CHOICE BASED CREDIT SYSTEM

Syllabus for B.Sc. Computer Science

Honours and Generic Electives

Under

Nagaland University

CHOICE BASED CREDIT SYSTEM
COURSE STRUCTURE
B.SC (Honours)

COMPUTER SCIENCE

Semester	COURSE		Course Code	CREDIT
I	Core 1	Programming Fundamentals using C(Theory)	CSC 1.11	4
		Programming Fundamentals using C (Practical)	CSC 1.12	2
	Core 2	Computer System Architecture(Theory)	CSC 1.21	4
		Computer System Architecture(Practical)	CSC 1.22	2
II	Core 3	Programming in Java(Theory)	CSC 2.11	4
		Programming in Java(Practical)	CSC 2.12	2
	Core 4	Object Oriented Programming in C++ (Theory)	CSC 2.21	5
		Object Oriented Programming in C++ (Tutorials)	CSC 2.22	1
III	Core 5	Data Structures(Theory)	CSC 3.11	4
		Data Structures(Practical)	CSC 3.12	2
	Core 6	Operating Systems(Theory)	CSC 3.21	4
		Operating Systems(Practical)	CSC 3.22	2
	Core 7	Computer Networks(Theory)	CSC 3.31	4
		Computer Networks(Practical)	CSC 3.32	2
	Skill Enhancement Course 1	Html Programming	CSS 3.11	2
IV	Core 8	Design and Analysis of Algorithms(Theory)	CSC 4.11	4
		Design and Analysis of Algorithms(Practical)	CSC 4.12	2
	Core 9	Software Engineering(Theory)	CSC 4.21	4
		Software Engineering(Practical)	CSC 4.22	2
	Core 10	Database Management Systems(Theory)	CSC 4.31	4
		Database Management Systems(Practical)	CSC 4.32	2
	Skill Enhancement Course 2	Android Programming	CSS 4.11	2

V	Core 11	Internet Technologies(Theory)	CSC 5.11	4
		Internet Technologies(Practical)	CSC 5.12	2
	Core 12	Theory of Computation (Theory)	CSC 5.21	5
		Theory of Computation(Tutorial)	CSC 5.22	1
	Discipline Specific Elective 1	PHP Programming (Theory)	CSD 5.11	4
		PHP Programming(Practical)	CSD 5.11	2
	Discipline Specific Elective 2	Visual Programing (Theory)	CSD 5.11	4
		Visual Programing (Practical)	CSD 5.12	2
VI	Core 13	Artificial Intelligence(Theory)	CSC 6.11	4
		Artificial Intelligence(Practical)	CSC 6.12	2
	Core 14	Computer Graphics(Theory)	CSC 6.21	4
		Computer Graphics(Practical)	CSC 6.22	2
	Discipline Specific Elective 3	Introduction to Data Science(Theory)	CSD 6.11	4
		Introduction to Data Science(Practical)	CSD 6.12	2
	Discipline Specific Elective 4	Project Work / Dissertation	CSD 6.21	6

Generic Elective Paper

Semester	COURSE		Course Code	CREDIT
I	Generic 1	Computer Fundamentals(Theory)	CS-GE1.1	4
		Computer Fundamentals(Practical)	CS-GE1.2	2
II	Generic 2	Database Management Systems(Theory)	CS-GE2.1	4
		Database Management Systems(Practical)	CS-GE2.2	2
III	Generic 3	HTML Programming(Theory)	CS-GE3.1	4
		HTML Programming(Practical)	CS-GE3.2	2
IV	Generic 4	Programming in Python (Theory)	CS-GE4.1	4
		Programming in Python Practical)	CS-GE4.2	2

SEMESTER – I

Core – 1

Programming Fundamentals using C

Theory: 60 Lectures

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, Initializing an Array, Accessing individual elements in an Array, Manipulating array elements using loops), Use Various types of arrays (integer, float and character arrays / Strings), Two-dimensional Arrays, Working with Rows and Columns of a matrix.

Unit 4: Understanding use of structures, declaring, initializing and using simple structures, Manipulating individual members of structures, Array of Structures

Unit 5: 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.

Core – 2

Computer System Architecture

Theory: 60 Lectures

Unit 1: Introduction : Logic gates, boolean algebra, combinational circuits, circuit simplification, flip-flops and sequential circuits, decoders, multiplexers, registers, counters and memory units.

**Unit 2: Data Representation and Basic Computer Arithmetic   :   Number systems, complements, fixed and floating point representation, character representation, addition, subtraction, magnitude comparison, multiplication and division algorithms for integers

Unit 3: Basic Computer Organization and Design: Computer registers, bus system, instruction set, timing and control, instruction cycle, memory reference, input-output and interrupt, Interconnection Structures, Bus Interconnection design of basic computer.

Unit 4: Central Processing Unit: Register organization, arithmetic and logical micro-operations, stack organization, micro programmed control. Instruction formats, addressing modes, instruction codes, machine language, assembly language, input output programming, RISC, CISC architectures, pipelining and parallel architecture.

Unit 5: Input-Output Organization: Input / Output: External Devices, I/O Modules, Programmed I/O, Interrupt-Driven I/O, Direct Memory Access, I/O Channels.
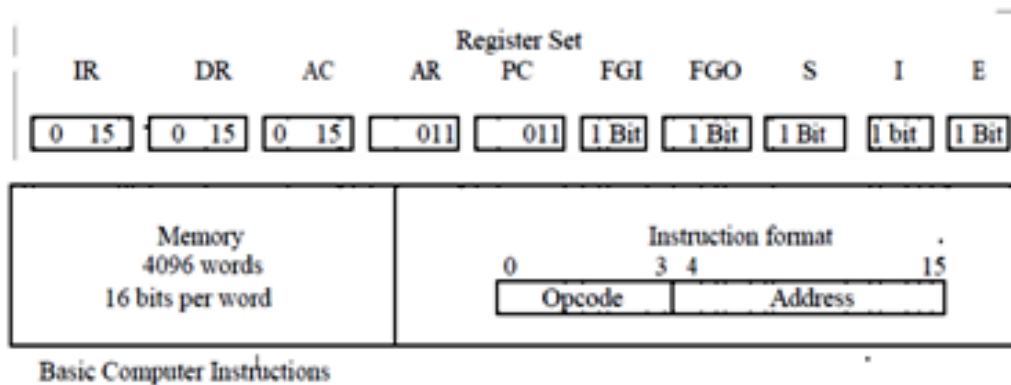
Recommended Books:

1. M. Mano, Computer System Architecture, Pearson Education 1992
2. A. J. Dos Reis, Assembly Language and Computer Architecture using C++ and JAVA,
Course Technology, 2004th
3. W. Stallings, Computer Organization and Architecture Designing for Performance, 8 Edition, Prentice Hall of India,2009
4. M.M. Mano , Digital Design, Pearson Education Asia,2013.
5. Carl Hamacher, Computer Organization, Fifth edition, McGrawHill, 2012.

