Syllabus

for

B.Sc. (Honours) Computer Science

Submitted

to

Academic Section, Guru Ghasidas Vishwavidyalaya

Bilaspur

Under

Choice Based Credit System

Session 2018-19

Course Structure (Computer Science-Major)

Details of courses under B.Sc.(Honours)

Course	*Credits	
	Theory + Practical	Theory + Tutorial

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I.Core Course
(14 Papers) 14X4=56   14X5=70
CoreCoursePractical/Tutorial*
(14Papers) 14X2=28   14X1=14

II.ElectiveCourse
(8Papers)
A.1.DisciplineSpecificElective   4X4=16   4X5=20
(4Papers)
A.2.DisciplineSpecificElective
   Practical/Tutorial*   4X2=8   4X1=4
(4Papers)

B.1.GenericElective/
   Interdisciplinary   4X4=16   4X5=20
(4Papers)
B.2.GenericElective
   Practical/Tutorial*   4X2=8   4X1=4
(4Papers)

- **Optional Dissertation or projectwork in place of one Discipline Specific Elective paper(6credits)in6thSemester**

III. Ability Enhancement Courses
1.**AbilityEnhancementCompulsory**
(2Papersof2crediteach)   2X2=4   2X2=4
  Environmental Science
  English/MIL Communication

2.**AbilityEnhancementElective**(Skill Based)
  (Minimum2)   2X2=4   2X2=4
  (2Papersof2crediteach)

Total credit   **140**   **140**
Institute should evolve a system/policy about ECA/ General Interest/Hobby/Sports/NCC/NSS/related courses on its own.
***wherever there is a practical there will be no tutorial and vice-versa**

SEMESTER-I

COMPUTER SCIENCE (CORE-I): Programming Fundamentals using C/C++ (SSCICR0101L)

Theory: 60 Lectures

1. Introduction to C and C++ (3 Lectures)

History of C and C++, Overview of Procedural Programming and Object-Orientation Programming, Using main() function, Compiling and Executing Simple Programs in C++.

2. Data Types, Variables, Constants, Operators and Basic I/O (5 Lectures)

Declaring, Defining and Initializing Variables, Scope of Variables, Using Named Constants, Keywords, Data Types, Casting of Data Types, Operators (Arithmetic, Logical and Bitwise), Using Comments in programs, Character I/O (getc, getchar, putc, putcharetc), Formatted and Console I/O (printf(), scanf(), cin, cout), Using Basic Header Files (stdio.h, iostream.h, conio.hetc).

3. Expressions, Conditional Statements and Iterative Statements (5 Lectures)

Simple Expressions in C++ (including Unary Operator Expressions, Binary Operator Expressions), Understanding Operators Precedence in Expressions, Conditional Statements (if construct, switch-case construct), Understanding syntax and utility of Iterative Statements (while, do-while, and for loops), Use of break and continue in Loops, Using Nested Statements (Conditional as well as Iterative)

4. Functions and Arrays (10 Lectures)

Utility of functions, Call by Value, Call by Reference, Functions returning value, Void functions, Inline Functions, Return data type of functions, Functions parameters, Differentiating between Declaration and Definition of Functions, Command Line Arguments/Parameters in Functions, Functions with variable number of Arguments.

Creating and Using One Dimensional Arrays (Declaring and Defining 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 (Declaring, Defining and Initializing Two Dimensional Array, Working with Rows and Columns), Introduction to Multi-dimensional arrays

5. Derived Data Types (Structures and Unions) (3 Lectures)

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.

6. Pointers and References in C++ (7 Lectures)

Understanding a Pointer Variable, Simple use of Pointers (Declaring and Dereferencing Pointers to simple variables), Pointers to Pointers, Pointers to structures, Problems withPointers, Passing pointers as function arguments, Returning a pointer from a function, using arrays as pointers, Passing arrays to functions. Pointers vs. References, Declaring and initializing references, Using references as function arguments and function return values

7. Memory Allocation in C++ (3 Lectures)

4

Differentiating between static and dynamic memory allocation, use of malloc, calloc and free functions, use of new and delete operators, storage of variables in static and dynamic memory allocation

8. File I/O, Preprocessor Directives   (4 Lectures)

Opening and closing a file (use of fstream header file, ifstream, ofstream and fstream classes), Reading and writing Text Files, Using put(), get(), read() and write() functions, Random access in files, Understanding the Preprocessor Directives (#include, #define, #error, #if, #else, #elif, #endif, #ifdef, #ifndef and #undef), Macros

9. Using Classes in C++   (7 Lectures)

Principles of Object-Oriented Programming, Defining & Using Classes, Class Constructors, Constructor Overloading, Function overloading in classes, Class Variables &Functions, Objects as parameters, Specifying the Protected and Private Access, Copy Constructors,Overview of Template classes and their use.

10. Overview of Function Overloading and Operator Overloading   (5 Lectures)

Need of Overloading functions and operators, Overloading functions by number and type of arguments, Looking at an operator as a function call, Overloading Operators (including assignment operators, unary operators)

11. Inheritance, Polymorphism and Exception Handling   (8 Lectures)
Introduction to Inheritance (Multi-Level Inheritance, Multiple Inheritance), Polymorphism (Virtual Functions, Pure Virtual Functions), Basics Exceptional Handling (using catch and throw, multiple catch statements), Catching all exceptions, Restricting exceptions, Rethrowing exceptions.

Reference Books

1. HerbtzSchildt, "C++: The Complete Reference", Fourth Edition, McGraw Hill.2003
2. BjarneStroustrup, "The C++ Programming Language", 4th Edition, Addison-Wesley , 2013.
3. BjarneStroustroup, "Programming -- Principles and Practice using C++", 2nd Edition, Addison-Wesley 2014.
4. E Balaguruswamy, "Object Oriented Programming with C++", Tata McGraw-Hill Education, 2008.
5. Paul Deitel, Harvey Deitel, "C++ How to Program", 8th Edition, Prentice Hall, 2011.
5. John R. Hubbard, "Programming with C++", Schaum's Series, 2nd Edition, 2000.
6. Andrew Koeni, Barbara, E. Moo, "Accelerated C++", Published by Addison-Wesley , 2000.
7. Scott Meyers, "Effective C++", 3rd Edition, Published by Addison-Wesley, 2005.
8. Harry, H. Chaudhary, "Head First C++ Programming: The Definitive Beginner's Guide", First Create space Inc, O-D Publishing, LLC USA.2014
9. Walter Savitch, "Problem Solving with C++", Pearson Education, 2007.
10. Stanley B. Lippman, JoseeLajoie, Barbara E. Moo, "C++ Primer", Published by Addison-Wesley, 5th Edition, 2012

COMPUTER SCIENCE LAB (CORE-II): Programming Fundamentals using C/C++ Lab (SSCICR0101P)
Practical: 15 Lectures

1. WAP to print the sum and product of digits of an integer.

2. WAP to reverse a number.

3. WAP to compute the sum of the first n terms of the following series
   $$S = 1+1/2+1/3+1/4+\ldots\ldots$$

4. WAP to compute the sum of the first n terms of the following series
   $$S = 1-2+3-4+5\ldots\ldots\ldots\ldots.$$

5. Write a function that checks whether a given string is Palindrome or not. Use this function to find whether the string entered by user is Palindrome or not.

6. Write a function to find whether a given no. is prime or not. Use the same to generate the prime numbers less than 100.

7. WAP to compute the factors of a given number.

8. Write a macro that swaps two numbers. WAP to use it.

9. WAP to print a triangle of stars as follows (take number of lines from user):

```
        *
       ***
      *****
     *******
    *********
```

10. WAP to perform following actions on an array entered by the user:
    i) Print the even-valued elements
    ii) Print the odd-valued elements
    iii) Calculate and print the sum and average of the elements of array
    iv) Print the maximum and minimum element of array
    v) Remove the duplicates from the array
    vi) Print the array in reverse order

    The program should present a menu to the user and ask for one of the options.
    The menu should also include options to re-enter array and to quit the program.

11. WAP that prints a table indicating the number of occurrences of each alphabet in the text entered as command line arguments.

12. Write a program that swaps two numbers using pointers.

13. Write a program in which a function is passed address of two variables and then alter its contents.

14. Write a program which takes the radius of a circle as input from the user, passes it to another function that computes the area and the circumference of the circle and displays the value of area and circumference from the main() function.

15. Write a program to find sum of n elements entered by the user. To write this program, allocate memory dynamically using malloc() / calloc() functions or new operator.

16. Write a menu driven program to perform following operations on strings:
    a) Show address of each character in string
    b) Concatenate two strings without using strcat function.

c) Concatenate two strings using strcat function.
d) Compare two strings
e) Calculate length of the string (use pointers)
f) Convert all lowercase characters to uppercase
g) Convert all uppercase characters to lowercase
h) Calculate number of vowels
i) Reverse the string

17. Given two ordered arrays of integers, write a program to merge the two-arrays to get an ordered array.

18. WAP to display Fibonacci series (i)using recursion, (ii) using iteration

19. WAP to calculate Factorial of a number (i)using recursion, (ii) using iteration

20. WAP to calculate GCD of two numbers (i) with recursion (ii) without recursion.

21. Create Matrix class using templates. Write a menu-driven program to perform following Matrix
    operations (2-D array implementation):
    a) Sum   b) Difference c) Product   d) Transpose

22. Create the Person class. Create some objects of this class (by taking information from the user). Inherit the class Person to create two classes Teacher and Student class. Maintain the respective information in the classes and create, display and delete objects of these two classes (Use Runtime Polymorphism).

