Progressive Education Society's

Modern College of Arts, Science and Commerce (Autonomous), Shivajinagar, Pune 5

(An Autonomous College Affiliated to Savitribai Phule Pune University)

Framework of Syllabus

For

B. Sc. (Computer Science)

Choice Based Credit System (CBCS) Syllabus
Under National Education Policy (NEP)

To be implemented from Academic Year 2024-2025

Level:- 4.5 (First Year) Sem : I

Course Type	Course Code	Course Title	Credits		Teaching Scheme Hr/Week		Evaluation Scheme and Max Marks		
			TH	PR	TH	PR	CE	ESE	Total
Subject 1 T(2)+ (T/P) (2) or T(4)	24CsCmpU1101	Programming in 'C'	2		2		20	30	50
	24CsCmpU1102	Lab Course on 24CsCmpU1101		2		4	20	30	50
Subject 2 T(2)+ (T/P) (2) or T(4)	24CsMatU1201	Discrete Mathematics	2		2		20	30	50
	24CsMatU1202	Lab Course on 24CsMatU1201		2		4	20	30	50
Subject 3 T(2)+ (T/P) (2) or T(4)	24CsEleU1301	Basics of Electronics Components and Circuits	2		2		20	30	50
	24CsEleU1302	Lab course on 24CsEleU1301		2		4	20	30	50
IKS T(2)	24CpCopU1901	Generic IKS	2		2		20	30	50
GE/OE (T/P) (2)	24CsCopU1401	Computer Fundamentals	2		2		20	30	50
SEC (P) (2)	24CsStaU1601	Lab Course on Statistical Analysis using R Programming I		2		4	20	30	50
AEC T(2)	24CpCopU1701 / 24CpCopU1702	MIL-I (Hindi) / MIL-I (Marathi)	2		2		20	30	50
VEC T (2)	24CpCopU1801	Environmental Science	2		2		20	30	50
Total			14	08	14	16			550

Level:- 4.5 (First Year) Sem : II

Course Type	Course Code	Course Title	Credits		Teaching Scheme Hr/Week		Evaluation Scheme and Max Marks		
			TH	PR	TH	PR	CE	ESE	Total
Subject 1 T(2)+ T/P(2) or T(4)	24CsCmpU2101	Advanced 'C' Programming	2		2		20	30	50
	24CsCmpU2102	Lab Course on 24CsCmpU2101		2		4	20	30	50
Subject 2 T(2)+ P(2)	24CsMatU2201	Matrix Theory	2		2		20	30	50
	24CsMatU2202	Lab Course on 24CsMatU2201		2		4	20	30	50
Subject 3 T(2)+ P(2)	24CsEleU2301	Basics of Electronic Instrumentation	2		2		20	30	50
	24CsEleU2302	Lab course on 24CsEleU2301		2		4	20	30	50
GE/OE (T/P) (2)	24CsCopU2401	Digital Marketing	2		2		20	30	50
SEC P(2)	24CsStaU2601	Lab Course on Statistical Analysis using R Programming II		2		4	20	30	50
AEC T(2)	24CpCopU2703	English Communication Skills I	2		2		20	30	50
VEC T(2)	24CpCopU2801	Democracy, Election and Governance	2		2		20	30	50

CC (2)	24CpCopU2001/ 24CpCopU2011 / 24CpCopU2021 / 24CpCopU2031 / 24CpCopU2041 / 24CpCopU2051 / 24CpCopU2061 / 24CpCopU2071	Physical Education / Cultural Activities / NSS / NCC / Fine Arts / Applied Arts / Visual Arts / Performing Arts	2		2		20	30	50
Total			14	08	14	16			550

SEMESTER - I

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F.Y. B.Sc. (Computer Science)
(2024 Course under NEP)

Course Code: 24CsCmpU1101
Course Name: Programming in 'C'

Teaching Scheme: TH: 2 Hours/Week **Credit: 02**
Examination Scheme: CIA: 20 Marks **End-Sem: 30 Marks**

Prerequisite Courses:

- Basic Mathematical operations and statistical operations.
- Operations on Set Theory and Matrices.

Course Objectives:

- To develop the ability in student to analyze the problem and develop algorithm to solve the problem.
- To develop the programming skill and logic to solve the arithmetic and logical problems.
- To understand the various steps in program development through the structured programming approach.
- To learn the syntax and semantics of C programming language thereby learning the programming concepts in general

Course Outcomes:
After successful completion of this course students will able to:

CO No	Course Outcomes (COs)	Blooms Cognitive level
CO 1	Identify and define appropriate own logic to solve any problem using programming tool.	1
CO 2	Outline the solutions of the problems in the form of algorithms, flowcharts.	2
CO 3	Construct the problem in the form of program using C language constructs like conditional branching, iteration and recursion.	3
CO 4	Examine the program with syntax error, logical error and runtime error, debug and correct the program.	4

CO 5	Code, test and debug the given logic in C programming language. Also, to test and execute the programs with different case values.	5
CO 6	To decompose a problem into functions and to develop modular reusable code.	6

Course Contents:

Unit 1	**Programming Languages and Tools**	**3 lectures**
	1.1 Computer Languages: Machine language , Assembly language, High level languages 1.2 Compilers, Interpreter and Assembler 1.3 Introduction to Problem-Solving using Computers , Algorithms and Flowcharts 1.4 Algorithm and flowcharts examples.	
Unit 2	**Fundamental of C**	**2 lectures**
	2.1 Introduction to C 2.2 Applications of C Language 2.3 Structure of a C Program 2.4 C Program development life cycle - Introduction to editor, Compilation, Execution and Debugging of C-Program	
Unit 3	**C Language Constructs**	**9 lectures**
	3.1 C Character Set 3.2 C Tokens: Keywords, Identifiers, Variables, Constants – character, integer, float, string, escape sequences 3.3 Data types and Qualifiers– built-in and user defined, enum 3.4 Operators and Expressions 3.5 Operator types (arithmetic, relational, logical, assignment, compound assignment, increment, decrement, bitwise, conditional , other operators (comma, sizeof)) 3.6 Precedence and associativity rules 3.7 Introduction and Feature of C preprocessor Directives: #define, File Inclusion (#include) 3.8 Formatted Input and Output 3.9 Simple programs using printf and scanf	
Unit 4	**Control Structures**	**8 lectures**
	4.1 Decision making structures: Branching Statements: 4.1.1 if statement, 4.1.2 if-else, 4.1.3 nested if-else, 4.1.4 else-if ladder, 4.1.5 switch-case statement 4.2 Loop Control structures: 4.2.1 While statement	

