

B.Sc. COMPUTER SCIENCE

Proposed Course Structure based on UGC - LOCF and TANSCHÉ

(Choice Based Credit System)

(Applicable for the candidates admitted from the academic year 2023 - 2024 onwards)

Sem	Part	Course code	Course Title	Hrs/ Week	Credits	Exam Hours	Marks		Total Marks
							Int	Ext	
I	I	U1R3TL1/HL1/ FL1	Language Course-I	6	3	3	25	75	100
	II	U1R3EL1	English Language course-I	6	3	3	25	75	100
	III	U1R3CSCC1	Python Programming	5	5	3	25	75	100
		U1R3CSCC2P	Python Programming Practical	4	5	3	40	60	100
		U1R3CSDSE 1:1/1:2	Numerical Methods / Statistical Analysis Using R	5	3	3	25	75	100
	IV	SEC1 (NME)	Office Automation/Mark up and Scripting Languages	2	2	3	25	75	100
		U1R3CSFC	Problem Solving Techniques	2	2	3	25	75	100
II	I	U2R3TL2/ HL2/FL2	Language - I (Tamil/Hindi/French)	6	3	3	25	75	100
	II	U2R3EL2	Language - II (English)	6	3	3	25	75	100
	III	U2R3CSCC3	Data Structures and Algorithms	5	5	3	25	75	100
		U2R3CSCC4P	Data Structures and Algorithms Practical	4	5	3	40	60	100
		U2R3CSDSE 2:1 / 2:2	Graph Theory and its applications/Digital Computer Fundamental	5	3	3	25	75	100
	IV	U2R3CSSEC2 (NME2)	Multimedia Systems/E- Commerce	2	2	3	25	75	100
		U2R3CSSEC 3:1 / 3:2	Advanced Excel/ R Programming	2	2	3	25	75	100

Core Course I–Python Programming

Course Code: U1R3CSCC1	Credit: 5
Category: Core Course	Hrs/Week: 5, Total Inst.Hrs: 75
Nature of the Course: Employability	Marks: CIA: 25+ EXT: 75 = 100

COURSE OBJECTIVES

- To make students understand the concepts of Python programming.
- To apply the OOPs concept in PYTHON programming
- To impart knowledge on demand and supply concepts
- To make the students learn best practices in PYTHON programming
- To know the costs and profit maximization

Unit-I: BASICS OF PYTHON PROGRAMMING Hours: 15

History of Python – Features of Python – Literal – Constants – Variables – Identifiers – Keywords - Built-in Data Types – Output Statements – Input Statements - Comments – Indentation-Operators-Expressions-Type conversions. Python Arrays: Defining and Processing Arrays – Array methods.

Unit – II: CONTROL STATEMENTS Hours: 15

Selection/Conditional Branching statements: if, if-else, nested if and if-elif-else statements. Iterative Statements: while loop, for loop, else suite in loop and nested loops. Jump Statements: break, continue and pass statements.

Unit-III: FUNCTIONS Hours:15

Function Definition – Function Call – Variable Scope and its Life time –Return Statement. Function Arguments: Required Arguments, Keyword Arguments, Default Arguments and Variable Length Arguments -Recursion. Python Strings: String operations - Immutable Strings - Built-in String Methods and Functions - String Comparison. Modules: import statement- The Python module – dir() function – Modules and Namespace–Defining our own modules.

Unit-IV: LISTS Hours:15

Creating a list – Access values in List - Updating values in Lists – Nested lists –Basic list operations – List Methods. Tuples: Creating, Accessing, Updating and Deleting Elements in a tuple – Nested tuples –Difference between lists and tuples. Dictionaries: Creating, Accessing, Updating and Deleting Elements in a Dictionary –Dictionary Functions and Methods- Difference between Lists and Dictionaries.

Unit-V: PYTHON FILE HANDLING**Hours: 15**

Types of files in Python -Opening and Closing files - Reading and Writing files: write() and writelines() methods- append() method – read() and readlines() methods–with keyword – Splitting words –File methods-File Positions-Renaming and deleting files.

Text Books

1. ReemaThareja, “Python Programming using problem solving approach”, First Edition, 2017, Oxford University Press.
2. Dr. R. NageswaraRao, “Core Python Programming”, First Edition, 2017, Dream tech Publishers.

Reference Books

1. VamsiKurama, “Python Programming: A Modern Approach”, Pearson Education.
2. Mark Lutz, ”Learning Python”, Orielly.
3. Adam Stewarts, “Python Programming”, Online.
4. Fabio Nelli, “Python Data Analytics”, APress.
5. Fabio Nelli, “Python Data Analytics”, APress.

Web Resources

1. <https://www.programiz.com/python-programming>
2. <https://www.guru99.com/python-tutorials.html>
3. https://www.w3schools.com/python/python_intro.asp
4. <https://www.geeksforgeeks.org/python-programming-language/>
5. [https://en.wikipedia.org/wiki/Python_\(programming_language\)](https://en.wikipedia.org/wiki/Python_(programming_language))

COURSE OUTCOMES

COURSE OUTCOMES	
CO:1	Learn the basics of python, Do simple programs on python,Learn how to use an array.
CO:2	Develop program using selection statement, Work with Looping and jump statements, Do programs on Loops and jump statements
CO:3	Concept of function, function arguments, Implementing the concept strings in various application, Significance of Modules, Work with functions, Strings and modules.
CO:4	Work with List, tuples and dictionary, Write program using list, tuples and dictionary.
CO:5	Usage of File handlings in python, Concept of reading and writing files, Do programs using files.

Core Course II – Python Programming Practical

Course Code: U1R3CSCC2P	Credit: 5
Category: Core Course	Hrs/Week: 4, Total Inst.Hrs: 60
Nature of the Course: Employability	Marks: CIA: 40 + EXT: 60 = 100

COURSE OBJECTIVES

- Be able to design and program Python applications.
- Be able to create loops and decision statements in Python.
- Be able to work with functions and pass arguments in Python.
- Be able to build and package Python modules for reusability.
- Be able to read and write files in Python.