23. Create a class Triangle. Include overloaded functions for calculating area. Overload assignment operator and equality operator.

24. Create a class Box containing length, breath and height. Include following methods in it:
    a) Calculate surface Area
    b) Calculate Volume
    c) Increment, Overload ++ operator (both prefix & postfix)
    d) Decrement, Overload -- operator (both prefix & postfix)
    e) Overload operator == (to check equality of two boxes), as a friend function
    f) Overload Assignment operator
    g) Check if it is a Cube or cuboid
  Write a program which takes input from the user for length, breath and height to test the above class.

25. Create a structure Student containing fields for Roll No., Name, Class, Year and Total Marks. Create 10 students and store them in a file.

26. Write a program to retrieve the student information from file created in previous question and print it in following format:
                    Roll No. Name Marks

27. Copy the contents of one text file to another file, after removing all whitespaces.

28. Write a function that reverses the elements of an array in place. The function must accept only one pointer value and return void.

29. Write a program that will read 10 integers from user and store them in an array. Implement array using pointers. The program will print the array elements in ascending and descending order.

COMPUTER SCIENCE (CORE-II): Data Structures (SSCICR0102L)

Theory: 60 Lectures

1. **Arrays**   **(5 Lectures)**
   Single and Multi-dimensional Arrays, Sparse Matrices (Array and Linked Representation)

2. **Stacks**   **(5 Lectures)**
   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

3. **Linked Lists**   **(10 Lectures)**
   Singly, Doubly and Circular Lists (Array and Linked representation); Normal and Circular representation of Stack in Lists; Self Organizing Lists; Skip Lists

4. **Queues**   **(5 Lectures)**
   Array and Linked representation of Queue, De-queue, Priority Queues

5. **Recursion**   **(5 lectures)**
   Developing Recursive Definition of Simple Problems and their implementation; Advantages and Limitations of Recursion; Understanding what goes behind Recursion (Internal Stack Implementation)

6. **Trees**   **(20 Lectures)**
   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).

7. **Searching and Sorting**   **(5 Lectures)**
   Linear Search, Binary Search, Comparison of Linear and Binary Search, Selection Sort, Insertion Sort, Insertion Sort, Shell Sort, Comparison of Sorting Techniques

8. **Hashing**   **(5 Lectures)**
   Introduction to Hashing, Deleting from Hash Table, Efficiency of Rehash Methods, Hash Table Reordering, Resolving collusion by Open Addressing, Coalesced Hashing, Separate Chaining, Dynamic and Extendible Hashing, Choosing a Hash Function, Perfect Hashing Function

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.

COMPUTER SCIENCE (C-II): Data Structures Tutorial   Tutorial: 15 lectures (SSCICR0102T)

Generic Elective (GE-1)   Subject – **Introduction to Programming** using C
(SSCIGE0101L)

Origin & Introduction to C : About C, Evolution of C, Structure of a C program, Compiling a C program, Simple C program, Character set in C, Keywords in C, Basic data types, Qualifiers used with basic data types, Variables in C, Type declaration, Input function, Output function and format specifiers.

Operators: Arithmetic operators, Unary operators, Relational and logical operators, address operator, conditional operator, Hierarchy of operators.

Decision Making, looping & Branching: Control statements, if statement, if else statement, for statement, while loop, do while loop, switch statement, break statement, continue statement, goto statement.

Arrays: Introduction to arrays, advantages of arrays, single dimensional arrays, multidimensional arrays, array declaration, array initialization, accessing data from array. Two-dimensional Arrays (Declaring, Defining and Initializing Two Dimensional Array, Working with Rows and Columns)

Introduction to pointers, function, structure and union.

Reference Books:

1. Y. Kanetkar, Let Us C, BPB Publication.
2. B.S. Gottfried, Schaum's outline of Theory and Problems of Programming with C, McGraw-Hill.
3. *Programming in ANSI C - Balaguruswami, TMH 2.*
4. *The 'C' programming language - B.W.Kernighan, D.M.Ritchie, PHI*
5. A.K. Saxena, Programming Language C : Anamaya Publishers, New Delhi.
6. *C The Complete Reference - H.Sohildt, TMH 3.*
7. *Computer fundamentals and programming in C – Pradip Dey & Manas Ghosh, OXFORD*

Generic Elective -1 LAB (GE- IA) : **Introduction to Programming using C Lab**
Practical : 15 Lectures (SSCIGE0101P)

1. Write a program to find greatest of three numbers.
2. Write a program to find gross salary of a person
3. Write a program to find grade of a student given his marks.
4. Write a program to find LCM of two numbers.
5. Write a program to find divisor or factorial of a given number.
6. Write a program to find Fibonacci sequence.
7. Write a program to print first ten natural numbers.
8. Write a program to print first ten even and odd numbers.
9. Write a program to find grade of a list of students given their marks.
10. Create Matrix class. Write a menu-driven program to perform following Matrix operations (2-D array implementation):
    a) Sum   b) Difference c) Product   d) Transpose

11.   Write a program to add first ten natural numbers using function.
12.   Write a program to display prime numbers using function.
13.   Write a program to store information of students using structure.

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SEMESTER-II

COMPUTER SCIENCE (CORE-III): Programming in Java (SSCICR0203L)

Theory: 60 Lectures

1. Introduction to Java   **(4 Lectures)**

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),

2. Arrays, Strings and I/O   **(8 Lectures)**

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.

3. Object-Oriented Programming Overview   **(4 Lectures)**

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.

3. Inheritance, Interfaces, Packages, Enumerations, Autoboxing and Metadata (14 lectures)

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.

4. Exception Handling, Threading, Networking and Database Connectivity   (15 Lectures)

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.

5. Applets and Event Handling   **(15 Lectures)**

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.

10. David J. Eck, "Introduction to Programming Using Java", Published by CreateSpace Independent Publishing Platform, 2009.

11. John R. Hubbard, "Programming with JAVA", Schaum's Series, 2nd Edition, 2004.

COMPUTER SCIENCE LAB (CORE-III): Programming in Java Lab (SSCICR0203P)

Practical: 15 Lectures

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 fibonacii 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.

22. Write a program to demonstrate multithread communication by implementing synchronization among threads (Hint: you can implement a simple producer and consumer problem).

23. Write a program to create URL object, create a URLConnection using the openConnection() method and then use it examine the different components of the URLand content.

24. Write a program to implement a simple datagram client and server in which a message that is typed into the server window is sent to the client side where it is displayed.

25. Write a program that creates a Banner and then creates a thread to scrolls the message in the banner from left to right across the applet‘s window.

26. Write a program to get the URL/location of code (i.e. java code) and document(i.e. html file).

27. Write a program to demonstrate different mouse handling events like mouseClicked(), mouseEntered(), mouseExited(), mousePressed, mouseReleased() and mouseDragged().

28. Write a program to demonstrate different keyboard handling events.

29. Write a program to generate a window without an applet window using main() function.

30. Write a program to demonstrate the use of push buttons.

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COMPUTER SCIENCE (CORE-IV): Discrete Structures Theory: 60 Lectures   (SSCICR0204L)

1.Introduction: (15 Lectures) Sets - finite and Infinite sets, uncountably 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.

2.Growth of Functions: **(8 Lectures)**

Asymptotic Notations, Summation formulas and properties, Bounding Summations, approximation by Integrals

3.Recurrences: **(10 Lectures)**

Recurrence Relations, generating functions, Linear Recurrence Relations with constant coefficients and their solution, Substitution Method, Recurrence Trees, Master Theorem

4.Graph Theory   **(15 Lectures)**

Basic Terminology, Models and Types, multigraphs and weighted graphs, Graph Representaion, Graph Isomorphism, Connectivity, Euler and Hamiltonian Paths and Circuits, Planar Graphs, Graph Coloring, Trees, Basic Terminology and properties of Trees, Introduction to Spanning Trees.

5.Prepositional Logic   **(12 Lectures)**

 Logical Connectives, Well-formed Formulas, Tautologies, Equivalences, Inference Theory

Recommended Books:

1. C.L. Liu , D.P. Mahopatra, Elements of Discrete mathematics, 2nd Edition , Tata McGraw Hill, 1985,
2. Kenneth Rosen, Discrete Mathematics and Its Applications, Sixth Edition ,McGraw Hill 2006

3. T.H. Coremen, C.E. Leiserson, R. L. Rivest, Introduction to algorithms, 3rd edition Prentice Hall on India, 2009

4. M. O. Albertson and J. P. Hutchinson, Discrete Mathematics with Algorithms , John wiley Publication, 1988

5. J. L. Hein, Discrete Structures, Logic, and Computability, 3rd Edition, Jones and Bartlett Publishers, 2009

6. D.J. Hunter, Essentials of Discrete Mathematics, Jones and Bartlett Publishers, 2008

COMPUTER SCIENCE (CORE-IV): Discrete Structures Tutorial   Tutorial: 15 lectures (SSCICR0204T)

Generic Elective (GE-2)   Subject – **Introduction to Internet Technologies (SSCIGE0202L)**

Theory: 60 lectures

Introduction to computer network: LAN, MAN, WAN, wireless
LAN, internet, intranet, extranet, LAN topologies, Network devices:
NIC, repeaters, hub, bridge, switch, gateway and router.