	4.2.2 do-while statement 4.2.3 for statement 4.3 Nested control structures 4.4 break ,continue, exit , goto statement	
Unit 5	**Functions in C**	**8 lectures**
	5.1 Introduction and Need of function 5.2 Advantages of functions 5.3 Standard library functions 5.4 User defined functions :Declaration, Definition, Function call, parameter passing (by value), return keyword 5.5 Scope of Variables : Local, Global 5.6 Storage Classes(Auto, Static, Register, External) 5.7 Recursion	

Reference Books:

1. The 'C' programming language, Brian Kernighan, Dennis Ritchie, PHI ,2nd Edition, ISBN0131103628, 9780131103627
2. Let us C by Yashwant Kanetkar, BPB Publication, ISBN 9387284492, 9789387284494
3. C: The Complete Reference, Schildt Herbert, 4th edition, McGraw Hill, ISBN 0071502394, 9780071502399
4. A Structured Programming Approach Using C, Behrouz A. Forouzan, Richard F. Gilberg, Cengage Learning India, ISBN8131507629, 9788131507629
5. Programming in C, A Practical Approach, Ajay Mittal , Pearson , ISBN 978-81-317-2934-2
6. Programming with C, B. Gottfried, 2nd edition, Schaum's outline Series, Tata McGraw Hill, ISBN 0071142592, 9780071142595
7. Programming in ANSI C, E. Balagurusamy, 6th Edition, McGraw Hill, ISBN 129051005
8. Problem Solving and Programming Concept, Maureen Sprankle, 7th Edition, ISBN-10: 0-13-119459-3,ISBN-13: 978-0-13-119459-5, Pearson Publication.
9. How to Solve it by Computer, R.G. Dromey, Pearson Education.ISBN-10: 81-317-0562-5

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F.Y. B.Sc. (Computer Science)
(2024 Course under NEP)

Course Code: 24CsCmpU1102
Course Name: Lab Course on 'C' Programming

Teaching Scheme: 4 Hours/Week **Credit : 02**
Examination Scheme: CIA: 20 Marks **End-Sem : 30 Marks**

Prerequisite Courses:

- Problem Solving Techniques
- Knowledge of Basic C

Course Objectives:

- Design and implement a 'C' programs for simple problems
- Understand appropriate use of 'C' data types and 'C' operators.
- Understand use of appropriate control structure and Functions.

Course Outcomes:
After successful completion of this course students will able to:

CO No	Course Outcomes (COs)	Blooms Cognitive level
CO 1	Define algorithms and flowcharts for given problems in C programming	1
CO 2	Illustrate the use of simple data types, operators and control structures in C programming.	2
CO 3	Implement various standard library functions in C programming	3
CO 4	Divide the programs into separate modules by writing user defined functions.	4
CO 5	Evaluate the programs using appropriate debugging methods to test and validate the output.	5
CO 6	Design and write programs to implement the concepts of functions in C programming	6

Course Contents:

Sr.No	Topic
1	Basic Linux Commands
2	Assignment to demonstrate use of data types, simple operators (expressions)
3	Assignment to demonstrate decision making statements (if and if-else)
4	Assignment to demonstrate use of nested structure (Nested if)
5	Assignment to demonstrate decision making statements (switch case)
6	Assignment to demonstrate Menu Driven Programs.
7	Assignment to demonstrate use of simple loops (while Loop)
8	Assignment to demonstrate use of simple loops (do-while Loop)
9	Assignment to demonstrate use of simple loops (For Loop)
10	Assignment to demonstrate use of nested loops
11	Assignment to demonstrate menu driven programs and use of standard library functions.
12	Assignment to demonstrate writing C programs in modular way (User defined functions)
13	Assignment to demonstrate recursive functions.

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F.Y. B.Sc. (Computer Science)
(2024 Course under NEP)

Course Code: 24CsMatU1201
Course Name: Discrete Mathematics

Teaching Scheme: TH: 2 hrs /Week **Credit : 02**
Examination Scheme: CIA: 20 Marks **End-Sem: 30 Marks**

Prerequisite: Set Theory, Logic

Course Objectives: To Study

- Propositional Logic, Arguments and Methods of Proofs.
- Graphs, types of graphs
- Operations on graphs viz. Union, Intersection, Ring Sum and Product.
- Connected graphs and its properties.
- Trees and its properties.

Course Outcomes: On completion of the course, student will be able to:-

- To check validity of an argument.
- Apply different methods of proofs.
- Convert real life problems into graph theoretical models
- Check whether two graphs are isomorphic or not.
- Apply basic operations on graphs and connected graphs.
- Find shortest spanning tree for a given graph.