List of Exercises:

1. Program using variables, constants, I/O statements in Python.
2. Program using Operators in Python.
3. Program using Conditional Statements.
4. Program using Loops.
5. Program using Jump Statements.
6. Program using Functions.
7. Program using Recursion.
8. Program using Arrays.
9. Program using Strings.
10. Program using Modules.
11. Program using Lists.
12. Program using Tuples.
13. Program using Dictionaries.
14. Program for File Handling.

COURSE OUTCOMES:

The learners would have the ability to,

	COURSE OUTCOMES
CO:1	Demonstrate the understanding of syntax and semantics of PYTHON language
CO:2	Identify the problem and solve using PYTHON programming techniques.
CO:3	Identify suitable programming constructs for problem solving.
CO:4	Analyze various concepts of PYTHON language to solve the problem in an efficient way.
CO:5	Develop a PYTHON program for a given problem and test for its correctness.

Discipline Specific Course I

1. Numerical Methods

Course Code: UIR3CSDSE1:1	Credit: 3
Category: Discipline Specific Course	Hrs/Week: 5, Total Inst.Hrs: 75
Nature of the Course: Skill Development	Marks: CIA: 25+ EXT: 75 = 100

COURSE OBJECTIVES:

- To introduce the various topics in Numerical methods.
- To make understand the fundamentals of algebraic equations.
- To apply interpolation and approximation on examples.
- To solve problems using numerical differentiation and integration.
- To solve linear systems, numerical solution of ordinary differential equations.

Unit I: **Fundamentals of Algebraic Equations** **Hours: 15**

Solution of algebraic and transcendental equations-Bisection method – Fixed point iteration method – Newton Raphson method –linear system of equations – Gauss elimination method – Gauss Jordan method .

Unit II: **Iterative and Interpolation** **Hours: 15**

Iterative methods - Gauss Jacobi and Gauss Seidel – Eigen values of a matrix by Power method and Jacobi's method for symmetric matrices. Interpolation with unequal intervals – Lagrange's interpolation – Newton's divided difference interpolation(Proof no needed)

Unit III: **Interpolation with Equal interval** **Hours: 15**

Difference operators and relations. -Interpolation with equal intervals – Newton's forward and backward difference formulae. (Problems only).

Unit IV: **Numerical Differentiation and Integration** **Hours: 15**

Approximation of derivatives using interpolation polynomials – Numerical integration using Trapezoidal, Simpson's 1/3 rule

Unit V: **Initial Value Problems For ODE** **Hours: 15**

Single step methods – Taylor's series method – Euler's method – Runge Kutta method for solving(first, second , Third and 4th) order equations.

Text books

1. **Introductory methods of numerical analysis**, S.S. Sastry, Prentical Hall India, 1994.
2. **Numerical Methods**, N. Subramaniam, Scm Publishers, Erode.

e – Resources:

1. <https://youtu.be/pUDeeE-ugyc>
2. <https://www.maths.dur.ac.uk/users/anthony.yeates/na17.pdf>

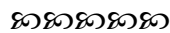
Reference Books:

1. **Numerical Methods**, P.Kandasamy, S.Chand & Co., New Delhi, .1998
2. **Statistics**, R.S.N. Pillai and Bagavathi S, Chand & Co Ltd., New Delhi, 1999.

COURSE OUTCOMES

The learners would have the ability to,

	COURSE OUTCOMES
CO:1	Know how to solve various problems on numerical methods
CO:2	Use approximation to solve problems
CO:3	Differentiation and integration concept are applied
CO:4	Know about numerical methods to solve Numerical differentiation and Integration.
CO:5	Numerical solution of ordinary differential equations



2. Statistical Analysis Using R

Course Code: UIR3CSDSE1:2	Credit: 3
Category: Discipline Specific Course	Hrs/Week: 5, Total Inst.Hrs: 75
Nature of the Course: Employability	Marks: CIA: 40 + EXT: 60 = 100

COURSE OBJECTIVES:

- Acquire programming skills in R Programming
- Acquire Object-oriented programming skills in R Programming.
- Develop the skill of designing graphical-user interfaces (GUI) in R Programming
- Acquire R Programming skills to move into specific branches
- To work with matrices in R-programming

List of Topics

1. Program to convert the given temperature from Fahrenheit to Celsius and vice versa depending upon user's choice.
2. Program, to find the area of rectangle, square, circle and triangle by accepting suitable input parameters from user.
3. Write a program to find list of even numbers from 1 to n using R-Loops.
4. Create a function to print squares of numbers in sequence.
5. Write a program to join columns and rows in a data frame using cbind() and rbind() in R.
6. Implement different String Manipulation functions in R.
7. Implement different data structures in R (Vectors, Lists, Data Frames)
8. Write a program to read a csv file and analyze the data in the file in R.
9. Create pie chart and bar chart using R.
10. Create a data set and do statistical analysis on the data using R.
11. Program to find factorial of the given number using recursive function
12. Write a R program to count the number of even and odd numbers from array of N numbers.

COURSE OUTCOMES

The learners would have the ability to,

COURSE OUTCOMES	
CO:1	Understand the problem solving approaches
CO:2	Learn the basic programming constructs in R Programming
CO:3	Practice various computing strategies for R Programming -based solutions to real world problems
CO:4	Use R Programming data structures - lists, tuples, dictionaries
CO: 5	Create the R- Programming documentations

Skill Enhancement Course I

1. Office Automation

Course Code: SEC1:1	Credit: 2
Category: Skill Enhancement Course	Hrs/Week: 2, Total Inst.Hrs: 30
Nature of the Course: Employability	Marks: CIA: 25+ EXT: 75 = 100

COURSE OBJECTIVES

- Understand the basics of computer systems and its components.
- Understand and apply the basic concepts of a word processing package.
- Understand and apply the basic concepts of electronic spreadsheet software.
- Understand and apply the basic concepts of database management system
- Understand and create a presentation using PowerPoint tool.