Computer System Architecture Lab

1. Create a machine based on the following architecture:

1. Create a machine based on the following architecture:

Register Set

IR	DR	AC	AR	PC	FGI	FGO	S	I	E
0 15	0 15	0 15	011	011	1 Bit	1 Bit	1 Bit	1 bit	1 Bit

Memory	Instruction format
4096 words	0 3 4 15
16 bits per word	Opcode | Address

Basic Computer Instructions

Memory Reference			Register Reference		Input-Output	
Symbol	Hex		Symbol	Hex	Symbol	Hex
AND	0xxx		CLA	E800	INP	F80 0
ADD	2xxx		CLE	E400	OUT	F40 0
LDA	4xxx	Direct	CMA	E200	SKI	F20 0
STA	6xxx	Addressing	CME	E100	SKO	F10 0
BUN	8xxx		CIR	E080	ION	F08 0
BSA	Axxx		CIL	E040	IOF	F04 0
ISZ	Cxxx		INC	E020		
AND_I	1xxx		SPA	E010		
ADD_I	3xxx		SNA	E008		
LDA_I	5xxx	Indirect	SZA	E004		
STA_I	7xxx	Addressing	SZE	E002		
BUN_I	9xxx		HLT	E001		
BSA_I	Bxxx					
ISZ_I	Dxxx					

Optional

Refer to Chapter-5 of Morris Mano for description of instructions.

2. Create the micro operations and associate with instructions as given in the chapter (except interrupts). Design the register set, memory and the instruction set. Use this machine for the assignments of this section.
3. Create a Fetch routine of the instruction cycle.

4. Simulate the machine to determine the contents of AC, E, PC, AR and IR registers in hexadecimal after the execution of each of following register reference instructions:

a. CLA   e. CIR   i. SNA

b. CLE	f. CIL	j. SZA
c. CMA	g. INC	k. SZE
d. CME	h. SPA	l. HLT

5. Simulate the machine for the following memory-reference instructions with I= 0 and address part = 082. The instruction to be stored at address 022 in RAM. Initialize the memory word at address 082 with the operand B8F2 and AC with A937. Determine the contents of AC, DR, PC, AR and IR in hexadecimal after the execution.

a. ADD f. BSA

b. AND g. ISZ

c. LDA

d. STA

e. BUN

6. Simulate the machine for the memory-reference instructions referred in above question with I= 1 and address part = 082. The instruction to be stored at address 026 in RAM. Initialize the memory word at address 082 with the value 298. Initialize the memory word at address 298 with operand B8F2 and AC with A937. Determine the contents of AC, DR, PC, AR and IR in hexadecimal after the execution.

Core – 3

Programming in Java

Theory: 60 Lectures

Unit 1: Introduction to Java: Java Architecture and Features, Understanding the semantic and syntax differences between C++ and Java, Compiling and Executing a Java Program, Variables, Constants, Keywords Data Types, Operators (Arithmetic, Logical and Bitwise) and Expressions, Comments, Doing Basic Program Output, Decision Making Constructs (conditional statements and loops) and Nesting, Java Methods (Defining, Scope, Passing and Returning Arguments, Type Conversion and Type and Checking, Built-in Java Class Methods),

Unit 2: Arrays, Strings and I/O: Creating & Using Arrays (One Dimension and Multi-dimensional), Referencing Arrays Dynamically, Java Strings: The Java String class, Creating & Using String Objects, Manipulating Strings, String Immutability & Equality, Passing Strings To & From Methods, String Buffer Classes. Simple I/O using System.out and the Scanner class, Byte and Character streams, Reading/Writing from console and files.

Unit 3: Object-Oriented Programming Overview: Principles of Object-Oriented Programming, Defining & Using Classes, Controlling Access to Class Members, Class Constructors, Method Overloading, Class Variables & Methods, Objects as parameters, final classes, Object class, Garbage Collection.

Inheritance: (Single Level and Multilevel, Method Overriding, Dynamic Method Dispatch,
Abstract Classes), Interfaces and Packages, Extending interfaces and packages, Package and Class Visibility, Using Standard Java Packages (util, lang, io, net),Wrapper Classes, Autoboxing/Unboxing, Enumerations and Metadata.

Unit 4: Exception Handling, Threading, Networking and Database Connectivity: Exception types, uncaught exceptions, throw, built-in exceptions, Creating your own exceptions; Multi-threading: The Thread class and Runnable interface, creating single and multiple threads, Thread prioritization, synchronization and communication, suspending/resuming threads. Using java.net package, Overview of TCP/IP and Datagram programming. Accessing and manipulating databases using JDBC.

Unit 5: Applets and Event Handling: Java Applets: Introduction to Applets, Writing Java Applets, Working with Graphics, Incorporating Images & Sounds. Event Handling Mechanisms, Listener Interfaces, Adapter and Inner Classes. The design and Implementation of GUIs using the AWT controls, Swing components of Java Foundation Classes such as labels, buttons, textfields, layout managers, menus, events and listeners; Graphic objects for drawing figures such as lines, rectangles, ovals, using different fonts. Overview of servlets.

Reference Books

1. Ken Arnold, James Gosling, David Homes, "The Java Programming Language", 4th Edition, 2005.
2. James Gosling, Bill Joy, Guy L Steele Jr, GiladBracha, Alex Buckley"The Java Language Specification, Java SE 8 Edition (Java Series)", Published by Addison Wesley, 2014.
3. Joshua Bloch, "Effective Java" 2nd Edition,Publisher: Addison-Wesley, 2008.
4. Cay S. Horstmann, GaryCornell, "Core Java 2 Volume 1 ,9th Edition,Printice Hall.2012
5. Cay S. Horstmann, Gary Cornell, "Core Java 2 Volume 2 - Advanced Features)", 9th Edition, Printice Hall.2013
6. Bruce Eckel, "Thinking in Java", 3rd Edition, PHI, 2002.
7. E. Balaguruswamy, "Programming with Java", 4th Edition, McGraw Hill.2009.
8. Paul Deitel, Harvey Deitel, "Java: How to Program", 10th Edition, Prentice Hall, 2011.
9. "Head First Java", Orielly Media Inc. 2nd Edition, 2005.

Programming in Java Lab

1. To find the sum of any number of integers entered as command line arguments

2. To find the factorial of a given number

3. To learn use of single dimensional array by defining the array dynamically.

4. To learn use of .lenth in case of a two dimensional array

5. To convert a decimal to binary number

6. To check if a number is prime or not, by taking the number as input from the keyboard

7. To find the sum of any number of integers interactively, i.e., entering every number from the keyboard, whereas the total number of integers is given as a command line argument

8. Write a program that show working of different functions of String and StringBufferclasss like setCharAt(, setLength(), append(), insert(), concat()and equals().

9. Write a program to create a —distance‖ class with methods where distance is computed in terms of feet and inches, how to create objects of a class and to see the use of this pointer

10. Modify the —distance‖ class by creating constructor for assigning values (feet and inches) to the distance object. Create another object and assign second object as reference variable to another object reference variable. Further create a third object which is a clone of the first object.

11. Write a program to show that during function overloading, if no matching argument is found, then java will apply automatic type conversions(from lower to higher data type).

12. Write a program to show the difference between public and private access specifiers. The program should also show that primitive data types are passed by value and objects are passed by reference and to learn use of final keyword.

13. Write a program to show the use of static functions and to pass variable length arguments in a function.

14. Write a program to demonstrate the concept of boxing and unboxing.

15. Create a multi-file program where in one file a string message is taken as input from the user

and the function to display the message on the screen is given in another file (make use of Scanner package in this program).

16. Write a program to create a multilevel package and also creates a reusable class to generate Fibonacci series, where the function to generate Fibonacci series is given in a different file belonging to the same package.

17. Write a program that creates illustrates different levels of protection in classes/subclasses belonging to same package or different packages.

18. Write a program —DivideByZero‖ that takes two numbers a and b as input, computes a/b, and invokes Arithmetic Exception to generate a message when the denominator is zero.