Course Contents:

Chapter 1	**Logic**	08 hours
	1. 1 Propositional logic, Propositional equivalences. 1. 2 Predicates and Quantifiers. 1. 3 Rules of Inference. 1. 4 Validity of an Argument. 1. 5 Direct and Indirect methods of proofs.	
Chapter 2	**Introduction to Graphs**	06 hours
	2.1 Definition, Elementary terminologies and results, Graphs as Models, Special types of graphs. 2.2 Isomorphism of graphs. 2.3 Adjacency and Incidence Matrix of a Graph. 2.4 Subgraphs, induced subgraphs, Vertex deletion, Edge deletion, Complement of a graph and self-complementary graphs. **2.5** Union, Intersection, Ring Sum and Product of graphs, Fusion of	

	vertices.	
Chapter 3	**Connected Graphs**	06 hours
	3.1 Walk, Trail, Path and Cycle: Definitions and elementary properties. 3.2 Distance between two vertices, eccentricity, center, radius and diameter of a graph. 3.3 Isthmus, Cutvetex: Definition and properties. 3.4 Cutset, edge-connectivity, vertex connectivity. 3.5 Weighted Graph and Dijkstra's Algorithm.	
Chapter 4	**Trees**	10 hours
	4.1 Definition, Properties of trees. 4.2 Binary Tree: Definition, examples and properties. 4.3 Tree Traversal: Ordered rooted Tree, Preorder traversal, inorder traversal and postorder traversal. 4.4 Prefix, Infix and Postfix Notations. 4.5 Spanning Tree: Definition, Properties, Spanning Tree, Kruskal's Algorithm, Prim's algorithm.	
	Total No. of Hours	**30**

Reference Books:

1) A First Look at Graph Theory by John Clark and Derek Holton, Allied Publishers (1st Indian edition), 1995.

2) Graph Theory with Applications to Computer Science and Engineering by Narsingh Deo, Prentice Hall of India (3rd Indian edition), 1986.

3) Discrete Mathematics and it's Applications by Kenneth Rosen, Tata McGraw Hill (Seventh edition), 2011.

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F.Y. B.Sc. (Computer Science)
(2024 Course under NEP)

Course Code: 24CsMatU1202
Course Name: Lab Course on 24CsMatU1201

Teaching Scheme: PR: 4 hrs /Week **Credit : 02**
Examination Scheme: CIA: 20 Marks **End-Sem: 30 Marks**

Prerequisite: Set Theory, Logic

Course Objectives: To Study

- Propositional Logic, Arguments and Methods of Proofs.
- Graphs, types of graphs
- Operations on graphs viz. Union, Intersection, Ring Sum and Product.
- Connected graphs and its properties.
- Trees and its properties.

Course Outcomes: On completion of the course, student will be able to:-

- To check validity of an argument.
- Apply different methods of proofs.
- Convert real life problems into graph theoretical models
- Check whether two graphs are isomorphic or not.
- Apply basic operations on graphs and connected graphs.
- Find shortest spanning tree for a given graph.

Course Contents:

	List of practical
Practical 1	Graphs-Types of Graphs.
Practical 2	Adjacency, Incidence Matrix, Application of handshaking Lemma.
Practical 3	Operations on Graphs.
Practical 4	Isomorphism of Graphs.
Practical 5	Eccentricity, centre and radius of a graph
Practical 6	Dijkastra's Algorithm
Practical 7	Connectivity (vertex, edge)
Practical 8	Trees
Practical 9	Fundamental Circuits and cutsets

Practical 10	Tree Traversal algorithms
Practical 11	Binary tree
Practical 12	Kruskal's and Prim's algorithms
Practical 13	Propositional equivalence of Logical arguments
Practical 14	predicates and quantifiers
Practical 15	Validity of an argument and methods of proofs

Note: There will be 4 hours for each practical session per week.

Reference Books:

1) A First Look at Graph Theory by John Clark and Derek Holton, Allied Publishers (1st Indian edition), 1995.

2) Graph Theory with Applications to Computer Science and Engineering by Narsingh Deo, Prentice Hall of India (3rd Indian edition), 1986.

3) Discrete Mathematics and it's Applications by Kenneth Rosen, Tata McGraw Hill (Seventh edition), 2011.

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F.Y. B.Sc. (Computer Science)
(2024 Course under NEP)

Course Code: 24CsEleU1301
Course Name: Basics of Electronics Components and Circuits

Teaching Scheme: TH: 2 Hours/Week **Credit: 02**
Examination Scheme: CIA: 20 Marks **End-Sem: 30 Marks**

Prerequisite Courses:

- Basic knowledge of general electronics used in day by day applications.
- Knowledge regarding semiconductor physics.
- Basic terms and information in electricity.

Course Objectives:

- To study basic electronic components and circuits.
- To learn applications of various semiconductor devices.
- To study various kinds of field effect transistors and their characteristics.
- To Study Number Systems and Logic Gates.
- To learn Boolean algebra and Karnaugh maps for simplifying logical expressions.
- To learn basic Arithmetic Circuits used in digital logic.

Course Outcomes: On completion of the course, student will be able to

- Identify electronic components.
- Understand working of basic electronic circuits and design them.
- Application of electronic circuits.
- Understand and apply digital circuit theory in applications.
- Design digital logical circuits like adder, subtractor etc.
- Analyze electronic gadgets working on digital electronics principle

Course Contents:-

SECTION I **(Basics of Analog Devices and Applications)**		
Unit 1	Basic electronic circuits and Applications of Semiconductor Diodes	10 hrs
	Passive electronic ,components, Concept of reactance , Concepts of DC and AC voltage sources, Ohms law ,Kirchhoff's laws ,Thevenin theorem , voltage and current dividers, Low pass filters, high pass filters, Overview of semiconductors, PN Diode, LED , Optocoupler, varactor diode, Solar cell, rectifiers and block diagram of regulated power supply and its specifications, Concepts of line and load regulation.	
Unit 2	FETs and its applications	5 hrs
	Overview of BJT and its application as CE amplifier, JFET, MOSFET, Applications: JFET as voltage variable resistor, MOSFET as a switch.	
SECTION- II **(Principles of Digital Electronics)**		
Unit 3	Number Systems and Logic Gates	7 Hrs
	Overview of Number systems :- Decimal, Binary and Hexadecimal number systems and their inter-conversions, Unsigned, Signed and floating point binary number representations, BCD,Excess-3 and Gray codes, Alphanumeric representation in ASCII codes, Positive and Negative Logic, Basic Logic gates (NOT, OR, AND),derived gates (NAND, NOR, EX-OR, EX-NOR) Symbol and truth table, Applications of Ex-OR gates as parity checker and generator, Introduction to logic families, characteristics and specifications of TTL families (Fan in ,fan out, propagation delay, noise margin).	
Unit 4	Boolean Algebra, K-maps and Arithmetic circuits	8 Hrs
	Boolean algebra rules and Boolean laws, De Morgan's theorem Universal gates (Interconversion), Boolean expression in SOP and POS form, Min terms, Max terms ,conversion of SOP/POS expression to its standard SOP/POS form, Simplifications of Logic equations using Boolean algebra rules and Karnaugh map (up to 4 variables).Rules of binary addition and subtraction ,subtraction using 1's and 2's complements, Half adder, full adder, Half subtractor, Full subtractor Four bit parallel adder, Universal adder / subtractor .	