UNIT-I: **Introductory concepts** **Hours:6**

Introductory concepts: Memory unit – CPU-Input Devices: Key board, Mouse and Scanner.Outputdevices:Monitor,Printer.IntroductiontoOperatingsystems&itsfeatures:DOS–UNIX–Windows.IntroductiontoProgrammingLanguages.

UNIT-II: **Word Processing** **Hours:6**

Word Processing: Open, Save and close word document; Editing text – tools, formatting, bullets; Spell Checker – Document formatting – Paragraph alignment, indentation, headersandfooters,numbering; printing– Preview,options,merge.

UNIT-III: **Spreadsheets** **Hours:6**

Spreadsheets: Excel – opening, entering text and data, formatting, navigating; Formulas –entering, handling and copying; Charts – creating, formatting and printing, analysis tables,preparation of financial statements,introductionto data nalytics.

UNIT-IV: **Database Concepts** **Hours:6**

DatabaseConcepts:Theconceptof databasemanagementsystem;Datafield,records,andfiles,Sortingandindexingdata;Searchingrecords.Designingqueries,andreports; Linking of data files; Understanding Programming environment in DBMS; Developing menu drive applications in querylanguage(MS–Access).

UNIT–V: Powerpoint**Hours: 6**

Power point: Introduction to Power point - Features – Understanding slide typecasting & viewing slides – creating slide shows. Applying special object – including objects & pictures – Slide transition – Animation effects, audio inclusion, timers.

RECOMMENDED BOOK

1. Peter Norton, "Introduction to Computers" – Tata McGraw-Hill.

REFERENCE BOOKS

1. Jennifer Ackerman Kettel, Guy Hat-Davis, Curt Simmons, Microsoft 2003", Tata McGraw-Hill.

WEB REFERENCES

1. Web content from NDL/SWAYAM or open source web resources

COURSE OUTCOMES

COURSE OUTCOMES	
CO:1	Possess the knowledge on the basics of computers and its components
CO:2	Understand and apply the basic concepts of a word processing package.
CO:3	Learn the concepts of Database and implement the Query in Database.
CO:4	Demonstrate the understanding of different automation tools.
CO:5	Utilize the automation tools for documentation, calculation and presentation purpose.

Skill Enhancement Course I

2. Markup and Scripting Languages

Course Code: SEC1:2	Credit: 2
Category: Skill Enhancement Course	Hrs/Week: 2, Total Inst.Hrs: 30
Nature of the Course: Employability	Marks: CIA: 25+ EXT: 75 = 100

COURSE OBJECTIVES

- To understand Web based programming and scripting languages.
- To learn the basic web concepts and to create rich internet applications that use most recent client-side programming technologies.

UNIT-I: HTML

Hours:6

HTML: HTML-Introduction-tag basics- page structure-adding comments working with texts, paragraphs and line break. Emphasizing test- heading and horizontal rules-list-font size, face and color-alignment links-tables-frames

UNIT-II: Forms & Images

Hours:6

Forms & Images Using Html: Graphics: Introduction-

How to work efficiently with images in web pages, image maps, GIF animation, adding multimedia, data collection with html form text box, password, list box, combobox, text area, tools for building web page front page

UNIT-III: XML & DHTML

Hours:6

XML & DHTML: Cascading style sheet (CSS)- what is CSS- Why we use CSS- adding CSS to your web pages- Grouping styles- extensible markup language (XML). Dynamic

HTML: Document object model (DOM)-

Accessing HTML & CSS through DOM Dynamic content styles & positioning- Event bubbling- data binding.

UNIT-IV: JavaScript

Hours:6

JavaScript: Client-side scripting, What is JavaScript, How to develop JavaScript, simple JavaScript, variables, functions, conditions, loops and repetition, Advance script, JavaScript and objects, JavaScript own objects, the DOM and web browser environments, forms and validations

UNIT-V: Ajax

Hours:6

Ajax: Introduction, advantages & disadvantages, Purpose of it, ajax based web

application, alternatives of ajax JavaScript & AJAX: Introduction to array-operators, making statements-date & time-mathematics strings-Event handling-form properties. AJAX. Introduction to jQuery and AngularJS.

REFERENCE BOOKS

1. Laura Lemay, Rafe Colburn, Jennifer Kyrnin, “Mastering HTML, CSS & Javascript Web Publishing”, 2016.
2. DT Editorial Services (Author), “HTML5 Black Book (Covers CSS3, JavaScript, XML, X HTML, AJAX, PHP, jQuery)”, Paperback 2016, 2nd Edition.

WEB REFERENCES

1. NPTEL & MOOC courses titled Web Design and Development

COURSE OUTCOMES

	COURSE OUTCOMES
CO:1	Communicate clearly and concisely, visually, verbally and in writing, using techniques appropriate for the intended audience.
CO:2	Demonstrate knowledge of discipline-specific skills and vocabulary
CO:3	Interpret the ethical, legal, and social impacts of various modes of media delivery
CO:4	Participate as a team member to make collaborative decisions toward shared objectives with interpersonal skills
CO:5	Construct a body of work that demonstrates visual intelligence, conceptual understanding, collaboration and technical facility at a professional entry level in media design and production

Foundation Course I–Problem Solving Techniques

Course Code: UIR3CSFC	Credit: 2
Category: FoundationCourse	Hrs/Week: 2, Total Inst.Hrs: 30
Nature of the Course: Employability	Marks: CIA: 25+ EXT: 75 = 100

COURSE OBJECTIVES

- Familiarize with writing of algorithms, fundamentals of C and philosophy of problem solving.
- Implement different programming constructs and decomposition of problems into functions.
- Use data flow diagram, Pseudo code to implement solutions.
- Define and use of arrays with simple applications.
- Understand about operating system and their uses.