19. Write a program to show the use of nested try statements that emphasizes the sequence of checking for catch handler statements.

20. Write a program to create your own exception types to handle situation specific to your application (Hint: Define a subclass of Exception which itself is a subclass of Throwable).

21. Write a program to demonstrate priorities among multiple threads.

Core –4

Object Oriented Programming in C++

Theory: 60 Lectures

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 Understanding utility of structures and unions, Declaring, initializing and using simple structures and unions, Manipulating individual members of structures and unions, Array of Structures, Individual data members as structures, Passing and returning structures from functions, Structure with union as members, Union with structures as members.

Unit - 5

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.

Core –5

Data Structures

Theory: 60 Lectures

Unit 1: Arrays
Single and Multi-dimensional Arrays, Sparse Matrices (Array and Linked Representation).

Unit 2: Stacks
Implementing single / multiple stack/s in an Array; Prefix, Infix and Postfix expressions, Utility and conversion of these expressions from one to another; Applications of stack; Limitations of Array representation of stack.

Unit 3: Linked Lists
Singly, Doubly and Circular Lists (Array and Linked representation); Normal and Circular
representation of Stack in Lists; Self Organizing Lists; Skip Lists. Introduction to Queues.

Unit 4: Trees
Introduction to Tree as a data structure; Binary Trees (Insertion, Deletion , Recursive and Iterative Traversals on Binary Search Trees); Threaded Binary Trees (Insertion, Deletion, Traversals); Height-Balanced Trees (Various operations on AVL Trees).

Unit 5: Searching and Sorting
Linear Search, Binary Search, Comparison of Linear and Binary Search, Selection Sort, Insertion Sort, Insertion Sort, Shell Sort, Comparison of Sorting Techniques.

Reference Books:
1. Adam Drozdek, "Data Structures and algorithm in C++", Third Edition, Cengage Learning,2012.
2. SartajSahni, Data Structures, "Algorithms and applications in C++", Second Edition, Universities Press, 2011.
3. Aaron M. Tenenbaum, Moshe J. Augenstein, YedidyahLangsam, "Data Structures Using C and C++:, Second edition, PHI, 2009.
4. Robert L. Kruse, "Data Structures and Program Design in C++", Pearson,1999.
5. D.S Malik, Data Structure using C++,Second edition, Cengage Learning, 2010.
6. Mark Allen Weiss, "Data Structures and Algorithms Analysis in Java", Pearson Education,3rd edition, 2011
7. Aaron M. Tenenbaum, Moshe J. Augenstein, YedidyahLangsam, "Data Structures Using Java, 2003.
8. Robert Lafore, "Data Structures and Algorithms in Java, 2/E", Pearson/ Macmillan Computer Pub,2003
9. John Hubbard, "Data Structures with JAVA", McGraw Hill Education (India) Private
Limited; 2 edition, 2009

10. Goodrich, M. and Tamassia, R. "Data Structures and Algorithms Analysis in Java", 4th Edition, Wiley,2013
11. Herbert Schildt, "Java The Complete Reference (English) 9th Edition Paperback", Tata McGraw Hill, 2014.
12. D. S. Malik, P.S. Nair, "Data Structures Using Java", Course Technology, 2003.

Data Structures Lab

1. Write a program to search an element from a list. Give user the option to perform Linear or Binary search. Use Template functions.
2. WAP using templates to sort a list of elements. Give user the option to perform sorting using Insertion sort, Bubble sort or Selection sort.
3. Implement Linked List using templates. Include functions for insertion, deletion and search of a number, reverse the list and concatenate two linked lists (include a function and also overload operator +).
4. Implement Doubly Linked List using templates. Include functions for insertion, deletion and search of a number, reverse the list.
5. Implement Circular Linked List using templates. Include functions for insertion, deletion and search of a number, reverse the list.
6. Perform Stack operations using Linked List implementation.
7. Perform Stack operations using Array implementation. Use Templates.
8. Perform Queues operations using Circular Array implementation. Use Templates.
9. Create and perform different operations on Double-ended Queues using Linked List implementation.
10. WAP to scan a polynomial using linked list and add two polynomial.
11. WAP to calculate factorial and to compute the factors of a given no. (i)using recursion, (ii) using iteration
12. (ii) WAP to display fibonacci series (i)using recursion, (ii) using iteration
13. WAP to calculate GCD of 2 number (i) with recursion (ii) without recursion
14. WAP to create a Binary Search Tree and include following operations in tree:
    (a) Insertion (Recursive and Iterative Implementation)
    (b) Deletion by copying
    (c) Deletion by Merging
    (d) Search a no. in BST
    (e) Display its preorder, postorder and inorder traversals Recursively
    (f) Display its preorder, postorder and inorder traversals Iteratively
    (g) Display its level-by-level traversals
    (h) Count the non-leaf nodes and leaf nodes
    (i) Display height of tree
    (j) Create a mirror image of tree
    (k) Check whether two BSTs are equal or not
15. WAP to convert the Sparse Matrix into non-zero form and vice-versa.
16. WAP to reverse the order of the elements in the stack using additional stack.
17. WAP to reverse the order of the elements in the stack using additional Queue.
18. WAP to implement various operations on AVL Tree.

Core – 6

Operating Systems

Theory: 60 Lectures

Unit 1: Introduction
Basic OS functions, resource abstraction, types of operating systems–multiprogramming systems, batch systems , time sharing systems; operating systems for personal computers &workstations, process control & real time systems.

Unit 2: Operating System Organization

Processor and user modes, kernels, system calls and system programs.

Unit 3: Process Management
System view of the process and resources, process abstraction, process hierarchy, threads, threading issues, thread libraries; Process Scheduling, non-pre-emptive and pre-emptive scheduling algorithms; concurrent and processes, critical section, semaphores, methods for inter-process communication; deadlocks.

Unit 4: Memory Management
Physical and virtual address space; memory allocation strategies -fixed and variable partitions, paging, segmentation, virtual memory

Unit 5: File and I/O Management
Directory structure, file operations, file allocation methods, device management.

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Recommended Books:

1. A Silberschatz, P.B. Galvin, G. Gagne, Operating Systems Concepts, 8th Edition, John Wiley Publications 2008.
2. A.S. Tanenbaum, Modern Operating Systems, 3rd Edition, Pearson Education 2007.
3. G. Nutt, Operating Systems: A Modern Perspective, 2nd Edition Pearson Education 1997.
4. W. Stallings, Operating Systems, Internals & Design Principles , 5th Hall of India. 2008.
Edition, Prentice.
5. M. Milenkovic, Operating Systems- Concepts and design, Tata McGraw Hill 1992.

Operating Systems Lab

C/ C++ programs

1. WRITE A PROGRAM (using *fork()* and/or *exec()* commands) where parent and child execute:

a) same program, same code.

b) same program, different code.

 c) before terminating, the parent waits for the child to finish its task.

2. WRITE A PROGRAM to report behavior of Linux kernel including kernel version, CPU type and model. (CPU information)

3. WRITE A PROGRAM to report behavior of Linux kernel including information on configured memory, amount of free and used memory. (memory information)

4. WRITE A PROGRAM to print file details including owner access permissions, file access time, where file name is given as argument.

