P.E. Society's Modern College of Arts, Science & Commerce
(Autonomous) Ganeshkhind, Pune-16.

Three Year B.Sc. Degree Program in Computer Science

(Faculty of Science & Technology)

F.Y.B.Sc. (Computer Science) NEP

Choice Based Credit System Syllabus to be implemented as per 13th March 2024
GR from Academic Year 2024-2025

Title of the Course: B. Sc. (Computer Science)
Preamble:

The B. Sc. (Computer Science) course is a systematically designed three year degree program under the faculty of Science and Technology. The objective of the course is to prepare students to undertake careers involving problem solving using computer science and technologies, or to pursue advanced studies and research in computer science. The syllabus which comprises Computer Science subject along with that of the three allied subjects (Mathematics, Electronics and Statistics) covers the foundational aspects of computing sciences and also develops the requisite professional skills and problem solving abilities using computing sciences.

Introduction:
At the first year of under-graduation, the basic foundations of two important skills required for software development are laid. A course in problem solving and programming along with a course in database fundamentals forms the preliminary skill set for solving computational problems. The practical courses are designed to supplement the theoretical training in the year. Along with Computer Science, the two theoretical and one practical course each in Statistics, Mathematics and Electronics help in building a strong foundation. Career Advancement courses are introduced in both semesters to cover additional areas of Computer Science.

At the second year of under-graduation, computational problem solving skills are further strengthened by a course in Data structures. Software engineering concepts that are required for project design are also introduced. Essential concepts of computer networking are also introduced this year. The practical course included in both semesters complements the theory courses.

At the third year of under-graduation, all the subjects are designed to fulfil core Computer Science requirements as well as meet the needs of the software industry. Theory courses are adequately supplemented by hands-on practical courses. Skill Enhancement courses enable the students to acquire additional value-added skills.

Objectives:

- To develop problem solving abilities using a computer.
- To build the necessary skill set and analytical abilities for developing computer based solutions for real life problems.
- To train students in professional skills related to the Software Industry.
- To prepare the necessary knowledge base for research and development in Computer Science.
- To help students build-up a successful career in Computer Science and to produce entrepreneurs who can innovate and develop software products.

Detailed Syllabus:

Semester- I
Subject 1 :24CMP11101
Course Title: Problem Solving Using 'C' Programming

Teaching Scheme	No. of Credits	Examination Scheme
2 Hours / Week	2	CIA : 20 Marks ESE: 30 Marks

Course Objectives

- To introduce the foundations of computing, programming and problem-solving using computers.
- To develop the ability to analyze a problem and devise an algorithm to solve it.
- To formulate algorithms, pseudo codes and flowcharts for arithmetic and logical problems
- Solve simple computational problems using modular design and basic features of the 'C' language.

Course Outcomes:- On completion of this course, students will be able to :

- Explore algorithmic approaches to problem solving.
- Develop modular programs using control structures and arrays in 'C'.
- To use advanced concepts of 'C' programming in solving various problems.
- To differentiate the usage of various structures in problem solutions.

Course Contents

Chapter 1	**Problem Solving Aspects**	**2 Hours**

1.1. Introduction to problem solving using computers.

1.2. Algorithms-definition, characteristics, examples, advantages and limitations.

1.3 Flowcharts - definition, notations, examples, advantages and limitations, Comparison with algorithms.

1.4 Pseudo codes - notations, examples, advantages and limitations.

Chapter 2	**'C' Fundamentals**	**4 Hours**

2.2 History of ‘C’ language.
2.3 Application areas.
2.4 Structure of a ‘C’ program.
2.5 ‘C’ Program development life cycle.
2.6 Function as building blocks.
2.7 ‘C’ tokens
2.8 Character set, Keywords , Identifiers
2.9 Variables, Constants (character, integer, float, string, escape sequences, constant).
2.10 Data Types (Built-in and user defined data types).
2.11 Operators, Expressions, types of operators, Operator precedence and Order of evaluation.
2.12 Character input and output.
2.13 String input and output.
2.14 Formatted input and output

Chapter 3	**Control Structures**	**6 Hours**

3.1 Decision making structures:- if ,if-else, switch and conditional operator.
3.2 Loop control structures:- while ,do while, for.
3.3 Use of break and continue.
3.4 Nested structures.
3.5 Unconditional branching (goto statement).