UNIT–I: Introduction

Hours:6

Introduction: History, characteristics and limitations of Computer. Hardware/Anatomy of Computer: CPU, Memory, Secondary storage devices, Input Devices and Output devices. Types of Computers: PC, Workstation, Minicomputer, Main frame and Supercomputer. Software: System software and Application software. Programming Languages: Machine language, Assembly language, High-level language, 4GL and 5GL-Features of good programming language. Translators: Interpreters and Compilers.

UNIT–II: Data&Programming: Algorithm Hours: 6

Data: Data types, Input, Processing of data, Arithmetic Operators, Hierarchy of operations and Output. Different phases in Program Development Cycle (PDC). **Structured Programming: Algorithm:** Features of good algorithm, Benefits and drawbacks of algorithm. **Flowcharts:** Advantages and limitations of flowcharts, when to use flowcharts, flowchart symbols and types of flowcharts. **Pseudocode:** Writing a pseudocode. Coding, documenting and testing a program: Comment lines and types of errors. **Program design:** Modular Programming.

UNIT–III: Selection Structures

Hours:6

Selection Structures: Relational and Logical Operators -Selecting from Several Alternatives – Applications of Selection Structures. **Repetition Structures:** Counter Controlled Loops –Nested Loops– Applications of Repetition Structures.

UNIT-IV: Data&Arrays**Hours:6****Data:** Numeric Data and Character Based Data. **Arrays:** One Dimensional Array - Two Dimensional Arrays – Strings as Arrays of Characters.**UNIT-V: Data Flow Diagrams&Program Modules****Hours:6****Data Flow Diagrams:** Definition, DFD symbols and types of DFDs. **Program Modules:** Subprograms-Value and Reference parameters- Scope of a variable - Functions – Recursion. **Files:** File Basics-Creating and reading a sequential file-Modifying Sequential Files.**RECOMMENDED BOOK**

1. R.G.Dromey,*HowtoSolve itby Computer*,PearsonIndia,2007.

REFERENCE BOOKS

1. George Polya, Jeremy Kilpatrick, *The Stanford Mathematics Problem Book: With HintsandSolutions*, DoverPublications,2009(KindleEdition2013).
2. Greg W.Scragg,*ProblemSolvingwithComputers*,Jones &Bartlett1stedition,1996.

COURSE OUTCOMES:

On completion of this course, students will

COURSE OUTCOMES	
CO:1	Study the basic knowledge of Computers.Analyze the programming languages.
CO:2	Study the data types and arithmetic operations.Know about the algorithms.Develop program using flow chart and pseudocode.
CO:3	Determine the various operators.Explain about the structures.Illustrate the concept of Loops
CO:4	Determine the various operators.Explain about the structures.Illustrate the concept of Loops.
CO:5	Explain about DFDIllustrate program modules.Creating and reading Files

First Year (Semester – II)

Core Course III – **Data Structures and Algorithms**

Course Code: U2R3CSCC3	Credit: 5
Category: Core Course	Hrs/Week: 6, Total Inst. Hrs: 90
Nature of the Course: Employability	Marks: CIA: 25 + EXT: 75 = 100

COURSE OBJECTIVES

- To impart the basic concepts of data structures and algorithms.
- To acquaint the student with the basics of the various data structures and make the students knowledgeable in the area of data structures.
- To provide knowledge about the categories of data structures
- This course also gives insight into the various algorithm design techniques
- To give more experience about the algorithm types with example problems.

UNIT-I: INTRODUCTION TO DATA STRUCTURES **Hours: 18**

- **Data Structures:** Definition- Time & Space Complexity,
- **Arrays:** Representation of arrays, Applications of arrays, sparse matrix and its representation,
- **Linear list:** Singly linked list implementation, insertion, deletion and searching operations on linear list
- **Circular linked list:** implementation, Double linked list implementation, insertion, deletion and searching operations. Applications of linked lists- Dynamic Storage management.

UNIT-II: STACKS **Hours: 18**

- **STACKS:** Operations, array and linked representations of stack, stack applications, infix to postfix conversion, postfix expression evaluation, recursion implementation

UNIT-III: QUEUES, TREES & GRAPHS **Hours: 18**

QUEUES, TREES & GRAPHS:

- **Queues:** operations on queues, array and linked representations.
- **Circular Queue:** operations, applications of queues.
- **Trees:** Definitions and Concepts- Representation of binary tree, Binary tree traversals (Inorder, Postorder, Preorder),
- Binary search trees
- **Graphs:** Representation of Graphs- Types of graphs -Breadth first traversal – Depth first traversal- -Applications of graphs.

UNIT-IV: INTRODUCTION TO ALGORITHMS**Hours: 18**

- **Introduction:** Definition of Algorithms- Overview and importance of algorithms- pseudocode conventions, Asymptotic notations, practical complexities.
- **Divide-and-Conquer:** : General Method – Binary Search- Quick Sort- Merge Sort.
- **Greedy Method:** General method- Knapsack problem- Tree vertex splitting- Job sequencing with deadlines

UNIT-V: DYNAMIC PROGRAMMING, BACKTRACKING & BRANCH & BOUND**Hours: 18**

- **Dynamic programming:** General method, Multistage Graphs, All pairs shortest path, Single source shortest path.
- **Backtracking:** General method, 8 , Graph coloring, Hamiltonian cycle.
- **Branch & Bound:** General method, Travelling salesperson problem.

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper) – Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)

Skills acquired from the course: Knowledge, Problem Solving and Analytical ability, Professional Competency, Professional Communication and Transferrable Skill.