Text/ Reference Books:

1. Basic Electronics: Bernard Grob, McGraw Hill Publication, 8th Revised Edition, 2010 2.
2. Electronic Principles: Albert Malvino, David J Bates, McGraw Hill 7th Edition. 2012
3. Principals of Electronics: V.K. Mehta, S.Chand and Co.
4. Digital Electronics: Jain R.P., Tata McGraw Hill
5. Digital Principles and Applications: Malvino Leach, Tata McGraw-Hill.
6. Digital Fundamentals: Floyd T.M., Jain R.P., Pearson Education
7. A Textbook of Digital Electronics , Dr. R S Sedha, 3rd Edition, S. Chand Publishing
8. Basic Electronics and Linear Circuits: Bhargava N.N., Kulshreshtha D.C., Gupta S.C., Tata McGraw Hill.
9. A First Course in Electronics: Khan Anwar, K.K.Day, PHI learning Pvt.Ltd.
10. A Textbook of Applied Electronics (Multicolor Edition), Dr. R S Sedha, 3rd Edition, S. Chand Publishing

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F.Y. B.Sc. (Computer Science)
(2024 Course under NEP)

Course Code: 24CsEleU1302
Course Name: Lab course on 24CsEleU1302

Teaching Scheme: TH: 4 Hours/Week **Credit: 02**
Examination Scheme: CIA: 20 Marks **End-Sem: 30 Marks**

Prerequisite Courses:

- Knowledge of electronic components, power supply , test and measuring devices.
- Experimental skill for connecting and testing circuits.

Course Objectives:

- Learn to identify electronic components,
- To use test and measuring instruments.
- To Study basic circuits in analog and digital electronics.
- To design, build and test electronic circuits.

Course Outcomes:

On completion of the course, student will be able to

- Design simple electronic circuits.
- Can test electronic circuits for measurement of various parameters.
- Analyze electronics circuits in various gadgets.

Course Contents:-

Experiments (Any 12) + Activity/Study tour report/Assignments/Demonstration/Virtual lab

1. Parametric measurement of Sine and Square waveform using CRO/DSO
2. Components identification and parametric measurements (active, passive).
3. Study of KCL and KVL.
4. Study of Thevenin's theorem.
5. Regulated power supply using Zener diode.
6. Study of Bridge rectifier circuit and its parameters.

7. Study of low pass and high pass RC filters.
8. Study of logic gates.
9. Build and test 4 bit parity checker/ generator using X-OR gate.
10. Build and test half adder, full adder using basic gate.
11. Build and test full adder and full subtractor.
12. Interconversion and realizations of logic expressions using ICs.
13. Study of four bit universal adder/subtractor.
14. Study of De Morgan’s theorem.

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F.Y. B.Sc. (Computer Science)
(2024 Course under NEP)

Course Code: 24CsCopU1401
Course Name: Computer Fundamentals

Teaching Scheme: TH: 2 Hours/Week **Credit : 02**

Examination Scheme: CIA: 20 Marks **End-Sem : 30 Marks**

Course Objectives:

- To study the basics of Computer System and to learn how to configure computer devices

Course Outcomes:

On completion of the course, student will be able to–

- Understanding the concept of input and output devices of Computers
- Learn the functional units and classify types of computers, how they process information and how individual computers interact with other computing systems and devices.
- Understand an operating system and its working, and solve common problems related to operating systems

Course Contents

Unit 1	Introduction to Computer System	12 lectures
	1.1 Introduction, Characteristics of Computers, Block diagram of computer 1.2 Types of computers and features- Mini Computers, Micro Computers, Mainframe Computers, Super Computers, Laptops and Tablets 1.3 Types of Programming Languages- Machine Languages, Assembly Languages, High Level Languages 1.4 Translators- Assembler, Compiler, Interpreter 1.5 Data Organization- Drives, Files, Directories 1.6 Devices: Primary And Secondary storage devices, I/O Devices 1.7 Concepts of Software , Types of software: System Software and Application Software	

Unit 2	**PC Hardware**	**5 lectures**
	2.1 Introduction of Hardware 2.2 Type and Working of Hardware parts – Ports, Motherboard, CPU. 2.3 Basic Input and Output Setting(BIOS), Network Interface Card (NIC) 2.4 Graphics card	
Unit 3	**Networking**	**5 lectures**
	3.1 Basic Concept of Networking 3.2 Basic Elements of a Communication System 3.3 Data Transmission Media 3.4 Topologies 3.5 LAN, MAN, WAN, Internet	
Unit 4	**Operating System**	**8 lectures**
	4.1 Operating System concept 4.2 Evolution of Operating System 4.3 Functions of Operating System 4.4 Types of Operating Systems. 4.5 Important Features of Window Operating System. 4.6 Important Features of LINUX OS.	

