Vidyasagar University

Curriculum for B.Sc (Honours) in Computer Science
[Choice Based Credit System]

Semester-IV

Course	Course Code	Name of the Subjects	Course Type/ Nature	Teaching Scheme in hour per week			Credit	Marks
				L	**T**	**P**		
CC-8		**C8T:** Design and Analysis of Algorithms	Core Course - 8	4	0	0	6	75
		C8P: Design and Analysis of Algorithms **Lab**		0	0	4		
CC-9		**C9T**: Software Engineering	Core Course - 9	4	0	0	6	75
		C9P: Software Engineering **Lab**		0	0	4		
CC-10		**C10T:** Database Management Systems	Core Course - 10	4	0	0	6	75
		C10P: Database Management Systems **(Lab)**		0	0	4		
GE-4		**TBD**	Generic Elective-4				4/5	75
							2/1	
SEC-2		**TBD**	Skill Enhancement Course-2	1	0	2	2	50
Semester Total							**26**	**350**

L=Lecture, **T**= Tutorial, **P**=Practical, **CC** = Core Course, **GE**= Generic Elective, **SEC** = Skill Enhancement Course, **TBD =** to be decided
Generic Elective (GE) (Interdisciplinary) from other Department.[Papers are to be taken from any of the following discipline: **Mathematics/Chemistry/Computer Science/Statistics/ Geology/ Electronics/Bio-technology**

Modalities of selection of Generic Electives (GE): A student shall have to choose **04** Generic Elective (GE1 to GE4) strictly from **02** subjects / disciplines of choice taking exactly **02** courses from each subjects of disciplines. Such a student shall have to study the curriculum of Generic Elective (GE) of a subject or discipline specified for the relevant semester.

Semester-IV
Core Course (CC)

CC-8: Design and Analysis of Algorithms   **Credits 06**

C8T: Design and Analysis of Algorithms   **Credits 04**

Course Contents:

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

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

3. Sorting and Searching Techniques
Elementary sorting techniques, Merge Sort, Heap Sort, Quick Sort, Sorting in Linear Time - Bucket Sort, Radix Sort and Count Sort, Searching Techniques, Medians & Order Statistics, complexity analysis;

4. Lower Bounding Techniques
Decision Trees

5. Balanced Trees
Red-Black Trees

6. Advanced Analysis Technique
Amortized analysis

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

8. String Processing

String Matching, KMP Technique

Suggested Readings:

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

C8P: Design and Analysis of Algorithms Lab   **Credits 02**

  Practical:

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

2.   Implement Heap Sort (The program should report the number of comparisons)
3.   Implement Randomized Quick sort (The program should report the number of comparisons)
4.   Implement Radix Sort
5.   Create a Red-Black Tree and perform following operations on it:
     i. Insert a node
     ii. Delete a node
     iii. Search for a number & also report the color of the node containing this number.
6.   Write a program to determine the LCS of two given sequences
7.   Implement Breadth-First Search in a graph
8.   Implement Depth-First Search in a graph
9.   Write a program to determine the minimum spanning tree of a graph

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

CC-9: Software Engineering   Credits 06

C9T: Software Engineering   Credits 04

Course Contents:

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

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

3. Software Project Management
Estimation in Project Planning Process, Project Scheduling.

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

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

6. Design Engineering
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
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.

Suggested Readings:

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.

C9P: Software Engineering Lab   **Credits 02**

Practical:

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

CC-10: Database Management Systems   Credits 06

C10T: Database Management Systems   Credits 04

Course Contents:

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

2. Entity Relationship(ER) Modeling

Entity types, relationships, constraints.

3. Relation data model
Relational model concepts, relational constraints normalization, relational algebra, SQL queries

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

5. Transaction Processing
ACID properties, concurrency control

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

Suggested Readings:

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.

C10P: Database Management Systems Lab   Credits 02

Practical:

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

EMPLOYEE Schema

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

DEPARTMENT Schema

Field	Type	NULL	KEY	DEFAULT
Dno	Integer	NO	PRI	NUL
Dname	Varchar(50)	YES		NUL
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.