Internet Terms: Web page, Home page, website, internet browsers, URL,
Hypertext,
ISP, Web server, download and upload, online and offline.

Internet Applications: www, telnet, ftp, e-mail, social networks, search engines,
Video Conferencing, e-Commerce, m-Commerce, VOIP, blogs.

Introduction to Web Design: Introduction to hypertext markup language (html)
Document type definition, creating web pages, lists, hyperlinks, tables, web forms,
inserting images, frames, hosting options and domain name registration.
Customized
Features: Cascading style sheet (css) for text formatting and other manipulations.

JavaScript Fundamentals: Data types and variables, functions, methods and events,
controlling program flow, JavaScript object model, built-in objects and operators.

Reference Books:
1. Andrew S. Tanenbaum, David J. Wetherall Computer Networks (5th Edition),PHI, 2010
2. B. A. Forouzan, Data Communication and Networking , TMH,2003.
3. D.R. Brooks, An Introduction to HTML and Javascript for Scientists and Engineers,
   Springer W. Willard,2009
4. HTML A Beginner's Guide, Tata McGraw-Hill Education, 2009.
5. J. A. Ramalho, Learn Advanced HTML 4.0 with DHTML, BPB Publications, 2007

Internet Technologies Lab Practical: 15 lectures
(SSCIGE0202P)

Practical exercises based on concepts listed in theory using HTML.

1. Create HTML document with following formatting – Bold, Italics, Underline, Colors,
   Headings, Title, Font and Font Width, Background, Paragraph, Line Brakes,
   Horizontal Line, Blinking text as well as marquee text.

2. Create HTML document with Ordered and Unordered lists, Inserting Images, Internal
   and External linking

3. Create HTML document with Table:

Some image here

4. Create Form with Input Type, Select and Text Area in HTML.

5. Create an HTML containing Roll No., student's name and Grades in a tabular form.

6. Create an HTML document (having two frames) which will appear as follows:

About Department 1 Department 2 Department 3	This frame would show the contents according to the link clicked by the user on the left frame.

7. Create an HTML document containing horizontal frames as follows:

Department Names (could be along with Logos)
Contents according to the Link clicked

8. Create a website of 6 – 7 pages with different effects as mentioned in above problems.

9. Create HTML documents (having multiple frames) in the following three formats:

Frame1

Frame2

Frame1	
Frame2	Frame3

10. Create a form using HTML which has the following types of controls:
  V.   Text Box
  VI.   Option/radio buttons
  VII.   Check boxes
  VIII. Reset and Submit buttons

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Business: [   ]
We must have a correct e-mail address to send you the news letter:
Email: [   ]
How did you hear about XYZ News Magazine and Emails?
⦿ Here on the Web ◯ In a magazine ◯ Television ◯ Other
Would you like to be on our regular mailing list?
☑ Yes, we love junk emails

[Reset] [Send it in!]

List of Practicals using Javascript :

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

SEMESTER-III

COMPUTER SCIENCE (C-V): Internet Technologies Theory: 60 Lectures

Java (5 lectures)

Use of Objects, Array and ArrayList class

JavaScript (15 lectures)

Data types, operators, functions, control structures, events and event handling.

JDBC (10 lectures)

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

JSP (20 lectures)

Introduction to JavaServer Pages, HTTP and Servlet Basics, The Problem with Servlets, The Anatomy 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.

Java Beans (10 Lectures)

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.

COMPUTER SCIENCE (CORE -V): Internet Technologies Tutorial   Tutorial : 15 lectures

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COMPUTER SCIENCE (C-VI): Database Management Systems Theory: 60 Lectures

by — Ram Sir

Lectures

1.Introduction   **(6)**
Characteristics of database approach, data models, database system architecture and data Independence.
data model reprsent the relation among various data and information

2.Entity Relationship(ER) Modelling   **(8 Lectures)**

 Entity types, relationships, constraints.

3.Relation data model   **(20 Lectures)**

Relational model concepts, relational constraints, relational algebra, SQLqueries

 4.Database design   (15 Lectures)
Mapping ER/EER model to relational database, functional dependencies,Lossless decomposition, Normalforms(upto BCNF).   1NF

5.Transaction Processing   (3 Lectures)
ACID properties, concurrency control

6.File Structure and Indexing   (8 Lectures)
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.

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COMPUTER SCIENCE LAB (C-VI): Database Management Systems
Lab Practical: 60 Lectures

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

schema manager
mid int
mname varchar
memplno int
mdep varchar

DEPARTMENT Schema

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

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%.

16. Query to display the Current Date.

17. Query to display Name, Hire Date and Salary Review Date which is the 1st Monday after six months of employment.

18. Query to display Name and calculate the number of months between today and the date each employee was hired.

19. Query to display the following for each employee <E-Name> earns < Salary> monthly but wants < 3 * Current Salary >. Label the Column as Dream Salary.

20. Query to display Name with the 1st letter capitalized and all other letter lower case and length of their name of all the employees whose name starts with _J', 'A' and _M'.

21. Query to display Name, Hire Date and Day of the week on which the employee started.

22. Query to display Name, Department Name and Department No for all the employees.

23. Query to display Unique Listing of all Jobs that are in Department # 30.

24. Query to display Name, Dept Name of all employees who have an _A' in their name.

25. Query to display Name, Job, Department No. And Department Name for all the employees working at the Dallas location.

26. Query to display Name and Employee no. Along with their Manger's Name and the Manager's employee no; along with the Employees' Name who do not have a Manager.

27. Query to display Name, Dept No. And Salary of any employee whose department No. and salary matches both the department no. And the salary of any employee who earns a commission.

28. Query to display Name and Salaries represented by asterisks, where each asterisk (*) signifies $100.

29. Query to display the Highest, Lowest, Sum and Average Salaries of all the employees

30. Query to display the number of employees performing the same Job type functions.

31. Query to display the no. of managers without listing their names.

32. Query to display the Department Name, Location Name, No. of Employees and the average salary for all employees in that department.

33. Query to display Name and Hire Date for all employees in the same dept. as Blake.

34. Query to display the Employee No. And Name for all employees who earn more than the average salary.

35. Query to display Employee Number and Name for all employees who work in a department with any employee whose name contains a _T'.

36. Query to display the names and salaries of all employees who report to King.

37. Query to display the department no, name and job for all employees in the Sales department.

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COMPUTER SCIENCE (C-VII): Computer Networks Theory: 60 Lectures

1. Introduction to Computer Networks   (8 Lectures)

Network definition; network topologies; network classifications; network protocol; layered network architecture; overview of OSI reference model; overview of TCP/IP protocol suite.

2. Data Communication Fundamentals and Techniques   (10 Lectures)

Analog and digital signal; data-rate limits; digital to digital line encoding schemes; pulse code modulation; parallel and serial transmission; digital to analog modulation-; multiplexing techniques- FDM, TDM; transmission media.

3. Networks Switching Techniques and Access mechanisms   (10 Lectures)

Circuit switching; packet switching- connectionless datagram switching, connection-oriented virtual circuit switching; dial-up modems; digital subscriber line; cable TV for data transfer.

4. Data Link Layer Functions and Protocol   (10 Lectures)

Error detection and error correction techniques; data-link control- framing and flow control; error recovery protocols- stop and wait ARQ, go-back-n ARQ; Point to Point Protocol on Internet.

5. Multiple Access Protocol and Networks   (5 Lectures)

CSMA/CD protocols; Ethernet LANS; connecting LAN and back-bone networks- repeaters, hubs, switches, bridges, router and gateways; Routing; routing algorithms; network layer protocol of Internet –IP protocol, Internet control protocol. Transport services-error and flow control, Connection establishment and release- three way handshake.

8. Overview of Application layer protocol   (5 Lectures)

Overview of DNS protocol; Overview of WWW &HTTP protocol.

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 SCIENCE (C-VII): Computer Networks Tutorial   Tutorial : 15 lectures
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Generic Elective -3 (GE- 3A)   Subject – **Introduction to Database System**

Theory: 60 lectures

Database: Introduction to database, relational data model, DBMS architecture, data
14L independence, DBA, database users, end users, front end tools

E-R Modeling: Entity types, entity set, attribute and key, relationships, relation **14L**
types, E- R diagrams, database design using ER diagrams

Relational Data Model: Relational model concepts, relational constraints, primary **14L**
and foreign key, normalization: 1NF, 2NF, 3NF

Structured Query Language: SQL queries, create a database table, create **18L**
relationships between database tables, modify and manage tables, queries, forms, reports,
modify, filter and view data.