Reference Books:

1. Computer Fundamentals by P.K. Sinha & Priti Sinha, 3rd edition, BPB pub.
2. Computers Today by S. Basandra Galgotia Pub.
3. PC/HARDWARE BY-Join Josh O`Reilly Publication

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F.Y. B.Sc. (Computer Science)
(2024 Course under NEP)

Course Code: 24CsStaU1601
Course Name: Statistical Analysis using R programming I

Teaching Scheme: 4 Hours/Week **Credit : 02**

Examination Scheme: CIA: 20 Marks **End-Sem :30 Marks**

Pre-requisites: Good logic and aptitude

Course outcome:

On completion of the course, student will be able to understand:

- Statistical techniques and R programming.

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Sr.No.	Title of Experiment/ Practical
1	Introduction to R-I
2	Introduction to R-II
3	Graphical and Diagrammatic representation of statistical data using R
4	Measures of Central Tendency-I
5	Measures of Central Tendency-II
6	Measures of Dispersion-I
7	Measures of Dispersion-II
8	Measures of Skewness and Kurtosis I
9	Measures of Skewness and Kurtosis II
10	Probability -I
11	Probability -II
12	Fitting of Binomial, Poisson and Geometric Distribution
13	Model sampling from Binomial, Poisson and Geometric Distribution
14	Application of Binomial, Poisson and Geometric Distribution
15	Correlation and Scatter diagram

***All practical are to be performed using R software**

SEMESTER - II

Progressive Education Society's
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F.Y. B.Sc. (Computer Science)
(2024 Course under NEP)

Course Code: 24CsCmpU2101
Course Name: Advanced 'C' Programming

Teaching Scheme: TH: 2 Hours/Week **Credit: 02**
Examination Scheme: CIA: 20 Marks **End-Sem: 30 Marks**

Prerequisite:

- Basic Mathematical operations and statistical operations.
- Problem Solving Techniques
- Knowledge of Basic C

Course Objectives:

- To understand the various steps in program development through the structured programming approach.
- To learn the syntax and semantics of C programming language thereby learning the programming concepts in general.
- To decompose the problem in structured way.
- To able to use an array to store multiple pieces of homogeneous data, and use a structure to store multiple pieces of heterogeneous data
- To test, debug and execute the program and to learn to fix logical errors in the program.

Course Outcomes:

CO No	Course Outcomes (COs)	Blooms Cognitive level
CO 1	Recall the basic concepts of C Programming to design complex programs for solving problems.	1
CO 2	Interpret the concept of array, pointer and memory handling techniques in programs with dynamic memory management.	2
CO 3	Develop program logic using string handling functions, structure and union.	3

CO 4	Analyse data in structures and files.	4
CO 5	Develop and test a given logic in C programming language.	5
CO 6	Construct modular programs using control structures, arrays, pointers, strings and structures.	6

Course Contents:

Unit 1	**Arrays**	**6 lectures**
	1.1 Array definition, declaration, initialization 1.2 Advantages and Disadvantages of arrays 1.3 Types – one, two and multidimensional 1.4 Memory representation of Arrays 1.5 Sorting (Bubble Sort, Insertion Sort) 1.6 Searching (Linear and Binary) 1.7 Passing arrays to functions	
Unit 2	**Pointers**	**7 lectures**
	2.1 Pointer declaration, initialization 2.2 De-referencing pointers 2.3 Pointer arithmetic 2.4 Pointer to pointer 2.5 Functions and pointers – passing pointers to functions (call by reference), function returning pointers 2.6 Arrays and pointers 2.7 Dynamic memory allocation (malloc, calloc, realloc, free)	
Unit 3	**Strings**	**6 lectures**
	3.1 Declaration and initialization, string input/output, format specifiers 3.2 Standard library string functions 3.3 User defined string operations 3.4 Strings and Pointers 3.5 Array of Strings	
Unit 4	**Structure and Union**	**6 lectures**
	4.1 Introduction 4.2 Creating structures 4.3 Accessing structure members 4.4 Structure initialization 4.5 Nested structures 4.6 Array of structures 4.7 Passing structures to functions 4.8 Returning structure from function 4.9 Pointers and structures (passing structure to function, returning structure, pointer to structure) 4.10 Typedef	

	4.11 Union 4.12 Difference between structures and unions 4.13 Command Line Arguments	
Unit 5	**File Handling**	**3 lectures**
	5.1 Streams 5.2 Types of Files 5.3 Modes of file opening 5.4 Operations on files 5.5 Use of Important File I/O Functions 5.6 Use of Important file functions	
Unit 6	**C Preprocessor**	**2 lectures**
	6.1 Difference between function and Macro 6.2 Format of Preprocessor directive - Conditional compilation (#ifdef, #endif, #if, #else, #ifndef) , File inclusion 6.3 Macro substitution, nested Macro, parameterized Macro	

Reference Books:

1. The 'C' programming language, Brian Kernighan, Dennis Ritchie, PHI , 2nd Edition, ISBN0131103628, 9780131103627
2. Let us C by Yashwant Kanetkar, BPB Publication 2018, ISBN 9387284492, 9789387284494
3. Understanding pointers in C, Yashwant Kanetkar, BPB Publication, 4th Edition, ISBN 9788176563581
4. C: The Complete Reference, Schildt Herbert, 4th edition, McGraw Hill, ISBN 0071502394, 9780071502399
5. A Structured Programming Approach Using C, Behrouz A. Forouzan, Richard F. Gilberg, Cengage Learning India, ISBN8131507629, 9788131507629
6. Programming in C, A Practical Approach, Ajay Mittal , Pearson , ISBN 978-81-317-2934-2
7. Programming with C, B. Gottfried, 2nd edition, Schaum's outline Series, Tata McGraw Hill, ISBN 0071142592, 9780071142595
8. Programming in ANSI C, E. Balagurusamy, 6th Edition, McGraw Hill, ISBN 129051005
9. Problem Solving and Programming Concept, Maureen Sprankle,7th Edition, , Pearson Publication, ISBN-10: 0-13-119459-3,ISBN-13: 978-0-13-119459-5

Progressive Education Society's

Modern College of Arts, Science and Commerce (Autonomous)

Shivajinagar, Pune – 5

First Year of B.Sc. (Computer Science)
(2024 Course under NEP)

Course Code: 24CsCmpU2102
Course Name: Lab on 24CsCmpU2101 (Advanced 'C' Programming)

Teaching Scheme: 4 Hours/Week **Credit : 02**
Examination Scheme: CIA: 20 Marks **End-Sem : 30 Marks**

Prerequisite Courses:

- Problem Solving Techniques
- Knowledge of Basic C

Course Objectives:

- To understand the various steps in program development through the structured programming approach.
- To learn the use of structured programming approach in solving problems.
- To decompose the problem in structured way.