5. WRITE A PROGRAM to copy files using system calls.

6. Write program to implement FCFS scheduling algorithm.

7. Write program to implement Round Robin scheduling algorithm.

8. Write program to implement SJF scheduling algorithm.

9. Write program to implement non-preemptive priority based scheduling algorithm.

10. Write program to implement preemptive priority based scheduling algorithm.

11. Write program to implement SRJF scheduling algorithm.

12. Write program to calculate sum of n numbers using *thread* library.

13. Write a program to implement first-fit, best-fit and worst-fit allocation strategies.

Core – 7

Computer Networks

Theory: 60 Lectures

Unit 1:

Introduction to Computer Networks and types, Network Topologies, Network Classifications,

Network Architecture models: Overview of OSI Reference Model, Overview of TCP/IP Reference Model.

Unit 2:

Physical Layer: Analog signal, digital signal, digital modulation techniques (ASK, PSK, QAM), encoding techniques, maximum data rate of a channel, transmission media (guided transmission media, wireless transmission, satellite communication), multiplexing (frequency division multiplexing, time division multiplexing, wavelength division multiplexing).

Unit 3:

Data Link MAC Layer: Data link layer services, error-detection and correction techniques, error recovery protocols (stop and wait, go back n, selective repeat), multiple access protocols, Datalink and MAC addressing, Ethernet, data link layer switching.

Unit 4:

Network layer: Routing; routing algorithms; network layer protocol of Internet- IP protocol, Internet control protocols.

Transport Layer: Transport services- error and flow control, Connection establishment and release- three way handshake.

Unit -5:
Overview of Application layer protocol

Protocols: FTP (File Transfer protocol), SMTP (Simple, Mail Transfer Protocol), Telnet and remote login protocol, WWW (World Wide Web), HTTP (Hyper Text Transfer protocol), Uniform Resource Locator, DNS, HTML.

Reference Books
1. B. A. Forouzan: Data Communications and Networking, Fourth edition, THM ,2007.
2. A. S. Tanenbaum: Computer Networks, Fourth edition, PHI , 2002

Computer Networks Lab

1. Simulate Cyclic Redundancy Check (CRC) error detection algorithm for noisy channel.

2. Simulate and implement stop and wait protocol for noisy channel.

3. Simulate and implement go back n sliding window protocol.

4. Simulate and implement selective repeat sliding window protocol.

5. Simulate and implement distance vector routing algorithm

6. Simulate and implement Dijkstra algorithm for shortest path routing.

SEMESTER – IV

Core – 8

Design and Analysis of Algorithms

Theory: 60 Lectures

Unit 1: Introduction
Basic Design and Analysis techniques of Algorithms, Correctness of Algorithm.

Unit 2: Algorithm Design Techniques
Iterative techniques, Divide and Conquer, Dynamic Programming, Greedy Algorithms.

Unit 3: Sorting and Searching Techniques
Elementary sorting techniques–Bubble Sort, Insertion Sort, Merge Sort, Advanced Sorting techniques - Heap Sort, Quick Sort, Sorting in Linear Time - Bucket Sort, Radix Sort and Count Sort, Searching Techniques, Medians & Order Statistics, complexity analysis;

Unit 4: Decision Trees, Red-Black Trees Amortized analysis

Unit 5: Graphs

Graph Algorithms–Breadth First Search, Depth First Search and its Applications, Minimum Spanning Trees.

Recommended Books:

1. T.H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein Introduction to Algorithms, PHI, 3rd Edition 2009
2. Sarabasse& A.V. Gelder Computer Algorithm – Introduction to Design and Analysis, Publisher – Pearson 3rd Edition 1999

Design and Analysis of Algorithms Lab Practical

1. i. Implement Insertion Sort (The program should report the number of comparisons)

   ii. Implement Merge Sort(The program should report the number of comparisons)

2. Implement Heap Sort(The program should report the number of comparisons)

3. Implement Randomized Quick sort (The program should report the number of comparisons)

4. Implement Radix Sort

5. Create a Red-Black Tree and perform following operations on it:

   i. Insert a node

   ii. Delete a node

   iii. Search for a number & also report the color of the node containing this number.

6. Write a program to determine the LCS of two given sequences

7. Implement Breadth-First Search in a graph

8. Implement Depth-First Search in a graph

9. Write a program to determine the minimum spanning tree of a graph.

For the algorithms at S.No 1 to 3 test run the algorithm on 100 different inputs of sizes varying from 30 to 1000. Count the number of comparisons and draw the graph. Compare it with a graph of n log n.

Core – 9

Software Engineering Theory

Theory: 60 Lectures

Unit 1: Introduction
The Evolving Role of Software, Software Characteristics, Changing Nature of Software, Software Engineering as a Layered Technology, Software Process Framework, Framework and Umbrella Activities, Process Models, Capability Maturity Model Integration (CMMI).

Unit 2: Requirement Analysis
Software Requirement Analysis, Initiating Requirement Engineering Process, Requirement Analysis and Modeling Techniques, Flow Oriented Modeling, Need for SRS, Characteristics and Components of SRS.

Unit 3: Software Project Management & Risk Management

Estimation in Project Planning Process, Project Scheduling.
Software Risks, Risk Identification, Risk Projection and Risk Refinement.

Unit 4: Quality Management and Design Engineering

Quality Concepts, Software Quality Assurance, Software Reviews.
Translating the Requirements model into the Design Model, The Design Process, Design Concepts - Abstraction, Modularity and Functional Independence; Architectural Mapping using Data Flow.
Unit 5: Testing Strategies & Tactics
Software Testing Fundamentals, Strategic Approach to Software Testing, Test Strategies for Conventional Software, Validation Testing, System testing, Black-Box Testing, White-Box Testing and their type, Basis Path Testing.

Recommended Books:

1. R.S. Pressman, Software Engineering: A Practitioner's Approach (7th Edition), McGraw-Hill, 2009.
2. P. Jalote, An Integrated Approach to Software Engineering (2nd Edition), Narosa Publishing House, 2003.
3. K.K. Aggarwal and Y. Singh, Software Engineering (2nd Edition), New Age International Publishers, 2008.
4. I. Sommerville, Software Engineering (8th edition), Addison Wesley, 2006.
5. D. Bell, Software Engineering for Students (4th Edition), Addison-Wesley, 2005.

6. R. Mall, Fundamentals of Software Engineering (2nd Edition), Prentice-Hall of India, 2004.

Software Engineering Lab

SL NO.	Practical Title
1	- Problem Statement - Process Model
2	Requirement Analysis: • Creating a Data Flow • Data Dictionary, Use Cases
3	Project Management: • Computing FP • Effort • Schedule, Risk Table, Timeline chart
4	Design Engineering: • Architectural Design • Data Design, Component Level Design
5	Testing: • Basis Path Testing

Sample Projects:

1. **Criminal Record Management**: Implement a criminal record management system for jailers, police officers and CBI officers

2. **DTC Route Information**: Online information about the bus routes and their frequency and fares

3. **Car Pooling**: To maintain a web based intranet application that enables the corporate employees within an organization to avail the facility of carpooling effectively.

4. Patient Appointment and Prescription Management System

5. Organized Retail Shopping Management Software

6. Online Hotel Reservation Service System

7. Examination and Result computation system

8. Automatic Internal Assessment System

9. Parking Allocation System

10. Wholesale Management System

Core – 10

Database Management Systems
Theory: 60 Lectures

Unit 1: Introduction
Characteristics of database approach, data models, database system architecture and data independence.

Unit 2: Entity Relationship(ER) Modeling
Entity types, relationships, constraints.

Unit 3: Relation data model
Relational model concepts, relational constraints, relational algebra, SQL queries

Unit 4: Database design
Mapping ER/EER model to relational database, functional dependencies, Lossless decomposition, Normal forms (upto BCNF).