COURSE OUTCOMES

On the successful completion of this course, students would be able to:

COURSE OUTCOMES	
CO:1	Have a good understanding about the concepts of Data structures and to understand simple linear Data structures.
CO:2	Have a good knowledge on the basics of stack Data structure, its implementation and application.
CO:3	Use the appropriate Data structures in context of solution of given problem and demonstrate a familiarity with major Data structures.
CO:4	Have an idea about the basic concepts of algorithms
CO:5	To have clear idea on algorithmic design paradigms like Dynamic Programming, Backtracking, Branch and Bound

RECOMMENDED BOOKS

1. Ellis Horowitz, Sartaj Sahni, Susan Anderson Freed, Second Edition , “Fundamentals of Data in C”, Universities Press
2. 2. E. Horowitz, S. Sahni and S. Rajasekaran, Second Edition ,“Fundamentals of Computer Algorithms “ Universities Press

REFERENCE BOOKS

1. Seymour Lipschutz, ”Data Structures with C”, First Edition, Schaum’s outline series in computers, Tata McGraw Hill.
2. R.Krishnamoorthy and G.Indirani Kumaravel, Data Structures using C, Tata McGrawHill – 2008.
3. A.K.Sharma, Data Structures using C , Pearson Education India,2011.
4. G. Brassard and P. Bratley, “Fundamentals of Algorithms”, PHI, New Delhi, 1997.
5. A.V. Aho, J.E. Hopcroft, J.D. Ullmann,, “The design and analysis of Computer Algorithms”, Addison Wesley, Boston, 1974
6. Thomas H. Cormen, C.E. Leiserson, R L.Rivest and C. Stein, Introduction to Algorithms, Third edition, MIT Press, 2009
7. Sanjoy Dasgupta, C.Papadimitriou and U.Vazirani , Algorithms , Tata McGraw-Hill, 2008.

WEB REFERENCES

1. Web resources from NDL Library, E-content from opensource libraries

Core Course IV – Data Structures and Algorithms Practical

Course Code: U2R3CSCC4P	Credit: 5
Category: Core Course	Hrs/Week: 3, Total Inst. Hrs:45
Nature of the Course: Employability	Marks: CIA: 40 + EXT: 60 = 100

COURSE OBJECTIVES

- To understand and implement basic data structures using C
- To apply linear and non-linear data structures in problem solving.
- To learn to implement functions and recursive functions by means of data structures
- To implement searching algorithms.
- To provide a deep learning experience about sorting algorithms

List of Exercises:

Implement the following exercises using C Programming language:

1. Array implementation of stacks
2. Array implementation of Queues
3. Linked list implementation of stacks
4. Linked list implementation of Queues
5. Binary Tree Traversals (Inorder, Preorder, Postorder)
6. Implementation of Linear search and binary search
7. Implementation Insertion sort, Quick sort and Merge Sort
8. Implementation of Depth-First Search & Breadth-First Search of Graphs.
9. Finding all pairs of Shortest Path of a Graph.
10. Finding single source shortest path of a Graph

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper) – Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)

Skills acquired from the course: Knowledge, Problem Solving and Analytical ability, Professional Competency, Professional Communication and Transferrable Skill

COURSE OUTCOMES

	COURSE OUTCOMES
CO: 1	Work on data structures.
CO: 2	Implement linked lists and their applications
CO: 3	Implement Tree Traversals
CO: 4	Handle various algorithms
CO: 5	Implement different sorting and searching algorithms

WEB REFERENCES

Web resources from NDL Library, E-content from open source libraries

Generic / Discipline Specific Elective Course II

1. Graph Theory and its Applications

Course Code: U2R3CSDSE2:1	Credit: 3
Category: Discipline Specific Elective	Hrs/Week: 5, Total Inst. Hrs: 75
Nature of the Course: Skill Development	Marks: CIA: 25 + EXT: 75 = 100

COURSE OBJECTIVES

- Definition of Graph, sub graph their representations, degree and algebraic operations.
- Connected graphs, weighted graphs and shortest paths
- Trees: Characterizations, spanning tree, minimum spanning trees
- Eulerian and Hamiltonian graphs: Characterization, Necessary and sufficient conditions
- Special classes of graphs: Bipartite graphs, line graphs, chordal graphs.

UNIT-I: Introduction to Graphs

Hours: 15

Graph-mathematical definition- Introduction – sub graphs –Walks, paths, Circuits connectedness- Components- Euler Graphs- Hamiltonian paths and circuits-Trees- properties of Trees- Distance and centers in Tree- Rooted and Binary Trees.

UNIT-II: Connectivity and Planarity

Hours: 15

Introduction to circuits - cut set- properties of cut set- All cut sets –connectivity and separability – Network Flows - 1-Isomorphism - 2-Isomorphism- Combinatorial and Geometric graphs- Planar Graphs – Different representation of planar graph.

UNIT-III: Colouring and Directed Graph

Hours: 15

Basics of Colouring & Chromatic number – Chromatic partitioning – Graph Colouring – four colour Problem Chromatic polynomial - Matching – Covering - Directed graphs - Types of Directed Graphs – Diagraphs and binary relations – Directed paths- Euler Graph.

UNIT-IV: Matrix Representation in Graph

Hours: 15

Matrix representation of graphs, Sub graphs& Quotient Graphs, Transitive Closure digraph, Euler's Path & Circuit (only definitions and examples), spanning Trees of Connected Relations, Prim's Algorithm to construct Spanning Trees, Weighted Graphs, Minimal, Spanning Trees by Prim's Algorithm & Kruskal's Algorithm.

UNIT-V: Applications of Graph**Hours: 15**

Traveling Sales Person Problem with Directed and Un directed Graph - Graph with n vertices and k colours - Shortest path from one to many Cities with directed graph - Shortest Paths with Un directed Graphs - Connected Components.

