1(Skill Enhancement Course)	Communicative English	2
Semester – IV		
Core- A4	Computer System Architecture	6
Core- B4	<From other subject>	
Core- C4	<From other subject>	
SEC-2(Skill Enhancement Course)	<From the pool of SEC courses>	2
Semester – V		
DSE-A1 (Discipline Specific Elective) **Any one**	Data Structures / Computer Networks	6
DSE-B1 (Discipline Specific Elective) **Any one**	<From other subject>	
DSE-C1 (Discipline Specific Elective) **Any one**	<From other subject>	
SEC-3 (Skill Enhancement Course)	<From the pool of SEC courses>	2
Semester – VI		
DSE-A2 (Discipline Specific Elective) **Any one**	Project work/Dissertation	6
DSE-B2 (Discipline Specific Elective) **Any one**	<From other subject>	
DSE-C2 (Discipline Specific Elective) **Any one**	<From other subject>	
SEC-4 (Skill Enhancement Course)	<From the pool of SEC courses>	2
	Total	**120**

SEMESTER - I

Core Paper– 1

Problem Solving using Computers

Unit -1

Computer Fundamentals: Introduction to Computers: Characteristics of Computers, Uses of Computers, Types and generations of Computers.

Basic Computer Organization - Units of a computer, CPU, ALU, memory hierarchy,registers,I/O devices.

Unit - 2

Techniques of Problem Solving: Flowcharting, algorithms, Programdesign, coding, compilation, program execution, Debugging, Types of errors in programming, Documentation, Structuredprogramming, Top-down and bottom-up program design

Unit -3

C Programming: Defining and Initializing Variables, Scope of Variables,Keywords, Data Types, Casting of Data Types, Operators (Arithmetic, relational, and Logical), Using Comments in programs, Character I/O (getc, getchar, putc), Formatted and Console I/O (printf(), scanf(), Basic Header Files (stdio.h,iostream.h, conio.hetc).

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3. Programming in ANSI C - E. Balguruswamy, TMH
4. Let us C –YaswantKanitkar, BPB

C Programming Lab

1. Write a program to find the maximum among three numbers.
2. Write a program to find factorial of a number.
3. Write a program to print the Fibonacci series.
4. Write a program to print the prime numbers between 1 to n.
5. Write a program to check if it a Palindrome (e.g., madam).
6. Write a program to check if it is an Armstrong number. (An Armstrong number of three digits is an integer such that the sum of the cubes of its digits is equal to the number itself)
7. Write program to reverse the digits of an input number.
8. Write a program to find the sum of digits of a number.
9. Write a program to find the GCD and LCM of two numbers.
10. Write a program to perform different arithmetic operations using switch….case.
11. Write a program to count the number bits "1" in a given binary number.
12. Write a program to find the factorial of a number using function.
13. Write a program to perform the arithmetic operations using function.

14. Write a program to find the largest element in an array.
15. Write a program to add two matrices.
16. Write a program to multiply two matrices.
17. Write a program to find the position of a given character in a string.
18. Write a program to count the number of times a character occurs in a string.
19. Write a program to create records of 10 students using structure.
20. Write a program to count the number of words, number of lines in a text file.

SEMESTER - II

Core Paper - 2

Database Management Systems

Unit -1
Concept of Database and DBMS, Characteristics of database approach, Role of DBMS, Data models (Relational, Hierarchical, network and Object-oriented), Layered architecture of DBMS, Data independence.

Unit -2
Entity Relationship(ER) Modeling, Entity types, relationships, constraints. Relational data model, relational constraints, Mapping ER models to relational database, Relational algebra, SQLqueries.

Unit -3
Database design, Data dependencies (functional transitive, and multi-valued), Normalforms(INF, 2NF, and 3NF), Database transactions: Transaction Processing, ACID properties, concurrency control.

Unit -4
File Structure and Indexing, overview of File organizations (Sequential, Indexed, and Direct Access files), Indexing (Primary index, secondary index, clustering index), Concept of B and B+ trees.