Chapter 4	**Functions**	**3 Hours**

4.1 Standard library functions.
4.2 User defined functions:- declaration , definition, function call, parameter passing (by value), return statement.
4.3 Recursive functions.

Chapter 5	**Arrays**	**4 Hours**

5.1 Concept of array.
5.2 Types of Arrays – One , Two and Multidimensional array.
5.3 Array Operations - declaration, initialization, accessing array elements.
5.4 Passing arrays to function.
5.5 Array applications - Finding maximum and minimum, Counting occurrences, Linear search,

Matrix operations (trace of matrix, addition, transpose, multiplication, symmetric, upper/ lower triangular matrix)

Chapter 6	**Pointers**	**3 Hours**

6.1 Introduction to Pointers.
6.2 Declaration, definition, initialization, dereferencing.
6.3 Pointer arithmetic.
6.4 Relationship between Arrays & Pointers- Pointer to array, Array of pointers.
6.5 Functions and pointers- Passing pointer to function, Returning pointer from function

Chapter 7	**Strings**	**3 Hours**

7.1 String Literals, string variables, declaration, definition, initialization.
7.2 Syntax and use of predefined string functions
7.3 Array of strings.
7.4 Strings and Pointers
7.5 Command line arguments.

Chapter 8	**Introduction to Structures and File Handling**	**5 Hours**

8.1 Concept of structure, definition and initialization, use of typedef.
8.2 Accessing structure members.
8.3 Arrays of Structures
8.4 Introduction to streams.
8.5 Types of files.
8.6 Operations on text files.

Reference Books:

1. How to Solve it by Computer, R.G. Dromey, Pearson Education.
2. Problem Solving and Programming Concept, Maureen Sprankle,7th Edition, Pearson Publication.
3. C: the Complete Reference, Schildt Herbert, 4th edition, McGraw Hill
4. A Structured Programming Approach Using C, Behrouz A. Forouzan, Richard F. Gilberg, Cengage Learning India
5. The ‘C’ programming language, Brian Kernighan, Dennis Ritchie, PHI
   Programming in C ,A Practical Approach, Ajay Mittal , Pearson
6. Programming with C, B. Gottfried, 3rd edition, Schaum’s outline Series, Tata McGraw Hill.
7. Programming in ANSI C, E. Balagurusamy, 7th Edition, McGraw Hill.
8. C: the Complete Reference, Schildt Herbert, 4th edition, McGraw Hill
9. A Structured Programming Approach Using C, Behrouz A. Forouzan, Richard F. Gilberg, Cengage Learning India
10. The ‘C’ programming language, Brian Kernighan, Dennis Ritchie, PHI
11. Programming in C ,A Practical Approach, Ajay Mittal , Pearson
12. Programming with C, B. Gottfried, 3rd edition, Schaum’s outline Series, Tata McGraw Hill.

• **Text Book :**

Parijat Publication - Problem Solving Using Computer and ‘C’ Programming
Parijat Publication- Advanced ‘C’ Programming.

Semester- I
Subject II :24CMP11102
Title : Lab course on C Programming

Teaching Scheme	No. of Credits	Examination Scheme
1 Hrs / week	2	CIA : 20 Marks ESE: 30 Marks

Course Objectives

- To understand the program development life cycle.
- Solve simple computational problems using modular design and basic features of the 'C' language.

Course Outcomes:-

On completion of this course, students will be able to :

- Devise pseudocodes and flowchart for computational problems.
- Write, debug and execute simple programs in 'C'.