Unit 5: File Structure and Indexing
Operations on files, File of Unordered and ordered records, overview of File organizations, Indexing structures for files (Primary index, secondary index, clustering index), Multilevel indexing using B and B+ trees.

Books Recommended:

1. R. Elmasri, S.B. Navathe, Fundamentals of Database Systems 6th Edition, Pearson Education, 2010.
2. R. Ramakrishanan, J. Gehrke, Database Management Systems 3rd Edition, McGraw-Hill, 2002.
3. A. Silberschatz, H.F. Korth, S. Sudarshan, Database System Concepts 6th Edition, McGraw Hill, 2010.
4. R. Elmasri, S.B. Navathe Database Systems Models, Languages, Design and application Programming, 6th Edition, Pearson Education,2013.

Database Management Systems Lab Practical

1.   Create and use the following database schema to answer the given queries.

EMPLOYEE Schema

Field	Type	NULL	KEY	DEFAULT
Eno	Char(3)	NO	PRI	NIL
Ename	Varchar(50)	NO		NIL
Job_type	Varchar(50)	NO		NIL
Manager	Char(3)	Yes	FK	NIL
Hire_date	Date	NO		NIL
Dno	Integer	YES	FK	NIL
Commission	Decimal(10,2)	YES		NIL
Salary	Decimal(7,2)	NO		NIL

DEPARTMENT Schema

Field	Type	NULL	KEY	DEFAULT
Dno	Integer	No	PRI	NULL
Dname	Varchar(50)	Yes		NULL

Query List
1. Query to display Employee Name, Job, Hire Date, Employee Number; for each employee with the Employee Number appearing first.

2. Query to display unique Jobs from the Employee Table.

3. Query to display the Employee Name concatenated by a Job separated by a comma.

4. Query to display all the data from the Employee Table. Separate each Column by a comma and name the said column as THE_OUTPUT.

5. Query to display the Employee Name and Salary of all the employees earning more than $2850.

6. Query to display Employee Name and Department Number for the Employee No= 7900.

7. Query to display Employee Name and Salary for all employees whose salary is not in the range of $1500 and $2850.

8. Query to display Employee Name and Department No. of all the employees in Dept 10 and Dept 30 in the alphabetical order by name.

9. Query to display Name and Hire Date of every Employee who was hired in 1981.

10. Query to display Name and Job of all employees who don't have a current Manager.

11. Query to display the Name, Salary and Commission for all the employees who earn commission.

12. Sort the data in descending order of Salary and Commission.

13. Query to display Name of all the employees where the third letter of their name is _A'.

14. Query to display Name of all employees either have two _R's or have two _A's in their name and are either in Dept No = 30 or their Manger's Employee No = 7788.

15. Query to display Name, Salary and Commission for all employees whose Commission Amount is 14 greater than their Salary increased by 5%.

SEMESTER – V

Core – 11

Internet Technologies
Theory: 60 Lectures

Unit 1: Java
Use of Objects, Array and ArrayList class

Unit 2: JavaScript
Data types, operators, functions, control structures, events and event handling.

Unit 3: JDBC
JDBC Fundamentals, Establishing Connectivity and working with connection interface, Working with statements, Creating and Executing SQL Statements, Working with Result Set Objects.

Unit 4: JSP
Introduction to JavaServer Pages, HTTP and Servlet Basics, The Problem with Servlets, TheAnatomy of a JSP Page, JSP Processing, JSP Application Design with MVC, Setting Up the JSP Environment, Implicit JSP Objects, Conditional Processing, Displaying Values, Using an expression to Set an Attribute, Declaring Variables and Methods, Error Handling and Debugging, Sharing Data Between JSP Pages, Requests, and Users, Database Access.

Unit 5: Java Beans

Java Beans Fundamentals, JAR files, Introspection, Developing a simple Bean, Connecting to DB

Recommended Books:
1. Ivan Bayross, Web Enabled Commercial Application Development Using Html, Dhtml,javascript, Perl Cgi , BPB Publications, 2009.
2. Cay Horstmann, BIG Java, Wiley Publication , 3rd Edition., 2009
3. Herbert Schildt , Java 7, The Complete Reference, , 8th Edition, 2009.
4. Jim Keogh ,The Complete Reference J2EE, TMH, , 2002.
5. O'Reilly , Java Server Pages, Hans Bergsten, Third Edition, 2003.

Internet Technologies Lab

Create event driven program for following:

1. Print a table of numbers from 5 to 15 and their squares and cubes using alert.

2. Print the largest of three numbers.

3. Find the factorial of a number n.

4. Enter a list of positive numbers terminated by Zero. Find the sum and average of these numbers.

5. A person deposits Rs 1000 in a fixed account yielding 5% interest. Compute the amount in the account at the end of each year for n years.

   Read n numbers. Count the number of negative numbers, positive numbers and zeros in the list.

Core – 12

Theory of Computation

Theory: 60 Lectures

Unit I. Languages

Introduction: Alphabets, Strings and Languages, Automata and Grammars, Kleen's Theorem

Unit II. Finite Automata and Regular Languages

Regular Expression (RE), Transition Graphs, Deterministic and non-deterministic finite automata, NFA to DFA Conversion, Regular expression to finite automata (FA), Pumping Lemma and Closure properties of regular languages, Application and Limitation of FA.

Unit III. Context free Grammar (CFG) and Context Free languages (CFL)

Context free grammar (CFG) and Context free languages (CFL): Definition, Examples, Derivation trees, Ambiguity in Grammar, Ambiguous to Unambiguous CFG, Simplification of CFLs

Unit IV. Pushdown Automata

Pushdown automata (PDA): Definition and Description, Language of PDA, Acceptance by Final state and Empty Stack, Deterministic and non-deterministic, CFG to PDA.

Unit V. Turing Machine

Turing Machines (TM): Basic model, definition and representation, Language acceptance by TM, Universal TM, Recursive and recursively enumerable language, Halting problem, Introduction to decidability and un-decidable problems.

Recommended Books:

1. Daniel I.A.Cohen, Introduction to computer theory, John Wiley,1996
2. Lewis & Papadimitriou, Elements of the theory of computation , PHI 1997.
3. Hoperoft, Aho, Ullman, Introduction to Automata theory, Language & Computation **–3rd** Edition, Pearson Education. 2006
4. P. Linz, An Introduction to Formal Language and Automata 4th edition Publication Jones Bartlett, 2006

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Theory of Computation: Tutorial

Core – 13

Artificial Intelligence

Theory: 60 Lectures

Unit 1: Introduction

Introduction to Artificial Intelligence, Background and Applications, Turing Test and Rational
Agent approaches to AI, Introduction to Intelligent Agents, their structure, behavior and environment.

Unit 2: Problem Solving and Searching Techniques

Problem Characteristics, Production Systems, Control Strategies, Breadth First Search, Depth First Search, Hill climbing and its Variations, Heuristics Search Techniques: Best First Search, A* algorithm, Constraint Satisfaction Problem, Means-End Analysis, Introduction to Game Playing, Min-Max and Alpha-Beta pruning algorithms.

Unit 3: Knowledge Representation

Introduction to First Order Predicate Logic, Resolution Principle, Unification, Semantic Nets, Conceptual Dependencies, Frames, and Scripts, Production Rules, Conceptual Graphs.
Programming in Logic (PROLOG)

Unit 4: Dealing with Uncertainty and Inconsistencies

Truth Maintenance System, Default Reasoning, Probabilistic Reasoning, Bayesian Probabilistic Inference, Possible World Representations.