Skill Enhancement Course (SEC)

SEC-2: HTML Programming   Credits 02

SEC2T: HTML Programming   Credits 01

Course Contents:

- **Unit-I: Introduction**
- **Unit-II: The Basics**

  - ➢ The Head, the Body

- Colors, Attributes
- Lists, ordered and unordered

- **Unit-III: Links**
  - Introduction
  - Relative Links, Absolute Links
  - Link Attributes
  - Using the ID Attribute to Link Within a Document
- **Unit-IV: Images**
  - Putting an Image on a Page
  - Using Images as Links
  - Putting an Image in the Background
- **Unit V: Tables**
  - Creating a Table
  - Table Headers
  - Captions
  - Spanning Multiple Columns
  - Styling Table
- **Unit VI: Forms**
  - Basic Input and Attributes
  - Other Kinds of Inputs
  - Styling forms with CSS
  - Where To Go From Here

Suggested Readings:

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

SEC2P: Software Lab Based on HTML   **Credits 01**

Q.1 Create an HTML document with the following formatting options:

1. Bold
2. Italics
3. Underline
4. Headings (Using H1 to H6 heading styles)
5. Font (Type, Size and Color)
6. Background (Colored background/Image in background)
7. Paragraph
8. Line Break
9. Horizontal Rule
10. 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
   o First Quarter
   o Second Quarter
   o Third Quarter
   o Fourth Quarter
3. Advertising Update
   o Result of Newspaper Campaign
   o Additions to staff
   o 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 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:

			Please 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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[Reset] [Send it in!]

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

Frame1
Frame 2

Frame 1	
Frame 2	Frame 3

Or

SEC-2: XML Programming   Credits 02

SEC2T: XML Programming   Credits 01

Course Contents:

Introduction:
Understanding Mark-up Languages, Introduction to XML and its Goals.

XML Basics:
XML Structure and Syntax, Document classes and Rules.

Other XML Concepts:
Scripting XML, XML as Data, Linking with XML.

XML with Style:
XSL –Style Sheet Basics, XSL basics, XSL style sheets.

Suggested Readings:

1. XML in action web technology by William J. Pardi

2. Step by Step XML by Michael J. Young

## SEC2P: Software Lab Based on XML   Credits 02

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.
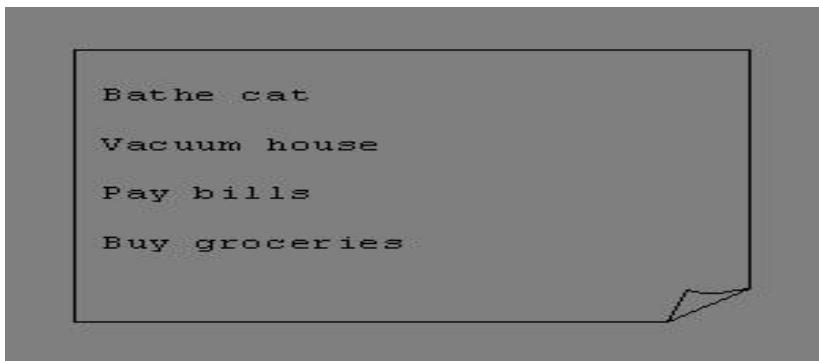
Exercise 2# Deconstructing an XML Document

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>

Or

SEC-2: Oracle (SQL/PL-SQL) — Credits 02

SEC2T: Oracle (SQL/PL-SQL) — Credits 01

Course Contents:

Introduction to Oracle as RDBMS

SQL Vs. SQL * Plus:

SQL Commands and Data types, Operators and Expressions, Introduction to SQL * Plus.

Managing Tables and Data:

➢ Creating and Altering Tables (Including constraints)

➢ Data Manipulation Command like Insert, update, delete

➢ SELECT statement with WHERE, GROUP BY and HAVING, ORDER BY, DISTINCT, Special operator like IN, ANY, ALL BETWEEN, EXISTS, LIKE

➢ Join, Built in functions

Other Database Objects
➢ View
➢ Synonyms, Index

Transaction Control Statements
➢ Commit, Rollback, Savepoint

Introduction to PL/SQL

➢ SQL v/s PL/SQL
➢ PL/SQL Block Structure
➢ Language construct of PL/SQL (Variables, Basic and Composite Data type, Conditions looping etc.) % TYPE and % ROWTYPE
➢ Using Cursor (Implicit, Explicit)

Suggested Readings :

1. Ivan Bayross, "SQL, PL/SQL the Programming Language of Oracle Paperback", BPB Publicatins, 2010.
2. Steven Feuerstein, Bill Pribyl , "Oracle PL/SQL Programming", 6th Edition, O'Reilly Media, 2014.
3. Rajeeb C. Chatterjee, "Learning Oracle SQL and PL/SQL: A simplified Guide", PHI, 2012.
4. Ron Hardman, Michael Mclaughlin, "Expert Oracle PL/SQL", Oracle Press, 2005.