Guidelines :

Lab Book: The lab book is to be used as a hands-on resource, reference and record of assignment submission and completion by the student. The lab book contains the set of assignments which the student must complete as a part of this course.

Submission:

Problem Solving Assignments:

The problem solving assignments are to be submitted by the student in the form of a journal containing individual assignment sheets. Each assignment includes the Assignment Title, Problem statement, Date of submission, Assessment date, Assessment grade and instructors sign.

Assessment:

Continuous assessment of laboratory work is to be done based on overall performance and lab assignments performance of student. Each lab assignment assessment will be assigned grade/marks based on parameters with appropriate weightage. Suggested parameters for overall assessment as well as each lab assignment assessment include- timely completion, performance, innovation, efficient codes and good programming practices.

Operating Environment:

For 'C' Programming :
Operating system: Linux
Editor: Any linux based editor like vi, gedit etc.
Compiler : cc or gcc

Suggested List of Assignments:

Lab course on C Programming

Assignment 1.	Problem Solving using Pseudocode and Flowchart, Simple programs, Understanding errors and error handling. &Decision Making Control Structures.
Assignment 2.	Datatypes and Program Execution
Assignment 3.	Decision Control Structure
Assignment 4.	Loop Control Structure
Assignment 5.	Functions (User Defined functions, Library functions and Recursion).
Assignment 6.	One Dimensional Arrays Implementation of 1D Array.
Assignment 7.	Two Dimensional Arrays 1. Implementation of 2D Array 2. Matrix Implementation using 2D arrays.
Assignment 8.	Pointers 1. Implementation of Arithmetic operation on Pointers. 2. Demonstration of call by value and call by reference.
Assignment 9.	Strings Implementation of String functions

Assignment 10.	Structure 1. Implementation of structure Programs 2. Implementation of array of structures.
Assignment 11.	Files 1. Implementation of file handling Programs

Semester- II

Subject I :24CMP12101

Course Title: DBMS & RDBMS

Teaching Scheme	No. of Credits	Examination Scheme
2 Hours / Week	2	CIA :20 Marks ESE: 30 Marks

Prerequisites

- Basic Knowledge of file system, storing data in file system and Operations on sets

Course Objectives

- To understand the fundamental concepts of databases.
- To understand user requirements and frame it in a data model.
- To understand creations, manipulation and querying of data in databases.

Course Outcomes

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

- Solve real world problems using appropriate set, function, and relational models.
- Design E-R Model for given requirements and convert the same into database tables.
- Use SQL.
- Use database techniques such as SQL & PL/SQL.
- Explain transaction Management in relational database System.
- Use advanced database Programming concepts

Course Contents

Chapter 1	**Introduction to DBMS**	**2 Hours**

1.1. Introduction
1.2. File system Vs DBMS
1.3. Levels of abstraction
1.4. Users of DBMS Advantages of DBMS

Chapter 2	**Conceptual Design**	**4 Hours**

2.1. Introduction to data models (E-R model, Relational model, Network model, Hierarchical model)
2.2. Conceptual design using ER data model (entities, attributes, entity sets, relations, relationship sets)
2.3. Constraints (Key constraints, Integrity constraints, referential integrity, unique constraint, Null/Not Null constraint, Domain, Check constraint, Mapping constraints)