Unit 5: Understanding Natural Languages

Parsing Techniques, Context-Free and Transformational Grammars, Recursive and AugmentedTransition Nets.

Books recommended:

1. DAN.W. Patterson, Introduction to A.I and Expert Systems – PHI, 2007.
2. Russell & Norvig, Artificial Intelligence-A Modern Approach, LPE, Pearson Prentice Hall, 2nd edition, 2005.
3. Rich & Knight, Artificial Intelligence – Tata McGraw 2nd Hill,
4. W.F. Clocksin and Mellish, Programming in PROLOG, Narosa Publishing edition, 1991. House, 3rd edition, 2001.
5. Ivan Bratko, Prolog Programming for Artificial Intelligence, Addison-Wesley, Pearson Education, 3rd edition, 2000.

Artificial Intelligence Lab

1. Write a prolog program to calculate the sum of two numbers.

2. Write a prolog program to find the maximum of two numbers.

3. Write a prolog program to calculate the factorial of a given number.

4. Write a prolog program to calculate the nth Fibonacci number.

5. Write a prolog program, insert_nth(item, n, into_list, result) that asserts that result is the list into_list with item inserted as the n'th element into every list at all levels.

6. Write a Prolog program to remove the Nth item from a list.

7. Write a Prolog program, remove-nth(Before, After) that asserts the After list is the Before list with the removal of every n'th item from every list at all levels.

8. Write a Prolog program to implement append for two lists.

9. Write a Prolog program to implement palindrome(List).

10. Write a Prolog program to implement max(X,Y,Max) so that Max is the greater of two numbers X and Y.

11. Write a Prolog program to implement maxlist(List,Max) so that Max is the greatest number in the list of numbers List.

12. Write a Prolog program to implement sumlist(List,Sum) so that Sum is the sum of a given list of numbers List.

13. Write a Prolog program to implement two predicates evenlength(List) and oddlength(List) so that they are true if their argument is a list of even or odd length respectively.

14. Write a Prolog program to implement reverse(List,ReversedList) that reverses lists.

15. Write a Prolog program to implement maxlist(List,Max) so that Max is the greatest number in the list of numbers List using cut predicate.

16. Write a Prolog program to implement GCD of two numbers.

17. Write a prolog program that implements Semantic Networks/Frame Structures.

Core – 14

Computer Graphics

Theory: 60 Lectures

Unit 1: Introduction:
Introduction to Graphics systems, Basic elements of Computer graphics, Applications of computer graphics. Architecture of Raster and Random scan display devices,
Input/output devices.

Unit 2: Drawing and clipping primitives:
Raster scan line, circle and ellipse drawing algorithms, Polygon filling, line clipping and polygon clipping algorithms

Unit 3: Transformation and Viewing:
2D and 3D Geometric Transformations, 2D and 3D Viewing Transformations (Projections- Parallel and Perspective), Vanishing points.

Unit 4: Geometric Modeling: Polygon Mesh Representation, Cubic Polynomial curves (Hermite and
Bezier).

Unit 5: Visible Surface determination and Surface Rendering: Z-buffer algorithm, List-priority algorithm and area subdivision algorithm for visible surface determination. Illumination and shading models, RGB color model and Basics of Computer Animation.

.**Books Recommended:**

1. J.D.Foley, A.Van Dan, Feiner, Hughes Computer Graphics Principles & Practice 2nd edition Publication Addison Wesley 1990.
2. D.Hearn, Baker: Computer Graphics, Prentice Hall of India 2008.
3. D.F.Rogers Procedural Elements for Computer Graphics, McGraw Hill 1997.
4. D.F.Rogers, Adams Mathematical Elements for Computer Graphics, McGraw Hill 2nd edition 1989.

Computer Graphics Lab

1. Write a program to implement Bresenham's line drawing algorithm.
2. Write a program to implement mid-point circle drawing algorithm.
3. Write a program to clip a line using Cohen and Sutherland line clipping algorithm.
4. Write a program to clip a polygon using Sutherland Hodgeman algorithm.
5. Write a program to apply various 2D transformations on a 2D object (use homogenous coordinates).
6. Write a program to apply various 3D transformations on a 3D object and then apply parallel and perspective projection on it.
7. Write a program to draw Hermite/Bezier curve.

SEMESTER - III

Skill Enhancement Course 1

1. HTML Programming

Unit-I: Introduction
The Head, the Body Colors, Attributes Lists, ordered and unordered

Unit-II: Links
Introduction Relative Links, Absolute Links Link Attributes Using the ID Attribute to Link Within a Document

Unit-III: Images
Putting an Image on a Page   Using Images as Links   Putting an Image in the Background

Unit IV: – Tables
Creating a Table Table Headers Captions Spanning Multiple Columns, Styling Table

Unit VI – Forms

Basic Input and Attributes Other Kinds of Inputs Styling forms with CSS

Book Recommended:
1. Introduction to **HTML** and CSS -- O'Reilly , 2010
2. Jon Duckett, HTML and CSS, John Wiely, 2012

Software Lab Based on HTML:
Q.1 Create an HTML document with the following formatting options:
    I. Bold
    II. Italics
    III. Underline
    IV. Headings (Using H1 to H6 heading styles)
    V. Font (Type, Size and Color)
    VI. Background (Colored background/Image in background)
    VII. Paragraph
    VIII. Line Break
    IX. Horizontal Rule
    X. Pre tag
Q.2 Create an HTML document which consists of:
    I. Ordered List
    II. Unordered List
    III. Nested List
    IV. Image
Q.3 Create a form using HTML which has the following types of controls:
    I. Text Box
    II. Option/radio buttons
    III. Check boxes
    IV. Reset and Submit buttons

Skill Enhancement Course 2

2. Android Programming

Unit 1: Introduction: History of Android, Introduction to Android Operating Systems, Android Development Tools, Android Architecture.

Unit 2: Overview of object oriented programming using Java: OOPs Concepts: Inheritance, Polymorphism, Interfaces, Abstract class, Threads, Overloading and Overriding, Java Virtual Machine.

Unit 3: Development Tools: Installing and using Eclipse with ADT plug-in, Installing Virtual machine for Android sandwich/Jelly bean (Emulator), configuring the installed tools, creating a android project

Hello Word, run on emulator, Deploy it on USB-connected Android device.

Unit 4: User Interface Architecture: Application context, intents, Activity life cycle, multiple screen sizes.

User Interface Design: Form widgets, Text Fields, Layouts, Button control, toggle buttons, Spinners(Combo boxes),Images, Menu, Dialog.

Unit 5: Database: Understanding of SQLite database, connecting with the database.

Book Recommended:
1. 1. Android application development for java programmers. By James C. Sheusi. Publisher: Cengage Learning, 2013.

   ONLINE READING / SUPPORTING MATERIAL:
   1. http://www.developer.android.com
   2. http://developer.android.com/about/versions/index.html
   3. http://developer.android.com/training/basics/firstapp/index.html
   4. http://docs.oracle.com/javase/tutorial/index.htm (Available in the form of free downloadable ebooks also).
   5. http://developer.android.com/guide/components/activities.html
   6. http://developer.android.com/guide/components/fundamentals.html
   7. http://developer.android.com/guide/components/intents-filters.html.
   8. http://developer.android.com/training/multiscreen/screensizes.html
   9. http://developer.android.com/guide/topics/ui/controls.html
   10. http://developer.android.com/guide/topics/ui/declaring-layout.html
   11. http://developer.android.com/training/basics/data-storage/databases.html

Software Lab Based on Android Programming:

1. Create ―Hello World‖ application. That will display ―Hello World‖ in the middle of the screen in the emulator. Also display ―Hello World‖ in the middle of the screen in the Android Phone.