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2. Fundamentals of Database Systems - Elmsari and Navathe (Addision Wesley)
3. Database Management Systems – Rajiv Chopra, S Chand

Database Lab

Create tables as indicated against each question and write SQL statements to answer the given queries:

4. Student (roll_no, name, department, marks), Attendance (roll_no, department, attendance)
    k) Create the table with above schema
    l) Display the details of the students
    m) Display the details of the student with attendance less than 20
    n) Find the average mark of student having attendance less than 20
    o) Find the average mark.

p) Display the details of the students whose name starts with ‘s’
q) Display details of the student with mark greater than 70
r) Display the details of the students whose name starts with ‘s’ or ‘c’
s) Find subject wise average mark
t) Display details of the students whose age is between 20 and 23

5. Course (roll_no, subject, mark) Attendance (roll_no, name, attendance)
   k) Create the table with above schema
   l) Find the Roll no. of the student securing the highest mark in a given subject
   m) Display the roll_no, marks of student who have taken the subject “IT”
   n) Display the average marks of the students who have attendance less than 25
   o) Find average mark for each subject
   p) Find lowest marks in each subject
   q) Find the Roll no.s of the students securing highest mark in each subject
   r) Find the student names with highest and lowest attendance
   s) Display the subjects taken by the students whose attendance more than 30
   t) Display the attendance details of the students whose mark less than 200

6. Employee (Emp_Id, Name, Address, Salary) Leave(Emp_Id,Leave_Taken)
   k) Create the table with above schema
   l) Count the number of employee with salary greater than 5000
   m) Find average salary of the employee who have taken more than 15 leaves
   n) Find average salary of all the employees
   o) Display the details of the employee with highest salary
   p) Display the leave details of the employee whose name starts with ‘R’
   q) Display the details of the employee whose salary less than 3000
   r) Count the number of employee belongs to “Education” department
   s) Display the details of the employee whose salary is between 10000 and 20000
   t) Find average salary of the employees belong to “Revenue” department

SEMESTER - III

Core Paper – 3

Operating Systems

Unit -1

Introduction, Basic OS functions, resource abstraction, types of operating systems–Batch, Multi programming, Time sharing, and Real time systems; operating systems for personal computers, Operating System Organization, Processor and user modes, kernels, system calls and system programs.

Unit -2

Process Management, Process State Transition diagram, Non-pre-emptive and pre-emptive scheduling algorithms: FCFS, Shortest Job First, Round Robin, Priority Scheduling, Concurrent processes, concept of critical section, semaphores, Concept of Deadlock, Condition for deadlock. Concept of deadlock prevention, detection and recovery.

Unit -3
Memory Management, Physical and virtual address space, memory allocation strategies: fixed and variable partitions, Paging, Segmentation, Demand paging, virtual memory, Page replacement techniques (FIFO, LRU and Optimal).

Unit -4
File and I/O Management, Directory structures: Single level, multi-level, and tree structured directory, Concept of file, file operations, file allocation methods, Disk scheduling techniques(FCFS, Shortest Seek Time First, and Scan), File Protection and Security Policy, File Authentication and Access control.

Books:

1. Operating Systems Concepts -A. Silberschatz and P.B. Galvin, John Wiley
2. Operating Systems: A Concept based Approach – D M Dhamdhere, TMH
3. Modern Operating Systems - A.S. Tanenbaum, Pearson Education
4. Operating Systems- Concepts and design - M. Milenkovic, Tata McGraw Hill

SEMESTER - IV

Core Paper – 4

Computer System Architecture

Unit -1
Number systems – Decimal, Binary, Octal and Hexa-decimal number systems and their inter conversion, 1's & 2's complement, Binary Fixed- Point Representation, Arithmetic operations on Binary numbers, Overflow & underflow. Logic Gates, AND, OR, NOT gates and their Truth tables, NOR, NAND & XOR gates, Boolean Algebra – Basic Operations and Boolean Law's, Demorgan's theorem.