Chapter 3	SQL	5 Hours
3.1. Introduction to query languages 3.2. Basic structure 3.3. DDL,DML Commands 3.4. Aggregate Operators and functions 3.5. Nested Subqueries 3.6 Introduction to joining relations (inner joins, outer joins and their types)		
Chapter 4	**Relational Database Design**	**4 Hours**
4.1. Introduction to Relational-Database Design 4.2.Introduction to Functional Dependency 4.3. Concept of Decomposition 4.4. Desirable Properties of Decomposition (Lossless join, Lossy join, Dependency Preservation) 4.5. Concept of normalization, Normal Forms (1NF,2NF and 3NF), Examples 4.6 Keys Concept with Examples : Candidate Keys and Super Keys, Algorithm to find the super keys / primary key for a relation		
Chapter 5	**Relational Database Design Using PLSQL**	**5 Hours**
5.1 Introduction to PLSQL 5.2 PL/PgSqL: Datatypes, Language structure 5.3 Stored Procedures 5.4 Stored Functions 5.5 Handling Errors and Exceptions 5.6 Cursors 5.7 Triggers		
Chapter 6	**Transaction Concepts and concurrency control**	**4 Hours**
6.1 Describe a transaction, properties of transaction, state of the transaction. 6.2 Executing transactions concurrently associated problem in concurrent execution. 6.3 Schedules, types of schedules, concept of Serializability, Precedence graph for Serializability. 6.4 Ensuring Serializability by locks, different lock modes, 2PL and its variations. 6.5 Deadlock and deadlock handling - Deadlock Avoidance(wait-die, wound-wait), Deadlock Detection and Recovery (Wait for graph).		

Chapter 7	**Database Integrity and Security Concepts**	**2 Hours**
7.1 Introduction to database security concepts 7.2 Methods for database security Discretionary access control method Mandatory access control 7.3 Overview of encryption techniques for security		
Chapter 8	**Crash Recovery**	**3 Hours**
8.1 Failure classification 8.2 Recovery concepts 8.3 Log base recovery techniques (Deferred and Immediate update) 8.4 Recovery with concurrent transactions (Rollback, checkpoints, commit) 8.5 Database backup and recovery from catastrophic failure.		
Chapter 9	**Other Databases**	**1 Hour**
9.1 Introduction to Parallel and distributed Databases 9.2 Multimedia Databases 9.3 Big Data Databases		

Reference Books:

1. Database System Concepts, Henry F. Korth, Abraham Silberschatz, S.Sudarshan,ISBN:9780071289597,Tata McGraw Hill Education
3. Database Management Systems, Raghu Ramakrishnan and Johannes Gehrke,McGraw Hill Science/Engineering/Math; 3 edition, ISBN: 9780072465631

Text Book: Parijat Publication - Relational Database Management Systems

Text Book : Parijat Publication - Database Management Systems.

Semester- II
Subject II -24CMP12102

Title : DBMS & RDBMS Practical

Teaching Scheme 1 Hours / week	No. of Credits 2	Examination Scheme CIA : 20 Marks ESE: 30Marks

Lab Book:
The lab book is to be used as a hands-on resource, reference and record of assignment submission and completion by the student. The lab book contains the set of assignments which the student must complete as a part of this course.

Assessment:
Continuous assessment of laboratory work is to be done based on overall performance and lab assignments performance of student. Each lab assignment assessment will be assigned grade/marks based on parameters with appropriate weightage. Suggested parameters for overall assessment as well as each lab assignment assessment include-timely completion, performance, innovation.

Suggested Assignments for RDBMS :

Assignment 1.	To create simple tables with only the primary key constraint (as a table level constraint & as a field level constraint) (include all data types)
Assignment 2	To create more than one table, with referential integrity constraint, PK constraint.
Assignment 3	1. To create one or more tables with following constraints, in addition to the first two constraints (PK & FK) a. Check constraint b. Unique constraint c. Not null constraint 2. To drop a table, alter schema of a table, insert / update / delete records using tables created in previous Assignments. (use simple forms of insert / update / delete statements)

Assignment 4	To query the tables using simple form of select statement Select from table [where order by] Select from table [where group by <> having <> order by <>]
Assignment 5	**To create views.**
Assignment 6	**Stored Function** 1) A Simple Stored Function 2) A Stored Function that returns 3) A Stored Function recursive
Assignment 7	**Cursors** 1) A Simple Cursor 2) A Parameterize Cursor
Assignment 8	**Triggers & Exception Handling** 1) Before Triggers (insert, update, delete) 2) After Triggers (insert, update, delete)
Books: Laboratory handbook prepared by the College.	