2. Create an application with login module. (Check username and password).

3. Create spinner with strings taken from resource folder (res >> value folder) and on changing the spinner value, Image will change.

4. Create a menu with 5 options and selected option should appear in text box.
5. Create a list of all courses in your college and on selecting a particular course teacher- in-charge of that course should appear at the bottom of the screen.

6. Create an application with three option buttons, on selecting a button colour of the screen will change.

7. Create and Login application as above. On successful login, pop up the message.

8. Create an application to Create, Insert, update, Delete and retrieve operation on the database.

SEMESTER – V

Discipline Specific Electives

DSE Paper – 1

PHP Programming

Theory: 60 Lectures

Unit 1: Introduction to PHP: PHP introduction, inventions and versions, important tools and software requirements (like Web Server, Database, Editors etc.). PHP with other technologies, scope of PHP. Basic Syntax, PHP variables and constants Types of data in PHP, Expressions, scopes of a variable (local, global), PHP Operators : Arithmetic, Assignment, Relational, Logical operators, Bitwise , ternary and MOD operator. PHP operator Precedence and associativity

Unit 2: Handling HTML form with PHP: Capturing Form Data, GET and POST form methods, Dealing with multi value fields, Redirecting a form after submission

Unit 3: PHP conditional events and Loops: PHP IF Else conditional statements (Nested IF and Else), Switch case, while ,For and Do While Loop, Goto , Break ,Continue and exit.

Unit 4: PHP Functions: Function, Need of Function, declaration and calling of a function, PHP Function with arguments, Default Arguments in Function, Function argument with call by value, call by reference, Scope of Function Global and Local

Unit 5: String Manipulation and Regular Expression: Creating and accessing String , Searching & Replacing String Formatting, joining and splitting String , String Related Library functions , Use and advantage of regular expression over inbuilt function, Use of preg_match(), preg_replace(), preg_split() functions in regular expression

Reference Books:
   1. Steven Holzner, "PHP: The Complete Reference Paperback", McGraw Hill
   Education (India), 2007.
   2. Timothy Boronczyk, Martin E. Psinas, "PHP and MYSQL (Create-Modify-
   Reuse)", Wiley India Private Limited, 2008.
   3. Robin Nixon, "Learning PHP, MySQL, JavaScript, CSS & HTML5", 3rd Edition
   Paperback, O'reilly, 2014.

Software Lab Based on PHP:

1. Create a PHP page using functions for comparing three integers and print the largest number.
2. Write a function to calculate the factorial of a number (non-negative integer). The function accept the number as an argument.
3. WAP to check whether the given number is prime or not.

4. Create a PHP page which accepts string from user. After submission that page displays the reverse of provided string.
5. Write a PHP function that checks if a string is all lower case.
6. Write a PHP script that checks whether a passed string is palindrome or not? (A palindrome is word, phrase, or sequence that reads the same backward as forward, e.g., madam or nurses run)
7. WAP to sort an array.
8. Write a PHP script that removes the whitespaces from a string.
Sample string : 'The quick " " brown fox' Expected Output : Thequick""brownfox

SEMESTER - V

Discipline Specific Electives

DSE Paper – 2

Theory: 60 Lectures

VISUAL PROGRAMING

UNIT-I

Introduction: Introduction to .Net, Two tier and Three tier client server model, .Net Architecture, Features of .Net, Advantages of .Net, .Net Framework, CLR, CTS, CLS, Assemblies, Memory management issues – Garbage Collector and collection process, Exception Handling, Code Access Security.

UNIT – II

Introduction to Visual Basic.Net IDE: Creating a project, Types of project in .Net, Exploring and coding a project, Solution explorer, toolbox, properties window, Output window, Object Browser. VB.Net Programming

Language: Similarities and Differences with Visual Basic, Variables, Comments, Data Types, Working with Data Structures – Arrays, Array Lists, Enumerations, Constants, Structures; Introduction to procedures, calling procedures, argument passing mechanisms, scope of variable. Control Flow Statements – conditional statement Loops, Nesting of Loops, MsgBox and Input Box.

UNIT-III

GUI Programming: Introduction to Window Applications, Using Form – Common Controls, Properties, Methods and Events. Interacting with controls - Textbox, Label, Button, List box, Combo box, Checkbox, Picture

Box, Radio Button, Panel, scroll bar, Timer, List View, Tree View, toolbar, Status Bar. Dialog Controls, Creating and Using MDI applications, Toolbar, Status Bar, Creating custom controls, Creating Menus. Object Oriented Features: Classes and Objects, Access Specifies: Private, Public and Protected, Building Classes, Reusability, Constructors, Inheritance, and Overloading, Overriding, Creating and Using Namespaces.

UNIT – IV

Introduction to ADO: ADO vs. ADO.Net, ADO.Net data namespaces, ADO.Net Object Model, Accessing data from Server Explorer, Creating Connection, Command, Data Adapter, Data Reader and Data Set with OLEDB and SQLDB, Data Binding.

UNIT – V

Crystal Report: Connection to Database, Table, Queries, Building Report, Modifying Report, Formatting Fields, Publishing and exporting reports

Recommended Books:

Visual Basic 2010 programming Black Book, by Kogent Learning Solutions, Wiley India;

Visual Basic 2010 Step By Step, Michael Halvorson, PHI ;

Mastering Microsoft Visual Basic 2010, Evangelos Petroutsos, Wiley Publications Beginning Visual Basic 2010

(Wrox); VB.NET Programming Black Book by stevenholzner –dreamtech publications ‰ Mastering VB.NET by Evangelospetroutsos- BPB publications ‰ Introduction to .NET framework-Worx publication.

Software Lab Based on Visual Programming

Introduction to Data Science

Theory: 60 Lectures

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

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

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 ―tidy‖.

Exploratory Data Analysis: Essential exploratory techniques for summarizing data, applied before formal modeling commences, eliminating or sharpening potential hypotheses about the world that can be addressed by the data, common multivariate statistical techniques used to 45 visualize high-dimensional data.

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

Reference Books

1. Rachel Schutt, Cathy O'Neil, "Doing Data Science: Straight Talk from the Frontiline" by Schroff/O'Reilly, 2013.

2. Foster Provost, Tom Fawcett, "Data Science for Business" What You Need to Know About Data Mining and Data-Analytic Thinking" by O'Reilly, 2013.

3. John W. Foreman, "Data Smart: Using data Science to Transform Information into Insight" by John Wiley & Sons, 2013.

4. Ian Ayres, "Super Crunchers: Why Thinking-by-Numbers Is the New Way to Be Smart" Ist Edition by Bantam, 2007.

5. Eric Seigel, "Predictive Analytics: The Power to Predict who Will Click, Buy, Lie, or Die", 1st Edition, by Wiley, 2013.

6. Matthew A. Russel, "Mining the Social Web: Data mining Facebook, Twitter, LinkedIn, Goole+,

GitHub, and More", Second Edition, by O'Reilly Media, 2013.

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Introduction to Data Science Lab

Practical: 60 Lectures

1. Write a program that prints ‗Hello World' to the screen.

2. Write a program that asks the user for a number n and prints the sum of the numbers 1 to n

3. Write a program that prints a multiplication table for numbers up to 12.

4. Write a function that returns the largest element in a list.

5. Write a function that computes the running total of a list.
6. Write a function that tests whether a string is a palindrome.