5. Michael Mclaughlin, "Oracle Database 11g PL/SQL Programming", Oracle Press, 2008.
6. John Watson, Roopesh Ramklass, "OCA Oracle Database11g SQL Fundamentals I Exam Guide", Oracle Press, 2008.

SEC2P: Software Lab Based on SQL/PL-SQL   Credits 01

[SQL COMMANDS]

1) SQL* formatting commands
2) To create a table, alter and drop table.
3) To perform select, update, insert and delete operation in a table.
4) To make use of different clauses viz where, group by, having, order by, union and intersection,
5) To study different constraints.

[SQL FUNCTION]
6) To use oracle function viz aggregate, numeric, conversion, string function.
7) To understand use and working with joins.
8) To make use of transaction control statement viz rollback, commit and save point.
9) To make views of a table.
10) To make indexes of a table.

[PL/SQL]
11) To understand working with PL/SQL
12) To implement Cursor on a table.
13) To implement trigger on a table

Or

SEC-2: Linux / Unix Programming   Credits 02

SEC2T: Linux / Unix Programming   **Credits 01**

Course Contents:

Introduction

What is linux / unix Operating Systems
  ➢ 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
  ➢ 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
- ➢ 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)

Suggested Readings:

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

SEC2P: Software Lab Based on Linux   Credits 01

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.

Program to show the pyramid of special character —*‖.**9**

Or

SEC-2: R-Programming   Credits 02

SEC2T: R-Programming   Credits 01

Course Contents:

Introduction: Overview and History of R, Getting Help, Data Types, Subsetting, Vectorized Operations, Reading and Writing Data.

Control Structures, Functions, lapply, tapply, split, mapply, apply, Coding Standards.

Scoping Rules, Debugging Tools, Simulation, R Profiler

Suggested Readings:

1. William N. Venables and David M. Smith, An Introduction to R. 2nd Edition. Network Theory Limited.2009
2. Norman Matloff, The Art of R Programming - A Tour of Statistical Software Design, No Starch Press.2011

SEC2P: Software Lab Based on R Programming   Credits 01

1. Write a program that prints _Hello World' to the screen. 2. Write a program that asks the user for a number n and prints the sum of the numbers 1 to n
3. Write a program that prints a multiplication table for numbers up to 12.
4. Write a function that returns the largest element in a list.
5. Write a function that computes the running total of a list.
6. Write a function that tests whether a string is a palindrome.
7. Implement the following sorting algorithms: Selection sort, Insertion sort, Bubble Sort
8. Implement linear search.
9. Implement binary search.
10. Implement matrices addition, subtraction and Multiplication

Generic Elective (GE)
[Interdisciplinary for other department]

GE-4: Programming in Python   Credits 06

GE4T: Programming in Python   **Credits 04**

Course Contents:

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

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

Overview of Programming :
Structure of a Python Program, Elements of Python

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

Creating Python Programs:
Input and Output Statements, Control statements(Branching, Looping, Conditional Statement, Exit function, Difference between break, continue and pass.), Defining Functions, default arguments, Errors and Exceptions.

Iteration and Recursion: Conditional execution, Alternative execution, Nested conditionals, The return statement, Recursion, Stack diagrams for recursive functions ,Multiple assignment, The while statement, Tables, Two-dimensional tables
Strings and Lists: String as a compound data type, Length, Traversal and the for loop, String slices, String comparison, A find function, Looping and counting, List values, Accessing elements, List length, List membership, Lists and for loops, List operations, List deletion. Cloning lists, Nested lists
Object Oriented Programming: Introduction to Classes, Objects and Methods, Standard Libraries.
Data Structures: Arrays, list, set, stacks and queues.
Searching and Sorting: Linear and Binary Search, Bubble, Selection and Insertion sorting.

Strings and Lists: String as a compound data type, Length, Traversal and the for loop, String slices, String comparison, A find function, Looping and counting, List values, Accessing elements, List length, List membership, Lists and for loops, List operations, List deletion. Cloning lists, Nested lists

Object Oriented Programming: Introduction to Classes, Objects and Methods, Standard Libraries

Data Structures: Arrays, list, set, stacks and queues.

Searching and Sorting: Linear and Binary Search, Bubble, Selection and Insertion sorting.