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper) – Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)

Skills acquired from the course: Knowledge, Problem Solving and Analytical ability, Professional Competency, Professional Communication and Transferrable Skill

COURSE OUTCOMES

On the successful completion of this course, students would be able to:

COURSE OUTCOMES	
CO: 1	Apply the concepts of Graph, sub graph their representations, degree and algebraic operations.
CO: 2	Handle Connected graphs, weighted graphs and shortest paths
CO: 3	Practice on Trees: Characterizations, spanning tree, minimum spanning trees
CO: 4	Work with Eulerian and Hamiltonian graphs: Characterization, Necessary and sufficient conditions
CO: 5	Handle Special classes of graphs: Bipartite graphs, line graphs, chordal graphs.

Text Books:

1. Narsingh Deo , “ Graph Theory with Application to Engineering and Computer Science” Prentice Hall of India 2010 (Reprint).
2. Rosen H “Discrete Mathematics and Its Application” McGraw Hill, 2007.

Reference Books:

1. Discrete Maths for Computer Scientists & Mathematicians by Mott, Kandel, Baker.
2. Clark J and Holton DA “ First look at Graph Theory” Allied Publishers 1995.
3. Discrete Maths for Computer Scientists & Mathematicians by Mott, Kandel, Baker.

E- Resources:

1. Web resources from NDL Library, E-content from open source libraries
2. <https://d3gt.com/>
3. <https://www.coursera.org/courses?query=graph%20theory>

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Generic / Discipline Specific Elective Course II

2. Digital Computer Fundamentals

Course Code: U2R3CSDSE2:2	Credit: 3
Category: Discipline Specific Elective	Hrs/Week: 5, Total Inst. Hrs:75
Nature of the Course: Skill Development	Marks: CIA: 25 + EXT: 75 = 100

COURSE OBJECTIVES

- It aims to train the student to the basic concepts of Digital Computer Fundamentals
- To impart the in-depth knowledge of logic gates, Boolean algebra
- To provide them a deep learning experience about combinational circuits and sequential circuits.
- To give the students an understanding about Flip flops.
- To provide the students a realization about counters and different types of ROM

UNIT-I: Numbersystems and Codes Hours: 15

Numbersystems and Codes: Number System – Base Conversion – Binary Codes – Code Conversion. Digital Logic: Logic Gates – Truth Tables – Universal Gates.

UNIT-II: Boolean Algebra Hours: 15

Boolean Algebra: Laws and Theorems – SOP, POS Methods – Simplification of Boolean Functions – Using Theorems, K-Map, Prime– Implicant Method–Binary Arithmetic: Binary Addition – Subtraction – Various Representations of Binary Numbers – Arithmetic Building Blocks–Adder–Subtractor.

UNIT-III: Combinational Logic Hours: 15

Combinational Logic: Multiplexers – Demultiplexers – Decoders – Encoders –Code Converters–Parity Generators and Checkers.

UNIT-IV: Sequential Logic Hours: 15

Sequential Logic: RS, JK, D and T Flip-Flops – Master - Slave Flip-Flops. Registers: Shift Registers – Types of Shift Registers.

UNIT-V: Counters Hours: 15

Counters: Asynchronous and Synchronous Counters - Ripple, Mod, Up – Down Counters– Ring Counters. Memory: Basic Terms and Ideas –Types of ROMs –Types of RAMs.

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper) – Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)

Skills acquired from the course: Knowledge, Problem Solving and Analytical ability, Professional Competency, Professional Communication and Transferrable Skill

COURSE OUTCOMES

On the successful completion of this course, students would be able to:

	COURSE OUTCOMES
CO: 1	Identify the logic gates and their functionality.
CO: 2	Perform number conversions from one system to another system
CO: 3	Understand the functions of combinational circuits
CO: 4	Perform number conversions.
CO: 5	Perform Counter design and learn its operations.

RECOMMENDED BOOKS

1. V.Rajaraman and T.Radhakrishnan, Digital Computer Design, Prentice Hall of India,2001
2. D.P.Leach and A.P.Malvino, Digital Principles and Applications–TMH–Fifth Edition–2002.
3. M.Moris Mano, Digital Logic and Computer Design, PHI,2001.
4. T.C.Bartee, Digital Computer Fundamentals, 6thEdition, Tata McGraw Hill, 1991.

Skill Enhancement Course – II (Offered to other Department)

1. Multimedia Systems

Course Code: U2R3CSSEC2:1	Credit: 2
Category: Skill Enhancement Course	Hrs/Week: 2, Total Inst. Hrs: 30
Nature of the Course: Employability	Marks: CIA: 25 + EXT: 75 = 100

COURSE OBJECTIVES:

- To understand the standards available for different audio, video and text applications.
- To learn various multimedia authoring systems in multimedia production team.

UNIT– I: Introduction to Multimedia

Hours: 6

Multimedia Definition - Use Of Multimedia - Delivering Multimedia - Text: About Fonts and Faces - Using Text in Multimedia - Computers and Text - Font Editing and Design Tools - Hypermedia and Hypertext.

UNIT–II: Images & Sound

Hours: 6

Images: Plan Approach - Organize Tools - Configure Computer Workspace - Making Still Images - Color - Image File Formats. **Sound:** The Power of Sound - Digital Audio - Midi Audio - Midi vs. Digital Audio - Multimedia System Sounds - Audio File Formats - Vaughan's Law of Multimedia Minimums - Adding Sound to Multimedia Project.

UNIT–III: Animation & Video

Hours: 6

Animation: The Power of Motion - Principles of Animation - Animation by Computer - Making Animations that Work. **Video:** Using Video - Working with Video and Displays - Digital Video Containers - Obtaining Video Clips - Shooting and Editing Video.

UNIT–IV: Making Multimedia

Hours: 6

Making Multimedia: The Stage of Multimedia Project - The Intangible Needs - The Hardware Needs - The Software Needs - An Authoring Systems Needs- Multimedia Production Team.