7. Implement linear search.

8. Implement binary search.

9. Implement matrices addition , subtraction and Multiplication

10. Fifteen students were enrolled in a course. There ages were:

20 20 20 20 20 21 21 21 22 22 22 22 23 23 23
i. Find the median age of all students under 22 years ii. Find the median age of all students
iii. Find the mean age of all students iv. Find the modal age for all students
v. Two more students
enter the class. The
age of both students
is 23. What is now
mean, mode and
median ?

SEMESTER - VI
Discipline Specific Electives
DSE Paper – 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 jointly by an External Examiner and Supervisor.

Project Group Organization/Plan

● Students will initially prepare a synopsis (500 words) and submit it to their respective department.

● For a given project, the group size could be a maximum of four (04) students.

● Each group will be assigned a teacher as a supervisor who will be responsible for their lab classes.

● A maximum of four (04) projects would be assigned to one teacher.

Generic Elective for Computer Science

Semester-I

CS-GE1.1: Computer Fundamentals (Credits 4)

Unit-I: Introduction to computer:

Introduction to Computer:-Definition, Characteristics, Capabilities and Limitations. Introduction to Operating System. Components of a Computer System-Control Unit, ALU, input/output functions and characteristics. : I/O Devices, Memory Introduction, Classifications- Volatile Memory and Non- Volatile , Flash Memory, ROM, RAM, EPROM, PROM, EEPROM other types of memory.

Unit-II: Introduction to Windows OS

What is an operating system and basics of Windows, Using Mouse and Moving Icons on the screen, The My Computer Icon, The Recycle Bin, Status Bar, Start and Menu & Menu-selection, Running an Application, Windows Explorer Viewing of File, Folders and Directories, Creating and Renaming of files and folders, Opening and closing of different Windows, Windows Setting, Control Panel, Wall paper and Screen Savers, Setting the date and Sound, Creating Short cuts, Window Accessories

Unit III: Ms-Word and Power Point

Starting word - Parts of word window - formatting features - menus, commands, Toolbars - File menu, Edit, view, insert, Format and tool menus - Working with text, tables - checking spelling and Grammars.

Power Point: Making presentation with Ms Power Points - working with Power Point - organization chart - inserting chart from excel.

Unit IV: MS - Excel:

Creating Work Sheets - Formulas - Functions - Charts - Coping Data, between worksheets - Case studies pay bill , profit and loss accounts etc.
Unit-V- The Internet and WWW:

World Wide Web, Internet, Domain Names and Internet Organization (.edu, .com, .mil, .gov, .net ,.in etc.) , Types of Network, Internet Service Provider, client-server, search engine, Web Browsing software, Basic of electronic mail, Using Emails, Document handling

Books Recommended:

1. A. Goel, Computer Fundamentals, Pearson Education, 2010.

2. P. Aksoy, L. DeNardis, Introduction to Information Technology, Cengage Learning, 2006
3. P. K.Sinha, P. Sinha, Fundamentals of Computers, BPB Publishers, 2007
4. E-Commerce Concepts, Models, Strategies-:-G.S.V.Murthy Himalaya Publishing House
5. E-Commerce :-Kamlesh K Bajaj and Debjani Nag

CS-GE 1.2   : Computer Fundamentals Practical   (Credits 2)

Generic Elective for Computer Science

Semester-II

CS-GE2.1 Database Management Systems(Theory)   (Credits 4)

Unit – I
DBMS Definition, Characteristics of DBMS ,Application and advantages of DBMS, Instances , Schemas and Database States, Three Levels of Architecture , Data Independence, DBMS languages, Data Dictionary, Database Users, Data Administrators.

Unit – II
Data Models, types and their comparison, Entity Relationship Model, Entity Types, Entity
Sets, Attributes and its types, Keys, E-R Diagram, Data Integrity

Unit – III
RDBMS –Concept, Components and Codd's rules, Relational Algebra (selection, projection, union, intersection, Cartesian product, Different types of join like theta join, equi-join, natural join, outer join)

Unit – IV
Functional Dependencies, Good & Bad Decomposition, Anomalies as a database: A consequences of bad design, Normalization: 1NF, 2NF, 3NF, BCNF

Unit – V
Introduction to SQL, DDL, DML, and DCL statements, Creating Tables, Adding Constraints, Altering Tables, Update, Insert, Delete & various Form of SELECT-Simple, Using Special Operators for Data Access. Aggregate functions, forms and reports.

CS-GE 2.2   : Database Management Systems (Practical)   **(Credits 2)**

CS-GE3.1: HTML Programming   **(Credits 4)**

Unit 1: Introduction: Basic HTML Concepts, HTML tags, Paragraphs, Lists, Formatted and Unformatted Text, Hyperlink, Font (Size, Color), Attributes, Lists and its attributes, Relative Links, Absolute Links, Link Attributes, Using the ID Attribute to Link Within a Document.

Unit 2: Images:

Image attributes, inserting an Image on a Page, Web Graphic Format (GIF, JPEG, and PNG), Inline Images Using Images as Links, inserting an Image in the Background, Working with Divs, placing <div> tags, Creating Layers, and Modifying a Layer

Unit 3: Tables: Creating a Table, Table Headers, Captions, Spanning Multiple Columns Styling Table

Unit 4: –. Forms:

How HTML forms work, Inserting a form, Using Text fields, Providing Checkboxes and Radio Buttons, Creating form lists and Menus, Activating forms with buttons, Using Hidden fields and File fields.

Unit 5 –CSS and Web Publishing:

Inline CSS, External and Internal CSS, CSS color, font, size, padding, margin, border, Domain Names, Web Hosting and DNS, Web publishing

Book Recommended:

1. Introduction to **HTML** and CSS -- O'Reilly , 2010

2. Jon Duckett, HTML and CSS, John Wiely, 2012

CS-GE 3.2   :HTML Programming   (Practical)   **(Credits 2)**

CS-GE4.1: Programming in Python (Theory)   **(Credits 4)**

Unit I: Planning the Computer Program:
Concept of problem solving, Problem definition, Program design, Debugging, Types of errors in programming, Documentation.

Unit II: Techniques of Problem Solving:
Flowcharting, decision table, algorithms, Structured programming concepts, Programming methodologies viz. top-down and bottom-up programming.

Unit III: Overview of Programming :

Structure of a Python Program, Elements of Python

Unit IV: Introduction to Python:

Python Interpreter, Using Python as calculator, Python shell, Indentation. Atoms, Identifiers and keywords, Literals, Strings, Operators(Arithmetic operator, Relational operator, Logical or Boolean operator, Assignment, Operator, Ternary operator, Bit wise operator,

Increment or Decrement operator).

Unit V: Creating Python Programs :

Input and Output Statements, Control statements(Branching, Looping, Conditional Statement, Exit function, Difference between break, continue and pass.),

Defining Functions, default arguments.

Reference Books

1. T. Budd, Exploring Python, TMH, 1st Ed, 2011

2. Python Tutorial/Documentation www.python.or 2015

3. Allen Downey, Jeffrey Elkner, Chris Meyers , How to think like a computer scientist : learning with Python , Freely available online.2012

4. http://docs.python.org/3/tutorial/index.html

5. http://interactivepython.org/courselib/static/pythonds

6. http://www.ibiblio.org/g2swap/byteofpython/read/

CS-GE 4.2: Programming in Python (Practical)   **(Credits 2)**