Reference Books :
1. P. Rob, C. Coronel, Database System Concepts by, Cengage Learning India, 2008
2. R. Elmsasri,S. Navathe Fundamentals of Database Systems, Pearson Education,
   Fifth Edition, 2007
3. MySQL : Reference Manual

Generic Elective (GE- 3) LAB : Database System Practical

Practical : 15 Lectures

Introduction to Database System Lab   Practical: 15 lectures
1) Create a database having two tables with the specified fields, to computerize a library
   system of a Delhi University College.
   LibraryBooks (Accession number, Title, Author, Department, PurchaseDate,
   Price) IssuedBooks (Accession number, Borrower)
   a) Identify primary and foreign keys. Create the tables and insert at least 5 records in
      each table.
   b) Delete the record of book titled ―Database System Concepts‖.
   c) Change the Department of the book titled ―Discrete Maths‖ to ―CS‖.
   d) List all books that belong to ―CS‖ department.
   e) List all books that belong to ―CS‖ department and are written by author ―Navathe‖.
   f) List all computer (Department=‖CS‖) that have been issued.
   g) List all books which have a price less than 500 or purchased between ―01/01/1999‖
      and ―01/01/2004‖.
2) Create a database having three tables to store the details of students of Computer Department

in your college.

Personal information about Student (College roll number, Name of student, Date of birth, Address, Marks(rounded off to whole number) in percentage at 10 + 2, Phone number) Paper Details (Paper code, Name of the Paper)
Student's Academic and Attendance details (College roll number, Paper code, Attendance, Marks in home examination).

a) Identify primary and foreign keys. Create the tables and insert at least 5 records in each table.
b) Design a query that will return the records (from the second table) along with the name of student from the first table, related to students who have more than 75% attendance and more than 60% marks in paper 2.
c) List all students who live in ─Delhi‖ and have marks greater than 60 in paper 1.
d) Find the total attendance and total marks obtained by each student.
e) List the name of student who has got the highest marks in paper 2.

3) Create the following tables and answer the queries given below:
   Customer (CustID, email, Name, Phone, ReferrerID)
   Bicycle (BicycleID, DatePurchased, Color, CustID,
   ModelNo) BicycleModel (ModelNo, Manufacturer, Style)
   Service (StartDate, BicycleID, EndDate)

   a) Identify primary and foreign keys. Create the tables and insert at least 5 records in each table.
   b) List all the customers who have the bicycles manufactured by manufacturer ─Honda‖.
   c) List the bicycles purchased by the customers who have been referred by customer ─C1‖.
   d) List the manufacturer of red colored bicycles.
   e) List the models of the bicycles given for service.

4) Create the following tables, enter at least 5 records in each table and answer the queries given below.
   EMPLOYEE (Person_Name, Street, City)
   WORKS (Person_Name, Company_Name, Salary)
   COMPANY (Company_Name, City)
   MANAGES (Person_Name, Manager_Name)

   a) Identify primary and foreign keys.
   b) Alter table employee, add a column ─email‖ of type varchar(20).
   c) Find the name of all managers who work for both Samba Bank and NCB Bank.
   d) Find the names, street address and cities of residence and salary of all employees who work for ─Samba Bank‖ and earn more than $10,000.
   e) Find the names of all employees who live in the same city as the company for which they work.
   f) Find the highest salary, lowest salary and average salary paid by each company.
   g) Find the sum of salary and number of employees in each company.
   h) Find the name of the company that pays highest salary.

5) Create the following tables, enter at least 5 records in each table and answer the queries given below.

Suppliers (SNo, Sname, Status, SCity)
Parts (PNo, Pname, Colour, Weight,
City) Project (JNo, Jname, Jcity)
Shipment (Sno, Pno, Jno, Qunatity)

a) Identify primary and foreign keys.

b) Get supplier numbers for suppliers in Paris with status>20.

c) Get suppliers details for suppliers who supply part P2. Display the supplier list in increasing order of supplier numbers.

d) Get suppliers names for suppliers who do not supply part P2.

e) For each shipment get full shipment details, including total shipment weights.

f) Get all the shipments where the quantity is in the range 300 to 750 inclusive.

g) Get part nos. for parts that either weigh more than 16 pounds or are supplied by suppliers S2, or both.

h) Get the names of cities that store more than five red parts.

i) Get full details of parts supplied by a supplier in London.

j) Get part numbers for part supplied by a supplier in London to a project in London.

k) Get the total number of project supplied by a supplier (say, S1).

l) Get the total quantity of a part (say, P1) supplied by a supplier (say, S1).

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SKILL ENHANCEMENT COURSE (SEC-1) A HTML and XML programming

Tutorials:60

HTML Programming

- **Unit-I: Introduction** (1L)
- **Unit-II: The Basics** (2L)
  - o The Head, the Body
  - o Colors, Attributes
  - o Lists, ordered and unordered
- **•Unit-III: Links** (3L)
  - o Introduction
  - o Relative Links, Absolute Links
  - o Link Attributes
  - o Using the ID Attribute to Link Within a Document
- **•Unit-IV: Images** (2L)
  - o Putting an Image on a Page
  - o Using Images as Links
  - o Putting an Image in the Background
- **Unit V: – Tables** (4L)
  - o Creating a Table
  - o Table Headers o
  - Captions
  - o Spanning Multiple Columns o
  - Styling Table
- **Unit VI – Forms** (3L)
  - o Basic Input and Attributes
  - o Other Kinds of Inputs o
  - Styling forms with CSS
  - o Where To Go From Here

Book Recommended:
1. Virginia DeBolt , Integrated HTML and CSS A Smarter, Faster Way to Learn Wiley / Sybex , 2006
2. Cassidy Williams, Camryn Williams Introduction to **HTML** and CSS, O'Reilly, 2015

Software Lab Based on HTML:

Q.1 Create an HTML document with the following formatting options:
  - I. Bold
  - II. Italics

  - V. Font (Type, Size and Color)

  - X. Pre tag

Q.2 Create an HTML document which consists of:
  - I. Ordered List
  - II. Unordered List III.
  - Nested List
  - IV. Image

XYZ Ltd's Update

1. Introduction
2. Company Financial Update
   - First Quarter
   - Second Quarter
   - Third Quarter
   - Fourth Quarter
3. Advertising Update
   - Result of Newspaper Campaign
   - Additions to staff
   - New Thoughts on Television
4. Human Resources Update

A. Saftey Considerations
   1. Body substance isolation
   2. Sense safty
   3. Initial size-up
B. Intitial Patient Assessment
   1. General Impression
   2. Unresponsiveness
      i. Alert to person, place and time
      ii. Verbal response to audible stimuli
      iii. Pain evokes verbal or physical response
      iv. Unresponsive to all stimuli
C. Patient Critical Needs
   1. Airway
   2. Breathing
      i. Use oxygen if indicated
      ii. Consider use of assisting with bag value mask
   3. Circulation
   4. Bleeding

Q.3 Create an HTML document which implements Internal linking as well as External linking. Q.4
Q4 Create a table using HTML which consists of columns for Roll No., Student's name and grade.

Result		
Roll No.	Name	Grade

Q.5   Create a Table with the following view:

				Place an image here

Q.6

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

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Please fill the following boxes to help us send the emails and our news letter:
First Name: [   ]
Last Name: [   ]
Business: [   ]
We must have a correct e-mail address to send you the news letter:
Email: [   ]
How did you hear about XYZ News Magazine and Emails?
⦿ Here on the Web ○ In a magazine ○ Television ○ Other
Would you like to be on our regular mailing list?
☑ Yes, we love junk emails

[Reset] [Send it in!]

Q.7   Create HTML documents (having multiple frames) in the following three formats:

Frame1
Frame2

Frame1	
Frame2	Frame3

4. XML Programming

Introduction: Understanding Mark-up Languages, Introduction to XML and its
Goals. (3L)

XML Basics: XML Structure and Syntax, Document classes
and Rules. (5L)

Other XML Concepts: Scripting XML, XML as Data, Linking
with XML. (4L)

XML with Style: XSL –Style Sheet Basics, XSL basics, XSL
style sheets. (3L)

Books Recommended

1. XML in action web technology by William J. Pardi
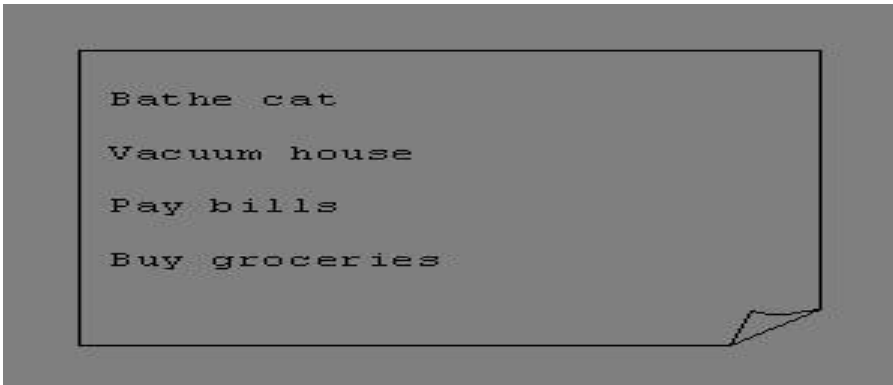2. Step by Step XML by Michael J. Young

Software Lab Based on XML:

Exercise #1 – Information Structure

In this exercise, student will practice identifying the structure of an

information object. For the sample document provided below:

Label the information structures you see, including containing structures.