UNIT–V: Planning and Costing

Hours: 6

Planning and Costing: The Process of Making Multimedia - Scheduling - Estimating - RFPs and Bid Proposals. Designing and Producing - Content and Talent: Acquiring Content - Ownership of Content Created for Project - Acquiring Talent.

TEXTBOOK:

1. PeterNorton,“IntroductiontoComputers”–TataMcGraw-Hill.

REFERENCE BOOKS

1. JenniferAckermanKettel,GuyHat-Davis,CurtSimmons,“Microsoft2003”,TataMcGraw-Hill.

COURSE OUTCOMES

	COURSE OUTCOMES
CO: 1	Communicate clearly and concisely, visually, verbally and in writing, using techniques appropriate for the intended audience.
CO: 2	Demonstrate knowledge of discipline-specific skills and vocabulary
CO: 3	Interpret the ethical, legal, and social impacts of various modes of media delivery
CO: 4	Participate as a team member to make collaborative decisions toward shared objectives with interpersonal skills
CO: 5	Construct a body of work that demonstrates visual intelligence, conceptual understanding, collaboration and technical facility at a professional entry level in media design and production

2. E-Commerce

Course Code: U2R3CSSEC2:2	Credit: 2
Category: Skill Enhancement Course	Hrs/Week: 2, Total Inst. Hrs: 30
Nature of the Course: Skill Development	Marks: CIA: 25+ EXT: 75 = 100

COURSE OBJECTIVES:

- To provide knowledge on Ecommerce technology, Business Models and M-Commerce.
- To explore the major issues associated with e-commerce-security, privacy, authentication, encryption and e-Payment.
- To educate about World Wide Web and E Marketing
- To teach the students about E-Security & Legal and Ethical Issues
- To educate them about Information systems for Mobile Commerce

UNIT I: **History of E-commerce and Indian Business Context** Hours: 6

E-Commerce –Emergence of the Internet –Emergence of the WWW – Advantages of E-Commerce – Transition to E-Commerce in India –The Internet and India – E-transition Challenges for Indian Corporate.

Business Models for E-commerce: Business Model – E-business Models Based on the Relationship of Transaction Parties -E-business Models Based on the Relationship of Transaction Types.

UNIT II: **Enabling Technologies of the WWW & e-Marketing** Hours: 6

World Wide Web – Internet Client-Server Applications –Networks and Internets – Software Agents – Internet Standards and Specifications – ISP. -Traditional Marketing – Identifying Web Presence Goals – Online Marketing – E-advertising – E-branding.

UNIT III: **E-Security & Legal and Ethical Issues** Hours: 6

E-Security:Information system Security – Security on the Internet – E-business Risk Management Issues –Information Security Environment in India. Legal and Ethical Issues : Cybers talking – Privacy is at Risk in the Internet Age – Phishing – Application Fraud – Skimming – Copyright – Internet Gambling – Threats to Children.

UNIT-IV: **e-Payment Systems** Hours: 6

Main Concerns in Internet Banking – Digital Payment Requirements – Digital Token-based e-payment Systems – Classification of New Payment Systems – Properties of Electronic Cash – Cheque Payment Systems on the Internet – Risk and e-Payment Systems – Designing e-payment Systems – Digital Signature – Online Financial Services in India - Online Stock Trading.

• UNIT–V: Information systems for Mobile Commerce

Hours: 6

Information systems for Mobile Commerce :What is Mobile Commerce?–Wireless Applications – Cellular Network – Wireless Spectrum – Technologies for Mobile Commerce – Wireless Technologies –Different Generations in Wireless Communication – Security Issues Pertaining to Cellular Technology. **Portals for E-Business:** Portals–Human Resource Management– Various HRIS Modules.

TEXT BOOK

1. PeterNorton,“IntroductiontoComputers”–TataMcGraw-Hill.

REFERENCE BOOKS

1. JenniferAckermanKettel,GuyHat-Davis,CurtSimmons,“Microsoft2003”,TataMcGraw-Hill.

WEB REFERENCES

1. Web content from NDL / SWAYAM or open source web resources

COURSE OUTCOMES:

On completion of this course, students will

	COURSE OUTCOMES
CO: 1	Have a sound knowledge on Ecommerce technology, Business Models and M-Commerce.
CO: 2	Handle the major issues associated with e-commerce-security, privacy, authentication, encryption and e-Payment.
CO: 3	Be knowing World Wide Web and E Marketing
CO: 4	Have ample skills in E-Security &Legal and Ethical Issues
CO: 5	Be knowing aboutInformation systems for Mobile Commerce

Skill Enhancement Course III

1. Advanced Excel

Course Code: U2R3CSSEC3:1	Credit: 2
Category: Skill Enhancement Course	Hrs/Week: 2, Total Inst. Hrs: 30
Nature of the Course: Employability	Marks: CIA: 25 + EXT: 75 = 100

COURSE OBJECTIVES

- To learn the advanced features of Excel.
- To impart the students an understanding about data validation through excel.
- To educate them about pivot tables of excel.
- To provide them an understanding about various functions and their use in excel.
- To summarize, analyze, explore, and present visualizations of data in the form of charts, graphs.

UNIT–I: Basics of Excel Hours: 6

Basics of Excel- Customizing common options- Absolute and relative cells- Protecting and un-protecting worksheets and cells- Working with Functions - Writing conditional expressions - logical functions - lookup and reference functions- VlookUP with Exact Match, Approximate Match- Nested VlookUP with Exact Match- VlookUP with Tables, Dynamic Ranges- Nested VlookUP with Exact Match- Using VLOOKUP to consolidate Data from Multiple Sheets.

UNIT–II: Data Validations Hours: 6

Data Validations - Specifying a valid range of values - Specifying a list of valid values- Specifying custom validations based on formula - Working with Templates Designing the structure of a template- templates for standardization of worksheets - Sorting and Filtering Data - Sorting tables- multiple-level sorting- custom sorting- Filtering data for selected view - advanced filter options- Working with Reports Creating subtotals- Multiple-level subtotal.