Course Outcomes:

On completion of the course, student will be able to–

CO No	Course Outcomes (COs)	Blooms Cognitive level
CO 1	Define the basic concepts of C Programming to design more complex programs for solving problems.	1
CO 2	Illustrate efficient memory handling techniques in programs with the concepts of pointers and dynamic memory management.	2
CO 3	Implement program logic using string handling functions, structure and union, file handling functions.	3
CO 4	Identify and organize data in structures and files to develop small applications.	4

CO 5	Test and validate the data stored in the structures and files and perform various operations on it..	5
CO 6	Construct modular programs using control structures, arrays, pointers, strings and structures.	6

Course Contents:

No	Topic
1	Assignment to demonstrate use of arrays (1-d arrays).
2	Assignment to demonstrate use of arrays using functions.
3	Assignment to demonstrate operations on array (Sorting and Searching)
4	Assignment to demonstrate use of multidimensional array (2-d arrays) and functions.
5	Assignment to demonstrate use of simple pointers (Call by Reference)
6	Assignment to demonstrate advanced use of pointers (DMA)
7	Assignment to demonstrate concept of strings (Library Functions)
8	Assignment to demonstrate concept of strings (User Defined Functions)
9	Assignment to demonstrate concept of string operations using pointers (User Defined Functions)
10	Assignment to demonstrate Structures and Unions
11	Assignment to demonstrate Structures (using array and functions)
12	Assignment to demonstrate command line arguments and pre-processor directives.
13	Assignment to demonstrate file handling (text files)

Progressive Education Society's

Modern College of Arts, Science and Commerce (Autonomous)

Shivajinagar, Pune – 5

F.Y. B.Sc. (Computer Science)
(2024 Course under NEP)

Course Code: 24CsMatU2201
Course Name: Matrix Theory

Teaching Scheme: TH: 2 hrs /Week **Credit : 02**
Examination Scheme: CIA: 20 Marks **End-Sem: 30 Marks**

Prerequisites: Set Theory, Matrices, Polynomials, System of Simultaneous Equations.

Course Objectives: To study

- Relations and types of relations.
- Determinants, eigenvalues and eigenvectors.
- System of linear equations.

Course Outcomes:

On completion of the course, student will be able to:-

- Understand various properties of relations.
- Solve system of linear equations.
- Find eigenvalues and eigenvectors of a square matrix.
- Find rank of a matrix.

Course Contents:

Chapter 1	**Relations**	07 hours
	1. 1 Relations, types of relations, Equivalence relations, Partial ordering: definitions and examples 1. 2 Transitive closure and Warshall's Algorithm. 1. 3 Matrix representation and composition of relations.	
Chapter 2	**System of linear equations**	14 hours
	2.1 Row reduction and echelon form of a matrix 2.2 The matrix equation Ax=b 2.3 Solution sets of Linear systems (Gauss elimination method, Gauss – Jordan elimination method, LU decomposition method.) 2.4 Application of Linear System 2.5 Linear Independence 2.6 Introduction to Linear Transformations 2.7 The matrix of Linear Transformation	

Chapter 3	**Determinants**	5 hours
	3.1 Determinants by Cofactor Expansion, adjoint of a matrix 3.2 Evaluating Determinants by Row Reduction. 3.3 Properties of the Determinant Function.	
Chapter 4	**Introduction to Eigenvalues and Eigenvectors**	4 hours
	4.1 Method to find Eigenvalues of a matrix 4.2 To find Eigenvectors corresponding to each eigenvalue of a matrix	
	Total No. of hours	**30** hours

Reference Books:

1) Elementary Linear Algebra (Applications Version) by Howard Anton, Chriss Rorres, John Wiley and Sons Inc.(Ninth edition), 2010 .

2) Linear Algebra and Its Applications by David Lay, Steven Lay and Judi McDonald, Pearson, Fifth edition.

3) Discrete Mathematical Structures by Kolman, Busby and Ross, PHI Publications, Sixth edition, 2010.

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Modern College of Arts, Science and Commerce (Autonomous)

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F.Y. B.Sc. (Computer Science)
(2024 Course under NEP)

Course Code: 24CsMatU2202
Course Name: Lab Course on 24CsMatU2201

Teaching Scheme: PR: 4 hrs /Week **Credit : 02**
Examination Scheme: CIA: 20 Marks **End-Sem: 30 Marks**

Prerequisites: Set Theory, Matrices, Polynomials, System of Simultaneous Equations.

Course Objectives: To study

- Relations and types of relations.
- Determinants, eigenvalues and eigenvectors.
- System of linear equations.

Course Outcomes:

On completion of the course, student will be able to:-

- Understand various properties of relations.
- Solve system of linear equations.
- Find eigenvalues and eigenvectors of a square matrix.
- Find rank of a matrix.