1. Draw a tree representation of the structure.

Exercise 2# Deconstructing an XML Document

In this exercise, student will practice identifying the explicit structure within an XML document. In a sense, this is the reverse of what you did in Exercise #1. For the sample XML markup below, create a document-like representation (or a simple drawing) for the content contained within the XML tags:

<book>

<coverInfo>

    <title>The XML Handbook</title>

    <author>Charles F. Goldfarb</author>

    <author>Paul Prescod</author>

    <edition>Second</edition>

\<description\>The definitive XML resource: applications, products, and technologies. Revised and expanded—over 600 new pages.
\</description\>

\</coverInfo\>

\</book\>

Exercise #3 – Creating XML Markup

In this exercise, create some XML markup based on the tree representation from Exercise #1 above, and the content from the original sample document.

Exercise #4 – Well-Formedness

This exercise checks your understanding of the constraints for well-formedness. Are the following document instances well-formed? Explain any NO answers.

 \<list\>\<title\>The first list\</title\>\<item\>An item\</list\>

\<item\>An item\</item\>\<item\>Another item\</item\>

\<para\>Bathing a cat is a \<emph\>relatively\</emph\> easy task as long as the cat is willing.\</para\>

\<bibl\>\<title\>How to Bathe a Cat\<author\>\</title\>Merlin Bauer\<author\>\</bibl\>

Exercise #5-Well Formedness

This exercise is a bit more challenging than the previous example. Here is a fragment of an XML document instance. Identify all the places where it fails to match the constraints for well-formedness.

\<PROCEDURE\>\<TITLEHow to Bathe a Cat\</TITLE\>

\<OVERVIEW\>

This procedure tells you how to bathe a cat. \<WARNING\>\</OVERVIEW\>Cats don't like to take baths. You could get hurt doing this. Be sure to obtain all the required protective gear before you start. \</WARNING\>\<EQUIPEMENT\>\<ITEM\>Hockey Mask \<ITEM\>Padded Full-body Kevlar Armor\</ITEM\>\<ITEM\>Tub full of warm water\</ITEM\>\<ITEM\>Towels \</ITEM\>\<ITEM\>First Aid kit\</ITEM\>\<ITEM\>Cat Shampoo\</ITEM\> \<EQUIPMENT\>\<INSTRUCTIONS\> \<STEP\> Locate the cat, who by now is hiding under the bed.\</STEP\>\<STEP\>Place the cat in the tub of water.\</STEP\> \<ITEM\>Using the First Aid kit, repair the damage to your head and arms.\</STEP\> \<STEP\>Place the cat back in the tub and hold it down.\</STEP\> \<STEP\>Wash it really fast, then make an effort to dry it with the towels.\</STEP\> \<STEP\>Decide not to do this again. \</STEP\> \</INSTRUCTIONS\>

Note: Cover more exercises based on XML Programming theory concepts.

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Skill Enhancement Course (SEC - 1) B   Linux / Unix Programming Syllabus

- What is linux/unix Operating systems   (5L)
- Difference between linux/unix and other operating systems
- Features and Architecture
- Various Distributions available in the market
- Installation, Booting and shutdown process

- System processes (an overview)
- External and internal commands
- Creation of partitions in OS
- Processes and its creation phases – Fork, Exec, wait

User Management and the File System   **(5 L)**

- Types of Users, Creating users, Granting rights
- User management commands
- File quota and various file systems available
- File System Management and Layout, File permissions
- Login process, Managing Disk Quotas
- Links (hard links, symbolic links)

Shell introduction and Shell Scripting (6L)

- What is shell and various type of shell, Various editors present in linux
- Different modes of operation in vi editor
- What is shell script, Writing and executing the shell script
- Shell variable (user defined and system variables)
- System calls, Using system calls
- Pipes and Filters
- Decision making in Shell Scripts (If else, switch), Loops in shell
- Functions
- Utility programs (cut, paste, join, tr , uniq utilities)
- Pattern matching utility (grep)

Reference Books:

1. Sumitabha, Das, Unix Concepts And Applications, Tata McGraw-Hill Education, 2006

2. Michael Jang RHCSA/ RHCE Red Hat Linux Certification: Exams (Ex200 & Ex300) (Certification Press), 2011

3. Nemeth Synder & Hein, Linux Administration Handbook, Pearson Education, 2nd Edition ,2010

4. W. Richard Stevens, Bill Fenner, Andrew M. Rudoff, Unix Network Programming,

The sockets Networking API, Vol. 1, 3rd Edition,2014

Software Lab Based on Linux:

1. Write a shell script to check if the number entered at the command line is prime or not.
2. Write a shell script to modify ―cal‖ command to display calendars of the specified months.
3. Write a shell script to modify ―cal‖ command to display calendars of the specified range of months.
4. Write a shell script to accept a login name. If not a valid login name display message – ―Entered login name is invalid‖.
5. Write a shell script to display date in the mm/dd/yy format.

6. Write a shell script to display on the screen sorted output of ―who‖ command along with the total number of users .
7. Write a shell script to display the multiplication table any number,
8. Write a shell script to compare two files and if found equal asks the user to delete the duplicate file.
9. Write a shell script to find the sum of digits of a given number.

10. Write a shell script to merge the contents of three files, sort the contents and then display them page by page.
11. Write a shell script to find the LCD(least common divisor) of two numbers.
12. Write a shell script to perform the tasks of basic calculator.
13. Write a shell script to find the power of a given number.
14. Write a shell script to find the binomial coefficient C(n , x).
15. Write a shell script to find the permutation P(n,x).
16. Write a shell script to find the greatest number among the three numbers.
17. Write a shell script to find the factorial of a given number.
18. Write a shell script to check whether the number is Armstrong or not.
19. Write a shell script to check whether the file have all the permissions or not.
20. Write a program to show the pyramid of special character —*.

SEMESTER-IV

COMPUTER SCIENCE (C-VIII): Computer System Architecture

Theory: 60 Lectures

1. Introduction (8 lectures)

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

2. Data Representation and Basic Computer Arithmetic (10 lectures)

Number systems, complements, fixed and floating point representation, character representation, addition, subtraction, magnitude comparison, multiplication and division algorithms for integers

3. Basic Computer Organization and Design (13 lectures)

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.

4. Central Processing Unit (15 lectures)

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.

5. Memory Organization (6 lectures)

Cache memory, Associative memory, mapping.

6. Input-Output Organization (8 lectures)

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 SCIENCE (C-IX): Software Engineering Theory: 60 Lectures

1. Introduction **(8 Lectures)**

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

2.Requirement Analysis **(10 Lectures)**

Software Requirement Analysis, Initiating Requirement EngineeringProcess, Requirement Analysis and Modeling Techniques, Flow   Oriented   Modeling, Need for SRS, Characteristics and Components of SRS.

3.Software Project Management **(8Lectures)**

Estimation in Project Planning Process, Project Scheduling, COCOMO model

4.Risk Management **(8 Lectures)**

Software Risks, Risk Identification, Risk Projection and Risk Refinement, RMMM Plan.

5.Quality Management **(8 Lectures)**

Quality Concepts, Software Quality Assurance, Software Reviews, Metrics for Process and Projects.

6.Design Engineering also the roles of software architect **(10 Lectures)**

Design Concepts, Architectural   Design Elements, Software   Architecture, Data Design at the Architectural Level and Component Level, Mapping of Data Flow into Software Architecture, Modeling Component Level Design.

7.Testing Strategies & Tactics **(8 Lectures)**

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.

COMPUTER SCIENCE LAB (C-IX): Software Engineering Lab
Practical: 60 Lectures

S. 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

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COMPUTER SCIENCE (C-X): Design and Analysis of Algorithms

Theory: 60 Lectures

1. Introduction (5 Lectures)

Basic Design and Analysis techniques of Algorithms, Correctness of Algorithm.

2. Algorithm Design Techniques (8 Lectures)

Iterative techniques, Divide and Conquer, DynamicProgramming, Greedy Algorithms.

check all source code in java folder.

also learnt selection sort

3. Sorting and Searching Techniques (20 Lectures)

Elementary sorting techniques–Bubble Sort, InsertionSort, 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;

buckets are used in radix sort.

this will be covered in unit one.(design and analysis of algorithm

4. Lower Bounding Techniques Lectures)

Decision Trees

5. Balanced Trees (7 Lectures)

Red-Black Trees

6. Advanced Analysis Technique (5 Lectures)

Amortized analysis

7. Graphs (5 Lectures)

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

8. String Processing

String Matching, KMP Technique (5Lectures)

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

COMPUTER SCIENCE (C-X): Design and Analysis of Algorithm
Tutorial: 15 lectures

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Generic Elective –IV   Multimedia and Applications
Theory: 60 lectures

Multimedia: Introduction to multimedia, components, uses of multimedia, **6L** multimedia applications, virtual reality.

Text: Fonts & Faces, Using Text in Multimedia, Font Editing & Design Tools,   **4L**
Hypermedia & Hypertext.

Images: Still Images – bitmaps, vector drawing, 3D drawing & rendering, natural   **6L**
light & colors, computerized colors, color palettes, image file formats.