UNIT–III: Pivot Table Hours: 6

Creating Pivot tables Formatting and customizing Pivot tables- advanced options of Pivot tables- Pivot charts- Consolidating data from multiple sheets and files using Pivot tables- external data sources- data consolidation feature to consolidate data- Show Value As % of Row, % of Column, Running Total, Compare with Specific Field- Viewing Subtotal under Pivot- Creating Slicers.

UNIT–IV: Functions Hours: 6

More Functions Date and time functions- Text functions- Database functions- Power Functions - Formatting Using auto formatting option for worksheets- Using conditional formatting option for rows, columns and cells- What-If Analysis - Goal Seek- Data Tables- Scenario Manager.

UNIT–V: Charts

Hours: 6

Charts - Formatting Charts- 3D Graphs- Bar and Line Chart together- Secondary Axis in Graphs- Sharing Charts with PowerPoint / MS Word, Dynamically- New Features Of Excel Spark lines, Inline Charts, data Charts- Overview of all the new features.

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper) – Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)

Skills acquired from the course: Knowledge, Problem Solving and Analytical ability, Professional Competency, Professional Communication and Transferrable Skill

COURSE OUTCOMES

On the successful completion of this course, students would be able to:

	COURSE OUTCOMES
CO: 1	Handle large amounts of data
CO: 2	Aggregate numeric data and summarize into categories and subcategories
CO: 3	Filtering, sorting, and grouping data or subsets of data
CO: 4	Create pivot tables to consolidate data from multiple files
CO: 5	Presenting data in the form of charts and graphs

RECOMMENDED BOOK

1. Excel 2019 All-in-One for Dummies – 2018- Greg Harvey

REFERENCE BOOKS

1. Microsoft Excel 2019 Pivot Table Data Crunching-2019,Bill Jelen and Michael Alexander

WEB REFERENCE

1. Web resources from NDL Library, E-content from opensource libraries

2. R Programming

Course Code: U2R3CSSEC3:2	Credit: 2
Category: Skill Enhancement Course	Hrs/Week: 2, Total Inst. Hrs: 30
Nature of the Course: Employability	Marks: CIA: 25 + EXT: 75 = 100

COURSE OBJECTIVES

- To understand and able to use basic programming concepts of R programming
- To automate data analysis, working collaboratively and openly on code
- To know how to generate dynamic documents
- To learn about Control structures, lists, factors and tables.
- To give them an understanding about Object Oriented programming in R programming

UNIT-I: INTRODUCTION Hours: 6

INTRODUCTION -Overview of R, R data types and objects, reading and writing data, sub setting R Objects, Essentials of the R Language, Installing R, Running R, Packages in R, Calculations, Complex numbers in R, Rounding, Arithmetic, Modulo and integer quotients, Variable names and assignment, Operators, Integers, Factors, Logical operations

UNIT-II: CONTROL STRUCTURES AND VECTORS Hours: 6

CONTROL STRUCTURES AND VECTORS -Control structures, functions, scoping rules, dates and times, Introduction to Functions, preview of Some Important R Data Structures, Vectors, Character Strings, Matrices, Lists, Data Frames, Classes Vectors: Generating sequences, Vectors and subscripts, Extracting elements of a vector using subscripts, Working with logical subscripts, Scalars, Vectors, Arrays, and Matrices, Adding and Deleting Vector Elements, Obtaining the Length of a Vector, Matrices and Arrays as Vectors Vector Arithmetic and Logical Operations, Vector Indexing, Common Vector Operations

UNIT-III: LISTS Hours: 6

LISTS- Lists: Creating Lists, General List Operations, List Indexing Adding and Deleting List Elements, Getting the Size of a List, Extended Example: Text Concordance Accessing List Components and Values Applying Functions to Lists, Data Frames, Creating Data Frames, Accessing Data Frames, Other Matrix-Like Operations

UNIT-IV: FACTORS AND TABLES**Hours: 6**

FACTORS AND TABLES - Factors and Levels, Common Functions Used with Factors, Working with Tables, Matrix/Array-Like Operations on Tables, Extracting a Sub table, Finding the Largest Cells in a Table, Math Functions, Calculating a Probability, Cumulative Sums and Products, Minima and Maxima, Calculus, Functions for Statistical Distributions R PROGRAMMING

UNIT-V: OBJECT-ORIENTED PROGRAMMING**Hours: 6**

OBJECT-ORIENTED PROGRAMMING - S Classes, S Generic Functions, Writing S Classes, Using Inheritance, S Classes, Writing S Classes, Implementing a Generic Function on an S Class, visualization, Simulation, code profiling, Statistical Analysis with R, data manipulation

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper) – Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)

Skills acquired from the course: Knowledge, Problem Solving and Analytical ability, Professional Competency, Professional Communication and Transferrable Skill

COURSE OUTCOMES

On the successful completion of this course, students would be able to:

COURSE OUTCOMES	
CO: 1	Understand the problem-solving approaches
CO: 2	Learn the basic programming constructs in R Programming
CO: 3	Decompose R Programming into functions
CO: 4	Use R Programming data structures -lists, tuples, and dictionaries.
CO: 5	Do input/output with files in R Programming.

RECOMMENDED BOOKS

1. Roger D. Peng,” R Programming for Data Science “, 2012
2. Norman Matloff,” The Art of R Programming- A Tour of Statistical Software Design”, 2011

REFERENCE BOOKS

1. Garrett Golemund, Hadley Wickham, ”Hands-On Programming with R: Write Your Own Functions and Simulations” , 1st Edition, 2014
2. Venables, W.N., and Ripley, “ S programming”, Springer, 2000.

WEB REFERENCE

1. Web resources from NDL Library, E-content from opensource libraries

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