Course Contents:

	List of practicals
Practical 1	Introduction to Scilab
Practical 2	Learning of Scilab commands
Practical 3	Equivalence relations
Practical 4	Warshall's Algorithm
Practical 5	Partial order relations
Practical 6	Evaluation of Determinants of matrices
Practical 7	Practical session using Scilab of practical 6
Practical 8	Gaussian Elimination method
Practical 9	Practical session using Scilab of practical 8
Practical 10	Gauss- Jordan Elimination method
Practical 11	Practical session using Scilab of practical 10

Practical 12	LU decomposition method
Practical 13	Practical session using Scilab of practical 12
Practical 14	Eigenvalues and eigenvectors
Practical 15	Practical session using Scilab of practical 14

Note: There will be 4 hours for each practical session per week.

Reference Books:

1) Elementary Linear Algebra (Applications Version) by Howard Anton, Chriss Rorres, John Wiley and Sons Inc.(Ninth edition), 2010 .

2) Linear Algebra and Its Applications by David Lay, Steven Lay and Judi McDonald, Pearson, Fifth edition.

3) Discrete Mathematical Structures by Kolman, Busby and Ross, PHI Publications, Sixth edition, 2010.

4) Modeling and Simulations in Scilab/Scicos by Stephen Campbell, Jean Philippe Chanceller, Ramine Nikoukhah, Springer, 2006.

Progressive Education Society's

Modern College of Arts, Science and Commerce (Autonomous)

Shivajinagar, Pune – 5

F.Y. B.Sc. (Computer Science)
(2024 Course under NEP)

Course Code: 24CsEleU2301
Course Name: Basics of Electronic Instrumentation

Teaching Scheme: TH: 2 Hours/Week **Credit: 02**
Examination Scheme: CIA: 20 Marks **End-Sem: 30 Marks**

Prerequisite Courses:

- Basic knowledge and terms used in electronics.
- Information regarding various electronic equipment.
- Knowledge of logic gates, digital arithmetic logic, flip flops.
- Digital number system.

Course Objectives:

- To Study Operational amplifiers and its applications.
- To study sensors and transducers.
- To study and apply signal conditioning circuits in various applications
- To Study combinational and sequential logic circuits.
- To study ADC and DAC.
- To learn various characteristics and parameters of ADC, DAC.

Course Outcomes:

On completion of the course, student will be able to–

- Understand Operational Amplifier circuits applications and troubleshooting in that circuits.
- Can design small application projects.
- Design digital counter circuits, decoder circuits.
- Apply digital circuits in designing of various applications.

Course Contents:-

SECTION-I (Electronic Instrumentation)		
Unit 1	Basics of Sensors and its applications	04 Hrs

	Block diagram of electronic measurement system,, Definition of sensors and transducers, classification of sensors and transducers (Active, Passive), Working principles and applications of LDR, LM -35, LVDT, PIR.	
Unit 2	Operational amplifiers and Signal conditioning circuits	11 Hrs
	Operational Amplifier block diagram and operation of each block ,parameters (definition ,ideal and practical values),Op-amp as inverting, concept of virtual ground, Op-amp as non-inverting amplifier, Op-amp as adder, and substractor. Pre-amplifier, voltage compensation circuits, Level Shifter, Three OP-amp instrumentation amplifier, crystal oscillator and multivibrators.	
SECTION-II (Fundamentals of Digital Electronics)		
Unit 3	Combinational Circuits	6 Hrs
	Basics of combinational circuits, Multiplexer (2:1, 4:1,8:1), demultiplexer (1:2, 1:4, 1:8), role of strobe, Encoder & decoder :-Decimal to binary, Hexadecimal to binary, BCD to decimal, BCD to seven segment decoder, 4 bit binary(Hexadecimal decoder). Basics of Sequential Circuits:- **Flip flops: RS** using NAND/NOR, latch, clocked RS, JK, Master slave JK, D and T.	
Unit 4	Flip-flop Applications and Data converters	9 Hrs
	Counters: Ripple Binary counter, up down counter, concept of modulus counters, Decade counter, Synchronous counters with timing diagrams, **Shift registers:** SISO, SIPO, PISO, PIPO shift registers, ring counter Universal 4-bit shift register. Digital to Analog Converter (DAC), R-2R ladder, Parameters: Linearity, resolution, accuracy, Analog to Digital Converter (ADC), Types of ADC- Flash, Successive approximation, dual slope. Parameters of ADC: Linearity, resolution, conversion time, accuracy.	

Text/ Reference Books:

1. Sensors & Transducers: Dr. A. D. Shaligram: CTC publications
2. Op-Amps and Linear Integrated Circuits: Ramakant Gaikwad: PHI: 4th Ed.
3. Electronic Instrumentation: H. S. Kalsi: TMH: 2nd Ed.
4. Modern Electronic Instrumentation and Measurement Techniques: Albert D. Helfrick, William D. Cooper :PHI publication
5. Digital Electronics: Jain R.P., Tata McGraw Hill
6. Digital Principles and Applications: Malvino Leach, Tata McGraw-Hill.
7. Digital Fundamentals: Floyd T.M., Jain R.P., Pearson Education.

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Shivajinagar, Pune – 5

F.Y. B.Sc. (Computer Science)
(2024 Course under NEP)

Course Code: 24CsEleU2302
Course Name: Lab course on 24CsEleU2301

Teaching Scheme: TH: 4 Hours/Week **Credit: 02**
Examination Scheme: CIA: 20 Marks **End-Sem: 30 Marks**

Prerequisite Courses:

- Knowledge of electronic components.
- Power supply.
- Test and measuring devices.
- Experimental skill for connecting and testing circuits.

Course Objectives:

- To Study electronic circuits using op-amp those are used in instrumentation.
- To learn use of sensors and transducers in electronic circuits for a specific applications.
- To design and test digital logic circuits.

Course Outcomes:

On completion of the course, student will be able to –

- Design and test digital circuits.
- Use sensors , transducers , digital circuits in projects.
- Can analyze various electronic system/circuits for troubleshooting.