Sound: Digital Audio, MIDI Audio, MIDI vs Digital Audio, Audio File Formats.   **6L**

Video: How video works, analog video, digital video, video file formats, video   **8L**
shooting and editing.

Animation: Principle of animations, animation techniques, animation file formats.   **10L**

Internet and Multimedia: www and HTML, multimedia on the web – web servers,   **6L**
web browsers, web page makers and site builders.

Making Multimedia: Stages of a multimedia project, Requirements to make good   **14L**
multimedia, Multimedia Hardware - Macintosh and Windows production Platforms,
Hardware peripherals - Connections, Memory and storage devices, Multimedia
software and Authoring tools.

References:
1. Tay Vaughan, ―Multimedia: Making it work‖, TMH, Eighth edition.2011
2. Ralf Steinmetz and KlaraNaharstedt, ―Multimedia: Computing, Communications Applications‖, Pearson.2012
3. Keyes, ―Multimedia Handbook‖, TMH,2000.
4. K. Andleigh and K. Thakkar, ―Multimedia System Design‖, PHI.2013

GENERIC ELECTIVE IV LAB   Multimedia and Applications Lab
Practical: 60 lectures
Practical exercises based on concepts listed in theory using Flash/ GIMP/ PhotoShop/
Animation Tools/ Image Editors/ Video Editors.

Optional

Implement the followings using Flash-

1. Create an animation using the tools panel and the properties panel to draw the following – Line, pe , oval, circle, rectangle , square, pencil , brush , lasso tool
2. Create an animation using text tool to set the font , size , color etc.
3. Create an animation using**Free transform tool** that should use followings-

   Move Objects

   Skew Objects

   Stretch Objects

   Rotate Objects

   Stretch Objects while maintaining proportion

   Rotate Objects after relocating the center dot
4. Create an animation using layers having following features-

   Insert layer, Delete layer, guide layer, Mask layer.
5. Modify the document (changing background color etc.)using the following tools

   Eraser tool Hand

   tool Ink bottle

   tool Zoom tool

   Paint Bucket tool

   Eyedropper tool

6. Create an animation for bus car race in which both starts from the same point and car wins the race.
7. Create an animation in which text Hello gets converted into GoodBye (using motion/shape tweening).
8. Create an animation having five images having fade-in fade-out effect.
9. Create an scene to show the sunrise (using multiple layers and motion tweening)
10. Create an animation to show the ripple effect.
11. Create an animation (using Shape tweening and shape hints) for transforming one shape into another.
12. Create an animation for bouncing ball (you may use motion guide layer).

SKIL ENHANCEMENT COURSE (SEC-2) A   PHP Programming (1 +2 Lab)

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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

Handling HTML form with PHP: (2L)
- Capturing Form Data
- GET and POST form methods
- Dealing with multi value fields
- Redirecting a form after submission

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

PHP Functions: (3L)
- 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

String Manipulation and Regular Expression: (3L)
- 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

Array: (3L)
- Anatomy of an Array ,Creating index based and Associative array ,Accessing array
- Looping with Index based array, with associative array using each() and foreach()
- Some useful Library function

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.

4. Luke Welling, Laura Thompson, PHP and MySQL Web Development", 4th Edition, Addition Paperback, Addison-Wesley Professsional,2008.

5. David Sklar, Adam Trachtenberg, "PHP Cookbook: Solutions & Examples for PHP Programmers", 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
9. Write a PHP script that finds out the sum of first n odd numbers.
10. Create a login page having user name and password. On clicking submit, a welcome message should be displayed if the user is already registered (i.e.name is present in the database) otherwise error message should be displayed.
11. Write a PHP script that checks if a string contains another string.
12. Create a simple 'birthday countdown' script, the script will count the number of days between current day and birth day.
13. Create a script to construct the following pattern, using nested for loop.

*
   * *
   * * *
   * * * *
   * * * * *

14. Write a simple PHP program to check that emails are valid.
15. WAP to print first n even numbers.
16. $color = array('white', 'green', 'red")
    Write a PHP script which will display the colors in the following way
    : Output :
    white, green, red,

    •
    green
    • red
    • white
17. Using switch case and dropdown list display a ―Hello‖ message depending on the language selected in drop down list.
18. Write a PHP program to print Fibonacci series using recursion.
19. Write a PHP script to replace the first 'the' of the following string with 'That'.

   Sample : 'the quick brown fox jumps over the lazy dog.'
          Expected Result : That quick brown fox jumps over the lazy dog.

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SKILL ENHANCEMENT COURSE (SEC-2)   B   Programming in MATLAB (1+2Labs)

Unit I- Introduction to Programming: Components of a computer, working with numbers, Machine

    code, Software hierarchy. (2L)

Unit I- Programming Environment: MATLAB Windows, A First Program, Expressions, Constants,

    Variables and assignment statement, Arrays. (3L)

Unit III- Graph Plots: Basic plotting, Built in functions, Generating waveforms, Sound replay, load

    and save. (2L)

Unit IV- Procedures and Functions: Arguments and return values, M-files, Formatted console

    input-output, String handling. (3L)

Unit V- Control Statements: Conditional statements: If, Else, Else-if, Repetition statements: While,

    for loop. (2L)

Unit VI- Manipulating Text: Writing to a text file, Reading from a text file, Randomising and

    sorting a list, searching a list. (2L)

Unit VII- GUI Interface: Attaching buttons to actions, Getting Input, Setting Output. (2L)

Recommended Books:

1. MATLAB: An Introduction with Applications, by Amos Gilat, 2nd edition, Wiley, 2004,
2. C.B. Moler, Numerical Computing with MATLAB, SIAM, 2004.

Software Lab Based on MatLab:

1. Write a program to assign the following expressions to a variable A and then to print out the value of A.

   a. (3+4)/(5+6)

   b. $2\pi^2$

   c. $\sqrt{2}$

   d. $(0.0000123 + 5.67\times10^{-3}) \times 0.4567\times10^{-4}$

2. Celsius temperatures can be converted to Fahrenheit by multiplying by 9, dividing by 5, and adding 32. Assign a variable called C the value 37, and implement this formula to assign a variable F the Fahrenheit equivalent of 37 Celsius.

3. Set up a vector called N with five elements having the values: 1, 2, 3, 4, 5. Using N, create assignment statements for a vector X which will result in X having these values:

   a. 2, 4, 6, 8, 10

   b. 1/2, 1, 3/2, 2, 5/2

   c. 1, 1/2, 1/3, 1/4, 1/5

   d. 1, 1/4, 1/9, 1/16, 1/25

4. A supermarket conveyor belt holds an array of groceries. The price of each product (in pounds) is [0.6, 1.2 ,0.5, 1.3] ; while the numbers of each product are [3, 2 ,1 ,5]. Use MATLAB to calculate the total bill.

5. The sortrows(x) function will sort a vector or matrix X into increasing row order. Use this function to sort a list of names into alphabetical order.

6. The ―identity‖ matrix is a square matrix that has ones on the diagonal and zeros elsewhere. You can generate one with the eye() function in MATLAB. Use MATLAB to find a matrix B, such that when multiplied by matrix A=[1 2; -1 0] the identity matrix I=[1 0; 0 1] is generated. That is A*B=I.

7. Create an array of N numbers. Now find a single MATLAB statement that picks out from that array the 1,4,9,16,…,√Nth entries, i.e. those numbers which have indices that are square numbers.

8. Draw a graph that joins the points (0,1), (4,3), (2,0) and (5,-2).

9. The seeds on a sunflower are distributed according to the formula below. Plot a small circle at each of the first 1000 co-ordinates :

$$r_n = \sqrt{n}$$

$$\theta_n = \frac{137.51}{180} \pi n$$

10. Calculate 10 approximate points from the function y=2x by using the formulae:

    i. $x_n = n$

    ii. $y_n = 2n + rand - 0.5$

    Fit a line of best fit to these points using the function polyfit() with degree=1, and generate co-ordinates from the line of best fit using polyval(). Use the on-line help to find out how to use these functions. Plot the raw data and the line of best fit.

11. Calculate and replay 1 second of a sinewave at 500Hz with a sampling rate of 11025Hz. Save the sound to a file called "ex35.wav". Plot the first 100 samples.

12. Calculate and replay a 2 second chirp. That is, a sinusoid that steadily increases in frequency with time, from say 250Hz at the start to 1000Hz at the end.

13. Build a square wave by adding together 10 odd harmonics: 1f, 3f, 5f, etc. The amplitude of the nth harmonic should be 1/n. Display a graph of one cycle of the result superimposed on the individual harmonics.

14. Write a function called FtoC (ftoc.m) to convert Fahrenheit temperatures into Celsius. Make sure the program has a title comment and a help page. Test from the command window with:

    i. FtoC(96)

    ii. lookfor Fahrenheit

    iii. help FtoC

15. Write a program to input 2 strings from the user and to print out (i) the concatenation of the two strings with a space between them, (ii) a line of asterisks the same length as the concatenated strings, and (iii) the reversed concatenation. For example:

    i. Enter string 1: Mark

    ii. Enter string 2: Huckvale

    iii. Mark Huckvale

    iv. *************

    v. elavkcuH kraM

SEMESTER- V

COMPUTER SCIENCE (C-XI): Operating Systems

Theory: 60 Lectures

1.Introduction   **(10 Lectures)**

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.