Unit -2
Sum of Product & Product of Sum, K-Map, Combinational & Sequential circuits, Half Adder & Full Adder, Adder & Subtractor, Multiplexer, De-multiplexer, Encoder, Decoder.

Unit -3
Flip-flops - RS, D, JK & T Flip-flops, Registers, Shift Registers, Counters.

Unit -4
Central Processing Unit: General register organisation, Stack organisation, Instruction Formats, Addressing modes, Memory: Main memory, Auxiliary memory, DMA- control signals for DMA transfers, Block diagram of DMA controller, DMA transfer in a microcomputer system.

Books:

1. Computer System Architecture - M. Mano, Pearson Education
2. Computer Organization - Carl Hamacher, McGrawHill
3. Digital Design - M. M. Mano, Pearson Education Asia
4. Computer Fundamentals - B. Ram, New Age International Publishers

SEMESTER - V

Discipline Specific Electives

DSE Paper – 1

(Under DSE, a student has to chooseeither Data Structures or Computer Network)

Data Structures

Unit -1

Primitive and non-primitive data types, Linear and non-linear data structures, Memory representation of Arrays (Single and Multi-dimensional Arrays), Representation of Stack, Queue, and Circular Queue, Insertion and deletion operations on these data structures, Applications of stack and Queue: Evaluation of recursive functions, Job Queues.

Unit -2

Limitations of Array representation, Linked List and its advantages, Representation of Singly, Doubly and Circularly linked Lists, Insertion and deletion operations on these data structures, Link list representation for Stack and Queue, Applications of linked list: Representation of polynomials, Sparse Matrix and its representation using Array and Linked list.

Unit -3

Introduction to Tree as a data structure, Binary Tree: Definition, related terminologies, Memory representation of Binary tree using array and linked list, Operations such as In order, Pre order, and Post order Traversals (recursive algorithms only), Binary Search Tree, Threaded Binary Tree (Representation only), Concept of Height-Balanced Tree.

Unit -4

Searching and Sorting techniques: Linear Search, Binary Search, Comparison of Linear and Binary Search, Selection Sort, Bubble sort, Insertion Sort, Comparison of Sorting techniques. Merging of arrays.

Books:

1. Data Structures, Schaume's Outlines – Lipschutz, TMH Publications
2. Data Structures, By Ellis Horowitz, SartajSahani, Galgotia Publications
3. Data Structures using C & C++ - Aaron M. Tenenbaum, YedidyahLangsam, PHI

Computer Networks

Unit -1

Introduction to Computer Networks, Network Hardware, Network Software, Network Topologies (Star, Ring, Bus, Mesh), Network Classifications, Network Protocol, Layered Network Architecture, Overview of OSI Reference Model, Overview of TCP/IP protocol suite, Data

Unit -2

Communication Fundamentals and Techniques, Analog and Digital Signal, Data-rate limits, Multiplexing Techniques - FDM, TDM, Transmission Media, Networks Switching Techniques and Access Mechanisms, Circuit Switching, Packet Switching - Connectionless Datagram Switching, Connection-Oriented, Virtual Circuit Switching.

Unit -3

Dial-up Modems, Digital Subscriber Line, Cable TV for data transfer, CSMA/CD protocols, Ethernet LANs, Connecting LAN and Back-bone Networks - Repeaters, Hubs, Switches, Bridges, Router and Gateways, Routing protocols, IP Addressing.

Unit -4

Transport Layer Functions and Protocols, Error and flow control, Connection establishment and release, Three-way handshaking, Overview of Application Layer Protocol, DNS,overview of WWW & HTTP Protocols, Electronic Mail.

Books:

1. Data Communications and Networking - B. A. Forouzan
2. Computer Networks - A. S. Tanenbaum

SEMESTER - VI

DSE Paper – 2

Software Development Project Work

A student has to undertake a software development project work (Preferably in C) under the guidance of a teacher during the 6^{th} semester. After completion of the project, the student has to submit a project report which will be evaluated by an External Examiner.