Course Contents:-

Experiments (Any 12) + Activity/Study tour report/Assignments/Demonstration/Virtual lab

1. Build and test adder and subtractor circuits using OPAMP.
2. Build and test Integrator and differentiator circuits using OPAMP.
3. Study of temperature sensor :LM-35
4. Study of Linear Variable Differential Transformer.
5. Build and test LDR based light control system
6. Build and test Instrumentation Amplifier.
7. Study of crystal oscillator.

8. Build and test 2:1 Multiplexer and 1:2 demultiplexer using gates.
9. Study of RS, and JK flip flops ,
10. Build and test DAC using R-2R Ladder network.
11. Build and test Decimal to BCD encoder using logic gates.
12. Build and test 3 bit synchronous counter using JK flip flops.
13. Study of read and write action of RAM.
14. Build and test astable multivibrator using IC 555.

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F.Y. B.Sc. (Computer Science)
(2024 Course under NEP)

Course Code: 24CsCopU2401
Course Name: Digital marketing

Teaching Scheme: TH: 2 Hours/Week **Credit : 02**
Examination Scheme: CIA: 20 Marks **End-Sem : 30 Marks**

Prerequisite Courses:

- Knowledge and Interest in Digital Platforms

Course Objectives:

- Develop a digital marketing plan that will address common marketing challenges.
- Articulate the value of integrated marketing campaigns across SEO, Paid Search, Social, Mobile, Email, Display Media, and Marketing Analytics.
- Recognize key performance Indicators tied to any digital marketing plan.
- Improve return on investment for any digital marketing plan
- Launch a new, or evolve an existing, career path in Digital Marketing

Course Outcomes:

On completion of the course, student will be able to–

- Self-Directed Learning: Develop the ability to work independently as well as effectively in the changing environment.
- Usage of Analytical Tools: Develop the ability to apply appropriate quantitative/qualitative techniques used in social science disciplines along with ICT, softwares etc.
- Life Skills: Articulate and apply ethics, values and ideals that demonstrate awareness of current societal challenges leading to better quality of life.

Course Contents

Unit 1	Basics of digital marketing	5 lectures
	1. 1 Introduction To Online Digital Marketing 1. 2 Importance Of Digital Marketing 1. 3 How did Internet Marketing work? 1. 4 Traditional Vs. Digital Marketing 1. 5 Types of Digital Marketing 1. 6 Increasing Visibility 1. 7 Visitors' Engagement	

	1. 8 Bringing Targeted Traffic 1. 9 Lead Generation	
Unit 2	**Analysis and keyword research**	**4 lectures**
	2.1 Market Research 2.2 Keyword Research And Analysis 2.3 Types Of Keywords 2.4 Tools Used For Keyword Research 2.5 Localized Keyword Research 2.6 Competitor Website Keyword Analysis 2.7 Choosing Right Keywords To The Project	
Unit 3	**Search engine optimization (SEO)**	**3 lectures**
	3.1 Introduction To Search Engine Optimization 3.2 How Did Search Engine work? 3.3 SEO Fundamentals & Concepts 3.4 Understanding the SERP 3.5 Google Processing 3.6 Indexing 3.7 Crawling	
Unit 4	**On-page optimization**	**4 lectures**
	4.1 Domain Selection 4.2 Hosting Selection 4.3 Meta Data Optimization 4.4 URL Optimization 4.5 Internal Linking 4.6 404 Error Pages 4.7 H1, H2, H3 Tags Optimization 4.8 Image Optimization	
Unit 5	**Off-page optimization**	**4 lectures**
	5.1 Link Building Tips & Techniques 5.2 Difference Between White Hat And Black Hat SEO 5.3 Social Bookmarking Submission 5.4 Search Engine Submission 5.5 Web 2.0 Submission 5.6 Article Submission 5.7 Image Submission 5.8 Video Submission 5.9 Forum Submission 5.10 PPT Submission 5.11 PDF Submission 5.12 Classified Submission 5.13 Business Listing 5.14 Blog Commenting	
Unit 6	**SEO updates and analysis**	**5 lectures**
	6.1 Google Panda,	

	6.2 Google Penguin 6.3 Google Penalties 6.4 SEO Tools 6.5 Backlinks Tracking, Monitoring, And Reporting	
Unit 7	**Social media optimization (SMO)**	**5 lectures**
	7.1 Social Media Optimization 7.2 Introduction To Social Media Networks 7.3 Types Of Social Media Websites 7.4 Social Media Optimization Concepts 7.5 Facebook, Google+, LinkedIn, YouTube, Pinterest 7.6 Hashtags 7.7 Image Optimization	

Reference Books:

1. DIGITAL MARKETING STEP-BY-STEP by Ondrej Svoboda
2. Digital Marketing Growth Hacks: The World's Best Digital Marketers Share Insights on How They Grew Their Businesses with Digital

Progressive Education Society's

Modern College of Arts, Science and Commerce (Autonomous)

Shivajinagar, Pune – 5

F.Y. B.Sc. (Computer Science)
(2024 Course under NEP)

Course Code: 24CsStaU2601
Course Name: Statistical Analysis using R programming II

Teaching Scheme: 4 Hours/Week **Credit : 02**

Examination Scheme: CIA: 20 Marks **End-Sem :30 Marks**

Pre-requisites:

- Good logic and aptitude
- Basic knowledge of R programming

Course outcome:

On completion of the course, student will be able to understand:

- Statistical techniques, applications and R programming.

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Sr.No.	Title of Experiment/ Practical
1	Fitting of second degree and exponential Curves
2	Simple linear regression
3	Multiple regression
4	To draw sample using SRSWR ,SRSWOR
5	To draw sample using stratified and systematic sampling
6	Time Series I
7	Time Series II
8	Fitting of uniform and exponential distributions
9	Fitting of normal distribution
10	Large Sample tests I
11	Large Sample tests II
12	Tests based on t - distribution
13	Test based on chi-square Distribution
14	Simulation I
15	Simulation II

***All practical are to be performed using R software.**