2. Operating System Organization   **(6 Lectures)**

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

3. Process Management   **(20Lectures)**

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. Physical and virtual address space; memory allocation strategies –fixed and variable partitions, paging, segmentation, virtual memory.

5. File and I/O Management   **(10 Lectures)**

Directory structure, file operations, files allocation methods, device management.

6. Protection and Security   **(4 Lectures)**

Policy mechanism, Authentication, Internal access Authorization.

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 Edition, Prentice Hall of India. 2008.
5. M. Milenkovic, Operating Systems- Concepts and design, Tata McGraw Hill 1992.

COMPUTER SCIENCE (C-XI): Operating Systems Tutorials   15 Lectures

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COMPUTER SCIENCE (C-XII): Theory of Computation

Theory: 60 Lectures

1. Languages   **(8 Lectures)**

Alphabets, string, language, Basic Operations on language, Concatenation, KleeneStar

2. Finite Automata and Regular Languages   **(20 Lectures)**

Regular Expressions, Transition Graphs, Deterministics and non-deterministic finite automata, NFA to DFA Conversion, Regular languages and their relationship with finite automata, Pumping lemma and closure properties of regular languages.

3. Context free languages **(17 Lectures)**

Context free grammars, parse trees, ambiguities in grammars and languages, Pushdown automata (Deterministic and Non-deterministic), Pumping Lemma, Properties of context free languages, normal forms.

4.Turing Macines and Models of Computations **(15 Lectures)**

33

RAM, Turing Machine as a model of computation, Universal Turing Machine, Language acceptability, decidability, halting problem, Recursively enumerable and recursive languages, unsolvability 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

COMPUTER SCIENCE LAB (C-XII): Theory of Computation   Tutorial: 15 Lectures

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DSE-I(A)   Information Security

Computer Security: Computer Security Concepts, Threats, Attacks, and Assets, Security Functional Requirements, A Security Architecture for Open Systems, Computer Security Trends, Computer Security Strategy.

Cryptography: Substitution, transposition ciphers, symmetric-key algorithms-Data Encryption Standard, advanced encryption standards, public key encryption – RSA; Diffie-Hellman key exchange, ECC cryptography, Message Authentication- MAC, hash functions.

User Authentication and Access Control:

User Authentication: Means of Authentication, Password-Based Authentication, Token-Based Authentication, Biometric Authentication, Remote User Authentication, Security Issues for User Authentication Access Control: , Access Control Principles, Subjects, Objects, and Access Rights, Discretionary Access Control Example: UNIX File Access Control, Role-Based Access Control

Database Security: The Need for Database Security, Database Management Systems, Relational Databases, Database Access Control, Inference, Statistical Databases, Database Encryption, Cloud Security

Malicious Software's and Denial of Service Attacks:

 Section-C Malicious Software: Types of Malicious Software (Malware), Propagation–Infected Content–Viruses, Propagation–Vulnerability Exploit–Worms, Propagation–Social Engineering–SPAM E-mail, Trojans, Payload–System Corruption, Payload–Attack Agent–Zombie, Bots, Payload–Information Theft– Keyloggers, Phishing, Spyware, Payload–Stealthing–Backdoors, Rootkits

Denial-of-Service Attacks: Denial-of-Service Attacks, Flooding Attacks, Distributed Denial-ofService Attacks, Application-Based Bandwidth Attacks, Reflector and Amplifier Attacks, Defenses Against Denial-of-Service Attacks, Responding to a Denial-of-Service Attack

Operating System Security: Introduction to Operating System Security, System Security Planning, Operating Systems Hardening, Application Security, Security Maintenance, Linux/Unix Security, Windows Security, Virtualization Security

Textbook W. Stallings, "Computer Security: Principles and Practice," 2nd Edition, Prentice Hall, ISBN: 0132775069, 2011.

Recommended Books
1. M. Stamp, "Information Security: Principles and Practice," 2nd Edition, Wiley, ISBN: 0470626399, 2011.
2. M. E. Whitman and H. J. Mattord, "Principles of Information Security," 4th Edition, Course Technology, ISBN: 1111138214, 2011.
3. M. Bishop, "Computer Security: Art and Science," Addison Wesley, ISBN: 0-201-44099-7, 2002.
4. G. McGraw, "Software Security: Building Security In," Addison Wesley, ISBN: 0321356705, 2006.

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DSE-I(B) Operational Research

Theory: 60 Lectures

Introduction to Operational Research (OR): Origin & Development, Different Phases of OR study, Methodology of OR, Scope and Limitations of OR, Applications of OR.

Linear Programming: Linearly independent / dependent vectors, Basis, Convex sets, Extreme points. Graphical method. Simplex method, Artificial variable techniques- Two Phase Method; M-Charnes Method, Special cases in LPP.

Duality: Definition of the dual problem, Primal-dual relationships, Economic Interpretation of Duality, Dual simplex Method.
Sensitivity analysis: Changes in cost and resource vector

Reference Books

1. **G. Hadley: Linear Programming. Narosa, 2002 (reprint).**

2. **A. Ravindran, D. T. Phillips and James J. Solberg:** Operations Research-Principles and Practice, John Wiley & Sons, 2005.

3. **Hamdy A. Taha:** Operations Research-An Introduction, Prentice Hall, 8th Edition, 2008.

4. **F.S. Hillier. G.J. Lieberman**: Introduction to Operations Research- Concepts and Cases, 9th Edition, Tata McGraw Hill. 2010.

Tutorial on Operation Research   15 Lectures

DSE-2(A)   Digital Image Processing

Theory: 60 Lectures
1. Introduction   (6 Lectures)
Light, Brightness adaption and discrimination, Pixels, coordinate conventions, Imaging Geometry, Perspective Projection, Spatial Domain Filtering, sampling and quantization.

2. Spatial Domain Filtering   (7 Lectures)
Intensity transformations, contrast stretching, histogram equalization, Correlation and convolution, Smoothing filters, sharpening filters, gradient and Laplacian.

3. Filtering in the Frequency domain   (8 Lectures)
Hotelling Transform, Fourier Transforms and properties, FFT (Decimation in Frequency and Decimation in Time Techniques), Convolution, Correlation, 2-D sampling, Discrete Cosine Transform, Frequency domain filtering.

4. Image Restoration   (8 Lectures)
Basic Framework, Interactive Restoration, Image deformation and geometric transformations, image morphing, Restoration techniques, Noise characterization, Noise restoration filters, Adaptive filters, Linear, Position invariant degradations, Estimation of Degradation functions, Restoration from projections.

5. Image Compression   (10 Lectures)
Encoder-Decoder model, Types of redundancies, Lossy and Lossless compression, Entropy of an information source, Shannon's 1st Theorem, Huffman Coding, Arithmetic Coding, Golomb Coding, LZW coding, Transform Coding, Sub-image size selection, blocking artifacts, DCT implementation using FFT, Run length coding, FAX compression (CCITT Group-3 and Group-4), Symbol-based coding, JBIG-2, Bit-plane encoding, Bit-allocation, Zonal Coding, Threshold Coding, JPEG, Lossless predictive coding, Lossy predictive coding, Motion Compensation

6. Wavelet based Image Compression   (5 Lectures)
Expansion of functions, Multi-resolution analysis, Scaling functions, MRA refinement equation, Wavelet series expansion, Discrete Wavelet Transform (DWT), Continuous Wavelet Transform, Fast Wavelet Transform, 2-D wavelet Transform, JPEG-2000 encoding, Digital Image Watermarking.

7. Morphological Image Processing   (7 Lectures)
Basics, SE, Erosion, Dilation, Opening, Closing, Hit-or-Miss Transform, Boundary Detection, Hole filling, Connected components, convex hull, thinning, thickening, skeletons, pruning, Geodesic Dilation, Erosion, Reconstruction by dilation and erosion.

8. Image Segmentation **(9 Lectures)**

Boundary detection based techniques, Point, line detection, Edge detection, Edge linking, local processing, regional processing, Hough transform, Thresholding, Iterative thresholding, Otsu's method, Moving averages, Multivariable thresholding, Region-based segmentation, Watershed algorithm, Use of motion in segmentation

Reference Books

1. R C Gonzalez , R E Woods, Digital Image Processing, 3rd Edition, Pearson Education.2008.
2. A K Jain, Fundamentals of Digital image Processing, Prentice Hall of India.1989.
3. K R Castleman, Digital Image Processing, Pearson Education.1996
4. Schalkoff, Digital Image Processing and Computer Vision, John Wiley and Sons.1989.
5. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins,' Digital Image Processing using MATLAB', Pearson Education, Inc., 2004.