Suggested Readings:

1. http://docs.python.org/3/tutorial/index.html
2. http://interactivepython.org/courselib/static/pythonds
3. T. Budd, Exploring Python, TMH, 1st Ed, 2011
4. How to think like a computer scientist: learning with Python / Allen Downey, Jeffrey Elkner, Chris Meyers. 1st Edition – Freely available online.2012

GE4P: Programming in Python Lab   Credits 02

Practical:

1. Using for loop, print a table of Celsius/Fahrenheit equivalences. Let c be the Celsius temperatures ranging from 0 to 100, for each value of c, print the corresponding Fahrenheit temperature.
2. Using while loop, produce a table of sins, cosines and tangents. Make a variable x in range from 0 to 10 in steps of 0.2. For each value of x, print the value of sin(x), cos(x) and tan(x).

3. Write a program that reads an integer value and prints ―leap year‖ or ―not a leap year‖.

1.   Write a program that takes a positive integer n and then produces n lines of output shown as follows.
     For example enter a size: 5
     *
     **
     ***
     ****
     *****
5.   Write a function that takes an integer ‗n' as input and calculates the value of 1 + 1/1! + 1/2! + 1/3! + … + 1/n
6.   Write a function that takes an integer input and calculates the factorial of that number.

7.   Write a function that takes a string input and checks if it's a palindrome or not.

8.   Write a list function to convert a string into a list, as in list (‗abc') gives [a, b, c].

9.   Write a program to generate Fibonacci series.

10. Write a program to check whether the input number is even or odd.

11. Write a program to compare three numbers and print the largest one.

12. Write a program to print factors of a given number.

13. Write a method to calculate GCD of two numbers.

14. Write a program to create Stack Class and implement all its methods. (Use Lists).

15. Write a program to create Queue Class and implement all its methods. (Use Lists)

16. Write a program to implement linear and binary search on lists.

17. Write a program to sort a list using insertion sort and bubble sort and selection sort.

<center>**Or**</center>

GE-4: Programming in VB/GAMBAS   Credits 06

GE4T: Programming in VB/GAMBAS   **Credits 04**

Course Contents:

GUI Environment:
 Introduction to graphical user interface (GUI), programming language (procedural, object oriented, event driven), the GUI environment, compiling, debugging, and running the programs.

Controls:
Introduction to controls textboxes, frames, check boxes, option buttons, images, setting orders and styles, the shape control, the line control, working with multiple controls and their properties, designing the user interface, keyboard access, tab controls, default & cancel property, coding for controls

Operations:
Data types, constants, named & intrinsic, declaring variables, scope of variables, val function, arithmetic operations, formatting data.

Decision Making:
If statement, comparing strings, compound conditions (and, or, not), nested if statements, case structure, using if statements with option buttons & check boxes, displaying message in message box, testing whether input is valid or not.

Modular programming:
Menus, sub-procedures and sub-functions defining / creating and modifying a menu, using common dialog box, creating a new sub- procedure, passing variables to procedures, passing argument by value or by reference, writing a function/ procedure.

Forms Handling:
Multiple forms creating, adding, removing forms in project, hide, show method, load, unload statement, me keyword, referring to objects on a different forms.

Iteration Handling:
 Do/loops, for/next loops, using msgbox function, using string function

Arrays and Grouped Data Control:
Arrays - 1-dimension arrays, initializing an array using for each, user-defined data types, accessing information with user-defined data types, using list boxes with array, two dimensional arrays. lists, loops and printing list boxes & combo boxes, filling the list using property window / add item method, clear method, list box properties, removing an item from a list, list box/ combo box operations.

Database Connectivity:

Database connectivity of forms with back end tool like mysql, populating the data in text boxes, list boxes etc. searching of data in database using forms. Updating/ editing of data based on a criterion

Suggested Readings :

1. Reference: Programming in Visual Basic 6.0 by Julia Case Bradley, Anita C. Millispangh (Tata Mcgraw Hill Edition 2000 (Fourteenth Reprint 2004))

GE4P: Programming in VB/GAMBAS Lab   **Credits 02**

Practical:

1. Print a table of numbers from 5 to 15 and their squares and Cubes.
2. Print the largest of three numbers.
3. Find the factional 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. Complete 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.
7. Read n numbers. Count the number of negative numbers, positive numbers and zeroes in the list. use arrays.
8. Read a single dimension array. Find the sum and average of these numbers.
9. Read a two dimension array. Find the sum of two 2D Array.
10. Create a database Employee and Make a form in VB 6.0 to allow data entry to **Employee Form** with the following command buttons:

Employee Form

Employee Name: ⬚⬚⬚⬚⬚⬚⬚⬚⬚⬚ | NEXT |

Employee Id: ⬚⬚⬚⬚⬚⬚⬚⬚⬚⬚

Date of Joining: ⬚⬚⬚⬚⬚⬚⬚⬚⬚⬚

Designation: ⬚⬚⬚⬚⬚⬚⬚⬚⬚⬚

Department: ⬚⬚⬚⬚⬚⬚⬚⬚⬚⬚

Address: ⬚⬚⬚⬚⬚⬚⬚⬚⬚⬚

⬚⬚⬚⬚⬚⬚⬚⬚⬚⬚

Basic Pay:

PREV

FIRST

LAST

ADD

DELETE

SAVE

CANCEL
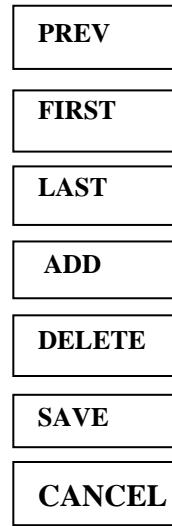
Or

GE-4: Information Security and Cyber Laws   Credits 06

GE4T: Information Security and Cyber Laws   **Credits 04**

Course Contents:

Course Introduction:
Computer network as a threat, hardware vulnerability, software vulnerability, importance of data security.

Digital Crime:
Overview of digital crime, criminology of computer crime.

Information Gathering Techniques:
Tools of the attacker, information and cyber warfare, scanning and spoofing, password cracking, malicious software, session hijacking.

Risk Analysis and Threat:
Risk analysis, process, key principles of conventional computer security, security policies, authentication, data protection, access control, internal vs external threat, security assurance, passwords, authentication, and access control, computer forensics and incident response

Introduction to Cryptography and Applications:
Important terms, Threat, Flaw, Vulnerability, Exploit, Attack, Ciphers, Codes, Caeser Cipher, Rail-Fence Cipher, Public key cryptography (Definitions only), Private key cryptography (Definition and Example)

Safety Tools and Issues :

Firewalls, logging and intrusion detection systems, Windows and windows XP / NT security, Unix/Linux security, ethics of hacking and cracking.

Cyber laws to be covered as per IT 2008:
- ➢ Chapter 1: Definitions
- ➢ Chapter 2: Digital Signature And Electronic Signature
- ➢ [Section 43] Penalty and Compensation for damage to computer, computer system, etc.
- ➢ [Section 65] Tampering with Computer Source Documents
- ➢ [Section 66 A] Punishment for sending offensive messages through communication service, etc.
- ➢ [Section 66 B] Punishments for dishonestly receiving stolen computer resource or communication device
- ➢ [Section 66C] Punishment for identity theft
- ➢ [Section 66D] Punishment for cheating by personation by using computer resource
- ➢ [Section 66E] Punishment for violation of privacy
- ➢ [Section 66F] Punishment for cyber terrorism
- ➢ [Section 67] Punishment for publishing or transmitting obscene material in electronic form
- ➢ [Section 67A] Punishment for publishing or transmitting of material
- ➢ containing sexually explicit act, etc. in electronic form[Section 67B] Punishment for publishing or transmitting of material depicting children in sexually explicit act, etc. in electronic form
- ➢ [Section 72] Breach of confidentiality and privacy

Suggested Readings:
1. M. Merkow, J. Breithaupt, Information Security Principles and Practices, Pearson Education.2005
2. G.R.F. Snyder, T. Pardoe, Network Security, Cengage Learning, 2010
3. A. Basta, W.Halton, Computer Security: Concepts, Issues and Implementation, Cengage Learning India, 2008

GE4P: Information Security and Cyber Laws Lab   **Credits 02**

Practical:

1. Demonstrate the use of Network tools: ping, ipconfig, ifconfig, tracert, arp, netstat, whois
2. Use of Password cracking tools : John the Ripper, Ophcrack. Verify the strength of passwords using these tools.
3. Perform encryption and decryption of Caesar cipher. Write a script for performing these operations.
4. Perform encryption and decryption of a Rail fence cipher. Write a script for performing these operations.
5. Use nmap/zenmap to analyse a remote machine.
6. Use Burp proxy to capture and modify the message.
7. Demonstrate sending of a protected word document.
8. Demonstrate sending of a digitally signed document.
9. Demonstrate sending of a protected worksheet.
10. Demonstrate use of steganography tools.
11. Demonstrate use of gpg utility for signing and encrypting purposes.