Digital Image Processing Lab
Practical: 60 Lectures

1. Write program to read and display digital image using MATLAB or SCILAB
   a. Become familiar with SCILAB/MATLAB Basic commands
   b. Read and display image in SCILAB/MATLAB
   c. Resize given image
   d. Convert given color image into gray-scale image
   e. Convert given color/gray-scale image into black & white image
   f. Draw image profile
   g. Separate color image in three R G & B planes
   h. Create color image using R, G and B three separate planes
   i. Flow control and LOOP in SCILAB
   j. Write given 2-D data in image file

2. To write and execute image processing programs using point processing method
   a. Obtain Negative image
   b. Obtain Flip image
   c. Thresholding
   d. Contrast stretching

3. To write and execute programs for image arithmetic operations
   a. Addition of two images
   b. Subtract one image from other image
   c. Calculate mean value of image
   d. Different Brightness by changing mean value

4. To write and execute programs for image logical operations
   a. AND operation between two images
   b. OR operation between two images
   c. Calculate intersection of two images
   d. Water Marking using EX-OR operation

    e. NOT operation (Negative image)

5. To write a program for histogram calculation and equalization using
    a. Standard MATLAB function
    b. Program without using standard MATLAB functions
    c. C Program

6. To write and execute program for geometric transformation of image
    a. Translation
    b. Scaling
    c. Rotation
    d. Shrinking
    e. Zooming

7. To understand various image noise models and to write programs for
    a. image restoration
    b. Remove Salt and Pepper Noise
    c. Minimize Gaussian noise
    d. Median filter and Weiner filter

8. Write and execute programs to remove noise using spatial filters
    a. Understand 1-D and 2-D convolution process
    b. Use 3x3 Mask for low pass filter and high pass filter

9. Write and execute programs for image frequency domain filtering
    a. Apply FFT on given image
    b. Perform low pass and high pass filtering in frequency domain
    c. Apply IFFT to reconstruct image

10. Write a program in C and MATLAB/SCILAB for edge detection using different edge detection mask
11. Write and execute program for image morphological operations erosion and dilation.
12. To write and execute program for wavelet transform on given image and perform inverse wavelet transform to reconstruct image.

DSE-2(B) Soft Computing

Tutorials on DSE-2(B) Soft Computing

Introduction: Hard computing, Soft Computing, Definition. Advantages and applications of neural networks, Artificial neural network, Biological neural network, Biological neuron vs artificial neuron, evolution of neural networks. Basic models of ANN : connections, supervised learning, unsupervised and reinforcement learning, activation functions, terminologies of ANN : weights, bias, threshold, learning rate, momentum factor. McCulloch-Pitts neuron, Linear separability, Nonlinear separability, Hebb Network, Perceptron Networks : theory, learning rule, architecture, training algorithm for single output classes, training algorithm for multiple output classes, testing algorithm, Adaline, Multiple adaptive linear neurons, Back propagation network, Functional link artificial neural network(FLANN), Radial basis function network(RBFN).

Introduction to Fuzzy logic, classical sets and Fuzzy sets, classical relation and Fuzzy relations, Membership functions, defuzzification, Fuzzy Inference systems.

Genetic algorithm : Encoding, types of selection, crossover and its types, mutation and its types, cost function, flow chart, algorithm for function optimization, real coded genetic algorithm.

Books:
1. Neural Networks and Learning Machines by Simon Haykin, Pearson Education, 3rd Edition.
2. Principles of Soft Computing by S. N. Sivanandam and S. N. Deepa, 2nd edition, Wiley.
3. Artificial Neural Networks by B. Yegnanarayana, PHI
4. Neural Networks, Fuzzy logic and Genetic algorithm by S. Rajasekaran and G. A. Vijayalakshmi Pai, PHI

SEMESTER-VI

COMPUTER SCIENCE (C-XIII): Artificial Intelligence

Theory: 60 Lectures

1. Introduction   **(06 Lectures)**

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

2. Problem Solving and Searching Techniques   **(20 Lectures)**

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.

3. Knowledge Representation   **(20 Lectures)**

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

Programming in Logic (PROLOG)

4. Dealing with Uncertainty and Inconsistencies   **(08 Lectures)**

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

5. Understanding Natural Languages   **(06 Lectures)**

Parsing Techniques, Context-Free and Transformational Grammars, Recursive and Augmented Transition 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 Hill, 2nd edition, 1991.

4.   W.F. Clocksin and Mellish, Programming in PROLOG, Narosa Publishing House, 3rd edition, 2001.

5.   Ivan Bratko, Prolog Programming for Artificial Intelligence, Addison-Wesley, Pearson Education, 3rd edition, 2000.

TUTORIALS ON COMPUTER SCIENCE (C-XIII): Artificial Intelligence
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COMPUTER SCIENCE LAB (C-XIV): Computer Graphics
Theory: 60 Lectures

1.Introduction   **(5 Lectures)**

Basic elements of Computer graphics, Applications of Computer Graphics.

2.Graphics Hardware   **(8 Lectures)**

Architecture of Raster and Random scan display devices, input/output devices.

3.Fundamental Techniques in Graphics   **(22 Lectures)**

Raster scan line, circle and ellipse drawing, thick primitives, Polygon filling, line and polygon clipping algorithms, 2D and 3D Geometric Transformations, 2D and 3D Viewing Transformations (Projections- Parallel and Perspective), Vanishing points.

4. Geometric Modeling   **(10 Lectures)**

Representing curves & Surfaces.

5. Visible Surface determination   **(8 Lectures)**

Hidden surface elimination.

6. Surface rendering   **(7 Lectures)**

Illumination and shading models. Basic color models and 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 SCIENCE LAB (C-XIV): Computer Graphics Lab

Practical: 60 Lectures

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.

DSE 3(A) Big Data Analytics

 1. Understanding Big Data: Datasets, Data Analysis, Data Analytics-Descriptive Analysis, Diagnostics Analytics, Predictive Analytics, Prescriptive Analytics, Big Data Characteristics – volume, velocity, variety, veracity, value, Different Types of Data – Structured Data, Unstructured Data, Semi-Structured Data

2. INTRODUCTION HADOOP: Big Data – Apache Hadoop & Hadoop EcoSystem – Moving Data in and out of Hadoop – Understanding inputs and outputs of MapReduce - Data Serialization.

4.   HADOOP ARCHITECTURE: Hadoop Architecture, Hadoop Storage: HDFS, Common Hadoop Shell commands, Anatomy of File Write and Read, NameNode, Secondary NameNode, and DataNode, Hadoop MapReduce paradigm, Map and Reduce tasks.

4. Theory and methods for big data analytics: Regression Modeling, Multivariate Analysis, Bayesian Modeling, Inference and Bayesian Networks, Support Vector and Kernel Methods, Analysis of Time Series: Linear Systems Analysis, Nonlinear Dynamics, Rule Induction, Decision Trees.

5.   Programming with R : Basic Syntax, Data types, Variables, Operators, Decision Making, Loops, Functions, Vectors, lists, Matrices, Arrays, Data Frames, R Data Interfaces – CSV Files, Excel Files, Database, R charts & graphs , R statistics – Mean, Median, Mode, Linear Regression.

Readings: 1. Chris Eaton, Dirk deroos et al. , "Understanding Big data ", McGraw Hill, 2012.
2. "Big Data Fundamentals: Concepts, Drivers & Techniques", 1/e, 2016, Thomas Erl, Wajid Khattak, Paul Buhler, Prentice Hall.
 3. "Big Data Analytics with R and Hadoop", 1e, 2013, Vignesh Prajapati, Packt Publishing Ltd, UK.
 4. "The Art of R Programming: A Tour of Statistical Software Design",revised,2011, Norman Matloff, No Starch Press 5. "Hadoop:The Definitive Guide," 3/e, 2012, Tom White, O'REILLY Publications.
6. "Understanding Big Data: Analytics for Enterprise Class Hadoop and streaming Data" ,2012, Paul Zikopoulos, IBM, Chris Eaton, Paul Zikopoulos, The McGraw-Hill Companies.
 7. "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications",2014, Bart Baesens, Wiley Publications .
8. "Mining of Massive Datasets", 2012, Anand Rajaraman and Jeffrey David Ullman , Cambridge University Press

Tutorials on DSE3 (A) Big Data Analytics
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DSE 3 (B)   Data Mining

Introduction, steps in knowledge discovery, architecture of data mining system, types of databases, functionalities of data mining, major issues.

Data Warehouse : difference between database and data warehouse, OLTP vs OLAP, Schemas for multidimensional databases, DMQL, Concept hierarchies, Starnet query model, three tier architecture of data warehouse.

Data Preprocessing : descriptive data summarization, data cleaning, data integration, transformation, data reduction, dimensionality reduction.

Cluster Analysis : types of variables, dissimilarity, Partitioning methods : k-means and k- medoids, Hierarchical clustering.

Classification : Meaning, issues, classification using k-NN and artificial neural network. Prediction : Meaning, regression techniques, prediction using neural network, Association rule mining : meaning, Apriori algorithm.

BOOKS
1.Data Mining concepts and techniques by J. Han and M. Kamber, 2nd Edition, Elsevier
2. Data Mining Methods for Knowledge Discovery, Cios, Pedrycz, Swiniarski,Kluwer Academic Publishers, London – 1998.

Tutorials on DSE3 (B) Data Mining
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DSE 4   **Project work followed by seminar**

Discipline Specific Elective: Dissertation / Project work

The students will be allowed to work on any project based on the concepts studied in core / elective or skill based elective courses.
The group size should be maximum of three (03) students.

Each group will be assigned a teacher as a supervisor who will handle both their theory as well lab classes.
A maximum of Four (04) projects would be assigned to one teacher.

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